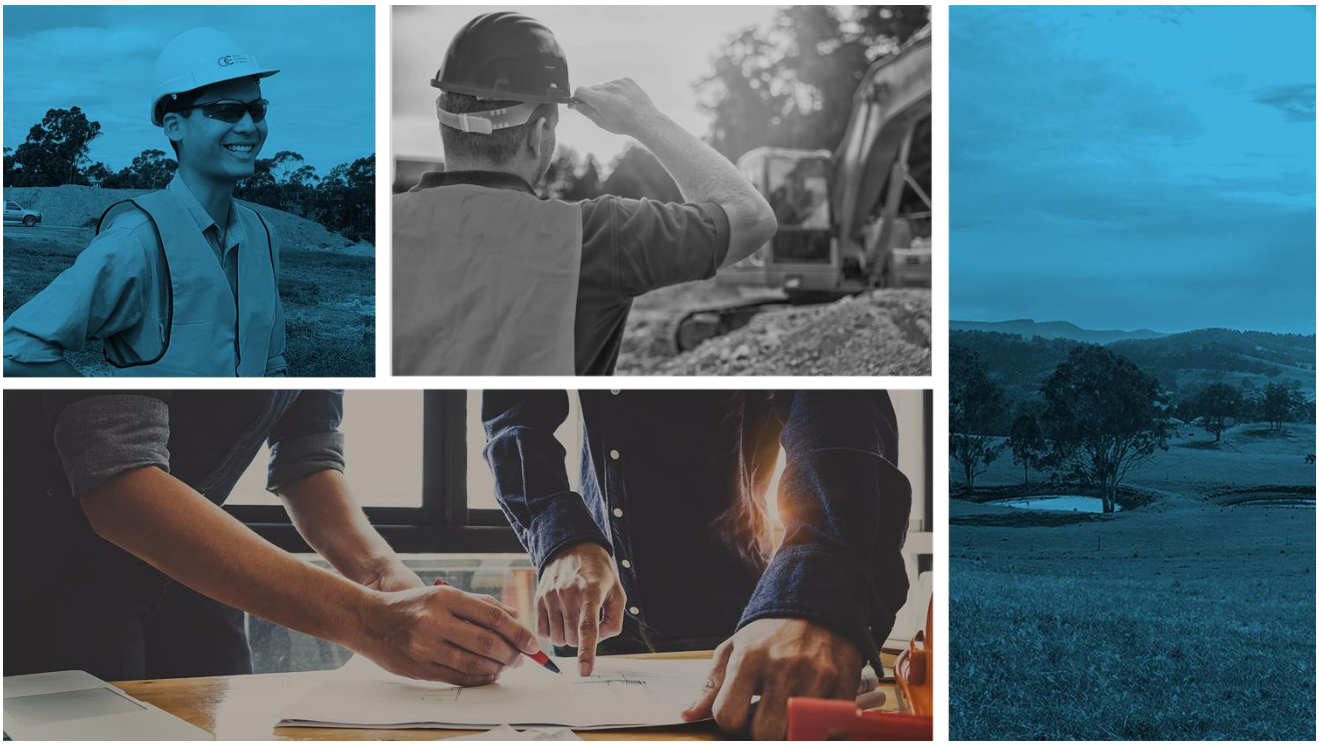
Orion Consulting
orionconsulting.com.au
info@orionconsulting.com.au
(02) 8660 0035

Stormwater Management and Servicing Report

Sydney Business Park – Stage 3
Astoria Street, Marsden Park
State Significant Development Application



October 2020 | For Sydney Business Park | Revision D

Commercial in Confidence

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:

David Healy
Senior Civil Design Engineer

Effective Date: 30 Oct 2020

Approved by:

Mariano Polisciuk
Engineering Design Manager

Effective Date: 30 Oct 2020

Document Control

Revision	Prepared	Reviewed	Approved	Date	Description	Project Reference
D	David Healy	Mariano Poliscuik	Mariano Polisuik	30 Oct 2020	Issued for SSD Approval	20-0127
C	Marie Crisafulli	David Healy	Mariano Polisciuk	3 Aug 2020	Issued for SSD Approval	20-0127
B	Marie Crisafulli	David Healy	Mariano Polisciuk	31 July 2020	Issued for SSD Approval	20-0127
A	Marie Crisafulli	David Healy	David Healy	29 July 2020	Issued for Client Review	20-0127

Table of Contents

Executive Summary 4

1 Introduction 6

1.1 Site Description 6

1.2 The Proposed Development 8

1.3 Stormwater Management Objectives 9

2 Water Quality Design 9

2.1 Water Quality Controls 9

2.2 Water Quality Design - Catchment Areas 9

2.3 MUSIC Modelling 10

2.4 On-lot Water Quality Treatment Devices 10

2.5 Water Quality Design - Results 11

3 Stream Erosion Index (SEI) 12

4 On-Site Detention 12

4.1 Interim Detention 13

5 Servicing 14

5.1 Water Supply 14

5.2 Sewer System 14

5.3 Electricity Supply 15

5.4 Telecommunications 15

5.5 Gas 15

6 Summary 16

7 References 16

Appendix A– MUSIC Link Results 17

Appendix B – Deemed to Comply Tool Results 18

List of Tables

Table 1 - Required Pollutant Reduction Targets 9
Table 2 – Sub-Catchment breakdown 10
Table 3 – Proposed Treatment Train Devices per allotment 11
Table 4 – Irrigation Areas and Toilet counts 11
Table 5 – MUSIC Modelling Results 11
Table 6 – Stream Erosion Index Calculations 12

List of Figures

Figure 1 – Existing Boundary Extent - Stage 3 Sydney Business Park (Imagery courtesy of Nearmap ©) 6
Figure 2 – Land Zoning Map, Blacktown Local Environment Plan Amendment (SRGC – North West Growth Centre) 7
Figure 3 – Site plan by architect 8
Figure 4 – Overall Catchment Plan 13

Executive Summary

Orion Consulting has been engaged by Sydney Business Park to prepare Civil Engineering Plans and an accompanying Stormwater Management and Servicing Report to support the State Significant Development (SSD) application for an industrial subdivision located at Astoria Street, Marsden Park NSW.

This report outlines the site-specific strategy for managing the stormwater quantity and quality to achieve the requirements and targets set out in the Marsden Park Industrial Development Control Plan. This report also aims to communicate the utility servicing requirements and availability for the future occupants of the development.

The proposed development is for four (4) warehouses. Each warehouse site is required to treat run-off generated from within its individual property boundary through water sensitive urban design. The concept proposal is that each site would utilise a combination of water quality treatment devices in a specific treatment train. The proposed devices include rainwater tanks for re-use, trash baskets (Ocean Protect 'OceanGuard'), water treatment tank incorporating filter cartridges (Ocean Protect 'StormFilter') and Raingardens (bio treatment). This on-site methodology is consistent with the overall requirements for development proposed within the Marsden Park Industrial Precinct.

Basin A is a regional basin proposed for delivery under Blacktown City Council's section 7.11 Contributions Plan. Basin A is being delivered by Council as part of a wider package of stormwater works for the Little Creek catchment. Council approved the Review of Environmental Factors for the works in January 2020. The concept approval is pending, subject to approval by Transgrid due to easement and stanchion locations. Basin A is located within the wider property boundary to the west of the development site and much of the development site will drain to this basin once it is constructed. Sydney Business Park is proposing to enter into an agreement with Council to partially deliver Basin A on Council's behalf (under Council's approval), which would enable the basin to be used as a temporary basin for the proposed development.

Run-off from the public roads will be treated via pit inserts (Ocean Protect OceanGuards or approved equivalent) for gross pollutant capture in the interim until the permanent Gross Pollutant Trap (GPT) upstream of the Basin A inlet and extension of Hollinsworth Road is completed. The discharge from the roads will be further treated by the raingarden located at the northern end of Basin A (upon completion).

Warehouses 2 and 4 will discharge to the interim Basin A via the road drainage system in Hollinsworth Road. Warehouse 1 will directly discharge to Basin A via an outlet pipe connection. Warehouse 3 will discharge to the east into stormwater network through the TC04 channel which is currently under construction. Basin A is designed (by others) to drain through a diversion line, that will head towards Stockland's Elara Development. If this connection is not available, excess runoff volume would be transferred from the little creek catchment to the Marsden Creek catchment via Basin E as per the currently approved and operating system for Basin B.

The availability of utilities to service the site has also been investigated. Potable water supply to the development will be extended from existing mains in Hollinsworth Road and Astoria Street. The cross connection of the water supply network between Hollinsworth Road and Astoria Street via the North-South subdivision Road (Road 1) will facilitate a ringed supply in the area.

Sewer connection to Warehouse 1 is possible by two options, via either Astoria Street or South Street. Warehouses 2, 3 and 4 can be readily serviced by extending the existing sewer constructed under case number 182934WW directly south along the alignment of the north-south collector road (Road 1).

Electricity is available within 700m of the development site provided by a recently completed substation located on Hollinsworth Road. In addition to this substation, Hollinsworth Road and Astoria Street both have 11kv feeders installed in the road reserve with the provision of conduits to facilitate future feeder upgrades.

Telecommunication connection to the development will be via the NBN as there are existing pit and pipe infrastructure in the existing roads. This network is to be extended during the construction of the proposed road extension of Hollinsworth Road and the North-South Road (Road 1).

At present no gas is required as part of this application, however gas is available within the Marsden Park Industrial Precinct and can be extended on as required between the site users and Jemena.

1 Introduction

Orion Consulting has been engaged by Sydney Business Park to prepare Civil Engineering Plans and an accompanying Stormwater Management Strategy and Servicing Report to support the State Significant Development application for an industrial subdivision located at Astoria Street, Marsden Park NSW.

This report outlines the site-specific strategy for managing the stormwater quantity and quality to achieve the requirements and targets set out in the Marsden Park Industrial Development Control Plan and utility servicing requirements and availability for the development.

1.1 Site Description

The proposed industrial development is located over the properties Lot 36 DP 262886, Lot 4 and part Lot 5 in DP 1210172, Astoria Street, Marsden Park within the Blacktown City Council Local Government Area (LGA) and is part of the Marsden Park Industrial Precinct within North-West Growth Centre.

The development footprint comprises of approximately 17.3 hectares in area with existing boundary extents shown in the figure below.

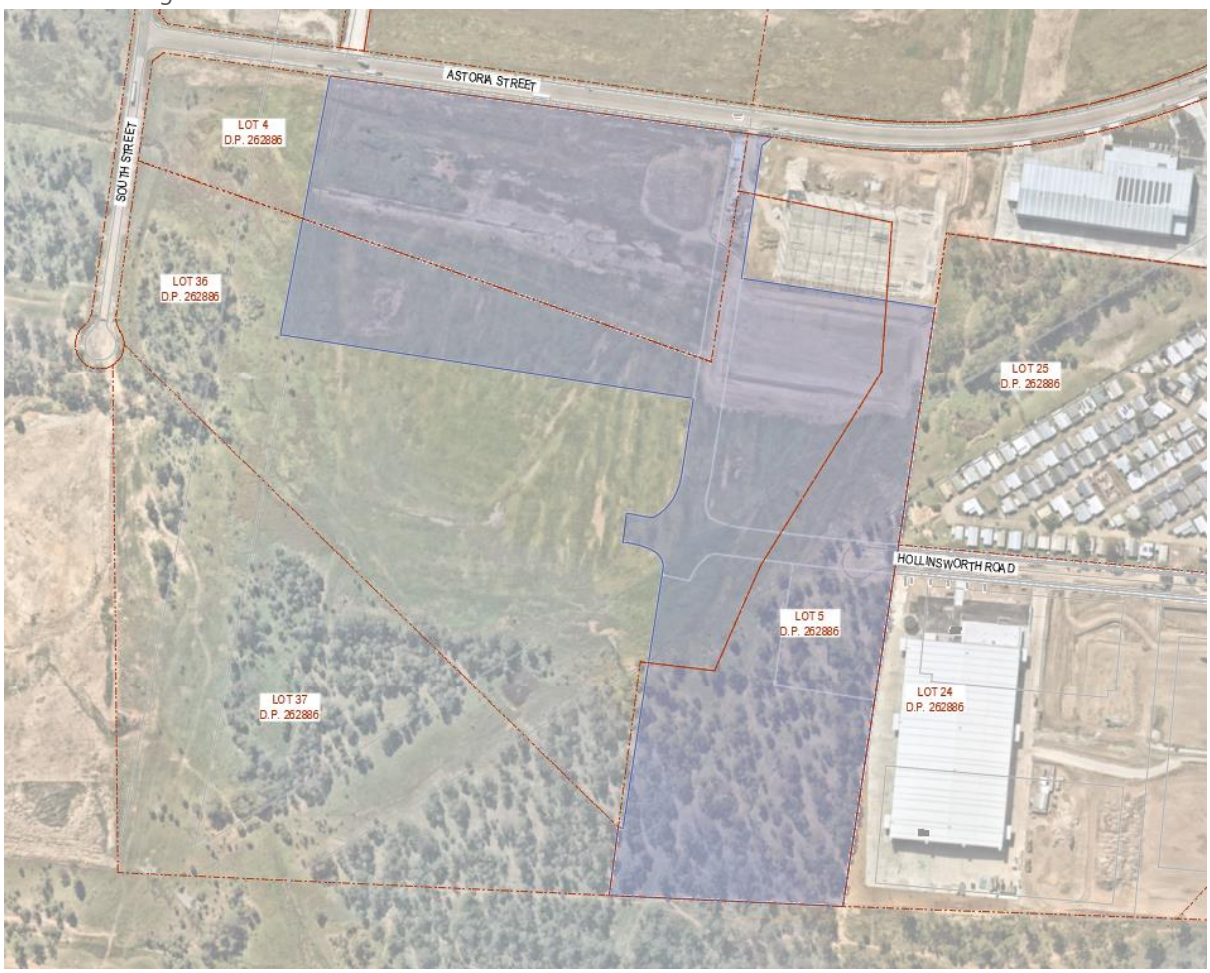


Figure 1 – Existing Boundary Extent - Stage 3 Sydney Business Park (Imagery courtesy of Nearmap ©)

Figure 2 shows the extent of the existing property boundaries and is zoned Industrial IN1 (General Industrial), IN2 Light Industrial and SP2 Infrastructure (Local Road) and SP2 (Local Drainage) under the State Environmental Planning Policy (Sydney Regional Growth Centre) 2006.

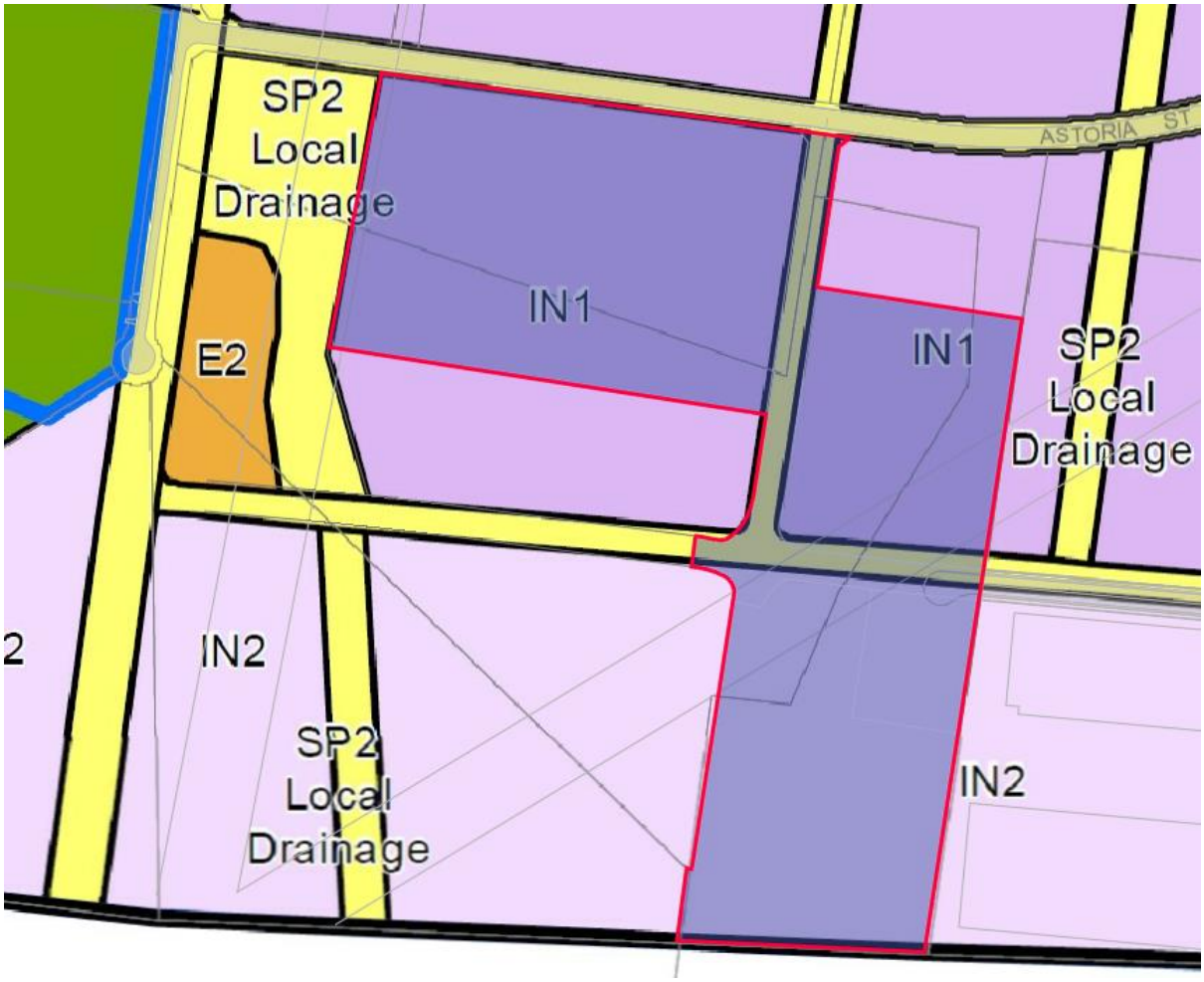


Figure 2 – Land Zoning Map, Blacktown Local Environment Plan Amendment (SRGC – North West Growth Centre)

The Stage 3 development area ('the site') incorporates the warehouse allotments including the road reserves.

The Stage 3 site extents is bordered by South Street to the west and Astoria Street to the north, open space vegetated land to the south with development under construction to the east. Hollinsworth Road intersects the property boundary at the east and will be extended through the site and eventually tie into the South Street extension.

The existing terrain consists of moderate grades of 2% to 3% and generally falls from east to west toward a proposed regional detention basin and South Street. The regional basin is known as 'Basin A' and a concept design has been prepared by Cardno (reference: 80218059-CI) on behalf of Blacktown City Council. A Review of Environmental Factors has been approved by Council in January, 2020, with concept approval pending, subject to Transgrid approval due to easement and stanchion locations.

Sydney Business Park is proposing to enter into an agreement with Council to partially construct the basin (under Council's approval) to aid with fulfilling the on-site detention requirements.

1.2 The Proposed Development

The development will involve the subdivision of the existing lot parcels and construction of:

- A new public collector road (Road 1) running north-south that will connect Astoria Street to Hollinsworth Road extension
- Hollinsworth Road extension towards the western boundary
- A new roundabout at the intersection of the collector road (Road 1) and Hollinsworth Road
- Four (4) industrial sites with warehouses, hardstand and landscaped areas, office space and carparks
- The regional detention basin, Basin A, in the Marsden Park Industrial Precinct Development Control Plan (under a future and separate agreement with Council)
- Associated service reticulation and augmentation

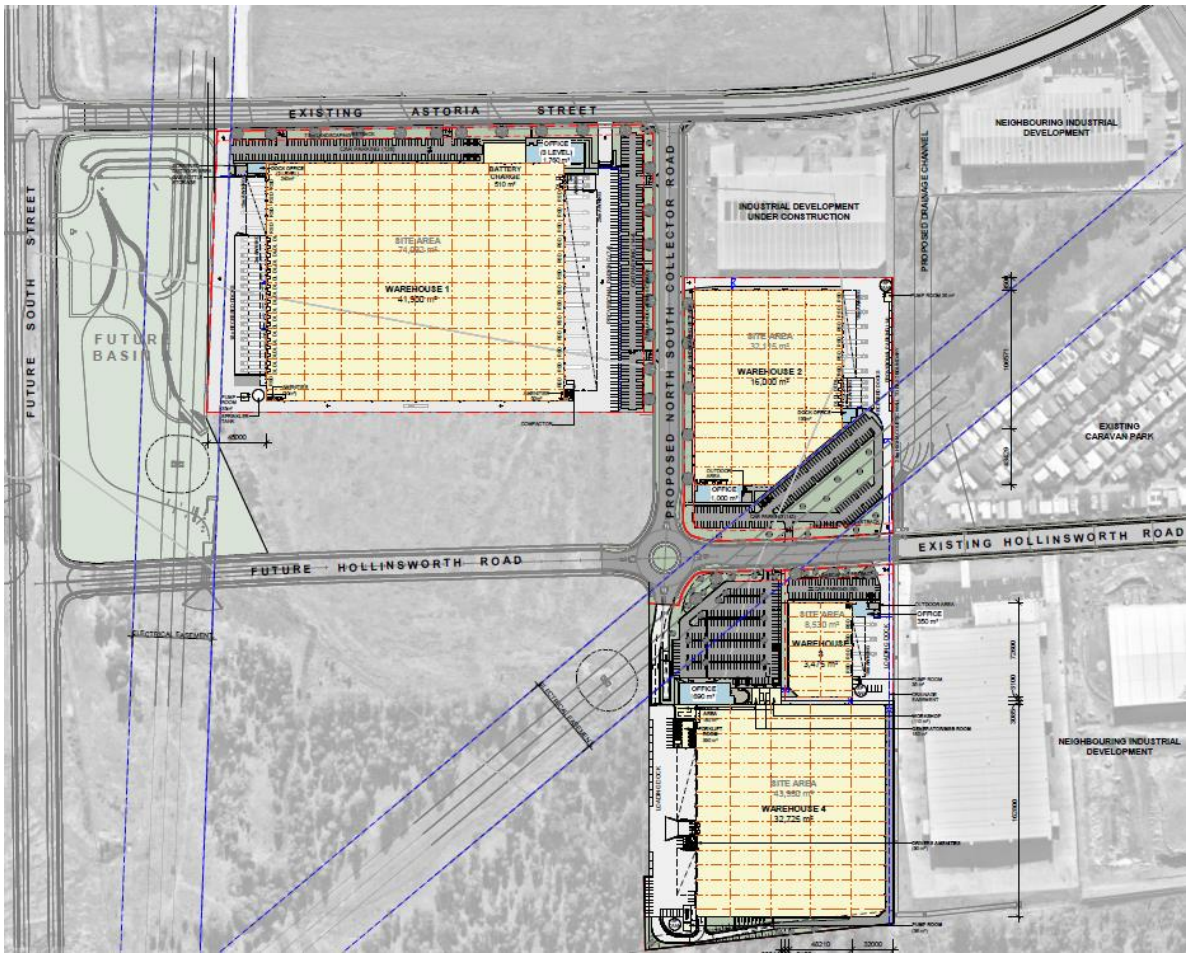


Figure 3 – Site plan by architect

The development has been designed to discharge into the regional stormwater basin 'Basin A' which will ultimately discharge into the receiving waters further downstream at Little Creek. A concept design has been prepared by Cardno for Blacktown City Council with the REF being approved by Council in January 2020.

Basin A will be partially constructed by Sydney Business Park (under Council's approval) and will be permanently developed and commissioned at a later stage in accordance with the section 94 (section 7.11) Council Contributions Plan. Basin A has been designed to cater for the permanent on-site detention requirements for the development and applicable post-development catchment as well as provide water quality treatment for the public domain.

In accordance with the DCP, water quality requirements to treat stormwater run-off from each private industrial lot will be achieved through means of permanent on-lot treatment measures.

1.3 Stormwater Management Objectives

The Integrated Water Cycle Management (IWCM) strategy for the Marsden Park Industrial Release Area was developed by J Wyndham Prince (JWP) in 2010, with the precinct wide stormwater management objectives adopted under the Marsden Park Development Control Plan.

This stormwater strategy also considers compliance with the Blacktown City Council Water Sensitive Urban Design (WSUD) Developer Handbook (the Handbook), which further highlights the required objectives for

- Water Quality
- Stream Erosion Index and
- On-Site Detention

2 Water Quality Design

2.1 Water Quality Controls

Under the Marsden Park IWCM Strategy, regional basins will be constructed throughout the growth centre to manage water quantity through on-site detention. The regional basins will also incorporate some water quality treatment measures to manage pollutants generated within the public domain. Each private allotment will be required to implement on-site treatment to achieve the pollutant reduction targets set out by the development controls. These targets are shown below:

Pollutant	% Post Development Pollutant Reduction Targets
Gross Pollutants (GP)	90
Total Suspended Solids (TSS)	85
Total Phosphorous (TP)	65
Total Nitrogen (TN)	45

Table 1 - Required Pollutant Reduction Targets

2.2 Water Quality Design - Catchment Areas

Developed catchments for each individual allotment were separated into sub-catchments consisting of roof areas, landscaping (pervious), paving (impervious), driveways/carpark and treatment bypassing areas and are shown in **Error! Reference source not found.** DA plans (Plan 400). A table showing the sub-catchment breakdown per w arehouse allotment is shown below:

	Sub-Catchment Type					
Warehouse	**Roof (m^2)**	**Landscaping (m^2)**	**Paving (m^2)**	**Driveway/Carpark (m^2)**	**Bypass Road (m^2)**	**Bypass Landscaping (m^2)**
1	49,035	3,024	550	18,782	220	2,294
2	17,389	3,656	1,063	8,586	119	1,240
3	4,213	44	110	3,569	-	598
4	26,850	1,519	320	12,255	538	2,150

Table 2 – Sub-Catchment breakdown

Developed catchments over the public road reserve areas have been excluded from this design as these flows will be treated in the raingarden located in Basin A when the filter media is ultimately installed. In the interim, pit inserts will be placed in the pits on Hollinsworth Road, Road 1 and Road 2 to capture gross pollutants.

2.3 MUSIC Modelling

The software program MUSIC and MUSIC link for Blacktown City Council was used to develop a site-specific water quality treatment train that would satisfy the pollutant reduction targets. The MUSIC model was set up in conjunction with Ocean Protect using Council approved treatment nodes. The MUSIC link results are contained in Appendix A.

2.4 On-lot Water Quality Treatment Devices

The devices adopted in the water quality treatment train proposed within each individual allotment consists of a combination of rainwater re-use tanks, proprietary treatment devices such as 'OceanGuard' and tanks containing 'StormFilter' cartridges by Ocean Protect (or approved equivalent) and raingardens.

The general treatment train is as follows:

- a minimum of 50% of the roof area will be directed into a rainwater tank for irrigation and toilet flushing re-use
- overflow from the rainwater tank will be treated using OceanGuard baskets
- The remaining roof catchments not draining into the rainwater tank will be directed through OceanGuard baskets
- Flows from ground areas will be directed towards pits fitted with OceanGuards
- All flows passing through OceanGuard treatments will eventually drain into a treatment tank containing StormFilter cartridges, with outflows then directed into the public stormwater network.

A summary of devices and sizes of treatment devices for each warehouse allotment is summarised in Table 3:

	Treatment Device				
Warehouse	**Rainwater Tank Size (kL)**	**Total No. of OceanGuards**	**No. of ZPG StormFilters**	**StormFilter Chamber Size (m^2)**	**Raingarden Media Size (m^2)**
1	271	59	100	120	
2	235	40	28	26	90
3	48	10	-	-	75
4	147	37	78	78.8	

Table 3 – Proposed Treatment Train Devices per allotment

The tank volumes listed in Table 3 are on the basis that 80% of the volume will be reused for non-potable water purposes.

Table 4 shows the irrigation areas and number of toilets for each warehouse used to determine the size of the required rainwater tank.

Warehouse	Irrigation Area (m^2)	Number of Toilets
1	5,318	49
2	4,896	20
3	642	7
4	3,669	22

Table 4 – Irrigation Areas and Toilet counts

2.5 Water Quality Design - Results

The table below contains a summary of the MUSIC model output demonstrating compliance with the water quality objectives. Copies of the electronic MUSIC models have also been included with the submission to Council for their review of the model details.

	Pollutant			
	GP	**TSS**	**TP**	**TN**
Reduction Targets (%)	90	85	65	45
Warehouse				
1	99.7	86.3	65.5	46.5
2	99.6	86.8	66.7	51.7
3	100	89.3	70.4	55.6
4	98.6	85	65.2	46.7

Table 5 – MUSIC Modelling Results

3 Stream Erosion Index (SEI)

The Blacktown City Council WSUD Developer Handbook requires that the permanent on-lot water quality treatments for developments located in the growth centres and employment zones be designed so that the Stream Erosion Index (SEI) is equal to or less than 3.5.

There are two methods in which Council allows the SEI to be determined. Method 1 was adopted as the methodology for the SEI calculation for this development. The SEI for each warehouse allotment was determined and is shown in the following table.

	Warehouse			
Parameter	**1**	**2**	**3**	**4**
Area (km^2)	0.074	0.032	0.009	0.044
T_c (min)	17	12	7.5	14
I_2 (mm/hr)	60	70	86	66
C_2	0.444	0.444	0.444	0.444
Q_2 (m3/s)	0.547	0.277	0.091	0.355
Q_{crit} (m3/s)	0.137	0.069	0.023	0.09
Post-Dev Output Flow (ML/yr)	8.33	2.52	0.666	4.46
Pre-Dev Output Flow (ML/yr)	2.38	0.93	0.211	1.31
SEI	3.50	2.72	3.16	3.40

Table 6 – Stream Erosion Index Calculations

The SEI calculated for each site is less than or equal to 3.5 in all cases and therefore complies with Council's requirements.

4 On-Site Detention

The road levels and finished surface levels within the warehouse allotments have been designed with consideration for the post-development catchments determined by J.Wyndham Prince and the ultimate stormwater management strategy for the Marsden Park Industrial precinct. Both permanent and temporary on-site detention for the development will be provided through the regional basin 'Basin A', which is located to the west of the development site.

Bulk earthworks and temporary stormwater infrastructure for Basin A will be constructed by Sydney Business Park (under Council's Basin A approval), generally in-line with the concept design by Cardno undertaken on behalf of Blacktown City Council. Until Basin A is permanent, it will be used as an interim means to satisfy Council's on-site detention requirement. The Deemed to Comply spreadsheet has been used to determine the storage requirements for the site.

Warehouses 2 and 4 will discharge via the public road system to Basin A. Warehouse 1 will discharge directly to the detention basin through an outlet pipe from within the property boundary. Warehouse 3 will discharge via TC04 to the east of the site and will ultimately head towards another regional basin downstream. Basin A is designed (by others) to drain through a diversion line towards Stockland's Elara Development. If this connection is not available, excess runoff volume would be transferred from the little creek catchment to the Marsden Creek

catchment via Basin E as per the currently approved and operating system for Basin B. This scenario is also applicable in the Interim situation when a sediment basin is in place.

Generally, where practical, the drainage system on the lots will be designed for 1 in 100 yr (1% AEP) flows to avoid the need for significant overland flow paths.

The total area of the development site and residual Stage 3 area is 250,667m^2 and the overall catchment extents include an undeveloped portion of the site, refer to Figure 4 for overall catchment plan (sheet DA-401 in Civil Plan set).

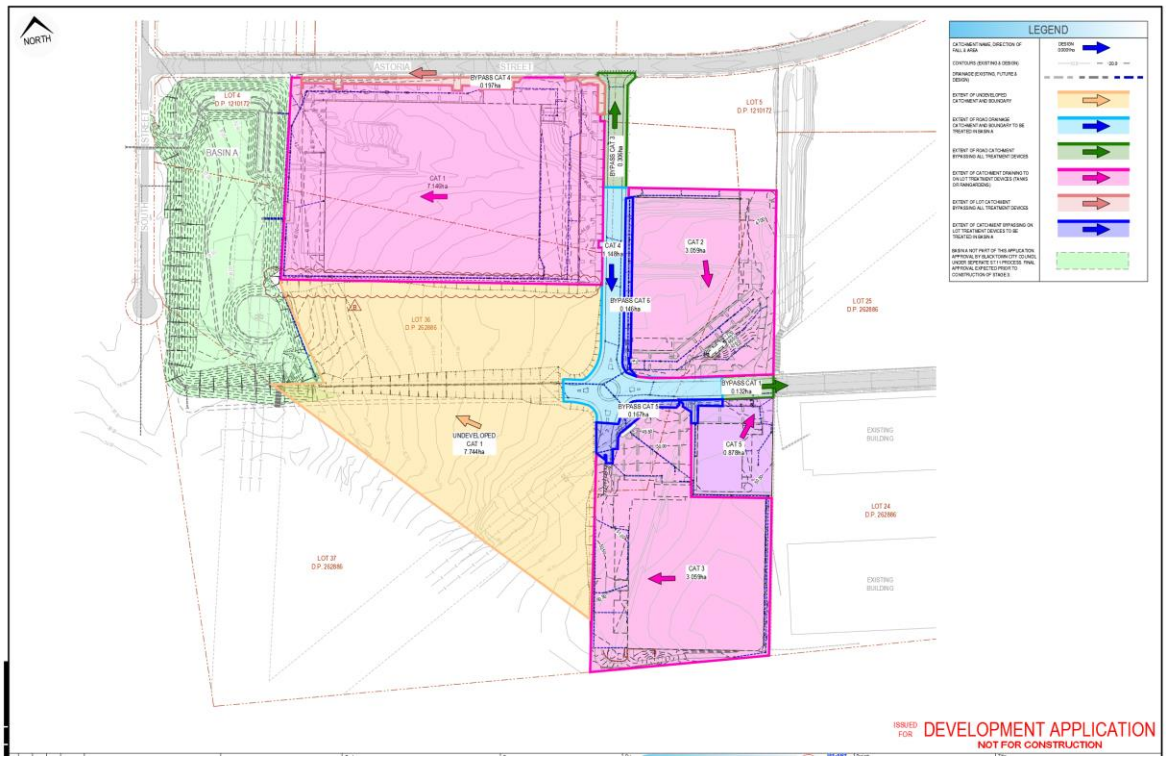


Figure 4 – Overall Catchment Plan

The catchment area draining to the Basin A detention basin is approximately 242,212m^2 including the undeveloped portion. The required volume for an interim detention basin for this development only is approximately 11,387m^3 and has been calculated using the Deemed to Comply Tool. The concept design undertaken by Cardno, reports an overall volume of 76,000m^3 which is greater than the volume required by this development. Council has provided updated DRAINS modelling for Basin A which results in an available volume of approximately 36,956m^3 at RL 40m. This volume is also larger than the required volume necessary for the development. The volume provided also considers an allowance for 42mm of dead storage over the entire catchment including the development of Sydney Business Park Stage 3. A summary of the results is contained in Appendix B.

4.1 Interim Detention

In the event Basin A is not commissioned or approved for construction when Stage 3 is to commence construction, an interim OSD solution has been designed. The interim design utilises the northern portion of Basin A by over excavating the raingarden area to allow for adequate storage. Additional excavation below the

future base of Basin A is proposed to account for 42mm of rainfall over the development and store it below the outlet level as dead storage. The dead storage volume required is approximately 10,500m³.

A diversion channel is proposed from Hollinsworth Road, passing the Transgrid stanchion and entering the interim Basin A configuration at the south west corner. This diversion channel will divert flows, up to the 100yr ARI (1% AEP), to the Interim Basin A infrastructure from the catchment upstream of Hollinsworth Road. The upstream catchment includes Hollinsworth Road, Road 1, Road 2, Warehouse 2, Warehouse 3 and Warehouse 4.

The total volume provided for in the interim Basin A design is 22,500m³ which includes the required detention component for the development and the dead storage requirement as discussed previously. The total volume required for development is 21,887m³.

The interim basin will discharge via the proposed 1200 dia pipe specified in the ultimate design to replace the existing culverts under South Street.

If the diversion line (as discussed in the main detention section of this report) is not available for the interim Basin A scenario, excess runoff volume would be transferred from the little creek catchment to the Marsden Creek catchment via Basin E as per the currently approved and operating system for Basin B.

5 Servicing

5.1 Water Supply

The application proposes the development of four warehouses, new public roads and associated infrastructure. A requirement for the development is to employ rainwater harvesting and reuse to minimise the impact on potable water use. Water demand for warehousing is typically very low. The proposed warehouses are primarily used for the storage and transfer of containerised goods and have low potable water demands, mainly usage for staff facilities such as kitchens and toilets.

Potable water supply to the development will be extended from existing mains in Hollinsworth Road and Astoria Street. The cross connection of the water supply network between Hollinsworth Road and Astoria Street via the Road 1 will facilitate a ringed supply in the area, thereby improving the security of the network. In the future, the water supply network will be extended east towards South Street and cross connected with major water supply infrastructure to be provided from Mt Druitt.

5.2 Sewer System

The proposed development will result in very low sewerage generation rates. Notwithstanding this, the Sydney Water standard sewer generation rates for the IN1 and IN2 zoning (45EP/Ha) have been adopted in the planning and design of sewerage system upgrades to service this development.

Planning and design work completed to date by Qalchek for the development site and the broader zoned wastewater catchment indicates that the existing sewer system that terminates on the southern side of Astoria Street at the intersection with South Street at an invert level of 35.04 can be extended by either:

- Option 1: running east along Astoria Street, within the site boundary of Warehouse 1 and extending South or
- Option 2: extending directly south along the future alignment of South Street.

These extensions would service Warehouse 1 and future development on the zoned land to the south.

Warehouses 2, 3 and 4 can be readily serviced by extending the existing sewer constructed under case number 182934WW directly south along the alignment of Road 1, which will be constructed as part of this application. Upgrades to the trunk sewer system by constructing the missing link of gravity sewer contemplated under case number 179024WW has been committed to by Marsden Park Developments Pty Ltd as evidenced by the recent signing of a novation deed with Sydney Water Corporation which legally commits to the construction of this infrastructure.

5.3 Electricity Supply

Marsden Park Industrial Precinct has recently had the benefit of the completion of major electricity infrastructure in the form of the South Marsden Park Zone substation located in Hollinsworth Road at Marsden Park. The Zone Substation is located 700 metres east of the subject site. The substation benefits from transmission supply at N-1 via connections to Rouse Hill and Marsden Park North Zone substations. The Zone substation currently has a firm capacity of 45MVA at N-1 and an installed capacity of 90MVA (2 x 45MVA). Current peak demand at this facility is 11MVA.

The expected demand on the network from the subject development is expected to be approximately 5.5 – 6.0 MVA. This bulk supply can be readily met by the existing zone capacity. Further Hollinsworth Road and Astoria Street both have new underground 11KV feeders located in the road reserve together with conduits to facilitate future feeder upgrades. It is proposed that as part of the Hollinsworth Road extension and the North-South Road 1 construction, the 11KV network would be extended and cross linked between Hollinsworth Road and Astoria Street. This will improve the reliability of the 11KV network in the area by enabling back up supply during outages or if any damage occurs.

5.4 Telecommunications

The telecommunication network in the Marsden Park Industrial Precinct is gradually being completed by NBNCo. The existing network consists of a pit and pipe network constructed in all existing roads to NBN standards. This network of pits and conduits will be extended in new roads as part of the proposed construction of Hollinsworth Road extension and Road 1 construction. Fibre has been extended by NBN and Telstra in both Hollinsworth Road and Astoria Street to service existing users and it is expected that this will be readily rolled out to the new premises proposed in this application.

5.5 Gas

No gas supply is required as part of this application. However, gas supply is available within the Marsden Park Industrial Precinct and is extended on an as required basis with commercial agreements between the users and Jemena.

6 Summary

Orion Consulting has been engaged by Sydney Business Park to prepare Civil Engineering Plans and an accompanying Stormwater Management Strategy and Servicing Report to support the State Significant Development application for an industrial subdivision located at Astoria Street, Marsden Park NSW.

Utilising Blacktown City Council nodes available through MUSIC Link, the software program MUSIC was used to determine a site-specific water quality management strategy that adheres to both Council requirements and the overall stormwater strategy for the Marsden Park Industrial precinct.

As part of the proposed treatment train, each warehouse allotment will incorporate rainwater tanks for re-use, OceanGuards to generally capture gross pollutants and suspended solids and an end of line treatment tank fitted with a number of StormFilters for further pollutant reduction before being discharged into the public stormwater network.

The results shown demonstrate that the water quality treatment measures over each warehouse allotment will satisfy Council's performance targets for pollutant reduction and the Stream Erosion Index.

The partial construction of the regional basin, Basin A, will satisfy Blacktown City Council's permanent and temporary on-site detention requirements for the development.

An investigation into the servicing strategy and provision of utilities for the development have indicated that existing connections can be made available for the supply of potable water, wastewater removal, electricity and telecommunications. Gas is not a mandated requirement for the site, but a supply point is available to be connected into should the customers require it. Reticulation design of services will be undertaken by others during detail design phase.

7 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

WSUD Developer Handbook: MUSIC modelling and design guide DRAFT 2019

Blacktown City Council: "Engineering Guide for Development" 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

Concept Design Report – Section 94 CP21 Marsden Park Industrial Precinct – Package 1 Little Creek Tributary, Prepared by Cardno, 3 March 2020

Appendix A– MUSIC Link Results

Blacktown City Council

music*e*link

MUSIC-*link* Report

Project Details		Company Details	
Project:	Sydney Business Park Stage 3	**Company:**	Orion Consulting
Report Export Date:	28/10/2020	**Contact:**	David Healy
Catchment Name:	14818 - Sydney Business Park (Marsden Park) Stage 3 (Preliminary Design) - 4 Warehouses RG and Tank Option	**Address:**	
Catchment Area:	15.806ha	**Phone:**	02 86600035
Impervious Area*:	90.82%	**Email:**	david.healy@orionconsulting.com.au
Rainfall Station:	67035 LIVERPOOL(WHITLAM		
Modelling Time-step:	6 Minutes		
Modelling Period:	1/01/1967 - 31/12/1976 11:54:00 PM		
Mean Annual Rainfall:	857mm		
Evapotranspiration:	1261mm		
MUSIC Version:	6.3.0		
MUSIC-link data Version:	6.33		
Study Area:	Blacktown		
Scenario:	Blacktown Development		

* 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	7.43%	Rain Water Tank Node	4	Urban Source Node	29
TSS	86.1%	Bio Retention Node	2		
TP	65.9%	Sedimentation Basin Node	3		
TN	48%	GPT Node	13		
GP	99.4%	Generic Node	3		

Comments

- GPT reflects Ocean Protect's OceanGuard and has the correct values.

- The 'SF Chamber' detention node (sedimentation basin) has been modified to represent a tank to hold volume for use with the Ocean Protect filter. k values has been set to 0 to prevent the tank from "treating" the flow as it would within a grassed above ground OSD.

- The 'Generic Node' represents Ocean Protect's Stormfilter Cartridge and has the correct values.

- We have also used 0.4kL/m² annually for irrigation.

- For RWT not meeting the 80% re-use demand, their re-use is within tolerance of 80%.

Passing Parameters

Node Type	Node Name	Parameter	Min	Max	Actual
Bio	Bioretention (75m²)	Hi-flow bypass rate (cum/sec)	None	None	100
Bio	Bioretention (75m²)	PET Scaling Factor	2.1	2.1	2.1
Bio	Bioretention (90m²)	Hi-flow bypass rate (cum/sec)	None	None	100
Bio	Bioretention (90m²)	PET Scaling Factor	2.1	2.1	2.1
GPT	12 x OceanGuard 200 (BCC 2015)	Hi-flow bypass rate (cum/sec)	None	None	0.24
GPT	16 x OceanGuard 200 (BCC 2015)	Hi-flow bypass rate (cum/sec)	None	None	0.32
GPT	16 x OceanGuard 200 (BCC 2015)	Hi-flow bypass rate (cum/sec)	None	None	0.32
GPT	16 x OceanGuard 200 (BCC 2015)	Hi-flow bypass rate (cum/sec)	None	None	0.32
GPT	19 x OceanGuard 200 (BCC 2015)	Hi-flow bypass rate (cum/sec)	None	None	0.38
GPT	2 x OceanGuard 200 (BCC 2015)	Hi-flow bypass rate (cum/sec)	None	None	0.04
GPT	2 x OceanGuard 200 (BCC 2015)	Hi-flow bypass rate (cum/sec)	None	None	0.04
GPT	23 x OceanGuard 200 (BCC 2015)	Hi-flow bypass rate (cum/sec)	None	None	0.46
GPT	6 x OceanGuard 200 (BCC 2015)	Hi-flow bypass rate (cum/sec)	None	None	0.12
GPT	6 x OceanGuard 200 (BCC 2015)	Hi-flow bypass rate (cum/sec)	None	None	0.12
GPT	6 x OceanGuard 200 (BCC 2015)	Hi-flow bypass rate (cum/sec)	None	None	0.12
GPT	9 x OceanGuard 200 (BCC 2015)	Hi-flow bypass rate (cum/sec)	None	None	0.18
GPT	9 x OceanGuard 200 (BCC 2015)	Hi-flow bypass rate (cum/sec)	None	None	0.18
Rain	Rainwater Tank 147kL	% Reuse Demand Met	80	None	80.73
Rain	Rainwater Tank 235kL	% Reuse Demand Met	80	None	81.55
Rain	Rainwater Tank 271kL	% Reuse Demand Met	80	None	83.06
Rain	Rainwater Tank 48kL	% Reuse Demand Met	80	None	85.02
Receiving	Receiving Node	% Load Reduction	None	None	7.43
Receiving	Receiving Node	GP % Load Reduction	90	None	99.4
Receiving	Receiving Node	TN % Load Reduction	45	None	48
Receiving	Receiving Node	TP % Load Reduction	65	None	65.9
Receiving	Receiving Node	TSS % Load Reduction	85	None	86.1
Sedimentation	SF Chamber - 26m²	High Flow Bypass Out (ML/yr)	None	None	0
Sedimentation	SF Chamber - 26m²	Notional Detention Time (hrs)	None	None	0.0797
Sedimentation	SF Chamber - 78.8m²	High Flow Bypass Out (ML/yr)	None	None	0
Sedimentation	SF Chamber - 78.8m²	Notional Detention Time (hrs)	None	None	0.0893
Sedimentation	SF Chamber 120m²	High Flow Bypass Out (ML/yr)	None	None	0
Sedimentation	SF Chamber 120m²	Notional Detention Time (hrs)	None	None	0.11
Urban	Warehouse 1 Bypass Road - 220m² (100% Imp.)	Area Impervious (ha)	None	None	0.022
Urban	Warehouse 1 Bypass Road - 220m² (100% Imp.)	Area Pervious (ha)	None	None	0
Urban	Warehouse 1 Bypass Road - 220m² (100% Imp.)	Total Area (ha)	None	None	0.022
Urban	Warehouse 1 Ground Landscape - 2293m² (100% Perv.)	Area Impervious (ha)	None	None	0
Urban	Warehouse 1 Ground Landscape - 2293m² (100% Perv.)	Area Pervious (ha)	None	None	0.229
Urban	Warehouse 1 Ground Landscape - 2293m² (100% Perv.)	Total Area (ha)	None	None	0.229
Urban	Warehouse 1 Landscape - 3024m² (100% Perv.)	Area Impervious (ha)	None	None	0
Urban	Warehouse 1 Landscape - 3024m² (100% Perv.)	Area Pervious (ha)	None	None	0.302

Only certain parameters are reported when they pass validation

Node Type	Node Name	Parameter	Min	Max	Actual
Urban	Warehouse 1 Landscape - 3024m² (100% Perv.)	Total Area (ha)	None	None	0.302
Urban	Warehouse 1 Paved Ground - 550m² (100% Imp.)	Area Impervious (ha)	None	None	0.055
Urban	Warehouse 1 Paved Ground - 550m² (100% Imp.)	Area Pervious (ha)	None	None	0
Urban	Warehouse 1 Paved Ground - 550m² (100% Imp.)	Total Area (ha)	None	None	0.055
Urban	Warehouse 1 Road -18780m² (100% Imp.)	Area Impervious (ha)	None	None	1.878
Urban	Warehouse 1 Road -18780m² (100% Imp.)	Area Pervious (ha)	None	None	0
Urban	Warehouse 1 Road -18780m² (100% Imp.)	Total Area (ha)	None	None	1.878
Urban	Warehouse 1 Roof - 24_500m² (100% Imp.)	Area Impervious (ha)	None	None	2.45
Urban	Warehouse 1 Roof - 24_500m² (100% Imp.)	Area Pervious (ha)	None	None	0
Urban	Warehouse 1 Roof - 24_500m² (100% Imp.)	Total Area (ha)	None	None	2.45
Urban	Warehouse 1 Roof to RWT - 24_500m² (100% Imp.)	Area Impervious (ha)	None	None	2.45
Urban	Warehouse 1 Roof to RWT - 24_500m² (100% Imp.)	Area Pervious (ha)	None	None	0
Urban	Warehouse 1 Roof to RWT - 24_500m² (100% Imp.)	Total Area (ha)	None	None	2.45
Urban	Warehouse 2 Bypass Ground - 1240m² (100% Perv.)	Area Impervious (ha)	None	None	0
Urban	Warehouse 2 Bypass Ground - 1240m² (100% Perv.)	Area Pervious (ha)	None	None	0.124
Urban	Warehouse 2 Bypass Ground - 1240m² (100% Perv.)	Total Area (ha)	None	None	0.124
Urban	Warehouse 2 Bypass Road - 119m² (100% Imp.)	Area Impervious (ha)	None	None	0.012
Urban	Warehouse 2 Bypass Road - 119m² (100% Imp.)	Area Pervious (ha)	None	None	0
Urban	Warehouse 2 Bypass Road - 119m² (100% Imp.)	Total Area (ha)	None	None	0.012
Urban	Warehouse 2 Landscape - 1340m² (100% Perv.)	Area Impervious (ha)	None	None	0
Urban	Warehouse 2 Landscape - 1340m² (100% Perv.)	Area Pervious (ha)	None	None	0.134
Urban	Warehouse 2 Landscape - 1340m² (100% Perv.)	Total Area (ha)	None	None	0.134
Urban	Warehouse 2 Landscape - 2315m² (100% Perv.)	Area Impervious (ha)	None	None	0
Urban	Warehouse 2 Landscape - 2315m² (100% Perv.)	Area Pervious (ha)	None	None	0.231
Urban	Warehouse 2 Landscape - 2315m² (100% Perv.)	Total Area (ha)	None	None	0.231
Urban	Warehouse 2 Paved Ground - 1063m² (100% Imp.)	Area Impervious (ha)	None	None	0.106
Urban	Warehouse 2 Paved Ground - 1063m² (100% Imp.)	Area Pervious (ha)	None	None	0
Urban	Warehouse 2 Paved Ground - 1063m² (100% Imp.)	Total Area (ha)	None	None	0.106
Urban	Warehouse 2 Road - 2635m² (100% Imp.)	Area Impervious (ha)	None	None	0.263
Urban	Warehouse 2 Road - 2635m² (100% Imp.)	Area Pervious (ha)	None	None	0
Urban	Warehouse 2 Road - 2635m² (100% Imp.)	Total Area (ha)	None	None	0.263
Urban	Warehouse 2 Road - 5950m² (100% Imp.)	Area Impervious (ha)	None	None	0.595
Urban	Warehouse 2 Road - 5950m² (100% Imp.)	Area Pervious (ha)	None	None	0
Urban	Warehouse 2 Road - 5950m² (100% Imp.)	Total Area (ha)	None	None	0.595
Urban	Warehouse 2 Roof - 8694m² (100% Imp.)	Area Impervious (ha)	None	None	0.869
Urban	Warehouse 2 Roof - 8694m² (100% Imp.)	Area Pervious (ha)	None	None	0
Urban	Warehouse 2 Roof - 8694m² (100% Imp.)	Total Area (ha)	None	None	0.869
Urban	Warehouse 2 Roof to RWT - 8694m² (100% Imp.)	Area Impervious (ha)	None	None	0.869
Urban	Warehouse 2 Roof to RWT - 8694m² (100% Imp.)	Area Pervious (ha)	None	None	0
Urban	Warehouse 2 Roof to RWT - 8694m² (100% Imp.)	Total Area (ha)	None	None	0.869

Only certain parameters are reported when they pass validation

Node Type	Node Name	Parameter	Min	Max	Actual
Urban	Warehouse 3 Bypass Ground - 598m² (100% Perv.)	Area Impervious (ha)	None	None	0
Urban	Warehouse 3 Bypass Ground - 598m² (100% Perv.)	Area Pervious (ha)	None	None	0.059
Urban	Warehouse 3 Bypass Ground - 598m² (100% Perv.)	Total Area (ha)	None	None	0.059
Urban	Warehouse 3 Landscape - 44m² (100% Perv.)	Area Impervious (ha)	None	None	0
Urban	Warehouse 3 Landscape - 44m² (100% Perv.)	Area Pervious (ha)	None	None	0.004
Urban	Warehouse 3 Landscape - 44m² (100% Perv.)	Total Area (ha)	None	None	0.004
Urban	Warehouse 3 Paved Ground - 111m² (100% Imp.)	Area Impervious (ha)	None	None	0.011
Urban	Warehouse 3 Paved Ground - 111m² (100% Imp.)	Area Pervious (ha)	None	None	0
Urban	Warehouse 3 Paved Ground - 111m² (100% Imp.)	Total Area (ha)	None	None	0.011
Urban	Warehouse 3 Road - 3569m² (100% Imp.)	Area Impervious (ha)	None	None	0.357
Urban	Warehouse 3 Road - 3569m² (100% Imp.)	Area Pervious (ha)	None	None	0
Urban	Warehouse 3 Road - 3569m² (100% Imp.)	Total Area (ha)	None	None	0.357
Urban	Warehouse 3 Roof - 2106m² (100% Imp.)	Area Impervious (ha)	None	None	0.211
Urban	Warehouse 3 Roof - 2106m² (100% Imp.)	Area Pervious (ha)	None	None	0
Urban	Warehouse 3 Roof - 2106m² (100% Imp.)	Total Area (ha)	None	None	0.211
Urban	Warehouse 3 Roof to RWT - 2106m² (100% Imp.)	Area Impervious (ha)	None	None	0.211
Urban	Warehouse 3 Roof to RWT - 2106m² (100% Imp.)	Area Pervious (ha)	None	None	0
Urban	Warehouse 3 Roof to RWT - 2106m² (100% Imp.)	Total Area (ha)	None	None	0.211
Urban	Warehouse 4 Bypass Road - 538m² (100% Imp.)	Area Impervious (ha)	None	None	0.054
Urban	Warehouse 4 Bypass Road - 538m² (100% Imp.)	Area Pervious (ha)	None	None	0
Urban	Warehouse 4 Bypass Road - 538m² (100% Imp.)	Total Area (ha)	None	None	0.054
Urban	Warehouse 4 Landscape Bypass - 2150m² (100% Perv.)	Area Impervious (ha)	None	None	0
Urban	Warehouse 4 Landscape Bypass - 2150m² (100% Perv.)	Area Pervious (ha)	None	None	0.215
Urban	Warehouse 4 Landscape Bypass - 2150m² (100% Perv.)	Total Area (ha)	None	None	0.215
Urban	Warehouse 4 Landscape Ground - 1519m² (100% Perv.)	Area Impervious (ha)	None	None	0
Urban	Warehouse 4 Landscape Ground - 1519m² (100% Perv.)	Area Pervious (ha)	None	None	0.152
Urban	Warehouse 4 Landscape Ground - 1519m² (100% Perv.)	Total Area (ha)	None	None	0.152
Urban	Warehouse 4 Paved Ground - 320m² (100% Imp.)	Area Impervious (ha)	None	None	0.032
Urban	Warehouse 4 Paved Ground - 320m² (100% Imp.)	Area Pervious (ha)	None	None	0
Urban	Warehouse 4 Paved Ground - 320m² (100% Imp.)	Total Area (ha)	None	None	0.032
Urban	Warehouse 4 Road - 12255m² (100% Imp.)	Area Impervious (ha)	None	None	1.225
Urban	Warehouse 4 Road - 12255m² (100% Imp.)	Area Pervious (ha)	None	None	0
Urban	Warehouse 4 Road - 12255m² (100% Imp.)	Total Area (ha)	None	None	1.225
Urban	Warehouse 4 Roof - 13425m² (100% Imp.)	Area Impervious (ha)	None	None	1.343
Urban	Warehouse 4 Roof - 13425m² (100% Imp.)	Area Pervious (ha)	None	None	0
Urban	Warehouse 4 Roof - 13425m² (100% Imp.)	Total Area (ha)	None	None	1.343
Urban	Warehouse 4 Roof to RWT - 13425m² (100% Imp.)	Area Impervious (ha)	None	None	1.343
Urban	Warehouse 4 Roof to RWT - 13425m² (100% Imp.)	Area Pervious (ha)	None	None	0
Urban	Warehouse 4 Roof to RWT - 13425m² (100% Imp.)	Total Area (ha)	None	None	1.343

Only certain parameters are reported when they pass validation

Failing Parameters

Node Type	Node Name	Parameter	Min	Max	Actual
Sedimentation	SF Chamber - 26m²	Total Nitrogen - k (m/yr)	40	40	0
Sedimentation	SF Chamber - 26m²	Total Phosphorus - k (m/yr)	300	300	0
Sedimentation	SF Chamber - 26m²	Total Suspended Solids - k (m/yr)	400	400	0
Sedimentation	SF Chamber - 78.8m²	Total Nitrogen - k (m/yr)	40	40	0
Sedimentation	SF Chamber - 78.8m²	Total Phosphorus - k (m/yr)	300	300	0
Sedimentation	SF Chamber - 78.8m²	Total Suspended Solids - k (m/yr)	400	400	0
Sedimentation	SF Chamber 120m²	Total Nitrogen - k (m/yr)	40	40	0
Sedimentation	SF Chamber 120m²	Total Phosphorus - k (m/yr)	300	300	0
Sedimentation	SF Chamber 120m²	Total Suspended Solids - k (m/yr)	400	400	0

Only certain parameters are reported when they pass validation

Appendix B – Deemed to Comply Tool Results

Blacktown City C

Project Details:

Project Title	Stage 3 SBP
Address	Astoria Street
Reference Number	20-0127

General Site Data:

Site Area (m^2)	250260 m²
Area Draining to OSD (m^2)	242212 m²

On-Site Detention Data:

OSD Location	Above Ground
OSD Discharge Location	Council Drainage Pit
RL of Bottom of OSD Storage Area	35.200
RL of Top of OSD Storage Area	39.000
Length of Emergency Overflow Weir (m)	34.00 m

Filter Cartridges:

Will filter cartridges be used to manage water quality?	No

Discharge Data:

RL of 1.5 Year ARI Orifice Centreline	35.500
Number of Orifices	1
RL of 100 Year ARI Orifice Centreline	35.400
Number of Orifices	1
RL of Invert of Discharge to Council Drainage Pit	34.800
RL of obvert of Pit outlet pipe	35.175

Above Ground OSD Summary with calculated values	
Site:	
Site Area	250260 m²
Site Area NOT Draining to OSD	8048 m²
Reduced Levels (AHD):	
RL of Top of Tank	39
RL of Bottom of OSD Tank	35.2
RL of 1.5 Year ARI Overflow Weir	37.5
RL of Emergency Overflow Weir	38.685
RL of 1.5 Year ARI Orifice Centerline	35.5
RL of 100 Year ARI Orifice Centreline	35.4
RL of Invert of Discharge to Council Drainage Pit	34.8
RL of obvert of Pit outlet pipe	35.175
Minium RL of Garage Floor	39.09
Minium RL of House Floor	39.19
OSD Volume:	
Required Storage BELOW 1.5 Year ARI Overflow Weir	7507.8 m³
Required Storage BELOW Emergency Overflow Weir	11386.8 m³
Discharge Details:	
Using Filter Cartridges to Manage Water Quality	No
Discharge Location	Council Drainage Pit
Length of Emergency Overflow Weir	34.00 m
Maximum 1.5 Year ARI Site Discharge	952.75 L/s
1.5 Year ARI Orifice Discharge	952.75 L/s
Maximum 100 Year ARI Site Discharge	4304.25 L/s
100 Year ARI Orifice Discharge	4304.25 L/s
Orifice Details:	
Number of 1.5 Year ARI Orifices	1
Number of 100 Year ARI Orifices	1
1.5 Year ARI Orifice Size (mm)	563.5 mm
100 Year ARI Orifice Size (mm)	1058.0 mm
Notifications:	