Warren Smith & Partners

30 MAY 2017

CIVIL ENGINEERING SERVICES

Bank Street Commercial Wharf Upgrade

Stormwater Management Report

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CIVIL ENGINEERING SERVICES

1. INTRODUCTION

Warren Smith & Partners (WS+P) has been engaged by Urban Growth NSW to prepare a stormwater management report for a s75W application to modify part 3A Approval MP11-0001 at Bank Street, Pyrmont. UrbanGrowth NSW is preparing a modification application in relation to the earlier Part 3A approval for Sydney Heritage Fleet facilities at 5 Bank Street, Pyrmont (MP 11_0001). The proposal involves the relocation of a RMS licensed Commercial Operator from Pyrmont Bridge Road, Glebe to the Bank Street, Pyrmont site to enable the development of the New Sydney Fish Market. The proposal is in effect a decanting of water-based operations within Blackwattle Bay and allows a working harbour use to continue in generally the same location with similar operational parameters to its current use. This report acknowledges the Secretary's Environmental Assessment Requirements (SEARS) and aims to outline the strategy plan associated with the following: -

- Stormwater drainage works;
- Water quality requirements; and;
- Sediment and erosion control.

1.1 BACKGROUND

The existing site is located on the western end of Bank Street, Pyrmont, approximately 500m west of the Sydney CBD and is lies directly under the eastern side of the Anzac Bridge. The site is bound by private land on its eastern and north western boundary and Blackwattle Bay on the southwest quadrant. Please refer to Figure 1 for an aerial view of the development area.

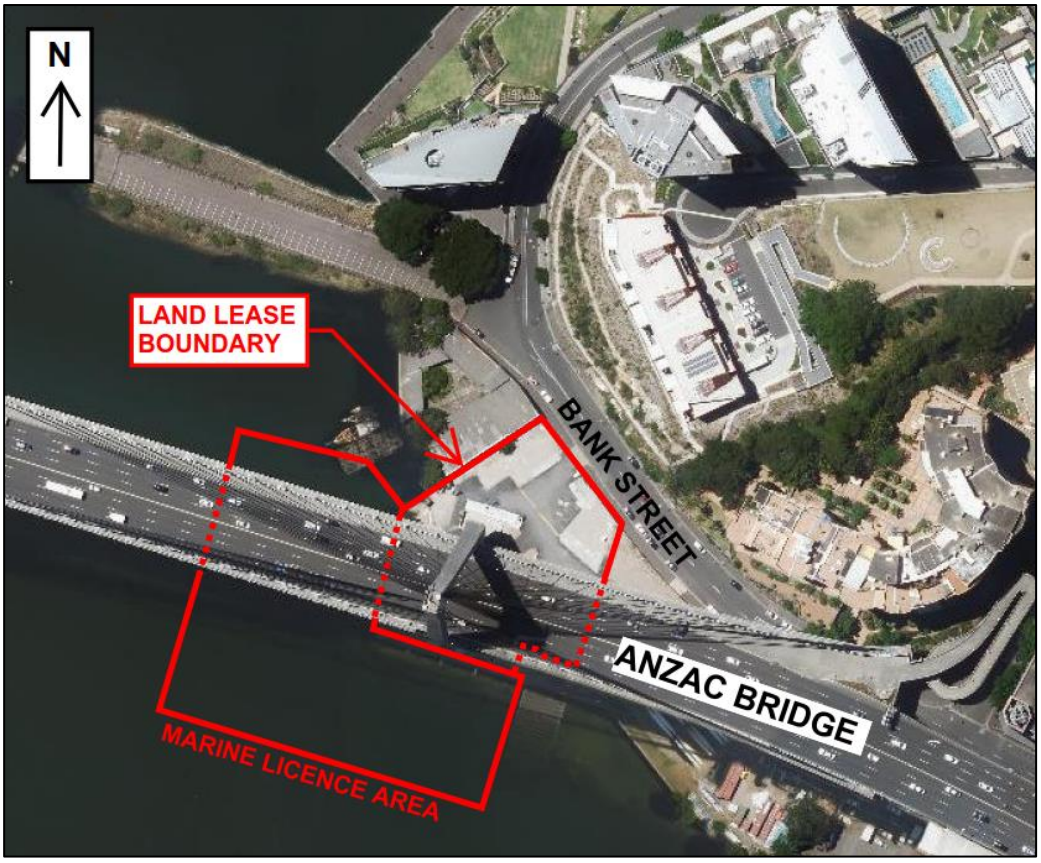


Figure 1: Aerial View of Development Area (Source: Google)

2. EXISTING STORMWATER INFRASTRUCTURE

A desktop review and site inspection was carried out in order to determine the existing drainage infrastructure within the development site. The inspection revealed the following: -

- The existing site is split into two levels. The upper level batters down to the ground level of the Anzac Bridge pylon.
- Bank Street grades towards a sag point just east of the existing driveway. There are two (2) council kerb inlet pits at this location which reticulate south and discharge into Blackwattle Bay.
- As per the Craig and Rhodes survey undertaken in November 2016, a 3m drainage easement traverses the site in the north-eastern quadrant.
- There are several closed stormwater manholes within the site. The pipework between these pits remains unknown.

Please refer to Figure 2 for the location of existing stormwater infrastructure.

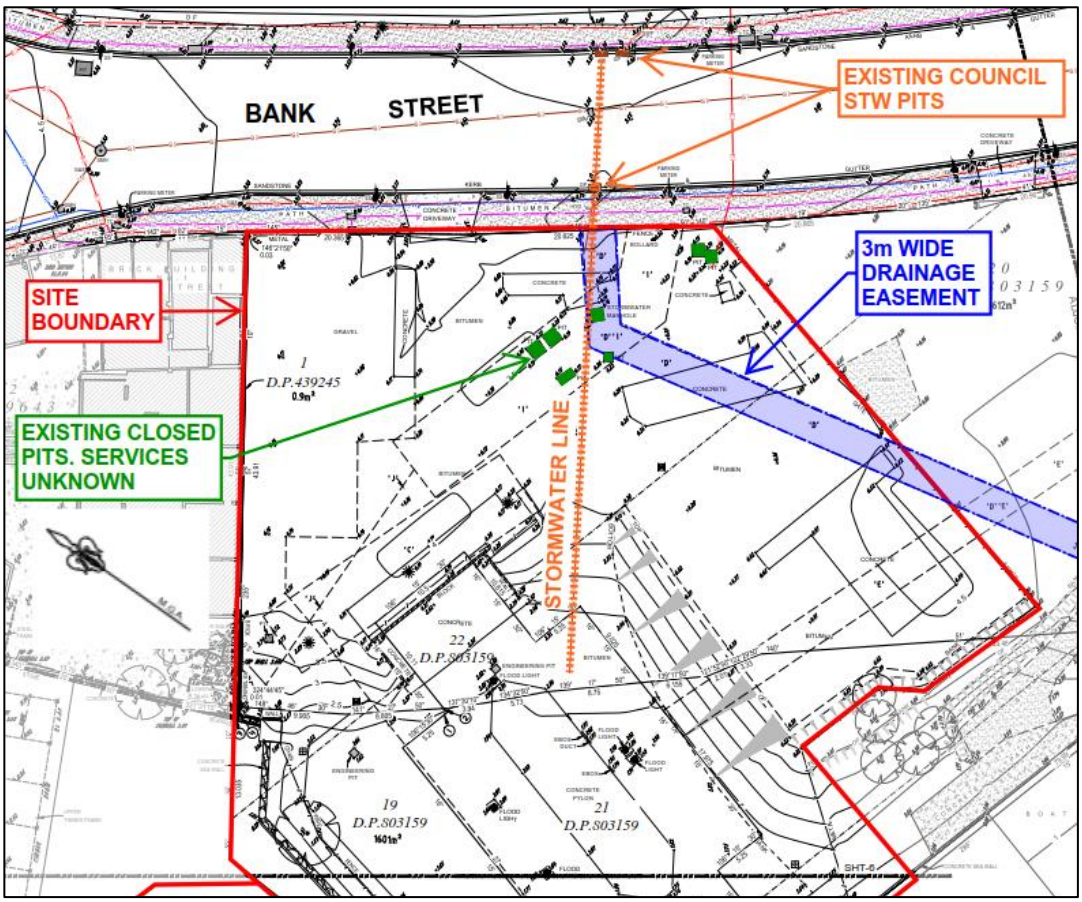


Figure 2: Aerial View of Existing Site Conditions

For further details, please refer to the Craig and Rhodes survey, dated 15th November 2016, which is attached in *Schedule 1.*

3. AUTHORITY AND REGULATORY REQUIREMENTS

3.1 STORMWATER DRAINAGE AND ON-SITE DETENTION REQUIREMENTS

With reference to the City of Sydney's *Development Control Plan (DCP) 2012, Section 3.7.2 Drainage and Stormwater Management* and the *Stormwater Drainage Manual,* dated 7th June 2016, the stormwater requirements are as follows:-

- All piped stormwater systems must be designed to cater for storms up to and including the 5% AEP storm event, and;
- Overland flows must be designed to cater for storms up to and including, the 1% AEP storm event.

3.2 WATER SENSITIVE URBAN DESIGN (WSUD) REQUIREMENTS

With reference to the City of Sydney DCP 2012, *Part 3.7.3 Stormwater Quality*, the WSUD requirements are presented in Table 1 below.

Table 1: WSUD Stormwater Quality Performance Targets

Pollutant Type	Target Reduction Percentage (%)
Gross pollutants	90%
Total Suspended Solids	85%
Total Phosphorus	65%
Total Nitrogen	45%

4. PROPOSED STORMWATER DRAINAGE SYSTEM

The proposed development has a total catchment area of 0.3654 Ha. The site runoff will be captured and discharged by 3 main stormwater networks. The first network will capture water from the lower ground area around the Anzac bridge pylon and discharge directly into Blackwattle Bay. As this area discharges directly into the Bay, no on-site detention is required.

A second stormwater network will capture runoff from the northwest quadrant of site and connect directly into an existing council pit in Bank Street. This area will not require OSD as the post development flow rates do not exceed the existing pre-development rates. Please refer to Table 2 for details.

Table 2: North West Catchment Discharge Rates

AEP Storm Event (%)	Pre-Development Flow Rate (L/s)	Post Development Flow Rate (L/s)
20	35	30
5	42	41
1	60	57

A third pit and pipe system will capture runoff from the eastern side of site which incorporates the demountable office, shipping containers and services enclosure. This system will connect into a new pit built over the existing stormwater line, which runs into Blackwattle Bay. Similarly, this area does not require OSD as the post development flow rates for the catchment do not exceed the pre-development rates. Please refer to Table 3 for details.

Table 3: East Catchment Discharge Rates

AEP Storm Event (%)	Pre-Development Flow Rate (L/s)	Post Development Flow Rate (L/s)
20	34	32
5	46	41
1	59	51

Please refer to Figure 3 for details on the proposed stormwater reticulation plan.

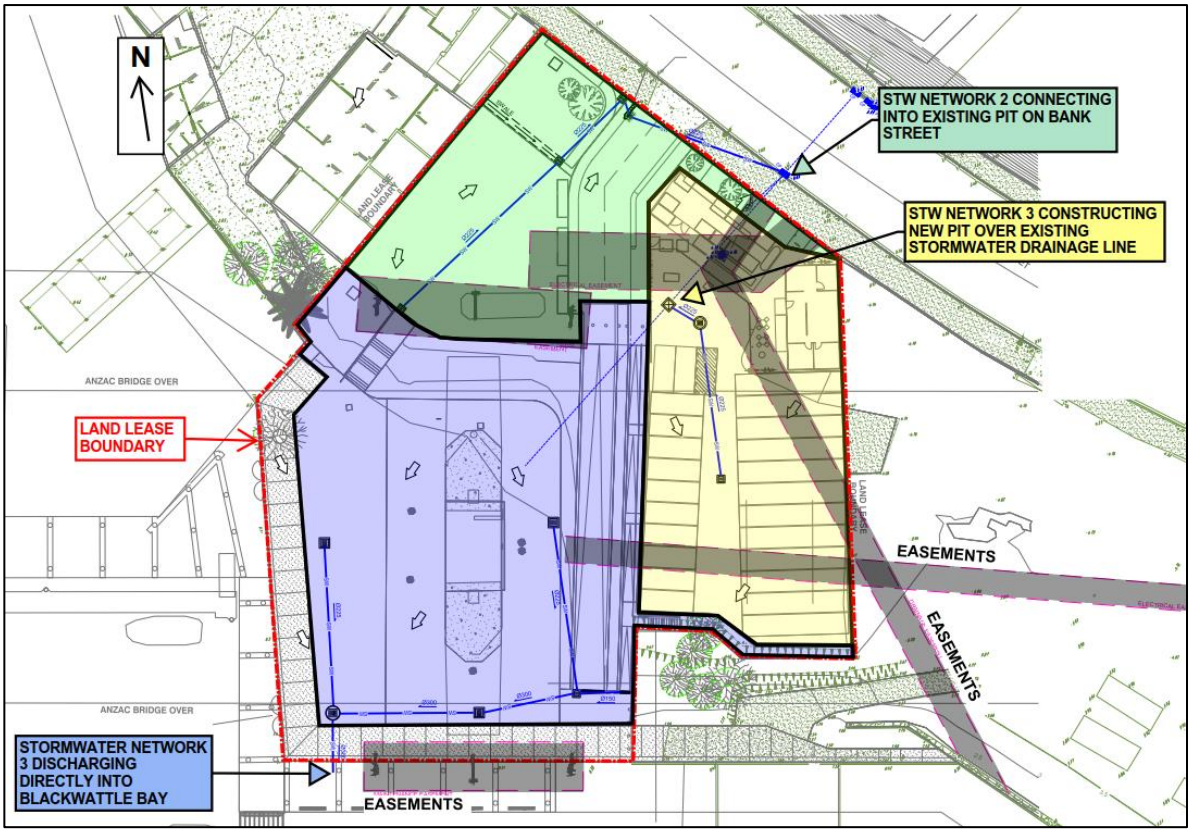


Figure 3: Proposed Stormwater Plan

4.1 OVERLAND FLOW

The proposed development site lies at the base of a natural sag point in the existing topography. In larger storm events, overland flow from five (5) local streets reticulate towards the two sag pits identified in Section 2 and through the proposed site to Blackwattle Bay. Overland flow from the residential developments at 20 Bank Street also flows down the existing sandstone embankment, through the site and towards the Bay. Please refer to Figure 4 and Figure 5 for details.

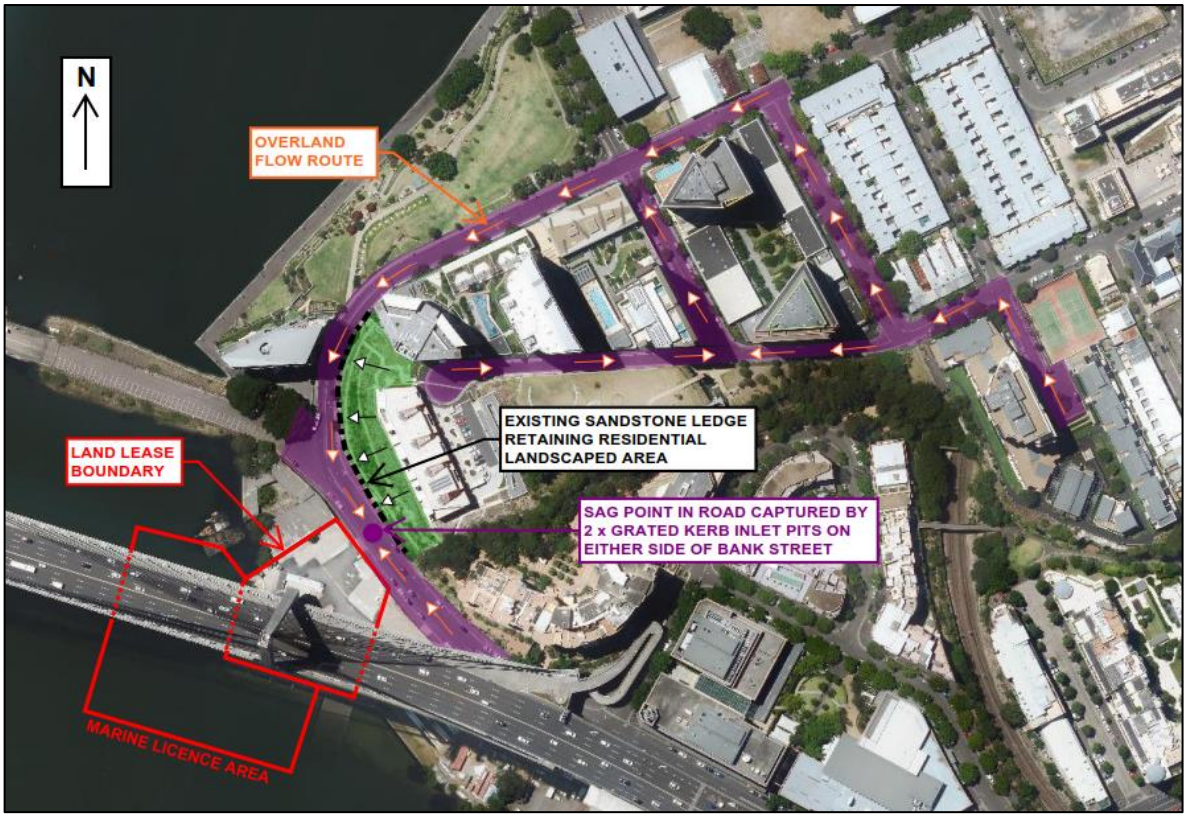


Figure 4: Existing Upstream Overland Flow Route

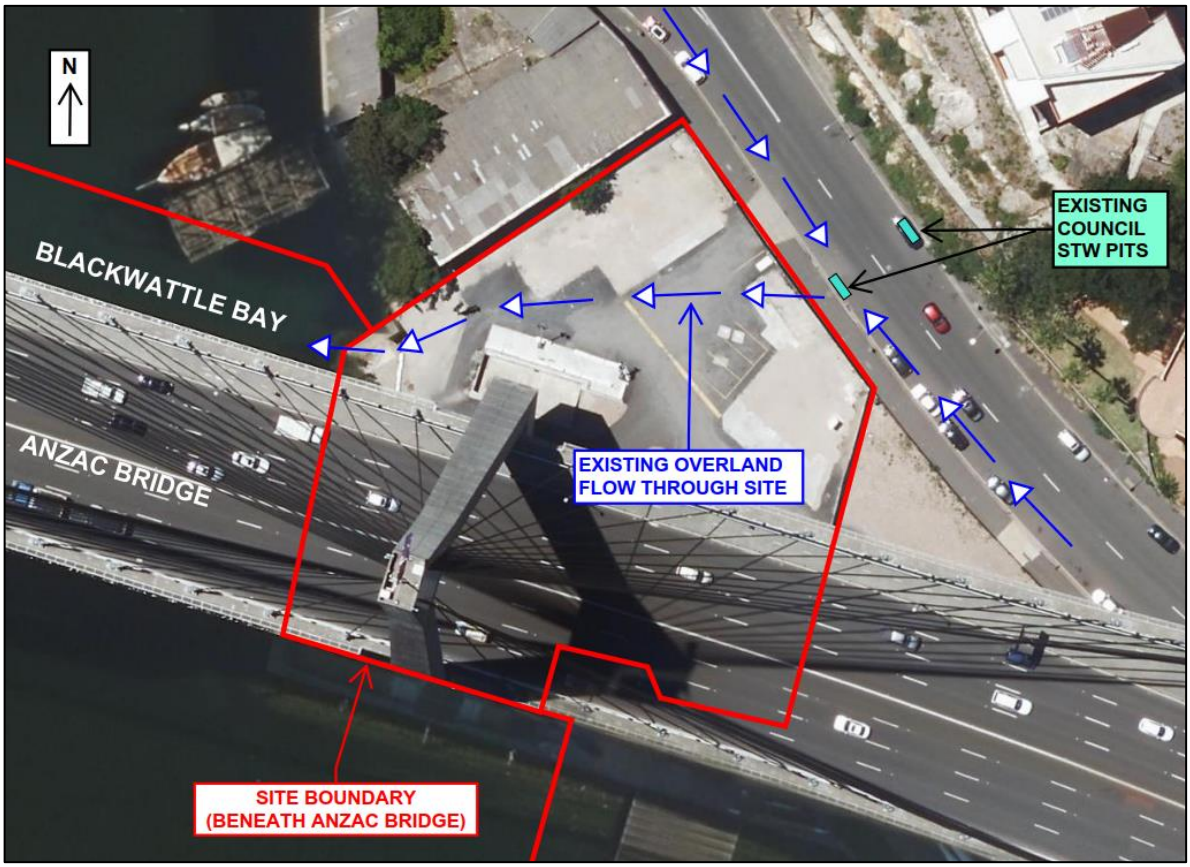


Figure 5: Existing Overland Flow Route Through Site

As the proposed site levels do not vary much in comparison to the existing RLs, the initial location of the overland flow route through the site remains unchanged. As a result the services enclosure will divert the existing overland flow north west and into the pedestrian footpath heading south to Blackwattle Bay. Please refer to Figure 6 for details on the proposed overland flow route.

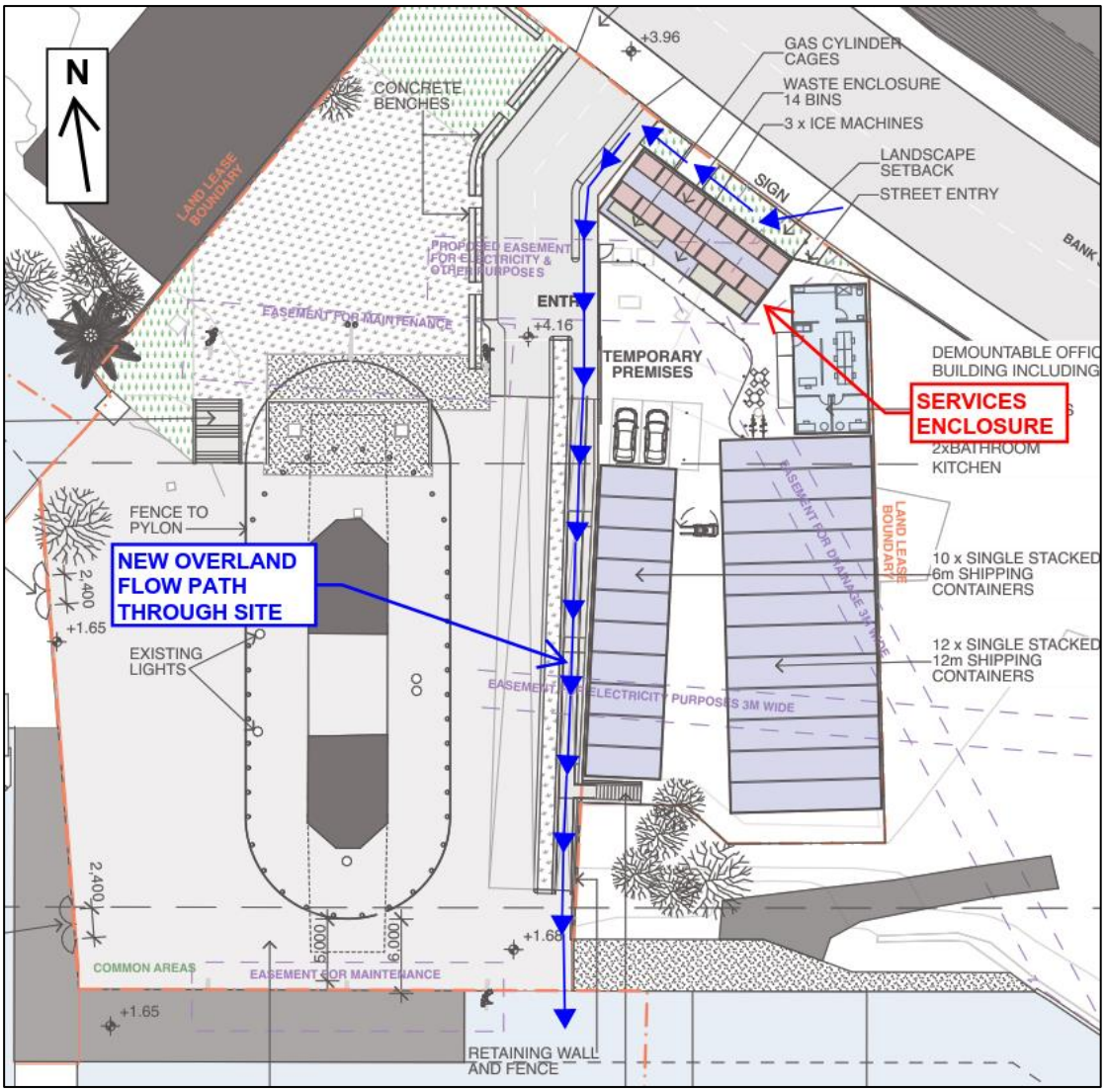


Figure 6: Overland Flow Route Through Proposed Development

4.2 FLOODING AND FLOOD PLANNING LEVELS (FPL)

The development site is located within the Blackwattle Bay Catchment area. With reference to the Blackwattle Bay Catchment Flood Study, published in September 2015, the site has frontage to very minor flooding adjacent to Bank Street in the 1% AEP. Please refer to Schedule 2 for existing flood maps. The City of Sydney's Interim Floodplain Management Policy indicates that the FPL for industrial or commercial business developments must be set at the 1% AEP flood level. Although the proposed office is to be a demountable building the floor level must be set at a minimum of the 1% AEP flood level. From the existing Blackwattle Bay Flood Study, this level can

be taken as RL 4.37m.

4.3 CLIMATE CHANGE

The extent of potential sea level rise due to climate change has been documented in SLR's *Climate Change and Sea Level Rise Report*, May 2017. The report uses sea level data for Blackwattle Bay from the following three main sources:-

- Fort Denison Sea Level Rise Vulnerability Study, NSW Coastal Unit (2008);
- The CSIRO-COM Climate Change Induced Sea Level Rise Predictions, and;
- Blackwattle Bay Catchment Flood Study.

This data is used to outline the sea level changes for different scenarios of future concentrations of carbon dioxide emissions over the next approximately 80 years. It determines the short and long term sea level rise for a scenario in which there is minimal curbing of carbon dioxide emissions (RCP 8.5) and a scenario in which carbon dioxide emissions peak around 2040. Please refer to Table 4 for details.

Table 4: Short and Long Term Rise in Sea Level in Blackwattle Bay

Design Year	RCP4.5	RCP8.5
2030 (applies to 2020-2040 period)	1.565 (= 1.375 + 0.14 + 0.05)	1.625 (= 1.375 + 0.15 + 0.1)
2090 (applies to 2080-2100 period)	2.175 (= 1.435 + 0.59 + 0.15)	2.475 (= 1.435 + 0.84 + 0.2)

The proposed office block must be set above the adopted level of sea rise. The office block is proposed to be set at an RL of 4.37m which is significantly greater than the worst case scenario of sea level rise of RL 2.475m.

5. WATER QUALITY MANAGEMENT

In order to follow City of Sydney's requirements for the adequate treatment of stormwater runoff, treatment solutions have been provided for the development area to remove suspended solids and nutrients prior to being discharged from site.

5.1 POTENTIAL POLLUTANTS GENERATED

The pollutants that could potentially be generated as a result of the development are as follows: -

- Litter;
- Sediments;
- Nutrients (Nitrogen and Phosphorus), and;
- Hydrocarbons

The development has been modelled to demonstrate the performance of the stormwater treatment system utilising a program called MUSIC (Model for Urban Stormwater Improvements Conceptualisation). MUSIC models the proposed stormwater treatment devices and estimates their respective performance against the performance targets of the project. The pollutants modelled in MUSIC are Gross Pollutants, Total Suspended Solids (TSS), Total Phosphorus (TP) and Total Nitrogen (TN).

5.2 RAINFALL

The rainfall data used in the MUSIC model was based on the Bureau of Meteorology data and is presented in Table 5 below.

Table 5: Rainfall Data for MUSIC Modelling

Rainfall Station	Rainfall Period	Rainfall Period Dates	Time Step
066062 Sydney Observatory	5 years	1 Jan 1981 – 31 Dec 1985	6 minutes

The average potential evapotranspiration (PET) data used in the MUSIC model was based on the average monthly PET data for the Sydney region and is presented in Table 6.

Table 6: Monhtly Evapotranspiration Data for MUSIC Modelling

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
PET (mm)	180	135	128	85	58	43	43	58	88	127	152	163

5.3 RAINFALL RUNOFF PROPERTIES

In accordance with the Draft NSW MUSIC Modelling Guidelines, dated August 2010, Table 7 and Table 8 present the rainfall runoff properties which have been used.

Table 7: Soil Properties for MUSIC Source Nodes

Parameter	Units	Urban
Impervious Area Parameters		
Rainfall Threshold	mm	1.5 (for roads/paths etc.) 0.3 (for roofs)
Pervious Area Parameters		
Soil Capacity	mm	120
Initial Storage	%	30
Field Capacity	mm	80
Infiltration Capacity Coefficient – a		200
Infiltration Capacity Coefficient – b		1.0
Groundwater Properties		
Initial depth	mm	10
Daily Recharge Rate	%	25
Daily Baseflow Rate	%	5
Deep Seepage	%	0

Table 8: Stormwater Water Quality Parameters for MUSIC Source Nodes*

Land-Use Category		Log_{10}TSS (mg/L)		Log_{10}TP (mg/L)		Log_{10}TN (mg/L)	
		Storm Flow	Base Flow	Storm Flow	Base Flow	Storm Flow	Base Flow
Roofs	Mean	1.3	N/A	-0.89	N/A	0.30	N/A
	Std Dev	0.32	N/A	0.25	N/A	0.19	N/A
Sealed Roads with Pervious Fractioms	Mean	2.43	1.20	-0.30	-0.85	0.34	0.11
	Std Dev	0.32	0.17	0.25	0.19	0.19	0.12
Landscaped Areas	Mean	2.15	1.20	-0.60	-0.85	0.30	0.11
	Std Dev	0.32	0.17	0.25	0.19	0.19	0.12

*These values have been taken from Approach 2 in the Draft NSW MUSIC Modelling Guidelines

5.4 MUSIC MODEL CATCHMENT AREAS & STORMWATER TREATMENT PLAN

The MUSIC model's total catchment area to be treated is 0.3654 Ha. A total area of 0.0811 Ha will not reticulate through a treatment tank before connecting into the council system. Furthermore, the existing sea wall, which currently grades towards the Bay, has not been included in the treatment plan as it is not being developed as part of this proposal. Please refer to Table 9 for a breakdown of the MUSIC model catchment areas.

Table 9: MUSIC Model Catchment Areas

	Catchment Area	Area (Ha)	Pervious Area (%)	Impervious Area (%)
To Blackwattle Bay	Roof Catchment	0.0217	0	100
	STW Line 1	0.1079	18	82
	STW Line 2	0.0493	22	78
	Grated Drain (South)	0.0159	0	100
To Council Stormwater Network	STW Line 3	0.0811	15	85
	STW Line 4	0.0848	0	100
	Site setback area	0.0047	22	78
	Total	**0.3654**		

It is proposed that the stormwater discharged from the proposed development site will pass through a treatment system in order to provide treatment to the stormwater runoff prior to it entering Blackwattle Bay. Stormwater lines 1, 2 and 5 will run through a treatment tank before discharging directly to Blackwattle Bay. Similarly, stormwater line 4, will run through a separate treatment tank before connecting into the existing stormwater network within site.

It is proposed that nine (9) grated stormwater pits on site will be fitted with enviropod filter baskets. These are a pre-treatment device used to capture pollutants entering the system while allowing the stormwater to pass through the pit into the piped system. An Enviropod is a pit basket fitted with a monofilament 200 micron pore size filter bag that removes gross pollutants such as sediment, trash and debris, as well as suspended solids. Please refer to Figure 7 for an illustration of a typical Enviropod.

Figure 7: Typical Enviropod Filter

It is proposed that Stormwater lines 1, 2 and 5 will run through a treatment manhole with four (4) 690mm Psorb Stormfilter cartridges, supplied by Stormwater 360, prior to discharging to Blackwattle Bay. Similarly, stormwater line 4 will run through a separate treatment manhole with two (2) 690mm Psorb Stormfilter cartridges before connecting into the existing stormwater network within site. A stormfilter cartridge system is provided to remove any remaining suspended sediments and nutrients which have entered the stormwater system. A non-return valve will be installed on the outgoing pipe from the manholes to prevent regular inundation of seawater and deterioration of the stormfilters. The height of the weir wall in the manholes will also be designed appropriately as a secondary measure for preventing inundation of seawater during smaller storm events whilst maintaining efficient function of the filters. Please refer to Figure 8 for an illustration of a typical Stormfilter.

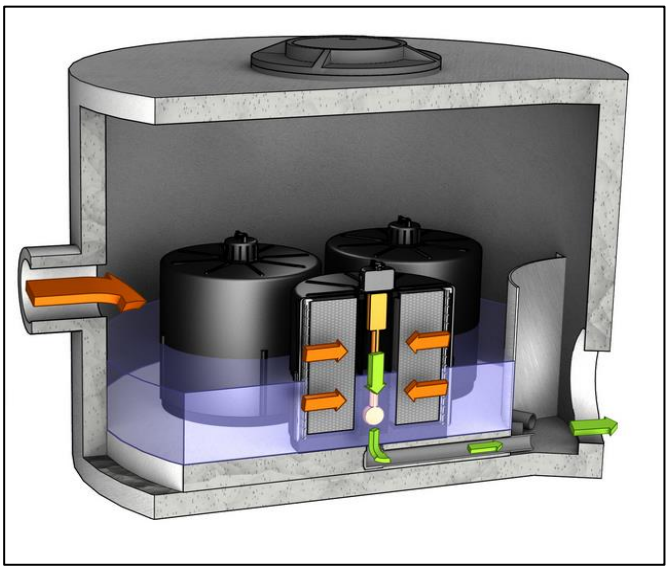


Figure 8: Typical Stormfilter

In order to facilitate further treatment of the northern catchment which will be bypassing the stormfilter treatment tank, a swale is to be installed in the grassed area in the north-east corner of the site. Please refer to Figure 9 for swale details.

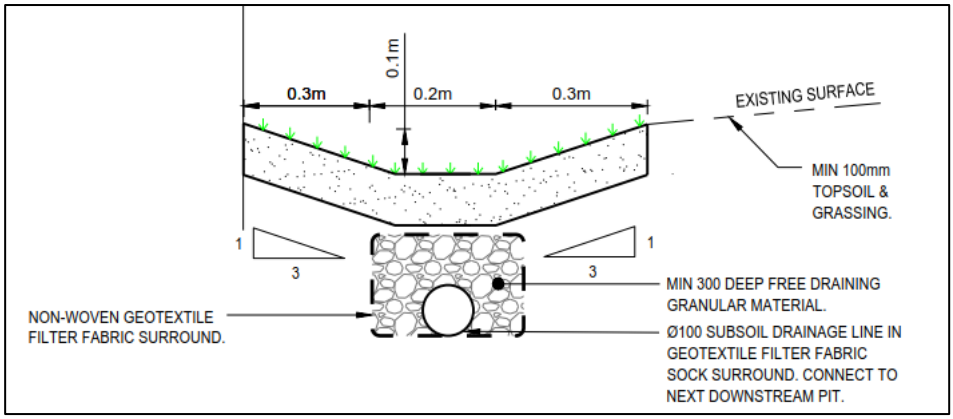


Figure 9: Swale Details

5.5 RAINWATER REUSE TANK SIZING

In order to calculate the proposed rainwater reuse tank size, the following average water demand assumptions were taken which are presented in Table 10 below.

Table 10: Average Water Demand

Use	Average Water Demand
WC Flushing	0.1 kL/Day/Toilet
Turf Irrigation	0.4 kL/Year/m²

Please refer to Table 11 for the WC flushing demand calculation.

Table 11: WC Flushing Average Daily Water Demand

Use	Average Water Demand	No of Toilets	Average Daily Demand (kL/Day)
WC Flushing	0.1 kL/Day/Toilet	1	0.1

Please refer to Table 12 for the irrigation demand calculation.

Table 12: Irrigation Average Daily Water Demand

Use	Average Water Demand	Area to be Irrigated (m²)	Average Daily Demand (kL/Day)
Turf Irrigation	0.4 kL/Year/m²	225.15	0.25

Therefore, the estimated total average daily water demand for the rainwater reuse tank is 0.35 kL/Day.

The City of Sydney DCP does not outline minimum requirements for a rainwater tank. Therefore, a 5kL tank has been proposed in order to achieve 75% of the rainwater reuse demands and water quality requirements.

5.6 ANTI-FOULING

To reduce the treatment devices required on site, it is proposed that there will be no area delineated for treatment of boat hulls with anti-fouling paint. Boats which will be berthed at the marina for long periods of time will naturally accumulate organic growth on the hull of the vessel as the anti-foul wears off. This process will not have adverse effects on the water quality, however low-toxicity anti fouling paint is recommended for use on hulls in accordance with the Environmental Action for Marinas, Boatsheds and Slipways published by the Department of Environment and Climate change.

5.7 MUSIC RESULTS

The stormwater quality treatment system has been modelled using MUSIC; please see Figure 10 for the treatment plan.

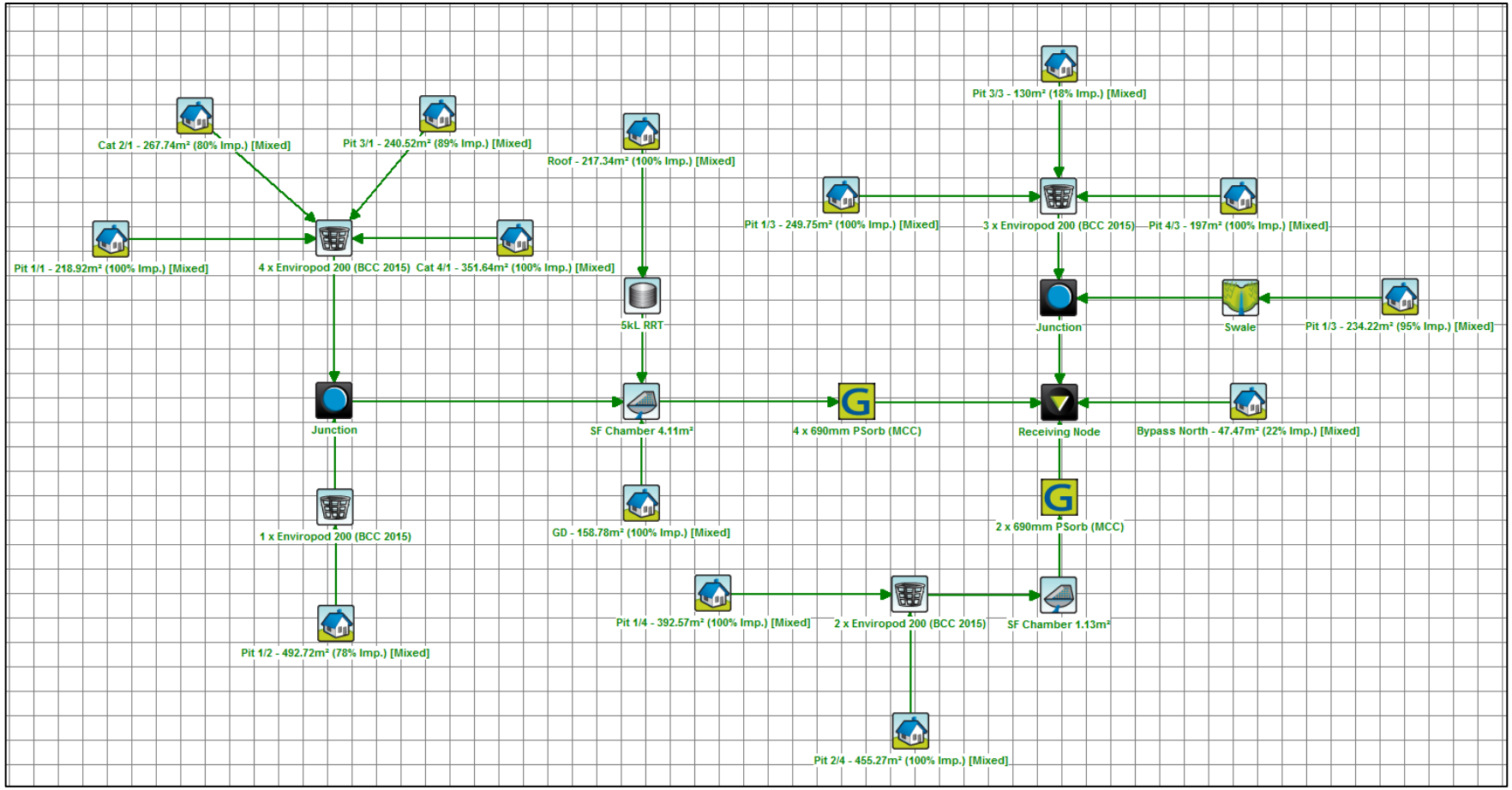


Figure 10: Stormwater Treatment Plan

Please refer to Table 13 and *Schedule 3* for the MUSIC results.

Table 13: Percentages Based Load Reduction in Pollutant Results

	Sources (kg/yr)	Residual Load (kg/yr)	Reduction (%)	City of Sydney Target (%)
Gross Pollutants (GP)	91.4	1.1	98.8	90
Total Suspended Solids (TSS)	1070	155	85.6	85
Total Phosphorus (TP)	1.91	0.523	72.7	65
Total Nitrogen (TN)	9.01	4.56	49.4	45

6. SEDIMENT AND EROSION CONTROL

The Contractor for the works is required to provide Sedimentation and Erosion Control in accordance with the general requirements outlined below.

6.1 SITE PROTECTION MEASURES

It is proposed to provide the following in order to inhibit the movement of sediment off the site during the demolition and construction phases.

6.1.1 SITE ACCESS

Construction vehicles leaving the site shall be required to pass over a Temporary Construction Vehicle Entry consisting of a 1.5m long by 3m wide ‘cattle rack’.

6.1.2 SEDIMENT CONTROL

All exposed earth areas where it may be possible for runoff to transport silt down slope shall be protected with a sediment and erosion control silt fence generally installed along the boundaries of the site.

The fence will be constructed in accordance with details provided by the Department of Conservation and Land Management incorporating geotextile fabric which will not allow suspended particles greater than 50mg/L non-filterable solids to pass through, and as such comply with the appropriate provisions of the Clean Waters Act 1970.

The construction of the silt fence will include the following:-

- Geotextile fabric buried to a maximum of 100mm below the surface;
- Overlapping any joins in the fabric;
- Turning up on the ends for a length of 1 metre in order to prevent volumes of suspended solids escaping in a storm event.

Please refer to Figure 11 for details.

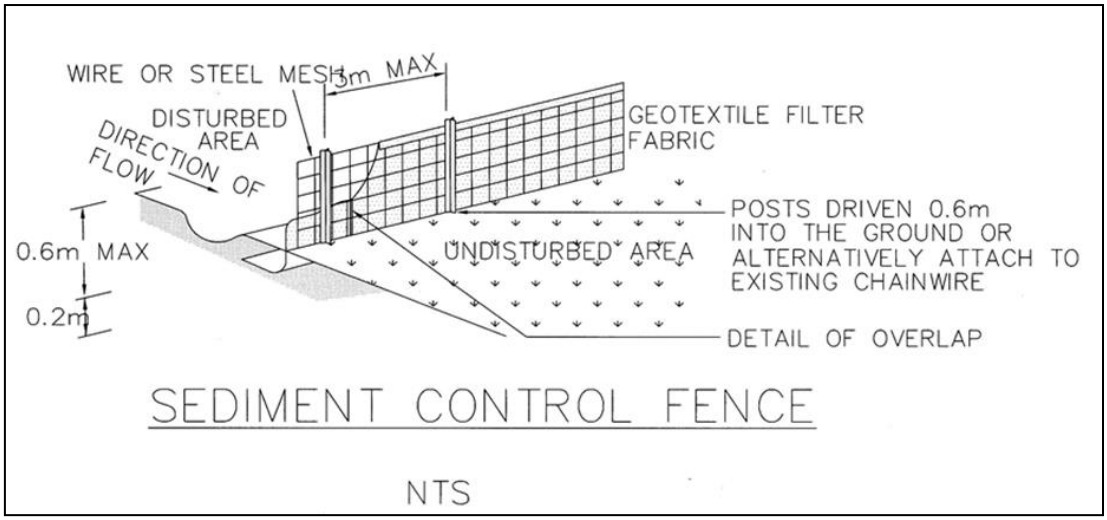


Figure 11: Sediment Control Fence Illustration

Existing stormwater infrastructure is also to be protected from incoming sediment using the following methods:-

- Any Council owned road kerb entry and or gully pits will be protected by Filter Bales and EcoSocks. Additional protection will be provided by inserting Water Clean Filter Cartridges into the gully opening, and;
- Internal site drainage pits shall be protected by Sediment Traps consisting of hay bales.

Please refer to Figure 12, Figure 13 and Figure 14 for details.

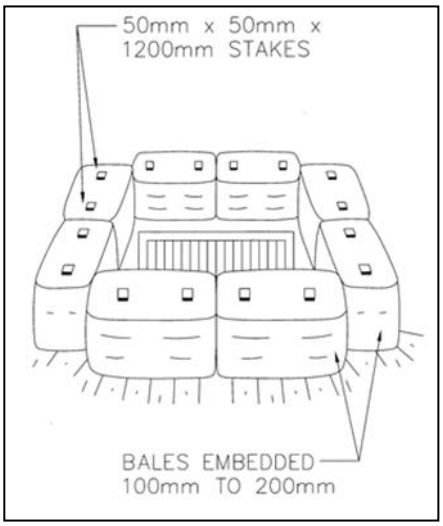


Figure 12: Stormwater Pit Sediment Trap (NTS)

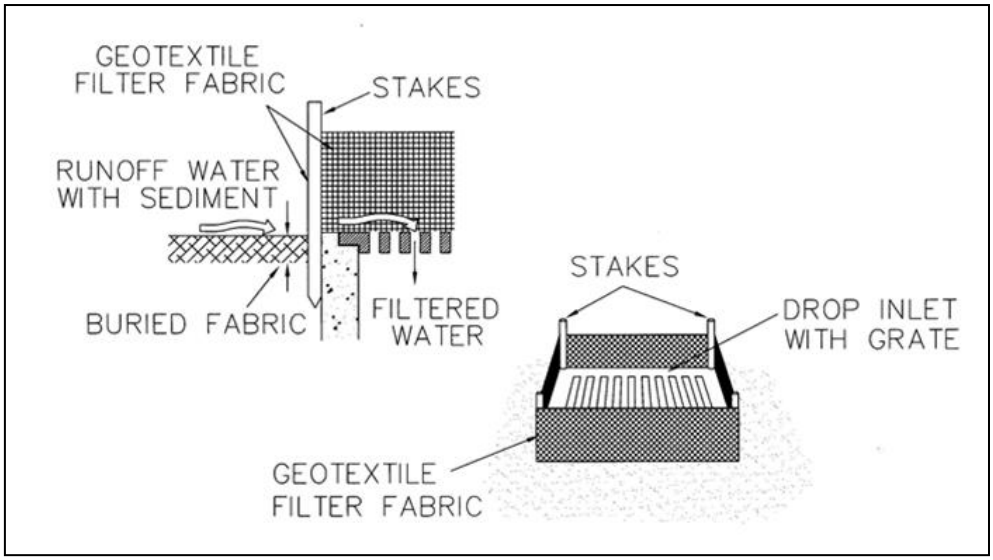


Figure 13: Geotextile Filter Fabric Drop Inlet Sediment Trap (NTS)

What are FilterBales?

Water Clean FilterBales are a unique new patented 7 stage sediment filter device developed to substantially reduce the migration of sediment and contaminants into drainage systems while allowing filtered water to easily pass through. FilterBales reduce customers' time and money by providing solutions to comply witht environmental and regulatory requirements.

Durable, Dependable, Reusable.
Replacing hay bales and other inadequate attempts to stop sediment run-off, FilterBales are durable and re-useable, effectively stopping your money from "pouring down the drain". They are also lightweight and easy to handle. Replaceable Water Clean Filter Cartridges guarantee peak performance is maintained.

Ask your local FilterBales stockist about replacement frequencies in your area. Cartridges and filter covers should be changed when the infiltration rate decreases. Water Clean FilterBales are suitable for a wide range of sediment and water management situations and can be easily secured in place for long term use. The unique multi-directional filter system allows you to position Water Clean FilterBales in any direction without reducing performance.

Water Clean FilterBales can be fixed to concrete or bitumen surfaces using an epoxy mortar-binder or fixed to earth surfaces using 6-10 mm pegs or stakes. When positioning, the side with the red reflective marker should be facing traffic.

1. FilterBales frames are a perforated plastic structure made from recycled wheelie bins, battery cases, milk bottles etc.

2. Filter medium (bio engineered soil media) used in the filter cartridges is made from a special blend of recycled organic (RO) materials from kerbside and vegetation drop off centres. The RO hosts enhanced naturally occurring micro-organisms. The blend also contains natural minerals to capture nutrients. The filter medium is as safe as normal soil.

3. FilterBales have a seven (7) stage filtration system:

1. In through the filter bag
2. Through the perforated plastic structure wall
3. In through the filter cartridge bag
4. Through the bio engineered filter medium
5. Out through the filter cartridge bag
6. Out through the perforated plastic structure wall
7. Out through the filter bag

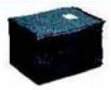
4. The filter bag is made from 300-micron (one third of a millimetre) pore size geotextile. This is the first stage that filters much of the sediment and other suspended solids from the run-off water. The geotextile is designed to stop sediment and reduce clogging but allow water to pass through easily. The filter cartridge bags are made from a similar geotextile.

5. FilterBales work effectively up to "a one-in-one-year 48 hours, 100 mm "storm events". This is the largest storm event experienced since the commercialisation of FilterBales. Having handled this easily, Filter Bales are considered capable of handling much greater "storm events". During these storm events FilterBales were used inside gully pits in one application and on the ground surrounding the gully pit in another application.

6. EcoSocks are made from a similar geotextile to the filter cartridge bags and contain the same bio engineered soil media as the FilterBales. They appear able to stand up to as much wear and tear as a sandbag.

7. FilterBales are much lighter (at around 15 kgs dry weight) than hay bales. This reduces exposure to Occupational Health and Safety problems

Product Range

Item No.	Description	
HFB001	**High FilterBale,** suitable for high flow situations and higher retention time applications. Contains two standard size WaterClean Filter Cartridges in upright formation to treat contaminated waters. (605mm x 485mm x 460mm)	
LFB002	**Low FilterBale,** suitable for low flow situations and kerb & gutter applications. Multi-directional module containing two standard size WaterClean Filter Cartridges. (605mm x 485mm x 220mm)	
ESF004	**Directional EcoSock,** can be used in conjunction with FilterBales to direct water. Will also provide some sediment filtration from seepage through bio-remediating media contained within the EcoSock (1135mm x 160mm x 30mm)	

Accessories

Item No.	Description	
FCR004	**WaterClean Filter Cartridges** contain a unique blend of fixating and bio-remediating products that treat common pollutants. To achieve maximum performance, each FilterBale uses two WaterClean Filter Cartridges. (440mm x 400mm x 100mm)	
HBC005 (High bale)	**Replaceable FilterBale covers,** made from specially designed geotextile. FilterBale covers have a standard aperture of 300 microns.	
HBC006 (Low bale)	**Replaceable FilterBale covers,** made from specially designed geotextile. FilterBale covers have a standard aperture of 300 microns.	

Figure 14: Erosion Control Filter Products

6.2 TEMPORARY STORMWATER SYSTEM (WHERE REQUIRED)

Site runoff within the zones of the excavation will be drained into a central holding well within the excavation. Runoff will be allowed to settle out suspended particles and debris, and an acceptable water of 50mg per litre of Non Filterable Residues (NFR) is required to be achieved prior to discharge.

6.2.1 DUST CONTROL

The following dust control procedures will be adhered to:

- Loose loads entering or leaving the site will be securely covered by a tarpaulin or like material in accordance with RMS and local Council Guidelines.
- Soil transport vehicles will use the single main access to the site.
- There will be no burning of any materials on site.
- Water sprays will be used across the site to suppress dust. The water will be applied either by water sprinklers or water carts across ground surfaces whenever the surface has dried out and has the potential to generate visible levels of dust either by the operation of equipment over the surface or by wind. The watercraft will be equipped with a pump and sprays.
- Spraying water at the rate of not less than three (3) L/s and not less than 700kPa pressure. The area covered will be small enough that surfaces are maintained in a damp condition and large enough that runoff is not generated. The water spray equipment will be kept on site during the construction of the works.
- During excavation all trucks/machinery leaving the site will have their wheels washed and/or agitated prior to travelling on Council Roads.
- Fences will have shade cloth or similar fabric fixed to the inside of the fence.

6.2.2 MAINTENANCE

- It will be the responsibility of the contractor to ensure sediment and erosion control devices on site are maintained. The devices shall be checked daily and the appropriate maintenance undertaken as necessary.
- Prior to the closing of the site each day, the road shall be swept and materials deposited back onto the site.
- Gutters and roadways will be kept clean regularly to maintain them free of sediment.
- Appropriate covering techniques, such as the use of plastic sheeting will be used to cover excavation faces, stockpiles and any unsealed surfaces;
- If dust is being generated from a given surface, and water sprays fail;
- If fugitive emissions have the potential to cause the ambient as quality to foul the ambient air quality;
- The area of soils exposed at any one time will be minimised wherever possible by excavating in a localised progressive manner over the site; and,
- Materials processing equipment suitably comply with regulatory requirements. The protection will include the covering of feed openings with rubber curtains or socks.

It is considered that by complying with the above, appropriate levels of protection are afforded to the site, the adjacent public roads, footpaths and environment.

SCHEDULE 1 – CRAIG AND RHODES SURVEY

A1

'A' - EASEMENT FOR WATER SUPPLY 1.8 WIDE (D.P.882897) LIMITED IN STRATUM
'B' - EASEMENT TO DRAIN WATER VARIABLE WIDTH (D.P.882897) LIMITED IN STRATUM
'C' - EASEMENT FOR MAINTENANCE VARIABLE WIDTH (D.P.1041963)
'D' - EASEMENT TO DRAIN WATER 3 WIDE (D.P.1041963) LIMITED IN STRATUM
'E' - EASEMENT FOR ELECTRICITY 3 & 4.265 WIDE (D.P.1041963) LIMITED IN STRATUM
'F' - EASEMENT TO DRAIN WATER 1.735 WIDE (D.P.1041963) LIMITED IN STRATUM
'G' - EASEMENT TO DRAIN WATER 1.735 WIDE (D.P.8301660) LIMITED IN STRATUM
'H' - EASEMENT FOR FOOTINGS & SUPPORT (D.P.803160) LIMITED IN STRATUM
'I' - PROPOSED EASEMENT FOR ELECTRICITY & OTHER PURPOSES OVER EXISTING LINE OF PIPE (APPROXIMATE POSITION) (D.P.120299)
'J' - EASEMENT FOR ELECTRICITY & OTHER PURPOSES 5 & 6.5 WIDE (D.P.120299)

NOTE:
* FULL DIMENSIONS & AREAS ARE NOT AVAILABLE FOR ALL LOTS.
ANY WORKS ON LANDS HEREIN MAY NECESSITATE THE LODGMENT OF A PLAN OF SURVEY.

SCHEDULE of LINES

No.	BEARING	DISTANCE
1	137°30'10"	0.27
2	16°15'30"	0.505
3	148°49'50"	0.485
4	55°56'30"	1.15

BOWMAN STREET
BANK STREET
QUARRY MASTER DRIVE
MILLER STREET
SP46801
92 D.P.1182887
1 D.P.1089643 TOTAL AREA 1324m²
2 D.P.1089643
1 D.P.439245 0.9m²
22 D.P.803159
21 D.P.803159
20 D.P.803159 5612m²
19 D.P.803159 1601m²
BRICK BUILDING No.1 BANK STREET
ADJOINS SHT-1
ADJOINS SHT-3
ADJOINS SHT-6
ADJOINS
SSM 32843 RL 5.36 A.H.D.
ORIGIN OF LEVELS: SSM 32843 RL5.36 A.H.D. VIDE SCIMS DATED 28/7/2015

LEGEND

AHD AUSTRALIAN HEIGHT DATUM
BM BENCH MARK
TC TELECOMMUNICATIONS PIT
EPIT ELECTRICAL PIT
EP ELECTRICAL PILLAR
EBOX ELECTRICAL BOX
GP GULLY PIT
HYD HYDRANT
SMH SEWER MAINTENANCE HOLE
SV STOP VALVE
LP LIGHT POLE
SWP STORMWATER PIT
WM WATER METER
SS STREET SIGN
TL TRAFFIC LIGHT
BOLLARD (Ø265 mm)
GATE
FENCE
RAIL
METAL GUARD RAIL
ROCK WALL
TREE
COM APPROXIMATE LOCATION OF UNDERGROUND TELECOMMUNICATION CABLES (TELSTRA, OPTUS, VOCUS & NEXTGEN) VIDE DBYD
T APPROXIMATE LOCATION OF UNDERGROUND TELSTRA CABLE VIDE DBYD
O APPROXIMATE LOCATION OF UNDERGROUND OPTUS CABLE VIDE DBYD
W APPROXIMATE LOCATION OF WATER MAINS VIDE DBYD
S APPROXIMATE LOCATION OF SEWER MAINS VIDE DBYD
G APPROXIMATE LOCATION OF GAS MAINS VIDE DBYD
A APPROXIMATE LOCATION OF UNDERGROUND AAPT CABLE VIDE DBYD
E APPROXIMATE LOCATION OF UNDERGROUND ELECTRICAL DUCTS VIDE DBYD
V APPROXIMATE LOCATION OF UNDERGROUND VERIZON DUCTS VIDE DBYD
SW APPROXIMATE LOCATION OF STORMWATER PIPES VIDE DBYD
BOUNDARY OF LOT 22 D.P.803159 ABOVE
BOUNDARY OF LOT 21 D.P.803159 ABOVE

5 4 3 2 1 0 5 10
1:200 @ A1

AMEND.No.	DATE	DETAILS
08	15/11/2016	DRAFTING OF ADDITIONAL INFORMATION COMPLETED
07	14/11/2016	ADDITIONAL INFORMATION ADDED
6	20/05/2016	INTERNAL WALLS ADDED FOR 5 BUILDING (B.M. & S.E.)

DIAL 1100 BEFORE YOU DIG

Project: DETAIL SURVEY OVER
LOTS 1 & 2 D.P.1089643, LOTS 5, 6, 12, 13, Pt.14, 19, 20, 21 & 22 D.P.803159
BANK STREET, QUARRY MASTER DRIVE, BOWMAN STREET
& MILLER STREET, PYRMONT

Principal: URBAN GROWTH
Scale 1:200 | Date 5/8/2015 | Council Ref.
Datum A.H.D. | L.G.A. SYDNEY
Cal's L.H., L.E., B.M., S.T. | Drawn. A.P | Proj.Man. D.J.S | Client Ref.

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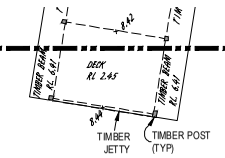
90th ANNIVERSARY 1923 - 2013

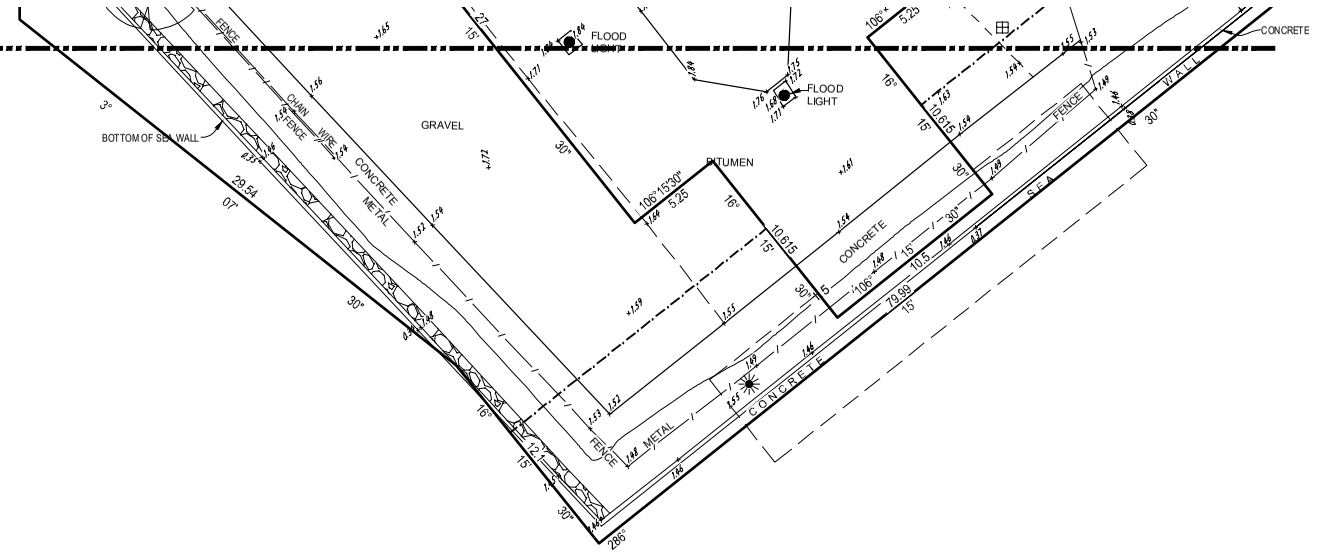
APPROVED COMPANY

Our Ref. 102-15
Dwg File Ref. [Rev] - Sheet Ref.
102-15G T02 [08] - 2 OF 7

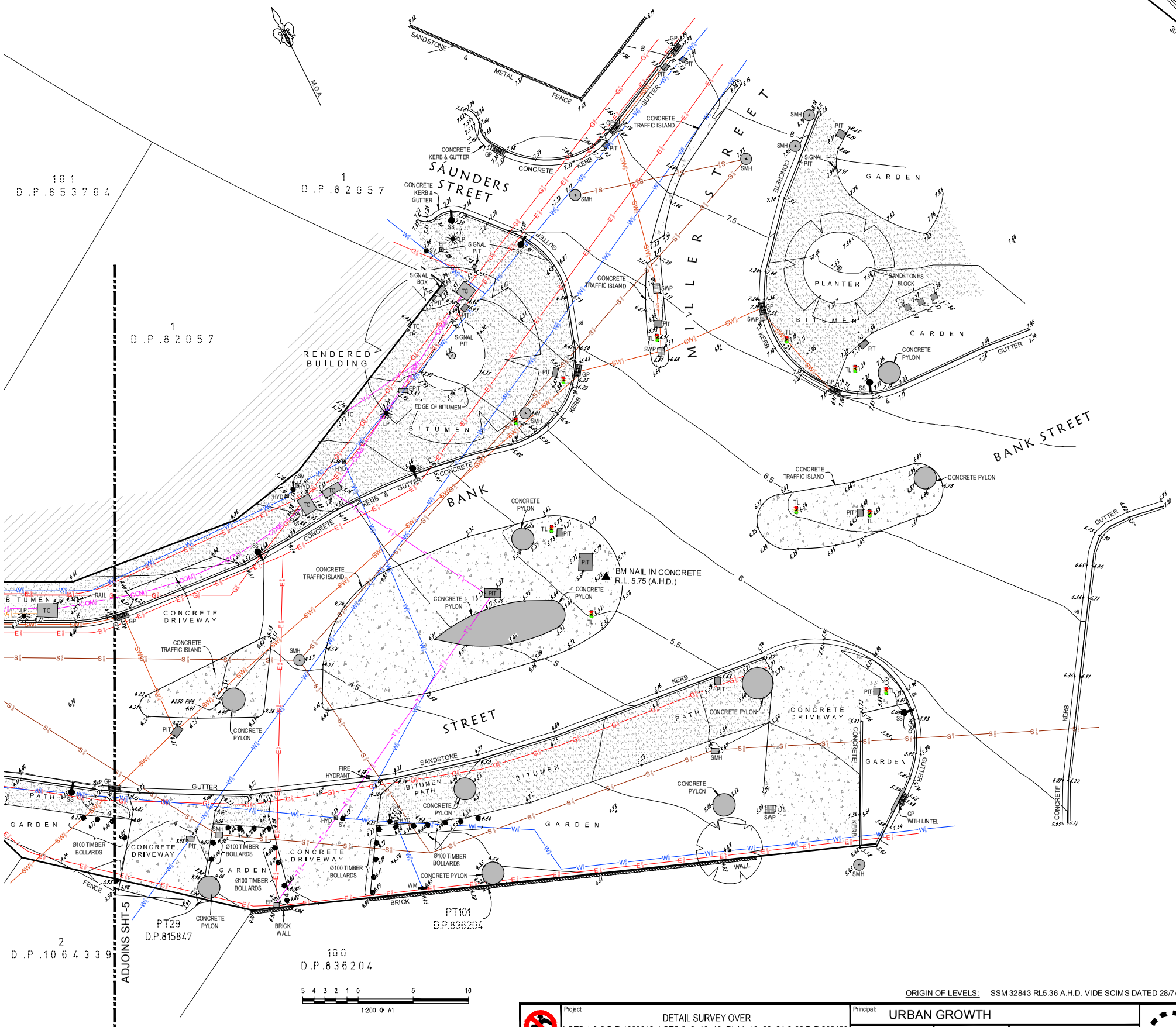
A1

ADJOINS SHT-2





SCALE 1:200



5 4 3 2 1 0 5 10

1:200 @ A1

LEGEND

- AHD AUSTRALIAN HEIGHT DATUM
- BM BENCH MARK
- TC TELECOMMUNICATIONS PIT
- EPIT ELECTRICAL PIT
- EP ELECTRICAL PILLAR
- EBOX ELECTRICAL BOX
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- SMH SEWER MAINTENANCE HOLE
- SV STOP VALVE
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- SS STREET SIGN
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- FENCE
- RAIL
- METAL GUARD RAIL
- ROCK WALL
- TREE
- COM| APPROXIMATE LOCATION OF UNDERGROUND TELECOMMUNICATION CABLES (TELSTRA, OPTUS, VOCUS & NEXTGEN) VIDE DBYD
- T| APPROXIMATE LOCATION OF UNDERGROUND TELSTRA CABLE VIDE DBYD
- O| APPROXIMATE LOCATION OF UNDERGROUND OPTUS CABLE VIDE DBYD
- W| APPROXIMATE LOCATION OF WATER MAINS VIDE DBYD
- S| APPROXIMATE LOCATION OF SEWER MAINS VIDE DBYD
- G| APPROXIMATE LOCATION OF GAS MAINS VIDE DBYD
- A| APPROXIMATE LOCATION OF UNDERGROUND AAPT CABLE VIDE DBYD
- E| APPROXIMATE LOCATION OF UNDERGROUND ELECTRICAL DUCTS VIDE DBYD
- V| APPROXIMATE LOCATION OF UNDERGROUND VERIZON DUCTS VIDE DBYD
- SW| APPROXIMATE LOCATION OF STORMWATER PIPES VIDE DBYD

ORIGIN OF LEVELS: SSM 32843 RL5.36 A.H.D. VIDE SCIMS DATED 28/7/2015

AMEND.No.	DATE	DETAILS
08	15/11/2016	DRAFTING OF ADDITIONAL INFORMATION COMPLETED
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DIAL 1100 BEFORE YOU DIG

Project: DETAIL SURVEY OVER LOTS 1 & 2 D.P.1089643, LOTS 5, 6, 12, 13, Pt.14, 19, 20, 21 & 22 D.P.803159 BANK STREET, QUARRY MASTER DRIVE, BOWMAN STREET & MILLER STREET, PYRMONT

Principal: URBAN GROWTH

Scale 1:200 | Date 5/8/2015 | Council Ref.

Datum A.H.D. | L.G.A. SYDNEY

Calc's L.H., L.E., B.M., S.T. | Drawn. A.P | Proj.Man. D.J.S | Client Ref:

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90th ANNIVERSARY 1923 - 2013

APPROVED COMPANY ISO 9001 QMS

Our Ref. 102-15

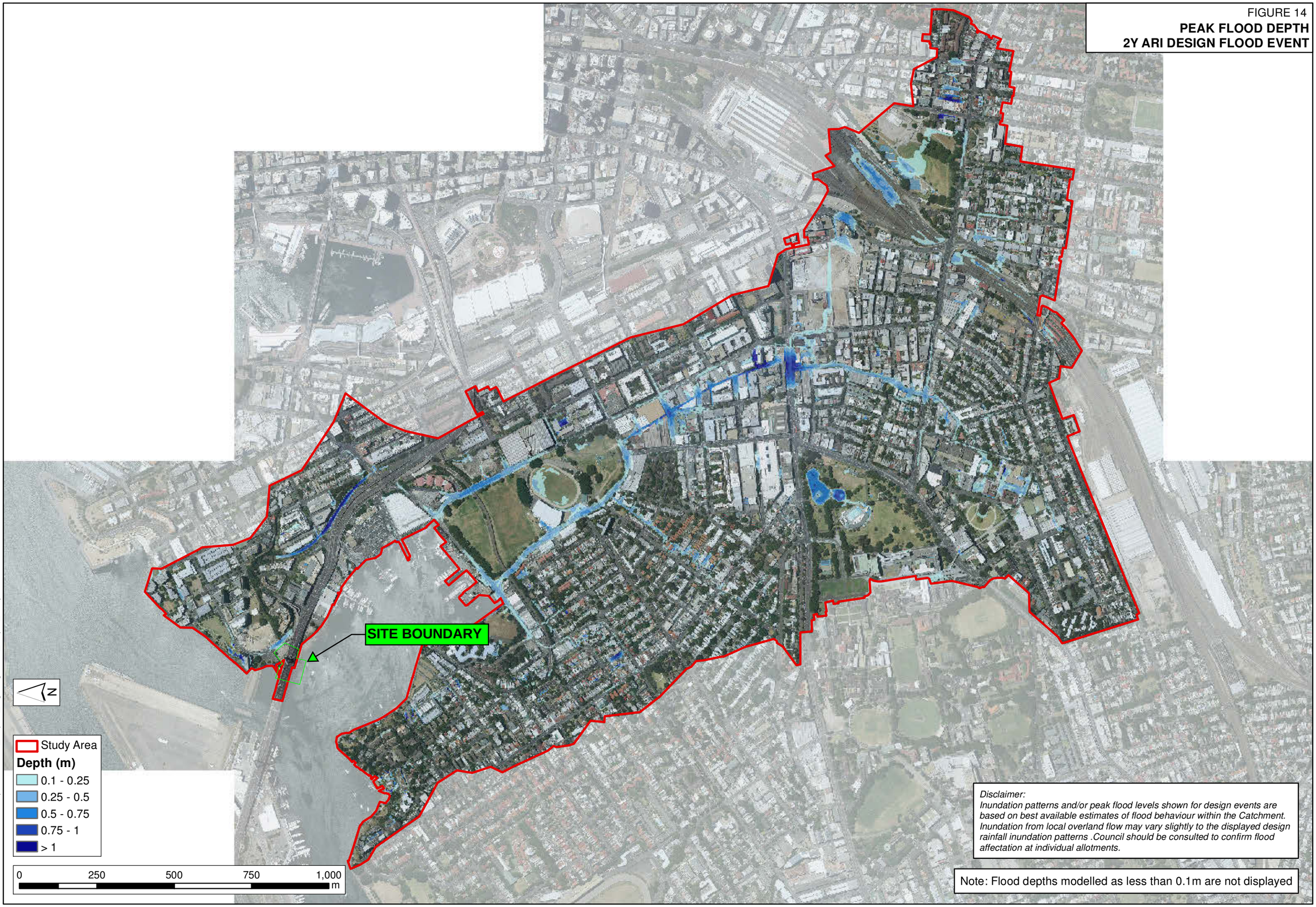
Dwg File Ref. [Rev] - Sheet Ref.

102-15G T02 [08] - 6 OF 7

SCHEDULE 2 – BLACKWATTLE BAY FLOOD MAPS

FIGURE 14

PEAK FLOOD DEPTH
2Y ARI DESIGN FLOOD EVENT



Disclaimer:
Inundation patterns and/or peak flood levels shown for design events are based on best available estimates of flood behaviour within the Catchment. Inundation from local overland flow may vary slightly to the displayed design rainfall inundation patterns .Council should be consulted to confirm flood affectation at individual allotments.

Note: Flood depths modelled as less than 0.1m are not displayed

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FIGURE 15

PEAK FLOOD DEPTH
5Y ARI DESIGN FLOOD EVENT

SITE BOUNDARY

N

Study Area

Depth (m)

0.1 - 0.25

0.25 - 0.5

0.5 - 0.75

0.75 - 1

> 1

0 250 500 750 1,000 m

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Note: Flood depths modelled as less than 0.1m are not displayed

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FIGURE 16

PEAK FLOOD DEPTH
10% AEP DESIGN FLOOD EVENT

SITE BOUNDARY

N

Study Area

Depth (m)

- 0.1 - 0.25
- 0.25 - 0.5
- 0.5 - 0.75
- 0.75 - 1
- > 1

0 250 500 750 1,000 m

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Note: Flood depths modelled as less than 0.1m are not displayed

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FIGURE 17

PEAK FLOOD DEPTH
5% AEP DESIGN FLOOD EVENT

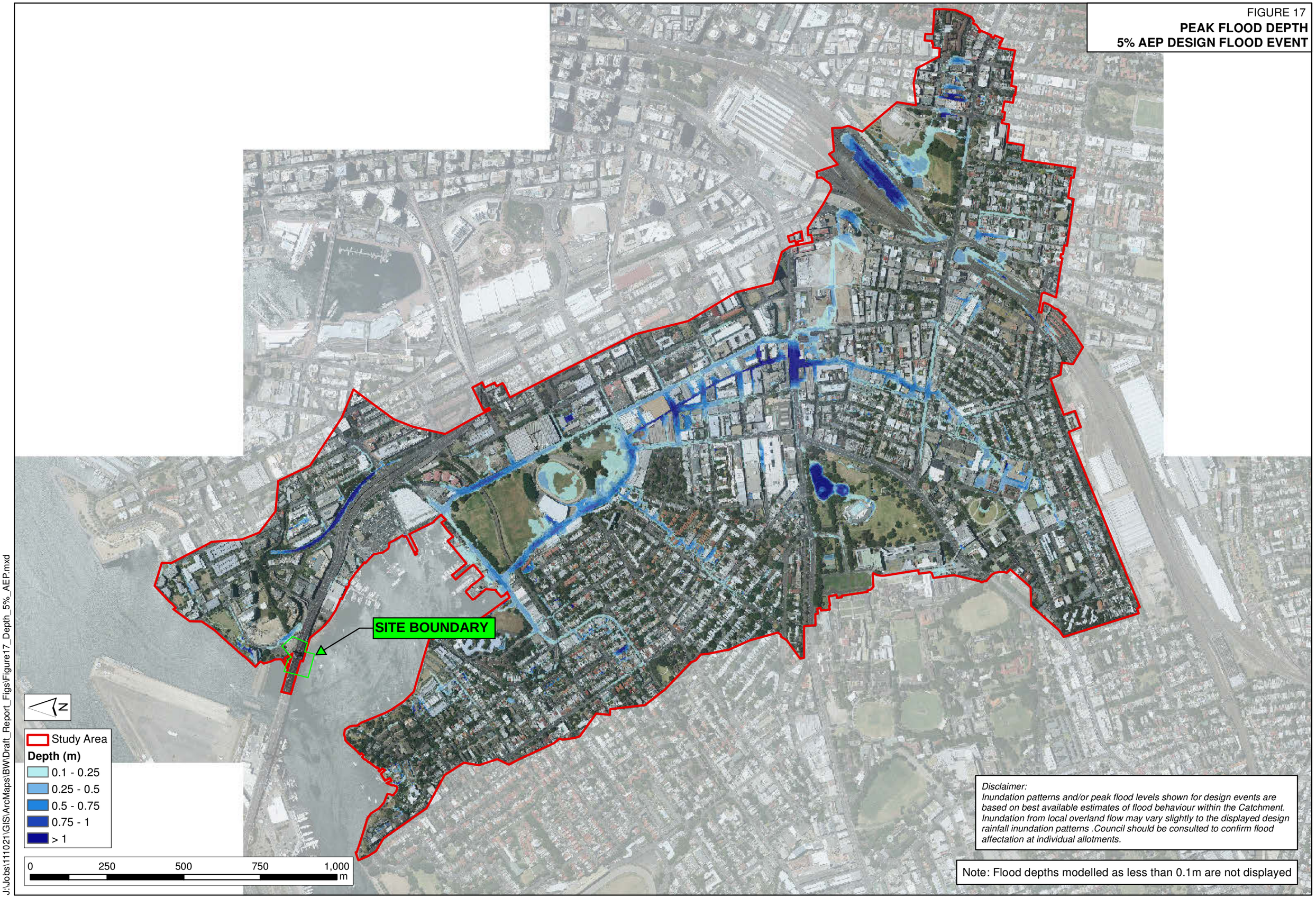

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FIGURE 18

PEAK FLOOD DEPTH
2% AEP DESIGN FLOOD EVENT

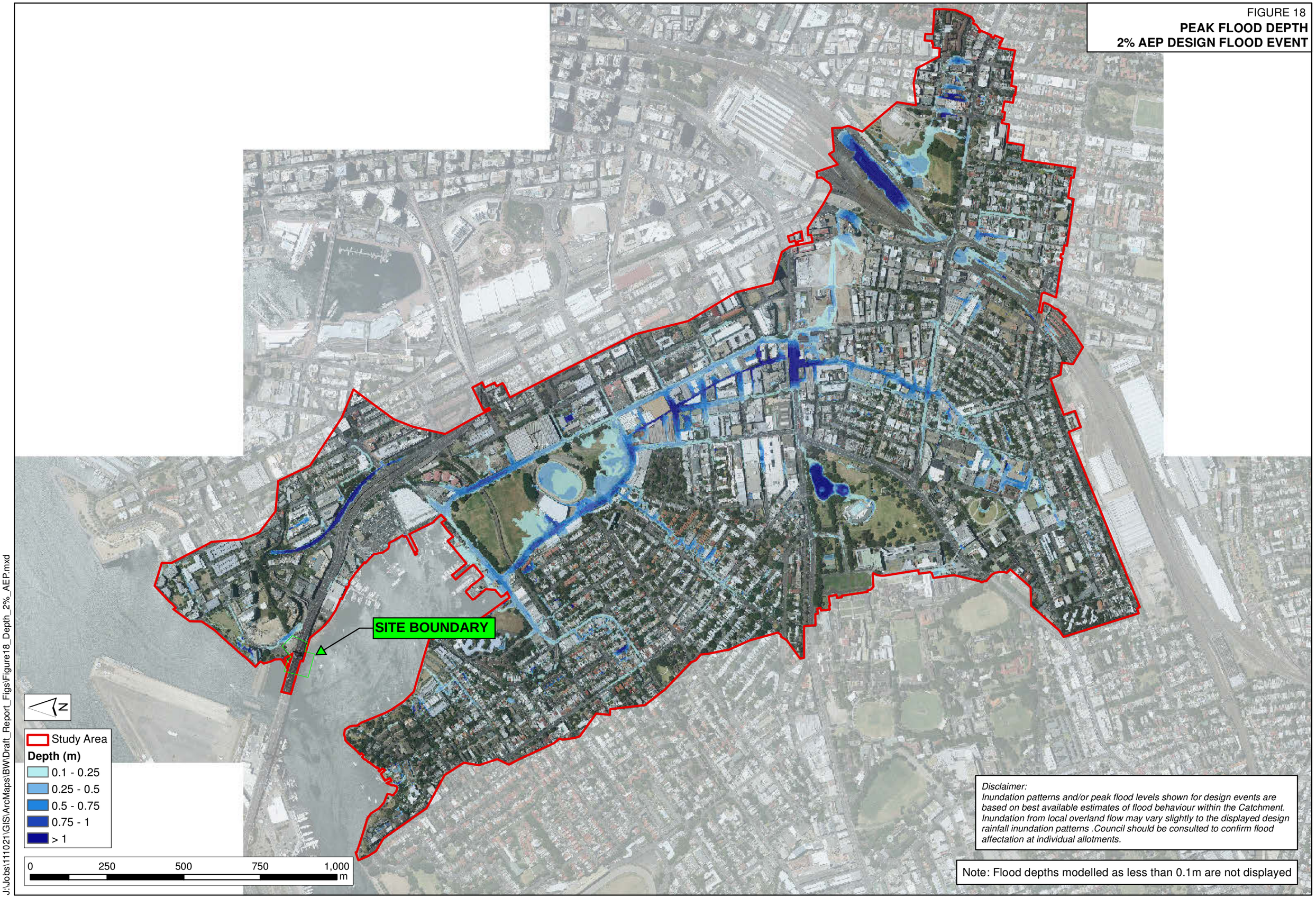

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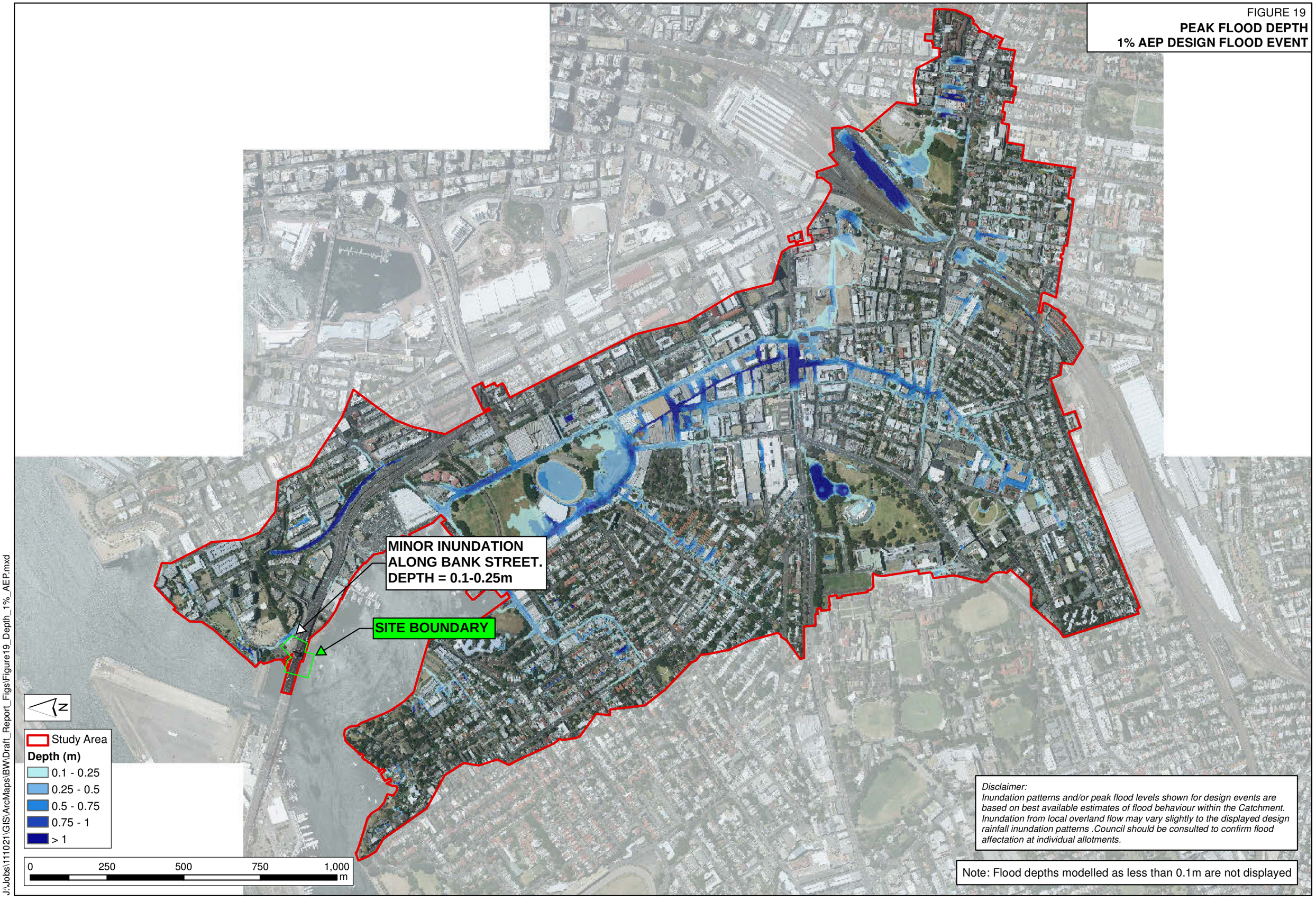
FIGURE 19

PEAK FLOOD DEPTH
1% AEP DESIGN FLOOD EVENT



Disclaimer:
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Note: Flood depths modelled as less than 0.1m are not displayed

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FIGURE 20
PEAK FLOOD DEPTH
PMF EVENT

MINOR INUNDATION ALONG BANK STREET. DEPTH = 0.25-0.5m

SITE BOUNDARY

N

Study Area
Depth (m)
0.1 - 0.25
0.25 - 0.5
0.5 - 0.75
0.75 - 1
> 1

0 250 500 750 1,000 m

Disclaimer:
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Note: Flood depths modelled as less than 0.1m are not displayed

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SCHEDULE 3 – MUSIC RESULTS

Receiving Node

30/05/2017 2:31:12 PM

Treatment Train Effectiveness

	Flow (ML/yr)	TSS (kg/yr)	TP (kg/yr)	TN (kg/yr)	Gross Pollutants (kg/yr)
Sources	3.86	1.07E3	1.91	9.01	91.4
Residual Load	3.76	155	0.523	4.56	1.10
% Reduction	2.4	85.6	72.7	49.4	98.8