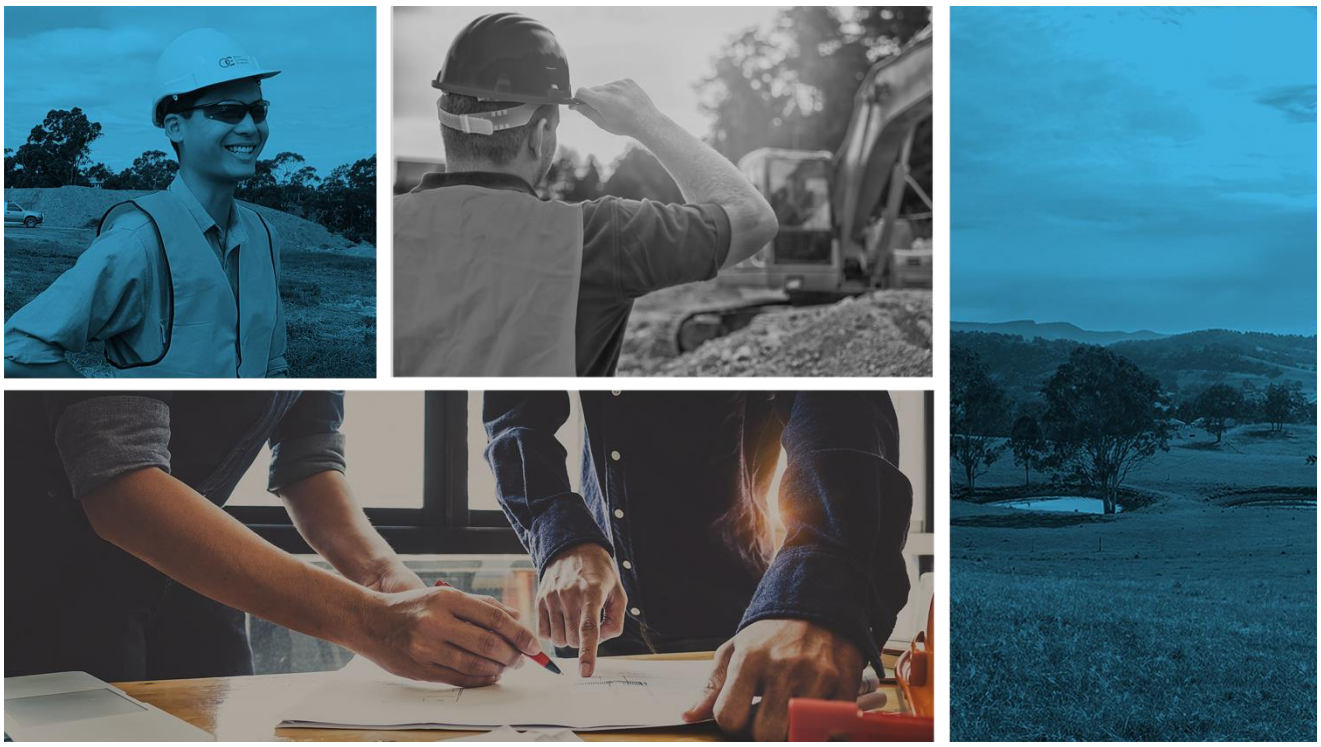
Orion Consulting

orionconsulting.com.au
info@orionconsulting.com.au
(02) 8660 0035

mirvac

Integrated Water Cycle Management Report

Mirvac Residential - Cobbitty DA1
Lot 2005 in DP 1162239
No. 421 The Northern Road, COBBITTY



03/02/2022 | Mirvac | Revision A | Ref: 21-0258-03

Commercial in Confidence

All intellectual property rights, including copyright, in documents created by Orion Consulting Engineers Pty Ltd (Orion) listed below remain the property of Orion. Any use made of such design or document without the prior written approval of Orion will constitute an infringement of the rights of the company which reserves all legal rights and remedies in respect of any such infringement.

The information, including any intellectual property, contained in this proposal is confidential and proprietary to Orion. It may only be used by the person to whom it is provided for the stated purpose for which it is provided and must not be imparted to any third person without the prior written approval of Orion. Orion reserves all legal rights and remedies in relation to any infringement of its rights in respect of its confidential information.

Contact

Orion Consulting Engineers Pty Ltd

ABN 25 604 069 981
Suite 4.04, No. 12 Century Circuit
Baulkham Hills NSW 2153

P: 02 8660 0035
E: info@orionconsulting.com.au

Prepared by:

Christopher Scholes
Senior Civil Design Engineer

Effective Date: 03/02/2022

Approved by:

Mariano Polisciuk
Engineering Design Manager

Effective Date: 03/02/2022

Document Control

Revision	Prepared	Reviewed	Approved	Date	Description	Project Reference
A	Christopher Scholes	Mariano Polisciuk/Toby Tames	Mariano Polisciuk	03/02/2022	Issued for Development Approval	21-0258-03

Table of Contents

Executive Summary **1**

1 Introduction **2**

1.1 Site Description **2**

1.2 The Proposed Development **3**

1.3 Objectives **3**

1.4 Study Methodology **4**
1.4.1 Water Quantity Methodology 4
1.4.2 Water Quality Methodology 4

2 Adopted Information **5**

2.1 Pre-Existing Flood Studies and Water Cycle Management Plans **5**
2.1.1 Integrated Water Cycle Management Study - Ecological Engineering, 2007 5
2.1.2 Stormwater Quantity Management & Flooding - Brown Consulting, 2007 5
2.1.3 Integrated Water Cycle Management Report, REV B – Orion Consulting for BHL, 2021 (for DA2020/345/1) 5

2.2 Survey Data **6**
2.2.1 Detailed Survey Data 6
2.2.2 ALS / LiDAR Survey Data 6
2.2.3 Aerial Imagery 6
2.2.4 Cadastral Data 6

3 Hydrology - WBNM Model **7**

3.1 Catchment Delineation **7**

3.2 WBNM Modelling Parameters **9**
3.2.1 Rainfall Data 9
3.2.2 Soil Loss Model 9
3.2.3 Lag Parameters 9
3.2.4 Existing Farm Dam 10
3.2.5 Pre Developed Model Calibration 10

3.3 Post Developed Scenario Management Strategy **11**
3.3.1 Bypass Catchments 11
3.3.1 On-Site Stormwater Detention Performance 12

4 Hydraulics - TUFLOW Model **14**

4.1 Materials and Impervious Area Mapping **14**

4.2 Primary 1D Model Elements **15**

4.3 Downstream Boundary **15**

4.4 Results Analysis **16**
4.4.1 Pre-Developed Scenario 16
4.4.2 Post-Developed Scenario 16
4.4.3 Flood Risk 17
4.4.4 Pre-Developed versus Post-Developed Scenario Results 18

5 Water Quality **19**

5.1 Assessment Metrics 19

5.2 Proposed Treatment Train 19

5.3 Modelling Input Data 19

5.3.1 Catchment Delineation 19
5.3.2 Sub-Catchment Breakdown 20
5.3.3 Catchment Areas Summary 20
5.3.4 Model Layout 21

5.4 MUSIC Modelling Results 22

6 Concept Masterplan Considerations 23

7 Conclusions and Recommendations 25

8 References 26

APPENDIX A - Catchment Plans ..... A

APPENDIX B - Pre Developed Flood Maps ..... B

APPENDIX C - Post Developed Flood Maps C

APPENDIX D - Pre vs Post Flood Difference Maps ..... D

APPENDIX E - MUSIC Link Report ..... E

APPENDIX F - Masterplan Concept Schematics ..... F

List of Tables

Table 1 - ARR1987 Rainfall Data Coefficients 9
Table 2 - Soil Loss Model Parameters 9
Table 3 - WBNM Runoff and Routing Parameters for Natural and Semi-Urban Catchments 9
Table 4 - On-Site Stormwater Detention Facilities 11
Table 5 - Pre vs Post Developed Scenario Flow Summary – Downstream Boundary 12
Table 6 - Pre vs Post Developed Scenario Flow Summary - T3.2 Basin Outlet 12
Table 7 - Pre vs Post Developed Scenario Flow Summary - Farm Dam Outlet 12
Table 8 - Selected Pre Developed Peak Flows 13
Table 9 - Selected Post Developed Peak Flows 13
Table 10 - Post Developed Scenario - OSD Storage Facility Water Level Summary 13
Table 11 - Materials Properties 14
Table 12 - 1D hydraulic structures 15
Table 13 - Hazard Vulnerability Classifications 17
Table 14 - Hazard Vulnerability Classification Limiting Conditions 18
Table 15 - Pre vs Post Developed Scenario TUFLOW Flow Summary – CK17 ST 18
Table 16 - Pre vs Post Developed Scenario TUFLOW Flow Summary - Downstream Domain Boundary 18
Table 17 - Water Quality Control Treatment Train Strategy 19
Table 18 - MUSIC Sub-Catchment Summary 20
Table 19 - Treatment Train Effectiveness 22

List of Figures

Figure 1 – Site Extents (Imagery courtesy of Nearmap ©) 2
Figure 2 - Pre-Developed Scenario Catchment Plan 7
Figure 3 - Post-Developed Scenario Catchment Plan 8
Figure 4 - General Flood Hazard Curves (Smith et al. 2014) 17
Figure 5 - MUSIC Model Layout 21
Figure 6 - Extract of Figure 7.2 *Proposed Stormwater Masterplan Oran Park Precinct West* (Browns, 2007) 23

Executive Summary

This report has been prepared by Orion Consulting (Orion) for Mirvac Homes (NSW) Pty Limited (Mirvac) to support the development approval for the first DA residential subdivision over part of Lot 2005 in DP 1162239 known as No. 421 The Northern Road Cobbitty (the site), located within the Oran Park release area. Orion has been engaged to provide a full suite of civil engineering design, project management and surveying services to support the development approval. This report is to be read in conjunction with the complementary Roads and Drainage Civil Engineering Plans as prepared by Orion Consulting for the proposed development.

This report demonstrates that the current proposed integrated water cycle management strategy meets the flooding, stormwater management and water sensitive urban design requirements as specified by Camden Council and other regulating authorities for this proposed development approval.

It is recognised that this site will be subject to a larger body of work in the future that will include a masterplan scale precinct Integrated Water Cycle Management strategy that will be consistent with the proposed ILP modification, associated Voluntary Planning Agreement and open space strategy.

This precinct scale body of work does not preclude this compliant, single stage development approval as it is demonstrated that all IWCM water quantity and quality targets can be met.

1 Introduction

1.1 Site Description

The subject site is located within the Camden Council LGA, approximately 3km South West of the new Oran Park town centre. The proposed development led by Mirvac represents the first stage development of the subject site and comprises of approximately 13 hectares in area with site extents shown in the figure below.

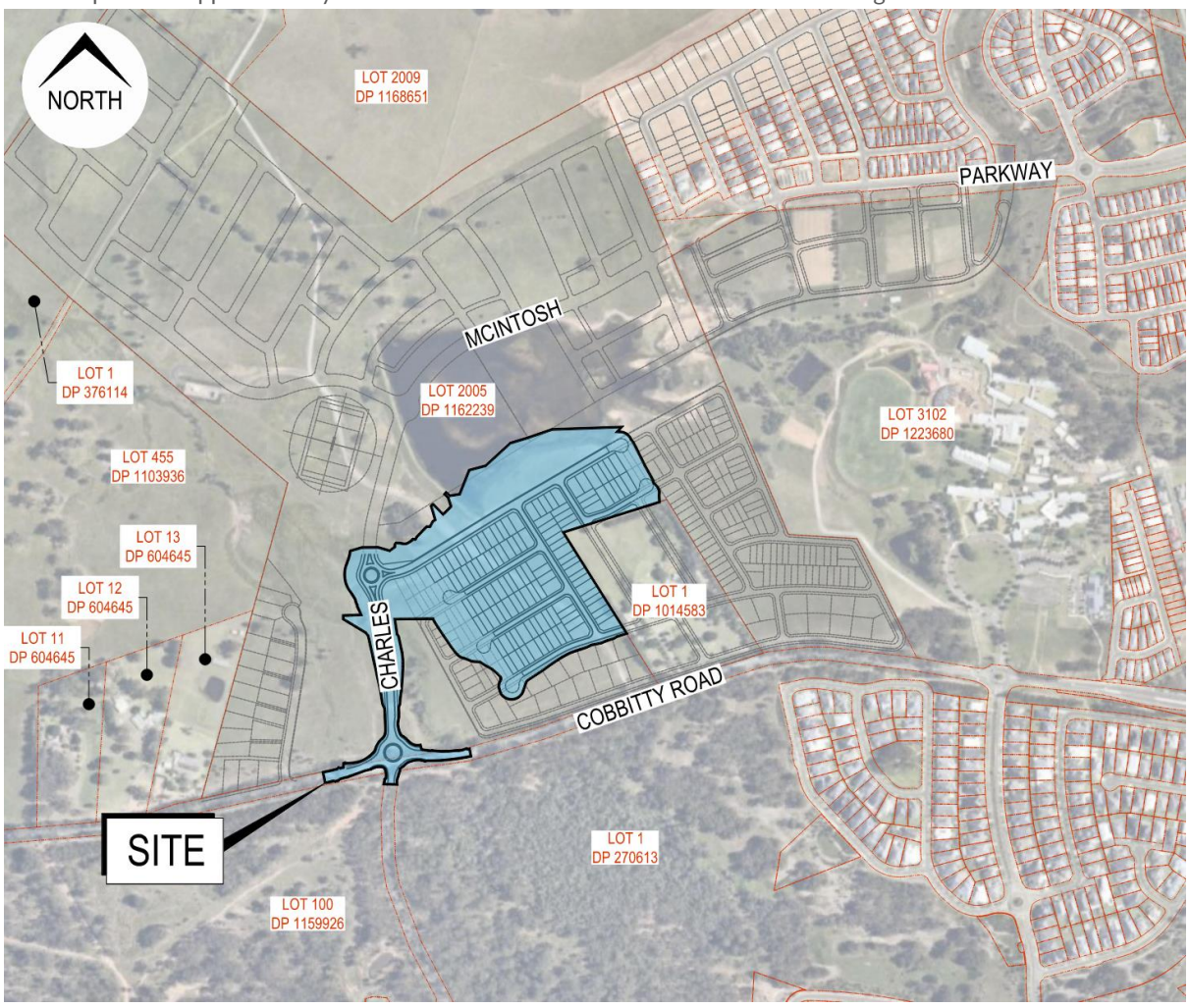


Figure 1 – Site Extents (Imagery courtesy of Nearmap ©)

Part of the Oran Park South West Priority Land Release Area the site has been rezoned for development comprising of R1 (General Residential), C4 (Environmental Living) and C2 (Environmental Conservation) zoned lands. The site is primarily lightly vegetated rural farmland generally used for livestock farming.

The site is bordered by Cobbitty Road to the South, Macarthur Anglican School and new Arcadian Hills development to the East, rural properties and farmland to West and the Denbigh heritage listed homestead to the North (531A and 531B Cobbitty Road). While the site known as No. 581 Cobbitty Road is partially surrounded by the proposed development no works are proposed on this land and it is not part of this application. No development over this site has been allowed for in this Development Application.

A large farm dam approximately 9 hectares in area is situated centrally within the subject site and sits on-line to a 3rd order stream, entering the site along the eastern boundary from Oran Park. Cobbitty Creek enters the site along the southern boundary at an existing culvert crossing under Cobbitty Road. Both the high-level overflow from the farm dam and Cobbitty Creek combines at a washout zone with undefined creek banks that straddles the common boundary with No. 455 Cobbitty Road. The confluence of these streams results in a 4th order stream classification of Cobbitty Creek exiting the site to the West.

The majority of the site proposed for development under this approval is moderately graded at around 2-5% with a defined crest running north to south through No. 581 Cobbitty Road.

1.2 The Proposed Development

As a part of this proposed development Mirvac are aiming to provide the following:

- Provide a standalone, ILP compliant development footprint for an expedited development approval.
- Maintaining existing vegetation and riparian corridors along Cobbitty Creek and minimising impact to the existing riparian zones.
- Demonstrate that a formalised, full roundabout intersection between Charles McIntosh Parkway and Cobbitty Road can be achieved without the need for land acquisitions.
- Maintaining and minimising the interface with the existing farm dam to minimise development impact.
- To provide temporary integrated water cycle management control facilities to ensure performance objectives are met for the proposed development footprint.

1.3 Objectives

The purpose of this report and assessment is to design, establish and present the integrated water cycle management strategy proposed for this development submission:

- Stormwater management controls that meet the intent of the Oran Park Development Control Plan (hereinafter referred to as 'the DCP').
- Stormwater management controls that do not adversely impact conditions downstream of the subject site. Adoption of ‘no-net-negative’ design principles to generally ensure that post developed flooding impacts are not greater than pre-existing flooding.
- Water Sensitive Urban Design (WSUD) to meet the requirements of the DCP for the post-development percentage reduction targets for total suspended solids, phosphorus, nitrogen and gross pollutants.
- Implementation of a temporary water quality treatment train for water quality control.

1.4 Study Methodology

The study methodology is in two distinct components; water quantity and overland flow assessment that includes the design of on-site stormwater detention (OSD) and flood mitigation controls and, water quality or WSUD controls.

1.4.1 Water Quantity Methodology

- Development of overall catchment plans encompassing the whole study area with clear structure for a suitable rainfall-runoff-routing hydrologic model.
- Development of a WBNM (Watershed Bounded Network Model) rainfall-runoff-routing hydrologic model for both pre-developed and post-developed scenarios for assessment. It is noted that ARR1987 design methodologies and rainfall data has been adopted to maintain continuity and consistency with the current assessment guidelines and other historical flood studies of the area.
- Development of a civil design model of the site to inform road grades and levels, particularly around critical sag points and the interface with the existing riparian corridors and farm dam.
- Development of a 2D TUFLOW hydraulic model for both pre-developed and post developed scenarios for detailed hydraulic assessment to validate the WBNM pre and post developed model scenarios. The 2D TUFLOW model is set-up within 12D model software to combine both GIS and civil design information in a coordinated environment.

WBNM is an industry standard runoff routing model originally developed in Wollongong in the mid 1970's. It is widely adopted for hydrological modelling for natural or partially developed urban catchments in South East NSW and is well documented and referenced in engineering research literature. It is noted that this model has been developed from primarily statistical data from coastal catchments of NSW.

TUFLOW (classic) is a finite difference second order implicit solver resolving 2D continuity and momentum, depth averaged shallow water equations and is specifically designed for calculating floodplain hydraulics. TUFLOW is an industry adopted standard both domestically and internationally backed by an active development team, extensive research and benchmark studies.

1.4.2 Water Quality Methodology

- Development of a detailed catchment plan encompassing a breakdown of total lots and proposed land use by sub-catchment.
- Development of a MUSIC Model (Model for Urban Stormwater Improvement Conceptualisation) for pre and post developed cases; assessment of percentage reduction target requirements for isolation of critical design requirements.

2 Adopted Information

2.1 Pre-Existing Flood Studies and Water Cycle Management Plans

2.1.1 Integrated Water Cycle Management Study - Ecological Engineering, 2007

This report by Ecological Engineering forms the original water cycle management report submitted to the Growth Centres Commission to support the land release and sets a number of general design principles for stormwater quality and quantity management.

Some key points noted from this study are as follows:

- Major online flood / OSD storage for events greater than the 5 year ARI.
- Indicative locations for stormwater quality treatment systems and major OSD basins.
- Specifications for the implementation of engineered wetlands and biofiltration systems for water quality control.
- Sets the environmental stormwater quality control objectives for Oran Park.

2.1.2 Stormwater Quantity Management & Flooding - Brown Consulting, 2007

The Oran Park Precinct Masterplan Stormwater Quantity Management & Flooding by Brown Consulting forms the original water quantity and flood management strategy submitted to the Growth Centres Commission to support the land release and sets a number of general design principles for stormwater quality and quantity management.

Some key points noted from this study are as follows:

- Implementation of a RAFTS hydrological model for pre and post developed assessment of the catchment under ARR1987 guidelines.
- Establishment of fraction impervious areas and soil loss model parameters.
- Implementation of a 1D/2D SOBEK Hydraulic Model to validate the hydrological modelling.

2.1.3 Integrated Water Cycle Management Report, REV B – Orion Consulting for BHL, 2021 (for DA2020/345/1)

Orion Consulting was previously engaged by Boyuan Holdings Limited to prepare the Civil Engineering and Integrated Water Cycle Management design documentation for the subject site between 2018 and the end of 2021. This report under DA2020/345/1 set the underlying stormwater management strategy for this first DA approval.

Key differences between this new management strategy and the previous report presented under DA2020/345/1 include:

- Inclusion of a temporary conventional raingarden for post developed stormwater runoff prior to discharge into the existing (modified) farm dam.

- Inclusion of a temporary basin for OSD and water quality to treat the eastern part of the proposed development. No ultimate/permanent basin is proposed under this DA. This temporary basin is located wholly within the current ILP limits.

- That an ILP modification and Voluntary Planning Agreement required for the larger site is currently underway and associated planning and engineering will be provided in parallel to this independent development application.

- Additional pre-vs-post flow summary tables have been extracted from the WBNM model to provide more detailed sub catchment and outlet structure target flows required for compliance. The WBNM Model and datafiles have been resubmitted containing the entire hydrologic modelling setup and results.

2.2 Survey Data

2.2.1 Detailed Survey Data

Original detailed survey data was provided by Geolyse (now Premise Pty Ltd) and dated 20th December 2018. The scope of this survey incorporated all lands within the subject site and survey works over portions of Cobbitty Road and levels upstream of the existing farm dam.

2.2.2 ALS / LiDAR Survey Data

For areas of the study outside the scope of the detailed survey data, Aerial Laser or LiDAR Scanning data was obtained from the ELVIS - Elevation and Depth Foundation Spatial Data website. The following ALS data has been adopted:

- 1m DEM (digital elevation model) data as published by NSW Land Registry Services (ex LPI) and dated February 2011.

2.2.3 Aerial Imagery

Historical and recent aerial imagery of the site was obtained through NearMap for documentation purposes.

2.2.4 Cadastral Data

Cadastral data of the surrounding lot boundaries was obtained through NSW LRS Spatial Information Exchange 'Clip & Ship' data service.

3 Hydrology - WBNM Model

3.1 Catchment Delineation

In order to develop a hydrological model the available survey data was combined to form a 'master' existing survey model used to delineate sub-catchments within the study area. It is noted that in order to maintain continuity with existing studies and minimise extensive re-assessment, the pre-developed 'existing' catchment plan as prepared by Brown Consulting (2007) was adopted as a base and adjusted to suit future hydraulic modelling considerations.

The figure below shows an extract of the pre-developed scenario catchment plan and can be found in full in Appendix A.

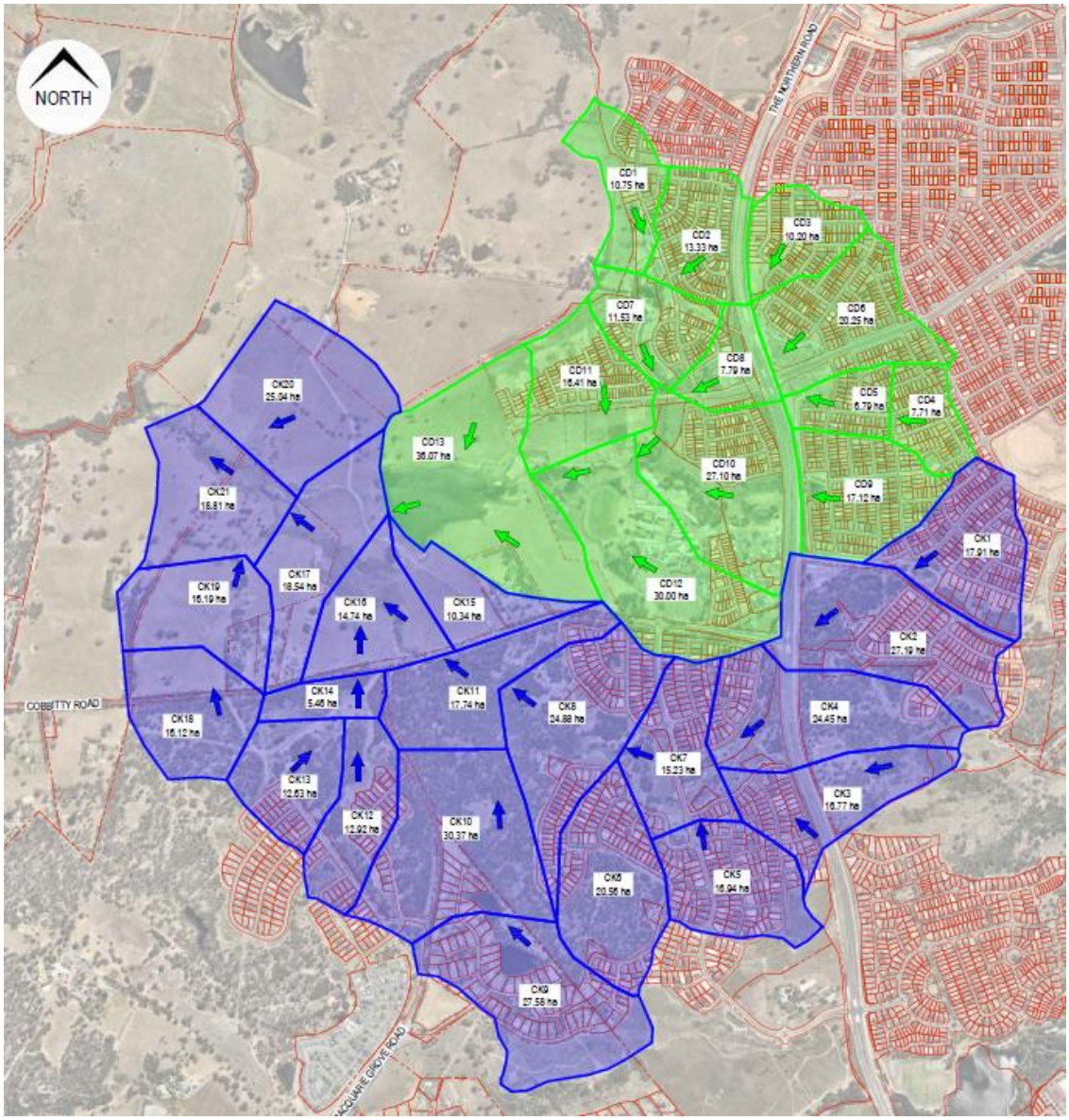


Figure 2 - Pre-Developed Scenario Catchment Plan

The pre-developed scenario catchment delineation is adjusted to suite the proposed civil engineering works. The figure below shows an extract of the post developed scenario catchment plan and can be found in full in Appendix A. Like the pre-developed scenario catchment plan, post-developed catchment delineation has been prepared with consideration of the hydrologic and hydraulic modelling steps to follow.

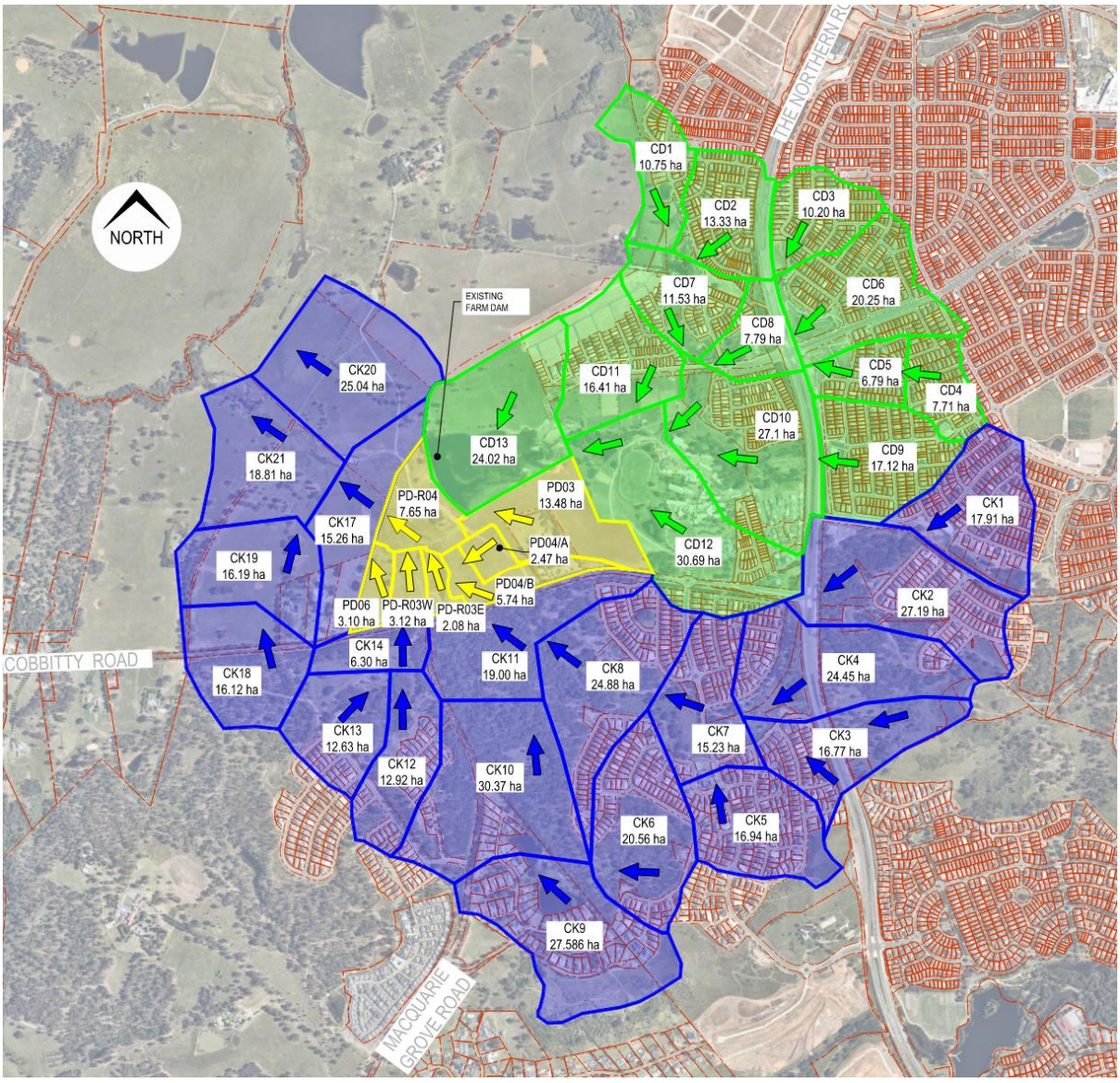


Figure 3 - Post-Developed Scenario Catchment Plan

3.2 WBNM Modelling Parameters

3.2.1 Rainfall Data

ARR1987 Rainfall data for the proposed development was extracted from the Bureau of Meteorology website. The coefficients adopted for rainfall and storm event generation are shown in Table 1 below:

Table 1 - ARR1987 Rainfall Data Coefficients

Coefficient	Value
2 Year ARI, 1 Hour Intensity	29.82 mm/hr
2 Year ARI, 12 Hour Intensity	6.12 mm/hr
2 Year ARI, 72 Hour Intensity	1.85 mm/hr
50 Year ARI, 1 Hour Intensity	59.77 mm/hr
50 Year ARI, 12 Hour Intensity	12.27 mm/hr
50 Year ARI, 72 Hour Intensity	3.85 mm/hr
F2 Factor	4.29
F50 Factor	15.79
Skew	0.01

3.2.2 Soil Loss Model

To account for soil infiltration losses an Initial Loss - Continuing Loss (ILCL) model was adopted across both the WBNM and 2D TUFLOW models with the parameters shown in Table 2 below:

Table 2 - Soil Loss Model Parameters

Parameter	Loss
Initial Loss (pervious)	10 mm
Continuing Loss (pervious)	2.5 mm/hr
Initial Loss (impervious)	1.5 mm
Continuing Loss (impervious)	0 mm/hr

3.2.3 Lag Parameters

Industry standard lag parameters and stream lag factors natively used on WBNM models for catchments on the East Coast of Australia were applied for this hydrological model.
The table below summarises the selected parameters accordingly:

Table 3 - WBNM Runoff and Routing Parameters for Natural and Semi-Urban Catchments

Lag Parameter	Stream Lag Factor
1.6	1

3.2.4 Existing Farm Dam

The existing detail survey data collected by Geolyse contains detailed bathymetry data of the existing farm dam. A full staged-storage relationship curve was established for the entirety of the dam for the hydrologic model.

3.2.5 Pre Developed Model Calibration

In order to validate parts of the Pre-Developed WBNM Hydrologic model, peak 100 year ARI pre developed flows were compared in certain locations against the quoted 100 Year ARI, 2 hour storm XP RAFTS model results presented in Precinct IWCM report (Browns, 2007) where possible. It is noted that discontinuity in data was observed in the Precinct IWCM report and is discussed below.

XP-RAFTS Precinct Study Location (Browns, 2007)	Flow (cumecs)	Source of Information	WBNM- Orion Equivalent Model Location	Flow (cumecs)	Contributing Catchment Area (ha)
Flows entering exiting farm dam	23.5	Appendices Part 3, Figure 5.2	Flows entering catchment CD13	22.09 (2 hour storm critical at this location)	215.0
Immediately upstream of Cobbitty Road (approaching 5 x 1050 culverts)	41.07 *or* (35.9 - assumed)	Appendices Part 3, Figure 5.2 (Table 4.2 of the main report)	Flows entering culvert structure on catchment CK11	26.5 (2 hour storm critical at this location)	239.4
'Western Boundary of Oran Park Precinct'	43.8	Table 4.2 of the main report	Total cumulative outflow at CK21	43.9 (2 hour); 46.1 (9 hour)	605.4

Based on these results there is consistency between the two models for flows entering the large farm dam and for the total flows calculated at the downstream or precinct boundary.

There is significant discontinuity observed for the flows calculated approaching Cobbitty Road both within the Precinct IWCM report itself and against the flows calculated in WBNM. Given the contributing catchment size relative to catchment CK11 and the total cumulative accuracy achieved at the downstream boundary it is understood that the flows presented in the precinct report via XP RAFTs are incorrect/inaccurate.
It is noted that there is discontinuity between Table 4.2 and figure 5.2 of the precinct report for quoted 100 year ARI pre developed flows calculated from the XP-RAFTS model. No information or diagram is provided to locate XP-RAFTS nodes or for Chainages along Cobbitty Creek to accurately allow for calibration against the 2D Hydraulic model.

3.3 Post Developed Scenario Management Strategy

In order to reduce post developed flows back to or improve on the pre-developed scenario, a series of on-site stormwater detention systems and flood mitigation strategies are proposed to be provided throughout the development.

The on-site stormwater detention (OSD) strategy has been designed to manage post developed flows at the following locations:

Table 4 - On-Site Stormwater Detention Facilities

Outlet / Catchment	Control Measures	Comments
Existing Farm Dam - online to existing stream	Storage above permanent water level. Weir 1: 3.2m wide @ RL 73.5 Weir 2: 6m wide @ RL 74.7	Calculated from the new permanent water level to maximum water level for the critical, 100 Year ARI event. (Due to proposed road levels the farm dam permanent water level is to be lowered/dewatered from RL 75.15 down to RL 73.5) Storage to 100 Year ARI (9hr) = 110,300 m^3 (RL 75.17) Storage to 100 Year ARI (90 minute) = 95,600 m^3 (RL 74.96)
PD04A - Developed Catchment (Same as T3.2 Basin for Music Modelling Catchment labelling purposes)	Temporary OSD Basin Low Flow Outlet: Ø 225mm pipe RL 72.5 High Flow Outlet 1.8m Wide Weir RL 74.5 (cut into DCP)	New temporary OSD basin for catchment PD04A. Effective storage to 100 Year ARI (90 minute) = 933 m^3

3.3.1 Bypass Catchments

Charles McIntosh Parkway and a small portion of the lots fronting Road No. 01 bypass OSD controls. These bypass catchments are offset by the storage provided in the modified existing farm dam and proposed temporary basin T3.2. This impervious fraction has been allocated to WBNM post developed sub catchments PDR03E and PDR04 with no control structure.

3.3.1 On-Site Stormwater Detention Performance

OSD performance has been measured for the 5, 10, 20, 50 and 100 Year ARI critical duration events at a number of locations within the subject site. The 90 minute duration storm was found to be the critical duration event when measuring local flows immediately downstream of the OSD control structures. The 540 minute duration storm was found to be critical at the downstream boundary.

WBNM results can be extracted from a number of locations within a sub catchment. These locations have been abbreviated as follows:

ST – Stream Top: All flows *entering* a catchment from upstream.
SB – Stream Bottom: All upstream flows *only* that have been routed through the catchment. This does not include local subcatchment flows.
OI – Outlet Inflow: All flows entering an outlet structure on the catchment. Sum of 'Stream Bottom' , Qc Pervious and Qc Impervious local catchment flows.
OO – Outlet Outflow: All flows exiting an outlet structure on the catchment. If a subcatchment does not have an outlet structure, Outlet Inflows and Outlet Outflows will be identical.

Table 5 - Pre vs Post Developed Scenario Flow Summary – Downstream Boundary

Event	Q_{PRE} CK17 ST	Q_{POST} CK17 ST	ΔQ CK17 ST
ARI (duration)	cu.m/s	cu.m/s	cu.m/s
5 (9hr)	20.39	19.76	-0.63
10 (9hr)	24.40	23.27	-1.13
20 (9hr)	29.58	28.17	-1.41
50 (9hr)	34.83	33.55	-1.28
100 (9hr)	40.00	38.78	-1.22

Table 6 - Pre vs Post Developed Scenario Flow Summary - T3.2 Basin Outlet

Event	Q_{PRE} CK15 OO	Q_{POST} PD04B OO	ΔQ PD04B OO
ARI (duration)	cu.m/s	cu.m/s	cu.m/s
5 (90min)	1.08	0.71	-0.37
10 (90min)	1.32	0.87	-0.46
20 (90min)	1.65	1.07	-0.58
50 (90min)	1.95	1.26	-0.69
100 (90min)	2.27	1.46	-0.81

Table 7 - Pre vs Post Developed Scenario Flow Summary - Farm Dam Outlet

Event	Q_{PRE} CD13 OO	Q_{POST} CD13 OO	ΔQ CD13 OO
ARI (duration)	cu.m/s	cu.m/s	cu.m/s
5 (90min)	4.26	4.25	-0.02
10 (90min)	5.48	5.17	-0.31
20 (90min)	7.17	6.42	-0.75
50 (90min)	9.49	8.62	-0.87
100 (90min)	11.37	10.45	-0.91

From the above table the proposed OSD design reduces the post developed flows to below the modelled pre-developed flow rates downstream of the subject site. This model takes into account the existing active storage that the farm dam provides for both pre and post development scenarios.

Additional selected peak flows are presented in the below tables for council's information. These are shown for the 9 hour duration storm. While local flows are shown to meet 'no-net-negative' design objectives at each OSD outlet, the 9 hour event is critical when the confluence of Cobbitty Creek and flows from the farm dam is considered wholistically.

Table 8 - Selected Pre Developed Peak Flows

Event	Q_{PRE} CD13 OI	Q_{PRE} CD13 OO	Q_{PRE} CK11 OO	Q_{PRE} CK14 OO	Q_{PRE} CK21 OO
ARI (duration)	cu.m/s	cu.m/s	cu.m/s	cu.m/s	cu.m/s
5 (9hr)	10.43	7.24	12.38	1.95	23.53
10 (9hr)	12.26	8.76	14.45	2.27	28.08
20 (9hr)	14.69	10.79	17.03	2.69	33.91
50 (9hr)	16.91	12.91	19.88	3.03	40.06
100 (9hr)	19.32	14.87	22.62	3.43	46.08

Table 9 - Selected Post Developed Peak Flows

Event	Q_{POST} CD13 OI	Q_{POST} CD13 OO	Q_{POST} CK11 OO	Q_{POST} CK14 OO	Q_{POST} CK21 OO
ARI (duration)	cu.m/s	cu.m/s	cu.m/s	cu.m/s	cu.m/s
5 (9hr)	10.86	6.41	12.41	2.00	22.98
10 (9hr)	12.76	7.88	14.49	2.32	27.03
20 (9hr)	15.29	9.98	17.08	2.75	32.36
50 (9hr)	17.56	12.22	19.94	3.10	38.59
100 (9hr)	20.02	14.23	22.70	3.51	44.64

Table 10 - Post Developed Scenario - OSD Storage Facility Water Level Summary

	Existing Farm Dam		**T3.2 Temp Basin**	
	m(AHD)	Volume (m^3)	m(AHD)	Volume (m^3)
Initial Water Level	73.50	23882	74.1	-
5 Year ARI (90min)	74.379	60544	74.451	614
10 Year ARI (90min)	74.507	67676	74.533	709
20 Year ARI (90min)	74.661	77119	74.605	796
50 Year ARI (90min)	74.841	88659	74.663	868
100 Year ARI (90min)	74.964	96948	74.714	933
Top of Bank (Max.) RL	76.0		75.0	

4 Hydraulics - TUFLOW Model

To determine the extent of flood affected land downstream of the development in the pre-development scenario as well as to validate the WBNM modelling, proposed flood mitigation and on-site stormwater detention strategy, a fully integrated 1D-2D linked TUFLOW Hydraulic model was developed over the study area. Key features of the model include:

- Primarily focusing on inflow hydrographs from the WBNM model - to simplify model domain extents and reduce calculation run times due to the catchment area.
- 2D Domain extending from Cobbitty Road in the South, the upper limits of the existing farm dam to the west and just beyond the site boundary to the east.
- Modelling of major 1D culverts and pipe systems linked with the 2D model domain.
- Consideration of the existing farm dam with the dead storage as completely full at the start of the simulation (maintaining consistency with the WBNM model).

The 2D domain is shown on the flood maps contained within Appendix B and Appendix C.

4.1 Materials and Impervious Area Mapping

The following table below presents the materials Mannings 'n' roughness coefficients and impervious area fractions adopted within the hydraulic model.

Table 11 - Materials Properties

Material	Manning's n Roughness Coefficient	Impervious Fraction
Pasture/Open Farmland/Floodplain	0.035	0
Road Corridors	0.012	0.95
Riparian Corridors and Washouts	0.05	0
Light Vegetation	0.075	0
Dense Vegetation	0.1	0
Open Water Bodies	0.03	1
Residential Lots	0.08	0.85

4.2 Primary 1D Model Elements

The following 1D hydraulic structures were modelled within the 2D domain:

Table 12 - 1D hydraulic structures

Location	Size	Source
Cobbitty Road	5 x 1200 Ø RCP	Visual Site Inspection, Detailed Survey (Geolyse, 2018)
Cobbitty Road	3 x 600 Ø RCP	Detailed Survey (Geolyse, 2018)
Existing Low Flow Crossing Under Service Road	375 Ø RCP	Detailed Survey (Geolyse, 2018) (Existing low flow crossing relocated in post developed scenario).
New Low Flow Crossing Under Service Road	2 x 900 Ø RCP	Proposed Design
Crossing Under Service Road	2.4w x 0.45h RCBC	Visual Site Inspection
Crossing Under Service Road	2.4w x 0.45h RCBC	Visual Site Inspection
Post Developed:		
Cobbitty Creek Crossing under Charles McIntosh Parkway	3 x 3.3w x 1.8h RCBC	Proposed new culvert crossing under Charles McIntosh Parkway for Cobbitty Creek.
Farm Dam Weir (New Outlet)	3.2m Wide Weir RL 73.5 6.0m Wide Weir RL 74.7	Proposed weir outlet from new farm dam outlet. New weirs to be cut into existing embankment.
T3.2 Temporary Basin	225 Ø Low Flow 1.8m Wide Weir RL73.5	Proposed discharge controls from new OSD Basin.

Scenarios that considered blockage in either pre or post developed cases have been considered for this initial Development Approval assessment. It is understood that blockage mechanics, detailed hydraulic design, levels of flood immunity and climate change considerations will be discussed in coordination with Council during detailed design phase.

4.3 Downstream Boundary

It is noted that due to shallow grades within Cobbitty Creek downstream of the site (based off lidar data); flood characteristics within Cobbitty Creek are conveyance (not tailwater constrained) in nature. As such a free outfall downstream boundary condition was applied at the end of the model domain with a 1% bed slope, allowing the model to release water across the boundary directly as a function of flow rate, material roughness and streamline topography.

4.4 Results Analysis

The 5 Year ARI and 100 Year ARI 9-hour critical storm events were run for both the pre and post developed scenarios with a 2-metre grid resolution for the full duration of the storm event.

4.4.1 Pre-Developed Scenario

Key points observed for the pre-developed scenario include:

- Only minor natural channelisation of Cobbitty Creek. Beyond the confluence of the farm dam overflow and Cobbitty Creek, a washout zone and sheet flow regime occurs across the western boundary.
- Localised overbank flooding occurs for both the minor 5 Year ARI and major 100 Year ARI event through the second order Cobbitty Creek (between the washout zone and Cobbitty Road Culvert Crossing).
- The washout zone transitions back into a reasonably well-defined channel with relatively minor (200-300mm) of overbank flooding witnessed in the minor 5 Year ARI event downstream of the subject site.
- The extent of overbank and sheet flow regimes is generally attributed to the extremely shallow (1% and in some areas less than 0.5%) grades throughout the various defined riparian zones.

4.4.2 Post-Developed Scenario

Key points observed for the post-developed scenario and flood difference maps include:

- Generally localised increases in flooded depths through the second order Cobbitty Creek area due to the introduction of the new culvert crossing under Charles McIntosh Parkway. This is a direct result of concentrating flows to a single culvert crossing over the existing sheet flow regime than what occurs in the pre-developed scenario.
- Local minor increases in flooded depths located wholly within the site upstream of the site boundary. This is attributed to the concentration of flow out of the culvert crossing under Charles McIntosh Parkway.
- No flood impact to any lots as a result of the mainstream flooding and overland flow paths through the proposed basin, modified existing farm dam or riparian corridors.
- No flood difference impact downstream of the subject site.

4.4.3 Flood Risk

In order to quantify and classify the flood risk hazard to people and property the flood risk hazard curves and associated Hazard Vulnerability Classifications were adopted from the Flood Hazard technical report prepared by Smith *et al.* 2014 and as generally suggested by Australian Rainfall and Runoff 2019, Book 6, Chapter 7 Section 7.2.7. It is noted that these flood hazard curves incorporate new stability curves for different vehicle classes and pedestrian age groups with defined limiting conditions for both velocity and depth profiles.

The following figure below shows the general flood hazard curves adopted:

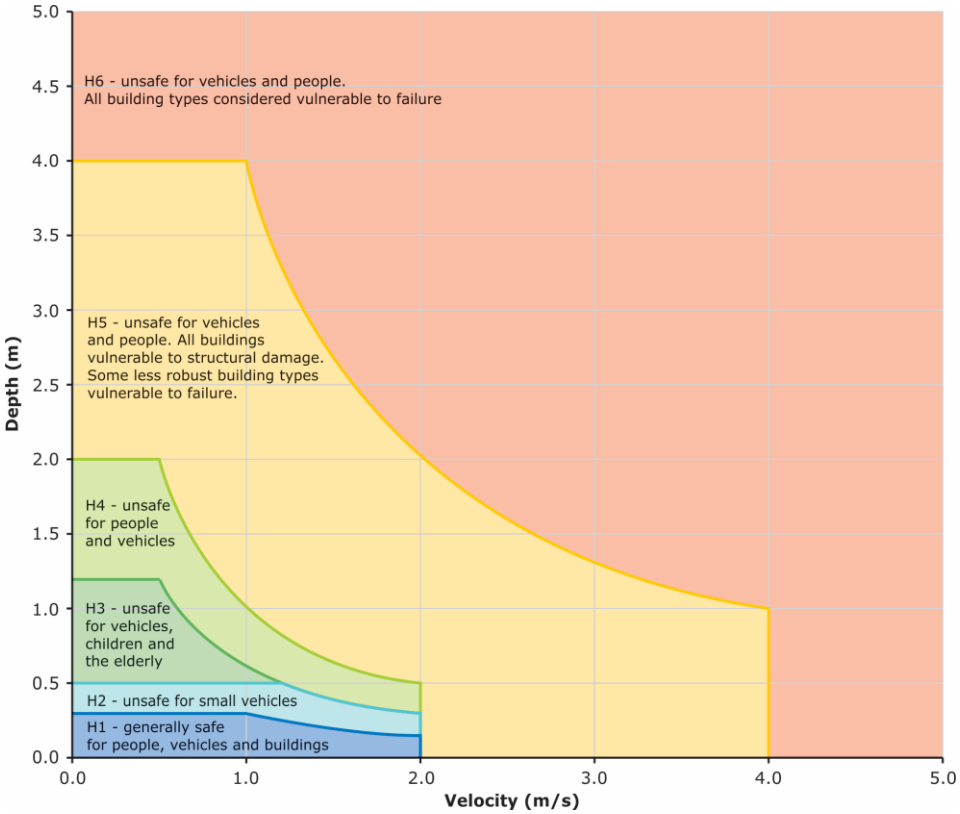


Figure 4 - General Flood Hazard Curves (Smith et al. 2014)

The following tables below identifies the Hazard Vulnerability Classifications and the limiting conditions:

Table 13 - Hazard Vulnerability Classifications

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 14 - Hazard Vulnerability Classification Limiting Conditions

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	-	-

The flood hazard maps contained within Appendix B and C adopt the abovementioned flood hazard vulnerability classifications.

4.4.4 Pre-Developed versus Post-Developed Scenario Results

In order to validate the improved performance of the post developed scenario hydraulic model over the pre-developed case flow rates were compared crossing the downstream *model* boundary. The table below shows a summary of the pre and post developed flow rates:

Table 15 - Pre vs Post Developed Scenario TUFLOW Flow Summary – CK17 ST

Event	Q_{PRE} CK17 ST	Q_{POST} CK17 ST	ΔQ CK17 ST
ARI (duration)	cu.m/s	cu.m/s	cu.m/s
5 (9hr)	18.66	18.85	+0.19
100 (9hr)	37.05	37.15	+0.1

Table 16 - Pre vs Post Developed Scenario TUFLOW Flow Summary - Downstream Domain Boundary

Event	Q_{PRE} DS BDY	Q_{POST} DS BDY	ΔQ DS BDY
ARI (duration)	cu.m/s	cu.m/s	cu.m/s
5 (9hr)	20.79	20.76	-0.03
100 (9hr)	41.26	40.92	-0.34

From the results above it can be seen that both the TUFLOW and WBNM models are performing generally consistently given the minor differences in where flow rates have been extracted from the model. The above results show that the TUFLOW model validates the proposed post-developed scenario OSD and flood mitigation controls proposed in the WBNM hydrologic model. While the WBNM modelling results show an explicit reduction in flows, the 2D hydraulic modelling peak flows demonstrate an *extremely* minor local increase in flows, due to the channelisation of flows from Cobbitty Creek through the culvert crossing under Charles McIntosh Parkway. At the downstream model domain, post developed flows are shown to be lower than the pre developed scenario. At either of these locations the flooded depth difference maps demonstrate that there is no measurable increase in flooded depths or any increase in flood hazard for any area downstream of the subject site.

Pre vs post flood difference maps can be found in Appendix D.

5 Water Quality

The water quality or water sensitive urban design strategy for the proposed development has been determined through the adoption and implementation of a MUSIC model. MUSIC is an industry standard modelling tool to design and size water quality controls subject to a number of water quality assessment criteria.

5.1 Assessment Metrics

The Oran Park Development Control Plan Section 6.2 identifies the following assessment criteria for water sensitive urban design:

Percentage reduction targets:

- Total Suspended Solids (TSS) 85%
- Total Phosphorus (TP) 65%
- Total Nitrogen (TN) 45%
- Gross Pollutants (GP) 90%

5.2 Proposed Treatment Train

The table below summaries the proposed treatment train strategy for the different stormwater outlets for the proposed development:

Table 17 - Water Quality Control Treatment Train Strategy

Outlet / Catchment	Control Measures	Comments
T3.1 (Design)	Temporary 400 m^2 Conventional Raingarden	Conventional raingarden. 300mm Extended Detention depth with 400mm deep filter media. Temporary only until regional controls established
T3.2 (Design)	Temporary 350 m^2 Conventional Raingarden	Conventional raingarden. 300mm Extended Detention depth with 400mm deep filter media. Temporary only until regional controls established
T3.B1	Temporary Vegetated Swale	Temporary 15m long vegetated swale with effective nutrient removal plants. To treat a small bypass catchment of Charles McIntosh Parkway
T3.B2	Temporary Vegetated Swale	Temporary 25m long vegetated swale with effective nutrient removal plants. To treat a small bypass catchment of Charles McIntosh Parkway and 10 residential lots.

5.3 Modelling Input Data

Camden Council MUSIC Link version 6.34 was implemented for water quality modelling and assessment.

5.3.1 Catchment Delineation

The post-developed scenario catchment delineation that was adopted for the hydrological modelling has been further refined and is shown in greater detail in Appendix A.

5.3.2 Sub-Catchment Breakdown

To apply both a conservative and accurate modelling approach sub-catchments and adopted impervious areas were defined by the following method:

i. Breakdown of the total lot areas into both roof area and supplementary (garden, driveway) areas. Supplementary areas (setbacks/gardens/driveways) were modelled as 65% impervious.

ii. A conservative estimate of minimum 60% of the lot area (or 225sq.m per roof) has been allowed for the roof area with 50% of the roof area to drain to a rainwater tank. All roof areas were modelled as 100% impervious.

iii. Total area of road corridors was calculated for each sub-catchment and assumed to be 95% impervious.

5.3.3 Catchment Areas Summary

The tables below summarise the primary sub-catchment areas and breakdown of land use:

Table 18 - MUSIC Sub-Catchment Summary

	T3.1	T3.2	T3.B1	T3.B2
Lot Area (ha)	2.05	1.71	-	0.33
Roof Area (ha)	1.33	1.15	-	0.23
Lot Sup. Area (ha)	0.72	0.57	-	0.11
Roads (ha)	0.96	0.76	0.606	0.44
Revegetated Land (ha)	-	-	-	0.535
Total Area (ha)	3.015	2.47	0.606	1.31

5.3.4 Model Layout

The figure below shows the MUSIC model layout and breakdown and can be reviewed in full in the provided modelling file (.sqz).

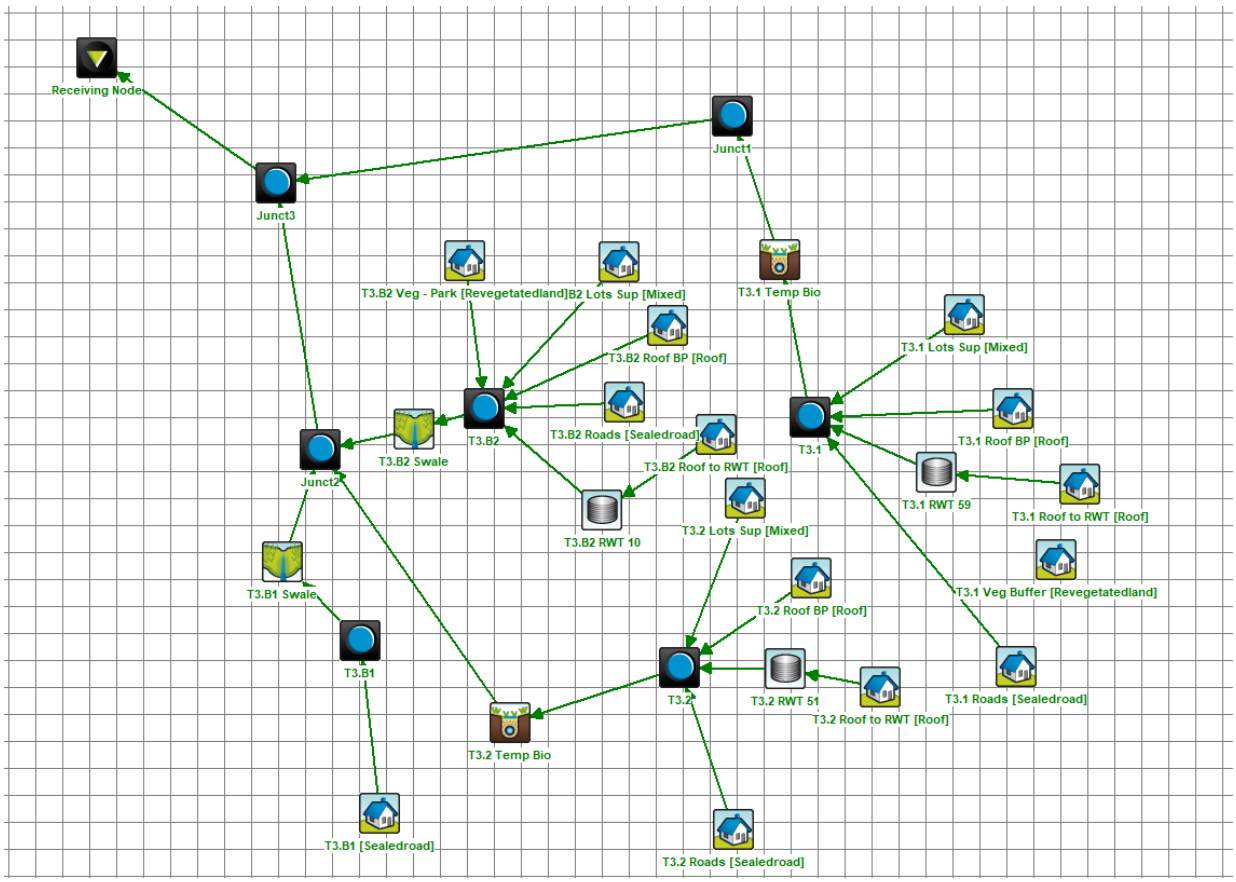


Figure 5 - MUSIC Model Layout

5.4 MUSIC Modelling Results

The table below summarises post-developed scenario source and residual pollutant loads as well as the percentage reduction results.

Table 19 - Treatment Train Effectiveness

	Sources	Residual Load	% Reduction	% Target
TSS (kg/yr)	8420	1230	85.4	85
TP (kg/yr)	16.7	5.01	70.1	65
TN (kg/yr)	107	52.1	51.3	45
Gross Pollutants (kg/yr)	1240	0	100	90

The above table demonstrates percentage reduction targets are achieved with the proposed treatment train and water quality management strategy.

6 Concept Masterplan Considerations

During the initial DA assessment of this proposed development council has requested information relating to the ultimate layout of the site. While not part of this formal assessment, background urban and landscaping design in coordination with the civil engineering and integrated water cycle management for the whole site is currently in development.

As a part of the final layout of the site this masterplan IWCM design will need to consider the regional water management infrastructure presented in the Precinct IWCM Report as shown in the figure below.

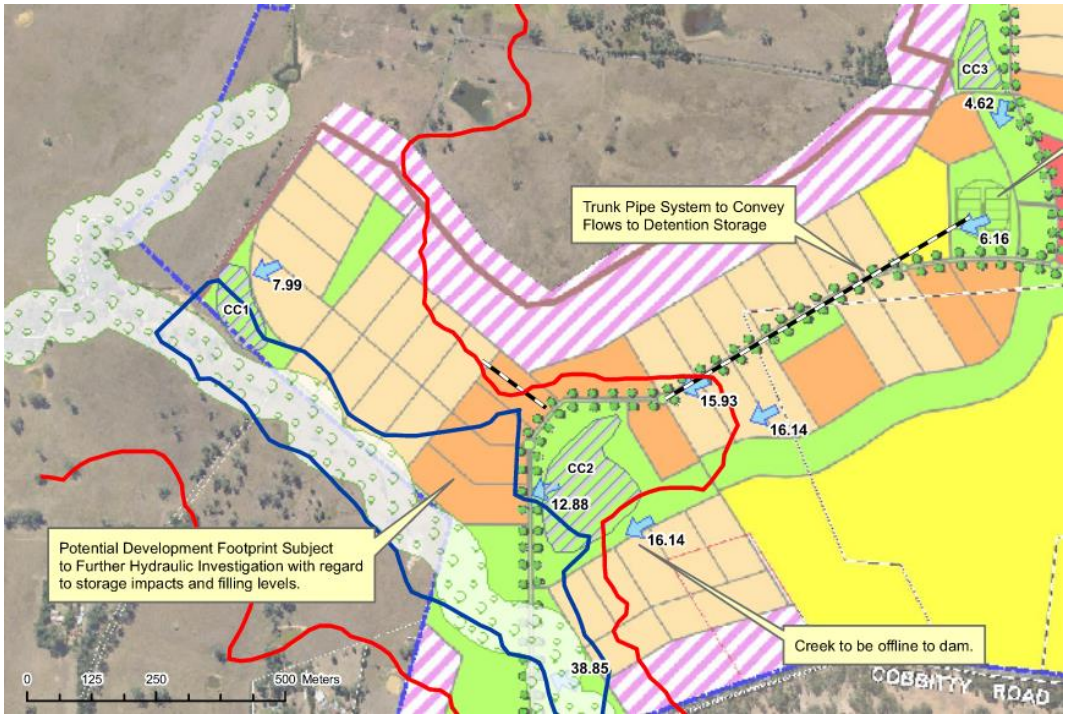


Figure 6 - Extract of Figure 7.2 *Proposed Stormwater Masterplan Oran Park Precinct West* (Browns, 2007)

This regional infrastructure includes:

- Regional detention and water quality basin in the north western most corner (CC1)
- Upgrade and embellishment of the existing farm dam to convert it into a man-made water body and water quality basins with surrounding parkland for combined recreational amenity, water quality and quantity management (CC2).
- A new (circa) 65m wide riparian corridor running through the site from east to west, sitting offline and to the south of the new open water body (the existing farm dam is currently located 'on-line' to this creek line).
- Culvert crossings under Charles McIntosh Parkway.
- A formal, coordinated and detailed hydrologic and hydraulic assessment of the whole system and no-net-negative metrics based assessment of overland flows at the downstream hydraulic model domain. It is noted that in the precinct report, for the 'Precinct West' further investigations are required to validate the ILP and proposed IWCM strategic design presented in the Oran Park Precinct Planning Documents.

Interpreting the masterplan features and land use zoning boundaries, a concept civil engineering schematic and associated flood maps have been prepared. This shows an indicative post-developed geometric arrangement of the new water body, water quality devices, culvert crossings and the offline riparian corridor running through the central portion of the site that adjoins the Tranche 3 Development covered under this application.

It is noted that this sketch is for information only to inform council that the civil engineering design and specifically the road and residential lot levels along Road No. 01 are fit for purpose with respect to the future anticipated Flood Planning Levels for the new riparian corridor.

This concept civil engineering schematic, associated site sections and 2D Hydraulic flood maps have been presented in Appendix F.

It is noted that the layout shown in Appendix F is the original masterplan layout proposed by BHL under DA2020/345/1. While this layout is subject to change, with respect to this DA approval, it is fit for purpose for concept schematic purposes.

7 Conclusions and Recommendations

For both water quantity, floodplain management and water quality the report demonstrates that the proposed management strategies reduce downstream peak flows and flooded depths and meet the relevant regulatory requirements for water quality targets. As such we conclude that this integrated water cycle management strategy is suitable to support the development proposal.

A summary of key findings is provided below:

i. The water quantity and flood mitigation strategy proposes to modify the existing farm dam for ongoing flood mitigation that the dam currently provides to the downstream catchment.

ii. Due to the proposed new culvert crossing under Charles McIntosh Parkway there is a minor concentration of flows into and out of the culvert system. Due to shallow grades in this area in the existing case the original flow regime was generally uncontained overbank sheet flow across the washout zones.

iii. The 2D TUFLOW hydraulic modelling demonstrates no increase in flood hazard or flood affectation for the 5 Year ARI and 100 Year ARI between the pre and post developed scenarios.

iv. The proposed water quality treatment train comprising of rainwater tanks, temporary bioretention systems and vegetated swales meets the post developed percentage reduction targets as outlined in the Oran Park DCP.

We note that the modelling and reporting of this strategy is concept in nature and future stages, under separate approvals will be subject to further review and refinement as more detailed design of the proposed management methodology is performed.

8 References

Australian Rainfall and Runoff: A Guide to Flood Estimation, Ball J, Babister M, Nathan R, Weeks W, Weinmann E, Retallick M, Testoni I, (Editors), Commonwealth of Australia (Geoscience Australia) 2019

Flood Hazard, Smith G, Davey E, Cox R S, University of New South Wales Water Research Laboratory Technical Report 2014/07, September 2014

Floodplain Development Manual, NSW Government Department of Infrastructure, Planning and Natural Resources April 2005

Queensland Urban Drainage Design Manual, Third Edition, Queensland Government Department of Energy and Water Supply 2013

Using MUSIC in Sydney Drinking Water Catchment, WaterNSW 2019

APPENDIX A - Catchment Plans

NORTH

LEGEND

CATCHMENT NAME, DIRECTION OF FALL & AREA	DESIGN 0.1760ha
COBBITTY DAM CATCHMENTS	
COBBITTY CREEK CATCHMENTS	

THE NORTHERN ROAD

COBBITTY CREEK

EXISTING COBBITTY DAM

CD1 10.75 ha
CD2 13.33 ha
CD3 10.20 ha
CD4 7.71 ha
CD5 6.79 ha
CD6 20.25 ha
CD7 11.53 ha
CD8 7.79 ha
CD9 17.12 ha
CD10 27.10 ha
CD11 16.41 ha
CD12 30.00 ha
CD13 36.07 ha

CK1 17.91 ha
CK2 27.19 ha
CK3 16.77 ha
CK4 24.45 ha
CK5 16.94 ha
CK6 20.56 ha
CK7 15.23 ha
CK8 24.88 ha
CK9 27.58 ha
CK10 30.37 ha
CK11 17.74 ha
CK12 12.92 ha
CK13 12.63 ha
CK14 5.46 ha
CK15 10.34 ha
CK16 14.74 ha
CK17 18.54 ha
CK18 16.12 ha
CK19 16.19 ha
CK20 25.04 ha
CK21 18.81 ha

COBBITTY ROAD

NEPEAN RIVER

MACQUARIE GROVE ROAD

ISSUED FOR **DEVELOPMENT APPLICATION**

NOT FOR CONSTRUCTION

Rev	Drawn	Design	Check	Appd.	Date	Revision Description
A	AP	CS	TT/MP	CS	03/02/2022	ISSUED FOR DEVELOPMENT APPLICATION

Disclaimer and Copyright:
ALL DIMENSIONS TO BE CHECKED ON SITE BY THE CONTRACTOR PRIOR TO CONSTRUCTION.
USE WRITTEN DIMENSIONS ONLY, DO NOT SCALE.
THESE DRAWINGS, PLANS, AND SPECIFICATIONS AND THE COPYRIGHT ARE THE PROPERTY OF ORION CONSULTING ENGINEERS PTY LTD AND MUST NOT BE REPRODUCED OR COPIED WHOLLY OR IN PART WITHOUT THE PERMISSION OF ORION CONSULTING ENGINEERS PTY LTD

Scale: 0 100 200 300 400 500 600 700 800 900 1000
SCALE 1:10000 (A1) SCALE 1:20000 (A3)

For: mirvac

By: Orion Consulting
JAS-ANZ
ABN:25 604 069 981 PO Box:7936, BAULKHAM HILLS NSW 2153 T:(02) 8660 0035 E:info@orionconsulting.com.au

Project: LOT 2005, DP 1162239
421 NORTHERN ROAD
(TRANCHE 3), COBBITTY
ROAD & DRAINAGE DESIGN

Title: OVERALL
PRE DEVELOPMENT
CATCHMENT PLAN

Project No.	Set No.	Milestone	Plan	Revision
21-0258	02	DA	400	A

Plotted:Monday, 30 March 2020 2:57:46 PM File Name:C:\2k5\data\ORION-SYNSTDES-02.0A Tranche 3 DA\01_210200\DWGS\cad\21-0258-02-DA-D-DCE_A1_TITLEBLOCK.dwg

NORTH

LEGEND

CATCHMENT NAME, DIRECTION OF FALL & AREA	DESIGN 0.1760ha
COBBITTY DAM CATCHMENTS	
COBBITTY CREEK CATCHMENTS	
POST DEVELOPED CATCHMENTS	

COBBITTY CREEK

THE NORTHERN ROAD

EXISTING FARM DAM

CD1 10.75 ha
CD2 13.33 ha
CD3 10.20 ha
CD4 7.71 ha
CD5 6.79 ha
CD6 20.25 ha
CD7 11.53 ha
CD8 7.79 ha
CD9 17.12 ha
CD10 27.1 ha
CD11 16.41 ha
CD12 30.69 ha
CD13 24.02 ha

PD03 13.48 ha
PD-R04 7.65 ha
PD04/A 2.47 ha
PD04/B 5.74 ha
PD06 3.10 ha
PD-R03W 3.12 ha
PD-R03E 2.08 ha

CK1 17.91 ha
CK2 27.19 ha
CK3 16.77 ha
CK4 24.45 ha
CK5 16.94 ha
CK6 20.56 ha
CK7 15.23 ha
CK8 24.88 ha
CK9 27.586 ha
CK10 30.37 ha
CK11 19.00 ha
CK12 12.92 ha
CK13 12.63 ha
CK14 6.30 ha
CK17 15.26 ha
CK18 16.12 ha
CK19 16.19 ha
CK20 25.04 ha
CK21 18.81 ha

COBBITTY ROAD

NEPEAN RIVER

MACQUARIE GROVE ROAD

ISSUED FOR **DEVELOPMENT APPLICATION**

NOT FOR CONSTRUCTION

Rev	Drawn	Design	Check	Appd.	Date	Revision Description
A	AP	CS	TT/MP	CS	03/02/2022	ISSUED FOR DEVELOPMENT APPLICATION

Disclaimer and Copyright:
ALL DIMENSIONS TO BE CHECKED ON SITE BY THE CONTRACTOR PRIOR TO CONSTRUCTION.
USE WRITTEN DIMENSIONS ONLY, DO NOT SCALE.
THESE DRAWINGS, PLANS, AND SPECIFICATIONS AND THE COPYRIGHT ARE THE PROPERTY OF ORION CONSULTING ENGINEERS PTY LTD AND MUST NOT BE REPRODUCED OR COPIED WHOLLY OR IN PART WITHOUT THE PERMISSION OF ORION CONSULTING ENGINEERS PTY LTD

Scale:
0 100 200 300 400 500 600 700 800 900 1000
SCALE 1:10000 (A1) SCALE 1:20000 (A3)

For: mirvac

By: Orion Consulting
ABN:25 604 069 981 PO Box:7936, BAULKHAM HILLS NSW 2153 T:(02) 8660 0035 E:info@orionconsulting.com.au

JAS-ANZ WWW.JAS-ANZ.ORG/REGISTER

Project: LOT 2005, DP 1162239
421 NORTHERN ROAD
(TRANCHE 3), COBBITTY
ROAD & DRAINAGE DESIGN

Title: OVERALL
POST DEVELOPMENT
CATCHMENT PLAN

Project No.	Set No.	Milestone	Plan	Revision
21-0258	02	DA	401	A

Printed Monday, 30 March 2020 2:57:46 PM File Name:C:\Users\Isabel.ORION-SYDNEY\DES-02-DA-Tranche 3\DA01_210200\DWGS\Xref\21-0258-02-DA-D-CCE_A1_TITLEBLOCK.dwg

NORTH

LEGEND

CATCHMENT NAME, DIRECTION OF FALL & AREA	DESIGN 0.1760ha
CONTOURS (EXISTING & DESIGN)	20.0 — 20.0
T3.B1 CATCHMENT BOUNDARY	
T3.B2 CATCHMENT BOUNDARY	
T3.1 CATCHMENT BOUNDARY	
T3.2 CATCHMENT BOUNDARY	
FUTURE CATCHMENT BOUNDARY	

LOT 455 DP1103936
LOT 745 DP1231306
LOT 596 DP1231304
LOT 3101 DP1223680
EXISTING FARM DAM
COBBITTY CREEK
LOT 11 604645
LOT 13 DP604645
LOT 12 DP604645
T3.3 FUTURE 3.254 ha
ROAD No.10
T3.B1 (OSD BYPASS) 0.61 ha
TEMP BASIN T3.2
T3.B2 (OSD BYPASS) 1.31 ha
TEMP BASIN T3.1
T3.1 DESIGN 3.02 ha
ROAD No.01
ROAD No.02
ROAD No.03
ROAD No.04
ROAD No.05
ROAD No.06
ROAD No.07
ROAD No.08
ROAD No.09
ROAD No.11
ROAD No.12
ROAD No.13
T3.2 DESIGN 2.470 ha
T3.2 FUTURE 3.835 ha
T3.1 FUTURE 12.379 ha
PARKWAY
MCINTOSH
CHARLES
LOT 1 DP1014583
LOT 3102 DP1223680 (MACARTHUR ANGLICAN SCHOOL)
LOT 100 DP1159926
FUTURE BASIN
COBBITTY ROAD
LOT 1 DP270613
MACQUARIE GROVE

ISSUED FOR **DEVELOPMENT APPLICATION**
NOT FOR CONSTRUCTION

Rev	Drawn	Design	Check	Appd.	Date	Revision Description
A	AP	CS	TT/MP	CS	03/02/2022	ISSUED FOR DEVELOPMENT APPLICATION

Disclaimer and Copyright:
ALL DIMENSIONS TO BE CHECKED ON SITE BY THE CONTRACTOR PRIOR TO CONSTRUCTION.
USE WRITTEN DIMENSIONS ONLY, DO NOT SCALE.
THESE DRAWINGS, PLANS, AND SPECIFICATIONS AND THE COPYRIGHT ARE THE PROPERTY OF ORION CONSULTING ENGINEERS PTY LTD AND MUST NOT BE REPRODUCED OR COPIED WHOLLY OR IN PART WITHOUT THE PERMISSION OF ORION CONSULTING ENGINEERS PTY LTD

Scale: 0 20 40 60 80 100 120 140 160 180 200
SCALE 1:2000 (A1) SCALE 1:4000 (A3)

For: mirvac

By: Orion Consulting
JAS-ANZ WWW.JAS-ANZ.ORG/REGISTER
ABN:25 604 069 981 PO Box:7936, BAULKHAM HILLS NSW 2153 T:(02) 8660 0035 E:info@orionconsulting.com.au

Project: LOT 2005, DP 1162239
421 NORTHERN ROAD
(TRANCHE 3), COBBITTY
ROAD & DRAINAGE DESIGN

Title: MUSIC MODELLING CATCHMENT PLAN

Project No.	Set No.	Milestone	Plan	Revision
21-0258	02	DA	402	A

Plotted:Monday, 30 March 2020 2:57:46 PM File Name:C:\12d\5data\ORION-SYNI\01DES-02-DA Tranche 3 DA\01_210200\DWGS\21-0258-02-DA-402.dwg

APPENDIX E - MUSIC Link Report

MUSIC-*link* Report

Project Details		Company Details	
Project:	DA01 - 421 Northern Road Cobbitty	**Company:**	Orion Consulting
Report Export Date:	27/01/2022	**Contact:**	Christopher Scholes
Catchment Name:	21-0258 Cobbitty T3 DA Music Model Temp	**Address:**	Suite 4.04, 12 Century Circuit NORWEST NSW 2153
Catchment Area:	7.381ha	**Phone:**	0499010239
Impervious Area*:	84.32%	**Email:**	chris.scholes@orionconsulting.com.au
Rainfall Station:	67035 LIVERPOOL(WHITLAM		
Modelling Time-step:	6 Mnutes		
Modelling Period:	1/01/1985 - 31/12/1994 11:54:00 PM		
Mean Annual Rainfall:	783mm		
Evapotranspiration:	1261mm		
MUSIC Version:	6.3.0		
MUSIC-link data Version:	6.34		
Study Area:	Camden City Council		
Scenario:	Camden City Council		

* takes into account area from all source nodes that link to the chosen reporting node, excluding Import Data Nodes

Treatment Train Effectiveness		Treatment Nodes		Source Nodes	
Node: Receiving Node	**Reduction**	**Node Type**	**Number**	**Node Type**	**Number**
Flow	16.6%	Rain Water Tank Node	3	Urban Source Node	15
TSS	85.4%	Bio Retention Node	2		
TP	70.1%	Swale Node	2		
TN	51.3%				
GP	100%				

Comments

Temporary Raingardens Only - 0.4m filter media depth adequate for meeting performance targets.

Vegetated Swales have been graded acording to site constraints based on where these swales are to be located.

Passing Parameters

Node Type	Node Name	Parameter	Min	Max	Actual
Bio	T3.1 Temp Bio	Hi-flow bypass rate (cum/sec)	None	None	100
Bio	T3.1 Temp Bio	PET Scaling Factor	2.1	2.1	2.1
Bio	T3.2 Temp Bio	Hi-flow bypass rate (cum/sec)	None	None	100
Bio	T3.2 Temp Bio	PET Scaling Factor	2.1	2.1	2.1
Rain	T3.1 RWT 59	% Reuse Demand Met	None	None	29.5223
Rain	T3.2 RWT 51	% Reuse Demand Met	None	None	29.34
Rain	T3.B2 RWT 10	% Reuse Demand Met	None	None	28.74
Receiving	Receiving Node	% Load Reduction	None	None	16.6
Receiving	Receiving Node	GP % Load Reduction	90	None	100
Receiving	Receiving Node	TN % Load Reduction	45	None	51.3
Receiving	Receiving Node	TP % Load Reduction	65	None	70.1
Receiving	Receiving Node	TSS % Load Reduction	85	None	85.4
Swale	T3.B1 Swale	Bed slope	0.01	0.05	0.01
Urban	T3.1 Lots Sup	Area Impervious (ha)	None	None	0.468
Urban	T3.1 Lots Sup	Area Pervious (ha)	None	None	0.251
Urban	T3.1 Lots Sup	Total Area (ha)	None	None	0.72
Urban	T3.1 Roads	Area Impervious (ha)	None	None	0.914
Urban	T3.1 Roads	Area Pervious (ha)	None	None	0.045
Urban	T3.1 Roads	Total Area (ha)	None	None	0.96
Urban	T3.1 Roof BP	Area Impervious (ha)	None	None	0.66
Urban	T3.1 Roof BP	Area Pervious (ha)	None	None	0
Urban	T3.1 Roof BP	Total Area (ha)	None	None	0.66
Urban	T3.1 Roof to RWT	Area Impervious (ha)	None	None	0.66
Urban	T3.1 Roof to RWT	Area Pervious (ha)	None	None	0
Urban	T3.1 Roof to RWT	Total Area (ha)	None	None	0.66
Urban	T3.1 Veg Buffer	Area Impervious (ha)	None	None	0
Urban	T3.1 Veg Buffer	Area Pervious (ha)	None	None	0.261
Urban	T3.1 Veg Buffer	Total Area (ha)	None	None	0.261
Urban	T3.2 Lots Sup	Area Impervious (ha)	None	None	0.370
Urban	T3.2 Lots Sup	Area Pervious (ha)	None	None	0.199
Urban	T3.2 Lots Sup	Total Area (ha)	None	None	0.57
Urban	T3.2 Roads	Area Impervious (ha)	None	None	0.723
Urban	T3.2 Roads	Area Pervious (ha)	None	None	0.036
Urban	T3.2 Roads	Total Area (ha)	None	None	0.76
Urban	T3.2 Roof BP	Area Impervious (ha)	None	None	0.57
Urban	T3.2 Roof BP	Area Pervious (ha)	None	None	0
Urban	T3.2 Roof BP	Total Area (ha)	None	None	0.57
Urban	T3.2 Roof to RWT	Area Impervious (ha)	None	None	0.57
Urban	T3.2 Roof to RWT	Area Pervious (ha)	None	None	0
Urban	T3.2 Roof to RWT	Total Area (ha)	None	None	0.57

Only certain parameters are reported when they pass validation

Node Type	Node Name	Parameter	Min	Max	Actual
Urban	T3.B1	Area Impervious (ha)	None	None	0.576
Urban	T3.B1	Area Pervious (ha)	None	None	0.029
Urban	T3.B1	Total Area (ha)	None	None	0.606
Urban	T3.B2 Lots Sup	Area Impervious (ha)	None	None	0.071
Urban	T3.B2 Lots Sup	Area Pervious (ha)	None	None	0.038
Urban	T3.B2 Lots Sup	Total Area (ha)	None	None	0.11
Urban	T3.B2 Roads	Area Impervious (ha)	None	None	0.418
Urban	T3.B2 Roads	Area Pervious (ha)	None	None	0.021
Urban	T3.B2 Roads	Total Area (ha)	None	None	0.44
Urban	T3.B2 Roof BP	Area Impervious (ha)	None	None	0.11
Urban	T3.B2 Roof BP	Area Pervious (ha)	None	None	0
Urban	T3.B2 Roof BP	Total Area (ha)	None	None	0.11
Urban	T3.B2 Roof to RWT	Area Impervious (ha)	None	None	0.11
Urban	T3.B2 Roof to RWT	Area Pervious (ha)	None	None	0
Urban	T3.B2 Roof to RWT	Total Area (ha)	None	None	0.11
Urban	T3.B2 Veg - Park	Area Impervious (ha)	None	None	0
Urban	T3.B2 Veg - Park	Area Pervious (ha)	None	None	0.535
Urban	T3.B2 Veg - Park	Total Area (ha)	None	None	0.535

Only certain parameters are reported when they pass validation

Failing Parameters

Node Type	Node Name	Parameter	Min	Max	Actual
Bio	T3.1 Temp Bio	Filter depth (m)	0.5	1	0.4
Bio	T3.2 Temp Bio	Filter depth (m)	0.5	1	0.4
Swale	T3.B2 Swale	Bed slope	0.01	0.05	0.005

Only certain parameters are reported when they pass validation

APPENDIX B - Pre Developed Flood Maps

NORTH

TO DENBIGH HOMESTEAD

2D DOMAIN BOUNDARY

DOWNSTREAM BOUNDARY

EXISTING FARM DAM

MACARTHUR ANGLICAN SCHOOL LOT 3102 DP 1223680

LOT 2005 DP 1162239

LOT 455 DP 1103936

LOT 1 DP 1014583

LOT 13 DP 604645

LOT 12 DP 604645

LOT 11 DP 604645

LOT 1 DP 270613

LOT 100 DP 1159926

CHARLES MCINTOSH PKWY

COBBITTY ROAD

TO ORAN PARK

TO COBBITTY VILLAGE

LEGEND

0.05 - 0.1m	
0.1 - 0.2m	
0.2 - 0.3m	
0.3 - 0.4m	
0.4 - 0.5m	
0.5 - 0.6m	
0.6 - 0.7m	
0.7 - 0.8m	
0.8 - 0.9m	
0.9 - 1.0m	
1.0 - 1.1m	
1.1 - 1.2m	
1.2 - 1.3m	
1.3 - 1.4m	
1.4 - 1.5m	
1.5 - 1.6m	
1.6 - 1.7m	
1.7 - 1.8m	
1.8 - 1.9m	
1.9 - 2.0m	
2.0 - 2.2m	
2.2 - 2.4m	
2.4 - 2.6m	
2.6 - 2.8m	
2.8 - 3.0m	
3.0 - 3.5m	
3.5 - 4.0m	
4.0 - 5.0m	
5.0 - 10.0m	
WATER SURFACE CONTOUR & LABEL	70.00

ISSUED FOR **DEVELOPMENT APPLICATION**

NOT FOR CONSTRUCTION

Rev	Drawn	Design	Check	Appd.	Date	Revision Description
A	SS	CS	MP	CS	03/02/2022	ISSUED FOR DEVELOPMENT APPLICATION

Disclaimer and Copyright:
ALL DIMENSIONS TO BE CHECKED ON SITE BY THE CONTRACTOR PRIOR TO CONSTRUCTION.
USE WRITTEN DIMENSIONS ONLY, DO NOT SCALE.
THESE DRAWINGS, PLANS, AND SPECIFICATIONS AND THE COPYRIGHT ARE THE PROPERTY OF ORION CONSULTING ENGINEERS PTY LTD AND MUST NOT BE REPRODUCED OR COPIED WHOLLY OR IN PART WITHOUT THE PERMISSION OF ORION CONSULTING ENGINEERS PTY LTD

Scale:
0 20 40 60 80 100 120 140 160 180 200
SCALE 1:2000 (A1) SCALE 1:4000 (A3)

For: mirvac

By: Orion Consulting
ABN:25 604 069 981 PO Box:7936, BAULKHAM HILLS NSW 2153 T:(02) 8660 0035 E:info@orionconsulting.com.au

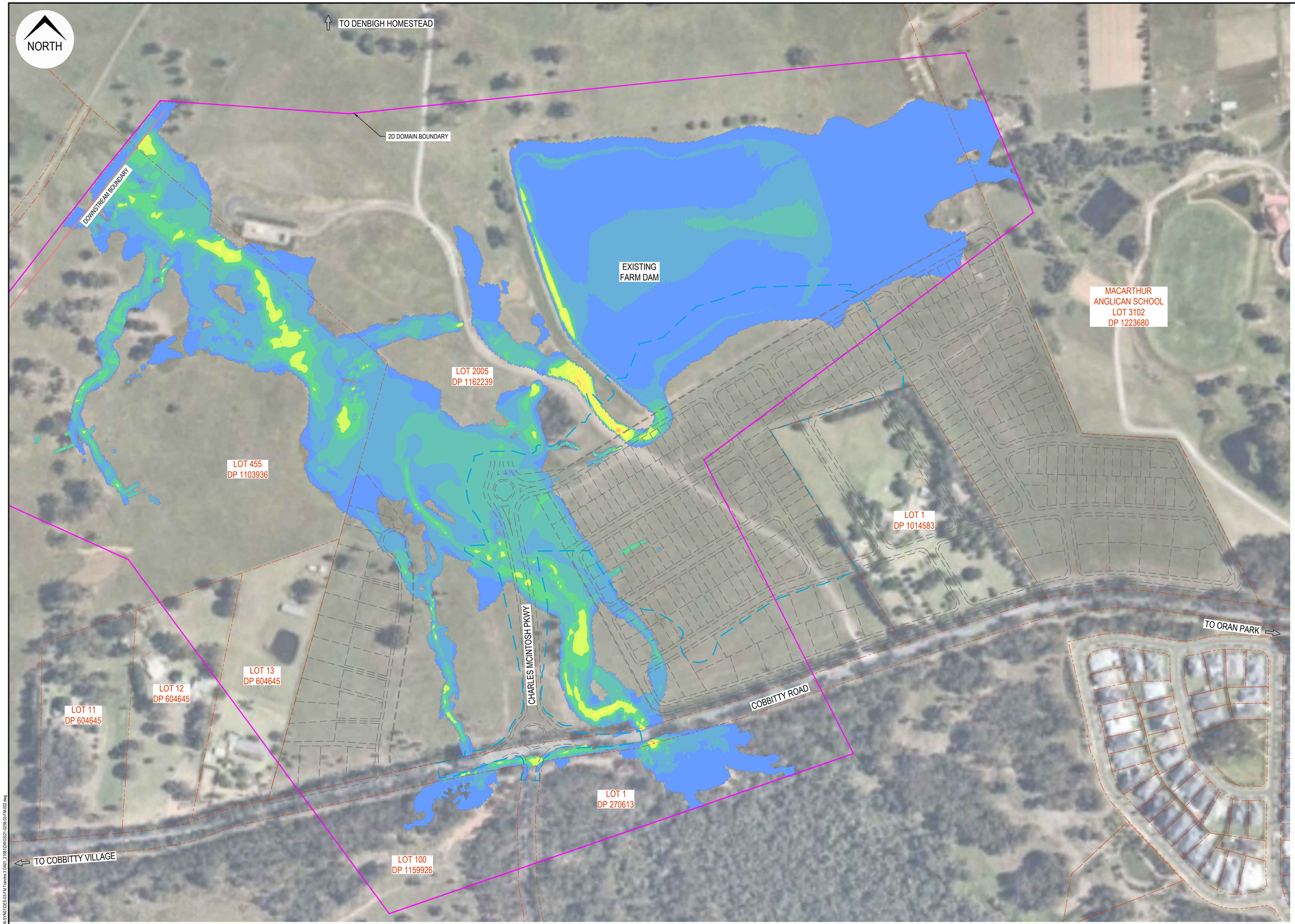
JAS-ANZ WWW.JAS-ANZ.ORG/REGISTER

Project: 421 THE NORTHERN ROAD (TRANCHE 3), COBBITTY ROAD & DRAINAGE DESIGN

Title: 5YR ARI PRE DEVELOPMENT FLOOD DEPTH MAP

Project No.	Set No.	Milestone	Plan	Revision
21-0258	03	FM	001	A

Plotted:Monday, 30 March 2020 2:57:46 PM File Name:C:\2Sites\ORION-SYD\21DSS-03-FM Tranche 3 DA01_21081DWGS\dwf\21-0258-03-FM-D-OCE_A1_TITLEBLOCK.dwg



LEGEND

0 - 0.25m/s	
0.25 - 0.5m/s	
0.5 - 0.75m/s	
0.75 - 1.0m/s	
1.0 - 1.5m/s	
1.5 - 2.0m/s	
2.0 - 2.5m/s	
2.5 - 3.0m/s	
3.0 - 3.5m/s	
3.5 - 4.0m/s	
4.0 - 5.0m/s	
5.0 - 6.0m/s	
6.0 - 10.0m/s	

ISSUED FOR **DEVELOPMENT APPLICATION**

NOT FOR CONSTRUCTION

Rev	Drawn	Design	Check	Appd.	Date	Revision Description
A	SS	CS	MP	CS	03/02/2022	ISSUED FOR DEVELOPMENT APPLICATION

Disclaimer and Copyright:
ALL DIMENSIONS TO BE CHECKED ON SITE BY THE CONTRACTOR PRIOR TO CONSTRUCTION.
USE WRITTEN DIMENSIONS ONLY, DO NOT SCALE.
THESE DRAWINGS, PLANS, AND SPECIFICATIONS AND THE COPYRIGHT ARE THE PROPERTY OF ORION CONSULTING ENGINEERS PTY LTD AND MUST NOT BE REPRODUCED OR COPIED WHOLLY OR IN PART WITHOUT THE PERMISSION OF ORION CONSULTING ENGINEERS PTY LTD

Scale:
0 20 40 60 80 100 120 140 160 180 200
SCALE 1:2000 (A1) SCALE 1:4000 (A3)

For: mirvac

By:
Orion Consulting
ABN:25 604 069 981 PO Box:7936, BAULKHAM HILLS NSW 2153 T:(02) 8660 0035 E:info@orionconsulting.com.au

Project: 421 THE NORTHERN ROAD (TRANCHE 3), COBBITTY ROAD & DRAINAGE DESIGN

Title: 5YR ARI PRE DEVELOPMENT FLOOD VELOCITY MAP

Project No.	Set No.	Milestone	Plan	Revision
21-0258	03	FM	002	A

Plotted:Monday, 30 March 2020 2:57:46 PM File Name:C:\12d\Data\ORION-SYNO1\DRS-03-FM Tranche 3 DA01_21081\DWG\021-0258-03-FM-002.dwg

NORTH

TO DENBIGH HOMESTEAD

2D DOMAIN BOUNDARY

DOWNSTREAM BOUNDARY

EXISTING FARM DAM

MACARTHUR ANGLICAN SCHOOL LOT 3102 DP 1223680

LOT 2005 DP 1162239

LOT 455 DP 1103936

LOT 1 DP 1014583

CHARLES MCINTOSH PKWY

COBBITTY ROAD

TO ORAN PARK

LOT 13 DP 604645

LOT 12 DP 604645

LOT 11 DP 604645

LOT 1 DP 270613

LOT 100 DP 1159926

TO COBBITTY VILLAGE

LEGEND

HAZARD VULNERABILITY CLASSIFICATION

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

ISSUED FOR **DEVELOPMENT APPLICATION**

NOT FOR CONSTRUCTION

Rev	Drawn	Design	Check	Appd.	Date	Revision Description
A	SS	CS	MP	CS	03/02/2022	ISSUED FOR DEVELOPMENT APPLICATION

Disclaimer and Copyright:
ALL DIMENSIONS TO BE CHECKED ON SITE BY THE CONTRACTOR PRIOR TO CONSTRUCTION.
USE WRITTEN DIMENSIONS ONLY, DO NOT SCALE.
THESE DRAWINGS, PLANS, AND SPECIFICATIONS AND THE COPYRIGHT ARE THE PROPERTY OF ORION CONSULTING ENGINEERS PTY LTD AND MUST NOT BE REPRODUCED OR COPIED WHOLLY OR IN PART WITHOUT THE PERMISSION OF ORION CONSULTING ENGINEERS PTY LTD

Scale:
0 20 40 60 80 100 120 140 160 180 200
SCALE 1:2000 (A1) SCALE 1:4000 (A3)

For: mirvac

By: Orion Consulting
JAS-ANZ
ABN:25 604 069 981 PO Box:7936, BAULKHAM HILLS NSW 2153 T:(02) 8660 0035 E:info@orionconsulting.com.au

Project: 421 THE NORTHERN ROAD (TRANCHE 3), COBBITTY ROAD & DRAINAGE DESIGN

Title: 5YR ARI PRE DEVELOPMENT PLAN HAZARD MAP

Project No.	Set No.	Milestone	Plan	Revision
21-0258	03	FM	003	A

Plotted:Monday, 30 March 2020 2:57:46 PM File Name:C:\12\05\data\ORION_SYNX\10\DES-03-FM Tranche 3.1NX1_21\10\DWG\521-0258-03-FM-003.dwg

NORTH

TO DENBIGH HOMESTEAD

2D DOMAIN BOUNDARY

DOWNSTREAM BOUNDARY

EXISTING FARM DAM

MACARTHUR ANGLICAN SCHOOL LOT 3102 DP 1223680

LOT 2005 DP 1162239

LOT 455 DP 1103936

LOT 1 DP 1014583

LOT 13 DP 604645

LOT 12 DP 604645

LOT 11 DP 604645

CHARLES MCINTOSH PKWY

COBBITTY ROAD

LOT 1 DP 270613

LOT 100 DP 1159926

TO ORAN PARK

TO COBBITTY VILLAGE

LEGEND

0.05 - 0.1m	
0.1 - 0.2m	
0.2 - 0.3m	
0.3 - 0.4m	
0.4 - 0.5m	
0.5 - 0.6m	
0.6 - 0.7m	
0.7 - 0.8m	
0.8 - 0.9m	
0.9 - 1.0m	
1.0 - 1.1m	
1.1 - 1.2m	
1.2 - 1.3m	
1.3 - 1.4m	
1.4 - 1.5m	
1.5 - 1.6m	
1.6 - 1.7m	
1.7 - 1.8m	
1.8 - 1.9m	
1.9 - 2.0m	
2.0 - 2.2m	
2.2 - 2.4m	
2.4 - 2.6m	
2.6 - 2.8m	
2.8 - 3.0m	
3.0 - 3.5m	
3.5 - 4.0m	
4.0 - 5.0m	
5.0 - 10.0m	
WATER SURFACE CONTOUR & LABEL	70.00

ISSUED FOR **DEVELOPMENT APPLICATION**

NOT FOR CONSTRUCTION

Rev	Drawn	Design	Check	Appd.	Date	Revision Description
A	SS	CS	MP	CS	03/02/2022	ISSUED FOR DEVELOPMENT APPLICATION

Disclaimer and Copyright:
ALL DIMENSIONS TO BE CHECKED ON SITE BY THE CONTRACTOR PRIOR TO CONSTRUCTION.
USE WRITTEN DIMENSIONS ONLY, DO NOT SCALE.
THESE DRAWINGS, PLANS, AND SPECIFICATIONS AND THE COPYRIGHT ARE THE PROPERTY OF ORION CONSULTING ENGINEERS PTY LTD AND MUST NOT BE REPRODUCED OR COPIED WHOLLY OR IN PART WITHOUT THE PERMISSION OF ORION CONSULTING ENGINEERS PTY LTD

Scale:
0 20 40 60 80 100 120 140 160 180 200
SCALE 1:2000 (A1) SCALE 1:4000 (A3)

For: mirvac

By: Orion Consulting
JAS-ANZ
ABN:25 604 069 981 PO Box:7936, BAULKHAM HILLS NSW 2153 T:(02) 8660 0035 E:info@orionconsulting.com.au

Project: 421 THE NORTHERN ROAD (TRANCHE 3), COBBITTY ROAD & DRAINAGE DESIGN

Title: 100 ARI PRE DEVELOPMENT FLOOD DEPTH MAP

Project No.	Set No.	Milestone	Plan	Revision
21-0258	03	FM	004	A

Plotted Monday, 30 March 2020 2:57:46 PM File Name C:\2x86data\ORION-SYNC\DES-03-FM Tranche 3 DA01_210815\WVS\21-0258-03-FM-004.dwg

NORTH

TO DENBIGH HOMESTEAD

2D DOMAIN BOUNDARY

DOWNSTREAM BOUNDARY

EXISTING FARM DAM

MACARTHUR ANGLICAN SCHOOL LOT 3102 DP 1223680

LOT 2005 DP 1162239

LOT 455 DP 1103936

LOT 1 DP 1014583

CHARLES MCINTOSH PKWY

COBBITTY ROAD

TO ORAN PARK

LOT 13 DP 604645

LOT 12 DP 604645

LOT 11 DP 604645

LOT 1 DP 270613

LOT 100 DP 1159926

TO COBBITTY VILLAGE

LEGEND

0 - 0.25m/s	
0.25 - 0.5m/s	
0.5 - 0.75m/s	
0.75 - 1.0m/s	
1.0 - 1.5m/s	
1.5 - 2.0m/s	
2.0 - 2.5m/s	
2.5 - 3.0m/s	
3.0 - 3.5m/s	
3.5 - 4.0m/s	
4.0 - 5.0m/s	
5.0 - 6.0m/s	
6.0 - 10.0m/s	

ISSUED FOR **DEVELOPMENT APPLICATION**

NOT FOR CONSTRUCTION

Rev	Drawn	Design	Check	Appd.	Date	Revision Description
A	SS	CS	MP	CS	03/02/2022	ISSUED FOR DEVELOPMENT APPLICATION

Disclaimer and Copyright:
ALL DIMENSIONS TO BE CHECKED ON SITE BY THE CONTRACTOR PRIOR TO CONSTRUCTION.
USE WRITTEN DIMENSIONS ONLY, DO NOT SCALE.
THESE DRAWINGS, PLANS, AND SPECIFICATIONS AND THE COPYRIGHT ARE THE PROPERTY OF ORION CONSULTING ENGINEERS PTY LTD AND MUST NOT BE REPRODUCED OR COPIED WHOLLY OR IN PART WITHOUT THE PERMISSION OF ORION CONSULTING ENGINEERS PTY LTD

Scale:
0 20 40 60 80 100 120 140 160 180 200
SCALE 1:2000 (A1) SCALE 1:4000 (A3)

For: mirvac

By: Orion Consulting

ABN:25 604 069 981 **PO Box:**7936, BAULKHAM HILLS NSW 2153 **T:**(02) 8660 0035 **E:**info@orionconsulting.com.au

Project: 421 THE NORTHERN ROAD (TRANCHE 3), COBBITTY ROAD & DRAINAGE DESIGN

Title: 100YR ARI PRE DEVELOPMENT FLOOD VELOCITY MAP

Project No.	Set No.	Milestone	Plan	Revision
21-0258	03	FM	005	A

Printed:Monday, 30 March 2020 2:57:48 PM File Name:C:\12d\Data\ORION-SYN\01DES-03-FM Tranche 3 DA\01_210810\WS\DS2_025B-03-FM-005.dwg

NORTH

TO DENBIGH HOMESTEAD

2D DOMAIN BOUNDARY

DOWNSTREAM BOUNDARY

EXISTING FARM DAM

MACARTHUR ANGLICAN SCHOOL LOT 3102 DP 1223680

LOT 2005 DP 1162239

LOT 455 DP 1103936

LOT 1 DP 1014583

CHARLES MCINTOSH PKWY

COBBITTY ROAD

TO ORAN PARK

LOT 13 DP 604645

LOT 12 DP 604645

LOT 11 DP 604645

LOT 1 DP 270613

LOT 100 DP 1159926

TO COBBITTY VILLAGE

LEGEND

HAZARD VULNERABILITY CLASSIFICATION

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

ISSUED FOR **DEVELOPMENT APPLICATION**

NOT FOR CONSTRUCTION

Rev	Drawn	Design	Check	Appd.	Date	Revision Description
A	SS	CS	MP	CS	03/02/2022	ISSUED FOR DEVELOPMENT APPLICATION

Disclaimer and Copyright:
ALL DIMENSIONS TO BE CHECKED ON SITE BY THE CONTRACTOR PRIOR TO CONSTRUCTION.
USE WRITTEN DIMENSIONS ONLY, DO NOT SCALE.
THESE DRAWINGS, PLANS, AND SPECIFICATIONS AND THE COPYRIGHT ARE THE PROPERTY OF ORION CONSULTING ENGINEERS PTY LTD AND MUST NOT BE REPRODUCED OR COPIED WHOLLY OR IN PART WITHOUT THE PERMISSION OF ORION CONSULTING ENGINEERS PTY LTD

Scale:
0 20 40 60 80 100 120 140 160 180 200
SCALE 1:2000 (A1) SCALE 1:4000 (A3)

For: mirvac

By: Orion Consulting
ABN:25 604 069 981 PO Box:7936, BAULKHAM HILLS NSW 2153 T:(02) 8660 0035 E:info@orionconsulting.com.au

JAS-ANZ WWW.JAS-ANZ.ORG/REGISTER

Project: 421 THE NORTHERN ROAD (TRANCHE 3), COBBITTY ROAD & DRAINAGE DESIGN

Title: 100YR ARI PRE DEVELOPMENT FLOOD HAZARD MAP

Project No.	Set No.	Milestone	Plan	Revision
21-0258	03	FM	006	A

Plotted:Monday, 30 March 2020 2:57:46 PM File Name:C:\12d\Data\ORION SYNOTDES-03-FM Tranche 3 DA\01_21061\DWGS\21-0258-03-FM-006.dwg

APPENDIX C - Post Developed Flood Maps

NORTH

TO DENBIGH HOMESTEAD

2D DOMAIN BOUNDARY

DOWNSTREAM BOUNDARY

EXISTING FARM DAM

MACARTHUR ANGLICAN SCHOOL LOT 3102 DP 1223680

LOT 2005 DP 1162239

LOT 455 DP 1103936

LOT 1 DP 1014583

LOT 13 DP 604645

LOT 12 DP 604645

LOT 11 DP 604645

LOT 1 DP 270613

LOT 100 DP 1159926

CHARLES MCINTOSH PKWY

COBBITTY ROAD

TO ORAN PARK

TO COBBITTY VILLAGE

LEGEND

0.05 - 0.1m	
0.1 - 0.2m	
0.2 - 0.3m	
0.3 - 0.4m	
0.4 - 0.5m	
0.5 - 0.6m	
0.6 - 0.7m	
0.7 - 0.8m	
0.8 - 0.9m	
0.9 - 1.0m	
1.0 - 1.1m	
1.1 - 1.2m	
1.2 - 1.3m	
1.3 - 1.4m	
1.4 - 1.5m	
1.5 - 1.6m	
1.6 - 1.7m	
1.7 - 1.8m	
1.8 - 1.9m	
1.9 - 2.0m	
2.0 - 2.2m	
2.2 - 2.4m	
2.4 - 2.6m	
2.6 - 2.8m	
2.8 - 3.0m	
3.0 - 3.5m	
3.5 - 4.0m	
4.0 - 5.0m	
5.0 - 10.0m	
WATER SURFACE CONTOUR & LABEL	70.00

ISSUED FOR **DEVELOPMENT APPLICATION**

NOT FOR CONSTRUCTION

Rev	Drawn	Design	Check	Appd.	Date	Revision Description
A	SS	CS	MP	CS	03/02/2022	ISSUED FOR DEVELOPMENT APPLICATION

Disclaimer and Copyright:
ALL DIMENSIONS TO BE CHECKED ON SITE BY THE CONTRACTOR PRIOR TO CONSTRUCTION.
USE WRITTEN DIMENSIONS ONLY, DO NOT SCALE.
THESE DRAWINGS, PLANS, AND SPECIFICATIONS AND THE COPYRIGHT ARE THE PROPERTY OF ORION CONSULTING ENGINEERS PTY LTD AND MUST NOT BE REPRODUCED OR COPIED WHOLLY OR IN PART WITHOUT THE PERMISSION OF ORION CONSULTING ENGINEERS PTY LTD

Scale:
0 20 40 60 80 100 120 140 160 180 200
SCALE 1:2000 (A1) SCALE 1:4000 (A3)

For: mirvac

By: Orion Consulting
ABN:25 604 069 981 PO Box:7936, BAULKHAM HILLS NSW 2153 T:(02) 8660 0035 E:info@orionconsulting.com.au

Project: 421 THE NORTHERN ROAD (TRANCHE 3), COBBITTY ROAD & DRAINAGE DESIGN

Title: 5YR ARI POST DEVELOPMENT FLOOD DEPTH MAP

Project No.	Set No.	Milestone	Plan	Revision
21-0258	03	FM	011	A

Plotted:Monday, 30 March 2020 2:57:46 PM File Name:C:\12d\Sdata\ORION-SYNY\DES\03-FM Tranche 3 DA\01_21581\DWGS\21-0258-03-FM011.dwg

NORTH

TO DENBIGH HOMESTEAD

2D DOMAIN BOUNDARY

DOWNSTREAM BOUNDARY

EXISTING FARM DAM

MACARTHUR ANGLICAN SCHOOL LOT 3102 DP 1223680

LOT 2005 DP 1162239

LOT 455 DP 1103936

LOT 1 DP 1014583

CHARLES MCINTOSH PKWY

COBBITTY ROAD

TO ORAN PARK

LOT 13 DP 604645

LOT 12 DP 604645

LOT 11 DP 604645

LOT 1 DP 270613

LOT 100 DP 1159926

TO COBBITTY VILLAGE

LEGEND

0 - 0.25m/s	
0.25 - 0.5m/s	
0.5 - 0.75m/s	
0.75 - 1.0m/s	
1.0 - 1.5m/s	
1.5 - 2.0m/s	
2.0 - 2.5m/s	
2.5 - 3.0m/s	
3.0 - 3.5m/s	
3.5 - 4.0m/s	
4.0 - 5.0m/s	
5.0 - 6.0m/s	
6.0 - 10.0m/s	

ISSUED FOR **DEVELOPMENT APPLICATION**

NOT FOR CONSTRUCTION

Rev	Drawn	Design	Check	Appd.	Date	Revision Description
A	SS	CS	MP	CS	03/02/2022	ISSUED FOR DEVELOPMENT APPLICATION

Disclaimer and Copyright:
ALL DIMENSIONS TO BE CHECKED ON SITE BY THE CONTRACTOR PRIOR TO CONSTRUCTION.
USE WRITTEN DIMENSIONS ONLY, DO NOT SCALE.
THESE DRAWINGS, PLANS, AND SPECIFICATIONS AND THE COPYRIGHT ARE THE PROPERTY OF ORION CONSULTING ENGINEERS PTY LTD AND MUST NOT BE REPRODUCED OR COPIED WHOLLY OR IN PART WITHOUT THE PERMISSION OF ORION CONSULTING ENGINEERS PTY LTD

Scale:
0 20 40 60 80 100 120 140 160 180 200
SCALE 1:2000 (A1) SCALE 1:4000 (A3)

For: mirvac

By: Orion Consulting

ABN:25 604 069 981 **PO Box:**7936, BAULKHAM HILLS NSW 2153 **T:**(02) 8660 0035 **E:**info@orionconsulting.com.au

Project: 421 THE NORTHERN ROAD (TRANCHE 3), COBBITTY ROAD & DRAINAGE DESIGN

Title: 5YR ARI POST DEVELOPMENT FLOOD VELOCITY MAP

Project No.	Set No.	Milestone	Plan	Revision
21-0258	03	FM	012	A

Printed:Monday, 30 March 2020 2:57:48 PM File Name:C:\12dSData\ORION-SYN\21025-03-FM Tranche 3 DA01_2108\12dW\SS12-0258-03-FM-A12.4wg

NORTH

TO DENBIGH HOMESTEAD

2D DOMAIN BOUNDARY

DOWNSTREAM BOUNDARY

EXISTING FARM DAM

MACARTHUR ANGLICAN SCHOOL LOT 3102 DP 1223680

LOT 2005 DP 1162239

LOT 455 DP 1103936

LOT 1 DP 1014583

CHARLES MCINTOSH PKWY

COBBITTY ROAD

TO ORAN PARK

LOT 13 DP 604645

LOT 12 DP 604645

LOT 11 DP 604645

LOT 1 DP 270613

LOT 100 DP 1159926

TO COBBITTY VILLAGE

LEGEND

HAZARD VULNERABILITY CLASSIFICATION

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

ISSUED FOR **DEVELOPMENT APPLICATION**

NOT FOR CONSTRUCTION

Rev	Drawn	Design	Check	Appd.	Date	Revision Description
A	SS	CS	MP	CS	03/02/2022	ISSUED FOR DEVELOPMENT APPLICATION

Disclaimer and Copyright:
ALL DIMENSIONS TO BE CHECKED ON SITE BY THE CONTRACTOR PRIOR TO CONSTRUCTION.
USE WRITTEN DIMENSIONS ONLY, DO NOT SCALE.
THESE DRAWINGS, PLANS, AND SPECIFICATIONS AND THE COPYRIGHT ARE THE PROPERTY OF ORION CONSULTING ENGINEERS PTY LTD AND MUST NOT BE REPRODUCED OR COPIED WHOLLY OR IN PART WITHOUT THE PERMISSION OF ORION CONSULTING ENGINEERS PTY LTD

Scale:
0 20 40 60 80 100 120 140 160 180 200
SCALE 1:2000 (A1) SCALE 1:4000 (A3)

For: mirvac

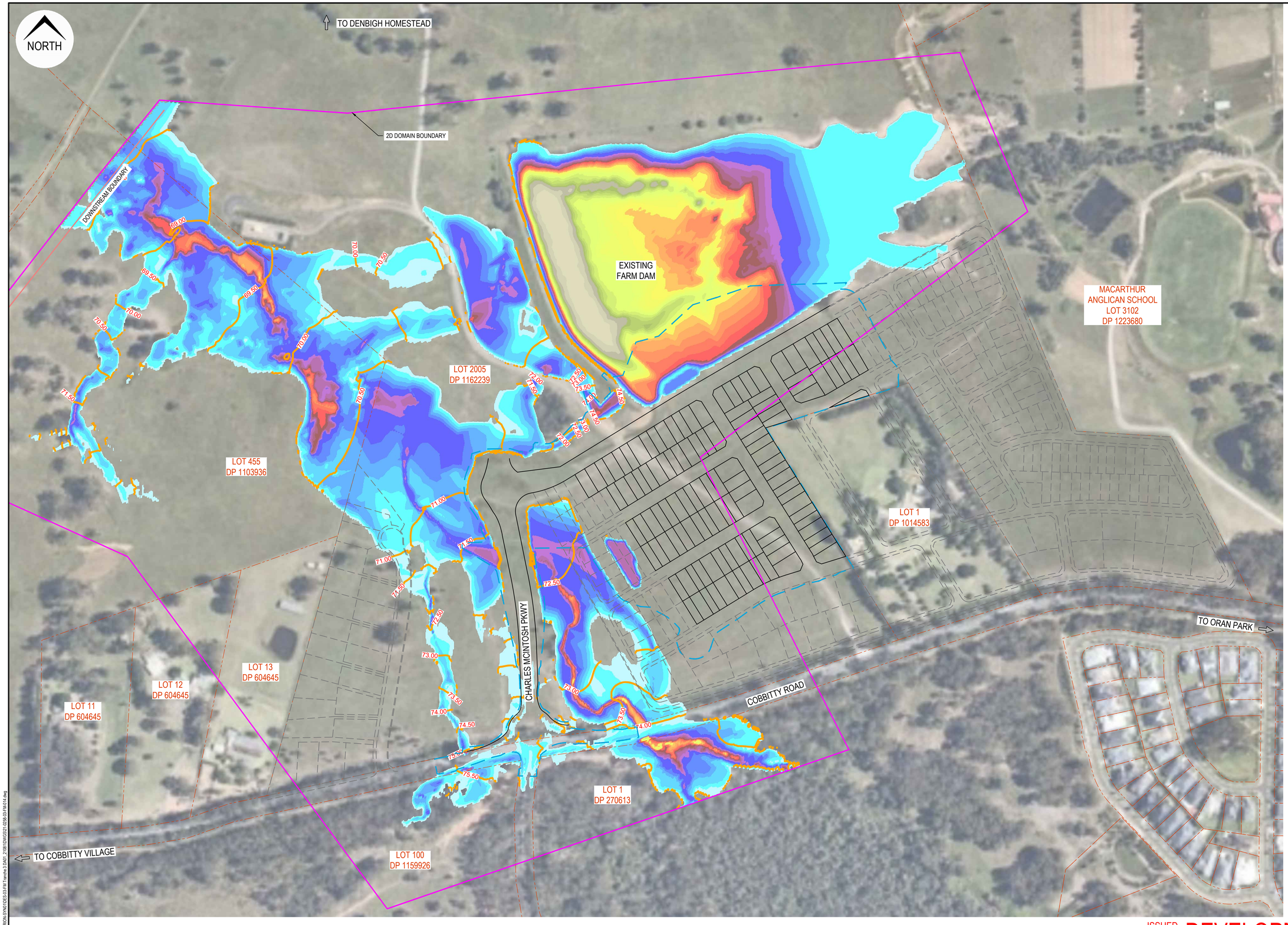
By: Orion Consulting
ABN:25 604 069 981 PO Box:7936, BAULKHAM HILLS NSW 2153 T:(02) 8660 0035 E:info@orionconsulting.com.au

Project: 421 THE NORTHERN ROAD (TRANCHE 3), COBBITTY ROAD & DRAINAGE DESIGN

Title: 5YR ARI POST DEVELOPMENT FLOOD HAZARD MAP

Project No.	Set No.	Milestone	Plan	Revision
21-0258	03	FM	013	A

Printed:Monday, 30 March 2020 2:57:45 PM File Name:C:\Jobs\detail\ORION-SYNSYDES-03-FM Tranche 3.DWG 21081\DWGS\21-0258-03-FM-013.dwg



LEGEND

- 0.05 - 0.1m
- 0.1 - 0.2m
- 0.2 - 0.3m
- 0.3 - 0.4m
- 0.4 - 0.5m
- 0.5 - 0.6m
- 0.6 - 0.7m
- 0.7 - 0.8m
- 0.8 - 0.9m
- 0.9 - 1.0m
- 1.0 - 1.1m
- 1.1 - 1.2m
- 1.2 - 1.3m
- 1.3 - 1.4m
- 1.4 - 1.5m
- 1.5 - 1.6m
- 1.6 - 1.7m
- 1.7 - 1.8m
- 1.8 - 1.9m
- 1.9 - 2.0m
- 2.0 - 2.2m
- 2.2 - 2.4m
- 2.4 - 2.6m
- 2.6 - 2.8m
- 2.8 - 3.0m
- 3.0 - 3.5m
- 3.5 - 4.0m
- 4.0 - 5.0m
- 5.0 - 10.0m
- WATER SURFACE CONTOUR & LABEL — 70.00

ISSUED FOR **DEVELOPMENT APPLICATION**

NOT FOR CONSTRUCTION

Rev	Drawn	Design	Check	Appd.	Date	Revision Description
A	SS	CS	MP	CS	03/02/2022	ISSUED FOR DEVELOPMENT APPLICATION

Disclaimer and Copyright:
ALL DIMENSIONS TO BE CHECKED ON SITE BY THE CONTRACTOR PRIOR TO CONSTRUCTION.
USE WRITTEN DIMENSIONS ONLY, DO NOT SCALE.
THESE DRAWINGS, PLANS, AND SPECIFICATIONS AND THE COPYRIGHT ARE THE PROPERTY OF ORION CONSULTING ENGINEERS PTY LTD AND MUST NOT BE REPRODUCED OR COPIED WHOLLY OR IN PART WITHOUT THE PERMISSION OF ORION CONSULTING ENGINEERS PTY LTD

Scale: 0 20 40 60 80 100 120 140 160 180 200
SCALE 1:2000 (A1) SCALE 1:4000 (A3)

For: mirvac

By: Orion Consulting

ABN:25 604 069 981 **PO Box:**7936, BAULKHAM HILLS NSW 2153 **T:**(02) 8660 0035 **E:**info@orionconsulting.com.au

Project: 421 THE NORTHERN ROAD (TRANCHE 3), COBBITTY ROAD & DRAINAGE DESIGN

Title: 100YR ARI POST DEVELOPMENT FLOOD DEPTH MAP

Project No.	Set No.	Milestone	Plan	Revision
21-0258	03	FM	014	A

Plotted:Monday, 30 March 2020 3:57:46 PM File Name:C:\12d\Data\ORION-SYNY\DES\03-FM\Tranche 3 DA\01_21081\DWGS\21-0258-03-FM014.dwg

NORTH

TO DENBIGH HOMESTEAD

2D DOMAIN BOUNDARY

DOWNSTREAM BOUNDARY

EXISTING FARM DAM

MACARTHUR ANGLICAN SCHOOL LOT 3102 DP 1223680

LOT 2005 DP 1162239

LOT 455 DP 1103936

LOT 1 DP 1014583

CHARLES MCINTOSH PKWY

COBBITTY ROAD

TO ORAN PARK

LOT 13 DP 604645

LOT 12 DP 604645

LOT 11 DP 604645

LOT 1 DP 270613

LOT 100 DP 1159926

TO COBBITTY VILLAGE

LEGEND

0 - 0.25m/s	
0.25 - 0.5m/s	
0.5 - 0.75m/s	
0.75 - 1.0m/s	
1.0 - 1.5m/s	
1.5 - 2.0m/s	
2.0 - 2.5m/s	
2.5 - 3.0m/s	
3.0 - 3.5m/s	
3.5 - 4.0m/s	
4.0 - 5.0m/s	
5.0 - 6.0m/s	
6.0 - 10.0m/s	

ISSUED FOR **DEVELOPMENT APPLICATION**

NOT FOR CONSTRUCTION

Rev	Drawn	Design	Check	Appd.	Date	Revision Description
A	SS	CS	MP	CS	03/02/2022	ISSUED FOR DEVELOPMENT APPLICATION

Disclaimer and Copyright:
ALL DIMENSIONS TO BE CHECKED ON SITE BY THE CONTRACTOR PRIOR TO CONSTRUCTION.
USE WRITTEN DIMENSIONS ONLY, DO NOT SCALE.
THESE DRAWINGS, PLANS, AND SPECIFICATIONS AND THE COPYRIGHT ARE THE PROPERTY OF ORION CONSULTING ENGINEERS PTY LTD AND MUST NOT BE REPRODUCED OR COPIED WHOLLY OR IN PART WITHOUT THE PERMISSION OF ORION CONSULTING ENGINEERS PTY LTD

Scale: 0 20 40 60 80 100 120 140 160 180 200
SCALE 1:2000 (A1) SCALE 1:4000 (A3)

For: mirvac

By: Orion Consulting
ABN:25 604 069 981 PO Box:7936, BAULKHAM HILLS NSW 2153 T:(02) 8660 0035 E:info@orionconsulting.com.au

Project: 421 THE NORTHERN ROAD (TRANCHE 3), COBBITTY ROAD & DRAINAGE DESIGN

Title: 100YRI ARI POST DEVELOPMENT FLOOD VELOCITY MAP

Project No.	Set No.	Milestone	Plan	Revision
21-0258	03	FM	015	A

Plotted:Monday, 30 March 2020 2:57:46 PM File Name:C:\2dS\data\ORION-SYN01\DES-S3-FM-Tranche 3.DAD1_210810\WDS321-0258-S3-FM-T15.dwg

NORTH

TO DENBIGH HOMESTEAD

2D DOMAIN BOUNDARY

DOWNSTREAM BOUNDARY

EXISTING FARM DAM

MACARTHUR ANGLICAN SCHOOL LOT 3102 DP 1223680

LOT 2005 DP 1162239

LOT 455 DP 1103936

LOT 1 DP 1014583

CHARLES MCINTOSH PKWY

COBBITTY ROAD

TO ORAN PARK

LOT 13 DP 604645

LOT 12 DP 604645

LOT 11 DP 604645

LOT 1 DP 270613

LOT 100 DP 1159926

TO COBBITTY VILLAGE

LEGEND

HAZARD VULNERABILITY CLASSIFICATION

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

ISSUED FOR **DEVELOPMENT APPLICATION**

NOT FOR CONSTRUCTION

Rev	Drawn	Design	Check	Appd.	Date	Revision Description
A	SS	CS	MP	CS	03/02/2022	ISSUED FOR DEVELOPMENT APPLICATION

Disclaimer and Copyright:
ALL DIMENSIONS TO BE CHECKED ON SITE BY THE CONTRACTOR PRIOR TO CONSTRUCTION.
USE WRITTEN DIMENSIONS ONLY, DO NOT SCALE.
THESE DRAWINGS, PLANS, AND SPECIFICATIONS AND THE COPYRIGHT ARE THE PROPERTY OF ORION CONSULTING ENGINEERS PTY LTD AND MUST NOT BE REPRODUCED OR COPIED WHOLLY OR IN PART WITHOUT THE PERMISSION OF ORION CONSULTING ENGINEERS PTY LTD

Scale:
0 20 40 60 80 100 120 140 160 180 200
SCALE 1:2000 (A1) SCALE 1:4000 (A3)

For: mirvac

By: Orion Consulting
JAS-ANZ
WWW.JAS-ANZ.ORG/REGISTER
ABN:25 604 069 981 PO Box:7936, BAULKHAM HILLS NSW 2153 T:(02) 8660 0035 E:info@orionconsulting.com.au

Project: 421 THE NORTHERN ROAD (TRANCHE 3), COBBITTY ROAD & DRAINAGE DESIGN

Title: 100YR ARI POST DEVELOPMENT FLOOD HAZARD MAP

Project No.	Set No.	Milestone	Plan	Revision
21-0258	03	FM	016	A

Plotted:Monday, 30 March 2020 3:57:46 PM File Name:C:\12d\Sdata\ORION-SYNY\DES\03-FM Tranche 3 DA01_210810VWSS21-0258-03-FM016.dwg

APPENDIX D - Pre vs Post Flood Difference Maps

NORTH

TO DENBIGH HOMESTEAD

2D DOMAIN BOUNDARY

DOWNSTREAM BOUNDARY

EXISTING FARM DAM

MACARTHUR ANGLICAN SCHOOL LOT 3102 DP 1223680

LOT 2005 DP 1162239

LOT 455 DP 1103936

LOT 1 DP 1014583

CHARLES MCINTOSH PKWY

COBBITTY ROAD

TO ORAN PARK

LOT 13 DP 604645

LOT 12 DP 604645

LOT 11 DP 604645

LOT 1 DP 270613

LOT 100 DP 1159926

TO COBBITTY VILLAGE

LEGEND

-5.0 - -1.0m	
-1.0 - -0.5m	
-0.5 - -0.3m	
-0.3 - -0.1m	
-0.1 - -0.0m	
0 - 0.1m	
0.1 - 0.3m	
0.3 - 0.5m	
0.5 - 1.0m	
1.0 - 5.0m	

LEGEND

PREVIOUSLY WET NOW DRY	
PREVIOUSLY DRY NOW WET	
NO CHANGE	

ISSUED FOR **DEVELOPMENT APPLICATION**

NOT FOR CONSTRUCTION

Rev	Drawn	Design	Check	Appd.	Date	Revision Description
A	SS	CS	MP	CS	03/02/2022	ISSUED FOR DEVELOPMENT APPLICATION

Disclaimer and Copyright:
ALL DIMENSIONS TO BE CHECKED ON SITE BY THE CONTRACTOR PRIOR TO CONSTRUCTION.
USE WRITTEN DIMENSIONS ONLY, DO NOT SCALE.
THESE DRAWINGS, PLANS, AND SPECIFICATIONS AND THE COPYRIGHT ARE THE PROPERTY OF ORION CONSULTING ENGINEERS PTY LTD AND MUST NOT BE REPRODUCED OR COPIED WHOLLY OR IN PART WITHOUT THE PERMISSION OF ORION CONSULTING ENGINEERS PTY LTD

Scale:
0 20 40 60 80 100 120 140 160 180 200
SCALE 1:2000 (A1) SCALE 1:4000 (A3)

For: mirvac

By: Orion Consulting

ABN:25 604 069 981 **PO Box:**7936, BAULKHAM HILLS NSW 2153 **T:**(02) 8660 0035 **E:**info@orionconsulting.com.au

JAS-ANZ WWW.JAS-ANZ.ORG/REGISTER

Project: 421 THE NORTHERN ROAD (TRANCHE 3), COBBITTY ROAD & DRAINAGE DESIGN

Title: 5YR ARI PRE & POST FLOOD DEPTH DIFFERENCE MAP

Project No.	Set No.	Milestone	Plan	Revision
21-0258	03	FM	021	A

Plotted:Monday, 30 March 2020 2:57:46 PM File Name:C:\2x50\data\ORION SYNOTDES-53-FM Tranche 3.DAN\ 2-2100\DWGS\21-0258-53-FM-021.dwg

NORTH

TO DENBIGH HOMESTEAD

2D DOMAIN BOUNDARY

DOWNSTREAM BOUNDARY

EXISTING FARM DAM

MACARTHUR ANGLICAN SCHOOL LOT 3102 DP 1223680

LOT 2005 DP 1162239

LOT 455 DP 1103936

LOT 1 DP 1014583

CHARLES MCINTOSH PKWY

COBBITTY ROAD

LOT 13 DP 604645

LOT 12 DP 604645

LOT 11 DP 604645

LOT 1 DP 270613

LOT 100 DP 1159926

TO ORAN PARK

TO COBBITTY VILLAGE

LEGEND

-5.0 - -1.0m	
-1.0 - -0.5m	
-0.5 - -0.3m	
-0.3 - -0.1m	
-0.1 - -0.0m	
0 - 0.1m	
0.1 - 0.3m	
0.3 - 0.5m	
0.5 - 1.0m	
1.0 - 5.0m	

LEGEND

PREVIOUSLY WET NOW DRY	
PREVIOUSLY DRY NOW WET	
NO CHANGE	

ISSUED FOR **DEVELOPMENT APPLICATION**

NOT FOR CONSTRUCTION

Rev	Drawn	Design	Check	Appd.	Date	Revision Description
A	SS	CS	MP	CS	03/02/2022	ISSUED FOR DEVELOPMENT APPLICATION

Disclaimer and Copyright:
ALL DIMENSIONS TO BE CHECKED ON SITE BY THE CONTRACTOR PRIOR TO CONSTRUCTION.
USE WRITTEN DIMENSIONS ONLY, DO NOT SCALE.
THESE DRAWINGS, PLANS, AND SPECIFICATIONS AND THE COPYRIGHT ARE THE PROPERTY OF ORION CONSULTING ENGINEERS PTY LTD AND MUST NOT BE REPRODUCED OR COPIED WHOLLY OR IN PART WITHOUT THE PERMISSION OF ORION CONSULTING ENGINEERS PTY LTD

Scale:
0 20 40 60 80 100 120 140 160 180 200
SCALE 1:2000 (A1) SCALE 1:4000 (A3)

For: mirvac

By: Orion Consulting
JAS-ANZ
SUSTAINABLE CERTIFICATION ISO 9001 ISO 14001 ISO 45001
WWW.JAS-ANZ.ORG/REGISTER
ABN:25 604 069 981 PO Box:7936, BAULKHAM HILLS NSW 2153 T:(02) 8660 0035 E:info@orionconsulting.com.au

Project: 421 THE NORTHERN ROAD (TRANCHE 3), COBBITTY ROAD & DRAINAGE DESIGN

Title: 100YR ARI PRE & POST FLOOD DEPTH DIFFERENCE MAP

Project No.	Set No.	Milestone	Plan	Revision
21-0258	03	FM	022	A

Plotted:Monday, 30 March 2020 2:57:46 PM File Name:C:\12d\5.data\ORION_SYNX\10DES-03-FM Tranche 3.SNX1_21081\DWGS\21-0258-03-FM-022.dwg

APPENDIX F - Masterplan Concept Schematics

NORTH

LOT 455
DP1103936

CHARLES MCINTOSH PARKWAY

SPLITTER PIT
AND GPT

HIGH FLOW BYPASS INTO
LAKE / OSD STORAGE

BIO BASIN 01
FILTERRA BIOFILTRATION SYSTEM
APPROXIMATE PLAN AREA: 1000 m²

LAKE / OSD
LAKE / PERMANENT WATER SURFACE AREA :
1.4 ha
LAKE PERMANENT WATER LEVEL 71.5 mAHD

BIO BASIN 02
FILTERRA BIOFILTRATION SYSTEM
APPROXIMATE PLAN AREA: 1100 m²

B1 COMMUNITY
LAND

CULVERT CROSSING UNDER CHARLES MCINTOSH
PARKWAY TO CONNECT RIPARIAN CORRIDOR TO
COBBITTY CREEK (DOWNSTREAM)

MAX 1V:6H BATTERS ON
SOUTHERN EMBANKMENT
(AVERAGE 1V:10H)

HIGH FLOW BYPASS INTO
LAKE / OSD STORAGE

GPT

MAX 1V:6H BATTERS ON
SOUTHERN EMBANKMENT
(AVERAGE 1V:10H)

SPLITTER PIT TO CONVEY
TREATABLE FLOWS FROM
UPSTREAM CATCHMENT
INTO RAINGARDEN

THIRD ORDER RIPARIAN
CORRIDOR
NEW THIRD ORDER RIPARIAN CORRIDOR TO CONVEY
UPSTREAM CATCHMENT THROUGH SITE

LOW FLOW PIPE UNDER
RIPARIAN CORRIDOR

HIGH FLOW BYPASS INTO
RIPARIAN CORRIDOR

MAX 1V:4H BATTERS ON
SOUTHERN EMBANKMENT

MAX 1V:4H BATTERS ON
SOUTHERN EMBANKMENT

ISSUED
FOR DEVELOPMENT APPLICATION
NOT FOR CONSTRUCTION

Rev	Drawn	Design	Check	Appd.	Date	Revision Description
A	SS	CS	MP	CS	03/02/2022	ISSUED FOR DEVELOPMENT APPLICATION

Disclaimer and Copyright:
ALL DIMENSIONS TO BE CHECKED ON SITE BY THE CONTRACTOR PRIOR TO CONSTRUCTION.
USE WRITTEN DIMENSIONS ONLY, DO NOT SCALE.
THESE DRAWINGS, PLANS, AND SPECIFICATIONS AND THE COPYRIGHT ARE THE PROPERTY OF ORION CONSULTING ENGINEERS PTY LTD AND MUST NOT BE REPRODUCED OR COPIED WHOLLY OR IN PART WITHOUT THE PERMISSION OF ORION CONSULTING ENGINEERS PTY LTD

Scale:
0 7.5 15.0 22.5 30.0 37.5 45.0 52.5 60.0 67.5 75.0
SCALE 1:750(A1) SCALE 1:1500(A3)

For: mirvac

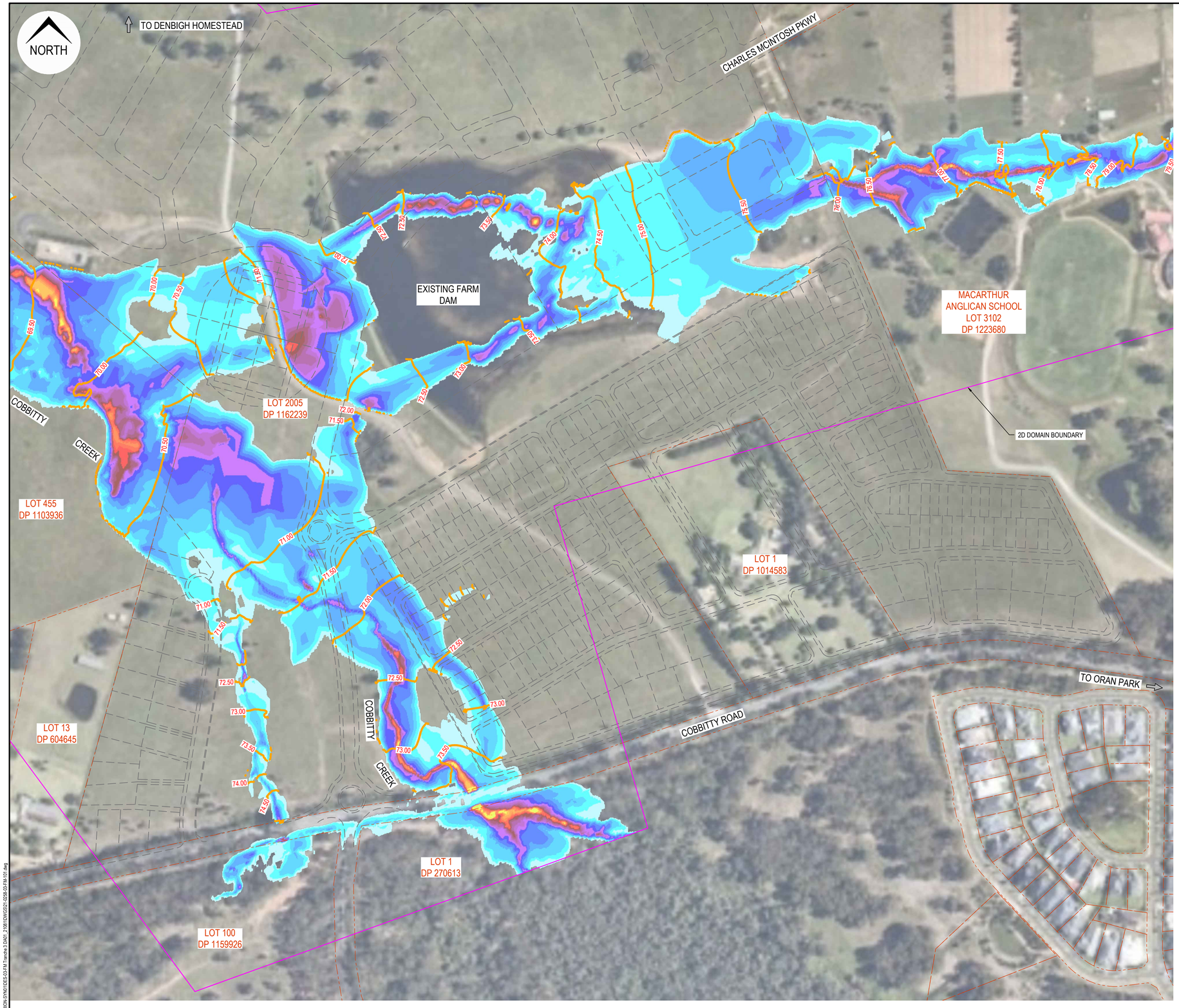
By: Orion Consulting
ABN:25 604 069 981 PO Box:7936, BAULKHAM HILLS NSW 2153 T:(02) 8660 0035 E:info@orionconsulting.com.au

Project: 421 THE NORTHERN ROAD (TRANCHE 3), COBBITTY ROAD & DRAINAGE DESIGN

Title: CENTRAL LAKE AND RIPARIAN CORRIDOR SCHEMATIC

Project No.	Set No.	Milestone	Plan	Revision
21-0258	03	FM	100	A

Plotted:Monday, 30 March 2020 2:57:16 PM File Name:C:\12dS\data\ORION-SYNSYDES-03-FM Tranche 3 DA01 - 210810\DWGS\21-0258-03-FM-100.dwg



LEGEND

0.05 - 0.1m	
0.1 - 0.2m	
0.2 - 0.3m	
0.3 - 0.4m	
0.4 - 0.5m	
0.5 - 0.6m	
0.6 - 0.7m	
0.7 - 0.8m	
0.8 - 0.9m	
0.9 - 1.0m	
1.0 - 1.1m	
1.1 - 1.2m	
1.2 - 1.3m	
1.3 - 1.4m	
1.4 - 1.5m	
1.5 - 1.6m	
1.6 - 1.7m	
1.7 - 1.8m	
1.8 - 1.9m	
1.9 - 2.0m	
2.0 - 2.2m	
2.2 - 2.4m	
2.4 - 2.6m	
2.6 - 2.8m	
2.8 - 3.0m	
3.0 - 3.5m	
3.5 - 4.0m	
4.0 - 5.0m	
5.0 - 10.0m	
WATER SURFACE CONTOUR & LABEL	70.00

ISSUED FOR **DEVELOPMENT APPLICATION**

NOT FOR CONSTRUCTION

Rev	Drawn	Design	Check	Appd.	Date	Revision Description
A	SS	CS	MP	CS	03/02/2022	ISSUED FOR DEVELOPMENT APPLICATION

Disclaimer and Copyright:
ALL DIMENSIONS TO BE CHECKED ON SITE BY THE CONTRACTOR PRIOR TO CONSTRUCTION.
USE WRITTEN DIMENSIONS ONLY, DO NOT SCALE.
THESE DRAWINGS, PLANS, AND SPECIFICATIONS AND THE COPYRIGHT ARE THE PROPERTY OF ORION CONSULTING ENGINEERS PTY LTD AND MUST NOT BE REPRODUCED OR COPIED WHOLLY OR IN PART WITHOUT THE PERMISSION OF ORION CONSULTING ENGINEERS PTY LTD

Scale: 0 20 40 60 80 100 120 140 160 180 200
SCALE 1:2000 (A1) SCALE 1:4000 (A3)

For: mirvac

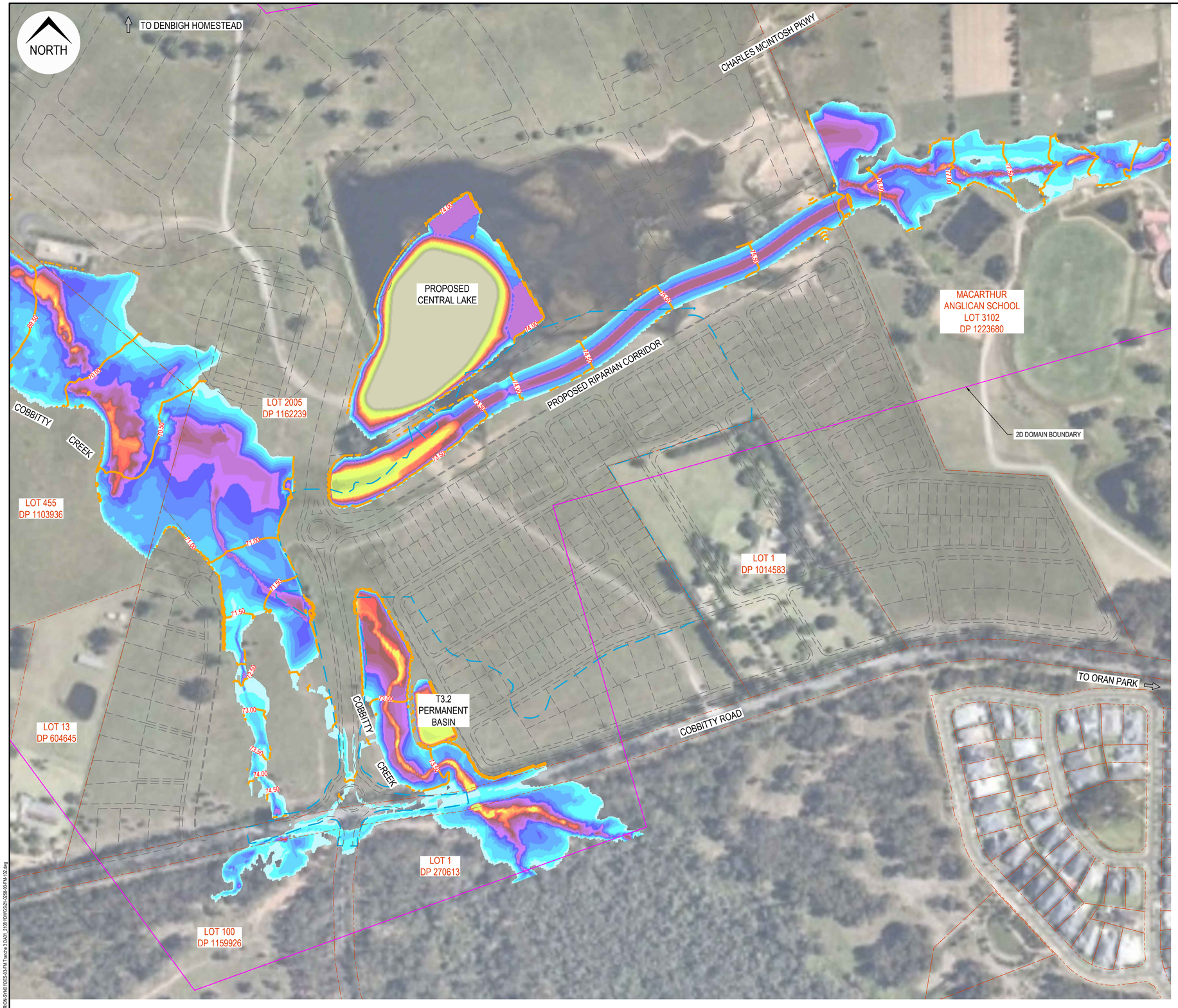
By: Orion Consulting
JAS-ANZ
ABN:25 604 069 981 PO Box:7936, BAULKHAM HILLS NSW 2153 T:(02) 8660 0035 E:info@orionconsulting.com.au

Project: 421 THE NORTHERN ROAD (TRANCHE 3), COBBITTY ROAD & DRAINAGE DESIGN

Title: PRE DEVELOPED ULTIMATE DESIGN FLOOD DEPTH MAP

Project No.	Set No.	Milestone	Plan	Revision
21-0258	03	FM	101	A

Plotted Monday, 30 March 2020 2:57:46 PM | File Name C:\2x5\data\ORION-SYNX\1DES\03-FM Tranche 3 DA01_210815DW\SS21-0258-03-FM-101.dwg



LEGEND

- 0.05 - 0.1m
- 0.1 - 0.2m
- 0.2 - 0.3m
- 0.3 - 0.4m
- 0.4 - 0.5m
- 0.5 - 0.6m
- 0.6 - 0.7m
- 0.7 - 0.8m
- 0.8 - 0.9m
- 0.9 - 1.0m
- 1.0 - 1.1m
- 1.1 - 1.2m
- 1.2 - 1.3m
- 1.3 - 1.4m
- 1.4 - 1.5m
- 1.5 - 1.6m
- 1.6 - 1.7m
- 1.7 - 1.8m
- 1.8 - 1.9m
- 1.9 - 2.0m
- 2.0 - 2.2m
- 2.2 - 2.4m
- 2.4 - 2.6m
- 2.6 - 2.8m
- 2.8 - 3.0m
- 3.0 - 3.5m
- 3.5 - 4.0m
- 4.0 - 5.0m
- 5.0 - 10.0m
- WATER SURFACE CONTOUR & LABEL — 70.00

ISSUED FOR **DEVELOPMENT APPLICATION**

NOT FOR CONSTRUCTION

Rev	Drawn	Design	Check	Appd.	Date	Revision Description
A	SS	CS	MP	CS	03/02/2022	ISSUED FOR DEVELOPMENT APPLICATION

Disclaimer and Copyright:
ALL DIMENSIONS TO BE CHECKED ON SITE BY THE CONTRACTOR PRIOR TO CONSTRUCTION.
USE WRITTEN DIMENSIONS ONLY, DO NOT SCALE.
THESE DRAWINGS, PLANS, AND SPECIFICATIONS AND THE COPYRIGHT ARE THE PROPERTY OF ORION CONSULTING ENGINEERS PTY LTD AND MUST NOT BE REPRODUCED OR COPIED WHOLLY OR IN PART WITHOUT THE PERMISSION OF ORION CONSULTING ENGINEERS PTY LTD

Scale: 0 20 40 60 80 100 120 140 160 180 200
SCALE 1:2000 (A1) SCALE 1:4000 (A3)

For: mirvac

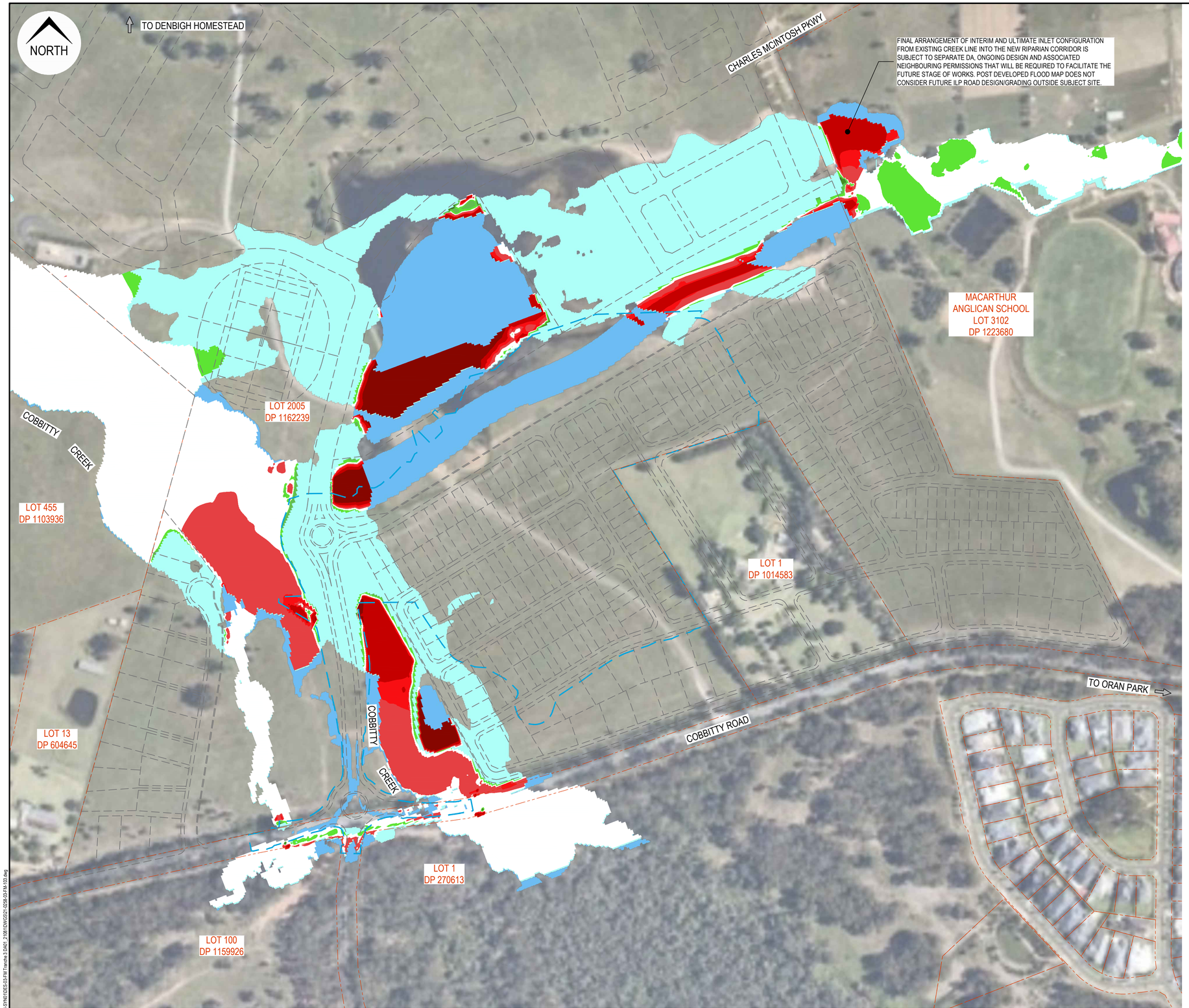
By: Orion Consulting
JAS-ANZ
WWW.IAS-ANZ.ORG/REGISTER
ABN:25 604 069 981 **PO Box:**7936, BAULKHAM HILLS NSW 2153 **T:**(02) 8660 0035 **E:**info@orionconsulting.com.au

Project: 421 THE NORTHERN ROAD (TRANCHE 3), COBBITTY ROAD & DRAINAGE DESIGN

Title: POST DEVELOPED ULTIMATE DESIGN FLOOD DEPTH MAP

Project No.	Set No.	Milestone	Plan	Revision
21-0258	03	FM	102	A

Plotted:Monday, 30 March 2020 3:57:16 PM File Name:C:\12d\Data\ORION-SYNY\DES\03-FM Tranche 3 DA01_210810\VISS\21-0258-03-FM-102.dwg



LEGEND

-5.0 - -1.0m	
-1.0 - -0.5m	
-0.5 - -0.3m	
-0.3 - -0.1m	
-0.1 - -0.0m	
0 - 0.1m	
0.1 - 0.3m	
0.3 - 0.5m	
0.5 - 1.0m	
1.0 - 5.0m	

LEGEND

PREVIOUSLY WET NOW DRY	
PREVIOUSLY DRY NOW WET	
NO CHANGE	

ISSUED FOR **DEVELOPMENT APPLICATION**

NOT FOR CONSTRUCTION

Rev	Drawn	Design	Check	Appd.	Date	Revision Description
A	SS	CS	MP	CS	03/02/2022	ISSUED FOR DEVELOPMENT APPLICATION

Disclaimer and Copyright:
ALL DIMENSIONS TO BE CHECKED ON SITE BY THE CONTRACTOR PRIOR TO CONSTRUCTION.
USE WRITTEN DIMENSIONS ONLY, DO NOT SCALE.
THESE DRAWINGS, PLANS, AND SPECIFICATIONS AND THE COPYRIGHT ARE THE PROPERTY OF ORION CONSULTING ENGINEERS PTY LTD AND MUST NOT BE REPRODUCED OR COPIED WHOLLY OR IN PART WITHOUT THE PERMISSION OF ORION CONSULTING ENGINEERS PTY LTD

Scale:
0 20 40 60 80 100 120 140 160 180 200
SCALE 1:2000 (A1) SCALE 1:4000 (A3)

For: mirvac

By: Orion Consulting
JAS-ANZ
ABN:25 604 069 981 PO Box:7936, BAULKHAM HILLS NSW 2153 T:(02) 8660 0035 E:info@orionconsulting.com.au

Project: 421 THE NORTHERN ROAD (TRANCHE 3), COBBITTY ROAD & DRAINAGE DESIGN

Title: PRE VS POST ULTIMATE DESIGN FLOOD DIFFERENCE MAP

Project No.	Set No.	Milestone	Plan	Revision
21-0258	03	FM	103	A

Plotted:Monday, 30 March 2020 2:57:46 PM File Name:C:\12d\SdataORION-SYNK\12DES-03-FM Tranche 3 UNIX_210810\WDS21-0258-03-FM-103.dwg