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06-MAR-2024  
  
APPLICATION REF  
  
A006476055

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~~PLANS AND DOCUMENTS  
referred to in the  
DEVELOPMENT APPROVAL  
  
Issued: 17/6/2022  
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# Proposed Industrial Development 372 Progress Rd, Wacol

PLANS AND DOCUMENTS  
referred to in the  
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## SITE BASED STORMWATER MANAGEMENT PLAN

CLIENT/ Garda Property Group

DATE/ FEBRUARY 2024

CODE/ REP002-06-20-3137-SITE BASED STORMWATER MANAGEMENT PLAN

# GARDA

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## Document Registration

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<b>Appendix C</b>	BCC FloodWise Property Report
<b>Appendix D</b>	Detailed Site Survey
<b>Appendix E</b>	BOM IFD Data
<b>Appendix F</b>	Atlan Product Information
<b>Appendix G</b>	Bio-Retention Basin Information and Maintenance Manual (Water by Design)
<b>Appendix H</b>	BCC Erosion Hazard Assessment Form
<b>Appendix I</b>	BCC Planning Scheme Development Code Responses

# 1. Introduction

## 1.1. Background

AT&I has been commissioned by Garda Property Pty Ltd to prepare a Site Based Stormwater Management Plan (SBSMP) in support of a Development Approval application associated with a proposed industrial development at 372 Progress Road, Wacol.

The subject site is situated in the suburb of Wacol within the Brisbane City Council (BCC) Local Government Area (LGA). It is currently zoned as “Industry investigation” and is formally described as Lot 86 on SP132953, Lot 87 on SP 288400 and Lot 91 on SP 283375. Please refer to Figure 1 below which shows the relative location of the site.

The intent of this SBSMP is to demonstrate that the site can be developed in accordance with current legislation and best engineering standards and practices, relevant to stormwater quantity and quality. This includes compliance with the *State Planning Policy (SPP) 2017*, the *Environmental Protection Policy 2019*, the *Queensland Urban Drainage Manual (QUDM)* and the Brisbane City Council City Plan.

Figure 1: Subject Site Locality (Queensland Globe)



## 1.2. Existing Site

The existing site covers a total area of approximately 41,350m<sup>2</sup> and includes the following land parcels:

- Lot 86 on SP 132953 (11,940m<sup>2</sup>)
- Lot 87 on SP 288400 (12,750m<sup>2</sup>)
- Lot 91 on SP 283375 (16,660m<sup>2</sup>)

The subject site is bounded by an existing industrial lot to the east, Progress Road to the north, McRoyle Street to the south and the Bullockhead Creek riparian corridor to the west.

The subject site has a frontage of 198m to Progress Road and 96m to McRoyle Street. Progress Road is classed as an Arterial Road whilst McRoyle Street is classified as a Neighbourhood Road.

Lot 86 is currently occupied by an Excavation and Earthmoving Business. An aerial image, in Figure 1, confirms that there is an existing dwelling/building near the McRoyle Street frontage and a large warehouse in the centre of the lot surrounded by multiple auxiliary sheds/containers with a gravel access track. The remainder of the subject site (i.e. Lot 87 and Lot 91) is currently vacant and covered in vegetation consisting of grass and shrubs with a scattering of mature trees along the existing boundary with Lot 86.

## 1.3. Existing Topography

The topography of the site generally falls from the east to west with an approximate slope of 3-4%. The detailed topographical survey (refer Appendix D) indicates that the site ranges in elevation from approximately 36.9m AHD in the centre of the eastern boundary to 22.6m AHD in the north-western corner.

## 1.4. Existing Drainage Infrastructure

A natural watercourse surrounded by dense vegetation, known as Bullockhead Creek, is located adjacent to the western boundary of the subject site. Bullockhead Creek drains north under the Progress Road bridge, approximately 1.8km to large culvert crossing under the Ipswich Motorway and then ultimately draining to the Brisbane River, which is approximately 3.8km in a westerly direction.

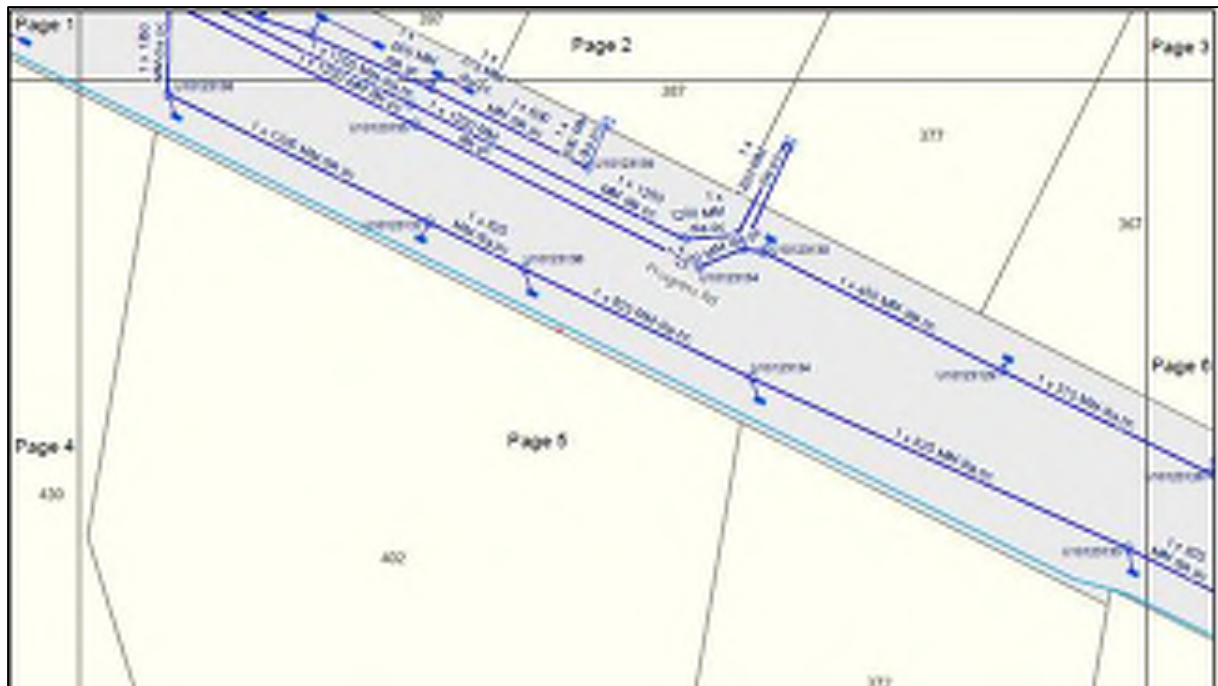
Based on existing asset data obtained from BCC's eBIMAP and survey plans, there is no existing stormwater infrastructure located within the subject site.

Underground public stormwater infrastructure exists along Progress Road and the pipe sizes vary from  $\Phi 825\text{mm}$  to  $\Phi 1200\text{mm}$ . This trunk stormwater main runs northwest and discharges into Bullockhead Creek via a headwall approximately, which is 300m west of the subject site.

No existing stormwater infrastructure has been identified in McRoyle Street. It appears that existing runoff from McRoyle Street is collected in open table drains, on either side of the road, and flow west into the Bullockhead Creek corridor.

Refer to Figure 2 below and Appendix D for available Council records of public stormwater infrastructure.

*Figure 2: Existing BCC Stormwater Infrastructure (Ebimap)*



## 1.5. Existing Catchments

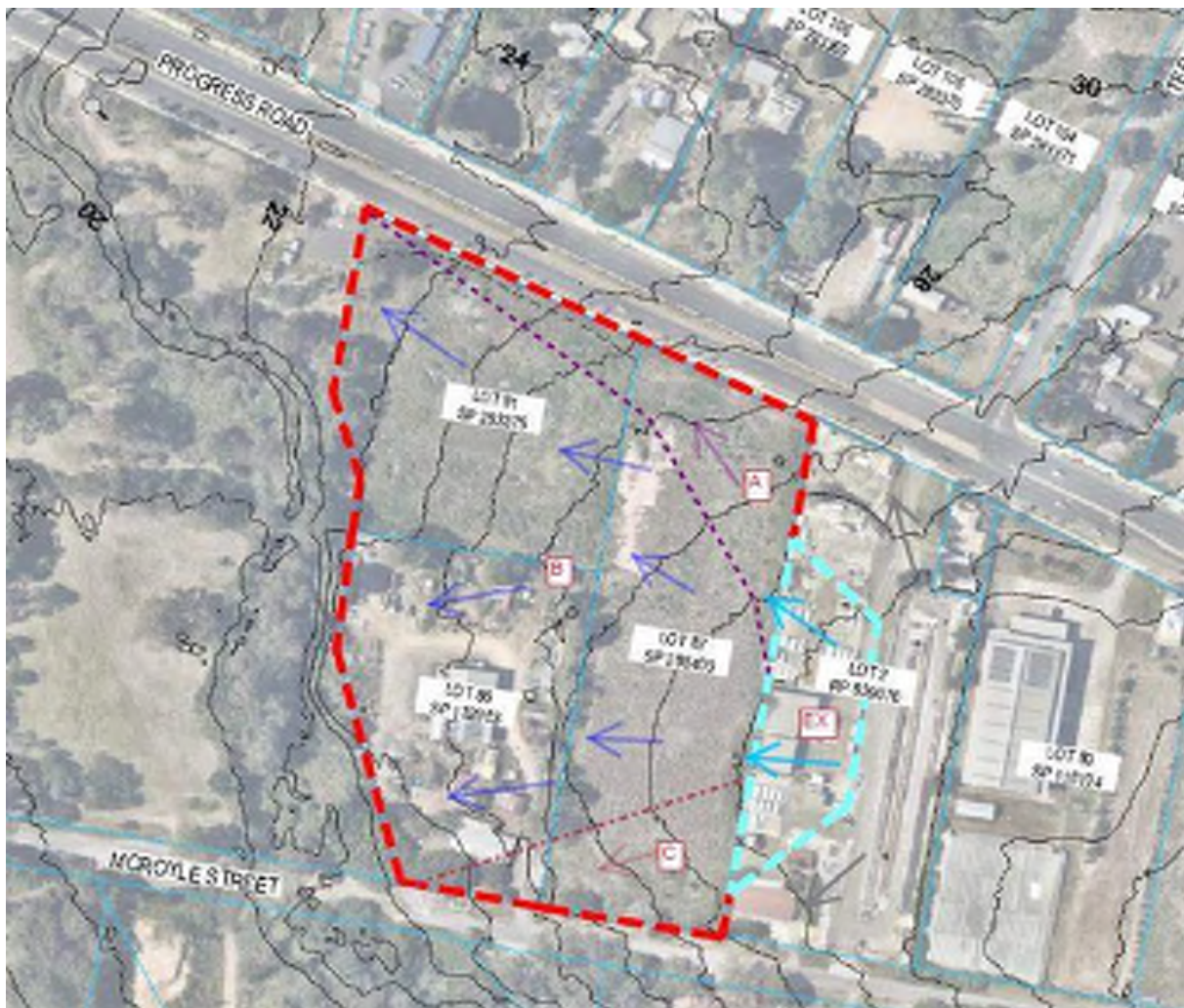
A review of existing ground contour information shows that runoff from the majority of the subject site (i.e. Catchment B in Figure 3) currently sheet flows west across the western boundary and discharges into Bullockhead Creek.

An area of approximately 7,000m<sup>2</sup> in the north-eastern corner (Catchment A) currently slopes northwest towards Progress Road - therefore the runoff from this area is captured by the existing gully pits on the Progress Road trunk stormwater network. An area in the south-eastern corner of the site (Catchment C), approximately 4,000m<sup>2</sup>, falls southwest to McRoyle Street and discharges from the site via sheet flow west towards Bullockhead Creek.

The subject site is also downstream of the adjoining industrial lot (i.e. Lot 2 RP 839076). The existing contours indicate that an external catchment area (Catchment EX) of approximately 4,500m<sup>2</sup> from the upstream lot currently flows into the subject site across the existing retaining wall and boundary. No adverse impacts or nuisance to the upstream property are anticipated from the proposed development as no filling is proposed in that area. The existing flow paths from the upstream property will not be altered and will continue to be conveyed through the subject site per the existing conditions.

Refer to the figure below for the indicative catchment areas.

Figure 3: Existing Catchments



## 2. Proposed Development

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The proposed development is to seek approval from Brisbane City Council (BCC) to reconfigure the existing three (3) lots into one (1) industrial development lot.

The existing warehouse, buildings and associated structures on existing Lot 86 will be demolished and removed to allow for construction of multiple large warehouses plus associated offices (13,797m<sup>2</sup> GFA) and surrounding loading hardstands, carparks and landscaping areas.

As part of this application, a new industrial access road is proposed along the western edge of the site, which will link McRoyle Street with Progress Road.

Please refer to Figure 4 below and Appendix A for the proposed development layout plan.



## 2.1. Proposed Stormwater Drainage

All stormwater drainage design will be undertaken in accordance with the requirements of the *Queensland Urban Drainage Manual (QUDM)* and Brisbane City Council City Plan Policies. Please refer to the concept stormwater drainage plan enclosed in Appendix B.

### 2.1.1. Internal Allotment

A new stormwater drainage network is proposed to be installed throughout the development site which will collect roof water and surface water runoff from hardstand areas (i.e. loading bays, carparks) and landscaped areas. Two (2) outlet points will be provided for the internal allotment via two (2) piped connections into the trunk stormwater networks. Separate stormwater quality treatment devices will be provided at each outlet to achieve State Planning Policy targets. Stormwater flows from the entire proposed development will ultimately discharge into the existing watercourse (i.e. Bullockhead Creek) to the west of the subject site, via headwalls.

All new stormwater drainage will be designed in accordance with the requirements of the *Queensland Urban Drainage Manual (QUDM)* and Brisbane City Council City Plan - Engineering Standards.

### 2.1.2. External Catchment

The External Catchment 'EX', which is identified in Figure 3, will continue to sheet flow into the subject site and will be collected by the proposed internal stormwater network. The internal stormwater network will be designed to cater for the additional flows from the upstream external catchment.

### 2.1.3. New Access Road

A new stormwater network will be constructed for the new access road linking McRoyle Street and Progress Road. The new stormwater drainage infrastructure will consist of kerb and channel, kerb inlet gully pits and underground pipes. All surface runoff from the road will be directed to BioPod's (Kerb Build Out in accordance with BCC Standard Drawing BSD-8333).

### 2.1.4. Progress Road & McRoyle Street

As part of the external roadworks associated with the development, it will be necessary to relocate several existing gully pits and field inlets within the Progress Road carriageway and median to suit the pavement widening new kerb alignments. Full analysis of flow widths and pipe capacities will be undertaken at detailed design stage using hydraulic modelling software.

A new gully pit is also proposed on the northern side of McRoyle Street along the new kerb alignment in order to improve the existing drainage conditions. A new pipe from this gully pit will connect with the southern access road catchment and discharge west into the Bullockhead Creek corridor.

## 2.2. Lawful Point of Discharge

The *Queensland Urban Drainage Manual (QUDM) 4th Edition 2016*, defines a lawful point of discharge test that can be used to assess whether a discharge point exists at a particular location, consisting of:

- 1) *The location of the discharge is under the lawful control of the local government or other statutory authority from whom permission to discharge has been received. This will include a park, drainage or road reserve, or stormwater drainage easement.*
  
- 2) *The discharge location will not cause an actionable nuisance for which the current or some future neighbouring proprietor may bring an action or claim for damages arising out of the nuisance or environmental or property damage.*

The designated lawful point of discharge for the proposed development will be the existing watercourse, Bullockhead Creek, as discussed in the sections above.

## 2.3. Design Storm Events

### 2.3.1. New Road

The minimum design storm events for industrial areas as identified by Tables 7.2.2.3.B in the Brisbane City Council City Plan - CH7 Stormwater Drainage and are as follows:

- Minor Drainage System = 1 in 2 year ARI (39% AEP)
- Major Drainage System = 1 in 50 year ARI (2% AEP)

### 2.3.2. Allotment

Allotment drainage will need to meet Level IV requirements in accordance with *Section 7.13 of QUDM*. This requires underground allotment drainage to cater for the 5% AEP (i.e. the 1 in 20 year ARI) design storm event. The major drainage system must cater for the 1% AEP (i.e. the 1 in 100-year ARI) design storm event.

## 2.4. Design Stormwater Flows (Rational Method)

The catchment composition for the post development scenario is identified in the table below:

*Table 1: Proposed Catchments Parameters*

Node	Sub-Catchment Type	Area (m <sup>2</sup> )	Impervious (%)
<b>A</b>	Proposed Lot 1 (Allotment Area)	19,366	90%
<b>B</b>	Proposed Lot 1 (Allotment Area)	14,032	90%
<b>C1</b>	New Road and Verges (Northern Portion)	4,055	75%
<b>C2</b>	New Road and Verges (Southern Portion)	2,335	75%
<b>D</b>	Proposed Lot 900	1,380	0%
<b>EX</b>	External Catchment	4,500	90%

The following design flows have been calculated, as an indication of the stormwater generated by the proposed development at each node, using the rational formula.

Rainfall intensity-frequency-duration (IFD) data was obtained from the Bureau of Meteorology (BOM) website specifically for the development site location. Refer to Appendix E for the IFD data retrieved from BOM.

Figure 5: Proposed Catchment Areas

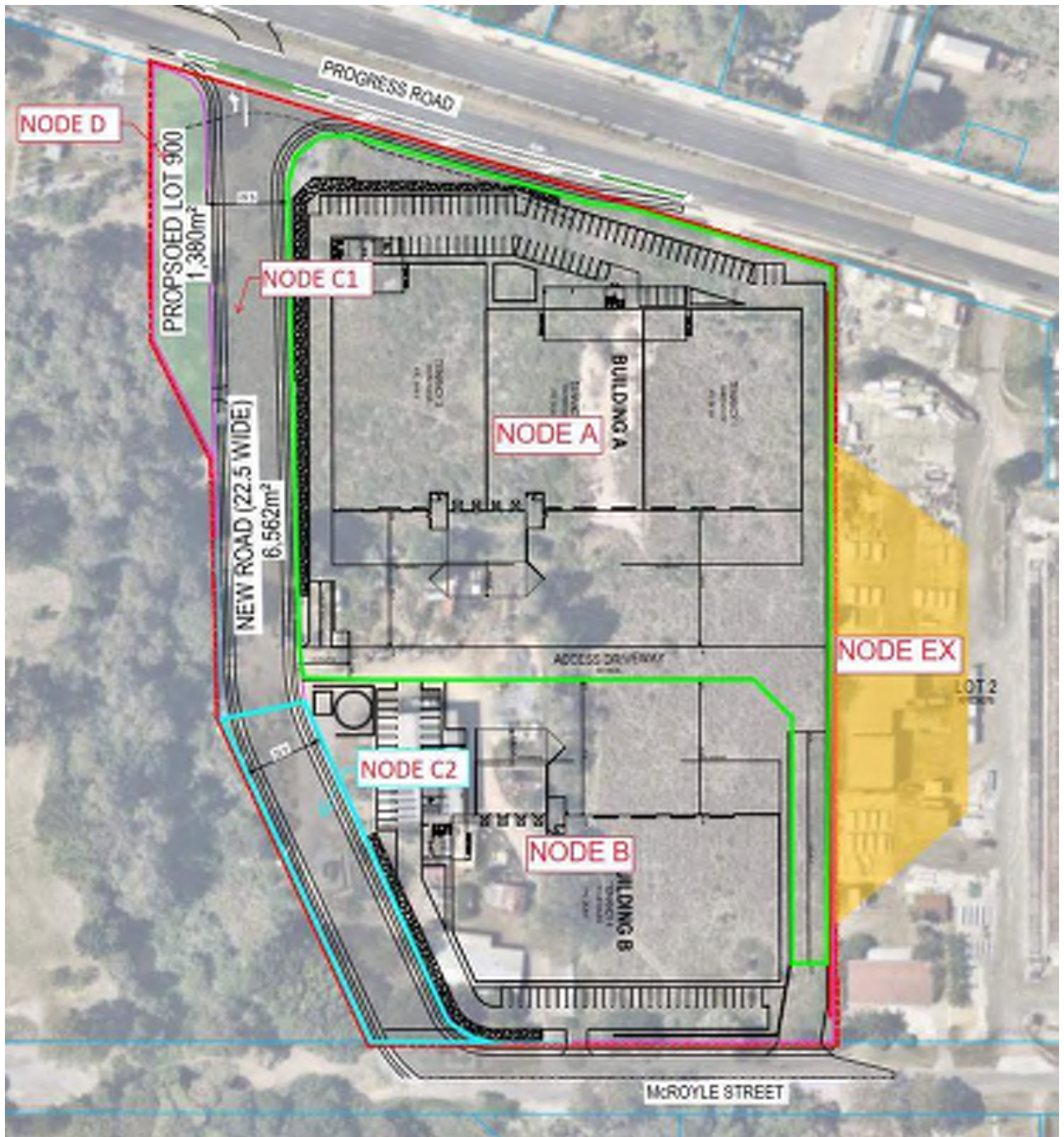


Table 2: Indicative Peak Stormwater Flows (Rational Method)

ARI (yr)	Node A (m <sup>3</sup> /s)	Node B (m <sup>3</sup> /s)	Node C1 (m <sup>3</sup> /s)	Node C2 (m <sup>3</sup> /s)	Node D (m <sup>3</sup> /s)	Node EX (m <sup>3</sup> /s)	Total (m <sup>3</sup> /s)
1	0.401	0.291	0.084	0.048	0.029	0.093	0.946
2	0.539	0.391	0.113	0.065	0.038	0.125	1.271
5	0.764	0.554	0.160	0.092	0.054	0.178	1.802
10	0.932	0.676	0.195	0.112	0.066	0.217	2.198
20	1.133	0.821	0.237	0.137	0.081	0.263	2.672
50	1.436	1.041	0.301	0.173	0.102	0.334	3.387
100	1.603	1.161	0.336	0.193	0.114	0.373	3.780

Where:

C <sub>10</sub> Runoff Coefficient - Impervious Area	0.88
Time of Concentration (min)	5

**Example of Q<sub>10</sub> at Node A -**

Time of Concentration = 5 mins

$${}^{5\text{min}}I_{10} = 197\text{mm/hr}$$

$$F_y = 1$$

$$q = (1/360) \times I \times F_y \times \text{Area} \times C_{10}$$

$$q_{10(\text{Node A})} = (1/360) \times 197 \times 1 \times 1.9366 \times 0.88 = 0.217 \text{ m}^3/\text{s}$$

### 3. Stormwater Quantity

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Section 7.5.2 of Brisbane City Council's Infrastructure Design Planning Scheme Policy (PSP), provides guidance on when it is necessary to provide stormwater detention on-site to attenuate site runoff. Stormwater detention requirements may be waived in the following circumstances:

1. *The development will not cause adverse impacts or actionable nuisance to surrounding properties;*
2. *the site discharges directly into the Brisbane River or Moreton Bay where flooding is controlled by river flooding or storm tide;*
3. *the site discharges directly into the lower catchments of creeks or major drains where it would generally be undesirable to have detention where it may allow peak flows from the site to coincide with the wider catchment flood peak;*
4. *the proposal is for residential development where stormwater is disposed to Council's kerb and channel or piped stormwater system and major flows from the site would drain to Council's road reserve;*
5. *for infill development only, the development site has an existing actual impervious fraction greater than 60%;*
6. *the applicant can demonstrate to Council's satisfaction that, if the total catchment containing the site were developed to its full potential while maintaining the existing infrastructure, stormwater detention on the subject site would not be of benefit in reducing adverse flooding impacts on downstream roads, properties and open watercourses, which may be the case at the lower end of major catchments;*
7. *the downstream drainage system has been upgraded, or is proposed to be upgraded by the development to cater for fully developed peak flows from the catchment to the Council's standard of service;*
8. *the development site is located entirely within the 1% AEP floodplain (waterway/creek or river flooding sources).*

Items 1 and 3 above are of particular relevance to the proposed development, as the subject site will drain directly into Bullockhead Creek. In addition, the site is located towards the lower reaches of the Bullockhead Creek catchment.

No adverse effects or nuisance would be expected to surrounding properties since there are no properties located between the subject site and Bullockhead Creek. Furthermore, the Bullockhead Creek and other tributaries of Wolston Creek were extensively modelled by Brisbane City Council as part of the Wolston Creek Flood Study (BCC, 2018). According to the study, the URBS model used to analyse peak flood levels assumed full ultimate catchment development per the Brisbane City Council City Plan and this included modelling the subject site as a fully developed industrial site. It is expected that Council's current flood mapping accounts for the results of this study.

Additionally, a recent runoff routing modelling exercise was completed by BMT WBM in RAFTS in support of a nearby development proposal at the Metroplex industrial development. This site is located approximately 1.5km to the north of the subject site along Bullockhead Creek (Council Ref. A005059861). According to their report, the results of their modelling demonstrated the peak flows within the main branch of Bullockhead Creek as a result of their unmitigated development were found to be less than the existing pre-development peak flows and therefore there was no advantage to providing mitigation/detention to reduce the peak discharges.

Therefore, it is considered that on-site detention will not be required as part of this development.

## 4. Stormwater Quality

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### 4.1. Planning Requirements

In Table B of Appendix 2 of the State Planning Policy (SPP - 2017), consultants are advised of the Stormwater Management Design Objectives (SMDO's) that apply to development applications. These include:

- 1) *A material change of use for an urban purpose that involves premises 2500m<sup>2</sup> or greater in size and:*
  - a) *will result in an impervious area greater than 25 per cent of the net developable area, or*
  - b) *will result in six or more dwellings, or*
- 2) *Reconfiguring a lot for urban purposes that involves a land area 2500m<sup>2</sup> or greater and will result in six or more lots.*

As the proposed development is greater than 2500m<sup>2</sup> the proposed development must be provided with stormwater quality treatment measures in order to achieve the target pollutant load reductions listed in the table below.

*Table 3: State Planning Policy Stormwater Management Design Objectives (for Operational Phase)*

<b>Pollutant</b>	<b>Percent Reduction</b>
<b>Total Suspended Solids</b>	80%
<b>Total Nitrogen</b>	45%
<b>Total Phosphorus</b>	60%
<b>Gross Pollutants &gt;5mm</b>	90%

## 4.2. Proposed Stormwater Treatment Devices

The primary aim of the WSUD is to minimise impact of the development on the natural water cycle by reducing the export of pollutants, sediments, and nutrients from the development into the natural watercourse.

Separate treatment trains have been proposed for the development which include the following:

### Proposed New Road

- All surface runoff from the road will be directed to BioPod's (Kerb Build Out in accordance with BCC Standard Drawing BSD-8333).

### Internal Allotment

- Underground proprietary treatment devices (Atlan Filter filtration units) and Stormsack gully pit inserts have been selected for use of the internal allotment due to their minimal footprint, high efficiency and suitability for industrial sites.

These devices primarily targeted at treatment of low flows from more frequent minor storm events, including the 'first flush' after a period of dry weather. Flows greater than the  $Q_{3\text{month}}$  will bypass the treatment systems via splitter structures to be installed immediately upstream.

Table 4: Proposed SQID Details

Treatment Level	Treatment Device	Treatment Area	Component
Tertiary	Bio-Retention (Kerb Build Out BioPods)	New Access Road	Typical Configuration: Top of filter media = 22.55mAHD Basin embankment crest level = 23.30mAHD Overflow spillway weir IL = 22.95mAHD Underdrainage IL = 21.65mAHD Filter media area = 450m <sup>2</sup> Filter media depth = 600mm Extended detention depth = 300mm
Tertiary	Underground Proprietary Device – Atlan Filter	Internal Allotment	Atlan Filter – 3 x cartridges Atlan Filter – 10 x cartridges
Secondary	Stormsack Pit Inserts	Internal Allotment	30 x Atlan Stormsack litter basket filters (20 Stormsacks for Catchment A and 10 for Catchment B)

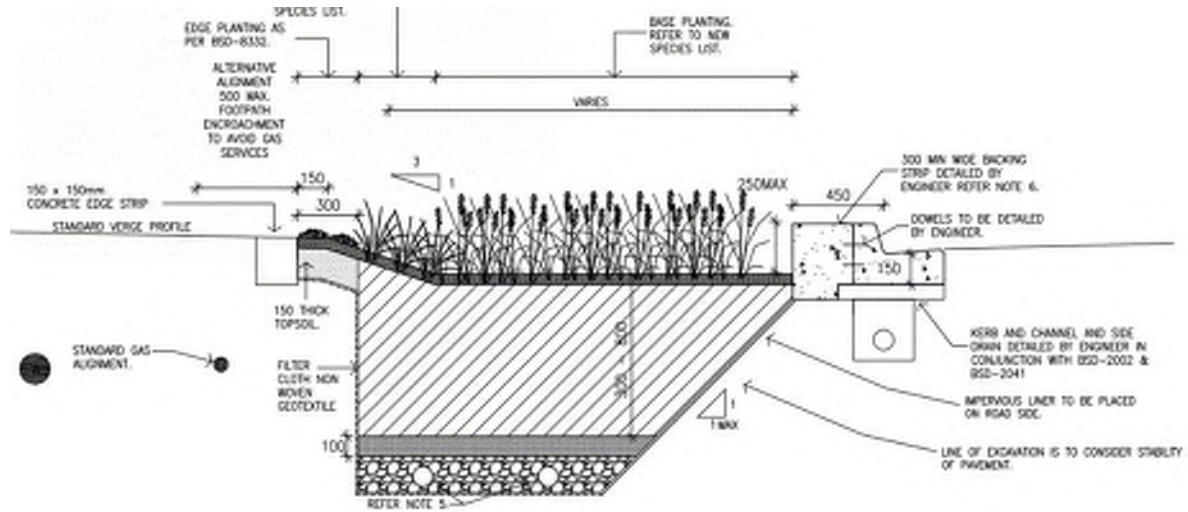
### 4.2.1. Proposed Bio-pods

The proposed bio-pods have a combined filter area of 95m<sup>2</sup> with a 600mm filter media depth and 200mm extended detention above. A typical section is presented in the figure below. As recommended by Bioretention Technical Design Guidelines by Water by Design, coarse sediment removal is not necessary for the bio-retention basin since the contributing catchment is less than 2ha.

Low flows will be discharged into the proposed bio-pods through kerb openings and filtered through a filter media layer, i.e. sandy loam, and percolate downwards to the receiving underlying drainage. Specific vegetation will be planted within the bio-pods to effectively reduce the generated nutrient loads.

Refer to Appendix A of Healthy Waterways' Water Sensitive Urban Design Technical Guidelines for South East Queensland which provides the general information on selecting appropriate species for the treatment system.

Figure 6: Typical Section of Bio-Pod (Brisbane City Council)



### 4.3. Water Quality Modelling

To assess the discharge concentrations of key pollutants from the development, the proposed treatment train has been analysed using the Model for Urban Stormwater Improvement Conceptualisation (MUSIC, Version 6.3). MUSIC is water quality modelling software which offers the ability to simulate both quantity and quality of runoff from catchments. Healthy Land and Water’s Water by Design MUSIC Modelling Guidelines (2018) were used to obtain the various source and treatment node parameters.

### 4.4. Modelling Inputs

#### 4.4.1. Climactic Data

Rainfall data for use in the MUSIC model was obtained from eWater’s pluviograph tool for the nearest BOM meteorological station to the proposed development. A 10-year modelling period and 6 minute time-step have been adopted.

*Table 5: Rainfall Station Data*

Station ID	Station Name	Rainfall Period	Mean annual Rainfall (mm)	Evapotranspiration
40659	Greenbank	1/1/1980 – 31/12/1989	745	1427

#### 4.4.2. Catchment Source Nodes

To increase the accuracy of the model, different MUSIC source nodes have been used to simulate various catchment characteristics i.e., for industrial allotment area, proposed industrial road area and landscape area. The proposed MUSIC model has considered the entire site to be a developed case and assumed 95% of the internal allotment area would be impervious.

The internal allotment area has been modelled with “Industrial Allotment” pollutant export parameters. The proposed landscaping area has been modelled using the “Landscape Industrial” parameters and the proposed new road has been modelled using the “Road Industrial” parameters.

The tables below summarise the recommended rainfall runoff parameters and pollutant export parameters that have been applied in the MUSIC model. These parameters have been used in accordance with the recommendations made in the HLW Water by Design Guidelines.

Table 6: Rainfall Runoff Parameters

Parameter	Industrial Land Use
Rainfall Threshold (mm)	1
Soil Storage Capacity (mm)	18
Initial Storage (% capacity)	10
Field Capacity (mm)	80
Infiltration Capacity Coefficient, a	243
Infiltration Capacity Coefficient, b	0.6
Initial Depth (mm)	50
Daily Recharge Rate (%)	0
Daily Drainage Rate (%)	31
Daily Deep Seepage Rate (%)	0

Table 7: Rainfall Runoff Parameters

Music Source Node	Parameter	Total Suspended Solids (Log10 mg/L)		Total Phosphorus (Log10 mg/L)		Total Nitrogen (Log10 mg/L)	
		Base Flow	Storm Flow	Base Flow	Storm Flow	Base Flow	Storm Flow
Industrial Allotment	Mean	0.78	1.92	-1.11	-0.59	0.14	0.25
	Std. Deviation	0.45	0.44	0.48	0.36	0.20	0.32
Road Industrial	Mean	0.78	1.92	-1.11	-0.59	0.14	0.25
	Std. Deviation	0.45	0.44	0.48	0.36	0.20	0.32
Landscape Industrial	Mean	0.78	1.92	-1.11	-0.59	0.14	0.25
	Std. Deviation	0.45	0.44	0.48	0.36	0.20	0.32

#### 4.4.3. Treatment Nodes

Multiple stormwater quality improvement devices will be used to account for the treatment for the runoff within the proposed development. The adopted properties of the basin are detailed in Table 8 below. Tables 9-12 below provide the details of the proposed Atlan devices. These are based on BCC-approved MUSIC nodes provided to AT&L by Atlan Stormwater.

Table 8: Bio-Retention Basin Parameters

Parameter	Bio-retention Basin (Offline)
<b>Storage Properties</b>	
Extended Detention Depth (m)	0.3
Surface Area (m <sup>2</sup> )	95
Transition Layer Depth (m)	0.1
<b>Filter Media Properties</b>	
Surface Area (m <sup>2</sup> )	210
Saturated Hydraulic Conductivity (mm/h)	180
Filter Depth (m)	0.6
TN Content (mg/kg)	400
Orthophosphate Content (mg/kg)	30

Table 9: Atlan Filter (20 Cartridges) Parameters

Parameter	
Maximum Flow (L/s)	57
<b>Concentration Based Capture Efficient</b>	<b>Input - Output</b>
Total Phosphorus (mg/L)	100 -26
Gross Pollutants (kg/ML)	15-15
Total Nitrogen (mg/L)	100-41
Total Suspended Solids (mg/L)	100-15

Table 10: Atlan Stormsack Parameters

Parameter	Ocean Protect OceanGuard
Maximum Flow (L/s)	11 (per Stormsack)
<b>Concentration Based Capture Efficient</b>	<b>Input - Output</b>
Total Phosphorus (mg/L)	100-79
Gross Pollutants (kg/ML)	15-0
Total Nitrogen (mg/L)	100-55
Total Suspended Solids (mg/L)	100-39

## 4.5. Model Configuration

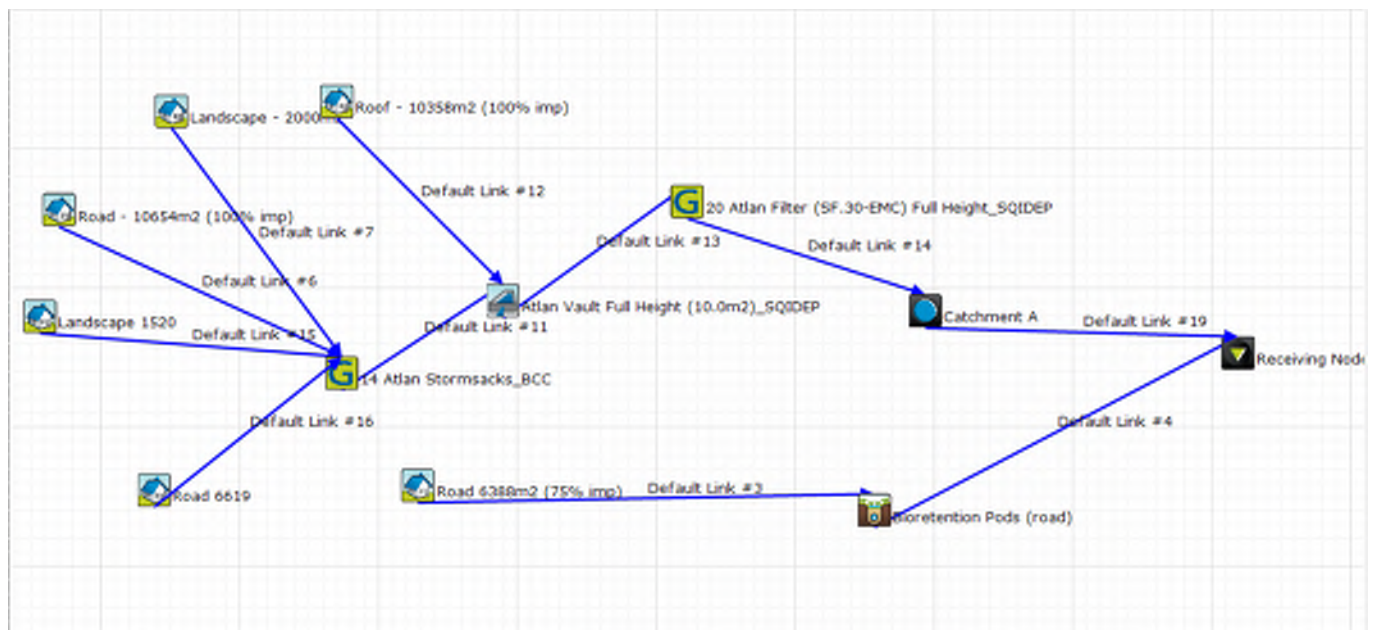
A treatment train has been developed on an iterative basis to find the optimal solution which meets the stormwater quality treatment requirements. The water quality catchment areas used in the MUSIC model are summarised in the table below, refer to Figure 5 above for the catchment nodes.

A conceptual view of the MUSIC model used in this report is shown in Figure 7 below.

Table 11: Water Quality Treatment Areas in MUSIC Model

Catchment Nodes	Area (m <sup>2</sup> )	Description
Catchment A	31,151	Allotment Area (to 20 x Atlan Filters)
Catchment C	6,388	Proposed new road (Excluding McRoyle St) (to 7 x BioPods)

Figure 7: MUSIC Model Treatment Train Configuration



## 4.6. Modelling Results

Results from the MUSIC model concludes that the proposed treatment train meets the State Planning Policy’s SMDOs for suspended solids, total phosphorous, total nitrogen and gross pollutants. Refer to Table 14 below for the comparison between mean annual pollutant loads generated from post-development unmitigated (“Sources”) versus mitigated (“Residual”) conditions and associated reductions.

Figure 8: MUSIC Model Treatment Train Effectiveness

	Sources	Residual Load	% Reduction
Flow (ML/yr)	42.08	41.82	0.6234
Total Suspended Solids (kg/yr)	1.348E+04	2633	80.46
Total Phosphorus (kg/yr)	23.31	8.052	65.46
Total Nitrogen (kg/yr)	98.27	45.46	53.74
Gross Pollutants (kg/yr)	904.1	0	100

Table 12: MUSIC Model Treatment Train Effectiveness Results

Pollutant	Annual Pollutant Loads (kg/yr)		Reduction (%)	Target Reduction (%)
	Sources	Residual		
Total Suspended Soils	1.348x10 <sup>4</sup>	2633	<b>80.46</b>	80
Total Phosphorous	23.31	8.052	<b>65.46</b>	60
Total Nitrogen	98.27	45.46	<b>53.74</b>	45
Gross Pollutants	904.1	0	<b>100</b>	90

## 4.7. Maintenance Schedule and Ownership

Following installation of the SQIDs (i.e. bio-pods), the Atlan Filter units, during the civil construction phase, the site owner will be responsible for the regular maintenance during the on-maintenance period of the development. The bio-pod maintenance procedures will be in accordance with *Maintaining Vegetated Stormwater Assets* (Water by Design, 2012), refer to Appendix G for details. The Atlan Filter and Stormsack maintenance procedures shall be in accordance with the Atlan maintenance manual included in Appendix F.

The site owner will be responsible for the regular maintenance of the internal SQIDs (i.e. Atlan Filter and Stormsack units) during the operational phase of the development. Subject to the confirmation and approval of Brisbane City Council, the ownership of the external stormwater quality treatment assets (i.e. the bio-pods) will be transferred to Council after the “On-Maintenance” period in accordance with Transferring Ownership of Vegetated Stormwater Assets (Water by Design, 2012) and the standard BCC handover procedures.

## 5. Construction Phase Stormwater Management

### 5.1. Planning Requirements

During the construction phase of the development, especially the bulk earthworks phase when large areas of the site will be exposed, erosion and sediment control measures will be required to protect the downstream receiving environment.

Control of stormwater runoff and pollution from development sites is regulated under the *Environmental Protection Act (1994)*, the *Environmental Protection (Water) Policy (2009)* and associated regulations.

The *State Planning Policy 2017* includes a Water Quality Code which specifies the following five key Stormwater Management Design Objectives (SMDOs) for the construction phase under Appendix 2, Table A:

#### 1) Drainage control –

- Manage stormwater flows around or through areas of exposed soil to avoid contamination. For a disturbed area exposed <12months the minimum design storm event is the 1 in 2-year ARI (i.e. 39% AEP storm event).
- Manage sheet flows in order to avoid or minimise the generation of rill or gully erosion.
- Provide stable concentrated flow paths to achieve the construction phase stormwater management design objectives for temporary drainage works (part 2).
- Provide emergency spillways for sediment basins to achieve the construction phase stormwater management design objectives for emergency spillways on temporary sediment basins

#### 2) Erosion control –

- Stage clearing and construction works to minimise the area of exposed soil at any one time.
- Effectively cover or stabilise exposed soils prior to predicted rainfall.
- Prior to completion of works for the development, and prior to removal of sediment controls, all site surfaces must be effectively stabilised using methods which will achieve effective short-term stabilisation.

#### 3) Sediment control –

- Direct runoff from exposed site soils to sediment controls that are appropriate to the extent of disturbance and level of erosion risk.
- All exposed areas greater than 2500m<sup>2</sup> must be provided with sediment controls which are designed, implemented and maintained to a standard which would achieve at least 80% of the average annual runoff volume of the contributing catchment treated (i.e. 80% hydrological effectiveness) to 50mg/L Total Suspended Solids (TSS) or less, and pH in the range (6.5–8.5).

#### 4) Litter, hydrocarbons and other contaminants –

- Remove gross pollutants and litter
- Avoid the release of oil or visible sheen to released waters
- Dispose of waste containing contaminants at authorised facilities

#### 5) Waterway stability and flood flow management –

- Where measures are required to meet post-construction waterway stability objectives (specified in table B), these are either installed prior to land disturbance and are integrated with erosion and sediment controls, or equivalent alternative measures are implemented during construction.
- Earthworks and the implementation of erosion and sediment controls are undertaken in ways which ensure flooding characteristics (including stormwater quantity characteristics) external to the development site are not worsened during construction for all events up to and including the 1 in 100 year ARI (1% AEP).

International Erosion Control Association's (IECA) *Best Practice Erosion and Sediment Control* (2008) and Healthy Land and Water's (HLW) toolkits and fact sheets both provide detailed recommendations on industry best practice.

## 5.2. Potential Sources of Pollution

The activities and aspects of the works that have potential to lead to erosion, sediment transport, siltation and contamination of natural waters include:

- Earthworks undertaken immediately prior to rainfall periods
- Work areas that have not been stabilised
- Extraction of construction water from waterways during low rainfall periods
- Clearing of vegetation and the methods adopted, particularly in advance of construction works
- Stripping of topsoil, particularly in advance of construction works
- Bulk earthworks and construction of pavements
- Works within drainage paths, including depressions and waterways
- Stockpiling of excavated materials
- Storage and transfer of oils, fuels, fertilisers and chemicals
- Maintenance of plant and equipment
- Ineffective implementation of erosion and sediment control measures
- Inadequate maintenance of environmental control measures
- Time taken for the rehabilitation / revegetation of disturbed areas

## 5.3. ESC Program

An Erosion Hazard Assessment has been completed to determine the risk of soil erosion and sediment pollution to the environment, refer to Appendix H for the completed BCC Erosion Hazard Assessment Form. The assessment indicates the site is considered "High Risk".

During the construction planning process, a robust erosion and sediment control program (ESCP) and plans shall be prepared and designed in accordance with IECA guidelines. The contractor should also include this information in their Construction Environment Management Plan (CEMP), along with appropriate risk response measures.

A copy of these plans are to be kept on-site and must be available at all times during the construction phase. An RPEQ Civil Engineer or CPESC will conduct inspections of the site throughout construction phase to monitor implementation of the ESCP. All construction personnel must be made aware of the relevant requirements of the ESCP prior to commencing works.

## 5.4. Construction Methodology

### 5.4.1. Pre-Construction

The following erosion control measures will be implemented prior to commencement of construction to minimise disturbance and ensure the performance criteria for water quality are met:

- The civil contractor will prepare a traffic management plan for the site which ensures efficient vehicle movement whilst minimising potential for sediment generation. This is to include designation and

marking of transport routes across undisturbed portions of the site to ensure minimal vegetation disturbance.

- Transport routes will be provided with stabilised construction entry/exits at the designated access points, including traffic rumble grids and wash-down areas, to prevent vehicles carrying soils beyond the site;
- Installation of a temporary sediment basin will occur before bulk earthworks across the site begin so that sediment-laden runoff from the works can be captured and treated. The size and configuration of sediment basins are to be designed in accordance with the IECA Appendix B (2018). It is noted that State Planning Policy now requires sediment basins to be provided with automated flocculant dosing devices where feasible. These devices can be either rainfall or flow activated. Basins shall be located clear of the 1 in 100 year ARI flood inundation extents;
- Diversion of “clean” water from upstream catchments, away from proposed areas of disturbance, and will be discharged via suitable scour protection methods;
- All site personnel are to complete an environmental induction covering the operation and maintenance of the erosion and sediment controls;

#### **5.4.2. During Construction**

Measures to mitigate water quality impacts during the construction phase will include:

- Sediment fences to be erected to filter and retain sediments at source – particularly around the base of all soil stockpiles and at the property boundary to prevent sediment-laden stormwater from flowing into the downstream receiving environment;
- Regular dust suppression on exposed areas by water truck or use of chemical dust suppressant;
- Rapid stabilisation of disturbed and exposed ground surfaces with hydro seeding in areas where imminent construction and building works are not proposed;
- Diversion of sediment-laden water into temporary sediment control basins for settling and flocculation, including provision of catch drains which may need to be moved/altered numerous times to suit construction sequencing. Rock check dams shall be installed along catch drains to minimise erosion;
- Inspections shall be undertaken prior to forecast significant rain events and as soon as practicable after storm events to check and maintain controls;
- Sediment to be removed from fences when controls are 40% full and at the completion of construction. All material to be re-used or stored on-site in a controlled manner or taken off-site for re-use or disposal at a licensed waste disposal facility;
- Geotextile inlet filters to be installed around all new stormwater inlet pits; and
- Monitoring of water quality to determine the effectiveness of the sediment and erosion control management practices;
- The sediment basin shall not be converted into its ultimate detention basin form until such time as all building and construction works have been completed and 90% of the site is stabilised.

Erosion and sediment control measures will remain in place for the duration of construction works and following completion until the site is fully stabilised.

## 5.5. Site Inspection and Maintenance

The inspection and maintenance requirements outlined in this section will need to be carried out during the bulk earthworks construction phase and until all areas have been suitably stabilised.

The Contractor's designated personnel will inspect the site's E&S control devices after every rainfall event and at least weekly, and will:

- Inspect and assess the effectiveness of the E&SCP and identify any inadequacies that may arise during normal work activities or from a revised construction methodology. Construct additional erosion and sediment control works as necessary to ensure the desired protection is given to downstream lands and waterways;
- Ensure that drains operate properly and to effect any repairs;
- Remove spilled sand or other materials from hazard areas, including lands closer than 5 metres from areas of likely concentrated or high velocity flows especially waterways and paved areas;
- Remove trapped sediment whenever less than design capacity remains within the structure;
- Ensure rehabilitated lands have affectively reduced the erosion hazard and to initiate upgrading or repair as appropriate;
- Maintain erosion and sediment control measures in a fully functioning condition until all construction activity is completed and the site has been rehabilitated;
- Remove temporary soil conservation structures as the last activity in the rehabilitation.

## 6. Flooding

### 6.1. Existing Creek Flooding

As identified in Council’s FloodWise Property Reports included under Appendix C, the Defined Flood Level for Lot 91 is 22.9m AHD and for Lot 86 is 23.9m AHD. This is based on the 1% Annual Exceedance Probability (AEP) or 1 in 100 year ARI flood event ,from the nearby Bullockhead Creek.

This is displayed graphically in Council’s City Plan -Creek/Waterway Flooding Overlay Maps – refer to Figure 9 below. The Floodwise reports also note that Lot 91 is within sub-categories 3, 4 and 5 of Council’s Creek/Waterway Flood Planning Area (FPA) and Lot 86 is only within FPA4. Please note, this may be an error, as it is not shown on the mapping and all existing levels on Lot 86 are higher than the DFL).

Figure 9 – Existing Creek Flooding Extents in vicinity of Site (BCC Interactive Mapping)



### 6.2. Proposed Development

The proposed development will comply with Acceptable Solutions A05.1 and A05.2 in relation to flood planning levels and not being located within the Flood Planning Area 1 or 2 sub-categories.

Per the BCC City Plan Flood Overlay Code– Table 8.2.11.3.L and Acceptable Solutions A017 and A018, the proposed development is required to achieve flood planning levels as a Category ‘C’ development. The minimum lot levels (for future building floor levels and pavements) are required to be above 1% AEP flood levels. In addition to the proposed lots, the new road is required to have a finished surface level above the 2% AEP flood levels at the crown of the road, compliant with Table 8.2.11.3.K.

Based on the existing site survey, the vast majority of the existing site levels are already well above the Designated Flood Level (i.e. DFL). The only exception, is a small area in the northern western corner of Lot 91

where the proposed bio-retention basin will be located (i.e. within proposed Lot 900). The basin embankment and underdrainage has been designed to ensure it has the required flood immunity. All proposed finished earthworks levels will also be above the DFL.

No flood modelling is proposed for the development since the majority of earthworks are located well above the Designated Flood Level and only very minor earthworks are proposed below this, where the proposed basin ties into existing surface levels. These works will be located above the 5%AEP flood extent and therefore comply with Acceptable Solution A08. Earthworks are not anticipated to have any impact on upstream or downstream flood levels in the creek.

### 6.3. Overland Flow

Brisbane City Council’s FloodWise Property Reports indicate that the subject site is not affected by inundation overlays associated with an overland flow path. However, as assessment of the flood overlays mapping system indicate that there is some potential overland flow running adjacent to the site along the carriageway of Progress Road.

As stated in the Brisbane City Plan 2014 – 8.2.11 Flood Overlay Code Table 8.2.11.3.K, flood planning levels for existing roads that provide access to or front a development, must have a 5% AEP flood level immunity, especially for an arterial road subject to overland flow flooding. This will be considered as part of the proposed road widening along Progress Road during detailed design phase.

Figure 10 – Existing Overland Flow Extents in vicinity of Site (BCC Interactive Mapping)



## 7. Summary

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This Civil Engineering Site Based Stormwater Management Plan has been completed for the proposed development at 372 Progress Road, Wacol. Key findings from AT&L's assessment and analysis are summarised below:

- The BCC FloodWise Property Report defines the Designated Flood Level (i.e. DFL) as 22.9m AHD; based on the 1% AEP (i.e. the 1 in 100-year ARI) storm event from the nearby watercourse, Bullockhead Creek, and the majority of the site is already above the DFL.
- No existing stormwater infrastructure within the subject lots is identified, the current stormwater runoff sheet flows onto Progress Road, McRoyle Street and across the boundary into Bullockhead Creek. An upstream catchment area of approximately 4,500m<sup>2</sup> has been identified from the adjacent industrial lot west of the subject site.
- On-site detention will not be required for the development as the subject site is discharging directly into the lower catchment of the Bullockhead Creek.
- Multiple stormwater quality treatment devices are proposed for the development – bio-pods are proposed for the treatment of the proposed new road; 30 x Atlan Stormsack pit inserts, 10 x Atlan Filter Cartridge unit and 3 x Atlan Cartridge Filter units are adopted for the internal allotment.
- The proposed bio-pods have a combined filter media area of 95m<sup>2</sup>. High flows will bypass the bio-pods discharge into the stormwater system that outlets to Bullockhead Creek via a headwall.
- The lawful point of discharge for the development site is the existing watercourse adjacent to the subject site, Bullockhead Creek.
- The existing stormwater gully pits and field inlets affected by the proposed roadworks in Progress Road will be relocated to suit the proposed road widening. A gully pit is proposed in McRoyle Street to improve the existing drainage condition.

# Appendix A

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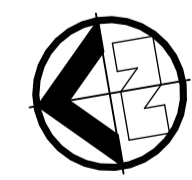
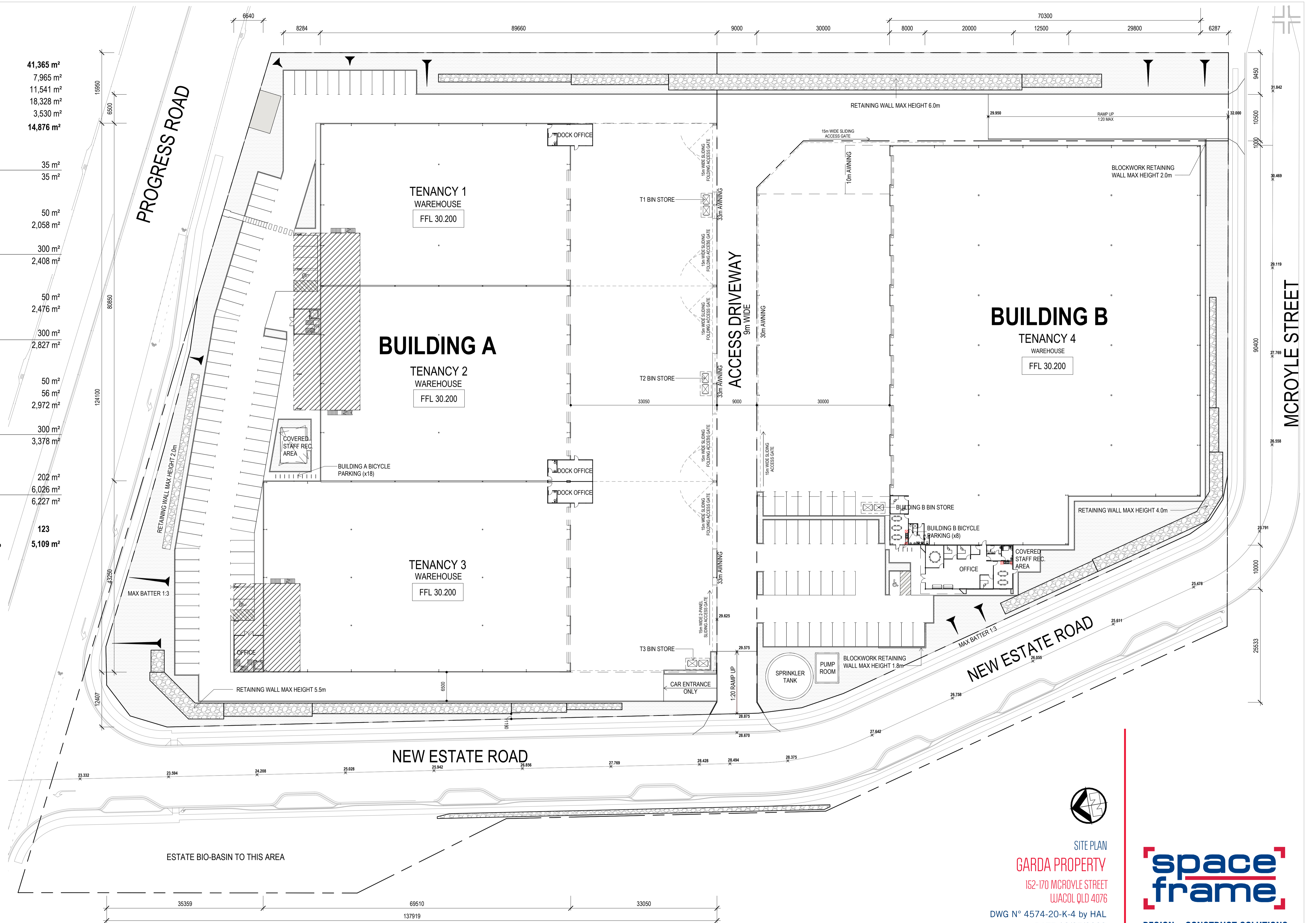
## Proposed Development Site Plans

### SITE INFORMATION

<b>OVERALL SITE</b>	<b>41,365 m<sup>2</sup></b>
New Estate Road	7,965 m <sup>2</sup>
Lease B	11,541 m <sup>2</sup>
Lease A	18,328 m <sup>2</sup>
Access Driveway	3,530 m <sup>2</sup>
<b>FLOOR AREA</b>	<b>14,876 m<sup>2</sup></b>
<b>COMMON AREA</b>	
GROUND FLOOR	
Lift Lobby	35 m <sup>2</sup>
	35 m <sup>2</sup>
<b>TENANCY 1</b>	
GROUND FLOOR	
Dock Office	50 m <sup>2</sup>
Warehouse	2,058 m <sup>2</sup>
FIRST FLOOR	
Office	300 m <sup>2</sup>
	2,408 m <sup>2</sup>
<b>TENANCY 2</b>	
GROUND FLOOR	
Dock Office	50 m <sup>2</sup>
Warehouse	2,476 m <sup>2</sup>
FIRST FLOOR	
Office	300 m <sup>2</sup>
	2,827 m <sup>2</sup>
<b>TENANCY 3</b>	
GROUND FLOOR	
Dock Office	50 m <sup>2</sup>
Office	56 m <sup>2</sup>
Warehouse	2,972 m <sup>2</sup>
FIRST FLOOR	
Office	300 m <sup>2</sup>
	3,378 m <sup>2</sup>
<b>TENANCY 4</b>	
GROUND FLOOR	
Office	202 m <sup>2</sup>
Warehouse	6,026 m <sup>2</sup>
	6,227 m <sup>2</sup>
<b>TOTAL CARPARKS</b>	<b>123</b>
<b>LANDSCAPING</b>	<b>15%</b>
	<b>5,109 m<sup>2</sup></b>

### SITE PLAN

1 : 400 @ A1



SITE PLAN  
**GARDA PROPERTY**  
 152-170 MCROYLE STREET  
 WJACOL QLD 4076  
 DWG N° 4574-20-K-4 by HAL  
 DATE 13/07/2023

