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CIVIL ENGINEERING REPORT INCORPORATING WATER CYCLE MANAGEMENT STRATEGY (RTS SUBMISSION)

SSD-31552370

42 RAYMOND AVENUE, MATRAVILLE NSW

Prepared For:
Hale Capital Partners
Level 13, 333 George Street,
SYDNEY NSW 2000

Prepared by:
Costin Roe Consulting
Level 4, 8 Windmill Street
WALSH BAY NSW 2000

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	Name	**Signature**
Prepared by	Daniel Soliman Denis Webber	
Reviewed by	Daniel Soliman	
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EXECUTIVE SUMMARY

Hale Capital Partners (Hale - the Applicant) are seeking to construct an industrial development located at 42 Raymond Avenue, Matraville.

The Proposal is considered a State Significant Development (SSD) and accordingly, an Environmental Impact Statement (EIS) has been prepared to support the SSD Application for the Proposal. This Water and Hydrology Assessment 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 soils and water including stormwater and stormwater management for both construction and operational phases of the development.

Revision D of this report has been prepared to include updates following the agency Response to Submission (RtS) phase, including additional overland flow assessment requested by Council.

Proposal overview

The proposed development is for a multi-level industrial warehouse distribution facility on a 1.9 Ha parcel of land. Works will include bulk earthworks, provision of services, building construction, and stormwater management. The existing site is noted to comprise hardstand and concrete associated with recent demolition of an existing industrial facility.

Access to the development would be made via Raymond Avenue.

Purpose of this assessment

This Water and Hydrology Impact Assessment has been prepared to address the following Secretary's Environmental Assessment Requirements (SEARs):

- Item Number 12: Ground and Water Conditions
- Item Number 13: Stormwater and Wastewater
- Item Number 14: Flooding Risk

Construction impacts

During the construction phase, a Sediment and Erosion Control Plan will be in place to ensure the downstream drainage system and receiving waters are protected from sediment laden runoff.

Operational impacts

During the operational phase of the development, the proposed stormwater quality treatment system incorporating the use of a treatment train of pit-filter baskets and proprietary filtration is proposed to mitigate any increase in stormwater pollutant load generated by the development. Best management practices have been applied to the development to ensure that the quality of stormwater runoff is not detrimental to the receiving environment.

Further it has been confirmed that the development considers flood and overland flow planning requirements. The development is categorised as a low flood hazard and the building will be constructed above the flood planning level. An overland flow path has been designed to convey waters from Raymond Avenue to Sydney Water Bunnerong Stormwater Channel No.11. The development does not increase runoff from existing conditions and, as such, the site discharge will not adversely affect any land drainage system or watercourse as a result of the development.

Conclusion

The hydrological assessment of the local site drainage confirms that recommended water quality and quantity measures will ensure that no adverse impacts result on receiving waterways as a result of the development.

The detail contained in this report provides sufficient information to show the consent authority that legal points of discharge and a suitable stormwater management strategy is available for the development and the requirements associated with the strategy. It is recommended the management strategies in this report be approved and incorporated into the future detailed design.

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1 INTRODUCTION & SCOPE

1.1 Introduction

Costin Roe Consulting Pty Ltd has been commissioned by Hale Capital Partners, on, to undertake a *Civil Engineering Report & Water Cycle Management Strategy* (WCMS) to accompany a State Significant Development Application (SSDA) with the NSW Department of Planning, Industry and Environment (DPIE) for an industrial development on the land.

This report presents a civil engineering assessment the property at 42 Raymond Avenue, Matraville, NSW. This report provides an assessment of the civil engineering characteristics of the development site and technical considerations of the following aspects:

- Earthworks & geotechnical considerations;
- Water Cycle Management Strategy (WCMS).

The WCMS comprises several key areas of stormwater and water management which are provided below. These key areas have been established with the aim to reduce impacts from the development on the surrounding environment and neighbouring properties. The water cycle management strategy identifies the management measures required to meet the targets set. The key water cycle management areas assessed in this report are:

- Storm Water Quantity;
- Storm Water Quality;
- Water Supply and Reuse;
- Flooding; and
- Erosion and Sediment Control

A request for Planning Secretary's Environmental Assessment Requirements (SEAR's) to the DPIE has been made by the applicant. Reference to **Appendix E** should be made for SSD-31552370 SEAR's dated 18 November 2021. **Section 1.3** of this report for specific responses to civil engineering and water management related items included in the SEAR's.

Revision D of this report has been prepared to include updates following the agency Response to Submission (RtS) phase, including additional overland flow assessment requested by Council.

1.2 Consultation

Consideration to the various stakeholders has been made in relation to the development, including Council and Sydney Water has been made during the assessment period.

- Consultations with Randwick City Council has included both emails and a Pre-Submission Meeting. The majority of the consultations have been regarding flooding and overland flow around the proposed development site.

- Consultations with Sydney Water has included both emails and phone calls to discuss the discharge requirements (quality and quantity) and discharge location.

1.3 SEAR's Responses

This report supports the EIS for the proposal and to address the NSW Department of Planning and Environment SEARS letter dated 18 November 2021, reference SSD-31552370.

We note the below "key issues and documentation" assessments are based on the standard Warehouse and Distribution Centre SEAR's document recently implemented (October 2021) by DPIE and following key areas in the document:

- *Item 12. Ground and Water Conditions,*
- *Item 13. Stormwater and Wastewater*
- *Item 14. Flooding Risk*

Further reference to the EIS prepared by Urbis should be made for confirmation of how the SEAR's have been addressed for non-civil engineering related items.

Table 1.1 provides a summary of the SEARs General Requirements which relate to water and hydrology, and where these have been addressed in this report.

Table 1.1. SEARs Warehouse and Distribution Centres Key Areas

SEAR's Key Item No. & Description	Issue & Assessment Requirements	How It Is Addressed	Location Within This Report
12. Ground and Water Conditions .	Provide an assessment of the potential impacts on soil resources, including related infrastructure and riparian lands on and near the site.	We note the site was previously developed as a warehouse with associated truck loading and circulation zones, and car parking areas. The previous warehouse has been demolished and the existing slab left in-situ. The site is noted to be located within an established industrial precinct. The proposed works involve filling and some minor cutting to the existing site. These works will be conducted generally on-top of the existing slab in order to raise	Refer to **Section 3** and geotechnical assessments by **PSM** for confirmation of soil resources and potential impacts.

SEAR's Key Item No. & Description	Issue & Assessment Requirements	How It Is Addressed	Location Within This Report
		the FFL to the flood planning level. Geotechnical investigations also confirm there will be minimal impact to existing soil resources, existing slab and soils.	
	Provide an assessment of the potential impacts on surface and groundwater resources (quality and quantity), including related infrastructure, hydrology, aquatic and groundwater dependent ecosystems, drainage lines, downstream assets and watercourses.	The site comprises a recently demolished existing industrial facility with significant remnant concrete/ impervious surfaces. The redevelopment of the land will not result in unacceptable impacts to any resources noting similar water quantity discharge and improved stormwater quality. We note no riparian lands or watercourses are located within the property boundary. We note the site is located adjacent to a Sydney Water Drainage Channel. The development though is clear of any riparian corridors or areas associated with this system. Refer to **Section 8** for soil and water management measures during construction, drawings in **appendix A** for associated erosion and sediment control drawings, and **Appendix C** for a Draft Soil and Water Management Plan. These sections show proposed measures, based on the Landcom document *Managing Urban Stormwater – Soils & Construction Volume 1 ('Blue*	Refer to **Section 4, 5 & 6** for assessment of water resources, hydrology (including quality and quantity), watercourses and riparian lands during operation.

SEAR's Key Item No. & Description	Issue & Assessment Requirements	How It Is Addressed	Location Within This Report
		Book')(Landcom, 2004), are proposed during the construction of the development. Measures proposed will limit potential for offsite impact associated with water runoff and soils during construction. Consideration to management of salinity and acid sulphate has been made based on the recommendations of the geotechnical investigations and noted Landcom document. Refer to Groundwater Quantity Letter by **PSM** for further discussion pertaining ground water conditions and potential impacts.	
	Identify predicted water discharge points to surface/groundwater and consider discharge quality against relevant water quality criteria.	A surface water runoff including surface water runoff, water quality and water quantity has been completed. The key stormwater objectives, based on relevant water sensitive urban design criteria, have been set out in **Section 4.1** and **Section 6.1** of the report. Discharge from the site is noted to be made to an existing Sydney Water Stormwater Drainage Culvert. **Section 6** provides demonstration of the key criteria being met, based on MUSIC modelling. Configuration of the proposed measures are shown on the	Refer to **Sections 4 & 6**

SEAR's Key Item No. & Description	Issue & Assessment Requirements	How It Is Addressed	Location Within This Report
		Civil Design Drawings included in **Appendix A**.	
	Provide a detailed site water balance including identification of water requirements for the life of the development, and measures to ensure an adequate and secure water supply.	Refer to infrastructure report prepared by Landpartners for water supply and wastewater assessments.	Refer to **Section 4, 5 & 6** for assessment of water resources, hydrology (including quality and quantity), watercourses and riparian lands.
	Provide an assessment of salinity and acid sulfate soil impacts.	Refer to **Section 3** and Acid Sulfate Soil Letter by **PSM** for confirmation of soil resources and potential impacts.	Refer to **Section 3**
13. Stormwater and Wastewater	Provide an Integrated Water Management Plan for the development that: • is prepared in consultation with the local council and any other relevant drainage or water authority. • details the proposed drainage design for the site including any on-site detention facilities, water quality	A surface water runoff including surface water runoff, water quality and water quantity has been completed. The key stormwater objectives, based on relevant water sensitive urban design criteria, have been set out in **Section 4.1** and **Section 6.1** of the report. The site comprises a recently demolished existing industrial facility with significant remnant concrete/ impervious surfaces. The redevelopment of the land will not result in unacceptable impacts to any resources noting similar water quantity discharge and improved stormwater quality.	Refer to **Section 4, 5 & 6** for assessment of water resources, hydrology (including quality and quantity), watercourses and riparian lands during operation.

SEAR's Key Item No. & Description	Issue & Assessment Requirements	How It Is Addressed	Location Within This Report
	management measures and the nominated discharge points, on-site sewage management, and measures to treat, reuse or dispose of water. • demonstrates compliance with the local council or other drainage or water authority requirements and avoids adverse impacts on any downstream properties.	Discharge from the site is noted to be made to existing Sydney Water Stormwater Channel.	
	Where drainage infrastructure works are required that would be handed over to the local council, or other drainage or water authority, provide full hydraulic details and detailed plans and specification of proposed works that have been prepared in consultation with, and comply with the relevant standards of, the local council	The proposal requires consideration to overland flow between Raymond Avenue and Sydney Water Drainage Culvert. Refer **Section 4** and drawings in **Appendix A** for detailed assessment of the existing and post development conditions pertaining to the inter-allotment culverts and overland flow path.	Refer to **Section 4** and **Appendix A**

SEAR's Key Item No. & Description	Issue & Assessment Requirements	How It Is Addressed	Location Within This Report
	or other drainage or water authority		
14. Flooding Risk	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.	The proposal requires consideration to overland flow between Raymond Avenue and Sydney Water Stormwater Channel. The development floor level has been set allowing for freeboard to the overland flow path of greater than 0.5m during the 1% AEP flood event. Freeboard greater than 0.5m during the 1% AEP flood event has also been achieved to the adjacent private detention basin. The requirements of council and NSW Floodplain Development Manual are met for this development.	Refer **Section 7** and **Appendix I** for assessments pertaining to flooding and overland flow.
	Assess the impacts of the development, including any changes to flood risk on-site or off-site, and detail design solutions and operational procedures to mitigate flood risk where required.	The assessments show the overland flow between Raymond Avenue and the Sydney Water Stormwater Drainage Culvert can be conveyed safely through the development site (with low hazard categorisation), flood planning considerations are met and the site has suitable flood immunity to the known flood behaviour, acceptable flood risk has been demonstrated.	Refer **Section 7** and **Appendix I** for assessments pertaining to flooding and overland flow.

2 DEVELOPMENT SITE

2.1 Location

The property is located within the Randwick City Council (RCC) local government area (LGA), as shown in **Figure 2.1.**

Figure 2.1. Site Location and Aerial Imagery (Source: Nearmap December 2021)

2.2 Existing Site Description

The site area is 1.9Ha.

The site is roughly rectangular in shape fronting Raymond Avenue at the north-east corner. The property is approximately 200m long with width varying between approximately 900m and 100m. The frontage along Raymond Avenue is approximately 45m.

To the north-west is the Sydney Water Bunnerong Stormwater Channel No. 11, to the south-west is a private detention system, to the south-east are existing industrial lots, and the north-east is Raymond Avenue and an existing industrial lot.

The site generally grades down from south-east to north-west. The highest level is RL 5.84m AHD along the south-eastern boundary. The lowest level on the existing slab on

is RL 5.69m at the north-west boundary of the site. The lowest level on the overall site is RL 5.50m at the south-west boundary of the site. The level of the frontage at Raymond Avenue is RL 6.86m AHD

2.3 Proposed Development

The proposed development is for the construction of a two-storey warehouse and distribution centre comprising 19,460m^2 GFA including ancillary office space, landscaping, bicycle and carpark 42 Raymond Avenue, Matraville comprising:

- Minor earthworks involving cut and fill works;
- Site preparation works and servicing;
- Warehouse, main office, ancillary office, dock office, loading docks, carparking, forklift charging room;
- External hardstands and landscaping;

The indicative site layout prepared by SBA Architects has been included in **Figure 2.2 & Figure 2.3**.

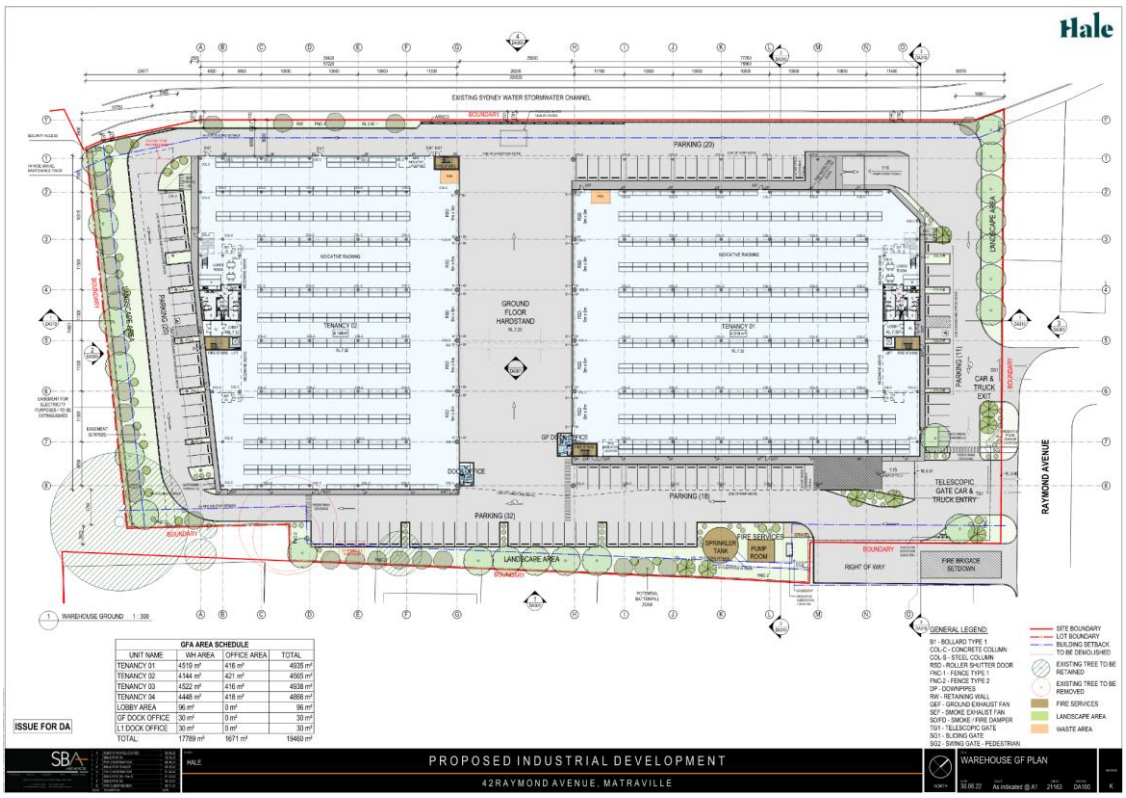


Figure 2.2. Proposed Development (Ground Level) – Concept Layout Plan

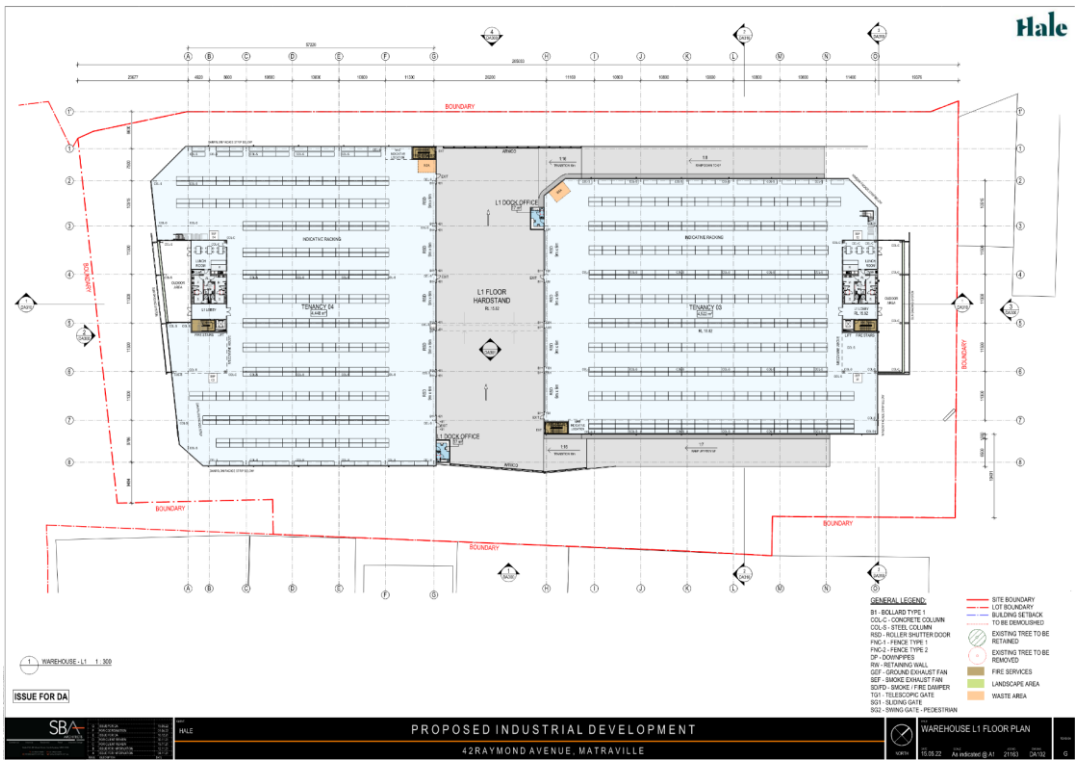


Figure 2.3. Proposed Development (First Level) – Concept Layout Plan

3 SITE WORKS

3.1 Soil and Geological Conditions

Assessment relating to soil have been undertaken by PSM (geotechnical investigation – PSM4375-003L REV2 dated 17 December 2021.

As referenced in the investigation by PSM the 1:100 000 Geological Series Sydney Geological Map indicates that the site is underlain by Quaternary Sand Sediments (Qhd); medium to fine grained "marine" sand with podsols.

The PSM Geotechnical report confirms that based on their detailed geotechnical investigation and historical use of the site, there should not be any geotechnical issues that would prevent the site from being developed as a light industry warehouse.

Acid sulphate soils are not likely to be present on the development site so are not considered to be an issue. Refer to the Acid Sulfate Soil Letter by **PSM** for confirmation of soil resources and potential impacts.

3.2 Bulk Earthworks

Bulk earthworks on the site will be minor overall and limited to minor import to lift the new building to a ground level of FFL 7.32m. This requires filling over the existing slab by approximately 1.50m. The existing slab was left in-situ during the demolition of the existing warehouse. The increase in floor level is proposed to ensure the building is sited 0.5m above the flood level (to ensure nuisance flooding from the Raymond Avenue is minimised).

Final levels would be subject to +/-0.5m variance to allow for variations in allowances for geotechnical conditions, final building layout and allowable building height, and drainage conditions.

Bulk earthworks will be required to facilitate the development of the site for industrial use. The earthworks will be undertaken to provide a large flat building pad, hardstand area and a car parking area. Earthworks are also required to facilitate access via Raymond Avenue and to provide an overland flow path through the site via the proposed carpark.

A high-level earthwork volume estimate assessment has been completed for the site. The estimated volumes are shown on the Costin Roe drawings in **Appendix A**.

The earthworks analysis has been completed to a level of detail to enable general pad levels to be set and to obtain an order of magnitude cut and fill volume estimate. Given the preliminary nature of the assessment, an upper and lower bound of earthworks volumes has been included to allow for contingency in cost planning estimates. The assessment in **Appendix A** is based on the earthworks using a building pad BEL of 6.52m AHD.

The primary drivers for the proposed earthworks levels are achieving the required flood planning levels as well as minimising the extent of external retaining walls which would require interface with adjacent properties to the south-east and with the adjacent drainage channel and basin to the south-west and north-west and while also minimising fill as much as practical.

The earthworks volume estimates are included in **Table 2.1**.

	Apparent Volume	Upper Bound (+15%)	Lower Bound (-15%)
Cut (m^3)	- 155	- 180	- 130
Fill (m^3)	+ 14,660	+ 16,860	+ 12,460
Detail Excavation (@ 1250m^3/ Ha)	- 3,860	- 4,440	- 3,280
Balance (m^3)	+ 10,645	+ 12,240	+ 9,050

Table 2.1. Earthwork Volume Estimates

Given the order of magnitude of the volume of earthworks and concept nature of the earthworks modelling, fill importation is expected to be able to be achieved through detail modelling exercise. Consideration to bulking of cut materials including sand, rock and clay materials should be allowed for. Bulking of clay would normally be expected to be 4% of the removed volume and rock bulking can be expected in the range of 8-12%. Sand bulking would be approximately 2%.

Spoil allowances for services trenches, retaining walls and detailed building excavation should also be made to avoid excessive unknown exports during later stages of the project. Allowances in the range of 1,250-2,500m^3/Ha can be expected depending on the type of development and final site layouts. This allowance is included in the earthworks assessment. As noted, an upper and lower bound of earthworks volumes has been included to allow for some of these items.

Soil Erosion and Sediment Control measures, including sedimentation basins are to be placed in accordance with submitted drawings and the *Soil and Water Management Plan* in **Section 8** and **Appendix C** of this report.

All geotechnical testing and inspections performed during the filling operations will be undertaken to Level 1 geotechnical control, in accordance with AS3798-2007.

3.3 Retaining Walls

The civil engineering objective is to minimise retaining walls within the constraints of the masterplan layout, allowable grading to suit industrial development and batters in landscaped areas where possible.

Retaining will be required along the Bunnerong Channel, along the north-western boundary of the site. This wall is noted to be approximately 3.0m high, however is buried 1.0-1.5m below the ground to minimise impact on the existing channel. As a result, the retaining wall along this boundary will be up to 2.0m in exposed height. These are anticipated to comprise modular masonry block system (Keystone) with reinforced soil backfill.

Retaining on the south-western property boundary is also required. This wall will be up to 1m in height, is anticipated to comprise reinforced concrete block system.

Location and indicative heights of retaining walls are shown on drawing **Co14452.00-C50**.

3.4 Embankment Stability

To assist in maintaining embankment stability permanent batters in clay will be no steeper than 3 horizontal to 1 vertical while temporary batters will be no steeper than 2 horizontal to 1 vertical.

Permanent batters will also be adequately vegetated or turfed which will assist in maintaining embankment stability.

Stability of batters and reinstatement of vegetation shall be in accordance with the submitted drawings and the *Soil and Water Management Plan* in **Section 8** and **Appendix C** of this report.

3.5 Groundwater

Groundwater was identified by PSM at depths between 3.0m and 3.5m below ground level. As there is limited excavation required for the development, and the site was previously fully developed with the existing slab to be left in-situ, impact from groundwater and on groundwater systems are considered negligible. Refer to Groundwater Quantity Letter by **PSM** for further discussion pertaining ground water conditions and potential impacts.

Surface water management, including conveyance of surface runoff, management of water quantity and water quality (using WSUD principles and best practice pollution reduction objective) has been proposed in the design.

3.6 Acid Sulphate Soils and Salinity

An assessment of the potential for salinity and acid sulphate soils has been requested as part of the SEAR's requirements.

We note the PSM report and acid sulfate risk maps show very low potential for acid sulfate soil impacts. The PSM report also confirms minimal impacts due to salinity. Refer to Salinity and Acid Sulfate Soil Letter by **PSM** for confirmation of soil resources and potential impacts.

4 WATER CYCLE MANAGEMENT STRATEGY & DRAINAGE METHODOLOGY

4.1 Key Areas and Objectives

Water Cycle Management (WCM) is a holistic approach that addresses competing demands placed on a region's water resources, whilst optimising the social and economic benefits of development in addition to enhancing and protecting the environmental values of receiving waters.

Developing a WCMS at the SSD stage of the land development process provides guidance on urban water management issues. This WCMS has been prepared to inform DPIE, and relevant stakeholders, that the development is able to provide and integrate WCM measures into the stormwater management strategy for the development.

The key WCM targets which have been adopted in the design are included in **Table 4.1** following, and included in the drawings found in **Appendix A**

Table 4.1. WCM Targets

Element	Target	Reference
Water Quantity	Minimise flooding from increased stormwater runoff due to development	
Water Quality	Load-based pollution reduction targets based on an untreated urbanised catchment: Gross Pollutants 90% Total Suspended Solids 85% Total Phosphorus 65% Total Nitrogen 45%	Sydney Water (Email dated 30 March 2021, Mr Jeya Jeyadevan). Refer to **Appendix F**
Flooding	Buildings set 0.5m above the 1% AEP flood level.	NSW Floodplain Development Manual.
Water Supply	Reduce Demand on non-potable water uses. Provide 50-70% reduction of non-potable uses.	
Construction Stormwater Management & Erosion and Sediment Control	A construction stormwater management plan and appropriate associated erosion and sedimentation control measures must be described in the environmental assessment for all stages of construction to mitigate potential impacts to surrounding properties.	Landcom Blue Book Council DPIE

A summary of the how each of the WCM objectives will be achieved are described below. Reference to the relevant sections of the report should be made for further and technical details relating to the WCM measures:

- *Stormwater Quantity Management (Refer **Section 5**)*

  The intent of this criterion is to reduce the impact of urban development on existing drainage system by limiting post-development discharge within the receiving waters to the pre-development peak, and to ensure no affectation of upstream, downstream or adjacent properties.

  Attenuation of stormwater runoff from the development is not required. The site discharges to a tidally influenced existing Sydney Water stormwater drainage system located on the land north of the property. The site is identified within the Randwick City Council – On-site detention Map and within the zone marked "*On-site detention is generally not required*".

  Refer to **Section 5** of the document for further discussion pertaining to water quantity management.

- *Stormwater Quality Management (Refer **Section 6**)*

  There is a need to target pollutants that are present in stormwater runoff to minimise the adverse impact these pollutants could have on downstream receiving waters.

  The required pollutant reductions are included in **Table 4.1** of this document and MUSIC modelling has been completed to confirm the reduction objectives can be met for the development.

  A series of Stormwater quality improvement devices (SQID's) have been incorporated in the design of the development. The proposed management strategy will include the following measures:

  - Primary treatment of external areas will be made via pit inserts.
  - Tertiary treatment of the development will be made via a proprietary filtration treatment system. Refer to drawings **Co14452.00-DA40.**
  - Some treatment will also be present by provision of rainwater reuse tanks on development sites through reuse and settlement within the tanks.

  Reference to **Section 6** of this document should be made for detailed Stormwater Quality modelling and measures.

- *Flood Management (refer **Section 7** and **Appendix I**)*

  The proposed development considered flooding and large rainfall events in relation to the adjacent regional detention system, and local runoff and overland flow paths including the overland flow from Raymond Avenue to the Sydney Water Stormwater Channel.

  Consideration to flood requirements has been made per Council Flood Management Policy. Refer **Section 7** and **Appendix I** for details.

The following measures have been incorporated in the design:

- All buildings are sited 500mm above the 1% AEP design flood level of local flow paths.
- Overland flow paths to manage runoff in large storm events have been made including achieving at least 500mm freeboard to building levels from the flow paths, noting that a greater level of flood immunity is provided to the building than that required by planning to ensure an appropriate level of risk to the building for the intended use.

- *Water Demand Reduction/ Rainwater Reuse (refer **Section 6.6**)*

  Rainwater reuse measures will be provided as part of this development design. Rainwater reuse will be required to reduce demand on non-potable uses by 50-70%. The reduction in demand will target non-potable uses such as toilet flushing and irrigation. **Refer Section 6.6**.

- *Stormwater Management During Construction (refer **Section 8**)*

  A construction stormwater management plan and associated erosion and sediment control measures is proposed based on *Landcom Blue Book* and Council requirements. The management measures take a staged approach from initial site establishment, construction stages and the period between the completion of the proposed infrastructure works and development of site.

4.2 Existing Site Drainage

The site was previously developed with the existing warehouse being demolished and the warehouse slab being left in-situ, which has been described in **Section 2.2**.

The site currently sheds stormwater as sheet flow to the existing Sydney Stormwater Drainage Channel located to the north-west of the site. The site has minimal existing formal inground drainage systems, with a several grated drains discharging directly into the Sydney Water Stormwater Channel.

4.3 Proposed Surface Water Drainage System

As per general engineering practice and the guidelines of Council, the proposed stormwater drainage system for the development will comprise a minor and major system to safely and efficiently convey collected stormwater run-off from the development to the legal point of discharge.

The minor system is to consist of a piped drainage system which has been designed to accommodate the 1 in 20-year ARI storm event (Q20). This results in the piped system being able to convey all stormwater runoff up to and including the Q20 event. The major system will be designed to cater for storms up to and including the 1 in 100-year ARI storm event (Q100). The major system will employ the use of defined overland flow paths, such as roads and open channels, to safely convey excess run-off from the site.

The design of the stormwater system for this site will be based on relevant national design guidelines, Australian Standard Codes of Practice, the standards of PCC and accepted engineering practice. Runoff from buildings will generally be designed in accordance with *AS 3500.3 National Plumbing and Drainage Code Part 3 – Stormwater Drainage*. Overall site runoff and stormwater management will generally be designed in accordance with the Institution of Engineers, Australia publication "*Australian Rainfall and Runoff*" (2019 Edition), Volumes 1 and 2 (AR&R).

Water quality and re-use are to be considered in the design to ensure that any increase in the detrimental effects of pollution are mitigated, Council Water Quality Objectives and Sydney Water Quality Objectives are met and that the demand on potable water resources is reduced.

The proposed drainage system will be required to convey the overland flow from upstream catchments south-east of the property through the site.

The legal point of discharge is a point specified by Council / Sydney Water where stormwater from a property can be discharged. The legal point of discharge is usually Council's / Sydney Water stormwater infrastructure (where available), the street kerb and channel for smaller developments or downstream receiving waters like an existing stream or gully, lake, pond or waterbody. Legal discharge for this site is via the existing Sydney Water Stormwater Channel located to the north-west of the site.

With reference to the drawings in **Appendix A,** the drainage system proposed can be described as follows:

- In-ground piped drainage system designed to the 5% AEP (1 in 20yr ARI);
- Site discharge via the existing Sydney Water Stormwater Channel.
- Treatment of stormwater via a proprietary filtration systems;
- Conveyance of overland flow from Raymond Avenue safely through the proposed carparking zone to the Sydney Water Drainage Channel.

4.4 Hydrologic Modelling and Analysis

4.4.1 Rainfall Data

Rainfall intensity Frequency Duration (IFD) data used as a basis for DRAINS modelling for the 2 to 100 Year ARI events, was taken from The Bureau of Meteorology Online IFD Tool.

4.4.2 Runoff Models

In accordance with the recommendations and standards of Council, the calculation of the runoff from storms of the design ARI has been calculated with the catchment modelling software DRAINS for internal drainage only.

Detailed hydraulic assessment of the internal drainage system will be calculated at detail/ construction certificate stage.

The design parameters for the DRAINS model are to be based on the recommendations as defined by council and parameters for the area and are as follows:

Table 4.1. DRAINS Parameters

Model	Model for Design and analysis run	Rational method	
	Rational Method Procedure	ARR2019	
	Soil Type-Normal	3.0	
	Paved (Impervious) Area Depression Storage	1	mm
	Supplementary Area Depression Storage	1	mm
	Grassed (Pervious) Area Depression Storage	5	mm
AMC	Antecedent Moisture Condition (ARI=1-5 years)	2.5	
AMC	Antecedent Moisture Condition (ARI=10-20 years)	3.0	
AMC	Antecedent Moisture Condition (ARI=50-100 years)	3.5	
	Sag Pit Blocking Factor (Minor Systems)	0	
	On Grade Pit Blocking Factor (Minor Systems)	0	
	Sag Pit Blocking Factor (Major Systems)	0.5	
	On Grade Pit Blocking Factor (Major Systems)	0.2	

4.5 Hydraulics

4.5.1 General Requirements

Hydraulic calculations will be carried out utilising DRAINS modelling software during the detail design stage to ensure that all surface and subsurface drainage systems perform to or exceed the required standard.

4.5.2 Freeboard

The calculated water surface level in open junctions of the piped stormwater system will not exceed a freeboard level of 150mm below the finished ground/ grate level, for the peak runoff from the Minor System runoff.

The calculated water surface for the peak runoff from the Major System runoff will not exceed a freeboard level of 500mm below the finished floor level of the building.

4.5.3 Public Safety

For all areas subject to pedestrian traffic, the product (dV) of the depth of flow d (in metres) and the velocity of flow V (in metres per second) will be limited to 0.4, for all storms up to the 100-year ARI.

For other areas, the dV product will be limited to 0.6 for stability of vehicular traffic (whether parked or in motion) for all storms up to the 100-year ARI.

4.5.4 Inlet Pit Spacing

The spacing of inlets throughout the site will be such that the depth of flow, for the Major System design storm runoff, will not exceed the top of the kerb (150mm above gutter invert).

4.5.5 Overland Flow (development lots)

Dedicated flow paths have been designed to convey all storms up to and including the 100-year ARI. These flow paths will convey stormwater from the site to the detention systems prior to discharge.

5 WATER QUANTITY MANAGEMENT

Randwick City Council Council's Part B DCP and Private Stormwater Code (WSUD) 2013 Developers Guideline require management of stormwater quantity for developments, with the intent of minimising flooding from the increased stormwater run-off due to the development.

Management of Stormwater Quantity has been considered for the site. Sydney Water has confirmed that any development at 42 Raymond Avenue, Matraville does not require on-site detention, refer **Appendix F.**

Further, as discussed in **Section 4.2** of this report, the property discharges directly into the Sydney Water Bunnerong Stormwater Channel No. 11, which is a tidally influenced water body. Providing on-site detention for discharge to this waterbody would not result in any improvements or changes to the flood levels or capacity for flow in the channel. The site is also currently 100% impervious. As such, upon development there will be no increase or changes in the flow rate or volume of runoff from the property.

Based on the above factors, no on-site detention systems are required or proposed for the development.

6 STORMWATER QUALITY, REUSE AND MAINTENANCE

6.1 Stormwater Quality Objectives

There is a need to provide a design which incorporates the principles of Water Sensitive Urban Design (WSUD) and to target pollutants that are present in the stormwater so as to minimise the adverse impact these pollutants could have on receiving waters and to also meet the requirements specified by Council.

Sydney Water (Mr Jeya Jeyadevan correspondence dated 30 March 2021) has nominated the requirements for stormwater quality prior to discharge to a Sydney Water asset, refer to **Appendix F**. The stormwater pollutant objectives are presented in terms of annual percentage pollutant reductions on a developed catchment and are included in **Table 4.1**.

6.2 Proposed Stormwater Treatment System

Developed impervious areas including roof, hardstand, car parking, roads and other extensive impervious areas are required to be treated by the Stormwater Treatment Measures (STM's). The STM's shall be sized according to the whole catchment area of the development. The STM's for the development shall be based on a treatment train approach to ensure that all the objectives above are met.

Components of the treatment train for the development are as follows:

- Primary treatment to the parking, roof, and hardstand areas is to be performed via the provision of pit inserts to all grated pits;
- Tertiary treatment is to be performed via Ocean Protect Stormfilters (or approved equivalent) prior to discharge from the site;
- A portion of the roof will also be treated via rainwater reuse and settlement within the rainwater tank.

6.3 Stormwater Quality Modelling

The MUSIC model was chosen to model water quality. By simulating the performance of stormwater management systems, MUSIC can be used to predict if the proposed systems and changes to land use are appropriate for their catchments and capable of meeting specified water quality objectives (CRC 2002). The water quality constituents modelled in MUSIC, of relevance to this report, include Total Suspended Solids (TSS), Total Phosphorus (TP) and Total Nitrogen (TN).

The pollutant retention criteria set as required by Council and nominated in **Section 4.1** of this report were used as a basis for assessing the effectiveness of the selected treatment trains.

The parameters used in the MUSIC model are presented in **Appendix B**. **Figure 6.1** below shows the MUSIC model layout.

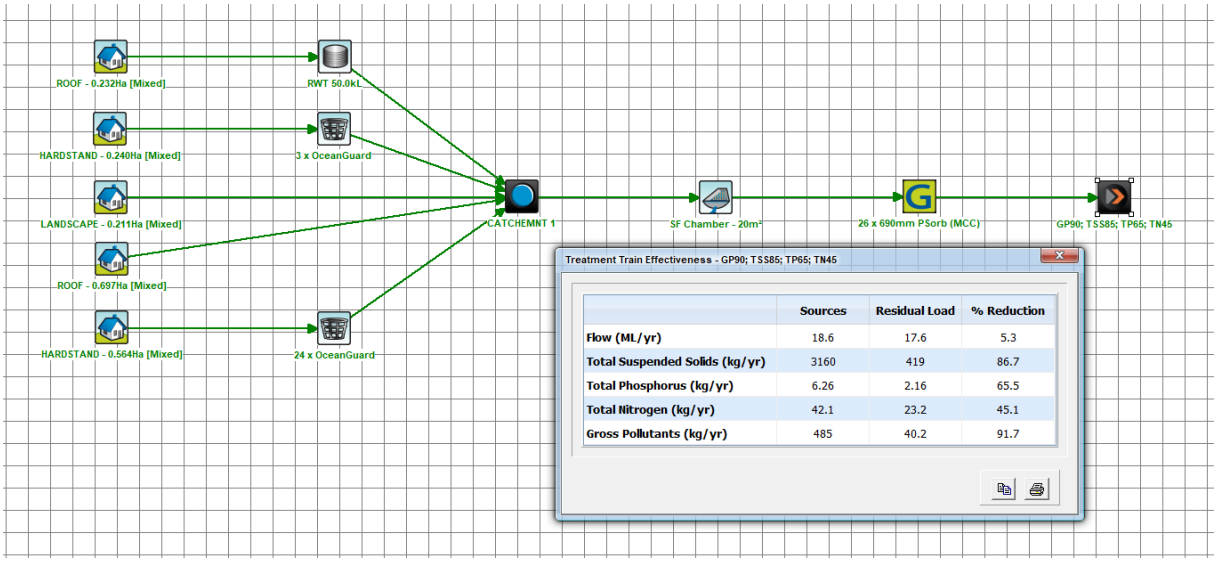


Figure 6.1. MUSIC model layout

Table 6.1 shows the results of the MUSIC analysis. The reduction rate is expressed as a percentage and compares the post-development pollutant loads without treatment versus post-development loads with treatment.

Table 6.1. MUSIC analysis results - % reductions

	Source	Residual Load	% Reduction Achieved	% Reduction Targets
Total Suspended Solids (kg/yr)	3160	419	86.7	85.0
Total Phosphorus (kg/yr)	6.26	2.16	65.5	65.0
Total Nitrogen (kg/yr)	42.1	23.2	45.1	45.0
Gross Pollutants (kg/yr)	485	40.2	91.7	90.0

MUSIC modelling has been performed to assess the effectiveness of the selected treatment trains and to ensure that the pollutant retention requirements of Council / Sydney Water have been met.

The MUSIC modelling has shown that the proposed treatment train of STM will provide stormwater treatment which will meet Council's and Sydney Waters reduction objective requirements in an effective and economical manner.

6.4 Stormwater Harvesting

Stormwater harvesting refers to the collection of stormwater from the developments internal stormwater drainage system for re-use in non-potable applications. Stormwater from the stormwater drainage system can be classified as either rainwater where the flow is from roof areas, or stormwater where the flow is from all areas of the development.

For the purposes of this development, we refer to a rainwater harvesting system, where benefits of collected stormwater from roof areas over a stormwater harvesting system can be made as rainwater is generally less polluted than stormwater drainage.

Rainwater harvesting is proposed for this development with re-use for non-potable applications. Internal uses include such applications as toilet flushing while external applications will be used for irrigation. The aim is to reduce the water demand for the development by 50-70%, subject to detail design .

In general terms the rainwater harvesting system will be an in-line tank for the collection and storage of rainwater. At times when the rainwater storage tank is full rainwater can pass through the tank and continue to be discharged via gravity into the stormwater drainage system. Rainwater from the storage tank will be pumped for distribution throughout the development in a dedicated non-potable water reticulation system. This however would be subject to future detail design.

Rainwater tanks have been designed, using MUSIC software to balance the supply and demand, based on the below base water demands and to provide 50-70% reduction in non-potable water demand. Rainwater tank reuse demands were calculated based on typical water demands of toilets and irrigation of landscaped areas. Water demands for toilets was calculated using 0.1kL/day/ toilet. Water demands for irrigation of landscaped areas was calculated using 0.3kL/year/m^2.

The above rates result in the following internal non-potable demand:

20 Toilets	2.0 kL/day

The above regime for the landscaped area for the site gives the following yearly outdoor water demand:

Irrigated Area (0.3kL/year/m^2)	2211m^2	663 kL/year
TOTAL		**663 kL/year**

6.4.1 Rainwater Tank Sizing

The use of rainwater reduces the mains water demand and the amount of stormwater runoff. By collecting the rainwater run-off from roof areas, rainwater tanks provide a valuable water source suitable for flushing toilets and landscape irrigation.

Rainwater tanks have been designed, using MUSIC software to balance the supply and demand, based on the calculated base water demands and proposed roof catchment areas. Allowances in the MUSIC model have been made for high flow bypass which will be managed by 300mm downpipe roofwater collection configuration along a portion of the northern elevation of the warehouse.

Table 6.4. Rainwater Reuse Requirements

Roof Catchment (m^2)	Highflow Bypass (L/s)	Tank Size in MUSIC (kL)	Predicted Demand Reduction (%)	Provided Tank (kL)
2320	100	50	68.74	50

The MUSIC model, results summarised in **Table 6.4**, predicts that the reuse demands of 50-70% will be met for the development with the provision of a minimum 50 kL rainwater tank.

We note that the final configuration and sizing of the rainwater tanks is subject to detail design considerations and optimum site utilisation.

6.5 Maintenance and Monitoring

It is important that each component of the stormwater system and water quality treatment train is properly operated and maintained. In order to achieve the design treatment objectives, an indicative maintenance schedule has been prepared and included as **Appendix D** to assist in the effective operation and maintenance of the various water quality components.

Inspection frequency may vary depending on site specific attributes and rainfall patterns in the area. In addition to the nominated frequency it is recommended that inspections are made following large storm events.

7 FLOODING AND OVERLAND FLOW

7.1 Introduction

An assessment of overland flow and flooding in relation to the proposed development has been completed. The assessment confirms the requirements of Randwick City Councils *Part B: General Controls DCP* and assessments as required of the SEAR's have been met.

Our review and assessment have been based on detail survey, the proposed development and assessment of the site in relation to the flood modelling and documented flood behaviour included *Randwick City Council GIS Report (document number: D04384959)* - refer to **Appendix G,** and TUFLOW modelling by Costin Roe Consulting (refer **Section 7.5** and **Appendix I)**. The GIS Report is noted to have been prepared by Randwick City Council dated 7 December 2021.

The site is noted to be located adjacent to a Sydney Water Stormwater Culvert (Bunnerong Stormwater Channel No.11). The site is noted as not being required to provide stormwater attenuation as discussed in detail in **Section 4.2 & 4.3** of this report.

We provide the following assessments pertaining to overland flow and flooding associated with the Sydney Water Stormwater Culvert and trunk drainage system. An overland flow TUFLOW model and assessment has been completed in relation to the overland flow path which is present between Raymond Avenue and the Bunnerong Channel, located on north-west of the property (as required by Council and their RtS submission). The following sections of the report describe the catchment description, flood description and proposed flood management.

Detailed technical information pertaining to the TUFLOW modelling and output completed by our office is included in **Appendix I**.

The site has minimal existing formal inground drainage systems, with the majority of water sheet-flowing towards the existing Sydney Water Stormwater Drainage Culvert and overland flow is present between Raymond Avenue and the drainage culvert (refer **Figure 7.2** and **7.5**). We note we understand the previous building on the property, which was recently demolished, discharged its roofwater and hardstands directly to the Bunnerong Channel.

We have included the following items as part of our review:

- Review of the Randwick City Council GIS Report (D04384959);
- Randwick City Council Flood Letter (D04384957). **Refer to Appendix H**;
- Review of Councils Floodplain Management Policy in relation to the development including review of potential impacts of the development on existing flooding, and potential impacts on the development from flooding.

7.2 Randwick City Council GIS Report (D04384959)

Extracts from a flood study of the Birds Gully catchment was provide by Randwick City Council. The study involved a hydrological and hydraulic assessment of the catchment at a regional level.

We provide excerpts of flooding associated with the 1% AEP storm event from the Flooding GIS report in **Figures 7.1, 7.2, 7.3, 7.4 and 7.5** below. **Figure 7.1** is noted to be an excerpt of the 1% AEP Flood Hazard; **Figure 7.2** is noted to be an excerpt of the 1% AEP Flood Fringe, Flood Storage and Floodway; **Figure 7.3** is noted to be an excerpt of the 1% AEP Flood Depth; **Figure 7.4** is noted to be an excerpt of the 1% AEP Flood Level; **Figure 7.5** is noted to be an excerpt of the 1% Level Cross-Section.

Discussion on flood behaviour is made in **Section 7.3**.

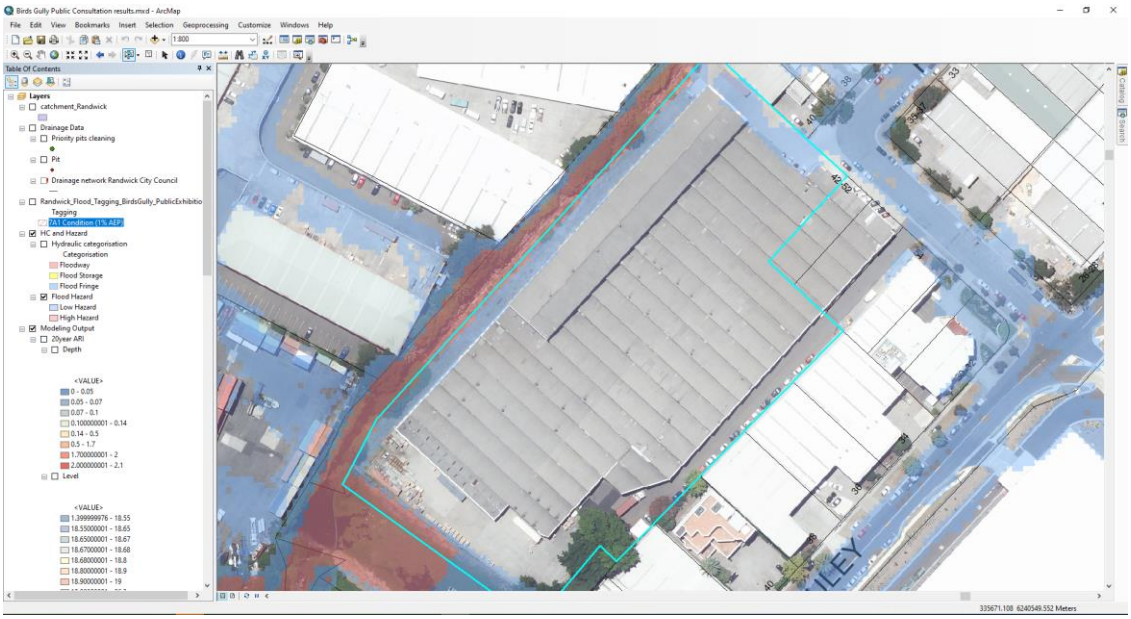


Figure 7.1. RCC Flood GIS – 1% AEP Flood Hazard

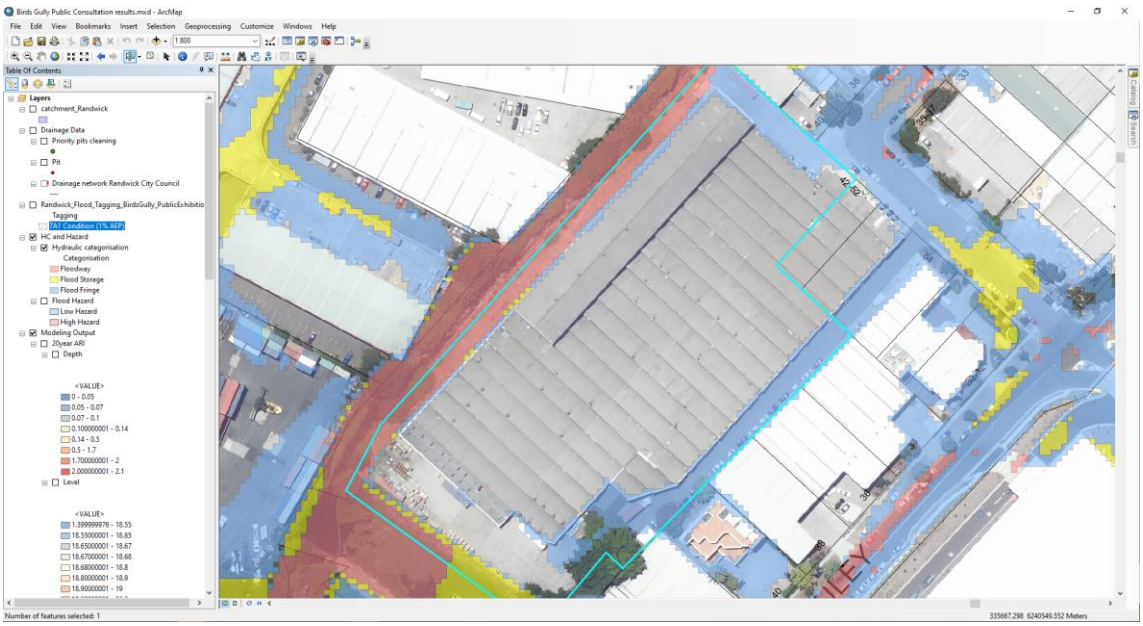


Figure 7.2. RCC Flood GIS – 1% AEP Flood Fridge, Flood Storage and Floodway

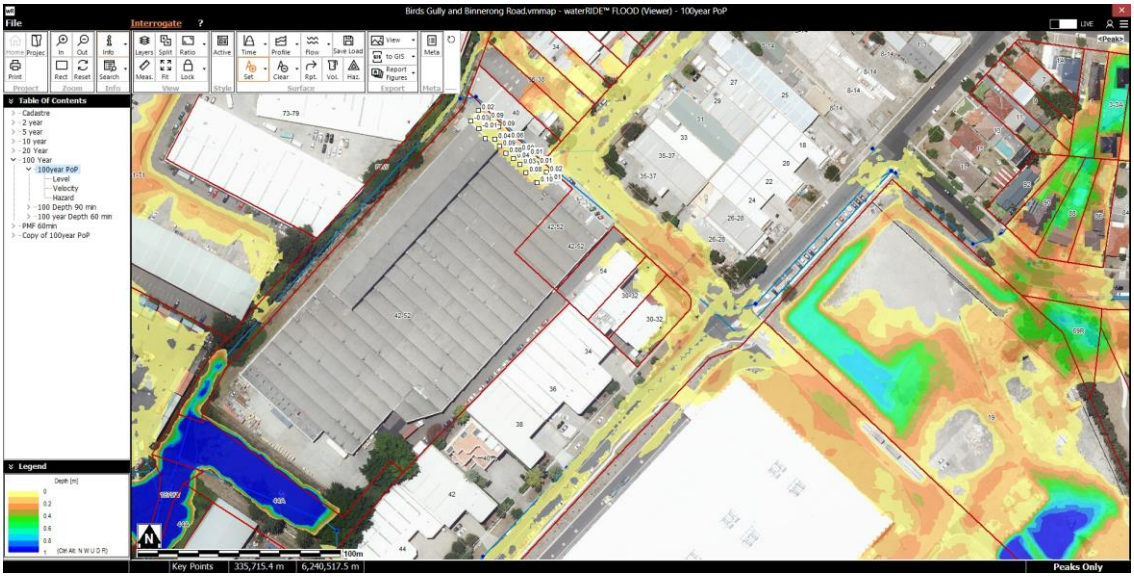


Figure 7.3. RCC Flood GIS – 1% AEP Flood Depth

Figure 7.4. RCC Flood GIS – 1% AEP Flood Level

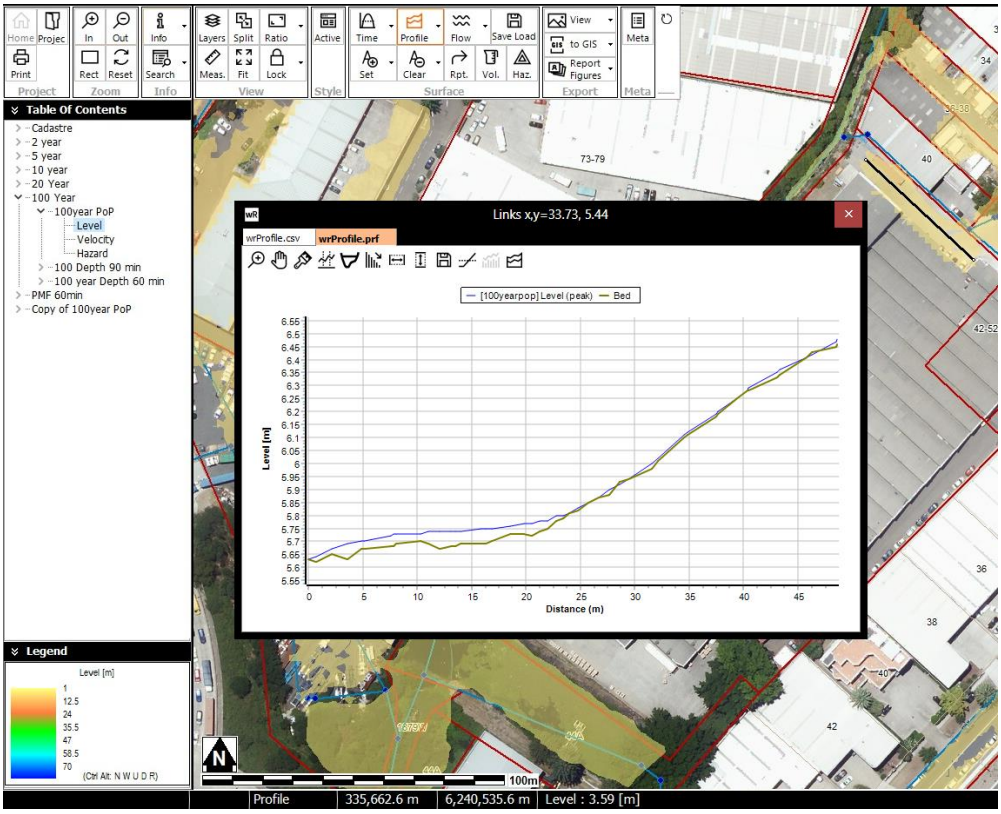


Figure 7.5. RCC Flood GIS – 1% AEP Level Cross-Section

7.3 Existing Overland Flow and Flood Behaviour

Councils GIS flood information shows the site is not affected by mainstream flooding associated with Bunnerong Channel in the 1% AEP flood event. Flood levels within Bunnerong Channel are quoted at RL 3.59m AHD. The existing site, generally at RL 5.8m AHD is approximately 2.2m above the mainstream flood level.

A minor overland flow path is noted on the north of the site which conveys overland flow from Raymond Avenue to the Bunnerong Channel, and roughly follows the alignment of a council drainage line which carries runoff from surrounding properties from Raymond Avenue to the Bunnerong Channel. The contributing catchment of this overland flow path is approximately 23Ha and, as described below, the overland flow is noted to be 0.1m in depth and velocity of less than 1.5m/s. The hazard categorisation of the flow path is noted to be H1 (generally safe for vehicles, people and buildings – refer **Section 7.6.2** for hazard categorisation definition).

With reference to **Figure 7.1**, the north-east and north-west (along the Bunnerong stormwater channel) of the site is categorised as low flood hazard during the 1% AEP storm with no flood hazards recorded to the south-east and south-west of the site. Raymond Avenue is classified as a low-hazard area.

With reference to **Figure 7.2**, the north-west of the site (along the stormwater channel) is classified as a Floodway during the 1% AEP storm. The north-east and south-east of the

site is classified as a Flood Fridge during the 1% AEP Flood Storm. The south-west of the site has no recorded flooding on the hardstand.

With reference to **Figure 7.3**, flood depths of up to 0.1m are recorded to the north-east of the site, on the overland flow path between Raymond Avenue and Sydney Water Bunnerong Stormwater Channel No. 11. No additional flooding is recorded for the remainder of the site.

With reference to **Figure 7.4** and **Figure 7.5**, flood levels between RL 6.66m to 5.69m AHD are recorded to the north-east of the site, on the overland flow path between Raymond Avenue and Sydney Water Bunnerong Stormwater Channel No. 11. The levels commence from RL 6.66m AHD along the frontage of Raymond Avenue and slope downwards towards the Stormwater Channel to a level of RL 5.69m AHD. No additional flooding is recorded for the remainder of the site.

7.4 Proposed Overland Flow Management Strategy

Council requires an assessment of the pre and post development overland flow conditions for the 1% AEP storm event. Further that the overland flow from the upstream catchment is able to be conveyed through the site without affection of upstream, downstream or adjacent properties in the 1% AEP.

A TUFLOW model has been prepared for the assessment as set out in the following sections of the report. The proposed management strategy allows for an overland flow path between Raymond Avenue to the Bunnerong Channel located in the parking area and vehicle circulation road on the east/ north-east of the development. Reference to drawings **Co14452.00-DA40** and **Section 3** on drawing **Co14452.00-DA55** should be made for details of the proposed flow path. Also reference to **Figures 7.6a** and **7.6b** should be made for excerpts of the flow path taken from the above noted drawings.

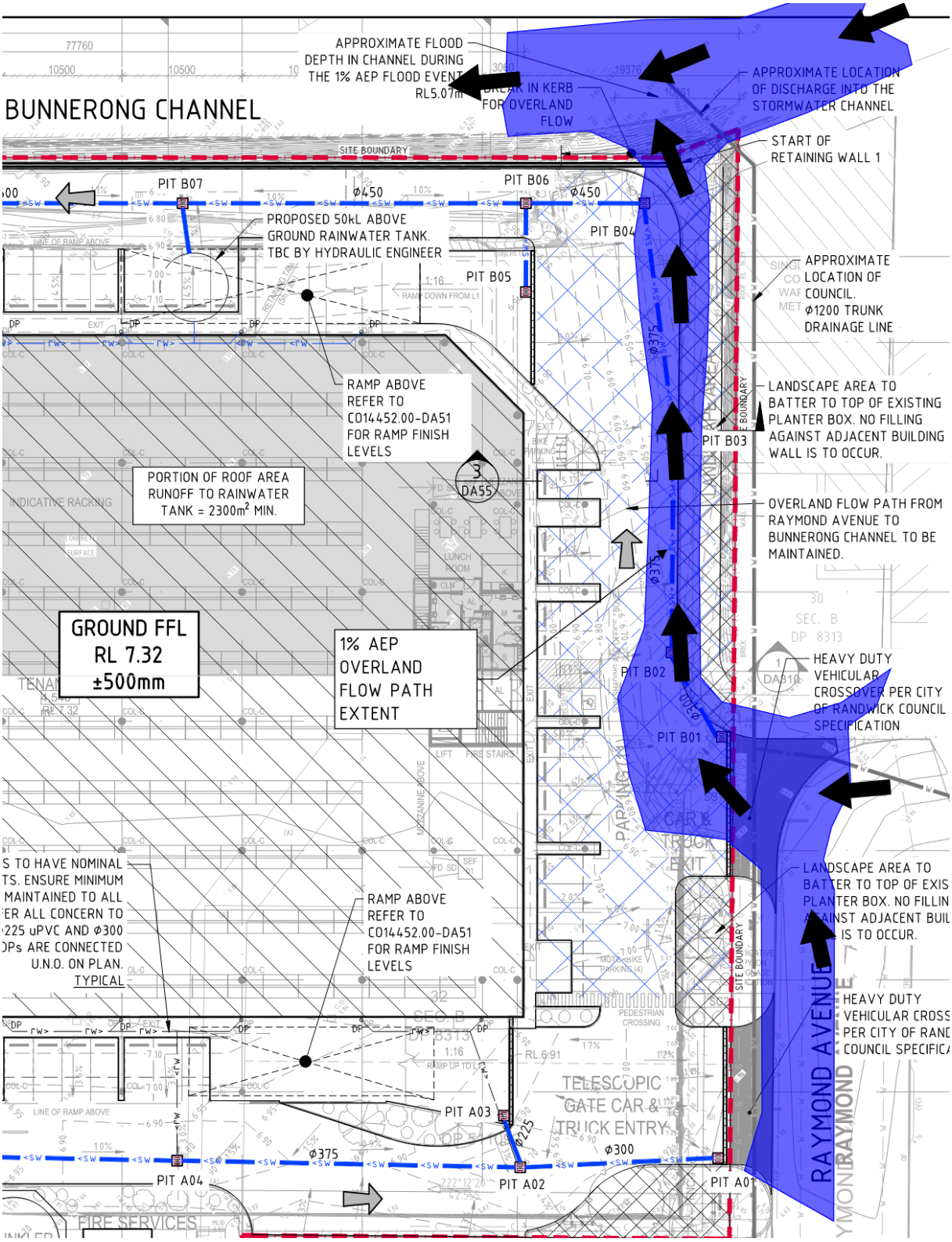


Figure 7.6a. Proposed Overland Flow Path (refer drawing Co14452.00-DA40)

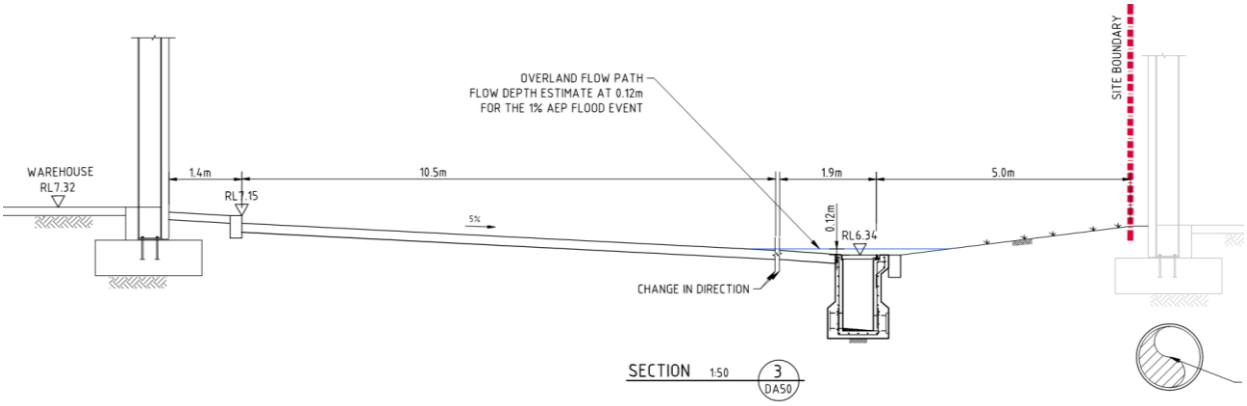


Figure 7.6b. Overland Flow Path Section (refer drawing Co14452.00-DA55)

7.5 Costin Roe Consulting Modelling

7.5.1 Introduction

A detailed site specific TUFLOW model of the pre and post development conditions has been completed by Costin Roe Consulting. The assessment being completed with consideration to Bayside City Council policy and the *NSW Floodplain Development Manual*. Technical parameters and detail included in the TUFLOW model are included as **Appendix I.**

The pre-developed model has been prepared utilising the flood levels and hydrographs as completed by our office, which has been verified against the flood information provided by Randwick City Council. Post development modelling has been completed with the introduction of the proposed development and overland flow path between Raymond Avenue and the Bunnerong Channel.

7.5.2 Pre-Development 1% AEP

Reference to **Figure 7.7** shows the pre-developed 1% AEP output for depth and levels. **Figure 7.8** shows velocity and **Figure 7.9** show true hazard categorisation.

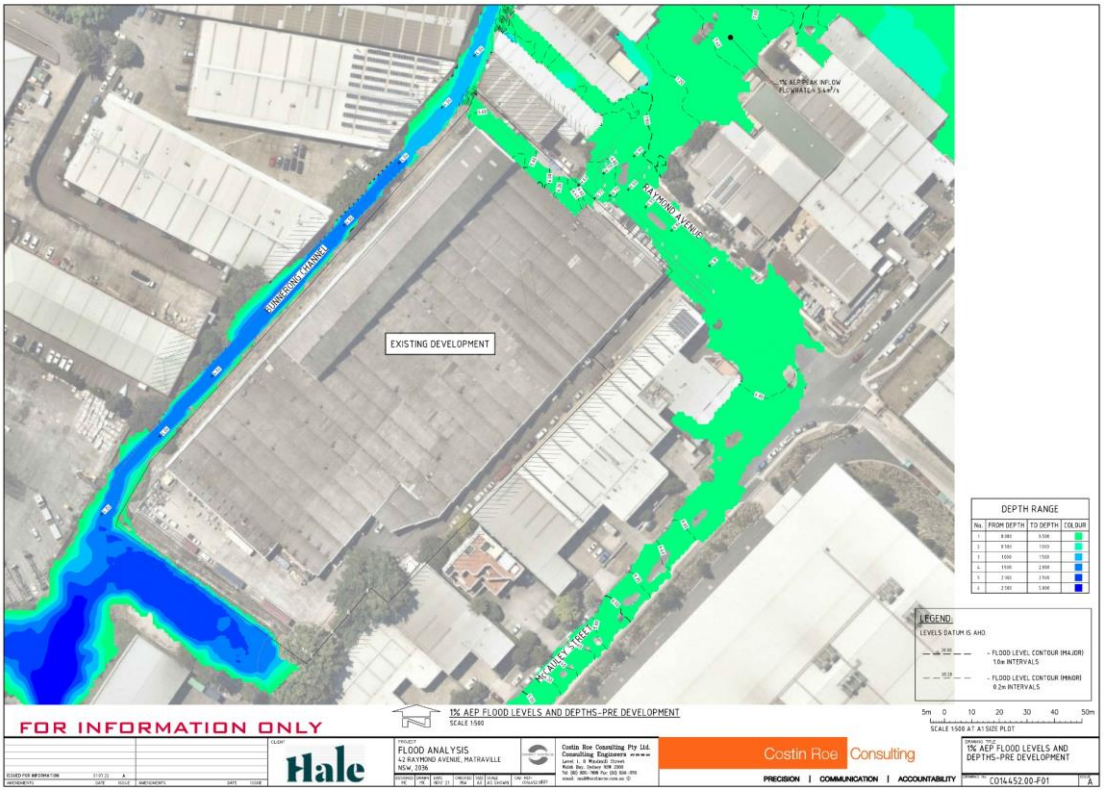


Figure 7.7: 1% AEP Pre-developed Level and Depth Output

Figure 7.8: 1% AEP Pre-developed Velocity

Figure 7.9: 1% AEP Pre-developed Flood Hazard Categorisation

7.5.3 Post-Development 1% AEP

Reference to **Figure 7.10** shows the post-developed 1% AEP output for depth and levels. **Figure 7.11** shows velocity and **Figure 7.12** show true hazard categorisation.

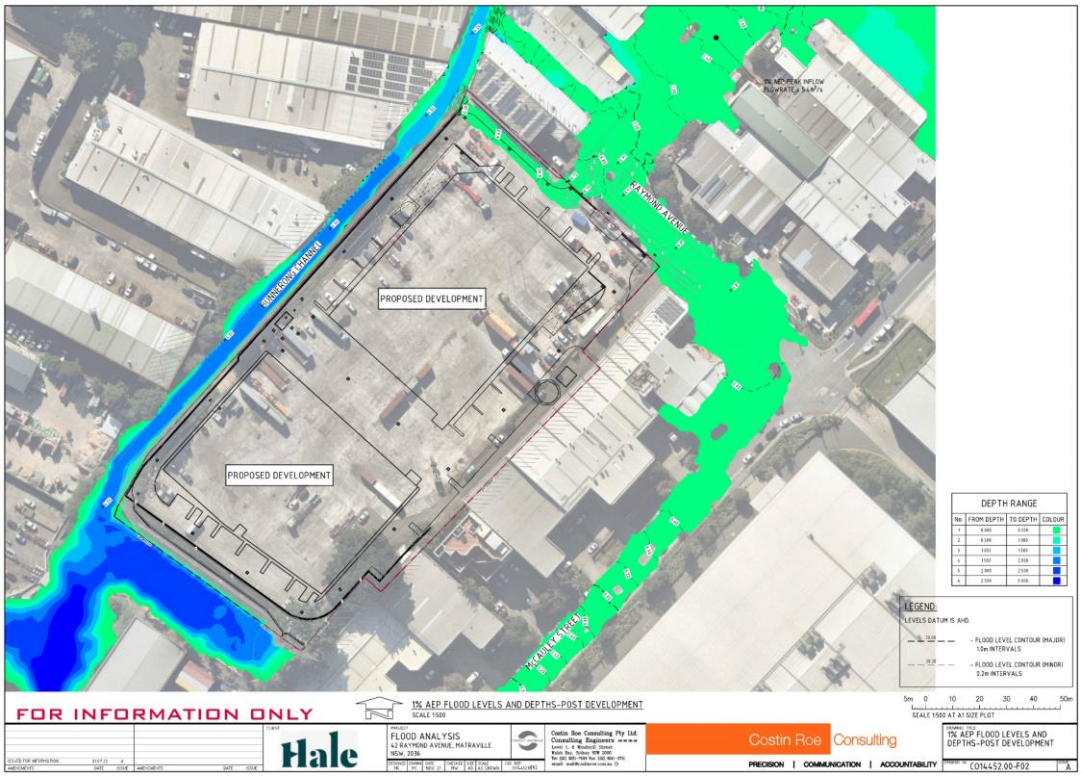


Figure 7.10: 1% AEP Post-developed Level and Depth Output

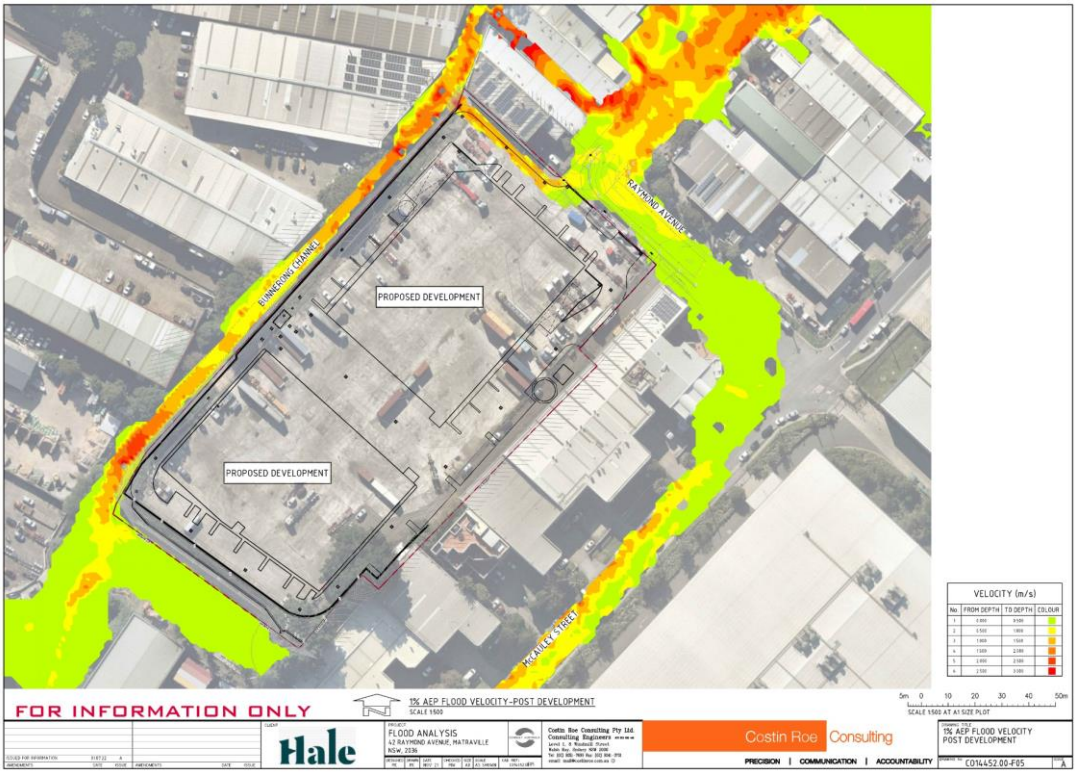


Figure 7.11: 1% AEP Post-developed Velocity

Figure 7.12: 1% AEP Post-developed Flood Hazard Categorisation

7.5.4 1% AEP Comparison

Figure 7.13 shows the 1% AEP flood level afflux (flood level difference) and **Figure 7.14** shows the 1% AEP velocity afflux, associated with the development.

The output for the 1% AEP storm event shows that:

- There is no upstream change to flood levels or velocity for any of the flow paths which enter the site;
- Flows within the site are able to be conveyed to the Bunnerong Channel within the proposed vehicle circulation pavement;
- Minor afflux (10-20mm) is experienced within the Bunnerong Channel. This is apparent locally at the entry of the overland flow path into the channel & has no impacts upstream or downstream within the channel.

Figure 7.13: 1% AEP Post Developed Flood Level Afflux

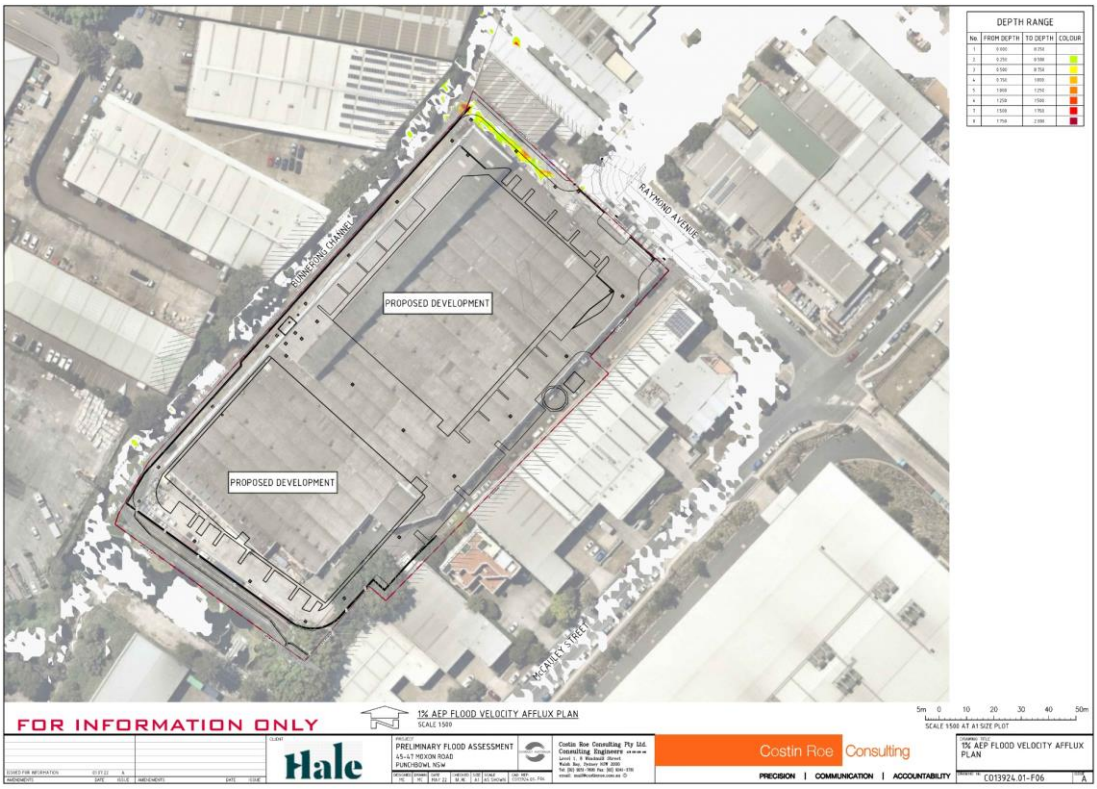


Figure 7.14: 1% AEP Post Developed Flood Velocity Afflux

7.6 Floodplain Management Considerations

7.6.1 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, 2005* recommends that the FPL generally be based on the 100-year ARI 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 Development 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.

The FPL defined in the *Floodplain Development Manual* is noted to be consistent with that of Bayside Council.

7.6.2 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.

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 within the site has been defined as H1 in relation to the overland flow path between Raymond Avenue and the Bunnerong Channel. It is noted that higher hazard categorisation is noted within Bunnerong Channel, which will be fenced from the site and has limited potential for interaction with occupants of the development.

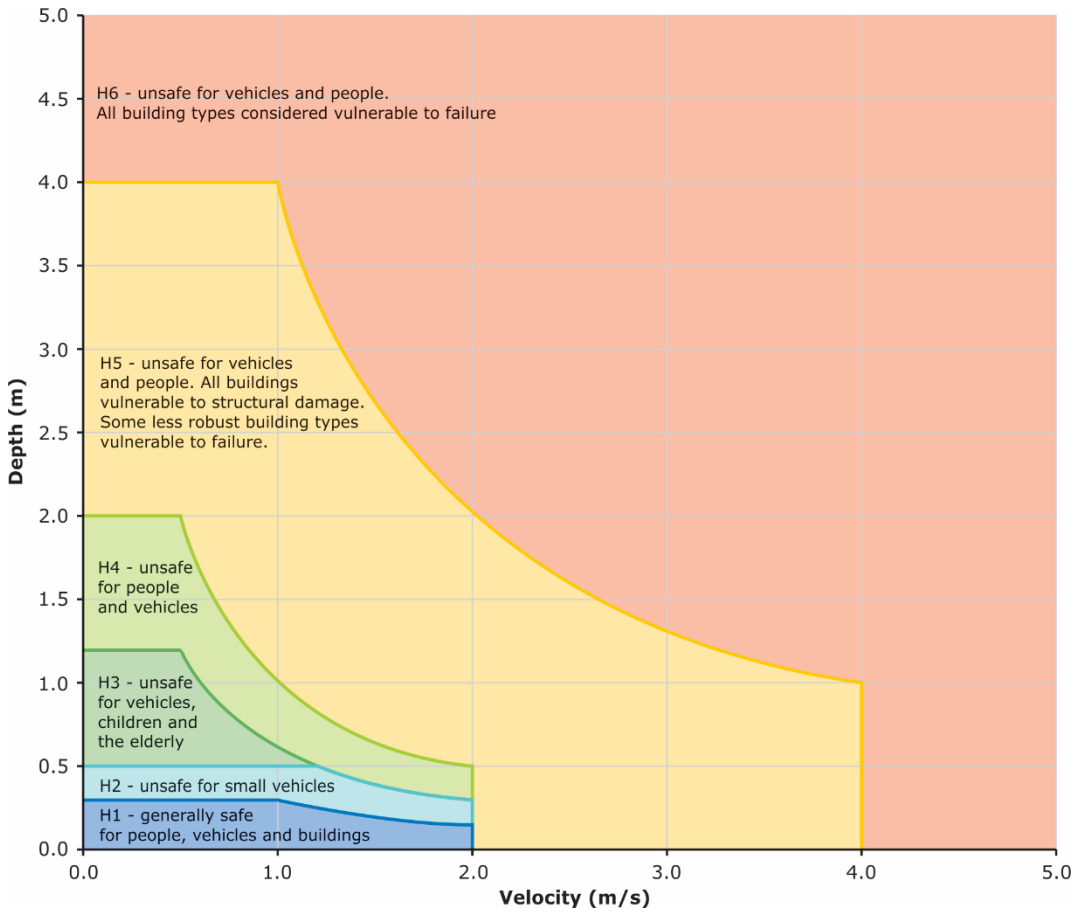


Figure 6.7.9. Combined Flood Hazard Curves (Smith et al., 2014)

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

7.6.3 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.

7.6.4 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.

7.7 Confirmation of Floodplain Management Requirements & Development Strategy

Councils *Floodplain Management Policy* provides relevant policy requirements relating to development in and around identified flood affected development sites.

The intent of the document is to ensure that new developments do not experience undue flood risk and that existing development is not adversely flood affected through increased damage or hazard as a result of new development.

The flood planning level (FPL) for business/ industrial to be at or above the 1% AEP (1 in 100-year ARI) flood level plus 0.5m freeboard as noted in **Section 7.4.1**. The FPL for

this site is RL 6.65m AHD (as per Randwick City Council Flood Letter D04384957 & confirmed by Costin Roe TUFLOW Modelling), associated with overland flow from Raymond Street. We note the proposed building level is RL 7.32m AHD and the lowest level on the site is noted to be RL 6.60m AHD.

The PMF or extreme event provides an upper limit of flooding and associated consequences for the problem being investigated. It is used for emergency response planning purposes to address the safety of people.

Provision of an overland flow path from Raymond Avenue to the Bunnerong Channel has been included in the design. This allows for unimpeded conveyance of overland flow without adverse impact to properties upstream, downstream or adjacent to the site. The arrangement of the overland flow path is depicted on drawing **Co14452.00-DA40, DA50 and DA55** in **Appendix A**. The design of the levels along the flow route have been completed to ensure the existing overland flow path and conveyance route is not impeded, and adequate capacity is maintained for the overland flow path. The flow path route has lowered to an RL6.65m between the driveway and the channel to maintain and enhance the existing flow path. It is estimated the peak 1% AEP flow within the overland flow path is less than $0.5m^3/s$, and the provided conveyance route ensures the existing H1 hazard categorisation has been maintained. This is confirmed in our TUFLOW modelling.

Overall flood risk for the development and from the development is considered low to negligible. The FFL of the warehouse is proposed to be constructed 0.67m above the council's specified flood planning level and the existing overland flow path between Raymond Avenue and Bunnerong Stormwater Channel No. 11 is maintained. Therefore, the development meets current council flood policy.

7.8 Flood Assessment Conclusion

A review of available flood study extracts has been made to determine flood behaviour in relation to the proposal.

Review of the available information, including Councils adopted flood study, shows the site is classified as a low flood hazard site during the 1% AEP Flood Event. The site is confirmed to be free of mainstream flooding associated with the adjacent Bunnerong Channel, however has a minor overland flow path which conveys runoff from Raymond Avenue to the Bunnerong Channel.

The proposed building FFL is set above the flood planning level specified by Randwick City Council.

The existing overland flow path between Raymond Avenue and Sydney Water Bunnerong Stormwater Channel No. 11 has been maintained and provisions for a H1 hazard categorisation.

Based on the assessment and management strategy proposed, the development meets current council flood policy and shows acceptable impacts in relation to flooding and flood safety.

8 CONSTRUCTION SOIL AND WATER MANAGEMENT

8.1 Soil and Water Management General

Without any mitigation measures and during typical construction activities, site runoff would be expected to convey a significant sediment load. A *Soil and Water Management Plan* (SWMP) and *Erosion and Sediment Control Plan* (ESCP), or equivalent, would be implemented for the construction of the Proposal. The SWMP and ESCPs would be developed in accordance with the principles and requirements of *Managing Urban Stormwater – Soils & Construction Volume 1 ('Blue Book')(Landcom, 2004)* with a staged approach.

In accordance with the principles included in the Blue Book, a number of controls have been incorporated into a preliminary Staged ESCP (refer to accompanying Drawings in **Appendix A**) and draft SWMP in **Appendix C**. The Staged ESCP considers initial site establishment, requirements during construction of the development, and completion of development works.

Section 1 provides a summary of the construction works for the Proposal. While all construction activities have the potential to impact on water quality, the key activities are:

- Erosion and sediment control installation.
- Grading of existing earthworks to suit building layout, drainage layout and pavements.
- Stormwater and drainage works.
- Service installation works.
- Building construction works.

The sections below outline the proposed controls for management of erosion and sedimentation during construction of the Proposal. The staged approach is noted to consider initial site establishment, construction of the development and the completion of the development, as included in the ESCP drawings **Appendix A**.

8.2 Typical Management Measures

Sediment Basins

Sediment basins have been considered as unnecessary for this development. **Refer CO14452.00-DA20** for the Rusle Calculation, per the Blue Book Guidelines Section 6.3.2.d

Sediment Fences

Sediment fences are located around the perimeter of the site to ensure no untreated runoff leaves the site. They have also been located around the existing drainage channels to minimise sediment migration into waterways and sediment basins.

Stabilised Site Access

For the proposal, stabilised site access is proposed at one location at the entry to the works area. This will limit the risk of sediment being transported onto Raymond Avenue and other public roads.

8.3 Other Management Measures

Other management measures that will be employed are expected to include:

- Minimising the extent of disturbed areas across the site at any one time.
- Progressive stabilisation of disturbed areas or previously completed earthworks to suit the proposal once trimming works are complete.
- Regular monitoring and implementation of remedial works to maintain the efficiency of all controls.

It is noted that the controls included in the preliminary ESCP are expected to be reviewed and updated as the design, staging and construction methodology is further developed for the Proposal.

9 CONCLUSION

This Civil Engineering Report has been prepared to support the State Significant Development Application for a Proposed Development at 42 Raymond Avenue, Matraville, NSW.

A civil engineering strategy for the site has been developed which provides a best practice solution within the constraints of the existing landform and proposed development layout. Within this strategy a stormwater quantity and quality management strategy has been developed to consider peak flows and reduce pollutant loads in stormwater leaving this site. The stormwater management for the development has been designed in accordance with Randwick City Council and Sydney Water requirements and ensuring acceptable impacts relating to the development.

The hydrological assessment shows local post development flows from the site will be consistent with pre-development flows and demonstrates that the site discharge will not adversely affect any land, drainage systems or watercourse as a result of the development.

During the construction phase, a Sediment and Erosion Control Plan will be in place to ensure the downstream drainage system and receiving waters are protected from sediment laden runoff.

During the operational phase of the development, a treatment train incorporating the use of a proprietary filtration system is proposed to mitigate any increase in stormwater pollutant load generated by the development. MUSIC modelling results indicate that the proposed STM are effective in reducing pollutant loads in stormwater discharging from the site and meet the requirements of Council's and Sydney Water's pollution reduction targets. Best management practices have been applied to the development to ensure that the quality of stormwater runoff is not detrimental to the receiving environment.

It is recommended the management strategies in this report be approved and incorporated into the future detailed design.

10 REFERENCES

- Development Control Plan Guide B (2013), Randwick City Council
- Private Stormwater Code (2013), Randwick City Council
- 42 Raymond Avenue – Preliminary Flood Risk Assessment (2021), BMT Commercial Australia
- NSW Government (2005). *Floodplain Development Manual.*
- Managing Urban Stormwater: Harvesting and Reuse – 2006 (NSW DEC);
- Managing Urban Stormwater: Source Control – 1998 (NSW EPA);
- Managing Urban Stormwater: Treatment Techniques – 1997 (NSW EPA);
- Landcom (2004). *Managing Urban Stormwater – Soils and Construction* – 4th Edition.

Appendix A

DRAWINGS BY COSTIN ROE CONSULTING

PROPOSED INDUSTRIAL DEVELOPMENT
42 RAYMOND AVENUE, MATRAVILLE, NSW, 2036
CIVIL DRAWINGS FOR DEVELOPMENT APPLICATION

DRAWING LIST:

DRAWING NO.	DRAWING TITLE
CO14552.00-DA10	DRAWING LIST & GENERAL NOTES
CO14552.00-DA20	EROSION & SEDIMENT CONTROL PAN
CO14552.00-DA25	EROSION & SEDIMENT CONTROL DETIALS
CO14552.00-DA30	BULK EARTHWORKS PLAN
CO14552.00-DA35	BULK EARTHWORKS SECTIONS
CO14552.00-DA40	STORMWATER DRAINAGE PLAN - GROUND LEVEL
CO14552.00-DA41	STORMWATER DRAINAGE PLAN - LEVEL 1
CO14552.00-DA45	STORMWATER DRAINAGE DETAILS - SHEET 1
CO14552.00-DA46	STORMWATER DRAINAGE DETAILS - SHEET 2
CO14552.00-DA50	FINISHED LEVELS PLAN - GROUND LEVEL
CO14552.00-DA51	FINISHED LEVELS PLAN - LEVEL 1
CO14552.00-DA55	TYPICAL SECTIONS

GENERAL NOTES:

1. THESE DRAWINGS SHALL BE READ IN CONJUNCTION WITH ALL ARCHITECTURAL AND OTHER CONSULTANTS' DRAWINGS AND SPECIFICATIONS AND WITH SUCH OTHER WRITTEN INSTRUCTIONS AS MAY BE ISSUED DURING THE COURSE OF THE CONTRACT. ANY DISCREPANCY SHALL BE REFERRED TO THE ENGINEER BEFORE PROCEEDING WITH THE WORK.
2. ALL MATERIALS AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE RELEVANT AND CURRENT STANDARDS AUSTRALIA CODES AND WITH THE BY-LAWS AND ORDINANCES OF THE RELEVANT BUILDING AUTHORITIES EXCEPT WHERE VARIED BY THE PROJECT SPECIFICATION.
3. ALL DIMENSIONS SHOWN SHALL BE VERIFIED BY THE BUILDER ON SITE.
   ENGINEER'S DRAWINGS SHALL NOT BE SCALED FOR DIMENSIONS.
   ENGINEER'S DRAWINGS ISSUED IN ANY ELECTRONIC FORMAT MUST NOT BE USED FOR DIMENSIONAL SETOUT.
   REFER TO THE ARCHITECT'S DRAWINGS FOR ALL DIMENSIONAL SETOUT INFORMATION.
4. DURING CONSTRUCTION THE STRUCTURE SHALL BE MAINTAINED IN A STABLE CONDITION AND NO PART SHALL BE OVERSTRESSED. TEMPORARY BRACING SHALL BE PROVIDED BY THE BUILDER TO KEEP THE WORKS AND EXCAVATIONS STABLE AT ALL TIMES.
5. UNLESS NOTED OTHERWISE ALL LEVELS ARE IN METRES AND ALL DIMENSIONS ARE IN MILLIMETRES.
6. ALL WORKS SHALL BE UNDERTAKEN IN ACCORDANCE WITH ACCEPTABLE SAFETY STANDARDS & APPROPRIATE SAFETY SIGNS SHALL BE INSTALLED AT ALL TIMES DURING THE PROGRESS OF THE JOB.

ELECTRONIC INFORMATION NOTES:

1. THE ISSUED DRAWINGS IN HARD COPY OR PDF FORMAT TAKE PRECEDENCE OVER ANY ELECTRONICALLY ISSUED INFORMATION, LAYOUTS OR DESIGN MODELS.
2. THE CONTRACTOR'S DIRECT AMENDMENT OR MANIPULATION OF THE DATA OR INFORMATION THAT MIGHT BE CONTAINED WITHIN AN ENGINEER-SUPPLIED DIGITAL TERRAIN MODEL AND ITS SUBSEQUENT USE TO UNDERTAKE THE WORKS WILL BE SOLELY AT THE DISCRETION OF AND THE RISK OF THE CONTRACTOR.
3. THE CONTRACTOR IS REQUIRED TO HIGHLIGHT ANY DISCREPANCIES BETWEEN THE DIGITAL TERRAIN MODEL AND INFORMATION PROVIDED IN THE CONTRACT AND/OR DRAWINGS AND IS REQUIRED TO SEEK CLARIFICATION FROM THE SUPERINTENDENT.
4. THE ENGINEER WILL NOT BE LIABLE OR RESPONSIBLE FOR THE POSSIBLE ON-GOING NEED TO UPDATE THE DIGITAL TERRAIN MODEL, SHOULD THERE BE ANY AMENDMENTS OR CHANGES TO THE DRAWINGS OR CONTRACT INITIATED BY THE CONTRACTOR.

EXISTING SERVICES NOTES:

1. DURING THE EXECUTION OF WORKS, THE CONTRACTOR SHALL MAINTAIN THE INTEGRITY OF EXISTING SERVICES. THE CONTRACTOR SHALL REPAIR ANY DAMAGE CAUSED TO THE EXISTING SERVICES TO THE SATISFACTION OF THE SUPERINTENDENT AND THE RELEVANT SERVICE AUTHORITY, AT NO COST TO THE PRINCIPAL.
2. WHERE IT IS NECESSARY TO REMOVE, DIVERT OR CUT INTO ANY EXISTING SERVICE, THE CONTRACTOR SHALL GIVE AT LEAST THREE (3) DAYS NOTICE OF ITS REQUIREMENTS TO THE SUPERINTENDENT, WHO WILL ADVISE WHAT ARRANGEMENTS SHOULD BE MADE FOR THE ALTERATION OF SUCH EXISTING WORKS.
3. EXISTING SERVICES HAVE BEEN PLOTTED FROM SUPPLIED DATA. THE ACCURACY IS NOT GUARANTEED. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO ESTABLISH THE LOCATION AND LEVEL OF ALL EXISTING SERVICES PRIOR TO COMMENCING WORK. ALL CLEARANCES AND APPROVALS SHALL ALSO BE OBTAINED FROM THE RELEVANT SERVICE AUTHORITY PRIOR TO THE COMMENCEMENT OF WORK.
4. ALL NEW AND EXHUMED SERVICES THAT CROSS EXISTING AND FUTURE ROADS/PAVEMENTS WITHIN THE SITE SHALL BE BACKFILLED WITH DGB20 MATERIAL TO SUBGRADE LEVEL AND COMPACTED TO 98% STANDARD DENSITY RATIO. SUBJECT TO PRIOR APPROVAL FROM RELEVANT AUTHORITY.
5. ON COMPLETION OF SERVICES INSTALLATION. ALL DISTURBED AREAS SHALL BE RESTORED TO ORIGINAL, INCLUDING KERBS, FOOTPATHS, CONCRETE AREAS, GRAVEL AREAS, GRASSED AREAS AND ROAD PAVEMENTS.
6. CARE TO BE TAKEN WHEN EXCAVATING NEAR UTILITY SERVICES. NO MECHANICAL EXCAVATION TO BE UNDERTAKEN OVER SERVICES. LIAISE WITH RELEVANT AUTHORITY.
7. THE CONTRACTOR SHALL ALLOW FOR THE CAPPING OFF, EXCAVATION AND REMOVAL IF REQUIRED OF ALL EXISTING SERVICES IN AREAS AFFECTED BY THE WORKS WITHIN THE CONTRACT AREA AS SHOWN ON THE DRAWINGS UNLESS DIRECTED OTHERWISE BY THE SUPERINTENDENT. ALL TO REGULATORY AUTHORITY STANDARDS AND APPROVAL.
8. THE CONTRACTOR IS TO MAINTAIN EXISTING STORMWATER DRAINAGE FLOWS THROUGH THE ROADS AT ALL TIMES. MAKE DUE ALLOWANCE FOR ALL SUCH FLOWS AT ALL TIMES.
9. PRIOR TO COMMENCEMENT OF ANY WORKS THE CONTRACTOR SHALL OBTAIN THE SUPERINTENDENT'S APPROVAL OF THE PROGRAM FOR THE RELOCATION/CONSTRUCTION OF TEMPORARY SERVICES.
10. CONTRACTOR SHALL CONSTRUCT TEMPORARY SERVICES AS REQUIRED TO MAINTAIN EXISTING SUPPLY TO BUILDINGS REMAINING IN OPERATION DURING WORKS TO THE SATISFACTION AND APPROVAL OF THE SUPERINTENDENT. ONCE DIVERSION IS COMPLETE AND COMMISSIONED THE CONTRACTOR SHALL REMOVE ALL SUCH TEMPORARY SERVICES AND MAKE GOOD TO THE SATISFACTION OF THE SUPERINTENDENT.
11. INTERRUPTION TO SUPPLY OF EXISTING SERVICES SHALL BE DONE SO AS NOT TO CAUSE ANY INCONVENIENCE OR DAMAGE TO THE ADJACENT RESIDENCES. CONTRACTOR TO GAIN APPROVAL OF THE SUPERINTENDENT FOR TIME OF INTERRUPTION.
12. THE CONTRACTOR SHALL UNDERTAKE A DIAL BEFORE YOU DIG (DBYD 1100) SERVICES SEARCH BEFORE THE COMMENCEMENT OF ANY WORKS.

SITE LOCATION PLAN
NTS

FOR DEVELOPMENT APPLICATION

AMENDMENTS	DATE	ISSUE
FOR DEVELOPMENT APPLICATION	10.03.22	C
FOR INFORMATION	15.12.21	B
PRELIMINARY ONLY	02.12.21	A

AMENDMENTS	DATE	ISSUE

ARCHITECT
SBA ARCHITECTS
Commercial Industrial Residential Sustainable Design
Suite 702, 83 Mount Street, North Sydney NSW 2060
T 02 9929 9988 F 02 9929 8899
E info@sbaarch.com.au W www.sbaarch.com.au

CLIENT
Hale

PROJECT
INDUSTRIAL DEVELOPMENT
42 RAYMOND AVENUE, MATRAVILLE
NSW, 2036

DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF:
DW	JB	NOV' 21	DS	B1	AS SHOWN	CO14452.00-DA 10

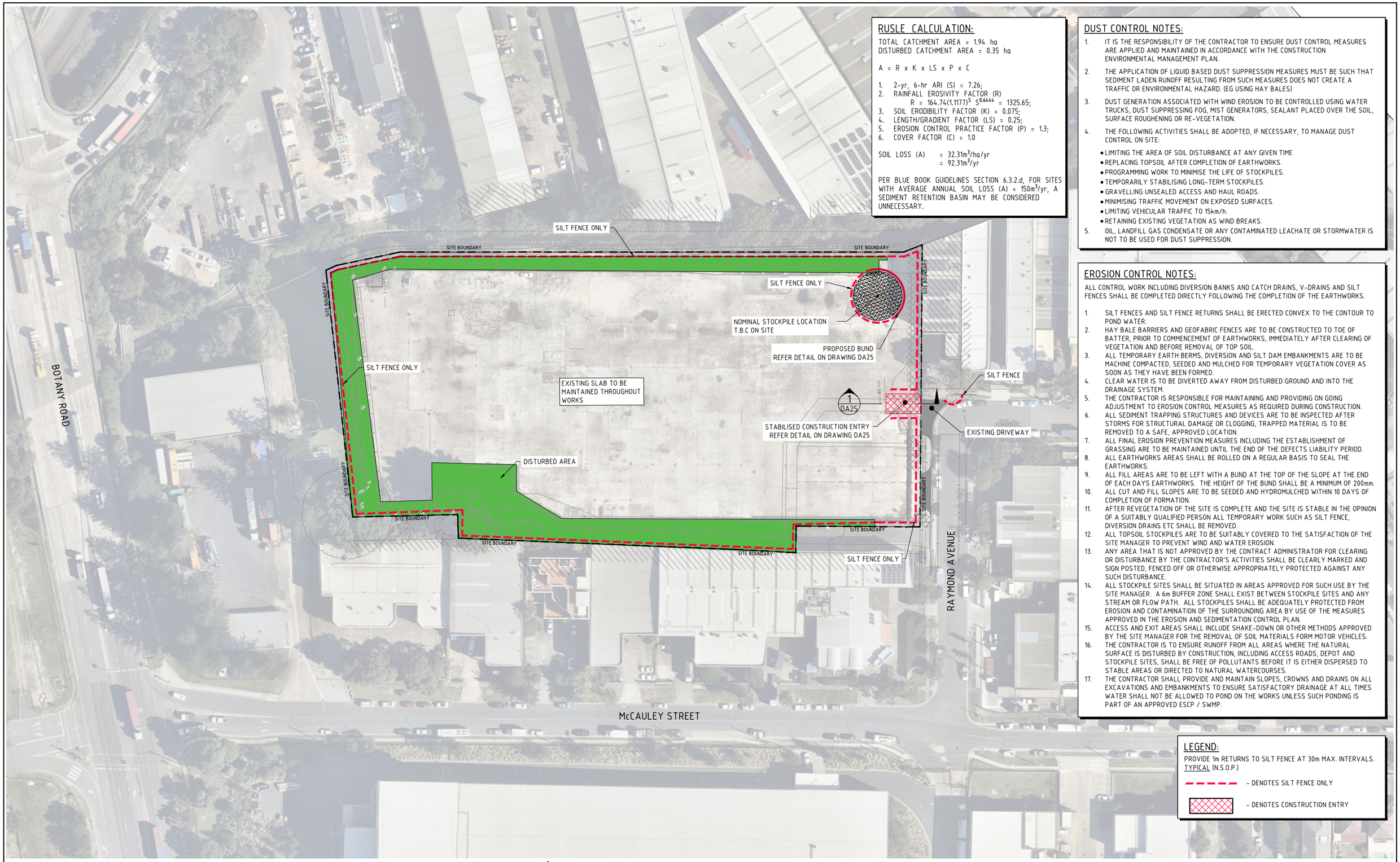
CONSULT AUSTRALIA

Costin Roe Consulting Pty Ltd.
Consulting Engineers ACN 003 696 448
Level 1, 8 Windmill Street
Walsh Bay, Sydney NSW 2000
Tel: (02) 9251-7699 Fax: (02) 9241-3731
email: mail@coetinroe.com.au ©

Costin Roe Consulting
PRECISION | COMMUNICATION | ACCOUNTABILITY

DRAWING TITLE
DRAWING LIST & GENERAL NOTES

DRAWING No CO14452.00-DA10
ISSUE C



RUSLE CALCULATION:

TOTAL CATCHMENT AREA = 1.94 ha
DISTURBED CATCHMENT AREA = 0.35 ha

A = R x K x LS x P x C

1. 2-yr, 6-hr ARI (S) = 7.26;
2. RAINFALL EROSIVITY FACTOR (R)
   $R = 164.74(1.1177)^S S^{0.6444} = 1325.65$;
3. SOIL ERODIBILITY FACTOR (K) = 0.075;
4. LENGTH/GRADIENT FACTOR (LS) = 0.25;
5. EROSION CONTROL PRACTICE FACTOR (P) = 1.3;
6. COVER FACTOR (C) = 1.0

SOIL LOSS (A) = $32.31 m^3/ha/yr$
= $92.31 m^3/yr$

PER BLUE BOOK GUIDELINES SECTION 6.3.2.d, FOR SITES WITH AVERAGE ANNUAL SOIL LOSS (A) < $150 m^3/yr$, A SEDIMENT RETENTION BASIN MAY BE CONSIDERED UNNECESSARY.

DUST CONTROL NOTES:

1. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO ENSURE DUST CONTROL MEASURES ARE APPLIED AND MAINTAINED IN ACCORDANCE WITH THE CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN.
2. THE APPLICATION OF LIQUID BASED DUST SUPPRESSION MEASURES MUST BE SUCH THAT SEDIMENT LADEN RUNOFF RESULTING FROM SUCH MEASURES DOES NOT CREATE A TRAFFIC OR ENVIRONMENTAL HAZARD. (EG USING HAY BALES)
3. DUST GENERATION ASSOCIATED WITH WIND EROSION TO BE CONTROLLED USING WATER TRUCKS, DUST SUPPRESSING FOG, MIST GENERATORS, SEALANT PLACED OVER THE SOIL, SURFACE ROUGHENING OR RE-VEGETATION.
4. THE FOLLOWING ACTIVITIES SHALL BE ADOPTED, IF NECESSARY, TO MANAGE DUST CONTROL ON SITE:
   - LIMITING THE AREA OF SOIL DISTURBANCE AT ANY GIVEN TIME
   - REPLACING TOPSOIL AFTER COMPLETION OF EARTHWORKS.
   - PROGRAMMING WORK TO MINIMISE THE LIFE OF STOCKPILES.
   - TEMPORARILY STABILISING LONG-TERM STOCKPILES.
   - GRAVELLING UNSEALED ACCESS AND HAUL ROADS.
   - MINIMISING TRAFFIC MOVEMENT ON EXPOSED SURFACES.
   - LIMITING VEHICULAR TRAFFIC TO 15km/h.
   - RETAINING EXISTING VEGETATION AS WIND BREAKS.
5. OIL, LANDFILL GAS CONDENSATE OR ANY CONTAMINATED LEACHATE OR STORMWATER IS NOT TO BE USED FOR DUST SUPPRESSION.

EROSION CONTROL NOTES:

ALL CONTROL WORK INCLUDING DIVERSION BANKS AND CATCH DRAINS, V-DRAINS AND SILT FENCES SHALL BE COMPLETED DIRECTLY FOLLOWING THE COMPLETION OF THE EARTHWORKS.

1. SILT FENCES AND SILT FENCE RETURNS SHALL BE ERECTED CONVEX TO THE CONTOUR TO POND WATER.
2. HAY BALE BARRIERS AND GEOFABRIC FENCES ARE TO BE CONSTRUCTED TO TOE OF BATTER, PRIOR TO COMMENCEMENT OF EARTHWORKS, IMMEDIATELY AFTER CLEARING OF VEGETATION AND BEFORE REMOVAL OF TOP SOIL.
3. ALL TEMPORARY EARTH BERMS, DIVERSION AND SILT DAM EMBANKMENTS ARE TO BE MACHINE COMPACTED, SEEDED AND MULCHED FOR TEMPORARY VEGETATION COVER AS SOON AS THEY HAVE BEEN FORMED.
4. CLEAR WATER IS TO BE DIVERTED AWAY FROM DISTURBED GROUND AND INTO THE DRAINAGE SYSTEM.
5. THE CONTRACTOR IS RESPONSIBLE FOR MAINTAINING AND PROVIDING ON GOING ADJUSTMENT TO EROSION CONTROL MEASURES AS REQUIRED DURING CONSTRUCTION.
6. ALL SEDIMENT TRAPPING STRUCTURES AND DEVICES ARE TO BE INSPECTED AFTER STORMS FOR STRUCTURAL DAMAGE OR CLOGGING, TRAPPED MATERIAL IS TO BE REMOVED TO A SAFE, APPROVED LOCATION.
7. ALL FINAL EROSION PREVENTION MEASURES INCLUDING THE ESTABLISHMENT OF GRASSING ARE TO BE MAINTAINED UNTIL THE END OF THE DEFECTS LIABILITY PERIOD.
8. ALL EARTHWORKS AREAS SHALL BE ROLLED ON A REGULAR BASIS TO SEAL THE EARTHWORKS.
9. ALL FILL AREAS ARE TO BE LEFT WITH A BUND AT THE TOP OF THE SLOPE AT THE END OF EACH DAYS EARTHWORKS. THE HEIGHT OF THE BUND SHALL BE A MINIMUM OF 200mm.
10. ALL CUT AND FILL SLOPES ARE TO BE SEEDED AND HYDROMULCHED WITHIN 10 DAYS OF COMPLETION OF FORMATION.
11. AFTER REVEGETATION OF THE SITE IS COMPLETE AND THE SITE IS STABLE IN THE OPINION OF A SUITABLY QUALIFIED PERSON ALL TEMPORARY WORK SUCH AS SILT FENCE, DIVERSION DRAINS ETC SHALL BE REMOVED.
12. ALL TOPSOIL STOCKPILES ARE TO BE SUITABLY COVERED TO THE SATISFACTION OF THE SITE MANAGER TO PREVENT WIND AND WATER EROSION.
13. ANY AREA THAT IS NOT APPROVED BY THE CONTRACT ADMINISTRATOR FOR CLEARING OR DISTURBANCE BY THE CONTRACTOR'S ACTIVITIES SHALL BE CLEARLY MARKED AND SIGN POSTED, FENCED OFF OR OTHERWISE APPROPRIATELY PROTECTED AGAINST ANY SUCH DISTURBANCE.
14. ALL STOCKPILE SITES SHALL BE SITUATED IN AREAS APPROVED FOR SUCH USE BY THE SITE MANAGER. A 6m BUFFER ZONE SHALL EXIST BETWEEN STOCKPILE SITES AND ANY STREAM OR FLOW PATH. ALL STOCKPILES SHALL BE ADEQUATELY PROTECTED FROM EROSION AND CONTAMINATION OF THE SURROUNDING AREA BY USE OF THE MEASURES APPROVED IN THE EROSION AND SEDIMENTATION CONTROL PLAN.
15. ACCESS AND EXIT AREAS SHALL INCLUDE SHAKE-DOWN OR OTHER METHODS APPROVED BY THE SITE MANAGER FOR THE REMOVAL OF SOIL MATERIALS FORM MOTOR VEHICLES.
16. THE CONTRACTOR IS TO ENSURE RUNOFF FROM ALL AREAS WHERE THE NATURAL SURFACE IS DISTURBED BY CONSTRUCTION, INCLUDING ACCESS ROADS, DEPOT AND STOCKPILE SITES, SHALL BE FREE OF POLLUTANTS BEFORE IT IS EITHER DISPERSED TO STABLE AREAS OR DIRECTED TO NATURAL WATERCOURSES.
17. THE CONTRACTOR SHALL PROVIDE AND MAINTAIN SLOPES, CROWNS AND DRAINS ON ALL EXCAVATIONS AND EMBANKMENTS TO ENSURE SATISFACTORY DRAINAGE AT ALL TIMES WATER SHALL NOT BE ALLOWED TO POND ON THE WORKS UNLESS SUCH PONDING IS PART OF AN APPROVED ESCP / SWMP.

LEGEND:

PROVIDE 1m RETURNS TO SILT FENCE AT 30m MAX. INTERVALS.
TYPICAL (N.S.O.P.)

- DENOTES SILT FENCE ONLY
- DENOTES CONSTRUCTION ENTRY

EROSION & SEDIMENT CONTROL PLAN

SCALE 1:500

5m 0 10 20 30 40 50m
SCALE 1:500 AT B1 SIZE SHEET

FOR DEVELOPMENT APPLICATION

AMENDMENTS	DATE	ISSUE
FOR DEVELOPMENT APPLICATION	10.03.22	C
FOR INFORMATION	15.12.21	B
PRELIMINARY ONLY	02.12.21	A

AMENDMENTS	DATE	ISSUE

ARCHITECT
SBA ARCHITECTS
Commercial Industrial Residential Project Interior Design
Suite 702, 83 Mount Street, North Sydney NSW 2060
T 02 9929 9988 F 02 9929 8899
E info@sbaarch.com.au W www.sbaarch.com.au

CLIENT
Hale

PROJECT
INDUSTRIAL DEVELOPMENT
42 RAYMOND AVENUE, MATRAVILLE
NSW, 2036

DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF:
DW	JB	NOV' 21	DS	B1	AS SHOWN	C014452.00-DA 20

Costin Roe Consulting Pty Ltd.
Consulting Engineers ACN 003 696 448
Level 1, 8 Windmill Street
Walsh Bay, Sydney NSW 2000
Tel: (02) 9251-7699 Fax: (02) 9241-3731
email: mail@coetinroe.com.au ©

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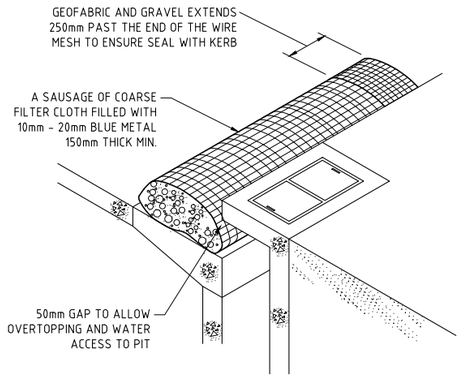
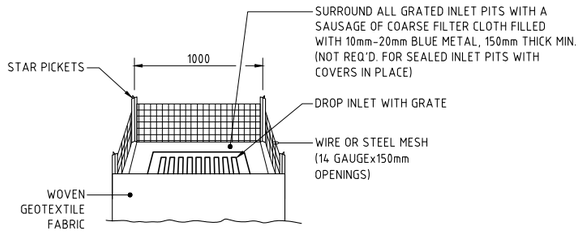
EROSION AND SEDIMENT CONTROL PLAN

DRAWING No C014452.00-DA20
ISSUE C



KERB INLET CONTROL

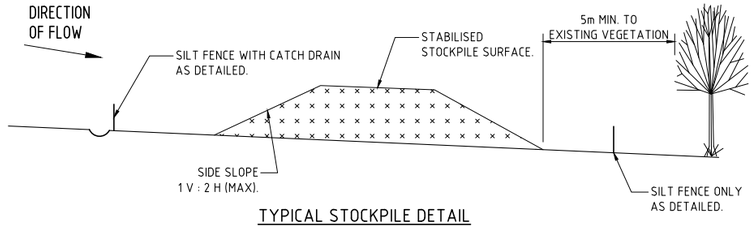
N.T.S



GRATED INLET PIT FILTER DETAIL

N.T.S

NOTE :
ADOPT ABOVE DETAILS AROUND ALL PITS WITHIN AREA ENCOMPASSED BY SILT FENCE & TO PITS ON THE ROAD ADJACENT TO SITE BOUNDARY.



TYPICAL STOCKPILE DETAIL

N.T.S

STOCKPILE NOTES

1. PLACE ALL STOCKPILES IN LOCATIONS MORE THAN 5m FROM EXISTING VEGETATION, ROADS & HAZARD AREAS.
2. CONSTRUCT ON THE CONTOUR AS LOW, FLAT ELONGATED MOUNDS. SIDE SLOPE TO BE 1 V: 2 H MAX.
3. WHERE THERE IS SUFFICIENT AREA, TOPSOIL STOCKPILES SHALL BE LESS THAN 2m IN HEIGHT.
4. WHERE STOCKPILES ARE TO BE IN PLACE FOR MORE THAN 10 DAYS, STABILISE USING WOOD CHIP MULCH - 16 TONNE/Ha.
5. CONSTRUCT SILT FENCE WITH CATCH DRAIN ON UPSLOPE SIDE TO DIVERT WATER AROUND STOCKPILES & SILT FENCE ONLY 1 TO 2m DOWNSLOPE AS SHOWN.

NOTES:

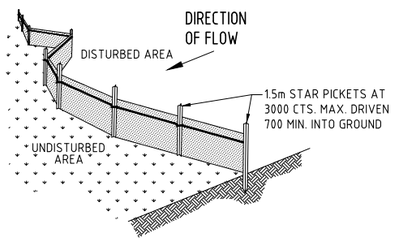
ALL EROSION & SEDIMENT CONTROL MEASURES TO BE INSPECTED & MAINTAINED DAILY BY SITE MANAGER.

MINIMISE DISTURBED AREAS.

ROADS & FOOTPATHS TO BE SWEPT DAILY.

1.2m TURF TO BE PLACED BEHIND KERBS.

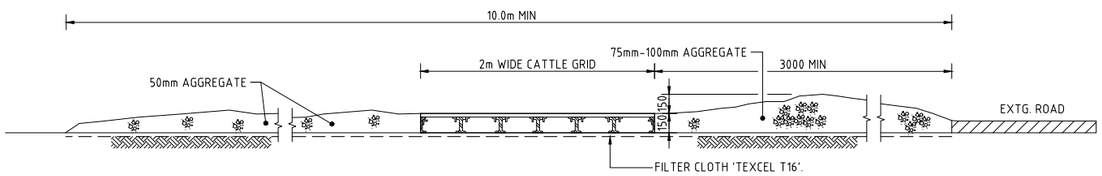
DUST MINIMISATION CONTROL BY WATERING TO BE IMPLEMENTED BY SITE MANAGER AS REQUIRED OR AS DIRECTED BY THE EPA.



TYPICAL SILT FENCE DETAIL

N.T.S

NOTE: PROVIDE 1m RETURNS AT 30m INTERVALS. TYPICAL



SECTION 1:20 1 DA20 : STABILISED CONSTRUCTION ENTRANCE 'TRUCK SHAKER'

200mm 0 500 1000 1500 2000mm

SCALE 1:20 AT B1 SIZE SHEET

FOR DEVELOPMENT APPLICATION

AMENDMENTS	DATE	ISSUE
FOR DEVELOPMENT APPLICATION	10.03.22	C
FOR INFORMATION	15.12.21	B
PRELIMINARY ONLY	02.12.21	A

AMENDMENTS	DATE	ISSUE

ARCHITECT
SBA ARCHITECTS
Commercial Industrial Residential Architecture Interior Design
Suite 702, 83 Mount Street, North Sydney NSW 2060
T 02 9929 9988 F 02 9929 8899
E info@sbaarch.com.au W www.sbaarch.com.au

CLIENT
Hale

PROJECT
INDUSTRIAL DEVELOPMENT
42 RAYMOND AVENUE, MATRAVILLE
NSW, 2036

DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF:
DW	JB	NOV' 21	DS	B1	AS SHOWN	C014452.00-DA 25

CONSULT AUSTRALIA

Costin Roe Consulting Pty Ltd.
Consulting Engineers ACN 003 696 448
Level 1, 8 Windmill Street
Walsh Bay, Sydney NSW 2000
Tel: (02) 9251-7699 Fax: (02) 9241-3731
email: mail@coetinroe.com.au ©

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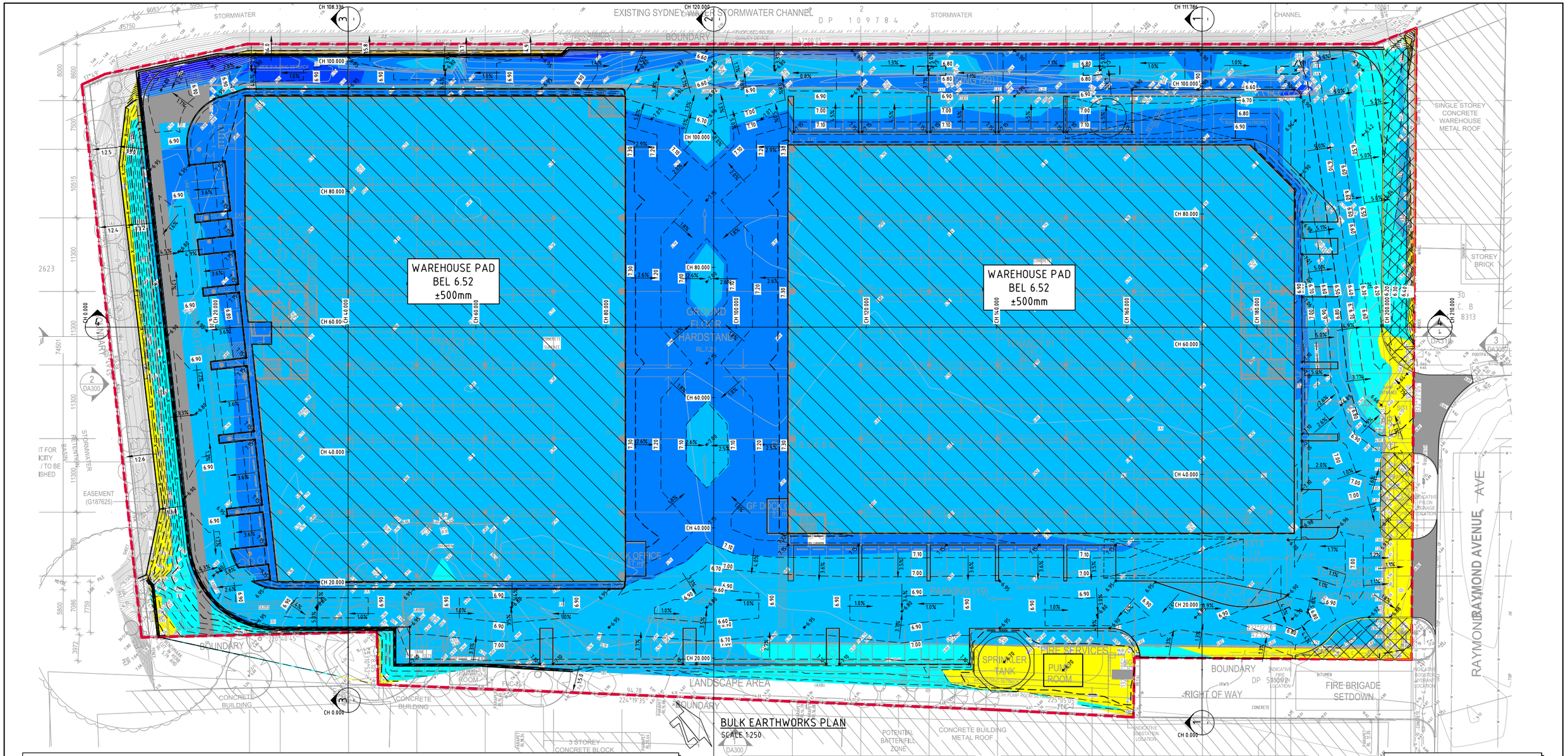
DRAWING TITLE
EROSION & SEDIMENT CONTROL DETAILS

DRAWING No C014452.00-DA25

ISSUE C



BULK EARTHWORKS PLAN

SCALE 1:250

SITE PREPARATION NOTES:

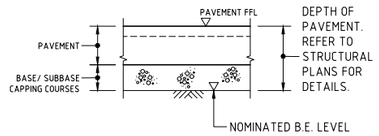
1. ALL EARTHWORKS SHALL BE COMPLETED GENERALLY IN ACCORDANCE WITH THE GUIDELINES SPECIFIED BY THE GEOTECHNICAL REPORT.
2. EXISTING LEVELS FOR THE PURPOSES OF EARTHWORKS QUANTITIES ARE BASED ON LIDAR INFORMATION OBTAINED FROM THE NSW SPATIAL SERVICES.
3. STRIP ANY TOP SOIL OR DELETERIOUS MATERIAL AND DISPOSE OF FROM SITE OR STORE AS DIRECTED.
4. COMPLETE CUT TO FILL EARTHWORKS TO ACHIEVE THE REQUIRED LEVELS AS INDICATED ON THE DRAWINGS WITHIN A TOLERANCE OF +0mm/-10mm THROUGH BUILDING PADS/PAVEMENTS AND +0mm/-20mm ELSEWHERE.
5. PREPARE STEEP BATTERS TO RECEIVE FILL BY CONSTRUCTING BENCHING TO FACILITATE FILL PLACEMENT AND COMPACTION.
6. AREAS TO RECEIVE FILL (THAT ARE NOT ON BENCHED BATTERS) AND AREAS IN CUT SHALL BE PROOF ROLLED TO IDENTIFY ANY SOFT HEAVING MATERIAL. SOFT MATERIAL SHALL BE BOXED OUT AND REMOVED PRIOR TO FILL PLACEMENT. PROOF ROLLING TO BE INSPECTED BY A GEOTECHNICAL ENGINEER OR THE EARTHWORKS DESIGNER.
7. SITE WON FILL SHALL BE COMPACTED IN MAXIMUM 300mm LAYERS AND TO DRY OR HILF DENSITY RATIOS (STANDARD COMPACTION) OF BETWEEN 98% AND 103%. THE PLACEMENT MOISTURE VARIATION OR HILF MOISTURE VARIATION SHALL BE CONTROLLED TO BE BETWEEN 2% DRY AND 2% WET.
8. IMPORTED FILL SHALL BE COMPACTED IN MAXIMUM 300mm LAYERS AND TO DRY OR HILF DENSITY RATIOS (STANDARD COMPACTION) OF BETWEEN 98% AND 103%. THE PLACEMENT MOISTURE VARIATION OR HILF MOISTURE VARIATION SHALL BE CONTROLLED TO BE BETWEEN 2% DRY AND 2% WET.
9. ALL ENGINEERED FILL PARTICLES SHALL BE ABLE TO BE INCORPORATED WITHIN A SINGLE LAYER. FURTHER, LESS THAN 30% OF PARTICLES SHALL BE RETAINED ON THE 37.5 mm SIEVE. ENGINEERED FILL SHALL BE ABLE TO BE TESTED IN ACCORDANCE WITH THE STANDARD COMPACTION METHOD (AS1289.5.4.1) OR HILF TEST METHOD (AS1289.5.7.1). THESE METHODS REQUIRE LESS THAN 20% RETAINED ON THE 37.5 mm SIEVE. WHERE BETWEEN 20% AND 30% OF PARTICLES ARE RETAINED ON THE 37.5 mm SIEVE THE ABOVE TEST METHODS SHALL STILL BE ADOPTED AND TEST REPORTS ANNOTATED APPROPRIATELY. THESE REQUIREMENTS SHOULD BE MET BY THE MATERIAL AFTER PLACEMENT AND COMPACTION
10. ALL THE EARTHWORKS UNDERTAKEN AND THE SUBGRADE CONDITION IN THE CUT AREAS (IN THE STATED PERIOD) ARE DOCUMENTED IN THE REPORTS AND HAVE BEEN UNDERTAKEN IN ACCORDANCE WITH THE SPECIFICATION.
11. PRIOR TO ANY EARTHWORKS, EROSION CONTROL AS OUTLINED IN THE EROSION AND SEDIMENTATION CONTROL PLAN SHALL BE COMPLETED.
12. EXISTING ROCK, IF ANY, SHALL BE REMOVED BY HEAVY ROCK BREAKING OR RIPPING.
13. MATCH EXISTING LEVELS AT BATTER INTERFACE.
14. CONTRACTOR TO MATCH EXISTING LEVELS AT THE INTERFACE OF EARTHWORKS AND EXISTING SURFACE AT BATTER LOCATIONS OR WHERE NO RETAINING WALLS ARE PRESENT. ANY DISCREPANCY BETWEEN DESIGN AND EXISTING LEVELS TO BE REFERRED TO THE ENGINEER FOR DIRECTION OR ADJUSTMENTS TO DESIGN LEVELS.
15. DURING EARTHWORKS THE CONTRACTOR IS TO ENSURE ALL AREAS ARE FREE DRAINING & WILL NOT RETAIN WATER DURING RAINFALL. PROVIDE TEMPORARY MEASURES AS REQUIRED TO ENSURE FREE FLOWING RUNOFF THROUGH MANAGED DRAINAGE PATHS, DIVERSION DRAINS OR OTHER SUITABLE DISPOSAL METHOD AS AGREED DURING THE WORKS. REFER ANY CONCERNS TO THE ENGINEER. REFER TO EROSION AND SEDIMENT CONTROL DRAWINGS AND NOTES.

LEGEND:

LEVELS DATUM IS AHD.

EXISTING SITE LEVELS AND DETAILS BASED ON SURVEY 'S1289001DT' PROVIDED BY LTS 29/03/21.

- 13.00 – EXISTING CONTOUR (0.2m INTERVAL)
- 13.00 – B.E.L. CONTOUR (MAJOR 0.5m)
- 13.10 – B.E.L. CONTOUR (MINOR 0.1m)
- 13.50 – B.E.L. SPOT LEVEL



NOMINATED B.E.L. DETAIL

NTS

EARTHWORKS VOLUMES ESTIMATE

EARTHWORKS VOLUMES:

CUT MATERIAL	= - 155m³
FILL MATERIAL	= + 14,660m³
DETAILED EXCAVATION	= - 3,860m³ (BASED ON 2,000m³/HA)
BALANCE	= + 10,645m³ (IMPORT)

EARTHWORKS VOLUMES ARE APPROXIMATE ONLY AND ARE CALCULATED ASSUMING EXISTING PAVEMENT AND BUILDING SLABS TO BE LEFT IN SITU. NO ALLOWANCE HAS BEEN MADE FOR EROSION AND SEDIMENT CONTROL, BULKING, COMPACTION OF FILLED SOILS.

REFER TO DRAWING DA20 FOR EROSION & SEDIMENT CONTROL PLAN.

THE EXISTING SURFACE IS BASED ON SURVEY 'S1289001DT' PROVIDED BY LTS 29/03/21.

LEVELS NOTE:

LEVELS SHOWN TO BE +/-500mm FROM THOSE SHOWN. FINAL LEVELS SUBJECT TO FINAL GEOTECHNICAL INVESTIGATIONS, ARCHITECTURAL LAYOUT AND ACHIEVING A CUT TO FILL EARTHWORKS BALANCE OVER THE PROPERTY.

ALLOWANCES FOR STRUCTURE

	DEPTH OF PAVEMENT
INTERNAL	
WAREHOUSE	800mm
EXTERNAL	
HARDSTAND	280mm
LANDSCAPING	300mm

DEPTH RANGE

No.	FROM DEPTH	TO DEPTH	COLOUR
1	-1.000	-0.500	
2	-0.500	0.000	
3	0.000	0.500	
4	0.500	1.000	
5	1.000	1.500	
6	1.500	2.000	
7	2.000	2.500	
8	2.500	3.000	

CUT / FILL

2m 0 5 10 15 20 25m

SCALE 1:250 AT B1 SIZE SHEET

FOR DEVELOPMENT APPLICATION

AMENDMENTS	DATE	ISSUE
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FOR INFORMATION	15.12.21	B
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ARCHITECT
SBA ARCHITECTS
Suite 702, 83 Mount Street, North Sydney NSW 2060
T 02 9929 9988 F 02 9929 8899
E info@sbaarch.com.au W www.sbaarch.com.au

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Costin Roe Consulting Pty Ltd.
Consulting Engineers ACN 003 696 448
Level 1, 8 Windmill Street
Walsh Bay, Sydney NSW 2000
Tel: (02) 9251-7699 Fax: (02) 9241-3731
email: mail@coestinroe.com.au ©

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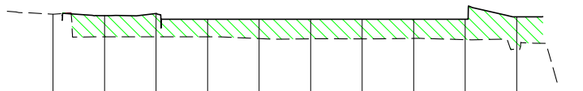
DRAWING TITLE
BULK EARTHWORKS PLAN

DRAWING No C014452.00-DA30 ISSUE D

LEGEND:

- DENOTES BULK EARTHWORKS PROFILE
- DENOTES EXISTING PROFILE
- DENOTES AREA IN CUT
- DENOTES AREA IN FILL

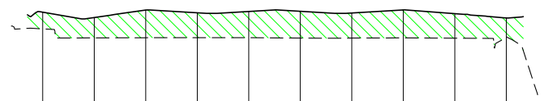


DATUM 3.00

CHAINAGE	CUT/FILL DEPTH	BULK EARTHWORKS LEVEL	EXISTING SURFACE LEVEL
0.000			
10.000			6.716
20.000	0.824	6.660	5.837
30.000	0.904	6.742	5.837
40.000	0.683	6.520	5.837
50.000	0.751	6.520	5.769
60.000	0.761	6.520	5.759
70.000	0.764	6.520	5.756
80.000	0.745	6.520	5.775
90.000	0.794	6.520	5.726
100.000	1.257	6.614	5.357
110.000			
111.786			

SECTION 1

HORIZONTAL SCALE 1:200
VERTICAL SCALE 1:40

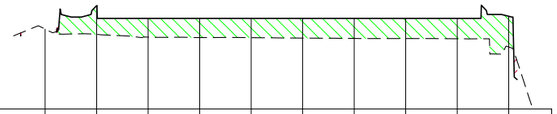


DATUM 3.00

CHAINAGE	CUT/FILL DEPTH	BULK EARTHWORKS LEVEL	EXISTING SURFACE LEVEL
0.000			
10.000			
20.000	0.646	6.792	6.146
30.000	0.791	6.584	5.794
40.000	1.073	6.874	5.802
50.000	0.965	6.768	5.803
60.000	1.019	6.821	5.802
70.000	1.040	6.828	5.788
80.000	0.974	6.761	5.787
90.000	1.088	6.881	5.794
100.000	0.954	6.737	5.783
110.000	0.737	6.569	5.832
120.000			

SECTION 2

HORIZONTAL SCALE 1:200
VERTICAL SCALE 1:40

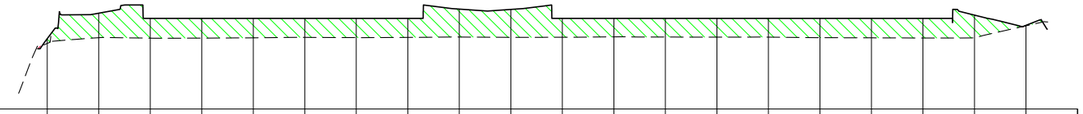


DATUM 3.00

CHAINAGE	CUT/FILL DEPTH	BULK EARTHWORKS LEVEL	EXISTING SURFACE LEVEL
0.000			
10.000			6.183
20.000	1.110	7.008	5.898
30.000	0.731	6.520	5.789
40.000	0.744	6.520	5.776
50.000	0.749	6.520	5.771
60.000	0.767	6.520	5.753
70.000	0.780	6.520	5.740
80.000	0.785	6.520	5.735
90.000	0.792	6.520	5.728
100.000	1.192	6.600	5.409
108.336			

SECTION 3

HORIZONTAL SCALE 1:200
VERTICAL SCALE 1:40



DATUM 3.00

CHAINAGE	CUT/FILL DEPTH	BULK EARTHWORKS LEVEL	EXISTING SURFACE LEVEL
0.000			
10.000	0.181	5.730	5.549
20.000	0.951	6.720	5.769
30.000	0.770	6.520	5.750
40.000	0.766	6.520	5.754
50.000	0.755	6.520	5.765
60.000	0.739	6.520	5.781
70.000	0.748	6.520	5.772
80.000	0.739	6.520	5.781
90.000	1.084	6.878	5.794
100.000	1.081	6.865	5.784
110.000	0.734	6.520	5.786
120.000	0.718	6.520	5.801
130.000	0.726	6.520	5.794
140.000	0.730	6.520	5.790
150.000	0.729	6.520	5.791
160.000	0.750	6.520	5.770
170.000	0.756	6.520	5.764
180.000	0.762	6.520	5.758
190.000	0.885	6.646	5.760
200.000	0.018	6.249	6.230
210.000			

SECTION 4

HORIZONTAL SCALE 1:200
VERTICAL SCALE 1:40

5m 0 10 20 30 40 50m
SCALE 1:500 AT A0 SIZE SHEET

1m 0 1 2 3 4 5 6 7 8 9 10m
SCALE 1:100 AT A0 SIZE SHEET

FOR DEVELOPMENT APPLICATION

AMENDMENTS	DATE	ISSUE
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ARCHITECT
SBA ARCHITECTS
Commercial Industrial Residential Interiors Design
Suite 702, 83 Mount Street, North Sydney NSW 2060
T 02 9929 9988 F 02 9929 8899
E info@sbaarch.com.au W www.sbaarch.com.au

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PROJECT
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Costin Roe Consulting Pty Ltd.
Consulting Engineers ACN 003 696 448
Level 1, 8 Windmill Street
Walsh Bay, Sydney NSW 2000
Tel: (02) 9251-7699 Fax: (02) 9241-3731
email: mail@costinroe.com.au ©

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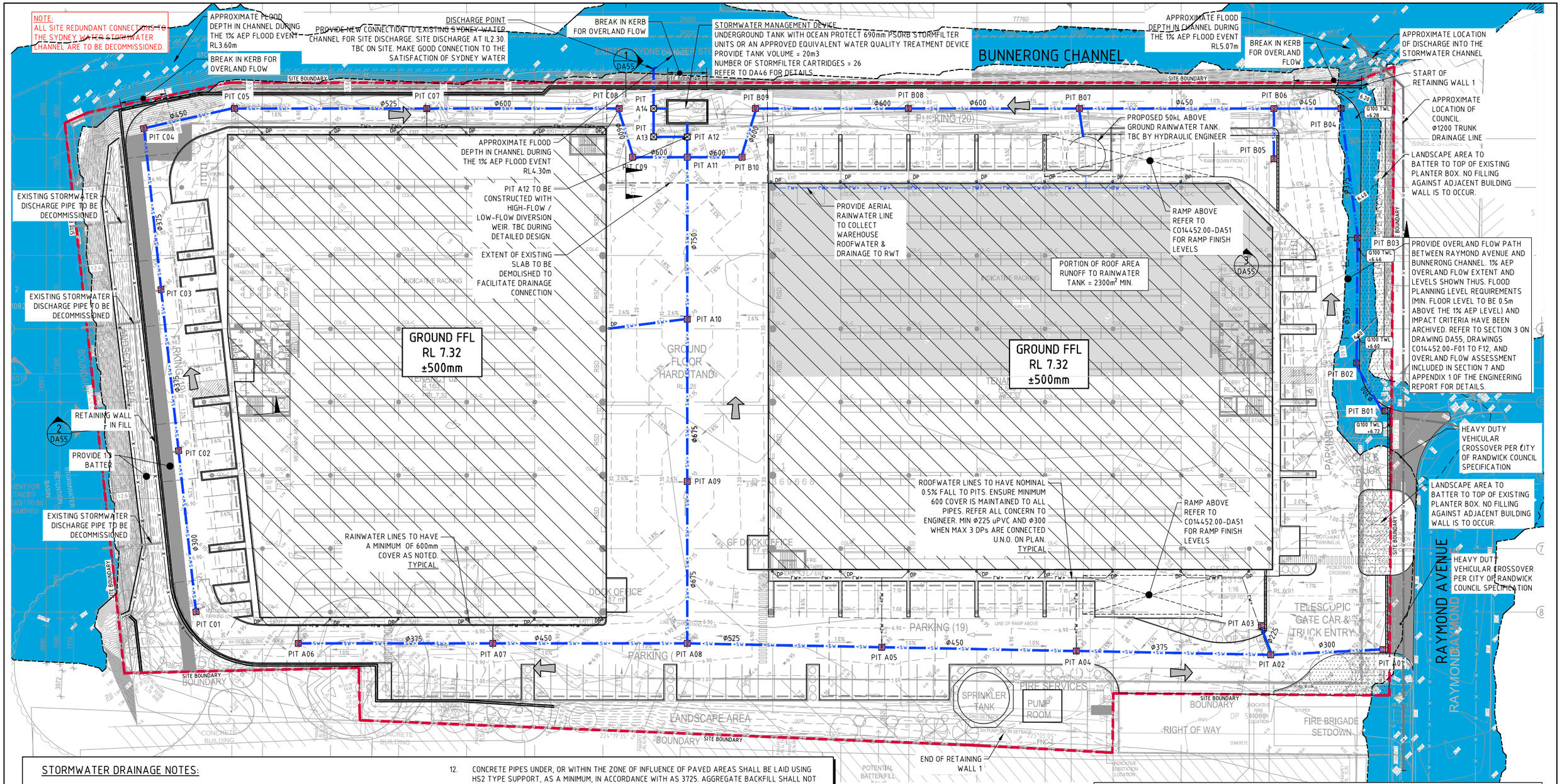
BULK EARTHWORKS SECTIONS

DRAWING No C014452.00-DA35
ISSUE C



STORMWATER DRAINAGE NOTES:

1. ALL STORMWATER WORKS TO BE COMPLETED IN ACCORDANCE WITH AUSTRALIAN STANDARD AS3500.3 PLUMBING AND DRAINAGE, PART 3: STORMWATER DRAINAGE.
2. THE MINOR (PIPED) SYSTEM HAS BEEN DESIGNED FOR THE 1 IN 20 YEAR ARI STORM EVENT AND THE MAJOR (OVERLAND) SYSTEM HAS BEEN DESIGNED FOR THE 1 IN 100 YEAR ARI STORM EVENT.
3. ALL FINISHED PAVEMENT LEVELS SHALL BE AS INDICATED ON FINISHED LEVELS PLANS DA50 / DA51.
4. PIT SIZES SHALL BE AS INDICATED IN THE SCHEDULE WHILE PIPE SIZES AND DETAILS ARE PROVIDED ON PLAN.
5. EXISTING STORMWATER PIT LOCATIONS AND INVERT LEVELS TO BE CONFIRMED BY SURVEY PRIOR TO COMMENCING WORKS ON SITE.
6. ALL STORMWATER PIPES Ø375 OR GREATER SHALL BE CLASS 2 (WITH HS2 SUPPORT) REINFORCED CONCRETE WITH RUBBER RING JOINTS UNLESS NOTED OTHERWISE.
7. ALL PIPES UP TO AND INCLUDING Ø300 TO BE uPVC GRADE SN8 UNO.
8. PIPE CLASS NOMINATED ARE FOR IN-SERVICE LOADING CONDITIONS ONLY. CONTRACTOR IS TO MAKE ANY NECESSARY ADJUSTMENTS REQUIRED FOR CONSTRUCTION CONDITIONS.
9. ALL CONCRETE PITS GREATER THAN 1000mm DEEP SHALL BE REINFORCED USING N12-200 EACH WAY CENTERED IN WALL AND BASE. LAP MINIMUM 300mm WHERE REQUIRED. ALL CONCRETE FOR PITS SHALL BE F'c=25 MPa. PRECAST PITS MAY BE USED WITH THE APPROVAL OF THE ENGINEER.
10. IN ADDITION TO ITEM 6 ABOVE, ALL CONCRETE PITS GREATER THAN 3000mm DEEP SHALL HAVE WALLS AND BASE THICKNESS INCREASED TO 200mm.
11. PIPES SHALL BE LAID AS PER PIPE LAYING DETAILS. PARTICULAR CARE SHALL BE TAKEN TO ENSURE THAT THE PIPE IS FULLY AND EVENLY SUPPORTED. RAM AND PACK FILLING AROUND AND UNDER BACK OF PIPES AND PIPE FAUCETS, WITH NARROW EDGED RAMMERS OR OTHER SUITABLE TAMPING DETAILS.
12. CONCRETE PIPES UNDER, OR WITHIN THE ZONE OF INFLUENCE OF PAVED AREAS SHALL BE LAID USING HS2 TYPE SUPPORT, AS A MINIMUM, IN ACCORDANCE WITH AS 3725. AGGREGATE BACKFILL SHALL NOT BE USED FOR PIPE BEDDING AND OR HAUNCH/SIDE SUPPORT.
13. WHERE PIPE LINES ENTER PITS, PROVIDE 2m LENGTH OF STOCKING WRAPPED SLOTTED Ø100 uPVC TO EACH SIDE OF PIPE.
14. ALL SUBSOIL DRAINAGE LINES SHALL BE Ø100 SLOTTED uPVC WITH APPROVED FILTER WRAP LAID IN 300mm WIDE GRANULAR FILTER UNLESS NOTED OTHERWISE. LAY SUBSOIL LINES TO MATCH FALLS OF LAND AND/OR 1 IN 200 MINIMUM. PROVIDE CAPPED CLEANING EYE (RODDING POINT) AT UPSTREAM END OF LINE AND AT 30m MAX. CTS. PROVIDE SUBSOIL LINES TO ALL PAVEMENT/ LANDSCAPED INTERFACES, TO REAR OF RETAINING WALLS (AS NOMINATED BY STRUCTURAL ENGINEER) AND AS SHOWN ON PLAN.
15. ALL PIPE GRADES 1 IN 200 MINIMUM UNO.
16. PROVIDE STEP IRONS IN PITS DEEPER THAN 1000mm.
17. MIN. 600 COVER TO PIPE OBVERT BENEATH ROADS & MIN. 400 COVER BENEATH LANDSCAPED AND PEDESTRIAN AREAS.
18. PIT COVERS IN TRAFFICABLE PAVEMENT SHALL BE CLASS D 'HEAVY DUTY', THOSE LOCATED IN NON-TRAFFICABLE AREAS SHALL BE CLASS B 'MEDIUM DUTY' U.N.O.
19. PROVIDE CLEANING EYES (RODDING POINTS) TO PIPES AT ALL CORNERS AND T-JUNCTIONS WHERE NO PITS ARE PRESENT.
20. DOWN PIPES (DP) TO BE AS PER HYDRAULIC ENGINEERS DETAILS WITH CONNECTOR TO MATCH DP SIZE U.N.O. ON PLAN. PROVIDE CLEANING EYE AT GROUND LEVEL.
21. PIPE LENGTHS NOMINATED ON PLAN OR LONGSECTIONS ARE MEASURED FROM CENTER OF PITS TO THE NEAREST 0.5m AND DO NOT REPRESENT ACTUAL LENGTH. THE CONTRACTOR IS TO ALLOW FOR THIS.
22. WHERE CONNECTION TO EXISTING INGROUND DRAINAGE SYSTEMS, OPEN SWALES, CHANNELS OR ANY OTHER EXISTING SYSTEM, IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO VERIFY THE LOCATION AND INVERT ON SITE AT THE BEGINNING OF THE CONSTRUCTION PERIOD. REFER ANY VARIANCE FROM DOCUMENTATION OR SURVEYS TO THE ENGINEER FOR CLARIFICATION.

STORMWATER DRAINAGE PLAN

SCALE 1:250

NOTE:

PITS TO BE FITTED WITH OCEAN PROTECT OCEAN GUARD OG200 PIT INSERTS SHOWN THUS ◇
TOTAL NO OF PIT INSERTS = 29
REFER TO PIT SCHEDULE ABOVE

LEVELS NOTE:

LEVELS SHOWN TO BE +/-500mm FROM THOSE SHOWN. FINAL LEVELS SUBJECT TO FINAL GEOTECHNICAL INVESTIGATIONS, ARCHITECTURAL LAYOUT AND ACHIEVING A CUT TO FILL EARTHWORKS BALANCE OVER THE PROPERTY.

LEGEND:

LEVELS DATUM IS AHD.

EXISTING SITE LEVELS AND DETAILS BASED ON SURVEY 'S1289001DT' PROVIDED BY LTS DATED 29/03/21.

- SGGP, SINGLE GRATED GULLY PIT
- SJP, SEALED JUNCTION PIT
- KIP, KERB INLET PIT
- GD, GRATED DRAIN (300W x 225D UNO)
- PROPOSED DRAINAGE LINE - GROUND
- PROPOSED DRAINAGE LINE - LEVEL 1
- ROOFWATER DOWNPIPE (INDICATIVE)
- 1% AEP FLOOD EXTENT
- ROOFWATER LINE
- SUBSOIL LINE
- OVERLAND FLOW DIRECTION
- FINISHED PAVEMENT CONTOUR (MAJOR) 0.5m INTERVALS
- FINISHED PAVEMENT CONTOUR (MINOR) 0.1m INTERVALS
- COUNCIL TRUNK DRAINAGE LINE
- FLOOD LEVEL CONTOUR 0.2m INTERVALS

2m 0 5 10 15 20 25m

SCALE 1:250 AT B1 SIZE SHEET

FOR DEVELOPMENT APPLICATION

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ARCHITECT
SBA ARCHITECTS
Commercial Industrial Residential Retail Interior Design
Suite 702, 83 Mount Street, North Sydney NSW 2060
T 02 9929 9988 F 02 9929 8899
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Costin Roe Consulting Pty Ltd.
Consulting Engineers ACN 003 696 448
Level 1, 8 Windmill Street
Walsh Bay, Sydney NSW 2000
Tel: (02) 9251-7699 Fax: (02) 9241-3731
email: mail@coestinroe.com.au ©

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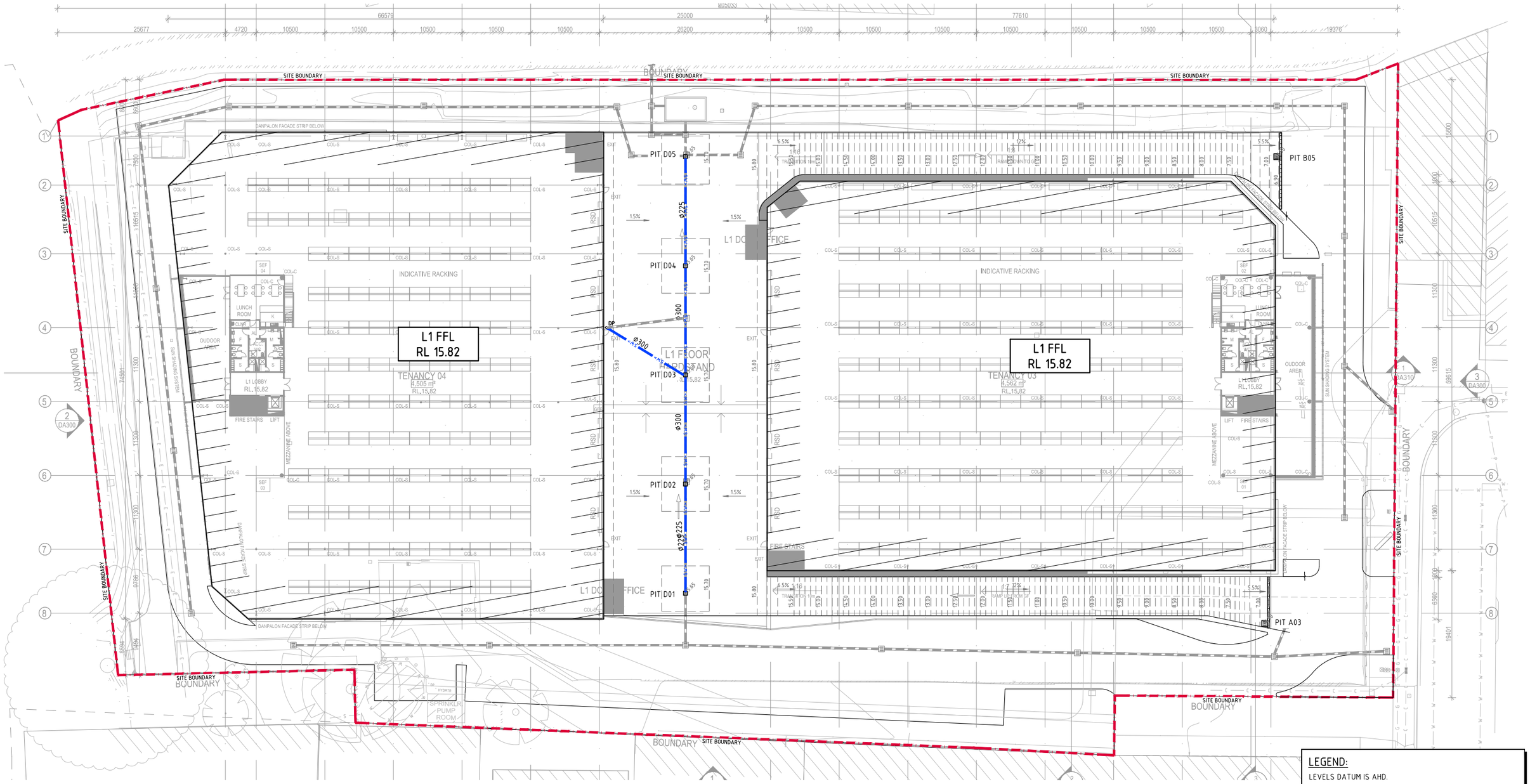
DRAWING TITLE
STORMWATER DRAINAGE PLAN
GROUND LEVEL

DRAWING No C014452.00-DA40
ISSUE E



STORMWATER DRAINAGE PLAN - LEVEL 1

SCALE 1:250

LEGEND:

LEVELS DATUM IS AHD.

EXISTING SITE LEVELS AND DETAILS BASED ON SURVEY 'S1289001DT' PROVIDED BY LTS DATED 29/03/21.

- SGGP, SINGLE GRATED GULLY PIT
- SJP, SEALED JUNCTION PIT
- GD, GRATED DRAIN (300W x 225D UNO)
- SW> - PROPOSED DRAINAGE LINE - LEVEL 1
- PROPOSED DRAINAGE LINE - GROUND
- 50.00 - FINISHED PAVEMENT CONTOUR (MAJOR) 0.5m INTERVALS
- 50.10 - FINISHED PAVEMENT CONTOUR (MINOR) 0.1m INTERVALS

NOTES:

1. REFER TO DRAWING C40 FOR STORMWATER DRAINAGE NOTES.

2m 0 5 10 15 20 25m

SCALE 1:250 AT B1 SIZE SHEET

FOR DEVELOPMENT APPLICATION

AMENDMENTS	DATE	ISSUE
FOR DEVELOPMENT APPLICATION	10.03.22	C
FOR INFORMATION	15.12.21	B
PRELIMINARY ONLY	02.12.21	A

AMENDMENTS	DATE	ISSUE

ARCHITECT
SBA ARCHITECTS
Commercial Industrial Residential Retail Interior Design
Suite 702, 83 Mount Street, North Sydney NSW 2060
T 02 9929 9088 F 02 9929 8899
E info@sbaarch.com.au W www.sbaarch.com.au

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PROJECT
INDUSTRIAL DEVELOPMENT
42 RAYMOND AVENUE, MATRAVILLE
NSW, 2036

DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF:
DW	JB	NOV' 21	DS	B1	AS SHOWN	C014452.00-DA 41

Costin Roe Consulting Pty Ltd.
Consulting Engineers ACN 003 696 448
Level 1, 8 Windmill Street
Walsh Bay, Sydney NSW 2000
Tel: (02) 9251-7699 Fax: (02) 9241-3731
email: mail@costinroe.com.au

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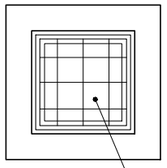
DRAWING TITLE
STORMWATER DRAINAGE PLAN
LEVEL 1

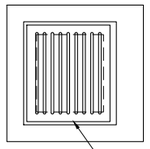
DRAWING No C014452.00-DA41

ISSUE C



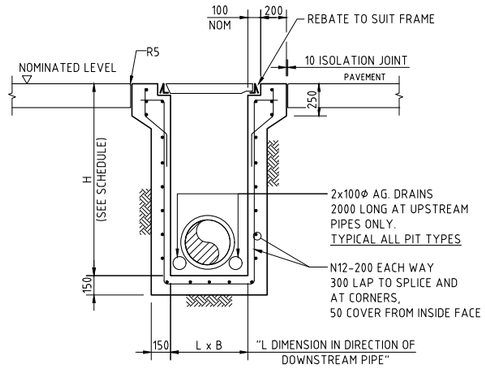
CONCRETE FILLED CAST IRON COVER
& FRAME (GATIC OR EQUAL)
SEE SCHEDULE

PLAN
SCALE 1:20



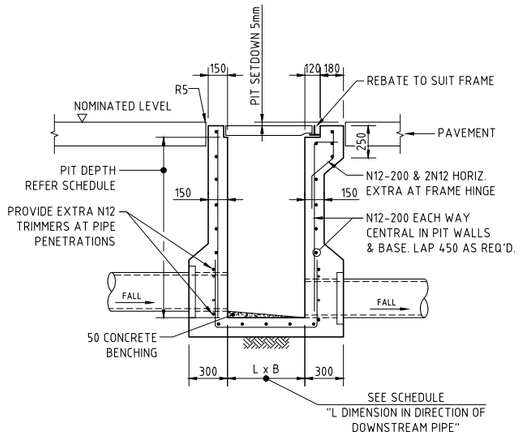
H.D. CAST IRON GRATE & TEE
BAR FRAME 'GATIC' OR EQUAL
SEE SCHEDULE

PLAN
SCALE 1:20



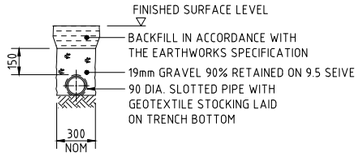
SECTION
SCALE 1:20

SEALED PIT - SJP



SECTION
SCALE 1:20

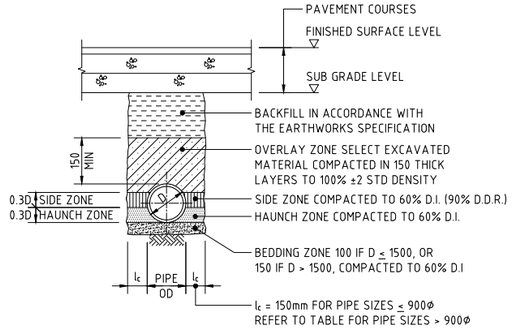
SINGLE GRATED GULLY PIT - SGGP



SUPPORT TO AGRICULTURAL DRAIN

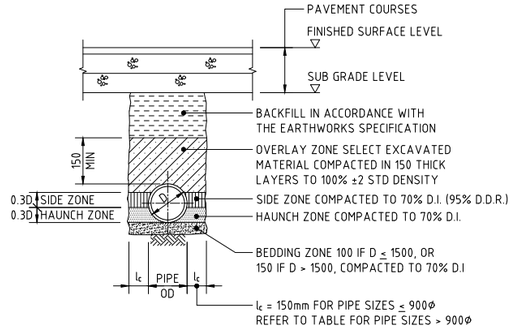
SCALE 1:20

SIDE ZONE MATERIAL GRADING	
SIEVE SIZE (mm)	WEIGHT PASSING (%)
19.0	100
9.5	100 TO 50
2.6	100 TO 30
0.60	50 TO 15
0.075	25 TO 0



TYPE HS2 SUPPORT TO CONCRETE PIPES UNDER PAVEMENT

SCALE 1:20
D ≤ 1350, MAX FILL = 4.0m
D > 1350, MAX FILL = 3.0m



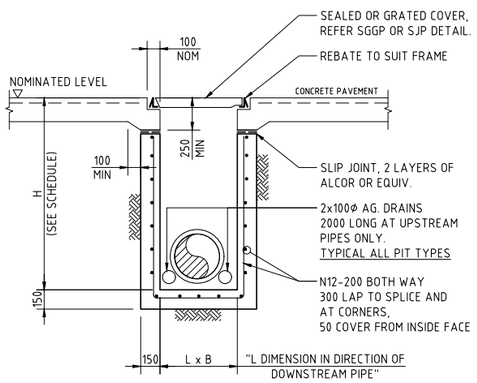
TYPE HS3 SUPPORT TO CONCRETE PIPES UNDER PAVEMENT

SCALE 1:20
D ≤ 1050, MAX FILL = 6.0m
D > 1050, MAX FILL = 4.8m

BEDDING & HAUNCH MATERIAL GRADING	
SIEVE SIZE (mm)	WEIGHT PASSING (%)
19.0	100
2.36	100 TO 50
0.60	90 TO 50
0.30	60 TO 10
0.15	25 TO 0
0.075	10 TO 0

SIDE ZONE WIDTH	
PIPE SIZE (mm)	l_c (mm)
≤ 900Φ	150
1050Φ	175
1200Φ	200
1350Φ	225
1500Φ	250
1650Φ	275
1800Φ	300
ENGINEER TO SPECIFY TRENCH WIDTHS FOR PIPE SIZES GREATER THAN 1800Φ	

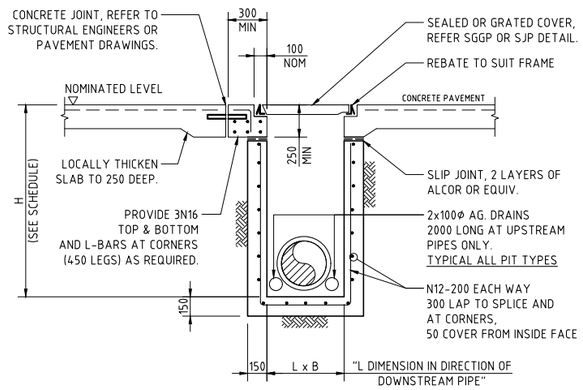
SIDE ZONE MATERIAL GRADING	
SIEVE SIZE (mm)	WEIGHT PASSING (%)
19.0	100
9.5	100 TO 50
2.6	100 TO 30
0.60	50 TO 15
0.075	25 TO 0
SELECT FILL MATERIAL IN ACCORDANCE WITH TABLE 1 AS 3725	



SECTION
SCALE 1:20

SJP/CIS & SGGP/CIS (CAST IN SLAB) PIT DETAIL GRATE/COVER SUPPORT CAST-INTO PAVEMENT SLAB

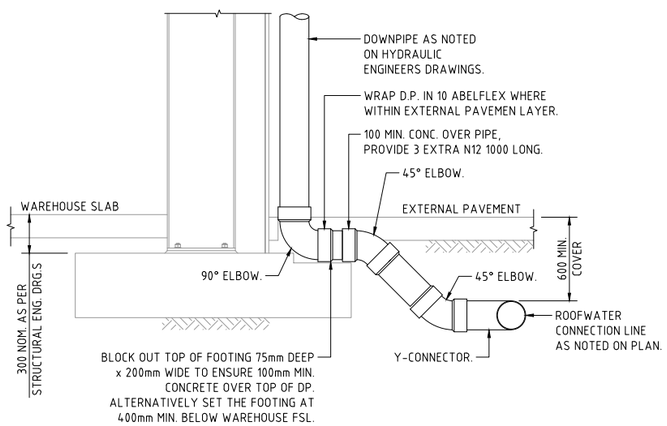
(ADOPT IN CONCRETE PAVEMENTS FOR SGGP's & SJP's, WHERE JOINTS ARE NOT LOCATED WITHIN PROXIMITY OF THE GRATE)



SECTION
SCALE 1:20

SJP/CIS & SGGP/CIS (CAST IN SLAB) PIT DETAIL GRATE/COVER SUPPORT CAST-INTO PAVEMENT SLAB

(ADOPT IN CONCRETE PAVEMENT FOR SGGP's & SJP's, WHERE PITS ARE LOCATED IN THE CORNER OF SLAB PANELS OR ADJACENT TO SLAB PANEL JOINTS)



DOWNPIPE TURN-UP DETAIL A

(AT FOOTING LOCATION)
SCALE 1:20

200mm 0 500 1000 1500 2000mm
SCALE 1:20 AT B1 SIZE SHEET

FOR DEVELOPMENT APPLICATION

AMENDMENTS	DATE	ISSUE
FOR DEVELOPMENT APPLICATON	10.03.22	C
FOR INFORMATION	15.12.21	B
PRELIMINARY ONLY	02.12.21	A

AMENDMENTS	DATE	ISSUE

ARCHITECT
SBA ARCHITECTS
Commercial Industrial Residential Retail Interior Design
Suite 702, 83 Mount Street, North Sydney NSW 2060
T 02 9929 9988 F 02 9929 8899
E info@sbaarch.com.au W www.sbaarch.com.au

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PROJECT
INDUSTRIAL DEVELOPMENT
42 RAYMOND AVENUE, MATRAVILLE
NSW, 2036

DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF:
DW	JB	NOV' 21	DS	B1	AS SHOWN	C014452.00-DA 45

Costin Roe Consulting Pty Ltd.
Consulting Engineers ACN 003 696 448
Level 1, 8 Windmill Street
Walsh Bay, Sydney NSW 2000
Tel: (02) 9251-7699 Fax: (02) 9241-3731
email: mail@costinroe.com.au ©

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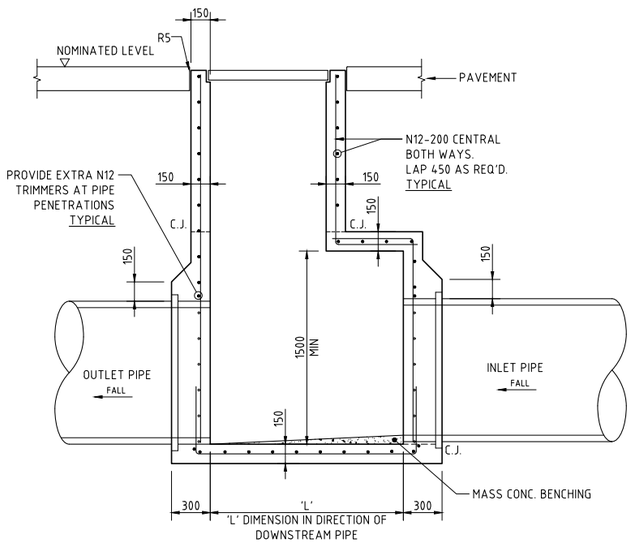
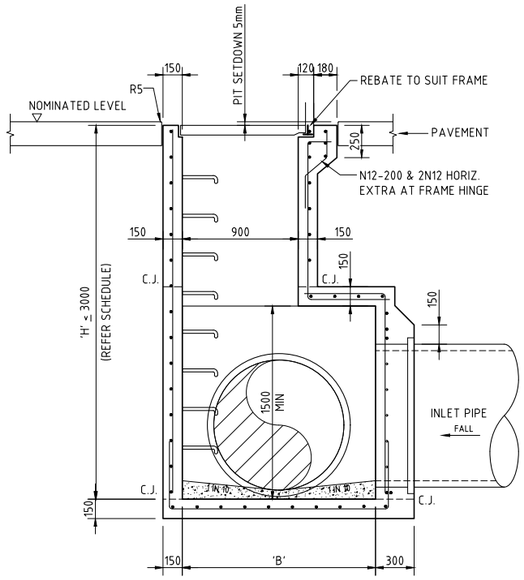
DRAWING TITLE
STORMWATER DRAINAGE DETAILS
SHEET 1

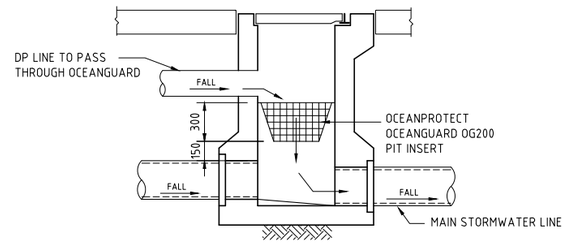
DRAWING No C014452.00-DA45
ISSUE C



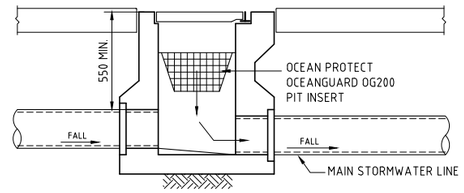
LONG SECTION
SCALE 1:20



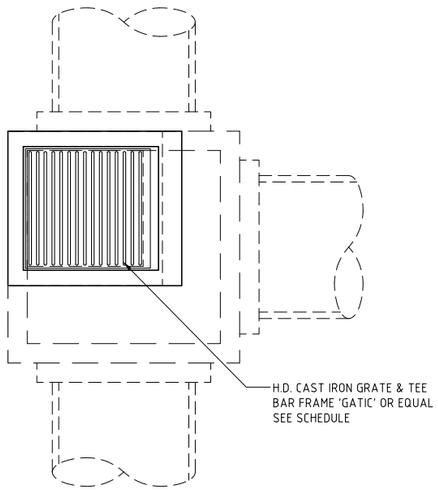
CROSS SECTION
SCALE 1:20



ROOFWATER/STORMWATER PIT WITH
OCEANGUARD CONFIGURATION
SCALE 1:20

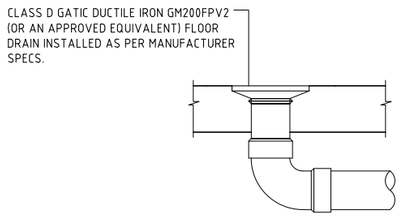


STORMWATER PIT WITH OCEANGUARD
CONFIGURATION

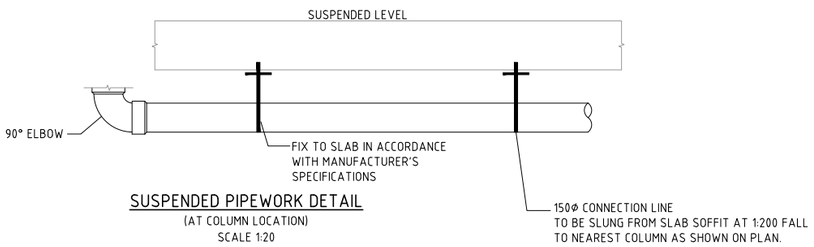


PLAN
SCALE 1:20

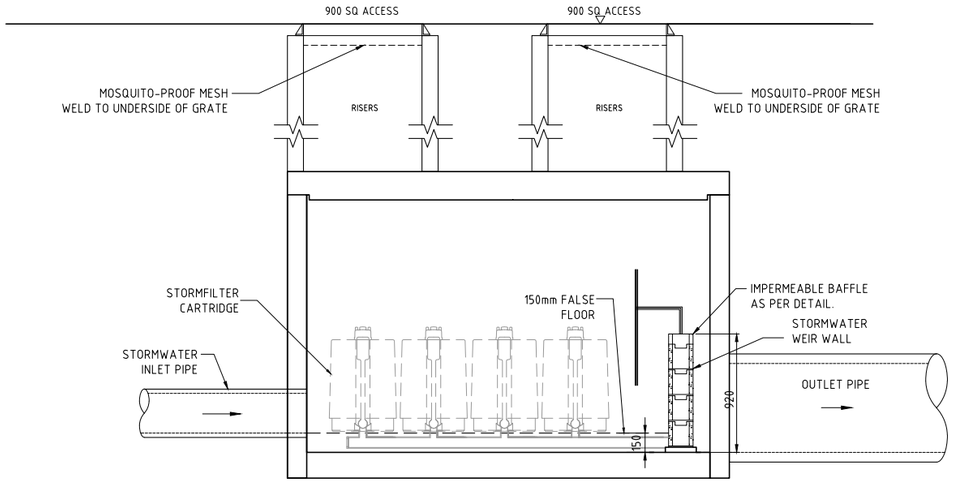
TAPERED SINGLE GRATED GULLY PIT - SGGP
SUBSOIL NOT SHOWN
FOR CLARITY



FLOOR DRAIN - FD
SCALE 1:10
(FOR USE IN SUSPENDED SLABS)



SUSPENDED PIPEWORK DETAIL
(AT COLUMN LOCATION)
SCALE 1:20



STORMFILTER CHAMBER TYPICAL DETAIL
SCALE 1:20

200mm 0 500 1000 1500 2000mm
SCALE 1:20 AT B1 SIZE SHEET

FOR DEVELOPMENT APPLICATION

AMENDMENTS	DATE	ISSUE
FOR DEVELOPMENT APPLICATON	10.03.22	C
FOR INFORMATION	15.12.21	B
PRELIMINARY ONLY	02.12.21	A

AMENDMENTS	DATE	ISSUE

ARCHITECT
SBA ARCHITECTS
Commercial Industrial Residential Architecture Interior Design
Suite 702, 83 Mount Street, North Sydney NSW 2060
T 02 9929 9988 F 02 9929 8899
E info@sbaarch.com.au W www.sbaarch.com.au

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Hale

PROJECT
INDUSTRIAL DEVELOPMENT
42 RAYMOND AVENUE, MATRAVILLE
NSW, 2036

DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF:
DW	JB	NOV' 21	DS	B1	AS SHOWN	C014452.00-DA 46

Costin Roe Consulting Pty Ltd.
Consulting Engineers ACN 003 696 448
Level 1, 8 Windmill Street
Walsh Bay, Sydney NSW 2000
Tel: (02) 9251-7699 Fax: (02) 9241-3731
email: mail@costinroe.com.au ©

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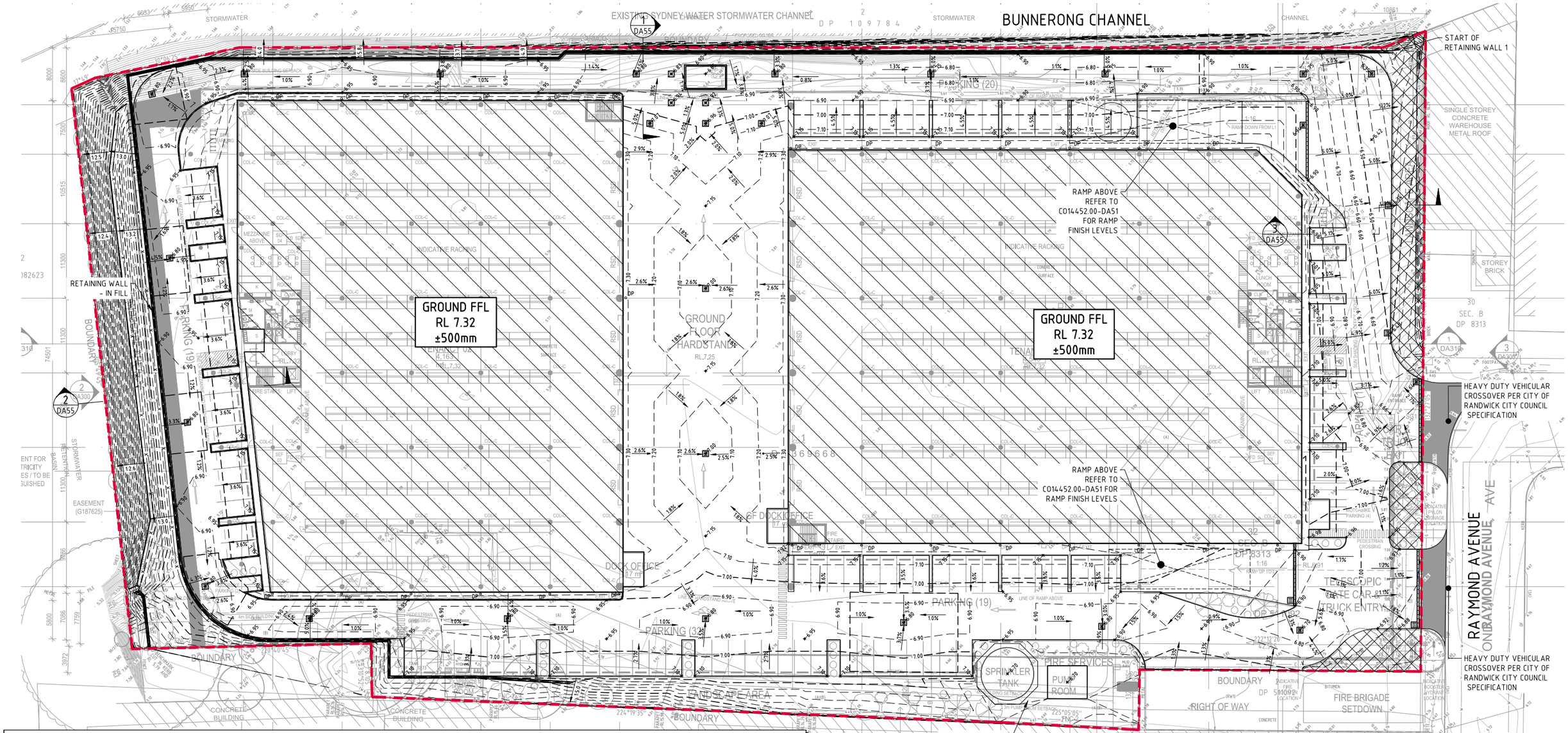
DRAWING TITLE
STORMWATER DRAINAGE DETAILS
SHEET 2

DRAWING No C014452.00-DA46
ISSUE C



FINISHED LEVELS PLAN
SCALE 1:250

FINISHED LEVELS PLAN NOTES:

1. LEVELS DATUM IS AUSTRALIAN HEIGHT DATUM (A.H.D.).
2. GRADING REQUIREMENTS TO BE COMPLETED IN ACCORDANCE WITH AUSTRALIAN STANDARD AS2890.1, AS2890.2 AND AS2890.6.
3. ALL CONTOUR LINES & SPOT LEVELS INDICATE FINISHED PAVEMENT LEVELS U.N.O. ON PLAN.
4. CONTOUR INTERVALS
   - THE MINOR CONTOUR INTERVAL IS 0.1m.
   - THE MAJOR CONTOUR INTERVAL IS 0.5m.
5. HARDSTAND GRADING
   - MINIMUM PAVEMENT GRADE IS TO BE 1:100 (1%).
   - GRADING OF ON-GRADE DOCKS TO BE 1:100 (1%) FALL AWAY FROM THE DOCK FACE FOR A LENGTH OF 15m U.N.O.
   - GRADING OF TRUCK CIRCULATION ZONES TO BE MINIMUM AS NOTED ABOVE, 3-4% NOMINAL AND MAX. 5%.
6. CAR PARKING AREA GRADES
   - MINIMUM PAVEMENT GRADE IS TO BE 1:100 (1%), DESIRABLE MINIMUM GRADE 1:50 (2%).
   - MAXIMUM PAVEMENT GRADE IS TO BE 1:20 (5%) N CARPARKING AREAS AND 1:25 (4%) ELSEWHERE.
   - DISABLED ACCESS PARKING ZONES AND SHARED SPACE TO BE MAXIMUM OF 1:33 (3%) IN ASPHALT PAVEMENT AND MAXIMUM OF 1:40 (2.5%) IN CONCRETE PAVEMENT.
   - CARPARK RAMP GRADES TO BE MAX 1:5 WITH 2.5m SMOOTH TRANSITION AT TOP AND BOTTOM U.N.O.
7. TRUCK RAMP GRADES
   - MAXIMUM B-DOUBLE OR 19.0m AV RAMP GRADES ARE TO BE 1:8.3 (12%) U.N.O. ON PLAN
   - PROVIDE MINIMUM 4.0m LONG TRANSITION WHERE CHANGES OF GRADE EXCEED 1:20 (5%) AT A CREST U.N.O.
   - PROVIDE MINIMUM 3.0m LONG TRANSITION WHERE CHANGE OF GRADE EXCEED 1:20 (5%) AT A SAG U.N.O.
   - TRANSITIONS ARE TO PROVIDE A SMOOTH CONTINOUS CIRCULAR AND TANGENTIAL CHANGE IN GRADE TO ENSURE NO SHARP OR ACUTE CHANGES IN GRADE ARE PRESENT.
8. WHERE FIRE BRIGADE ACCESS IS REQUIRED, MAXIMUM RAMP GRADIENTS ARE TO BE 1:6 (16.6%), DESIRABLE RAMP GRADIENTS ARE TO BE 1:8 (12.5%) WITH 7m TRANSITION TOP AND BOTTOM U.N.O. ON PLAN.
9. PERMANENT BATTER SLOPES ARE TO HAVE A MAXIMUM GRADE OF 1V:3H U.N.O. BASED ON GEOTECHNICAL ASSESSMENT. PROVIDE MINIMUM 0.5m BERM BETWEEN THE BACK OF KERB OR PAVEMENT EDGES AND THE TOP OR TOE OF A BATTER.
10. ALL BATTER SLOPE WITH GRADES AT OR EXCEEDING 1V:6H ARE TO BE TURFED IMMEDIATELY OR APPROPRIATE EROSION CONTROL IS TO BE PROVIDED TO THE SATISFACTION OF THE ENGINEER.
11. ALL FOOTPATHS ARE TO FALL AWAY FROM THE BUILDING AT 2.5% NOMINAL. GRADE.
12. ALL PAVEMENTS ARE TO BE SET AT 30mm BELOW THE FINISHED FLOOR LEVEL OF THE WAREHOUSE AND OFFICE AREAS. PROVIDE LOCAL FEATHERING AT DOORWAYS OR ROLLER SHUTTERS TO PROVIDE FLUSH FINISH AS REQUIRED.
13. WHERE NEW AND EXISTING INTERFACING IS REQUIRED, MATCH EXISTING LEVELS AND PROVIDE SMOOTH INTERFACE BETWEEN NEW AND EXISTING GRADIENTS. REFER ANY CONCERNS TO THE ENGINEER.

LEVELS NOTE:

LEVELS SHOWN TO BE +/-500mm FROM THOSE SHOWN. FINAL LEVELS SUBJECT TO FINAL GEOTECHNICAL INVESTIGATIONS, ARCHITECTURAL LAYOUT AND ACHIEVING A CUT TO FILL EARTHWORKS BALANCE OVER THE PROPERTY.

LEGEND:

LEVELS DATUM IS AHD.

- SGGP, SINGLE GRATED GULLY PIT
- SJP, SEALED JUNCTION PIT
- KIP, KERB INLET PIT
- GD, GRATED DRAIN (300W x 225D UNO)
- 50.00 - FINISHED PAVEMENT CONTOUR (MAJOR) 0.5m INTERVALS
- 50.10 - FINISHED PAVEMENT CONTOUR (MINOR) 0.1m INTERVALS

2m 0 5 10 15 20 25m
SCALE 1:250 AT B1 SIZE SHEET

FOR DEVELOPMENT APPLICATION

AMENDMENTS	DATE	ISSUE
FOR DEVELOPMENT APPLICATION	07.07.22	D
FOR DEVELOPMENT APPLICATION	10.03.22	C
FOR INFORMATION	15.12.21	B
PRELIMINARY ONLY	02.12.21	A

AMENDMENTS	DATE	ISSUE

ARCHITECT
SBA ARCHITECTS
Commercial Industrial Warehousing Tilt Panel Design
Suite 702, 83 Mount Street, North Sydney NSW 2060
T 02 9929 9988 F 02 9929 8899
E info@sbaarch.com.au W www.sbaarch.com.au

CLIENT
Hale

PROJECT
INDUSTRIAL DEVELOPMENT
42 RAYMOND AVENUE, MATRAVILLE
NSW, 2036

DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF:
DW	JB	NOV' 21	DS	B1	AS SHOWN	C014452.00-DA 50

Costin Roe Consulting Pty Ltd.
Consulting Engineers ACN 003 696 448
Level 1, 8 Windmill Street
Walsh Bay, Sydney NSW 2000
Tel: (02) 9251-7699 Fax: (02) 9241-3731
email: mail@costinroe.com.au ©

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DRAWING TITLE
FINISHED LEVELS PLAN
GROUND LEVEL

DRAWING No C014452.00-DA50
ISSUE D

FINISHJED LEVELS PLAN - LEVEL 1

SCALE 1:250

NOTES:

1. REFER TO DRAWING C50 FOR STORMWATER DRAINAGE NOTES.

LEGEND:

LEVELS DATUM IS AHD.

- SGGP, SINGLE GRATED GULLY PIT
- SJP, SEALED JUNCTION PIT
- KIP, KERB INLET PIT
- GD, GRATED DRAIN (300W x 225D UNO)
- 50.00 - FINISHED PAVEMENT CONTOUR (MAJOR) 0.5m INTERVALS
- 50.10 - FINISHED PAVEMENT CONTOUR (MINOR) 0.1m INTERVALS

2m 0 5 10 15 20 25m

SCALE 1:250 AT B1 SIZE SHEET

FOR DEVELOPMENT APPLICATION

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AMENDMENTS DATE ISSUE

ARCHITECT
SBA ARCHITECTS
Commercial Industrial Warehousing Residential Design
Suite 702, 83 Mount Street, North Sydney NSW 2060
T 02 9929 9988 F 02 9929 8899
E info@sbaarch.com.au W www.sbaarch.com.au

CLIENT
Hale

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42 RAYMOND AVENUE, MATRAVILLE
NSW, 2036

DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF:
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Costin Roe Consulting Pty Ltd.
Consulting Engineers ACN 003 696 448
Level 1, 8 Windmill Street
Walsh Bay, Sydney NSW 2000
Tel: (02) 9251-7699 Fax: (02) 9241-3731
email: mail@coetinroe.com.au ©

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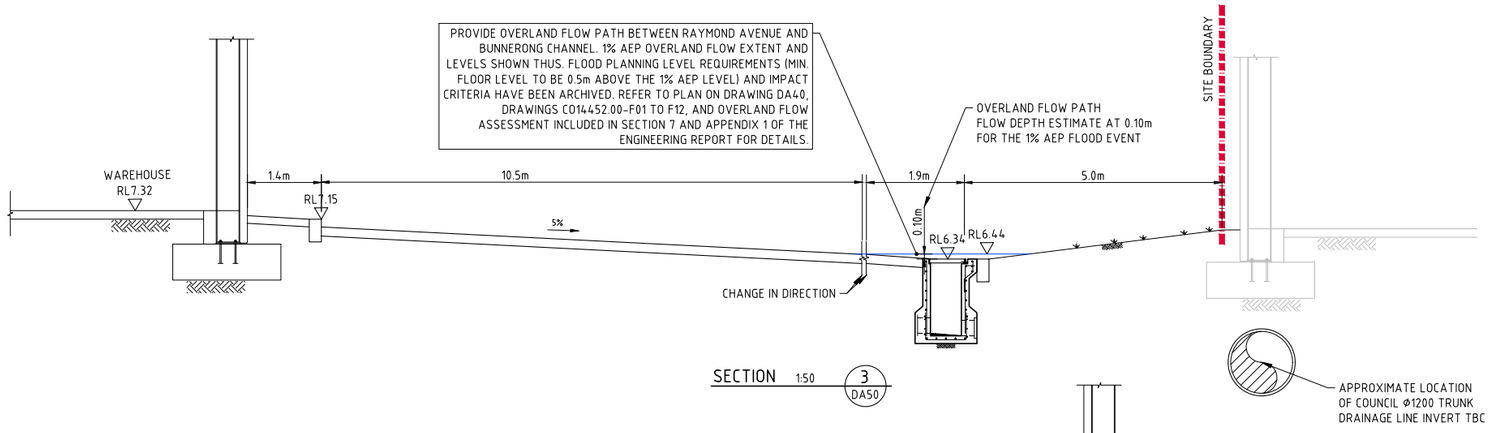
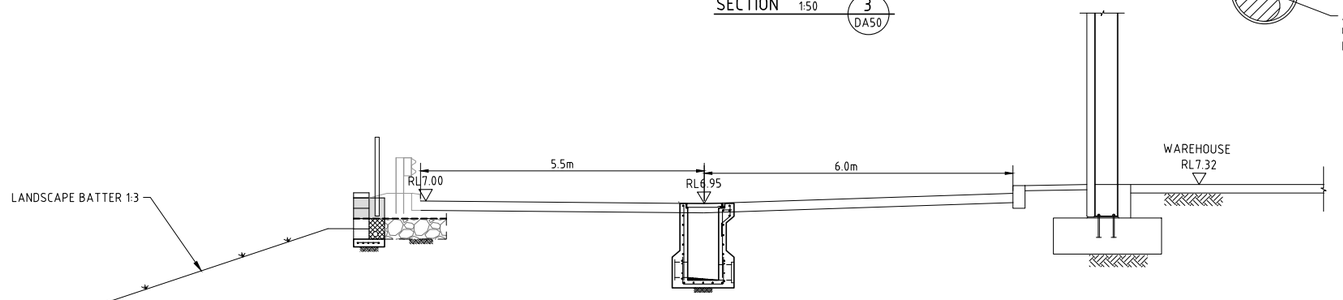
DRAWING TITLE
FINISHED LEVELS PLAN
LEVEL 1

DRAWING No C014452.00-DA51

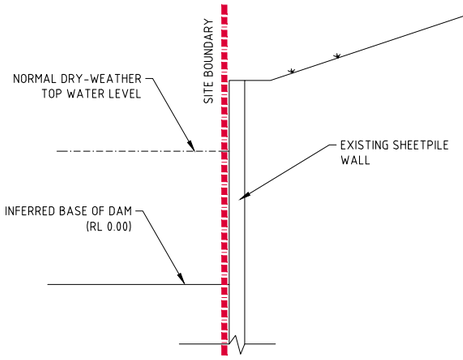
ISSUE C

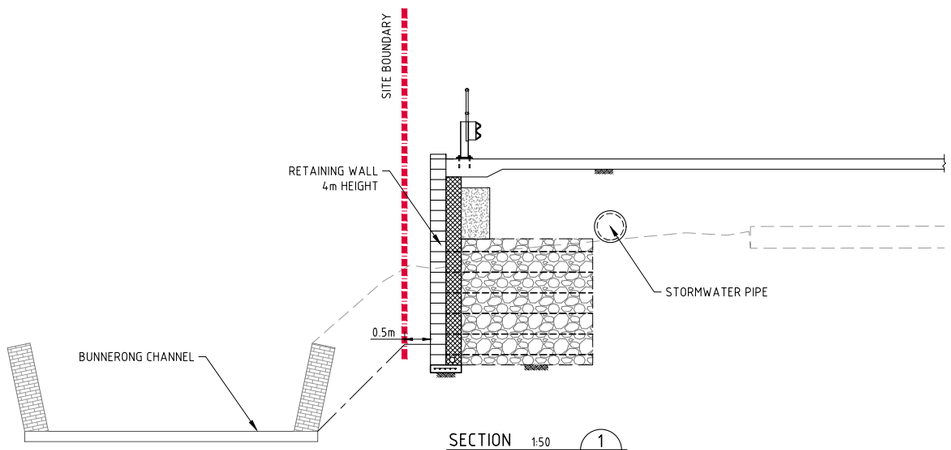


SECTION 1:50 3 DA50



SECTION 1:50 2 DA50





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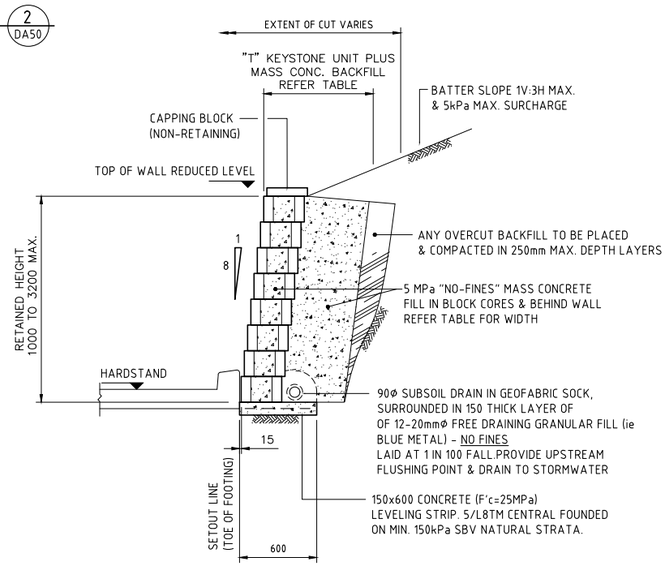
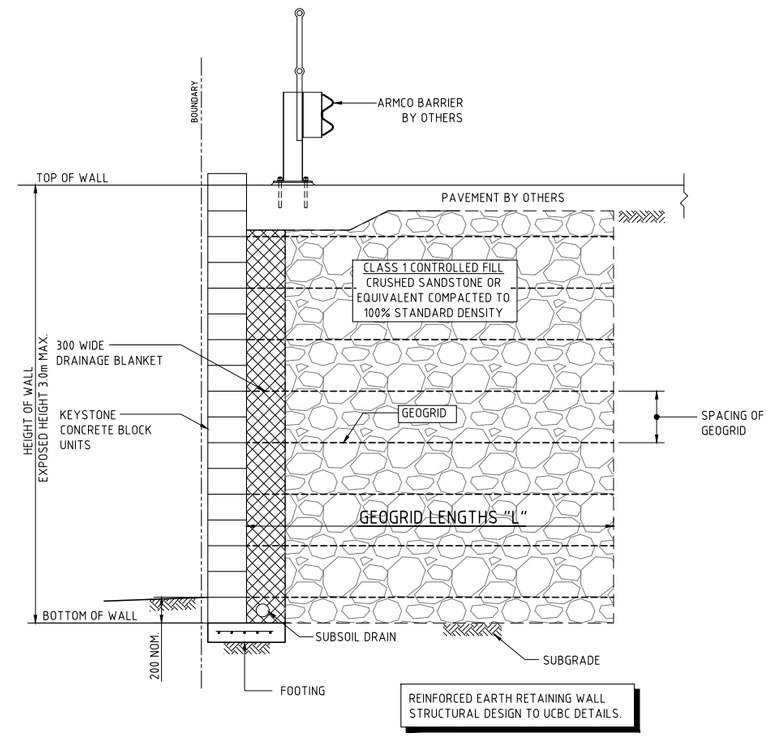


TYPICAL THRU' KEYSTONE RETAINING WALL
(1000 TO 3000 MAXIMUM RETAINED HEIGHT)

KEYSTONE WALL SPECIFICATIONS :	
RETAINED HEIGHT (mm)	OVERALL THICKNESS "T" (mm)
UP TO 1000	600 - NO FINES MASS. CONC. FILL
1000 TO 1200	700 - NO FINES MASS. CONC. FILL
1200 TO 1800	950 - NO FINES MASS. CONC. FILL
1800 TO 2400	1200 - NO FINES MASS. CONC. FILL
2400 TO 3000	1450 - NO FINES MASS. CONC. FILL



RETAINING WALL
(REINFORCED EARTH WALL)
SCALE 1:20

200mm 0 500 1000 1500 2000mm
SCALE 1:20 AT B1 SIZE SHEET

500mm 0 1 2 3 4 5m
SCALE 1:50 AT B1 SIZE SHEET

FOR DEVELOPMENT APPLICATION

AMENDMENTS	DATE	ISSUE
FOR DEVELOPMENT APPLICATION	07.07.22	D
FOR DEVELOPMENT APPLICATION	10.03.22	C
FOR INFORMATION ONLY	23.12.21	B
FOR INFORMATION ONLY	15.12.21	A

AMENDMENTS DATE ISSUE

ARCHITECT
SBA ARCHITECTS
commercial residential heritage interiors design
Suite 702, 83 Mount Street, North Sydney NSW 2060
T 02 9929 9988 F 02 9929 8899
E info@sbaarch.com.au W www.sbaarch.com.au

CLIENT
Hale

PROJECT
INDUSTRIAL DEVELOPMENT
42 RAYMOND AVENUE, MATRAVILLE
NSW, 2036

DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF:
DW	JB	NOV. 21	DS	B1	AS SHOWN	CO14452.00-DA 55

CONSULT AUSTRALIA

Costin Roe Consulting Pty Ltd.
Consulting Engineers ACN 003 696 448
Level 1, 8 Windmill Street
Walsh Bay, Sydney NSW 2000
Tel: (02) 9251-7699 Fax: (02) 9241-3731
email: mail@coetinroe.com.au ©

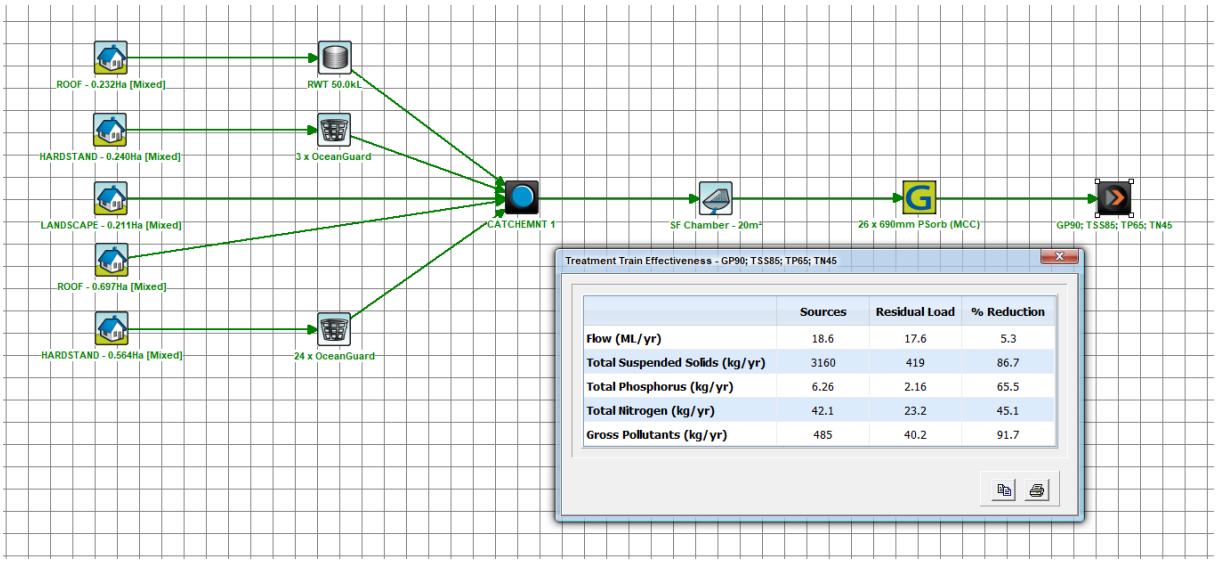
Costin Roe Consulting
PRECISION | COMMUNICATION | ACCOUNTABILITY

DRAWING TITLE
TYPICAL SECTIONS

DRAWING No CO14452.00-DA55
ISSUE D

Appendix B

MUSIC MODEL CONFIGURATION & PARAMETERS



	Sources	Residual Load	% Reduction
Flow (ML/yr)	18.6	17.6	5.3
Total Suspended Solids (kg/yr)	3160	419	86.7
Total Phosphorus (kg/yr)	6.26	2.16	65.5
Total Nitrogen (kg/yr)	42.1	23.2	45.1
Gross Pollutants (kg/yr)	485	40.2	91.7

B.1 Introduction

The MUSIC modelling software was chosen to model water quality. This model has been released by the Cooperative Research Centre for Catchment Hydrology (CRCCH) and is a standard industry model for this purpose. MUSIC (the Model for Urban Stormwater Improvement Conceptualisation) is suitable for simulating catchment areas of up to 100 km^2 and utilises a continuous simulation approach to model water quality.

By simulating the performance of stormwater management systems, MUSIC can be used to predict if these proposed systems and changes to land use are appropriate for their catchments and are capable of meeting specified water quality objectives (CRC 2002). The water quality constituents modelled in MUSIC and of relevance to this report include Total Suspended Solids (TSS), Total Phosphorus (TP) and Total Nitrogen (TN).

The pollutant retention criteria set out in Sydney Water requirments and nominated in **Section 4.1** of this report were used as a basis for assessing the effectiveness of the selected treatment trains.

The MUSIC model "*Co14452.00 Rev.1.sqz*" was set up to examine the effectiveness of the water quality treatment train and to predict if council requirements have been achieved. The model was set up using the rainfall data from Sydney Airport 1979-1988 and the layout of the MUSIC model is presented in **Appendix B**.

Modelling parameters used are based on those nominated in the Sydney Catchment Management Authority (SCA) document *Using Music in Sydney's Drinking Water Catchment – A Sydney Catchment Authority Standard (2012)* and *Draft NSW MUSIC Modelling Guidelines (2011).*

B.2 Rainfall Data

A six-minute pluviographic data for the Sydney Meteorological Office Station was sourced from the Bureau of Meteorology (BOM) as nominated below. Evapo-transpiration data for the period was sourced from the Sydney Monthly Areal PET data set supplied with the MUSIC software.

Input	**Data Used**
Rainfall Station	066037 Sydney Airport
Rainfall Period	1 January 1979 – 31 December 1988 (10 years)
Evapotanspiration	Sydney Monthly Areal PET
Model Timestep	6 minutes

B.3 Rainfall Runoff Parameters

Parameter	**Value**
Rainfall Threshold	1.50
Soil Storage Capacity (mm)	195
Initial Storage (% capacity)	30
Field Capacity (mm)	135

Infiltration Capacity Coefficient a	250
Infiltration Capacity exponent b	1.3
Initial Depth (mm)	10
Daily Recharge Rate (%)	60
Daily Baseflow Rate (%)	45
Daily Seepage Rate (%)	0

B.4 Pollutant Concentrations & Source Nodes

Pollutant concentrations for source nodes are based on parameters adopted as per **Table B.1**.

Flow Type	Surface Type	TSS (log_{10} values)		TP (log_{10} values)		TN (log_{10} values)	
		Mean	Std Dev.	Mean	Std Dev.	Mean	Std Dev.
Baseflow	Roof	1.20	0.17	-0.85	0.19	0.11	0.12
	Roads	1.20	0.17	-0.85	0.19	0.11	0.12
	Landscaping	1.2	0.17	-0.85	0.19	0.11	0.12
Stormflow	Roof	1.30	0.32	-0.89	0.25	0.30	0.19
	Roads	2.43	0.32	-0.30	0.25	0.34	0.19
	Landscaping	2.15	0.32	-0.6	0.25	0.30	0.19

Table B.1. Pollutant Concentrations

The MUSIC model has been setup with a treatment train approach based on the pollutant concentrations in **Table B.1** above.

The relevant stormwater catchment sizes are listed below in **Table B.2** and their configuration within the MUSIC model.

Catchment	Area (Ha)	Source Node	% Impervious	Stormwater Treatment
Roof RWT	0.232	Roof	100%	Rainwater Tank/ StormFilter Cartridges
Roof	0.697	Roof	100%	StormFilter Cartridges
Hardstand	0.240	Sealedroad	100%	OceanGuard OG 200 Pit Insert/ StormFilter Cartridges
Driveway	0.564	Sealedroad	100%	OceanGuard OG 200 Pit Insert/ StormFilter Cartridges
Landscape	0.211	Mixed	0%	OceanGuard OG 200 Pit Insert/ StormFilter Cartridges

Table B.2. Music Model Source Nodes

B.5 Treatment Nodes

Gross Pollutant Trap and Filtration device treatment nodes have been used in the modelling of the development as provided by the suppliers of the products based on testing completed by the product manufacturers.

Gross Pollutant Trap

Parameter	**Value**
Treatable Flow	0.020m^3/s (per OceanGuard)
Pollutant Reductions	
Per Ocean Protect Technical Guidelines	

Filtration Device (Ocean Protect StormFilters)

Parameter	**Value**
Treatable Flow	0.0009m^3/s (per 690 PSorb Cartridge)
Pollutant Reductions	
Per Ocean Protect Technical Guidelines	

B.6 Results

Table B.3 shows the results of the MUSIC analysis. The reduction rate is expressed as a percentage and compares the post-development pollutant loads without treatment versus post-development loads with treatment.

	Source	**Residual Load**	**% Reduction**
Total Suspended Solids (kg/yr)	3160	419	86.7
Total Phosphorus (kg/yr)	6.26	2.16	65.5
Total Nitrogen (kg/yr)	42.1	23.2	45.1
Gross Pollutants (kg/yr)	485	40.2	91.7

Table B.3. MUSIC analysis results

The model results indicate that, through the use of the STM in the treatment train, pollutant load reductions for Total Suspended Solids, Total Phosphorous, Total Nitrogen and Gross Pollutants will meet the requirements of Council's and Sydney Water on an overall site basis.

B.7 Modelling Discussion

MUSIC modelling has been performed to assess the effectiveness of the selected treatment trains and to ensure that the pollutant retention requirements of Council and Sydney Water have been met. The MUSIC modelling has shown that the proposed treatment train of STM will provide stormwater treatment which will meet Councils and Sydney Water requirements in an effective and economical manner.

Appendix C

DRAFT SOIL AND WATER MANAGEMENT PLAN

C.1 Introduction

An erosion and sediment control plan (ESCP) is shown on drawing **Co14452.00-DA20** with details on **DA25**. These are conceptual plans only providing sufficient detail to clearly show that the works can proceed without undue pollution to receiving waters. A detailed plan will be prepared once consent is given and before works start.

The Staged ESCP considers initial site establishment, requirements during construction of the development, and completion of development.

C.2 General Conditions

1. The ESCP will be read in conjunction with the engineering plans, and any other plans or written instructions that may be issued in relation to development at the subject site.
2. Contractors will ensure that all soil and water management works are undertaken as instructed in this specification and constructed following the guidelines stated in *Managing Urban Stormwater, Soils and Construction (2004) "The Blue Book"* and Blacktown City Council specifications.
3. All subcontractors will be informed of their responsibilities in minimising the potential for soil erosion and pollution to down slope areas.

C.3 Land Disturbance

1. Where practicable, the soil erosion hazard on the site will be kept as low as possible and as recommended in Table C.1.

Land Use	Limitation	Comments
Construction areas	Limited to 5 (preferably 2) metres from the edge of any essential construction activity as shown on the engineering plans.	All site workers will clearly recognise these areas that, where appropriate, are identified with barrier fencing (upslope) and sediment fencing (downslope), or similar materials.
Access areas	Limited to a maximum width of 5 metres	The site manager will determine and mark the location of these zones onsite. They can vary in position so as to best conserve existing vegetation and protect downstream areas while being considerate of the needs of efficient works activities. All site workers will clearly recognise these boundaries.
Remaining lands	Entry prohibited except for essential management works	

Table C.1 Limitations to access

C.4 Erosion Control Conditions

1. Clearly visible barrier fencing shall be installed as shown on the plan and elsewhere at the discretion of the site superintendent to ensure traffic control and prohibit unnecessary site disturbance. Vehicular access to the site shall be limited to only those essential for construction work and they shall enter the site only through the stabilised access points.
2. Soil materials will be replaced in the same order they are removed from the ground. It is particularly important that all subsoils are buried and topsoils remain on the surface at the completion of works.
3. Where practicable, schedule the construction program so that the time from starting land disturbance to stabilisation has a duration of less than six months.
4. Notwithstanding this, schedule works so that the duration from the conclusion of land shaping to completion of final stabilisation is less than 20 working days.
5. Land recently established with grass species will be watered regularly until an effective cover has properly established and plants are growing vigorously. Further application of seed might be necessary later in areas of inadequate vegetation establishment.
6. Where practical, foot and vehicular traffic will be kept away from all recently established areas
7. Earth batters shall be constructed in accordance with the Geotechnical Engineers Report or with as law a gradient as practical but not steeper than:
   - 2H:1V where slope length is less than 7 metres
   - 2.5H:1V where slope length is between 7 and 10 metres
   - 3H:1V where slope length is between 10 and 12 metres
   - 4H:1V where slope length is between 12 and 18 metres
   - 5H:1V where slope length is between 18 and 27 metres
   - 6H:1V where slope length is greater than 27 metres
8. All earthworks, including waterways/drains/spillways and their outlets, will be constructed to be stable in at least the design storm event.
9. During windy weather, large, unprotected areas will be kept moist (not wet) by sprinkling with water to keep dust under control. In the event water is not available in sufficient quantities, soil binders and/or dust retardants will be used or the surface will be left in a cloddy state that resists removal by wind.

C.5 Pollution Control Conditions

1. Stockpiles will not be located within 5 metres of hazard areas, including likely areas of high velocity flows such as waterways, paved areas and driveways. Silt/ sediment fences and appropriate stabilisation of stockpiles are to be provided as detailed on the drawings.
2. Sediment fences will:
   a) Be installed where shown on the drawings, and elsewhere at the discretion of the site superintendent to contain the coarser sediment fraction (including aggregated fines) as near as possible to their source.
   b) Have a catchment area not exceeding 720 square meters, a storage depth (including both settling and settled zones) of at least 0.6 meters, and internal dimensions that provide maximum surface area for settling, and
   c) Provide a return of 1 metre upslope at intervals along the fence where catchment area exceeds 720 square meters, to limit discharge reaching each section to 10 litres/second in a maximum 20-year t_c discharge.
3. Sediment removed from any trapping device will be disposed in locations where further erosion and consequent pollution to down slope lands and waterways will not occur.
4. Water will be prevented from directly entering the permanent drainage system unless it is relatively sediment free (i.e. the catchment area has been permanently landscaped and/or likely sediment has been treated in an approved device). Nevertheless, stormwater inlets will be protected.
5. Temporary soil and water management structures will be removed only after the lands they are protecting are stabilised.

C.6 Waste Management Conditions

Acceptable bind will be provided for any concrete and mortar slurries, paints, acid washings, lightweight waste materials and litter. Clearance service will be provided at least weekly.

C.7 Site Inspection and Maintenance

1. A self-auditing program will be established based on a Check Sheet. A site inspection using the Check Sheet will be made by the site manager:
   - At least weekly.
   - Immediately before site closure.
   - Immediately following rainfall events in excess of 5mm in any 24-hour period.

The self-audit will include:

- Recording the condition of every sediment control device
- Recording maintenance requirements (if any) for each sediment control device

- Recording the volumes of sediment removed from sediment retention systems, where applicable
- Recording the site where sediment is disposed
- Forwarding a signed duplicate of the completed Check Sheet to the project manager/developer for their information

2. In addition, a suitably qualified person will be required to oversee the installation and maintenance of all soil and water management works on the site. The person shall be required to provide a short monthly written report. The responsible person will ensure that:
   - The plan is being implemented correctly
   - Repairs are undertaken as required
   - Essential modifications are made to the plan if and when necessary

The report shall carry a certificate that works have been carried out in accordance with the plan.

3. Waste bins will be emptied as necessary. Disposal of waste will be in a manner approved by the Site Superintendent.
4. Proper drainage will be maintained. To this end drains (including inlet and outlet works) will be checked to ensure that they are operating as intended, especially that,
   - No low points exist that can overtop in a large storm event
   - Areas of erosion are repaired (e.g. lined with a suitable material) and/or velocity of flow is reduced appropriately through construction of small check dams of installing additional diversion upslope.
   - Blockages are cleared (these might occur because of sediment pollution, sand/soil/spoil being deposited in or too close to them, breached by vehicle wheels, etc.).
5. Sand/soil/spoil materials placed closer than 2 meters from hazard areas will be removed. Such hazard areas include and areas of high velocity water flows (e.g. waterways and gutters), paved areas and driveways.
6. Recently stabilised lands will be checked to ensure that erosion hazard has been effectively reduced. Any repairs will be initiated as appropriate.
7. Excessive vegetation growth will be controlled through mowing or slashing.
8. All sediment detention systems will be kept in good, working condition. In particular, attention will be given to:
   a) Recent works to ensure they have not resulted in diversion of sediment laden water away from them
   b) Degradable products to ensure they are replaced as required, and
   c) Sediment removal, to ensure the design capacity or less remains in the settling zone.
9. Any pollutants removed from sediment basins or litter traps will be disposed of in areas where further pollution to down slope lands and waterways should not occur.

10. Additional erosion and/or sediment control works will be constructed as necessary to ensure the desired protection is given to down slope lands and waterways, i.e. make ongoing changes to the plan where it proves inadequate in practice or is subjected to changes in conditions at the work site or elsewhere in the catchment.
11. Erosion and sediment control measures will be maintained in a functioning condition until all earthwork activities are completed and the site stabilised
12. Litter, debris and sediment will be removed from the gross pollutant traps and trash racks as required.

EROSION AND SEDIMENT CONTROL
WEEKLY SITE INSPECTION SHEET

LOCATION .....
INSPECTION OFFICER ..... **DATE** .....
SIGNATURE .....

Legend: OK Not OK N/A Not applicable

Item	Consideration	Assessment
1	Public roadways clear of sediment.	.....
2	Entry/exit pads clear of excessive sediment deposition.	.....
3	Entry/exit pads have adequate void spacing to trap sediment.	.....
4	The construction site is clear of litter and unconfined rubbish.	.....
5	Adequate stockpiles of emergency ESC materials exist on site.	.....
6	Site dust is being adequately controlled.	.....
7	Appropriate drainage and sediment controls have been installed prior to new areas being cleared or disturbed.	.....
8	Up-slope "clean" water is being appropriately diverted around/through the site.	.....
9	Drainage lines are free of soil scour and sediment deposition.	.....
10	No areas of exposed soil are in need of erosion control.	.....
11	Earth batters are free of "rill" erosion.	.....
12	Erosion control mulch is not being displaced by wind or water.	.....
13	Long-term soil stockpiles are protected from wind, rain and stormwater flow with appropriate drainage and erosion controls.	.....
14	Sediment fences are free from damage.	.....
15	Sediment-laden stormwater is not simply flowing "around" the sediment fences or other sediment traps.	.....
16	Sediment controls placed up-slope/around stormwater inlets are appropriate for the type of inlet structure.	.....
17	All sediment traps are free of excessive sediment deposition.	.....
18	The settled sediment layer within a sediment basin is clearly visible through the supernatant prior to discharge such water.	.....
19	All reasonable and practicable measures are being taken to control sediment runoff from the site.	.....
20	All soil surfaces are being appropriately prepared (i.e. pH, nutrients, roughness and density) prior to revegetation.	.....
21	Stabilised surfaces have a minimum 70% soil coverage.	.....
22	The site is adequately prepared for imminent storms.	.....
23	All ESC measures are in proper working order.	.....

Appendix D

STORMWATER SYSTEM

DRAFT MAINTENANCE SCHEDULE

MAINTENANCE ACTION	FREQUENCY	RESPONSIBILITY	PROCEDURE
SWALES/ LANDSCAPED AREAS			
Check density of vegetation and ensure minimum height of 150mm is maintained. Check for any evidence of weed infestation	Six monthly	Maintenance Contractor	Replant and/or fertilise, weed and water in accordance with landscape consultant specifications
Inspect swale for excessive litter and sediment build up	Six monthly	Maintenance Contractor	Remove sediment and litter and dispose in accordance with local authorities' requirements.
Check for any evidence of channelisation and erosion	Six monthly/ After Major Storm	Maintenance Contractor	Reinstate eroded areas so that original, designed swale profile is maintained
Weed Infestation	Three Monthly	Maintenance Contractor	Remove any weed infestation ensuring all root ball of weed is removed. Replace with vegetation where required.
Inspect swale surface for erosion	Six Monthly	Maintenance Contractor	Replace top soil in eroded area and cover and secure with biodegradable fabric. Cut hole in fabric and revegetate.
INLET & JUNCTION PITS			
Inside of pits	Six Monthly	Maintenance Contractor	Remove grate and inspect internal walls and base, repair where required. Remove any collected sediment, debris, litter.
Outside of pits	Four Monthly/ After Major Storm	Maintenance Contractor	Clean grate of collected sediment, debris, litter and vegetation.
PROPRIETARY TREATMENT DEVICES (OceanSave & StormFilters)			
Refer to Manufacturers Operation and Maintenance Manuel	Annually	Maintenance Contractor	Refer to Manufacturers Operation and Maintenance Manuel

MAINTENANCE ACTION	FREQUENCY	RESPONSIBILITY	PROCEDURE
RAINWATER TANK			
Check for any clogging and blockage of the first flush device	Monthly	Maintenance Contractor	First flush device to be cleaned out
Check for any clogging and blockage of the tank inlet - leaf/litter screen	Six monthly	Maintenance Contractor	Leaves and debris to be removed from the inlet leaf/litter screen
Check the level of sediment within the tank	Every two years	Maintenance Contractor	Sediment and debris to be removed from rainwater tank floor if sediment level is greater than the maximum allowable depth as specified by the hydraulic consultant
STORMWATER SYSTEM			
General Inspection of complete stormwater drainage system	Bi-annually	Maintenance Contractor	Inspect all drainage structures noting any dilapidation in structures and carry out required repairs.
TANKS			
Inspect and remove any blockage from orifice	Six Monthly	Maintenance Contractor/ Owner	Remove grate and screen to inspect orifice.
Inspect trash screen and clean	Six Monthly	Maintenance Contractor/ Owner	Remove grate and screen if required to clean it.
Inspect flap valve and remove any blockage.	Six Monthly	Maintenance Contractor/ Owner	Remove grate. Ensure flap valve moves freely and remove any blockages or debris.
Inspect pit sump for damage or blockage.	Six Monthly	Maintenance Contractor/ Owner	Remove grate & screen. Remove sediment/ sludge build up and check orifice and flap valve are clear.
Inspect storage areas and remove debris/ mulch/ litter etc likely to block screens/ grates.	Six Monthly	Maintenance Contractor/ Owner	Remove debris and floatable materials.

MAINTENANCE ACTION	FREQUENCY	RESPONSIBILITY	PROCEDURE
Check attachment of orifice plate and screen to wall of pit	Annually	Maintenance Contractor	Remove grate and screen. Ensure plate or screen mounted securely, tighten fixings if required. Seal gaps if required.
Check orifice diameter is correct and retains sharp edge.	Five yearly	Maintenance Contractor	Compare diameter to design (see Work-as-Executed) and ensure edge is not pitted or damaged.
Check screen for corrosion	Annually	Maintenance Contractor	Remove grate and screen and examine for rust or corrosion, especially at corners or welds.
Inspect overflow weir and remove any blockage	Six monthly	Maintenance Contractor/ Owner	Ensure weir is free of blockage.
Inspect walls for cracks or spalling	Annually	Maintenance Contractor	Remove grate to inspect internal walls, repair as necessary.
Check step irons	Annually	Maintenance Contractor	Ensure fixings are secure and irons are free from corrosion.

Appendix E

PLANNING SECRETARY'S ENVIRONMENTAL ASSESSMENT REQUIREMENTS

SSDA-31552370 (18 NOVEMBER 2021)

Planning Secretary's Environmental Assessment Requirements

Warehouses and distribution centres

NSW GOVERNMENT

Development details

Application number	SSD-31552370
Project name	Multi-level Warehouse Matraville
Location	42-52 Raymond Avenue, Matraville (Lot 1 in DP 369888, Lot 32 Section B DP 8313 and Lot 1 DP 511092) in the Randwick LGA
Applicant	Hale Capital Partners Pty Ltd
Date of issue	18 November 2021

Content and guidance

Any Environmental Impact Statement (EIS) must meet the minimum form and content requirements as prescribed by Schedule 2 of the *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation) and the *State Significant Development Guidelines*.

Relevant policies and guidelines can be found at https://www.planningportal.nsw.gov.au/major-projects/assessment/policies-and-guidelines.

Key issues and documentation

Issue and Assessment Requirements	Documentation
1. Statutory Context • Address all relevant legislation, environmental planning instruments (EPIs) (including drafts), plans, policies and guidelines. • Identify compliance with applicable development standards and provide a detailed justification for any non-compliances. • If the development is only partly State significant development (SSD) under clause 8(1) of the State and Regional Development SEPP, provide an explanation of how the remainder of the development is sufficiently related to the component that is SSD. • Address the requirements of any approvals applying to the site, including any concept approval or recommendation from any Gateway determination.	• Address in EIS
2. Capital Investment Value and Employment • Provide a detailed calculation of the capital investment value (CIV) of the development, prepared by a qualified quantity surveyor. • Provide an estimate of the retained and new jobs that would be created during the construction and operational phases of the development, including	• Cost Summary Report

details of the methodology to determine the figures provided.	

3. Design Quality
• Demonstrate how the development will achieve:
  ○ design excellence in accordance with any applicable EPI provisions.
  ○ good design in accordance with the seven objectives for good design in *Better Placed*.
• Where required by an EPI or concept approval, demonstrate how the development has been subject to a competitive design process or reviewed by the State Design Review Panel (SDRP). Recommendations are to be addressed prior to lodgement.
	• Address in EIS
	If required:
	• Design Review Report (where the project has been reviewed by the SDRP)
	• Design Excellence Strategy (where design excellence is required by an EPI)
	• Competition Report (where a competitive design process has been held)

4. Built Form and Urban Design • Explain and illustrate the proposed built form, including a detailed site and context analysis to justify the proposed site planning and design approach. • Demonstrate how the proposed built form (layout, height, bulk, scale, separation, setbacks, interface and articulation) addresses and responds to the context, site characteristics, streetscape and existing and future character of the locality. • Demonstrate how the building design will deliver a high-quality development, including consideration of façade design, articulation, materials, finishes, colours, any signage and integration of services. • Assess how the development complies with the relevant accessibility requirements.	• Architectural drawings • Design Report • Survey Plan • Building Code of Australia Compliance Report • Accessibility Report
5. Visual Impact • Provide a visual analysis of the development from key viewpoints, including photomontages or perspectives showing the proposed and likely future development. • Where the visual analysis has identified potential for significant visual impact, provide a visual impact assessment that addresses the impacts of the development on the existing catchment.	• Visual Analysis • Visual Impact Assessment
6. Traffic, Transport and Accessibility • Provide a transport and accessibility impact assessment, which includes: ○ details of all traffic types and volumes likely to be generated during construction and operation, including a description of key access and	• Transport and Accessibility Impact Assessment • Construction Traffic

haul routes. ○ an assessment of the predicted impacts of this traffic on road safety and the capacity of the road network, including consideration of cumulative traffic impacts at key intersections (using industry standard modelling). ○ plans demonstrating how all vehicles likely to be generated during construction and operation and awaiting loading, unloading or servicing can be accommodated on the site to avoid queuing in the street network. ○ details and plans of any proposed internal road network, loading dock provision and servicing, on-site parking provisions, and sufficient pedestrian and cyclist facilities, in accordance with the relevant Australian Standards. ○ swept path analysis for the largest vehicle requiring access to the development. ○ details of road upgrades, infrastructure works, or new roads or access points required for the development if necessary. • Provide a Construction Traffic Management Plan detailing predicted construction vehicle movements, routes, access and parking arrangements, coordination with other construction occurring in the area, and how impacts on existing traffic, pedestrian and bicycle networks would be managed and mitigated.	Management Plan • Green Travel Plan or equivalent
7. Trees and Landscaping • Provide a detailed site-wide landscape plan, that: ○ identifies the number and location of trees to be removed and retained, and how opportunities to retain significant trees have been explored and/or informs the plan. ○ details the proposed site planting, including location, number and species of plantings, heights of trees at maturity and proposed canopy coverage. ○ demonstrates how the proposed development would: ▪ contribute to long term landscape setting in respect of the site and streetscape. ▪ mitigate the urban heat island effect and ensure appropriate comfort levels on-site. ▪ contribute to the objective of increased urban tree canopy cover. ▪ maximise opportunities for green infrastructure, consistent with *Greener Places*.	• Landscape Plan
8. Ecologically Sustainable Development (ESD) • Identify how ESD principles (as defined in clause 7(4) of Schedule 2 of the EP&A Regulation) are incorporated in the design and ongoing operation of the development.	• ESD Report

• Demonstrate how the development will meet or exceed the relevant industry recognised building sustainability and environmental performance standards. • Demonstrate how the development minimises greenhouse gas emissions (reflecting the Government's goal of net zero emissions by 2050) and consumption of energy, water (including water sensitive urban design) and material resources.	
9. Biodiversity • Assess any biodiversity impacts associated with the development in accordance with the *Biodiversity Conservation Act 2016* and the *Biodiversity Assessment Method 2020*, including the preparation of a Biodiversity Development Assessment Report (BDAR), unless a waiver is granted, or the site is on biodiversity certified land. • If the development is on biodiversity certified land, provide information to identify the site (using associated mapping) and demonstrate the proposed development is consistent with the relevant biodiversity measure conferred by the biodiversity certification.	• Biodiversity Development Assessment Report or BDAR Waiver
10. Air Quality • Identify significant air emission sources at the proposed development (during construction and operation), assess their potential to cause adverse off-site impacts, and detail proposed management and mitigation measures that would be implemented. Where air emissions during operation have the potential to cause adverse off-site impacts, provide a quantitative air quality impact assessment prepared in accordance with the relevant NSW Environment Protection Authority (EPA) guidelines.	• Address in EIS If required: • Air Quality Impact Assessment
11. Noise and Vibration • Provide a noise and vibration assessment prepared in accordance with the relevant EPA guidelines. The assessment must detail construction and operational noise and vibration impacts on nearby sensitive receivers and structures and outline the proposed management and mitigation measures that would be implemented.	• Noise and Vibration Impact Assessment
12. Ground and Water Conditions • Provide an assessment of the potential impacts on soil resources, including related infrastructure and riparian lands on and near the site. • Provide an assessment of the potential impacts on surface and groundwater resources (quality and quantity), including related infrastructure, hydrology, aquatic and groundwater dependent ecosystems, drainage lines, downstream assets and watercourses. • Identify predicted water discharge points to surface/groundwater and consider discharge quality against relevant water quality criteria.	• Geotechnical Assessment • Surface and Groundwater Impact Assessment • Salinity Management Plan and/or Acid Sulfate Soils Management Plan

• Provide a detailed site water balance including identification of water requirements for the life of the development, and measures to ensure an adequate and secure water supply. • Provide an assessment of salinity and acid sulfate soil impacts.	

13. Stormwater and Wastewater
• Provide an Integrated Water Management Plan for the development that:
  ○ is prepared in consultation with the local council and any other relevant drainage or water authority.
  ○ details the proposed drainage design for the site including any on-site detention facilities, water quality management measures and the nominated discharge points, on-site sewage management, and measures to treat, reuse or dispose of water.
  ○ demonstrates compliance with the local council or other drainage or water authority requirements and avoids adverse impacts on any downstream properties.
• Where drainage infrastructure works are required that would be handed over to the local council, or other drainage or water authority, provide full hydraulic details and detailed plans and specification of proposed works that have been prepared in consultation with, and comply with the relevant standards of, the local council or other drainage or water authority.
	• Integrated Water Management Plan

14. Flooding Risk • 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*. • Assess the impacts of the development, including any changes to flood risk on-site or off-site, and detail design solutions and operational procedures to mitigate flood risk where required.	• Flood Risk Assessment
15. Hazards and Risks • Where there are dangerous goods and hazardous materials associated with the development provide a preliminary risk screening in accordance with SEPP 33. • Where required by SEPP 33, provide a Preliminary Hazard Analysis prepared in accordance with *Hazardous Industry Planning Advisory Paper No.6 – Guidelines for Hazard Analysis*. • If the development is adjacent to or on land in a pipeline corridor, report on consultation outcomes with the operator of the pipeline, and prepare a hazard analysis.	• Preliminary Hazard Analysis
16. Contamination and Remediation	• Preliminary Site Investigation

• In accordance with SEPP 55, assess and quantify any soil and groundwater contamination and demonstrate that the site is suitable (or will be suitable, after remediation) for the development.	If required: • Detailed Site Investigation • Remedial Action Plan • Preliminary Long-term Environmental Management Plan
17. Waste Management • Identify, quantify and classify the likely waste streams to be generated during construction and operation. • Provide the measures to be implemented to manage, reuse, recycle and safely dispose of this waste. • Identify appropriate servicing arrangements for the site. • If buildings are proposed to be demolished or altered, provide a hazardous materials survey.	• Waste Management Plan • Hazardous Material Survey
18. Aboriginal Cultural Heritage • Provide an Aboriginal Cultural Heritage Assessment Report prepared in accordance with relevant guidelines, identifying, describing and assessing any impacts for any Aboriginal cultural heritage values on the site.	• Aboriginal Cultural Heritage Assessment Report
19. Environmental Heritage • Where there is potential for direct or indirect impacts on the heritage significance of environmental heritage, provide a Statement of Heritage Impact and Archaeological Assessment (if potential impacts to archaeological resources are identified), prepared in accordance with the relevant guidelines, which assesses any impacts and outlines measures to ensure they are minimised and mitigated.	• Statement of Heritage Impact • Archaeological Assessment
20. Social Impact • Provide a Social Impact Assessment prepared in accordance with the *Social Impact Assessment Guidelines for State Significant Projects*.	• Social Impact Assessment

21. Infrastructure Requirements and Utilities
• In consultation with relevant service providers:
  ○ assess the impacts of the development on existing utility infrastructure and service provider assets surrounding the site.
  ○ identify any infrastructure upgrades required on-site and off-site to facilitate the development and any arrangements to ensure that the
	• Infrastructure Delivery, Management and Staging Plan

upgrades will be implemented on time and be maintained. ○ provide an infrastructure delivery and staging plan, including a description of how infrastructure requirements would be co-ordinated, funded and delivered to facilitate the development.	
22. Bush Fire Risk • If the development is on bush fire prone land, provide a bush fire assessment that details proposed bush fire protection measures and demonstrates compliance with *Planning for Bush Fire Protection*.	• Bush Fire Assessment
23. Construction, Operation and Staging • If staging is proposed, provide details of how construction and operation would be managed and any impacts mitigated.	• Address in EIS
24. Contributions and Public Benefit • Address the requirements of any relevant contribution plan(s), planning agreement or EPI requiring a monetary contribution, dedication of land and/or works-in-kind and include details of any proposal for further material public benefit. • Where the development proposes alternative public benefits or a departure from an existing contributions framework, the local council, the Department and relevant State agencies are to be consulted prior to lodgement and details, including how comments have been addressed, are to be provided.	• Address in EIS
25. Engagement • Detail engagement undertaken and demonstrate how it was consistent with the *Undertaking Engagement Guidelines for State Significant Projects*. Detail how issues raised and feedback provided have been considered and responded to in the project. In particular, applicants must consult with: ○ the relevant Department assessment team. ○ any relevant local councils. ○ any relevant agencies. ○ the community. ○ if the development would have required an approval or authorisation under another Act but for the application of s 4.41 of the EP&A Act or requires an approval or authorisation under another Act to be applied consistently by s 4.42 of the EP&A Act, the agency relevant to that approval or authorisation.	• Engagement Report

Appendix F

SYDNEY WATER CORRESPONDANCE

EMAIL DATED 30 March 2021 (Mr JEYA JEYADEVAN)

Adrian Liu

From: JEYADEVAN, JEYA <JEYA.JEYADEVAN@sydneywater.com.au>
Sent: Tuesday, 30 March 2021 2:17 PM
To: Adrian Liu
Cc: Frank Xie
Subject: RE: [External] 42-52 Raymond Ave, Matraville - Sydney Water

Adrian,

With reference to your following email regarding the development at 42-52 Raymond Ave, Matraville.

Building Adjacent to Stormwater Channel

As the development site is adjacent to Sydney Water's stormwater channel, no buildings or permanent structures are to be proposed within 1m from outside face of the stormwater channel or within Sydney Water land, whichever is larger. Permanent structures include (but are not limited to) basement car park, hanging balcony, roof eves, hanging stairs, stormwater pits, stormwater pipes, elevated driveway, basement access or similar structures. This clearance requirement would apply for unlimited depth and height.

Stormwater Discharge

Sydney Water has no objection to discharge of stormwater into Sydney Water's stormwater channel from your development site. On Site Detention is not required for this development as the location of this development site is identified as lower end of the stormwater catchment area of "Bunnerong to Botany Bay" stormwater system. There is no limit for stormwater discharge.

Retention Basin

Retention basin as you have noted in your email is private basin for stormwater reuse by the owner of the property for their industrial use. It is not a Sydney Water basin.

Water Quality Requirements

Generally, Council would require you to comply with certain water quality requirements for stormwater discharge from your development site. In the event Council did not specify any water quality requirements, then following requirements would apply:

Discharged Stormwater Quality Targets

Stormwater run-off from the site should be of appropriate quality before discharge into a Sydney Water asset or system. Developments must demonstrate stormwater quality improvement measures that meet the following specified stormwater pollutant reductions:

Pollutant	Pollutant load reduction objective (%)
Gross Pollutants (>5mm)	90

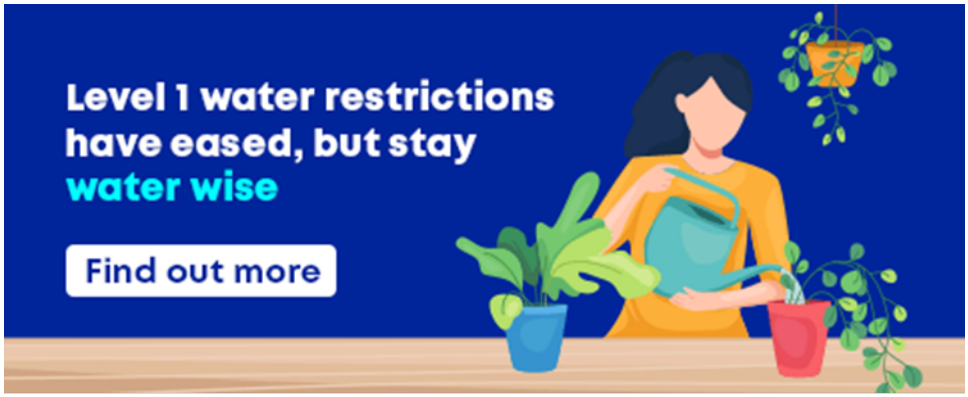
Total Suspended Solids	85
Total Phosphorus	65
Total Nitrogen	45

Best Regards

Jeya Jeyadevan
Senior Capability Assessor
Business Development
Sydney Water, Level 13, 1 Smith Street, Parramatta NSW 2150

Sydney WATER

Phone: 8849 6118
Mobile: 0409 318 827
jeya.jeyadevan@sydneywater.com.au



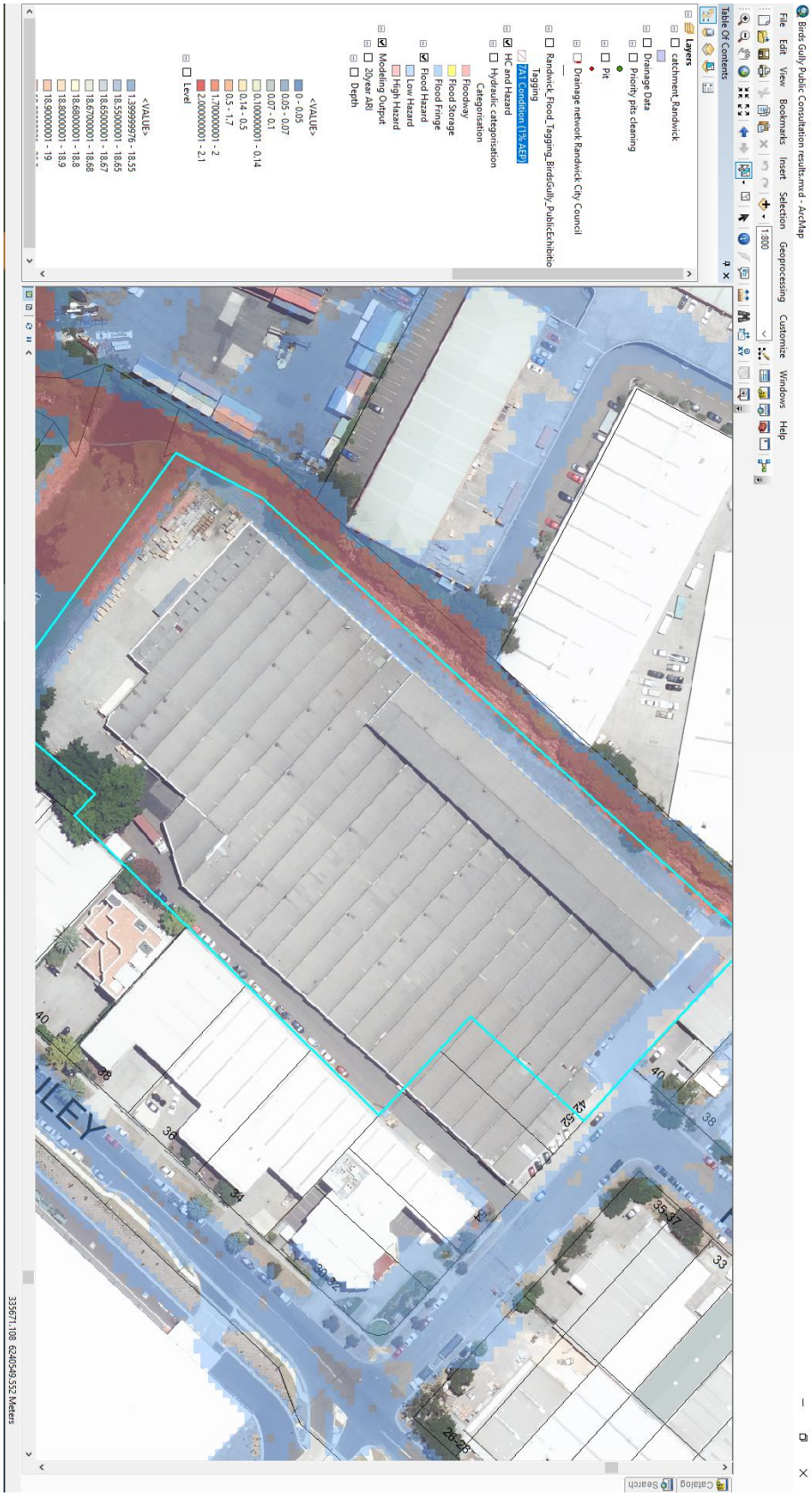
Appendix G

RANDWICH CITY COUNCIL – GIS FLOOD REPORT

DOCUMENT NUMBER: D04384959 (Date 07/12/21)

42 RAYMODN AVENUE, MATRAVILLE, 2036

100 YEAR HAZARD



Model indicates that the property is categorized as low hazard

HYDRAULIC CATEGORIES:

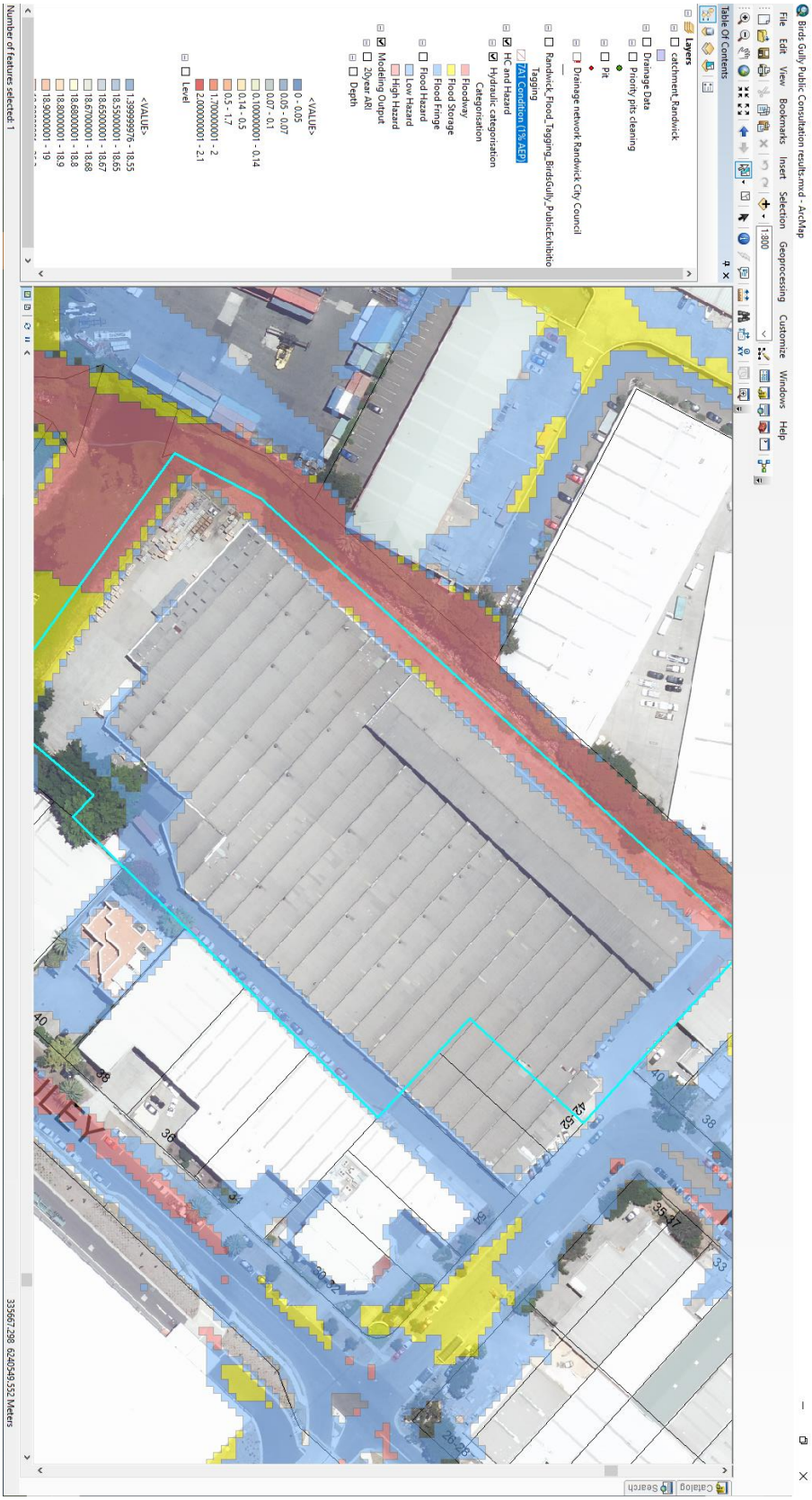
Hydraulic categorisation has been mapped and is shown on Figure 29. Hydraulic categorisation is based on the following:

- Flood Fringe (base layer):
  PMF extent for peak depth greater than 0.15 m.

- Flood Storage (supersedes Flood Fringe when overlapping):
  1% AEP extent for peak depth greater than 0.15 m.

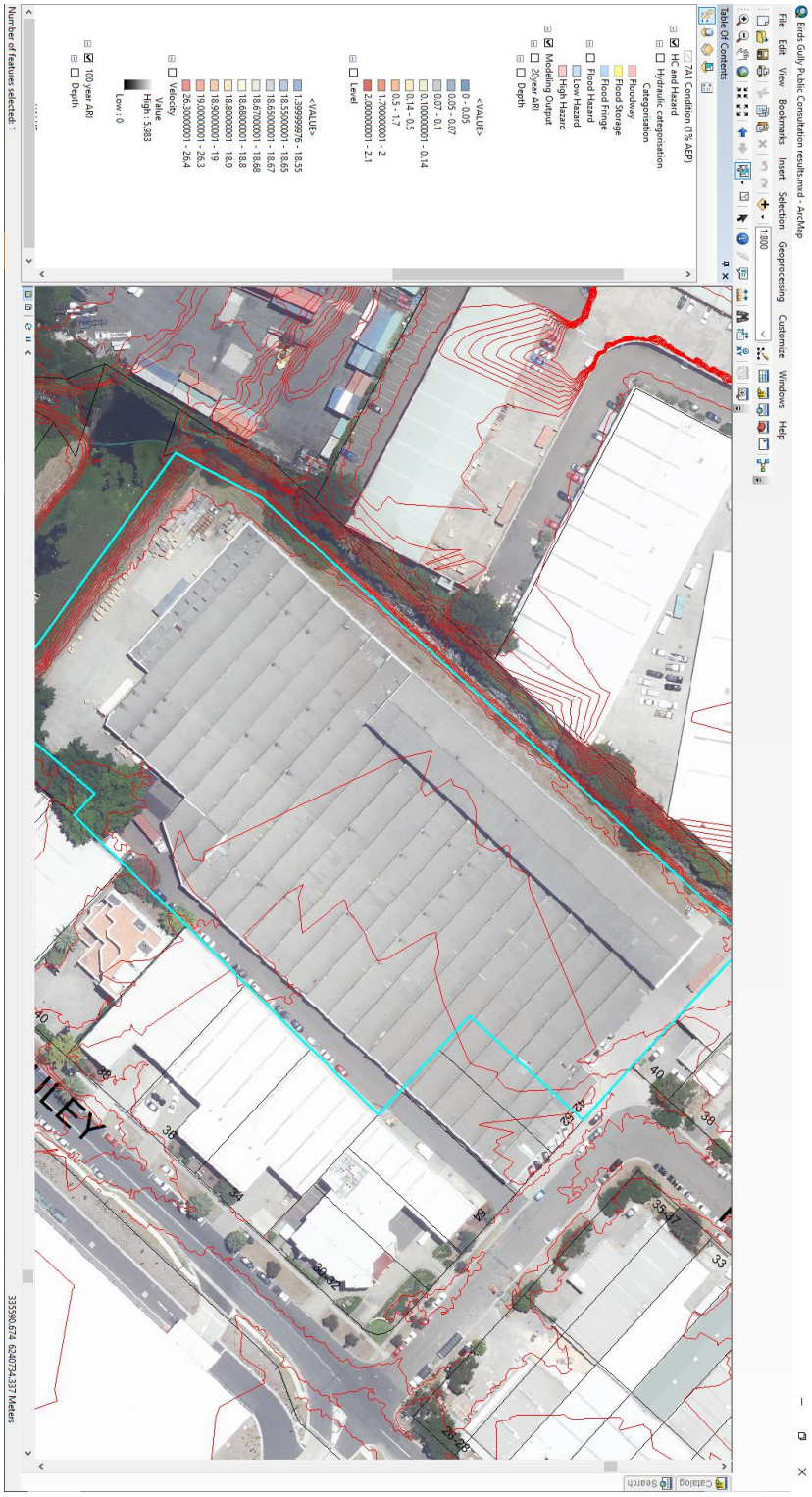
- Flood Way (supersedes Flood Storage when overlapping):
  Extent of 1% AEP peak velocity depth product when greater than 0.3 m^2/s; or
  Extend of 1% AEP peak velocity when greater than 0.5 m/s.

FLOOD FRINGE, FLOOD STORAGE AND FLOODWAY



Model indicates that property is categorized as a flood way, flood storage area and flood fringe.

CONTOURS


Birds Gully Public Consultation results.mxd - ArcMap
File Edit View Bookmarks Insert Selection Geoprocessing Customize Windows Help
Table Of Contents
741 Condition (1% AEP)
HC and Hazard
Hydraulic categorisation
Categorisation
Floodway
Flood Storage
Flood Fringe
Flood Hazard
Low Hazard
High Hazard
Modelling Output
20year ARI
Depth
<VALUE>
0 - 0.05
0.05 - 0.07
0.07 - 0.1
0.100000001 - 0.14
0.14 - 0.5
0.5 - 1.7
1.700000001 - 2
2.000000001 - 2.1
Level
<VALUE>
1.399999976 - 18.55
18.550000001 - 18.65
18.650000001 - 18.67
18.670000001 - 18.68
18.680000001 - 18.8
18.800000001 - 18.9
18.900000001 - 19
19.000000001 - 26.3
26.300000001 - 26.4
Velocity
Value
High : 5.983
Low : 0
100 year ARI
Depth
Number of features selected: 1
335590.674 6240734.337 Meters
Catalog
Search

100 YEAR ARI DEPTH

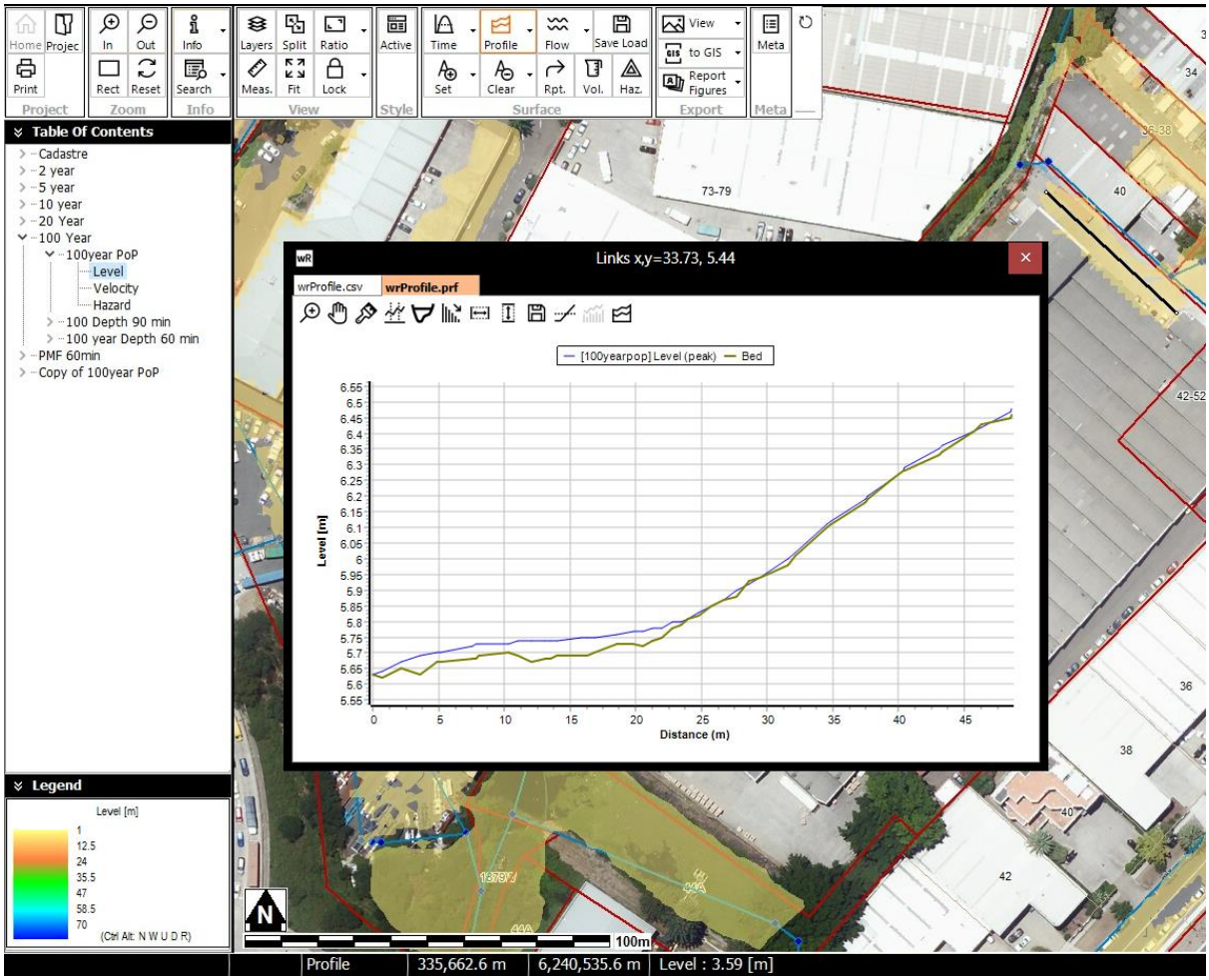
Flood Depth: 0.09m

100 YEAR ARI LEVEL

Flood Level: 5.6-6.66mAHD

100 YEAR ARI LEVEL CROSS-SECTION

Cross Section 1:



20 YEAR ARI DEPTH

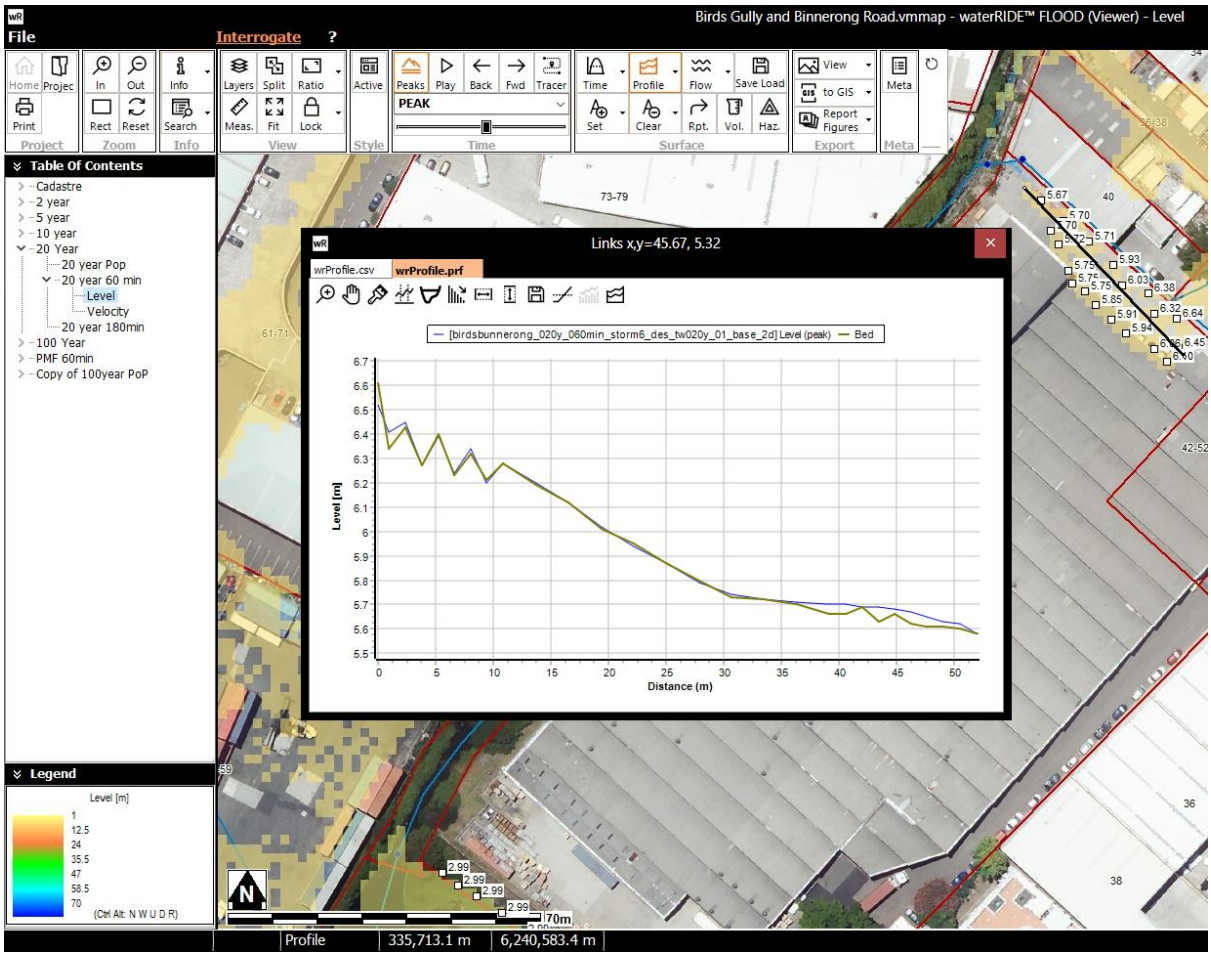
Depth = 0.07m

20 YEAR ARI LEVEL

Level = 5.67 – 6.64mAHD

20 YEAR ARI CROSS-SECTION

Cross Section 1:



100 YEAR ARI VELOCITY

Appendix H

RANDWICK CITY COUNCIL –FLOOD LETTER

DOCUMENT NUMBER: D04384957 (Date 28/10/21)

Randwick City Council
a sense of community

Randwick City Council
30 Frances Street
Randwick NSW 2031

Phone 1300 722 542
ABN: 77 362 844 121

council@randwick.nsw.gov.au
www.randwick.nsw.gov.au

Follow us here

File No: F2021/00106
Doc No: D04384957

28 October 2021

Ms Jessica Smith
1/8 Windmill Street
WALSH BAY NSW 2000

RE: 42 Raymond Avenue, Matraville, 2036

I refer to your recent application for a flood report. Flooding advice is provided as follows.

Property Details

Title Refs:	Lot 1 DP 369668, Lot 32 Sec B DP 8313, Lot 1 DP 511092
Address	42 Raymond Avenue, Matraville 2036

Calculated Flood Depth

	Flood Level (mAHD)	
Flood Event	**Front of Property**	**Back of Property**
1% AEP Flood	6.15	3.59
5% AEP Flood	6.10	2.99

Council's flood modelling indicates that this property is affected by an overland flow path. The minimum floor planning level for the property is 6.65mAHD at the front of the property and 3.49mAHD at the back of the property.

Hazard and Hydraulic Categorisation
The table below contains hazard and hydraulic categorisation of the property in accordance with the NSW Floodplain Development Manual April 2005.

1% AEP flood hazard	☐ Property is categorised as high hazard ☐ Part of Property is categorised as high hazard ☐ Property is adjacent to a high hazard area ☐ Part of Property is categorised as Low hazard ☒ Property is categorised as low hazard ☐ Property does not have a hazard categorisation
Hydraulic categorisation	☐ Property is located in a floodway ☒ Property is located adjacent to a floodway ☐ Property is located in a flood storage area ☒ Part of Property is located in a flood storage area ☐ Property is located in a flood fringe ☒ Part of Property is located in a flood fringe

Randwick City Council
a sense of community

Randwick City Council
30 Frances Street
Randwick NSW 2031

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council@randwick.nsw.gov.au
www.randwick.nsw.gov.au

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Source of Flooding Information
Birds Gully and Bunnerong Road Flood Study (2018)

State Environmental Planning Policy (Exempt and Complying Development Codes) 2008

Council's flooding information indicates that a whole or part of the property is located within at least one of the exclusionary categories in Clause 3.5 (1) of the State Environmental Planning Policy (Exempt and Complying Development Codes) 2017 and therefore complying development may not be permitted.

A minimum habitable floor level under Clause 3.5(2) (a) of the State Environmental Planning Policy (Exempt and Complying Development Codes) 2017 is:

- a minimum of 6.65mAHD at the front of the property and 3.49mAHD at the back of the property.

Council policy regarding flooding

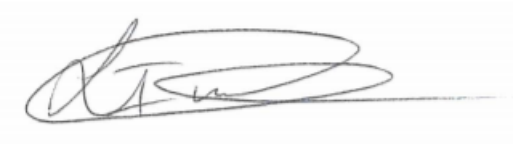
The Randwick City Council Flooding Advice and Flood Related Development Controls Policy sets out flood planning levels and development principles for this property.

Validity

This report is valid for a period of six months from the date of issue. It should be noted that flood studies, legislation, manuals and policy documents may change in the future. Changes to these documents or the built form may impact on the information provided.

Verification

Prepared by:



Jake Irvine
Student Engineer

Checked by:

Paramesh Halaradhya
Drainage Engineer

Randwick City Council
30 Frances Street
Randwick NSW 2031

Phone 1300 722 542
ABN: 77 362 844 121

council@randwick.nsw.gov.au
www.randwick.nsw.gov.au

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Glossary

AHD	Australian Height Datum is a common national surface level datum approximately corresponding to mean sea level.
1% AEP flood	The 1% Annual Exceedance Probability flood has a 1% (1:100) probability of occurring in any given year. This flood is also known as 1 in 100, 100yr ARI or Q100.
5% AEP flood	The 5% Annual Exceedance Probability flood has a 5% (1:20) probability of occurring in any given year. This flood is also known as 1 in 20, 20yr ARI or Q20.
High Hazard Categorisation*	Possible danger to personal safety; evacuation by trucks difficult; able-bodied adults would have difficulty in wading to safety; potential for significant structural damage to buildings.
Low Hazard Categorisation*	Should it be necessary, trucks could evacuate people and their possessions; able-bodied adults would have little difficulty in wading to safety.
Floodways*	Those areas where a significant volume of water flows during floods and are often aligned with obvious natural channels. They are areas that, even if only partially blocked, would cause a significant increase I flood levels and/or a significant redistribution of flood flow, which may in turn adversely affect other areas. They are often, but not necessarily, areas with deeper flow or areas where higher velocities occur.
Flood storage*	Those parts of the floodplain that are important for the temporary storage of floodwaters during the passage of flood. If the capacity of a flood storage area is substantially reduced by, for example, the construction of levees or by landfill, flood levels in nearby areas may rise and the peak discharge downstream may be increased. Substantial reduction of the capacity of a flood storage area can also cause a significant redistribution of flood flows.
Flood fringe*	The remaining area of land affected by flooding, after floodway and flood storage areas have been defined.

* Source – NSW Floodplain Development Manual April 2005
* Note: Flooding related development controls are applicable to all land that is below the 1% AEP flood plus half a metre freeboard.

Appendix I1

FLOOD ASSESSMENT

I.1 INTRODUCTION

I.1.1 Introduction

This Appendix is provided to confirm technical parameters adopted in the *Overland Flow Assessment*, as summarised in **Section 7** of this report, for the proposed industrial estate development. The *Study Area* has been identified by Bayside Council, as being affected by overland flow from an external catchment on the north-east of the property.

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

- Determine the design flows generated by the contributing external catchments for the 1% AEP & PMF; Hydrology would be based on RAFTS modelling.
- Assess the pre-development overland flow path through the development site for the 1% AEP storm event;
- Assess the post-development levels on the effect of overland flow through the development site for the listed range of storms including 1% AEP storm event so that potential impacts on the development can be assessed and mitigated;
- Confirm that there is adverse impact to upstream, downstream and adjacent properties as a result of the development; and
- Confirm flood planning levels applicable to the development.

Appendix I provides technical detail to the summary and conclusions discussed in the **Section 7** of this report.

I.1.2 Survey/ DTM

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

The pre-development scenario survey has been compiled based on a detail site survey for areas within the site, and for areas external to the site where detail survey is not available, digital terrain information has been obtained through government sources in the form of ALS survey. The on-ground survey information was completed in and around the study area to properly define the existing overland flow path cross section and features.

For assessment of the post-development scenario, the proposed development levels and drainage system (where appropriate) were then added to the pre-developed survey surface to create a post developed surface to use in the TUFLOW model and scenario modelling. This DTM was imported to the TUFLOW model to simulate land filling and proposed compensation areas in and around the flood affected land.

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

I.1.3 Previous Studies

Bayside Council has undertaken a flood study of the Birds Gully & Bunnerong Road – *Birds Gully & Bunnerong Road Flood Study: Final Report (June 2018).* The site is noted to be south east of the Bunnerong Channel however clear of the Bunnerong Channel mainline Floodplain, hence does not form part of Bunnerong Channel Flood Study. The site is noted to be a contributing catchment of Botany Bay.

The site is located within the Industrial Zone and an excerpt of the flood model output is shown in **Figure I1.1** The area shown on the northern portion of the site as being affected by overland flow from Raymond Avenue to the Bunnerong Channel in the 1 in 100 year flood event. The site is not to be not affected by mainline flooding in the Bunnerong Channel

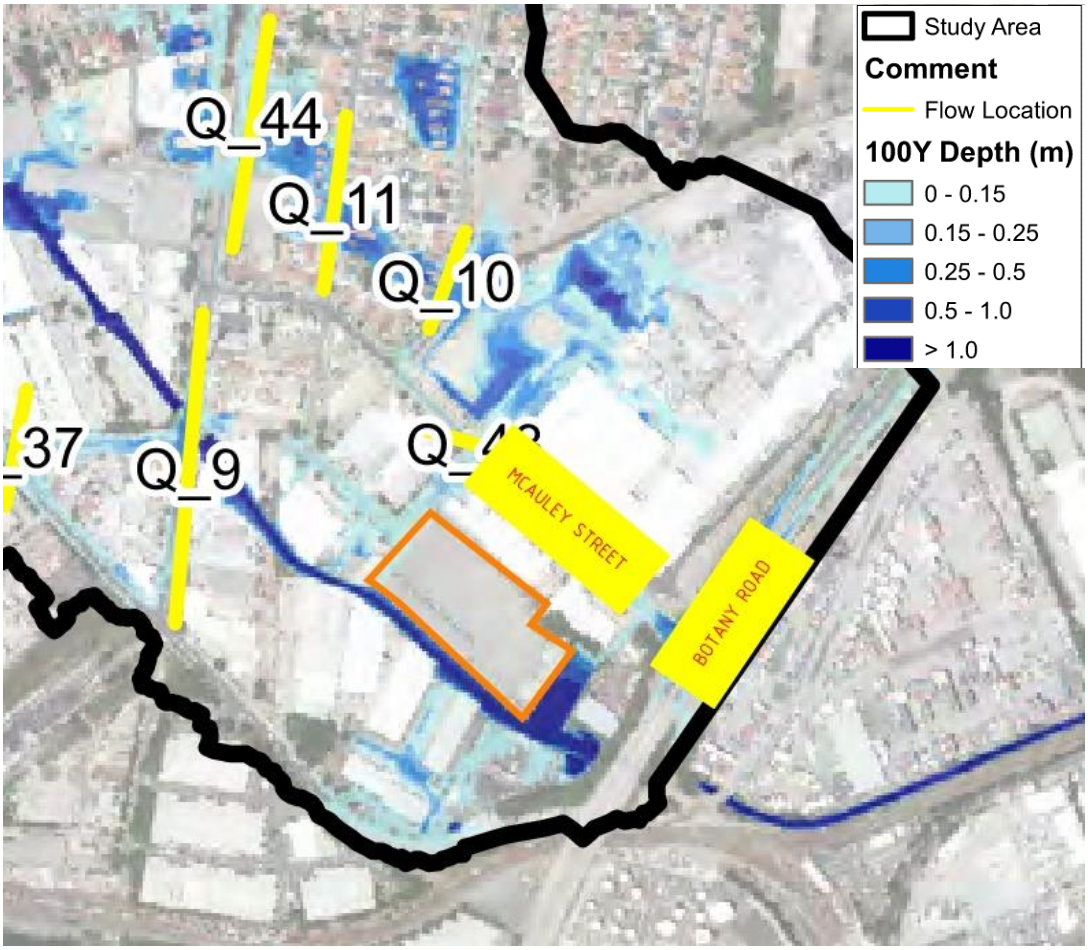

Figure I1.1. Excerpt of Figure 21 of BMT 2018 Study

I.2 CATCHMENT INVESTIGATION & HYDROLOGY

I.2.1 Contributing Catchment Definition

The contributing catchment comprises a combination of residential, commercial and industrial land use with approximately 60% impervious surfaces. For the pre-development condition, the total catchment area contributing to the Raymond Avenue Flooding is approximately 23Ha. It is also noted that an approximately 250Ha catchment draining through the. These catchments are shown below in **Figure I2.1**.

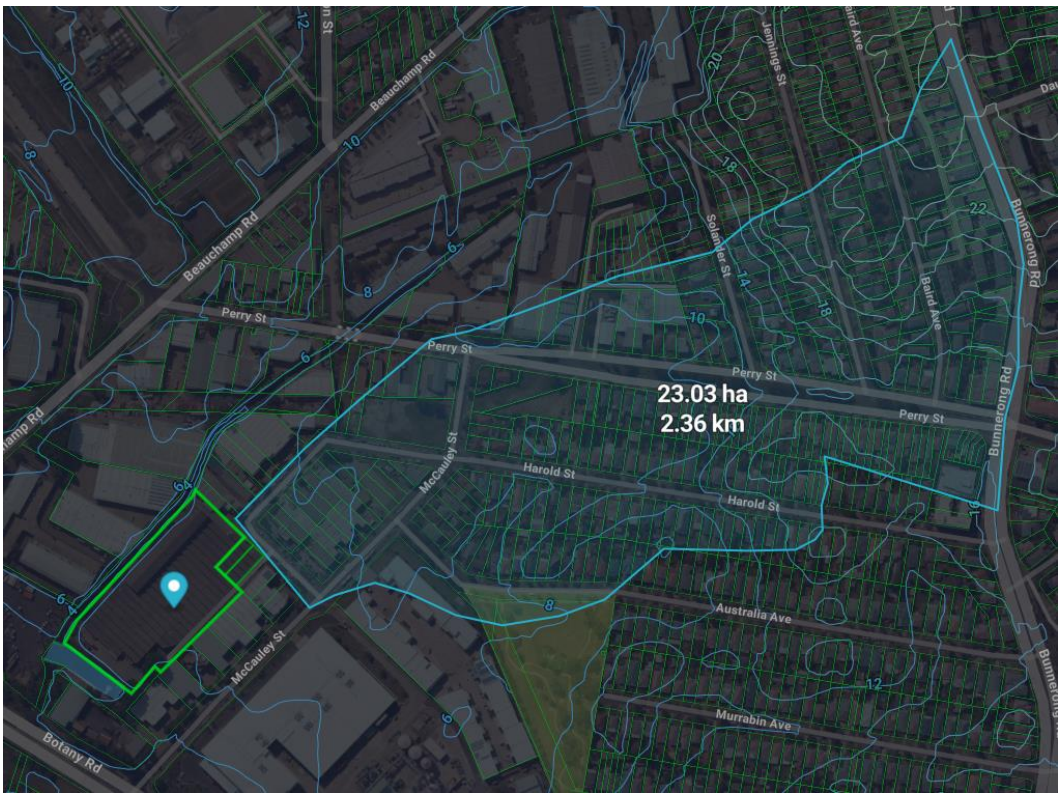

Figure I2.1. Overland Flow Contributing Catchment.

I.2.2 Hydrological Assessment of Existing Catchment

Flood hydrographs were assessed using a RAFTS model based on the contributing catchment. Rainfall intensities and temporal patterns were derived from the Bureau of Meteorology online IFD tool and Australian Rainfall and Runoff. It was determined that the critical storm duration which produces peak flows for the contributing catchments is the 45-minute storm event.

I.3 HYDRODYNAMIC MODEL DEVELOPMENT

I 3.1 Extent and Topography

The model extent is shown in **Figure I3.1** of this appendix. The model begins approximately 200m upstream of the development and extending to Botany Road which is approximately 270m downstream of the overland flow path and 70m downstream of the development site.

I.3.2 Boundary Conditions

Inflow Boundaries

Design inflow hydrographs for the model have been included at the location approximately 200m upstream of the existing upstream of the overland flow point in Raymond Avenue. Flows are based on hydrology as discussed in **Section I.2.2** of this Appendix.

The upstream boundary was 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 zone.

Downstream Water Level Boundaries

The downstream water levels, 270m downstream of the overland flow path and 70m downstream of the development site (just upstream of Botany Road), are based on the levels included in Councils Bunnerong Channel flood study.

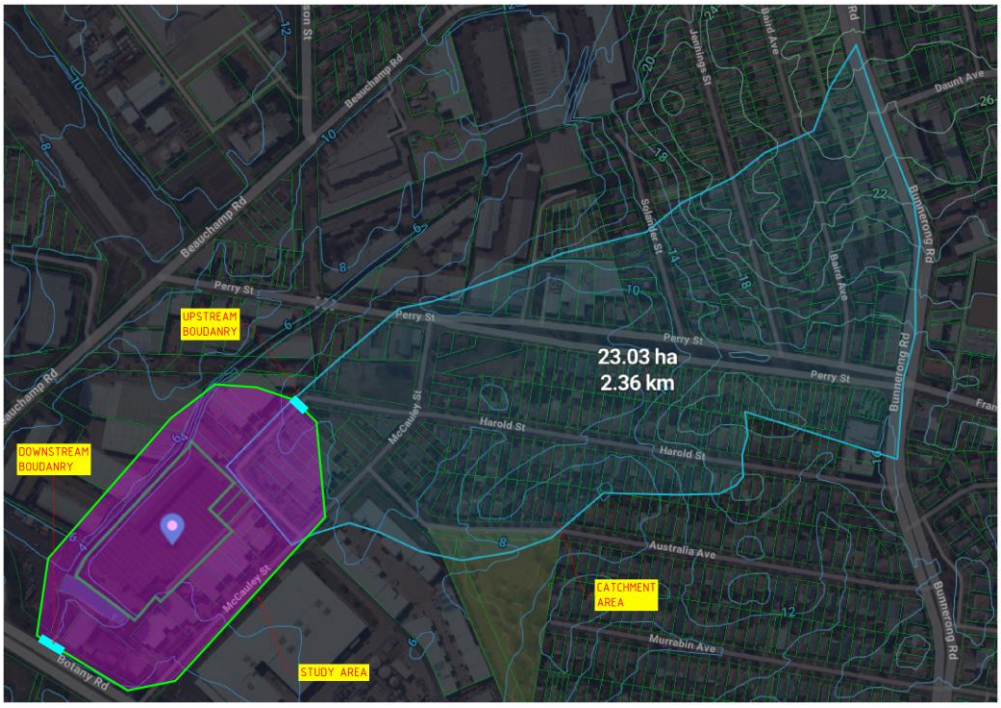

Figure I3.1: Model Extent and Model Boundary Locations

I.3.3 Channel and Floodplain Roughness

Roughness values adopted in the model are contained in **Table I2** below. These are generally consistent with previous studies completed within the Council area and have been adopted in this overland flow study.

Table I2. Adopted TUFLOW Element Roughness Values

Model Element	Description	Roughness Parameter Value
1	Urban Residential	0.05
2	Open Space	0.03
3	Road	0.02
4	Industrials	0.07
5	Infrastructure	0.06
6	Barracks	0.06
7	Concrete Channel	0.015
9	Building	(blockout)

I.3.4 Model Validation

Model validation has been completed by comparing results of the TUFLOW modelling against the results contained in the Bayside Council study from 2018. Model parameters were adjusted as required to achieve acceptable agreement between the model output. The process for the validation was as follows:

- Establish hydrology, peak flows and hydrograph for modelled events;
- Establish TUFLOW Model using defined parameters;
- Compare results of TUFLOW modelling with the Randwick City Council Figures including flood depths, flood levels, flood extents and hydraulics. The comparison is made at the peak of the predicted parameters;
- Adjust roughness factors to align TUFLOW flood extent to align with the Randwick Council Results.

Hydrology and peak flows were established as described in **Section I.2.2** of this report.

A number of trial models and iterations of the TUFLOW model were performed. Adjustment of roughness parameters were used to align the flood levels with those compiled in the council figures.

The comparison of the flood level results shows good alignment of those produced in the TUFLOW model when compared with those of the council figures. The

predicted flood extent is consistent between the two models for the flood event modelled.

Given the differences in modelling techniques, parameters, predicted model accuracy (+/-0.2m) and model components these differences are considered acceptable for the base model and for continuation of post-developed scenario modelling.

I.3.5 Proposed Overland Flow Management Strategy

Flows from within the development sites have been only considered in the sizing of the stormwater system and erosion control for the development sites. The proposed buildings will be set at the 1% AEP level plus 0.5m freeboard per council policy.

Randwick City Council require that overland flows from the upstream Raymond Avenue catchment to be conveyed through the site. Council also requires proof that the proposed development does not increase the flood risk to the surrounding properties. Further, the TUFLOW modelling and assessment confirms there is negligible impact on upstream, downstream and/ or adjoining sites as a result of the proposed developments.

I.4 MODEL OUTPUT

Model output for pre and post development conditions for the Catchment flooding events on site as discussed in earlier sections have been included in the following Figures.

We note figures represent predicted values at the peak of each event. The figures represent predicted values at the peak of the 1% AEP. Further figures for the PMF event can be found in **Appendix I2** of this report.

Figure I4.1: 1% AEP Flood Depths – Pre-Development

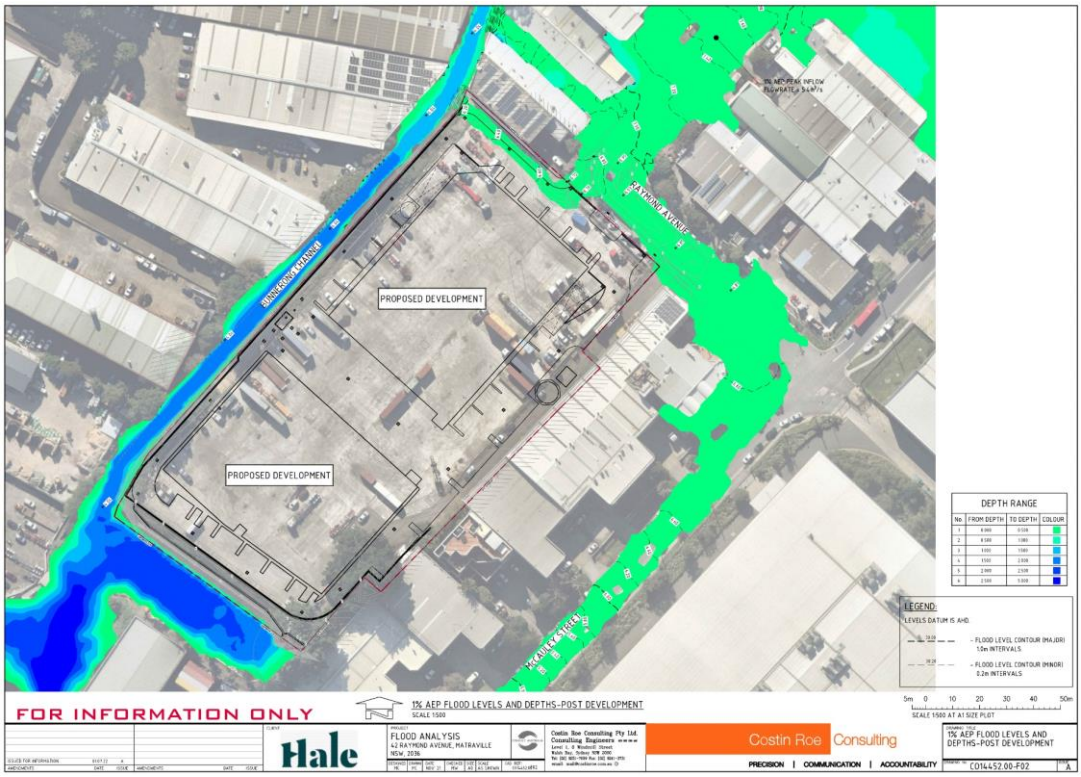

Figure I4.2: 1% AEP Flood Depths – Post Development

Figure I4.3: 1% AEP Flood Afflux Plan

I.5 FLOOD ASSESSMENT DISCUSSION

This Appendix to the *Civil Engineering Report* for 42 Raymond Avenue, Matraville NSW, has been prepared to assess the effect of flooding on the proposed development, and also to confirm no affectation on upstream downstream or adjoining properties. Further the assessment was also completed to ensure that sufficient flood conveyance are available, post development, during the 1% AEP and PMF flood event.

A TUFLOW hydrodynamic flood model has been completed and the pre and post development flood events assessed for the 1%. AEP and PMF rainfall event.

This Appendix confirms the technical input and detailed output completed as part of the assessment. **Appendix I** is to be read in conjunction with **Section 7** of this report.

Appendix I2
FLOOD ASSESSMENT FIGURES

DEPTH RANGE			
No.	FROM DEPTH	TO DEPTH	COLOUR
1	0.000	0.500	
2	0.500	1.000	
3	1.000	1.500	
4	1.500	2.000	
5	2.000	2.500	
6	2.500	5.000	

LEGEND:

LEVELS DATUM IS AHD.

30.00 - FLOOD LEVEL CONTOUR (MAJOR) 1.0m INTERVALS

30.20 - FLOOD LEVEL CONTOUR (MINOR) 0.2m INTERVALS

FOR INFORMATION ONLY

1% AEP FLOOD LEVELS AND DEPTHS-PRE DEVELOPMENT

SCALE 1:500

5m 0 10 20 30 40 50m

SCALE 1:500 AT A1 SIZE PLOT

AMENDMENTS	DATE	ISSUE
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CLIENT: Hale

PROJECT: FLOOD ANALYSIS
42 RAYMOND AVENUE, MATRAVILLE
NSW, 2036

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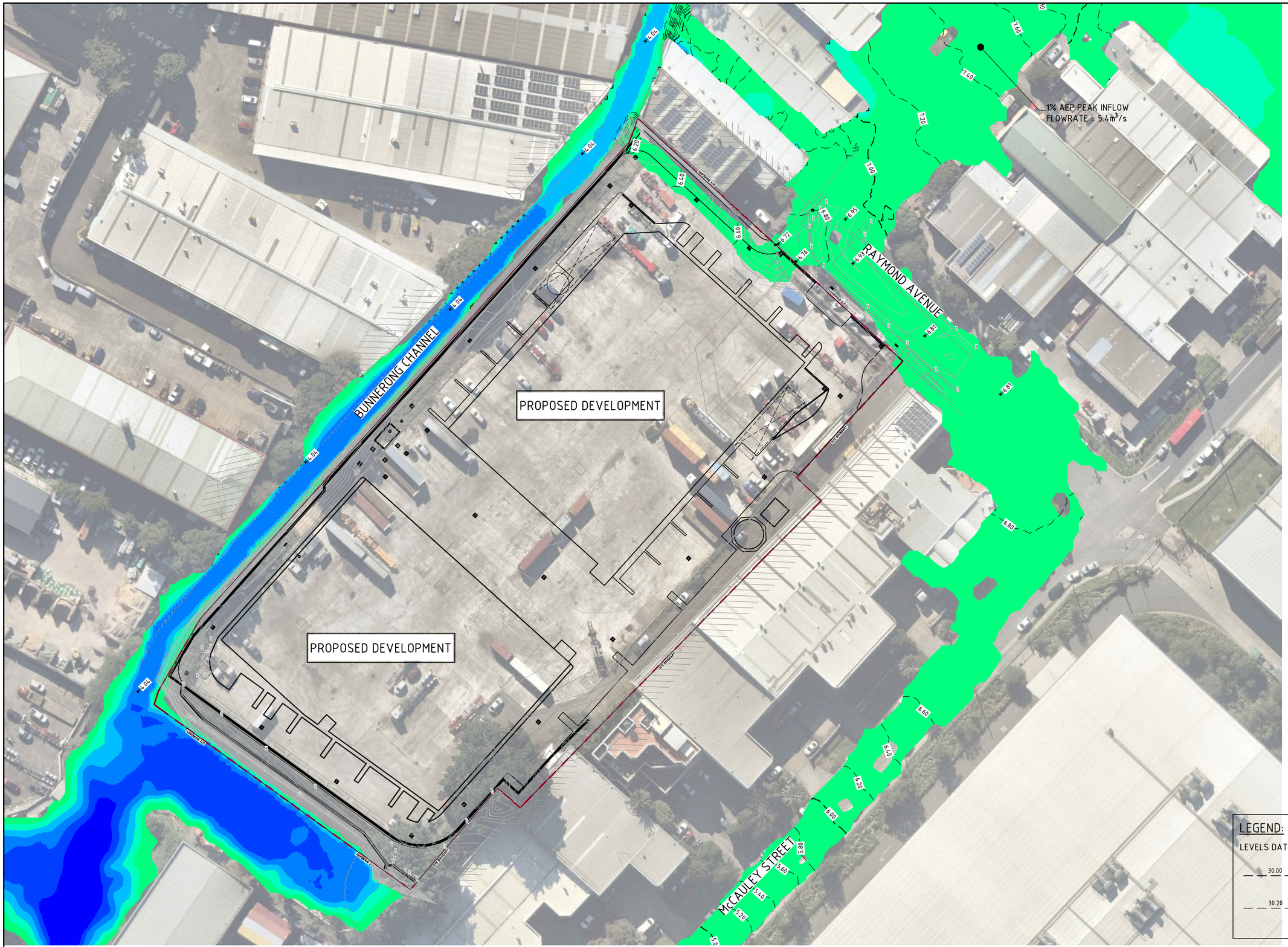

DEPTH RANGE			
No.	FROM DEPTH	TO DEPTH	COLOUR
1	0.000	0.500	
2	0.500	1.000	
3	1.000	1.500	
4	1.500	2.000	
5	2.000	2.500	
6	2.500	5.000	

LEGEND:

LEVELS DATUM IS AHD.

30.00 – FLOOD LEVEL CONTOUR (MAJOR) 1.0m INTERVALS

30.20 – FLOOD LEVEL CONTOUR (MINOR) 0.2m INTERVALS

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1% AEP FLOOD LEVELS AND DEPTHS-POST DEVELOPMENT

SCALE 1:500

5m 0 10 20 30 40 50m

SCALE 1:500 AT A1 SIZE PLOT

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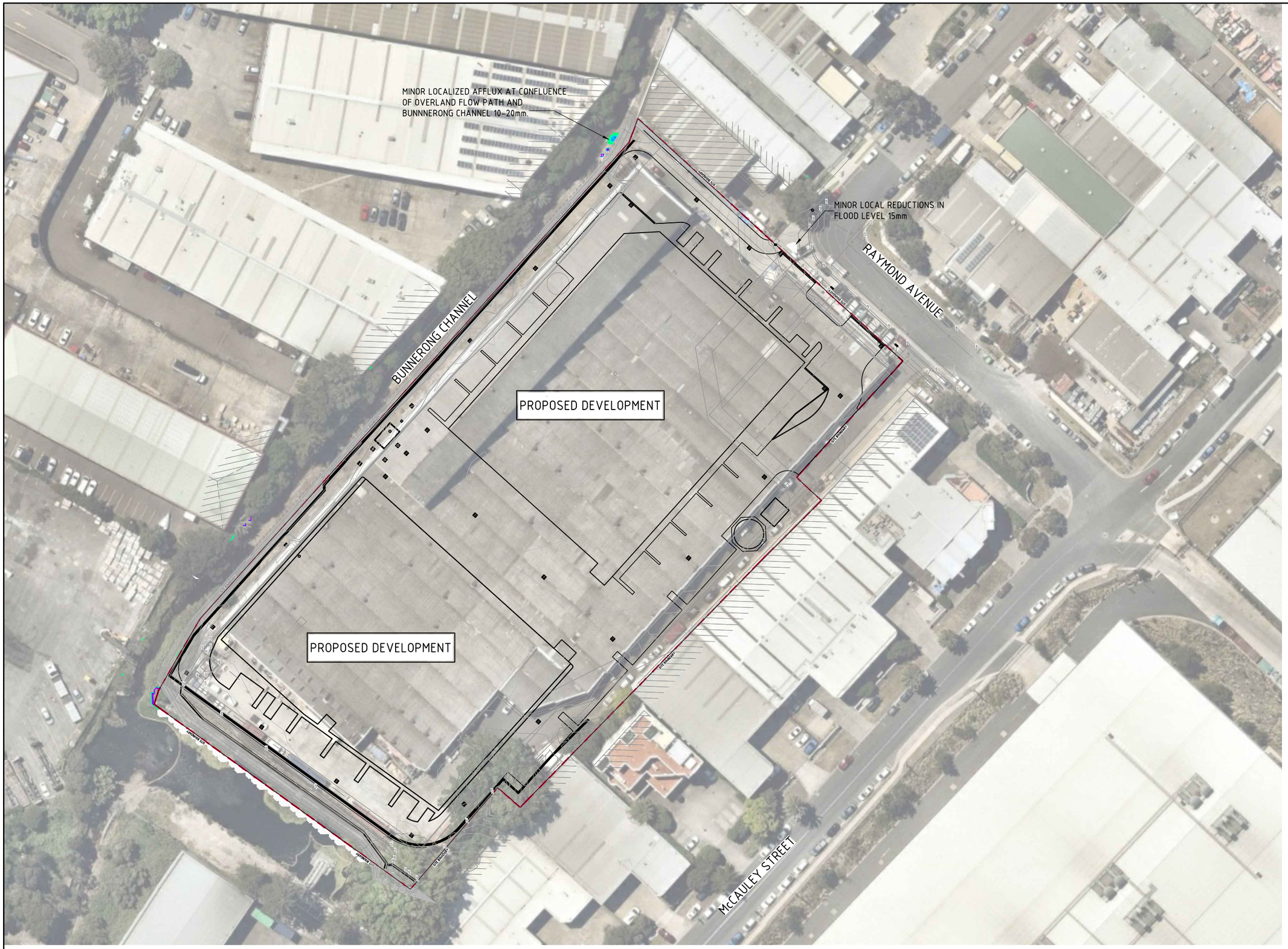

DEPTH RANGE			
No.	FROM DEPTH	TO DEPTH	COLOUR
1	-1.000	-0.010	
2	0.010	0.020	
3	0.020	0.030	
4	0.030	0.040	
5	0.040	0.050	
6	0.050	0.060	
7	0.060	0.070	
8	0.070	0.080	
9	0.080	0.090	

FOR INFORMATION ONLY

1% AEP FLOOD AFFLUX PLAN
SCALE 1:500

5m 0 10 20 30 40 50m
SCALE 1:500 AT A1 SIZE PLOT

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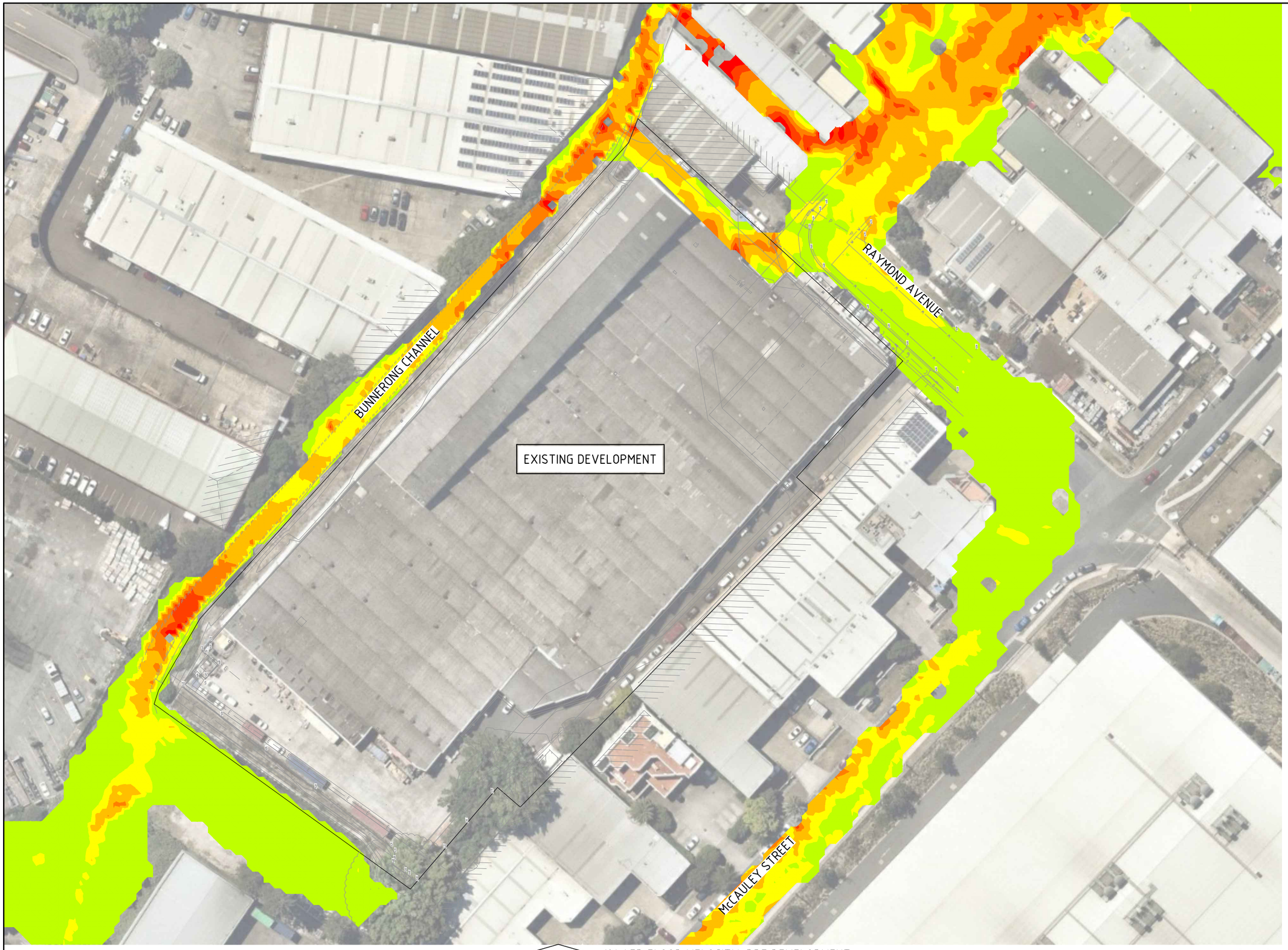

VELOCITY (m/s)			
No.	FROM DEPTH	TO DEPTH	COLOUR
1	0.000	0.500	
2	0.500	1.000	
3	1.000	1.500	
4	1.500	2.000	
5	2.000	2.500	
6	2.500	3.000	

FOR INFORMATION ONLY

1% AEP FLOOD VELOCITY-PRE DEVELOPMENT

SCALE 1:500

5m 0 10 20 30 40 50m

SCALE 1:500 AT A1 SIZE PLOT

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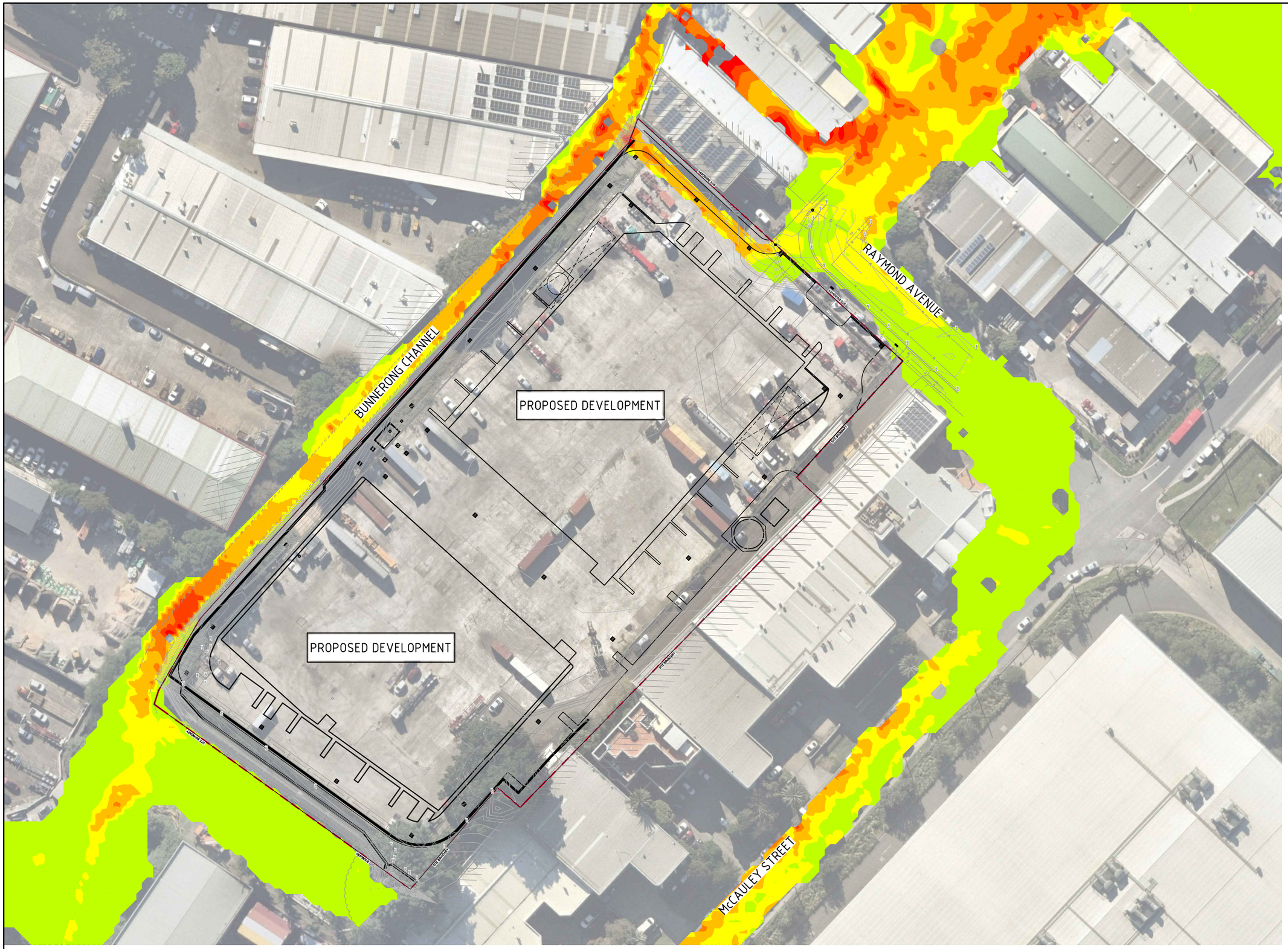

VELOCITY (m/s)			
No.	FROM DEPTH	TO DEPTH	COLOUR
1	0.000	0.500	
2	0.500	1.000	
3	1.000	1.500	
4	1.500	2.000	
5	2.000	2.500	
6	2.500	3.000	

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1% AEP FLOOD VELOCITY-POST DEVELOPMENT
SCALE 1:500

5m 0 10 20 30 40 50m
SCALE 1:500 AT A1 SIZE PLOT

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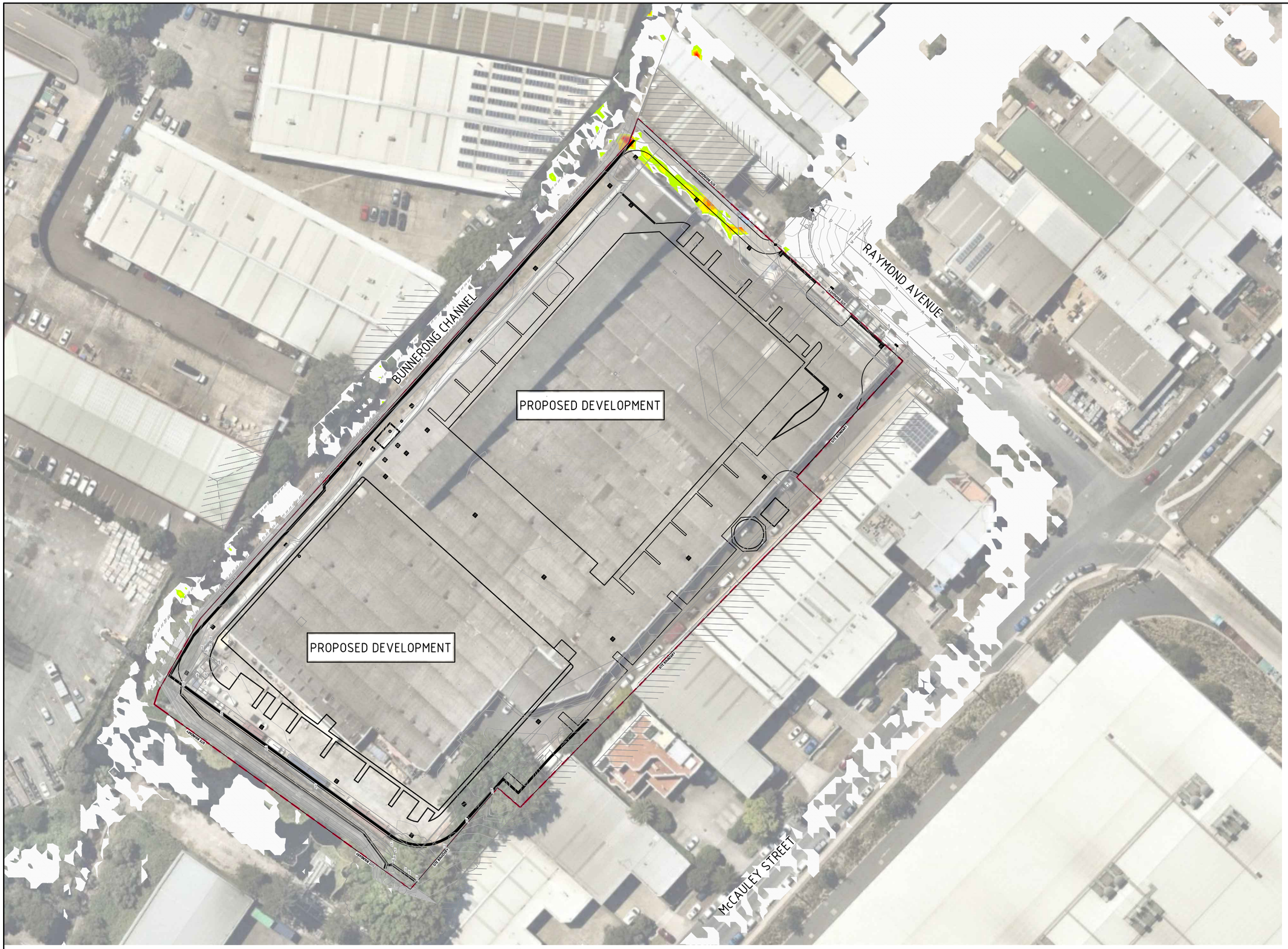

DEPTH RANGE			
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2	0.250	0.500	
3	0.500	0.750	
4	0.750	1.000	
5	1.000	1.250	
6	1.250	1.500	
7	1.500	1.750	
8	1.750	2.000	

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1% AEP FLOOD VELOCITY AFFLUX PLAN
SCALE 1:500

5m 0 10 20 30 40 50m
SCALE 1:500 AT A1 SIZE PLOT

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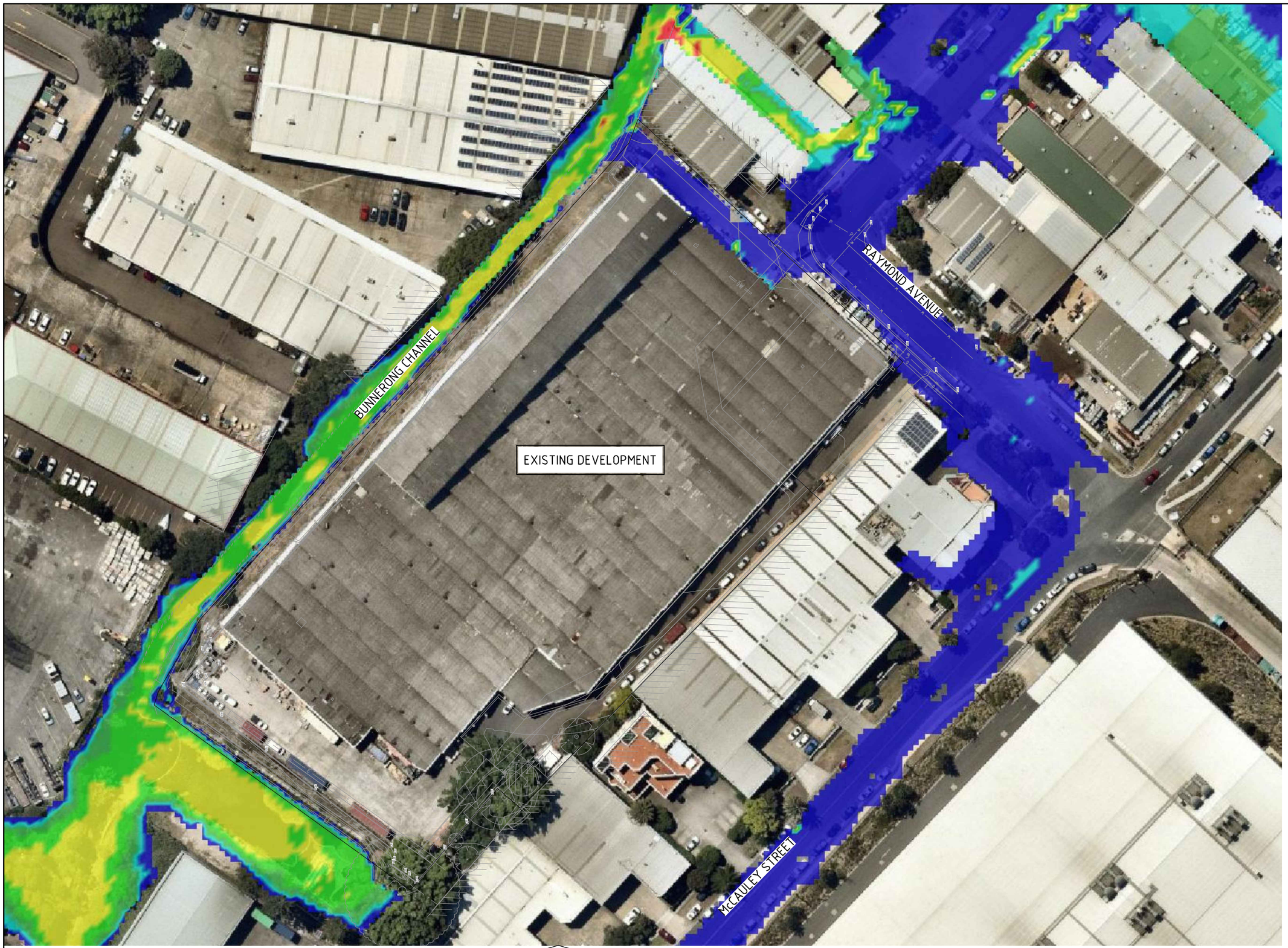

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- H1
- H2
- H3
- H4
- H5
- H6

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1% AEP FLOOD HAZARD

SCALE 1:500

5m 0 10 20 30 40 50m

SCALE 1:500 AT A1 SIZE PLOT

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NSW, 2036

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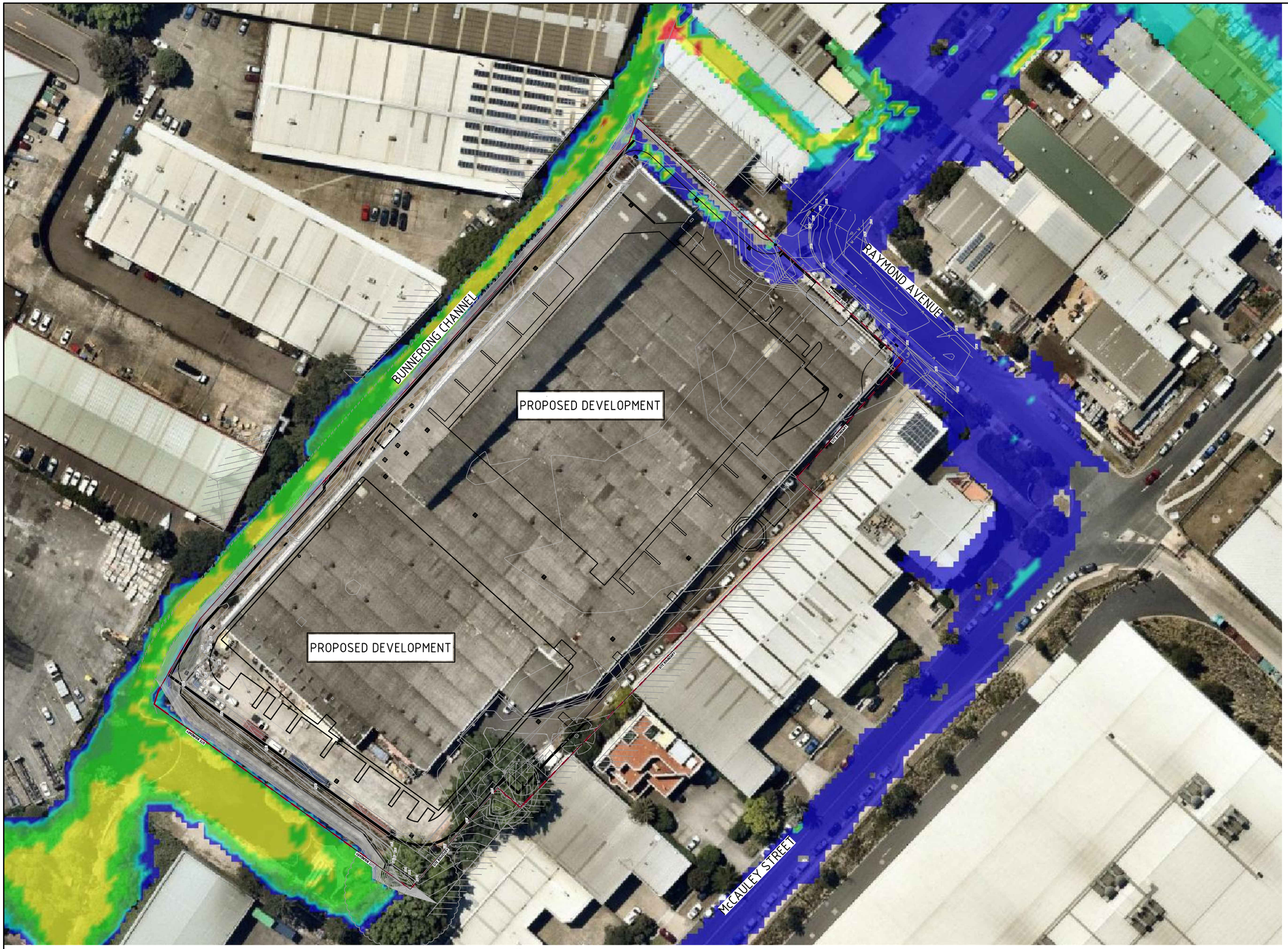

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1% AEP FLOOD HAZARD PLAN
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SCALE 1:500 AT A1 SIZE PLOT

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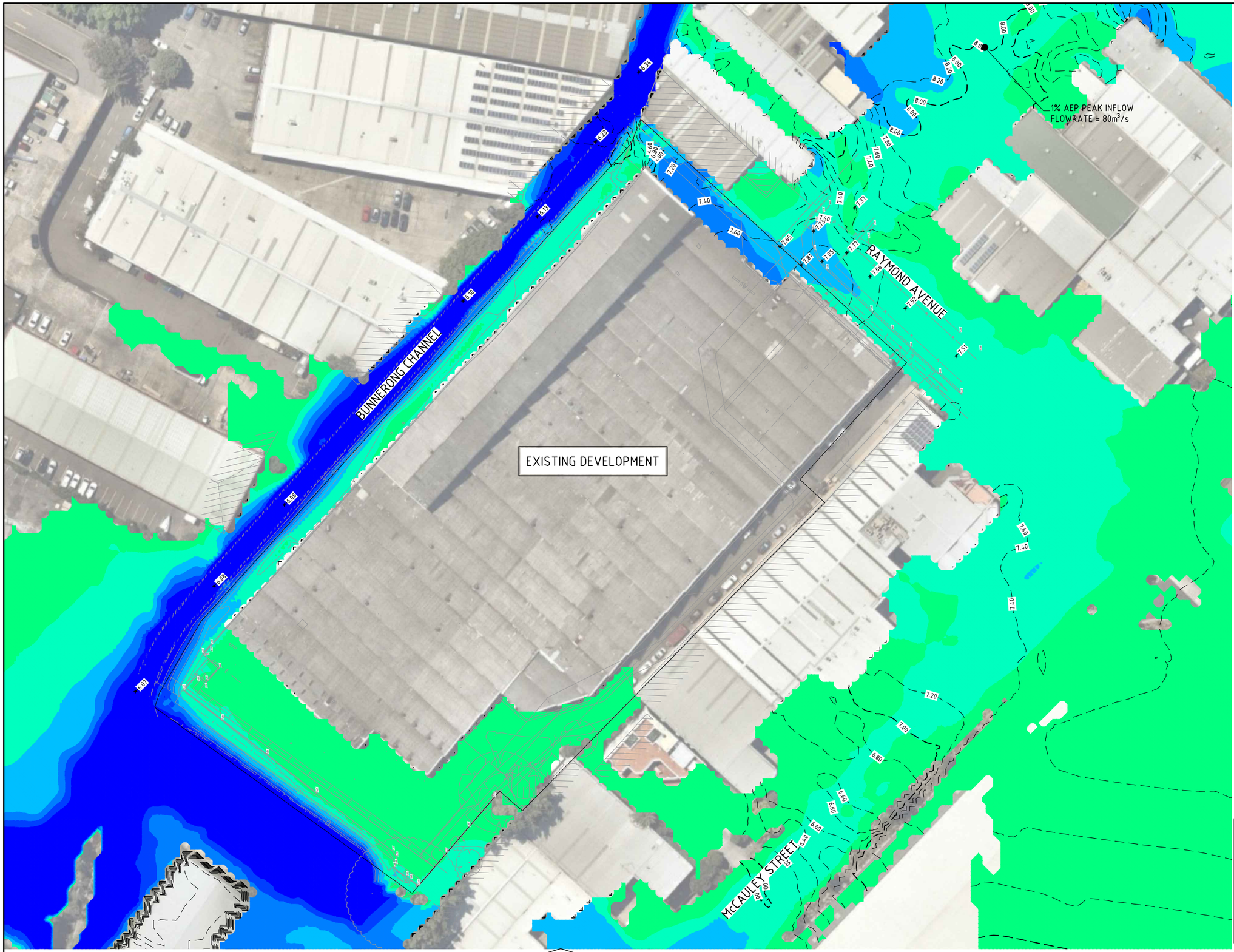

DEPTH RANGE			
No.	FROM DEPTH	TO DEPTH	COLOUR
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2	0.500	1.000	
3	1.000	1.500	
4	1.500	2.000	
5	2.000	2.500	
6	2.500	5.000	

LEGEND:

LEVELS DATUM IS AHD.

30.00 - FLOOD LEVEL CONTOUR (MAJOR) 1.0m INTERVALS

30.20 - FLOOD LEVEL CONTOUR (MINOR) 0.2m INTERVALS

PMF FLOOD LEVELS AND DEPTHS-PRE DEVELOPMENT

SCALE 1:500

5m 0 10 20 30 40 50m

SCALE 1:500 AT A1 SIZE PLOT

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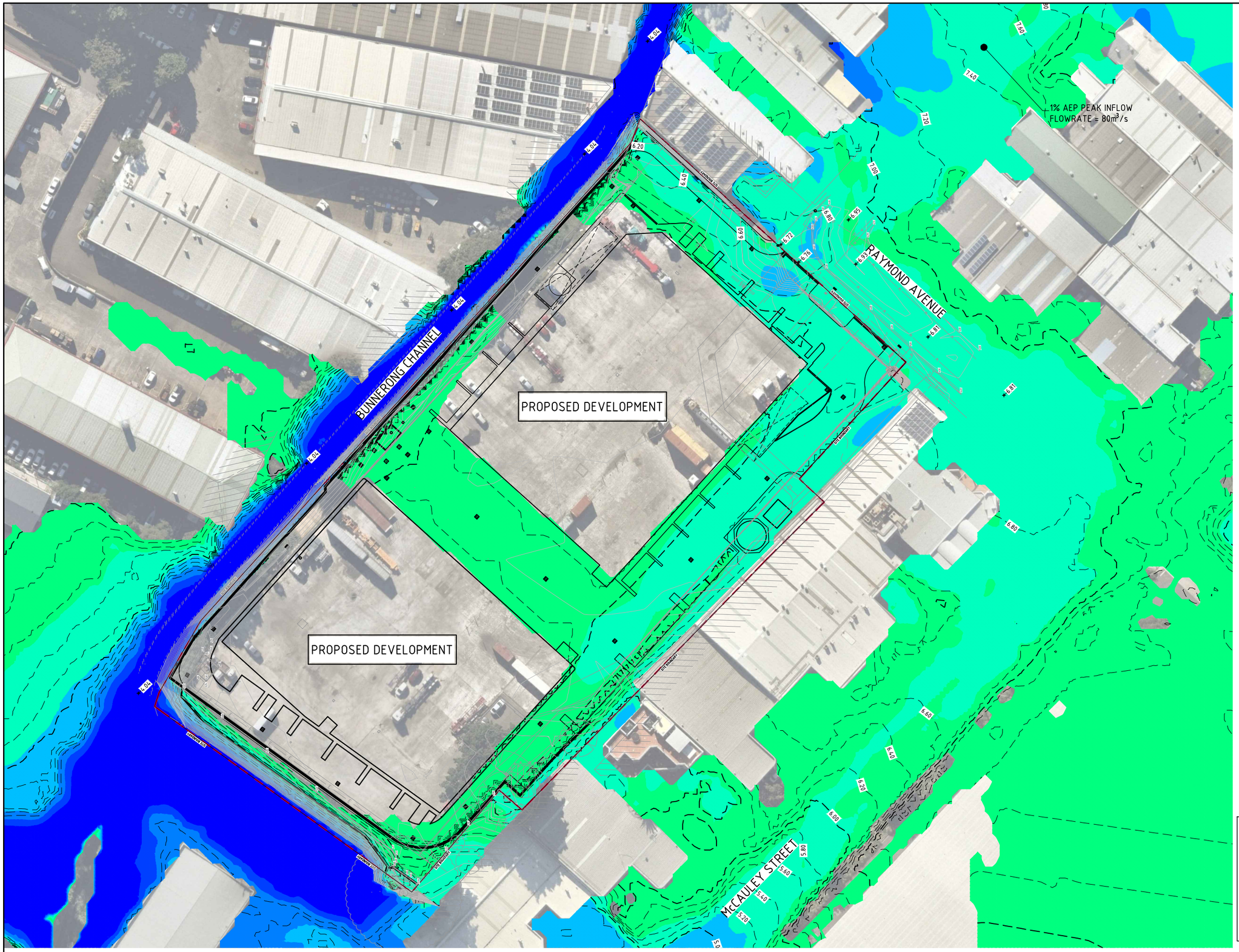

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5	2.000	2.500	
6	2.500	5.000	

LEGEND:

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30.00 - FLOOD LEVEL CONTOUR (MAJOR) 1.0m INTERVALS

30.20 - FLOOD LEVEL CONTOUR (MINOR) 0.2m INTERVALS

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PMF FLOOD LEVELS AND DEPTHS-POST DEVELOPMENT

SCALE 1:500

5m 0 10 20 30 40 50m

SCALE 1:500 AT A1 SIZE PLOT

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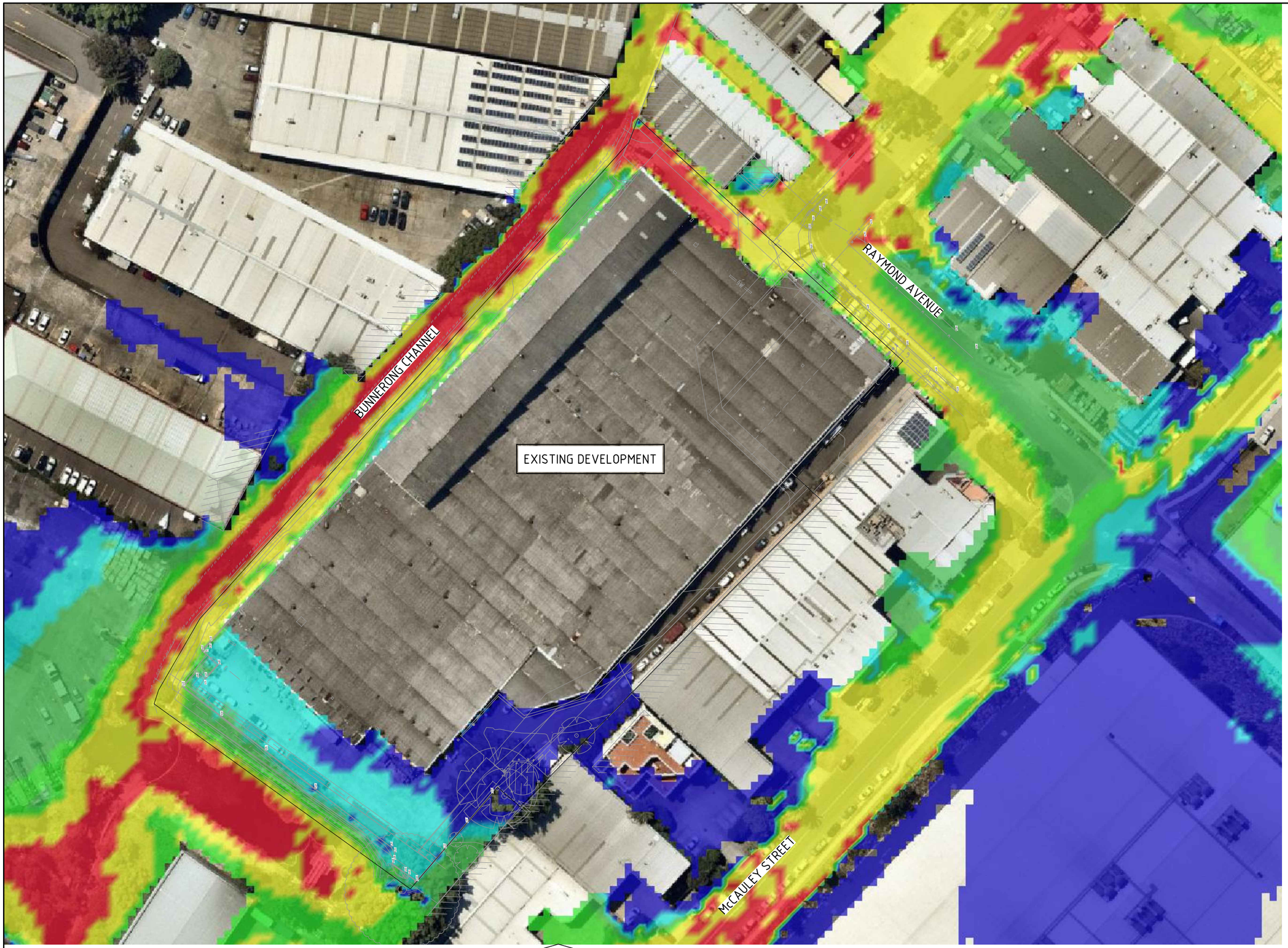

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- H4
- H5
- H6

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SCALE 1:500 AT A1 SIZE PLOT

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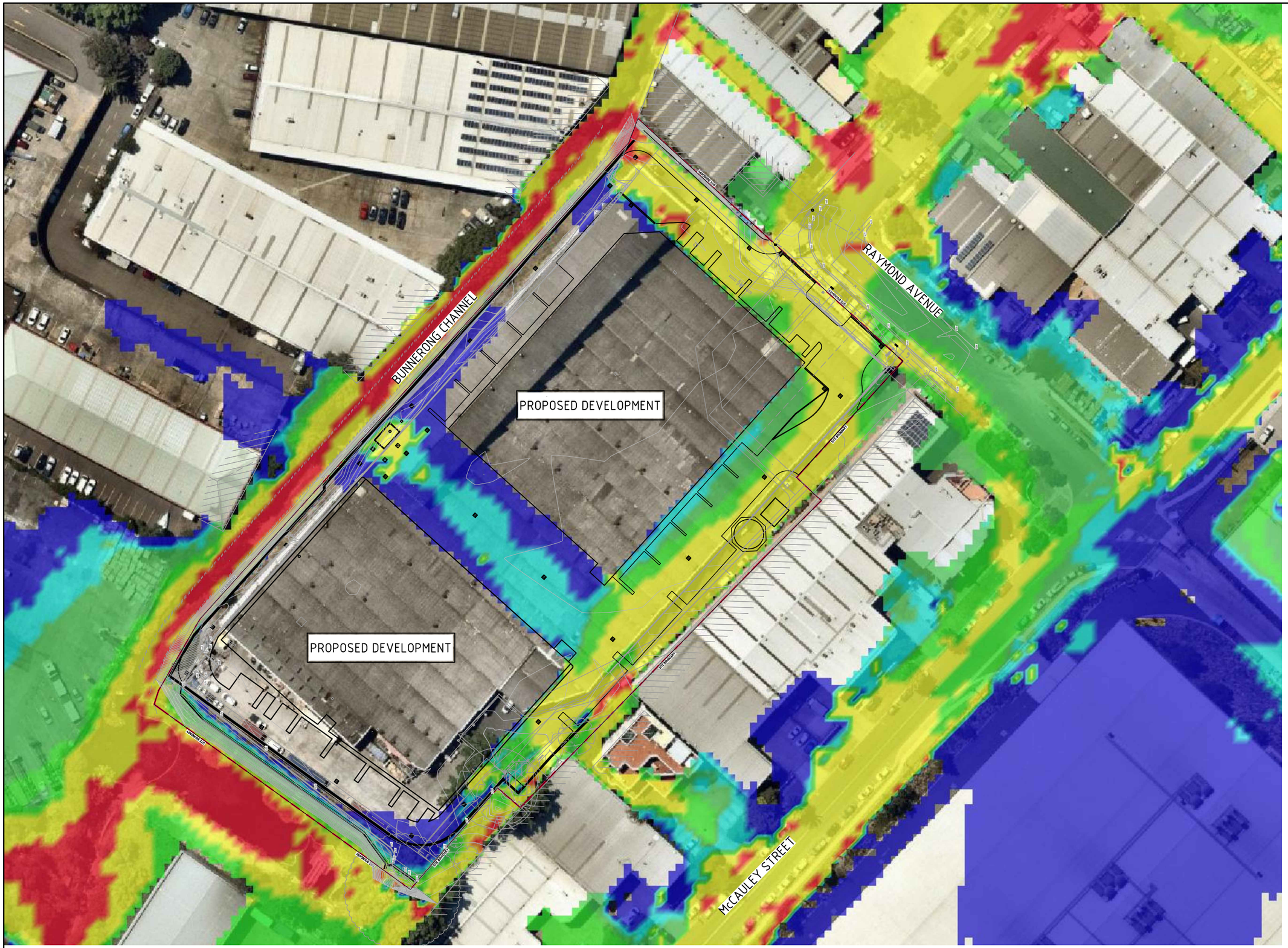

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PMF FLOOD HAZARD PLAN
SCALE 1:500

5m 0 10 20 30 40 50m
SCALE 1:500 AT A1 SIZE PLOT

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