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Civil Development Application Report

Brookvale Oval Redevelopment

Prepared for Hassel / 22 Oct 2019

191326

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Contents

1.0 Introduction

Taylor Thomson Whitting has been engaged by Hassell Architects to provide civil engineering advice to support the Development Application for the redevelopment of the Brookvale Oval. The upgrade includes a proposed grandstand and centre of excellence at the northern end of the site which will utilise existing site access. The upgrade will also include an additional 10 parking spaces in addition to the existing parking arrangements on the western side of the stand.

The project involves a Centre of Excellence, a state-of-the-art facility to be used by professional sportsmen and women in conjunction with the community, and 3,000 covered seats to deliver an improved experience for spectators attending the site. The project will support the operations of the Manly Warringah Sea Eagles (MWSE) and ensure its viability into the future. The Project represents a significant investment into rugby league in the region, and is being jointly funded by the Federal Government, New South Wales State Government, and the MWSE.

1.1 Relevant Documents

The following documents have been reviewed in preparing this document:

- Warringah Council On-Site Stormwater Detention Technical Specification
- PL850 Water Management Policy (2017)
- Building over or adjacent to constructed Council Drainage Systems and Easements Technical Specification.
- Northern Beaches Mapping
- Northern Beaches Council WSUD & MUSIC Modelling Guidelines (2016)

2.0 Site Overview

2.1 Site Location and Topography

The Brookvale Oval (the site) is located at Lot 1 DP 784268, Lot 1 on DP 114027, Lot B on DP966128, and Lot 6 on DB 785409. The site is within the Warringah area of the Northern Beaches Council. The site is bounded by Pittwater Road to the south, Federal Parade to the north Pine Avenue to the east and Alfred Road to the west. Refer to Figure 1. The Brookvale Oval is a sporting ground for the Manly Warringah Sea Eagles. The subject site currently includes an existing carpark, some landscaped areas located along the site's western boundary with Alfred Road and a mix of paved and landscaped areas along the subject site's northern boundary with Brookvale Northern park.

Figure 1 Site Location

The proposed works are located at the western and northern sides of the site. The new carpark towards the West will replace an existing landscaped area adjacent to the existing carpark. The new building footprint towards the North will replace some landscaped areas, some trees, a concrete path, small structures and some seats for spectators as shown in Figure 2.

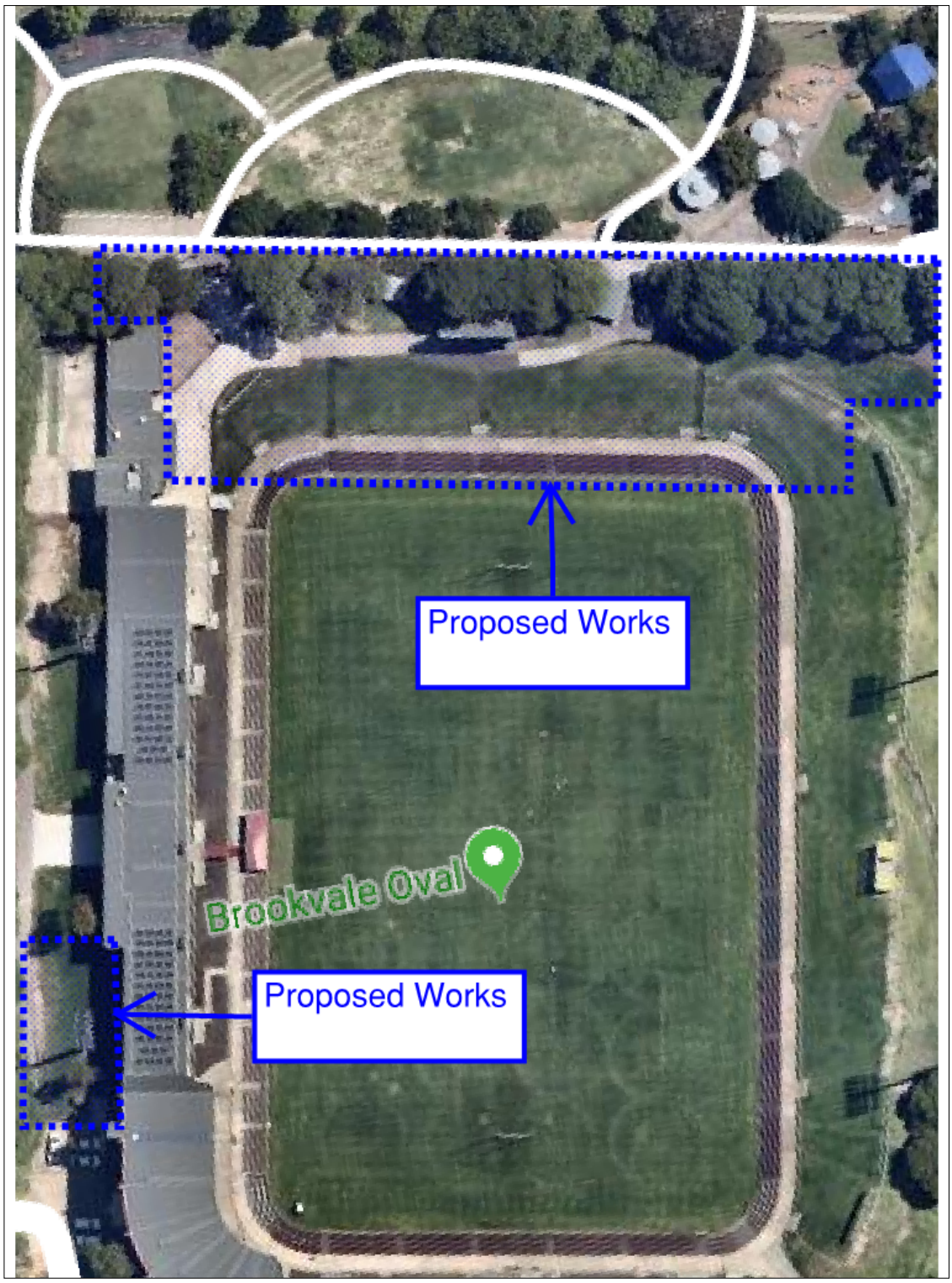

Figure 2 Existing site conditions

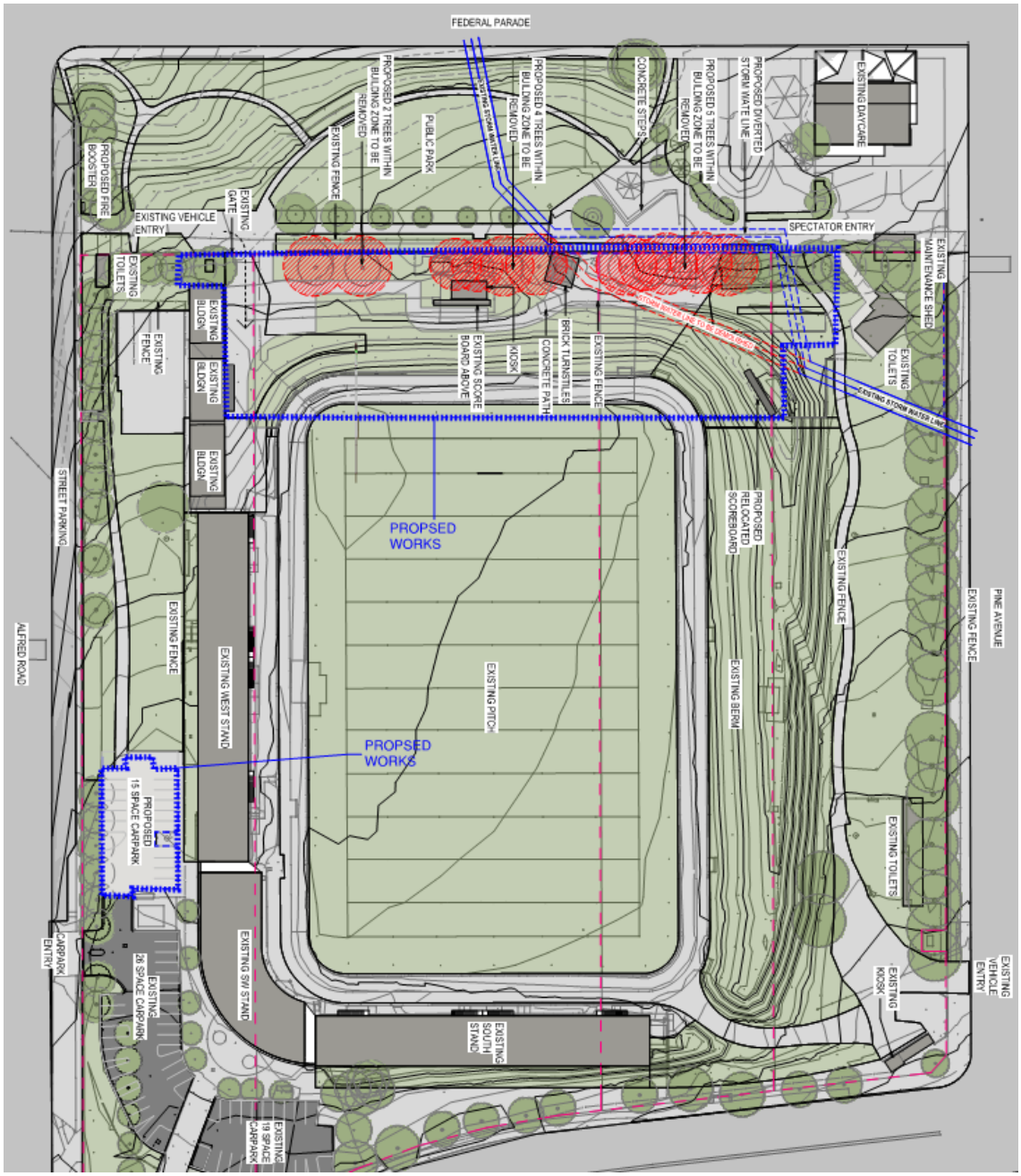

Figure 3 Proposed development extent

3.0 Proposed Development

The scope of the proposed works includes:

- Consolidate the MWSE training and administration bases at one location;
- Provide improved training facilities for all players (from community to elite levels) to develop their skills as well as for professional players to have access to high performance training facilities;

- Provide spectators with additional covered seating that delivers the highest quality viewing and entertainment experience possible at MWSE home games;
- The proposed Centre of Excellence and Grandstand will have a footprint of approximately 1,800 square metres, and span over two levels;
- A cantilevered roof will extend over the seating area.
- Changeroom and Amenities; and
- Proposed carpark to the west.

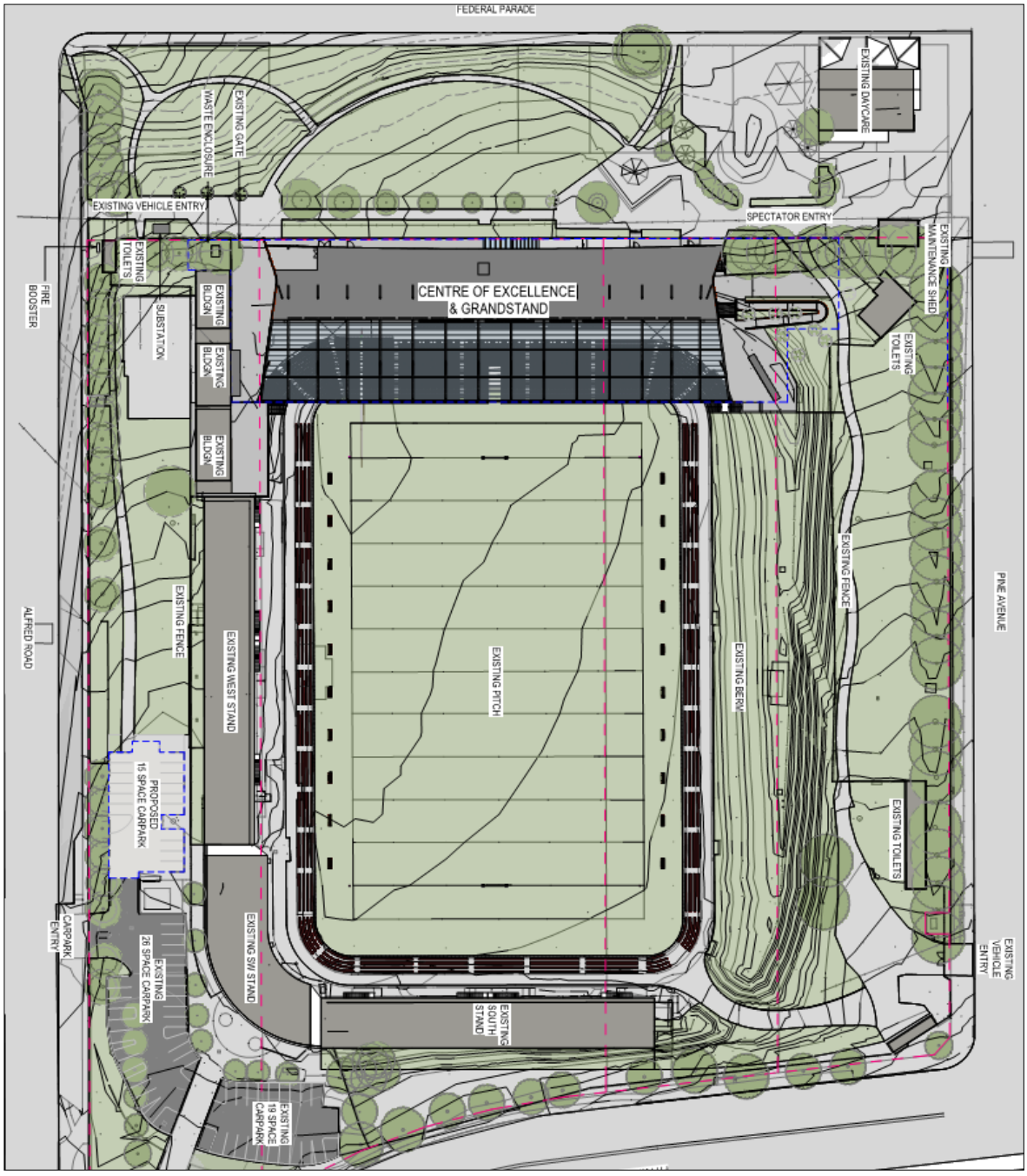

Figure 4 Proposed development by Hassell

Figure 5 Proposed Development Visualisation from the South-West

Figure 6 Proposed Development Visualisation from the North

Figure 7 Proposed Development Visualisation from the East

4.0 Stormwater

4.1 Existing Stormwater

The site generally falls from the north towards the south of the site.

There is an existing stormwater easement with a 600mm pipe crossing the site. This will be diverted around the proposed works. The proposed stormwater system will connect to the existing stormwater 600mm pipe.

Figure 8 Existing Stormwater Layout

4.2 Proposed Stormwater

The objective is to provide stormwater controls that ensure that the proposed development does not adversely impact on the quantity or quality of stormwater flows within, adjacent and downstream of the site. The site must drain to Council's existing drainage system.

4.2.1 Proposed Drainage System

The site stormwater system for the development has been designed to capture concentrated flows from impermeable surfaces including building roofs, on-grade pavements and courtyards open to the sky. The proposed stormwater management system for the development includes:

- Pit and pipe drainage network to collect runoff from areas;
- Stormwater flows up to the 5-year ARI event are conveyed by a minor drainage system; and
- Stormwater flows above the 5-year ARI event are conveyed by a major drainage system;

It is to be noted that the flowrates generated to size the internal pit and pipe network are based off Australian Rainfall and Runoff – A Guide to Flood Estimation 2016.

4.2.2 Stormwater Quantity Control

The Warringah Council On-Site Stormwater Detention Specification states that Generally OSD is required for all developments where the total existing and proposed impervious areas exceed 40% of total site area.
The Specification states that OSD must limit post-development discharge to the “state of nature condition” for the 5-year ARI and 100-year ARI” storm events. The state of nature condition is found by using an impervious percentage of 0% over the area of the site.

The total piped flow from the site must not exceed the maximum 5-year ARI predevelopment runoff. The total piped and overland flows from the site must not exceed the 100-year ARI predevelopment discharge.

The OSD storage has been sized to cater for the storm events up to and including the 100-year ARI storm event, its capacity has been modelled and analysed in DRAINS modelling software to ensure the proposed OSD system complies with Council’s stormwater related requirements. Refer to Figure xx for the DRAINS modelling layout. Note that the methodology for calculating stormwater flows has been based on the methods detailed in Australian Rainfall and Runoff 2016.

A comparison of the pre and post development flows has been shown in Figure xx, which indicates that the proposed OSD complies with Council’s requirements.

The proposed OSD will have a footprint of 70 m2 and is designed to provide 169m3 of storage. The catchment area captured is 0.5ha. The restricted flow from the OSD system is to be conveyed by the proposed inground drainage system and connected to the existing 600mm stormwater pipe in the diverted stormwater easement.

Council states that rainwater reuse storage cannot be credited against the calculated OSD storage except for single residential dwellings in Clause 2.3 of the on-site detention technical specification.

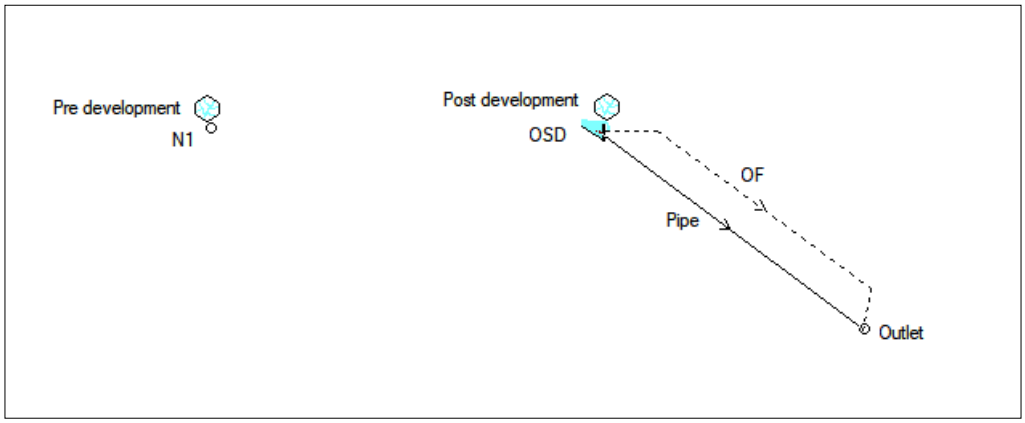

Figure 9 DRAINS Modelling Layout

	Pre-developed Flow (m3/s)	Post-developed
5-year ARI storm event	0.107	0.073
100-year ARI storm event	0.251	0.107

Table 1 Pre and Post Development Comparison

The proposed stormwater will connect the new roof to a 50KL rainwater re-use tank (RWT). The 50KL RWT and driveway will discharge into the storm filter chamber inside the OSD tank before discharging to the existing stormwater system adjacent to Pine Avenue. The existing stormwater pipe has a diameter of 600mm and runs south along Pine Street and eventually to Curl Curl Lagoon as shown in Figure 10 below. The existing 600mm pipe will be diverted around the building perimeter as shown in Figure 11.

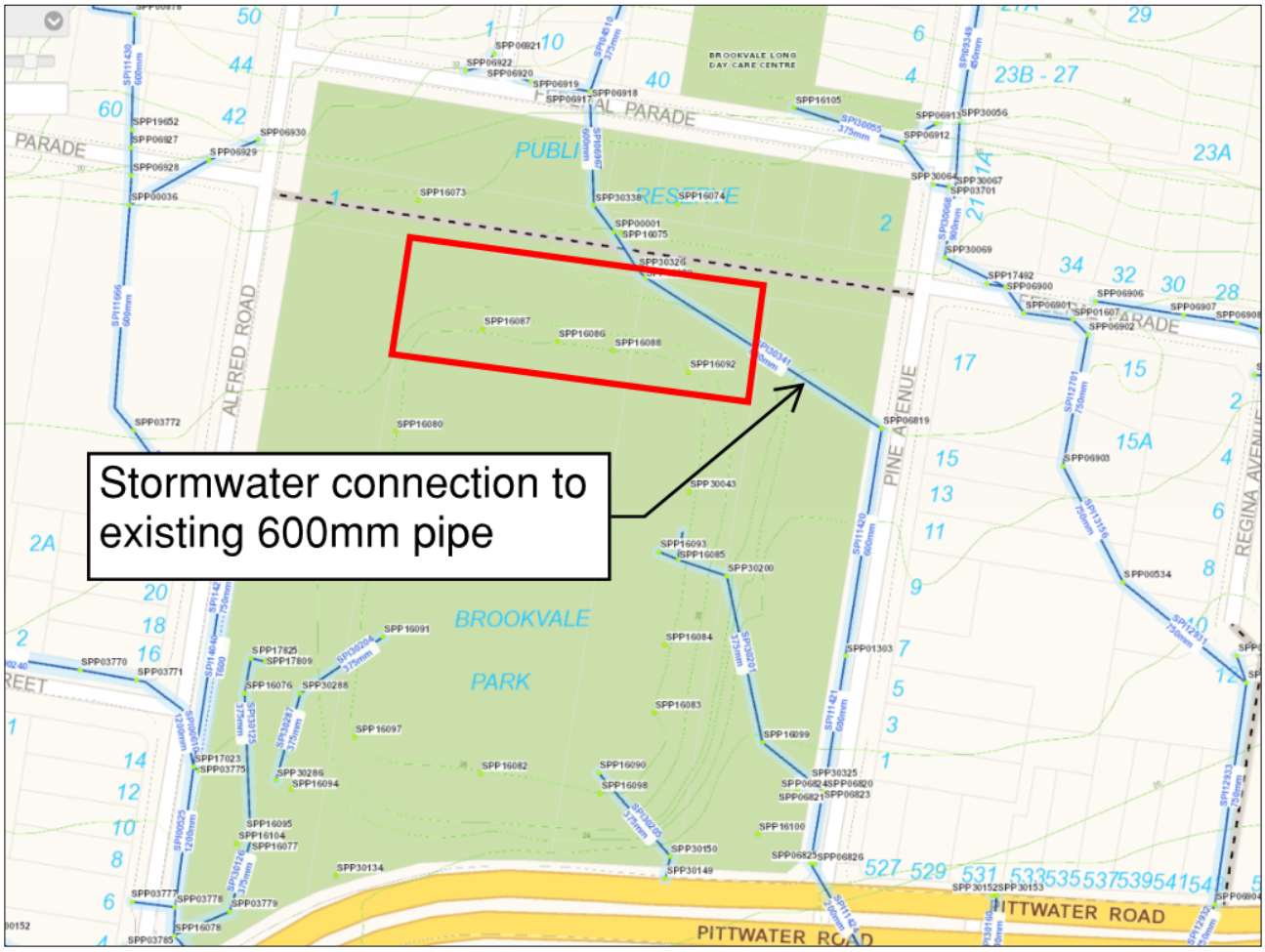

Figure 10 Existing Stormwater Layout

4.2.3 Overland Flow Path

The OSD is designed to cater for storm events up to the 100-year ARI storm events. The overland flow path is designed to cater for storm events greater than the 100-year ARI to avoid flooding of the building. The proposed path outside the proposed building perimeter is to fall away from the building towards the proposed grassed swale designed to convey the overland flow path route. This overland flow path will pass under the suspended slab of the accessways to the building. All building entry levels adjacent to the grassed swale are higher than the overland flow path route levels as shown in Figure 11.

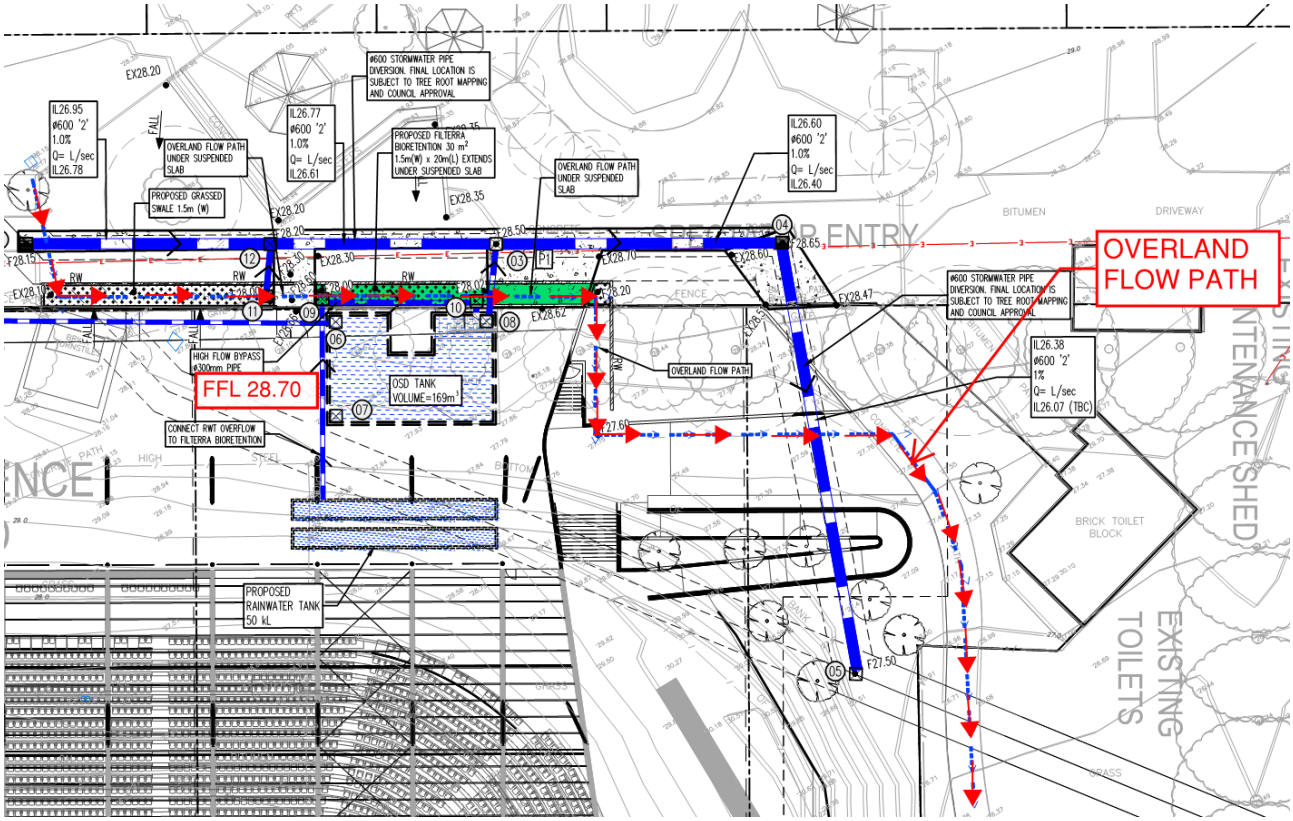

Figure 11 Overland Flow Path Route

4.2.4 Authority's Stormwater Quality Control Requirements

Council's PL850 Water Management Policy stipulates that stormwater treatment measures are required to reduce stormwater pollutants according to the following targets:

- 85% removal of total suspended solids;
- 65% removal of total phosphorus; and
- 45% removal of total nitrogen.
- 90% Gross Pollutants

4.2.5 Stormwater Quality Control Measures

The stormwater quality treatment train is designed based on the impervious area provided by the architect and modelled in MUSIC software to show compliance with council targets.

The northern side of the site is designed in MUSIC to treat pollutants from the roof and driveway. The western side of the site is not treated as it is a porous granite gravel surface.

The WSUD treatment terrain includes: 50KL Rainwater tank (RWT) re-use for irrigation and toilet purposes, one (1) ocean guard to treat the driveway area and a 'filterra bioretention' with a minimum of surface area of 30 m^2 by Ocean Protect or equivalent.

There are a number of measures that can reduce pollutant loadings with their effectiveness varying depending on the targetted pollutant, land use type, maintenance access or requirements and site topography. The proposed combination of measures aims to provide the most efficient and manageable measures suited to the site. The individual elements of the proposed treatment train for the site are summarised in the table below:

Element	Description
Rainwater Tank: Refer to hydraulic plans for details.	• Rainwater tanks are an effective measure as they can remove pollutant loads at source. • The pollutant removal process occurs through harvesting roof runoff for reuse, thereby reducing the nutrients that are discharged into the stormwater network. • It is proposed to provide one (1) 50kL rainwater reuse tank for the northern proposed roof, plumbed for landscape irrigation and toilet use as detailed on the hydraulic engineer's plans. • The rainwater tank shall receive a mains top up from a potable water source.
Ocean Guard	• One (1) ocean guard is proposed in the driveway pit to treat the driveway. Refer to Appendix B for details.
Filterra Bioretention	• Filterra Bioretention 30m^2 is proposed to treat roof water. Refer to Appendix B for details.

Table 2 Proposed Water Quality Measures

4.2.6 MUSIC Modelling

The effectiveness of the combination of treatment train measures has been assessed using numerical modelling within MUSIC (Model for Urban Stormwater Improvement Conceptualisation version 6). The results of the modelling were compared against the Council's pollutant reduction targets to determine the effectiveness of the proposed measures.
MUSIC simulates the performance of a group of stormwater management measures, configured in series or in parallel to form a "treatment train" against historic rainfall event data sets. It is the industry standard water quality modelling software developed by the MUSIC Development Team of the Cooperative Research Centre for Catchment Hydrology (CRCCH).
The MUSIC User Manual suggests that the time-step should not exceed the time of concentration of the smallest sub-catchment however due consideration must also be made regarding the shortest detention time of nodes within the treatment train.

4.2.7 MUSIC Catchment Breakdown

The Table below provides a breakdown of the catchment areas used in the MUSIC model:

	Catchment Area (ha)	% Imperviousness
Roof	0.465	100%
Driveway	0.028	100%

Table 3 MUSIC Catchment Breakdown

4.2.8 Event Mean Concentration

MUSIC uses different event mean concentrations (EMC) to determine the pollutant loads generated by different land uses. The standard EMCs adopted within MUSIC were based on research undertaken by Duncan (1999) through the CRCCH and the results are reproduced in Australian Runoff Quality – A Guide to

Water Sensitive Urban Design (ARQ). The EMC values used in the MUSIC models for this project were based on the Sydney Catchment Management Authority (CMA) Source Node(s) utilising modified % impervious area, rainfall threshold, soil properties & pollutant concentrations. The table below summarises the parameters used for the development site;

NODE TYPE	MEAN BASE FLOW CONCENTRATIONS Log_{10} (mg/L)			MEAN STORM FLOW CONCENTRATIONS Log_{10} (mg/L)		
	TSS	TP	TN	TSS	TP	TN
Roof	Not Applicable*Note			1.300	-0.890	0.300
Impervious	Not Applicable*Note			2.150	-0.600	0.300
Pervious	1.200	-0.850	0.110	2.150	-0.600	0.300

Table 4 EMC Inputs for MUSIC

**Note – Impervious areas do not have base flows.*

4.2.9 Results

The results of the modelling are summarised below with the pollutant loads expressed in kilograms per year. The reduction rate is expressed as a percentage and compares the pollution from the post developed site to that of the existing developed state of the site to determine whether the reduction targets have been achieved.

Treatment Train Effectiveness - Receiving Node

	Sources	Residual Load	% Reduction
Flow (ML/yr)	3.69	2.42	34.6
Total Suspended Solids (kg/yr)	164	23.1	85.9
Total Phosphorus (kg/yr)	0.648	0.141	78.2
Total Nitrogen (kg/yr)	8.1	2.13	73.7
Gross Pollutants (kg/yr)	107	0	100

Table 5 MUSIC Results

GP	=	Gross Pollutants	TSS	=	Total Suspended Solids
TP	=	Total Phosphorus	TN	=	Total Nitrogen

The MUSIC model layout is shown in the figure below.

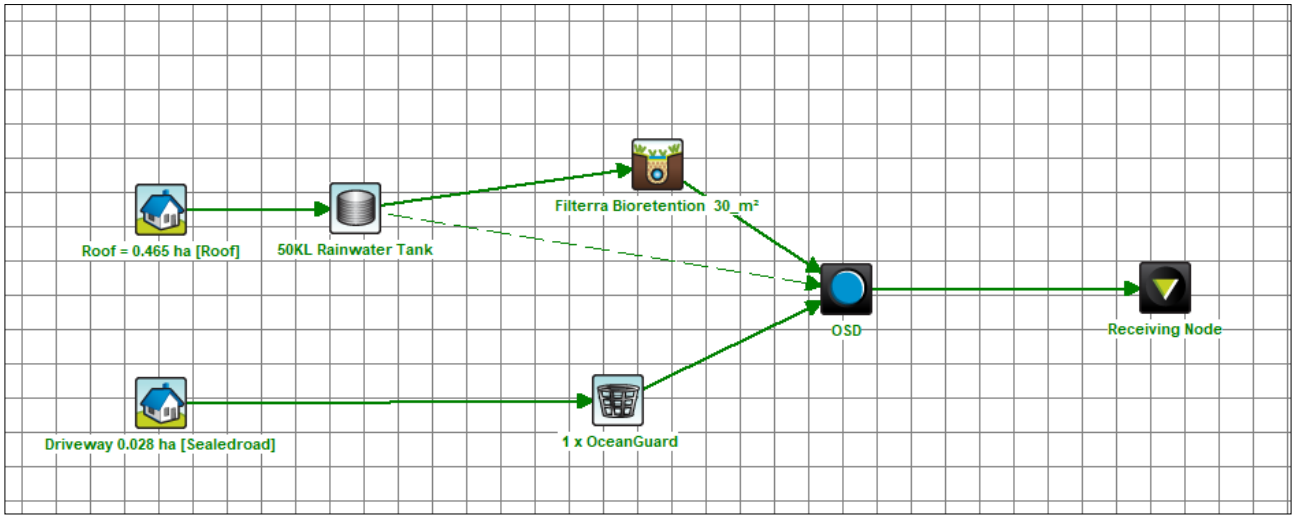

Figure 12 MUSIC model Layout

The results tables show that the proposed treatment train will achieve the reduction targets for the full range of pollutants. Through the implementation of the proposed water quality measures stormwater discharge from the site can be effectively managed to ensure that there is no detrimental effect to the water quality downstream of the subject site.

According to the MUSIC modelling results, the proposed strategy achieves the reduction targets specified by Council summarised in Table 6.

	Council's Load Reduction Targets	MUSIC Model Reduction Results
Total Suspended Solids	**85%**	85.9%
Total Phosphorus	**65%**	78.2%
Total Nitrogen	**45%**	73.7%
Gross Pollutants	**90%**	100%

Table 6 Council's Load Reduction Targets & MUSIC Results Comparison

5.0 Building over Council Drainage Systems

A 600mm stormwater pipe runs underneath the proposed works area. The minimum easement width is 3m. If an easement does not already exist, then an easement shall be granted in accordance with Council's standard terms and all costs are to be borne by the applicant. Diversion of the stormwater system is our recommended solution as the vertical height from the surface level over the public drainage system to the underside of the overlying structure shall be a minimum 5.0m and the horizontal distance between permanent obstructions along the lone of the drainage system shall be a minimum of 3.0m.

A right of carriage way in favour of Council will need to be created to provide access to the drainage system. The minimum clearances shall be 3.5m for both horizontal and vertical clearance.

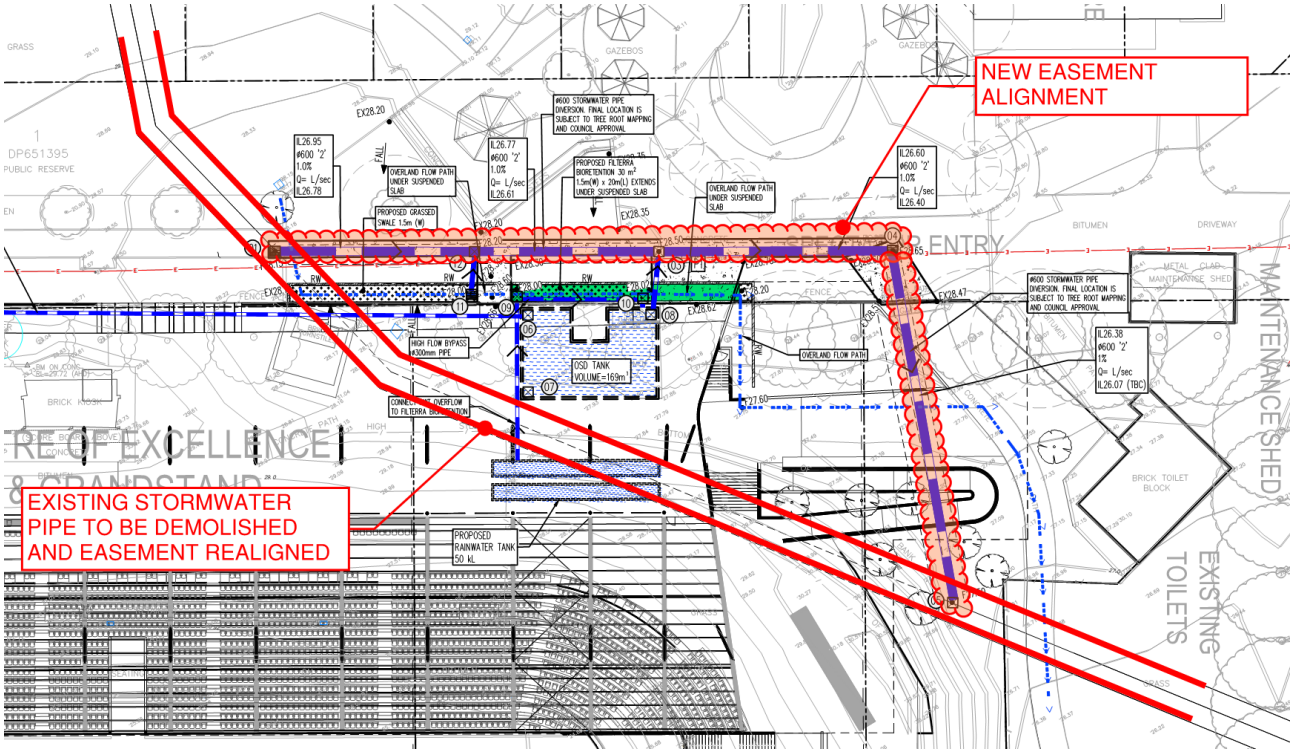

Figure 13 Stormwater Easement Diversion

6.0 Flooding

Northern Beaches Mapping on the Council's website shows that the proposed site is outside the flood risk planning precinct. Figure 14 is an extract from the Warringah Flood Risk Precinct Map.

The oval on the site may have localised flooding but the site is not at risk of mainstream flooding. All habitable floor areas are to have a 500mm freeboard above the 100-year ARI water surface level. Basement entries and other potential water entry points are to have a minimum 500mm freeboard above the 100-year ARI water surface level.

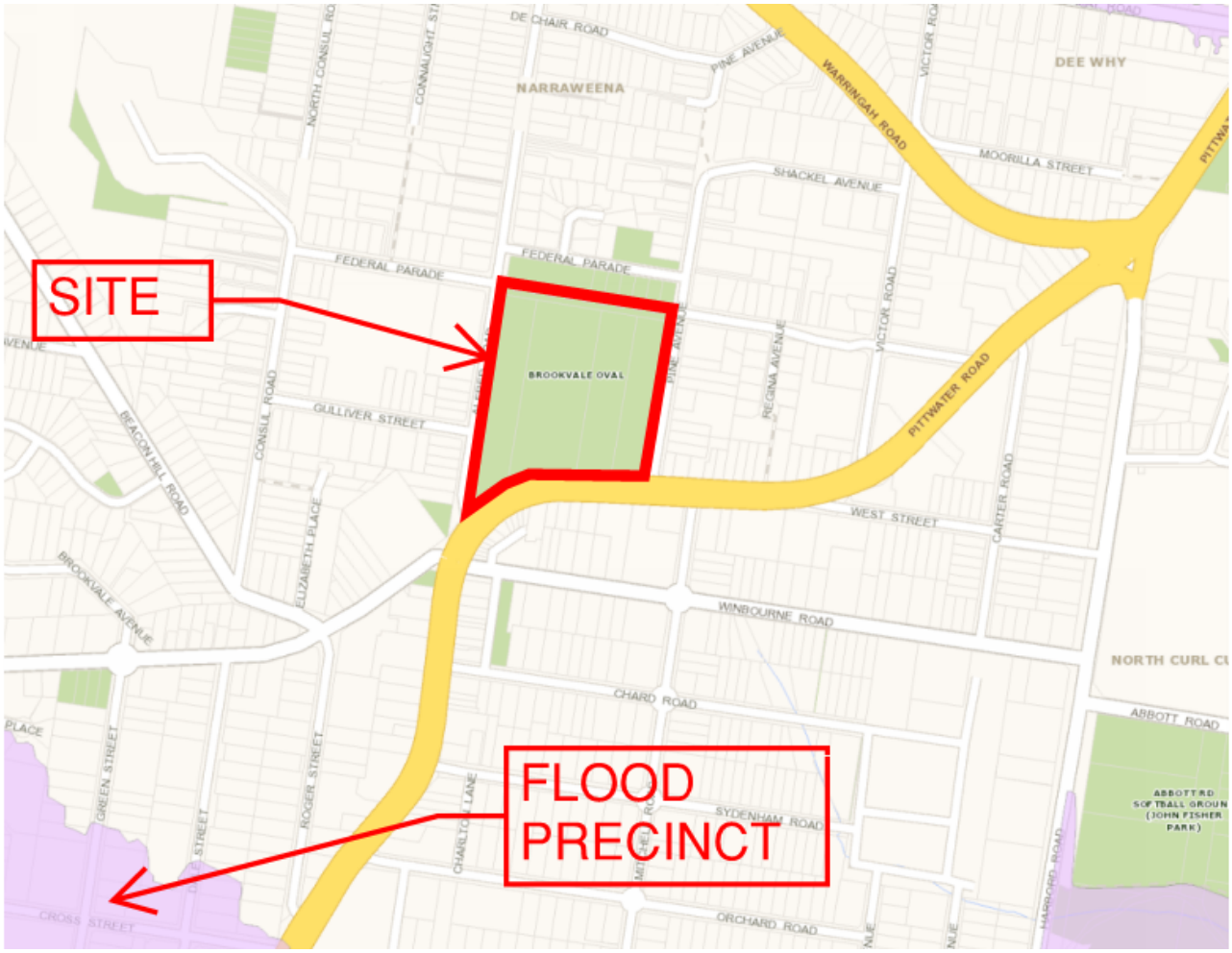

Figure 14 Flood Risk Precinct Map

7.0 Construction Phase Erosion and Sediment Control

During the construction phase of the project, an erosion and sediment control plan, will be implemented to prevent sediment laden stormwater from entering the stormwater drainage network. Stormwater controls on site are detailed in the erosion and sediment control plan, refer to drawing SKC04-P4. This plan is in accordance with the “Blue Book” - Managing Urban Stormwater: Soils and Construction (Landcom NSW). The plan may vary based on construction staging and methodology, but will typically include:

- Protection of stormwater and kerb inlet pits;
- Silt fences;
- Dust control; and
- Vehicle wash down.

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STEPHEN BRAIN
Technical Director

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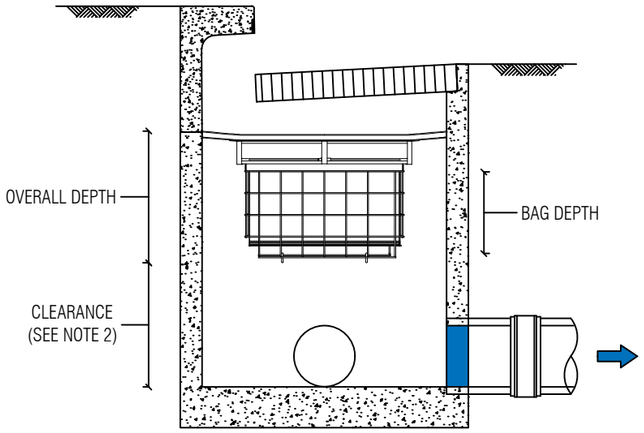
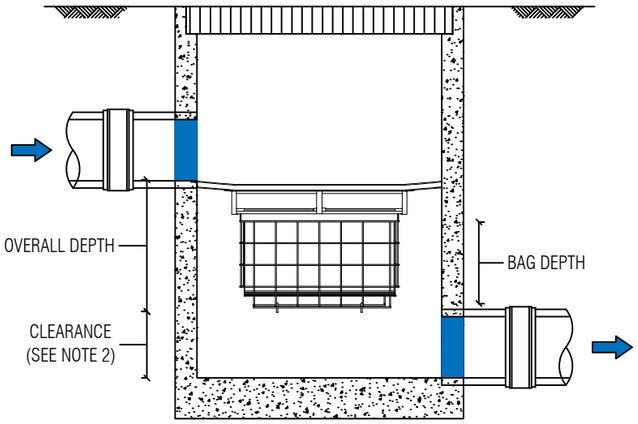
Appendix A

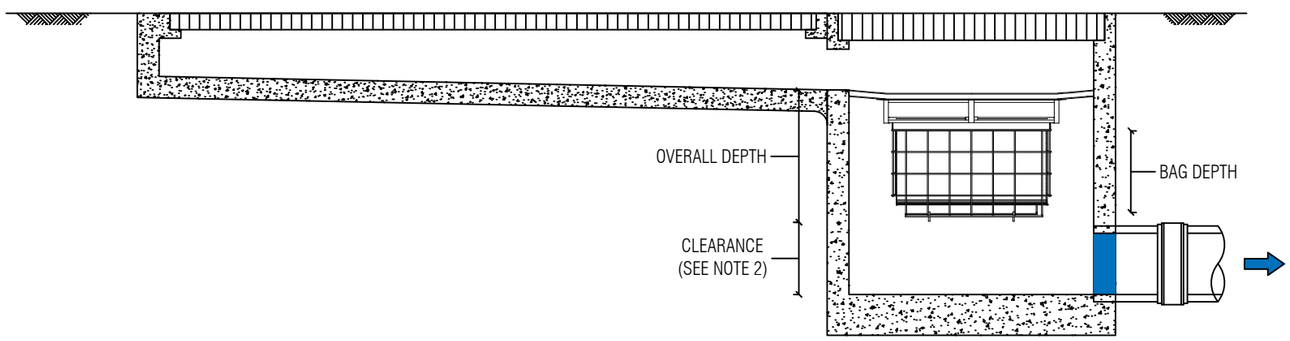
Ocean Guard Detail



SURFACE FLOW CONFIGURATION



PIPE FLOW CONFIGURATION

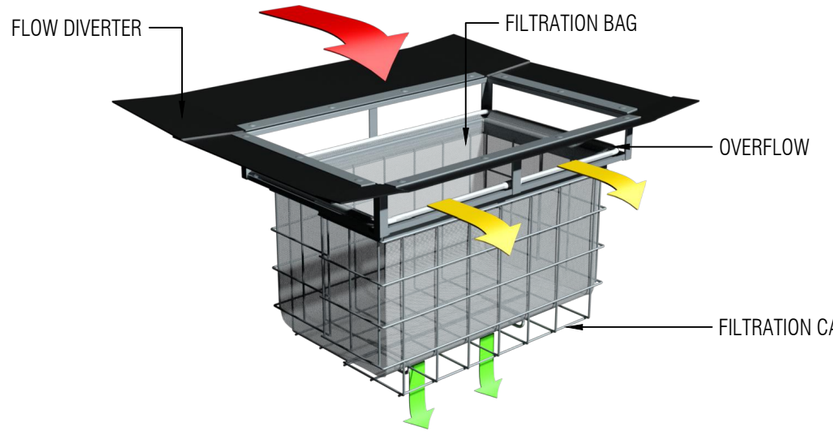


GRATED STRIP DRAIN CONFIGURATION

PLAN ID	MAXIMUM PIT PLAN DIMENSIONS
S	450mm x 450mm
M	600mm x 600mm
L	900mm x 900mm
XL	1200mm x 1200mm

DEPTH ID	BAG DEPTH	OVERALL DEPTH
1	170	270
2	300	450
3	600	700

		DEPTH ID		
		1	2	3
PLAN ID	S	■		
	M	■	■	
	L	■	■	■
	XL	■	■	■



GENERAL NOTES

1. THE MINIMUM CLEARANCE DEPENDS ON THE CONFIGURATION (SEE NOTE 2) AND THE LOCAL COUNCIL REQUIREMENTS.
2. CLEARANCE FOR ANY PIT WITHOUT AN INLET PIPE (ONLY USED FOR SURFACE FLOW) CAN BE AS LOW AS 50mm. FOR OTHER PITS, THE RECOMMENDED CLEARANCE SHOULD BE GREATER OR EQUAL TO THE PIPE OBVERT SO AS NOT TO INHIBIT HYDRAULIC CAPACITY.
3. OCEAN PROTECT PROVIDES TWO FILTRATION BAG TYPES:- 200 MICRON BAGS FOR HIGHER WATER QUALITY FILTERING AND A COARSE BAG FOR TARGETING GROSS POLLUTANTS.
4. DRAWINGS NOT TO SCALE.

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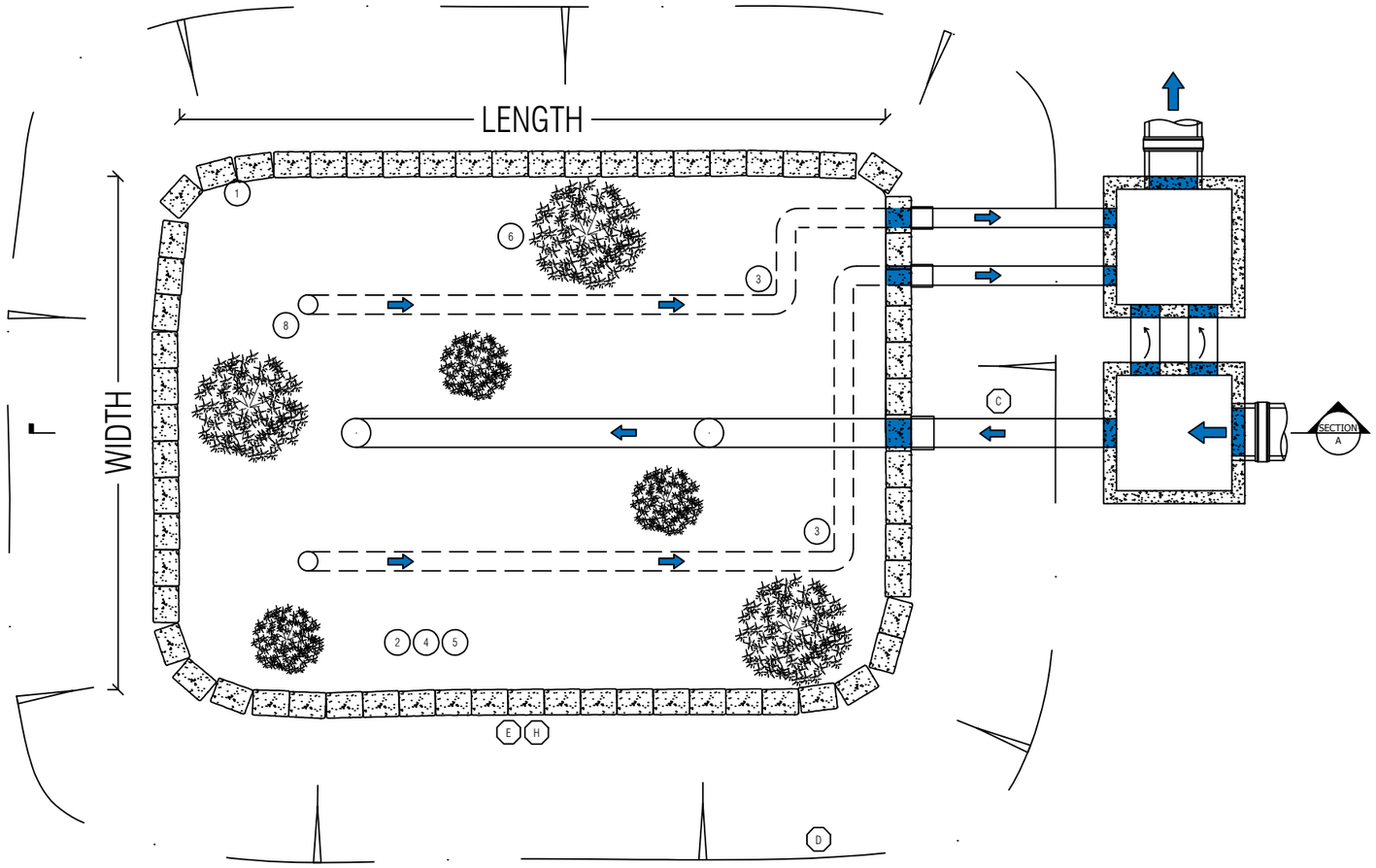
TYPCIAL ARRANGEMENTS
SPECIFICATION DRAWING

LAST MODIFIED: 18-03-19

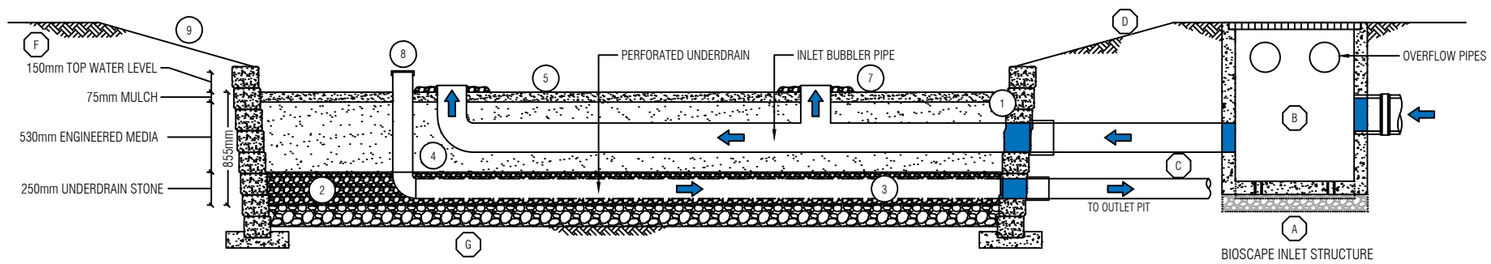
Appendix B

Filterra Bioretention Detail

NOT FOR CONSTRUCTION



PLAN



SECTION A-A

(PLANTING NOT SHOWN FOR CLARITY)

SITE SPECIFIC REQUIREMENTS		
COUNT	DESCRIPTION	INSTALLED BY
	FILTERRA SURFACE AREA (m^2)	OCEAN PROTECT
	MULCH VOLUME (m^3)	OCEAN PROTECT
	FILTERRA MEDIA DEPTH (mm)	OCEAN PROTECT
	VOLUME OF UNDERDRAIN STONE (m^3)	OCEAN PROTECT
	FILTERRA LINER (m)	OCEAN PROTECT

PLANTING SCHEDULE	
COUNT	FILTERRA BIOSCAPE SYSTEM PLANT PALETTE

GENERAL NOTES

- CONTRACTOR SHALL CONTACT OCEAN PROTECT TO COORDINATE DELIVERY AND INSTALLATION OF FILTERRA BIOSCAPE SYSTEM. OCEAN PROTECT ACTIVIATION CAN ONLY OCCUR ONCE CONTRACTOR RESPONSIBILTIES ARE COMPLETE.
- PERFORM FILTERRA BIOSCAPE SYSTEM EXCAVATION ONLY AFTER ALL THE CONTRIBUTING DRAINAGE AREAS ARE PERMANENTLY STABILISED. DO NOT CONSTRUCT FILTERRA BIOSCAPE SYSTEM IN AN AREA PREVIOUSLY USED AS EROSION AND SEDIMENT CONTROL FACILITIES. DO NOT STOCKPILE MATERIALS OR STORE EQUIPMENT IN THIS AREA. CONTRACTOR SHALL TAKE APPROPRIATE MEASURES TO PREVENT CONSTRUCTION-RELATED EROSION RUNOFF FROM ENTERING THE FILTERRA MEDIA BAY.
- FILTERRA SHALL BE INSTALLED OFFLINE AS EARLY AS POSSIBLE AFTER SITE STABILISATION TO ALLOW FOR SOIL MATURITY AND SYSTEM ESTABLISHMENT.
- CONTRACTOR SHALL COORDINATE WITH OCEAN PROTECT BEFORE THE FILTERRA BIOSCAPE SYSTEM IS EXCAVATED TO MINIMISE THE TIME BETWEEN EXCAVATION AND COMPLETION OF THE FILTERRA BIOSCAPE SYSTEM. ONCE EXCAVATED, ANY STANDING WATER THAT ACCUMULATES IN THE EXCAVATED AREA MUST BE REMOVED BY THE CONTRACTOR BEFORE OCEAN PROTECT CAN COMMENCE THE FILTERRA BIOSCAPE SYSTEM. ANY ADDITIONAL EXCAVATION WILL BE THE RESPONSIBILITY OF THE CONTRACTOR.
- CONTRACTOR SHALL PROVIDE ACCESS TO THE EXCAVATED AREA(S) FOR OCEAN PROTECT TO USE DURING THE CONSTRUCTION OF THE FILTERRA BIOSCAPE SYSTEM(S). ACCESS SHALL NOT PROHIBIT LIGHT DUTY EQUIPMENT THAT MAY BE USED TO INSTALL THE COMPONENTS (STONE, MEDIA, ETC). THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY RE-STABILIZATION THAT MAY BE REQUIRED AFTER THE FILTERRA BIOSCAPE SYSTEM INSTALLATION/ACTIVATION.
- OCEAN PROTECT AND/OR ITS REPRESENTATIVES SHALL BE RESPONSIBLE FOR THE LIST ENTITLED 'OCEAN PROTECT INSTALLATION RESPONSIBILITIES'.
- NO FLOW SHALL ENTER THE FILTERRA SYSTEM UNLESS OCEAN PROTECT HAS ACTIVATED THE SYSTEM AND CONFIRMED ESTABLISHMENT

CONTRACTOR WORKS AND INSTALLATION RESPONSIBILITIES

A. CONTRACTOR TO PLACE FILTERRA INLET STRUCTURE ON BEDDING AS SPECIFIED BY THE ENGINEER. OCEAN PROTECT SUGGESTS AS A MINIMUM TO USE 150MM BEDDING STONE ON COMPACTED SUB-GRADE TO 90% DENSITY. UNSUTIABLE MATERIAL SHALL BE REPLACED AS ADVISED BY THE ENGINEER.
B. CONTRACTOR SHALL PROVIDE AND INSTALL DRAINAGE ITEMS TO, FROM AND INCLUDING THE INLET AND OUTLET STUCTURES AS PER THE APPROVED SITE PLANS.
C. OCEAN PROTECT CAN PROVIDE COUPLERS AT THE FILTERRA INTERFACE FOR CONNECTION TO THE INLET DIVERSION PIPES. ALL DRAINAGE TO AND FROM THE FILTERRA MUST ALLOW FOR POSITIVE FLOW.
D. CONTRACTOR TO PROVIDE BATTER ACCORDING TO DIMENSION AND SLOPE SHOWN ON PLANS. SLOPE FROM SHOULDER TO FILTERRA BIOSCAPE SYSTEM SURFACE PERIMETER SHALL NOT EXCEED 3:1. TURF IS REQUIRED TO STABILISE SIDE SLOPES SHOWN ON DETAIL AND ON PLAN SHEETS.
E. CONTRACTOR TO EXCAVATE MEDIA AREA CORRESPONDING TO THE SIZE OF THE FILTERRA BIOSCAPE SYSTEM SURFACE AREA AS SHOWN ON DETAIL AND ON PLAN SHEETS.
F. CONTRACTOR SHALL EXCAVATE VERTICALLY FROM BOTTOM OF UNDERDRAIN STONE OR DRAINAGE STONE IF REQUIRED, TO ELEVATION OF MULCH AS SHOWN ON THIS DETAIL.
G. CONTRACTOR TO CONFIRM DEPTH OF EXCAVATION. IF THE EXCAVATION HAS BEEN MADE TOO DEEP AND ADDTITIONAL UNDERDRAIN STONE NEEDS TO BE USED TO RAISE THE BASE OF THE FILTERRA, THIS COST SHALL BE TAKEN ON BY THE CONTRACTOR.
H. RETAINING WALLS AND ADDITIONAL EROSION CONTROL AROUND THE FILTERRA BIOSCAPE SYSTEM. RETAINED OFFLINE FROM FILTERRA

OCEAN PROTECT SUPPLY AND INSTALLATION RESPONSIBILITIES

1. GEOTEXTILE FABRIC ALONG THE PERIMETER OF THE FILTERRA BIOSCAPE SYSTEM EXCAVATION.
2. UNDERDRAIN STONE. TYPICALLY 250mm THICK (50mm UNDER THE PIPING 150mm AROUND THE PIPING AND 50mm ABOVE THE PIPING)
3. 150mm UNDERDRAIN PIPING UNLESS OTHERWISE APPROVED BY OCEAN PROTECT, ASSOCIATED PIPING AND FITTINGS/ELBOWS TO CONNECT TO THE PIPING/FITTING(S) THAT IS PROVIDED BY CONTRACTOR (SEE CONTRACTOR INSTALLATION RESPONSIBILITIES THIS DETAIL).
4. 530mm FILTERRA MEDIA.
5. 75mm DOUBLE SHREDDED HARDWOOD MULCH OVER ENTIRE FILTERRA BIOSCAPE SYSTEM SURFACE AREA.
6. PLANTINGS OF PLANTS SELECTED BY ENGINEER THAT MATCH OCEAN PROTECTS APPROVED PLANTING LIST.
7. RIPRAP APRON AROUND ALL FLOW ENTRY POINTS AS DESIGNED AND INDICATED ON THIS DETAIL
8. CLEAN-OUT ADAPTER,PLUG AND PIPING.
9. COMMISIONING THE SYSTEM

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FILTERRA BIOSCAPE SYSTEM
WITH BIOSCAPE INLET STRUCTURE
SPECIFICATION DRAWING

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