

Stormwater Management Report

Enstruct

COCKLE BAY WHARF

STORMWATER MANAGEMENT REPORT



Prepared for: DPT Operator Pty Ltd &

DPPT Operator Pty Ltd

By: enstruct group pty ltd

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STORMWATER MANAGEMENT REPORT

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Executive Summary

enstruct Group has been commissioned by DPT Operator Pty Ltd & DPPT Operator Pty Ltd to assist with the preparation of the Environmental Impact Statement (EIS) in response to the Secretary's Environmental Assessment Requirements (SEARs) for the proposed Cockle Bay Wharf Development. This report addresses stormwater management issues to be considered in the EIS.

The proposed development involves demolition of existing buildings and construction of a commercial tower and podium within a site bounded on the west by Cockle Bay, on the north by Pyrmont Bridge, on the east by Harbour Street and the Western Distributor, and on the south by the IMAX theatre complex. Wheat Street will also be realigned within the building footprint.

Existing major street drainage pipelines passing through the site will generally remain undisturbed. New drainage systems will meet authority requirements in terms of capacity and water quality management.

The proposed development at Cockle Bay affords the opportunity to collect roof runoff for irrigation of podium level garden planters and it is proposed that appropriate rainwater storage will be provided.

A review was made of the Flood Assessment previously undertaken for the City of Sydney Council and predicted flood levels derived from this flood study are directly relevant to the Cockle Bay Development. An existing Jersey kerb barrier (RMS Type F unit) exists along Harbour Street and will be reconstructed to provide a flood protection barrier for the site. Additional provisions will be made to improve drainage from Harbour Street during extreme flood events as well as draining the site itself. There will be no adverse effects on flooding as a result of the proposed development.

Finished floor levels will be above the predicted maximum sea level in Cockle Bay, taking into account the effects of sea level rise.

Contents

Executive Summary	i
1 Introduction.....	1
2 Project Overview.....	1
3 Site Description	2
4 Overview of Proposed Development.....	3
5 Existing Drainage.....	4
6 Proposed Drainage.....	5
7 On-Site Detention	6
8 Rainwater Storage	6
9 Water Quality Requirements	7
10 Flood Assessment	7
11 Sediment and Erosion Control.....	9

Appendices

- A EXISTING STORMWATER PLAN
- B EROSION AND SEDIMENT CONTROL PLAN
- C STORMWATER CONCEPT DRAWINGS
- D FLOODING INFORMATION

1 Introduction

enstruct has been engaged by DPT Operator Pty Ltd & DPPT Operator Pty Ltd to provide civil engineering consultancy and design services in support of the proposed development at the Cockle Bay Wharf, adjacent to Wheat Road and the Western Distributor in Sydney. The location of the proposed development is in the local government area of the Council of the City of Sydney, but is administered by the Sydney Harbour Foreshore Authority. In September 2015 it was announced that the Sydney Harbour Foreshore Authority's functions would be consolidated with Property NSW.

As part of the Development Approval process, enstruct has been commissioned to develop conceptual performance requirements for a stormwater management plan, considering the respective components of the stormwater drainage system, rainwater harvesting, on-site detention (OSD) storage, flood level assessment and water quality targets to suit anticipated and applicable local authority requirements. This report addresses these conceptual design requirements.

2 Project Overview

The proposed development includes the construction of a high rise tower on the northern part of the site, low rise development on the southern part of the site, an elevated deck structure spanning across the roadways to the east and providing pedestrian connectivity with established buildings along Sussex Street, and realignment of Wheat Road (refer to Figure 1). No underground basement is proposed for the development.

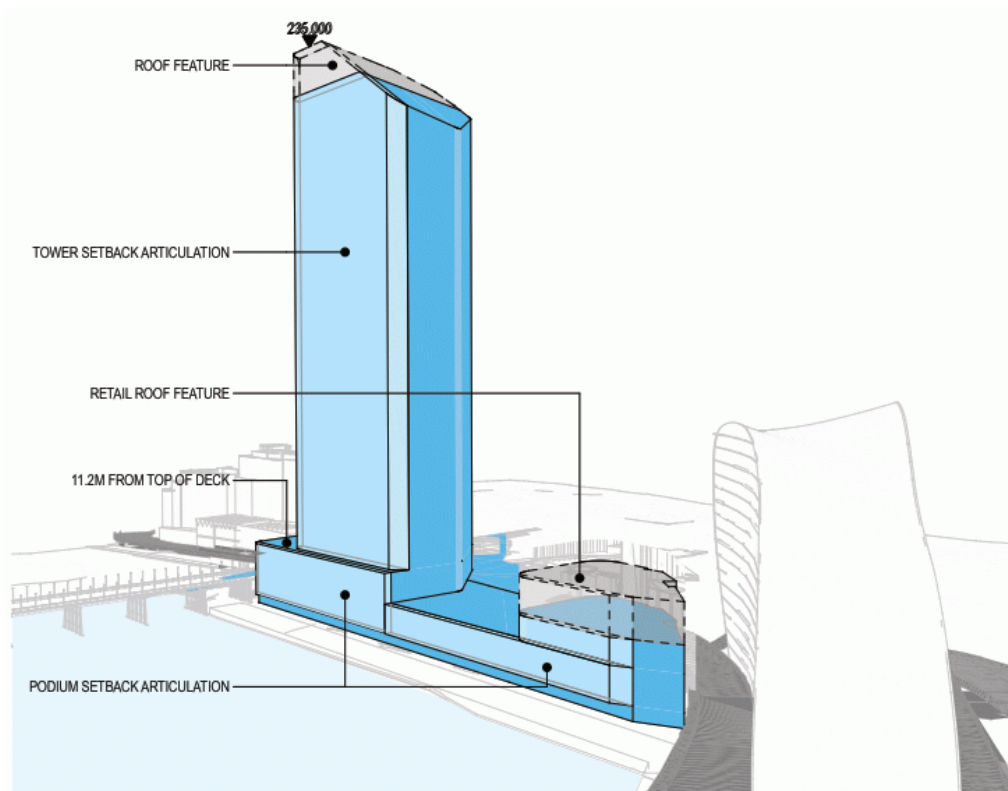


Figure 1 - Conceptual Image of Proposed Development

3 Site Description

The Site is located within Darling Harbour. Darling Harbour is a 60 hectare waterfront precinct on the south-western edge of the Sydney Central Business District that provides a mix of functions including recreational, tourist, entertainment and business.

The Site is located to the immediate south of Pyrmont Bridge, within the Sydney CBD on the eastern side of the Darling Harbour precinct. The Site is located within the City of Sydney local government area (LGA).

A location context area plan and indicative site area plan are provided at Figures 2 and 3 below.

The Darling Harbour precinct is undergoing significant redevelopment as part of the Sydney International Convention, Exhibition and Entertainment Precinct (SICEEP), Darling Square, and IMAX renewal projects. The urban, built form and public transport / pedestrian context for Harbourside will fundamentally change as these developments are progressively completed.

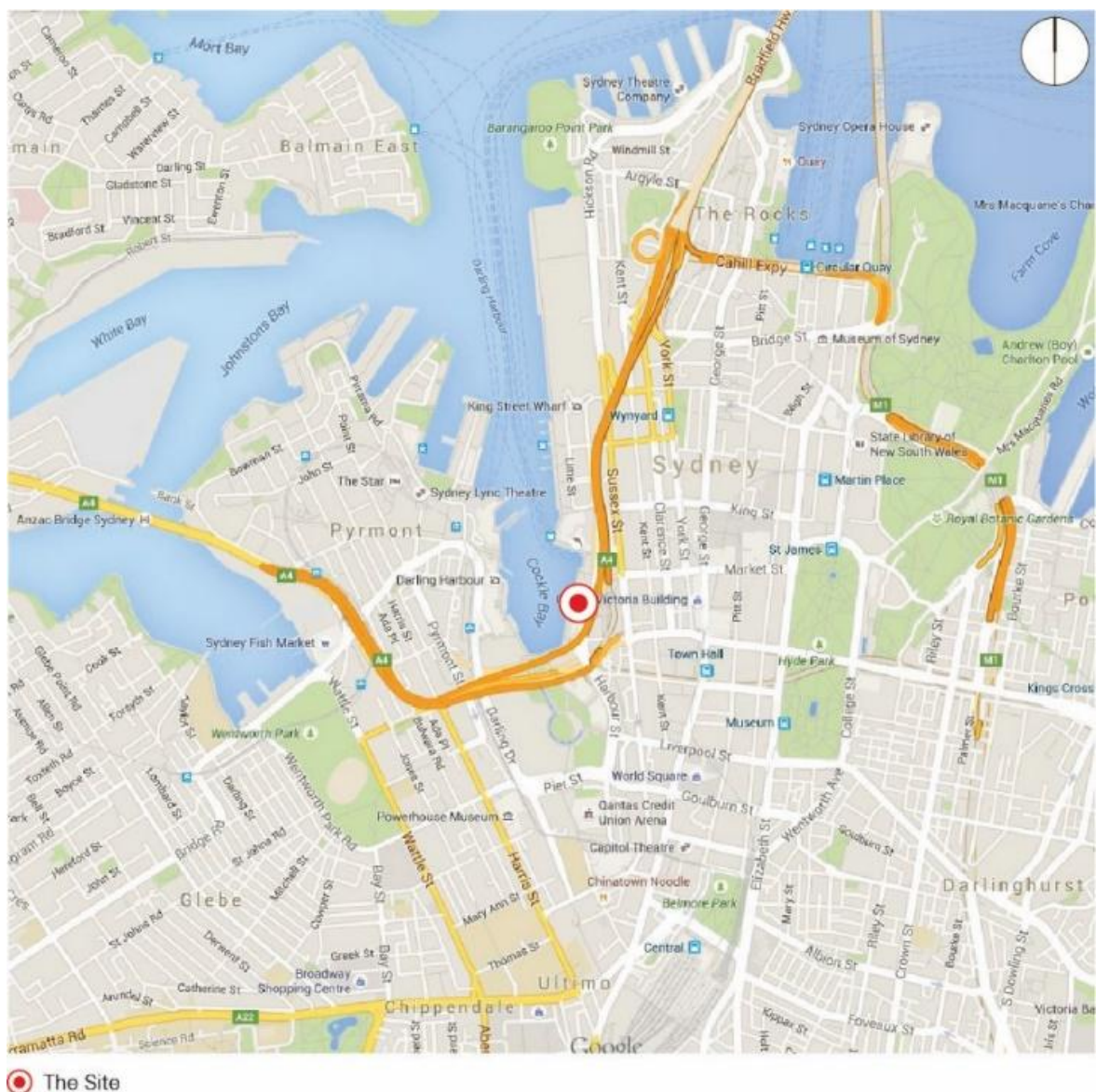


Figure 2 – Location Context Area Plan



Indicative Site Area

Figure 3 – Indicative Site Area

4 Overview of Proposed Development

The proposal relates to a staged development application and seeks to establish concept proposal details for the renewal and re-imagining of Cockle Bay Wharf.

The concept proposal establishes the vision and planning and development framework which will be the basis for the consent authority to assess future detailed development proposals.

The Cockle Bay Wharf site is to be developed for a mix of Retail, Cultural and Commercial (Office) uses, including retail and restaurants, commercial offices and open space.

The Concept Proposal seeks approval for the following key components and development parameters:

- Demolition of existing site improvements, including the existing Cockle Bay Wharf, pedestrian bridge links across the Western Distributor, and obsolete monorail infrastructure;
- Building envelopes;
- Land uses across the site;
- A maximum total Gross Floor Area (GFA) across the Cockle Bay Wharf of 85,000m² for commercial development and 25,000m² for retail (including food and beverage) development;
- Car parking rates to be utilised in subsequent detailed (Stage 2) Development Applications;
- Urban Design and Public Realm Guidelines to guide future development and the public domain; and
- Strategies for utilities and services provision, drainage and flooding, and ecological sustainable development.

A more detailed and comprehensive description of the proposal is contained in the Environmental Impact Statement (EIS) prepared by JBA.

Cockle Bay is one of the waterways that make up the precinct of Darling Harbour. Pyrmont Bridge is located to the north of the site and spans across the waters of Cockle Bay. Wheat Road and Harbour Street accommodate vehicular movement at ground level on the east side of the site, whilst the elevated roadways of the Western Distributor are suspended several metres above Harbour Street. The existing adjacent IMAX theatre complex is located to the south of the site, and is subject to a recent separate development application by Grocon.

The existing development comprises two and three storey buildings that accommodate restaurants, bars and other commercial activities as well as a wharf structure to support a public pedestrian precinct. A sea wall exists under this wharf on an alignment that passes under existing buildings in some locations. The existing buildings will be demolished as part of the proposed development but the existing wharf and sea wall will remain.

The existing alignment of Wheat Road is to be diverted from the east side of the existing building westward below the proposed building structure within the ground floor space. The upper podium or terrace areas are to include landscaping and pedestrian paths, whilst the ground level will include parking spaces and service areas. The building works include suspended garden planting areas and will require associated subsoil drainage.

5 Existing Drainage

Existing stormwater drainage is generally located to the east of the site and includes assets owned and maintained by the City of Sydney Council (CoS) and Sydney Water Corporation (SWC). Two main underground drainage lines convey flows through the

property including a 1500mm diameter line in the central part of the site and an 1800mm diameter line in the southern part of the site (refer to Figure 4).

The works-as-executed (as-built) plans prepared in 1998 indicate three silt arrestors were installed to capture pollutants from local drainage catchments prior to discharge into Cockle Bay. The outlets from these silt arrestors project through the sea wall and discharge via three 375mm diameter pipes fitted with non-return flaps (refer to Appendix A for existing stormwater plan).

An additional 600mm pipe is shown on the as-built plan which is not indicated on CoS or SWC records. Investigations will be undertaken to confirm if this line drains the sag areas in Wheat Road and Harbour Street.

Existing major street drainage lines will remain undisturbed in their current locations, aside from some proposed inlet modifications at the eastern edge of the property to improve drainage during extreme floods in Harbour Street. This arrangement is described further in the Flood Assessment section of this report.

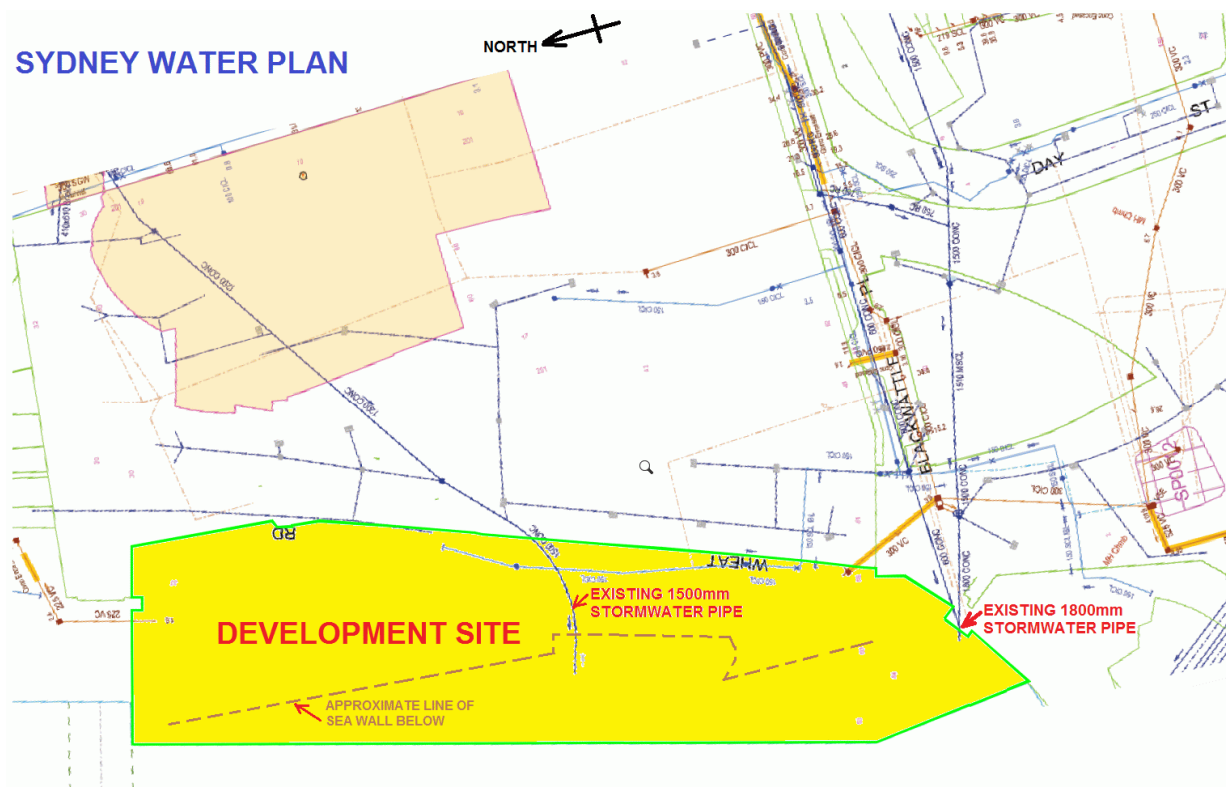


Figure 4. Sydney Water Hydraplot Record of Existing Stormwater Mains

6 Proposed Drainage

The site drainage from the new development is to be discharged into Cockle Bay through the existing sea wall in a similar manner to the current outlet discharge arrangement. The new drainage system will include pollution control devices.

Characteristics of the proposed stormwater system are shown on the stormwater concept drawings contained in Appendix C of this report. Where stormwater structures such as pits or tanks are to be installed, safe access is to be provided in accessible locations for regular inspection and maintenance.

Wheat Road is to be diverted through the new ground level space and will include grated drainage pits located at sag points along the road. An alternative option is to provide linear grated trench drains along “flat” longitudinal grades with appropriate crossfalls associated with the road design layout.

Rainwater storage and treatment devices as well as water efficient fixtures are all proposed to manage water capture and usage within the site.

The roof drainage system including gutters, downpipes and associated pipework is to be designed in accordance with AS/NZS 3500.3 Plumbing and Drainage Part 3: Stormwater Drainage.

7 *On-Site Detention*

Stormwater detention is applied to many sites within the local government area administered by the City of Sydney Council, but is generally not considered applicable to properties along the harbour foreshore. It is not proposed to provide on-site detention as part of this development. A review of the as-built drainage plans prepared in 1998 for the existing Cockle Bay development confirms that no on-site detention was provided.

8 *Rainwater Storage*

Rainwater harvesting is commonly incorporated into new residential developments to reduce the amount of water drawn from the town mains supply and to assist in the achievement of BASIX water conservation targets. The proposed hotel development at Cockle Bay affords the opportunity to collect relatively clean roof runoff for irrigation of podium level garden planters and it is proposed that appropriate provision for rainwater storage be provided to suit the available roof catchments.

Water collected from non-trafficable roof areas is considered to be relatively clean and can be readily used for irrigation purposes. Surface runoff from pedestrian or vehicular traffic areas is considered to be potentially contaminated and harvesting of this surface runoff is not recommended. The distribution of collected rainwater is normally achieved by a pump system to direct flows at a suitable pressure to the required locations (e.g. garden hose taps or automatic sprinklers).

9 Water Quality Requirements

The quality of stormwater discharge into Cockle Bay is intended to meet the requirements normally imposed by the Council of the City of Sydney as specified in the Sydney Development Control Plan 2012 - Section 3 - Clause 3.7.3. The pollutant reduction guidelines outlined in the following table have therefore been adopted as the target values for water quality treatment.

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

Water pollution reduction targets can typically be met using the following treatment methods:

- Gross pollutant traps to filter stormwater runoff. These devices primarily collect larger debris whilst also removing some smaller pollutants and sediment.
- Treatment devices such as cartridge filters. These devices provide superior levels of capture of hydrocarbons and various chemical pollutants.

These treatment options will be reviewed and confirmed during detailed design in relation to the types of pollutants expected from each sub-catchment. The new alignment of Wheat Road will be predominantly covered by the proposed building works, excluding direct rainfall runoff from much of the new road drainage system. Refer to the stormwater concept drawings with provisional locations of treatment units to be installed.

10 Flood Assessment

A Flood Assessment was undertaken for the City of Sydney Council and is presented in the “*Darling Harbour Catchment Flood Study*” dated October 2014, prepared by BMT WBM. Information from this flood study has been extracted for the vicinity of the Cockle Bay Development (refer to Appendix D). The flood modelling indicates anticipated flood levels in Harbour Street immediately adjacent to the development site will be RL2.87 for the 100 year average recurrence interval (ARI) storm event and RL3.34 for the probable maximum flood (PMF) storm event.

An existing Type F Jersey kerb barrier exists between Wheat Road and Harbour Street and currently provides some level of protection from floods in Harbour Street. As part of the development works it is intended that the Type F kerb will be reconstructed to provide a formal flood barrier while retaining its primary function as a traffic barrier. A series of new low level drainage slot inlets will be provided to improve conveyance of floodwaters to Cockle Bay via a proposed concrete box culvert located below the ground floor level of the proposed development. Although this provision is not a specified proposal or requirement of the Flood Study, it would provide some reduction in flood levels in Harbour Street during extreme flood events and improve the current flood risk levels.

Flood planning levels for the worst case storm events are based on the higher value of 100 year ARI flood level plus 0.5m freeboard ($RL2.87 + 0.50 = RL3.37$) or the PMF level ($RL3.34$). The proposed ground floor level can be set lower than the flood planning level as it will be fully protected from flooding by the Type F kerb/flood barrier.

Sea level rise has previously been derived for the vicinity of Cockle Bay in the Darling Harbour Catchment Flood Study as described in the following extract:

9.1.1 Ocean Water Level

As discussed in Section 1.3.1, the sea level rise planning benchmarks provided in the NSW Sea Level Rise Policy Statement (DECCW, 2009) have been adopted for this Flood Study.

The benchmarks are a projected rise in sea level, relative to the 1990 mean sea level, of 0.4 metres by 2050 and 0.9 metres by 2100 (DECCW, 2009). Based on these guidelines, design ocean boundary conditions were raised by 0.4 m and 0.9 m to assess the potential impact of sea level rise on flood behaviour in the Darling Harbour catchment for the year 2050 and 2100 respectively.

The sea level rise allowances provide for direct increases in these ocean water levels. Table 9-1 presents a summary of the adopted peak ocean water levels for 1% AEP design modelling for existing water level conditions and the 2050 and 2100 sea level rise benchmarks.

Table 9-1 Design peak Sydney Harbour water levels incorporating sea level rise

Existing (5% AEP Tide)	2050 (+0.4m)	2100 (+0.9m)
1.38 m AHD	1.78 m AHD	<u>2.28 m AHD</u>

The peak water level expected in Sydney Harbour will be $RL2.28$. The proposed flood level for the development will be at least $RL3.05$ (the intended base structural slab level). Therefore, no adverse flood impacts are anticipated to affect the proposed development from flooding in Harbour Street or from sea levels in Cockle Bay.

11 Sediment and Erosion Control

Erosion and sediment controls are to be provided during the construction phase in accordance with applicable guidelines and as shown in Appendix B.

The general approach is intended to confine all ground level soil disturbance between Harbour Street and the foreshore of Cockle Bay, so that no sediment will be transferred to the adjacent streets or introduced into the existing stormwater drainage lines discharging through the sea wall. During earthworks behind the existing wharf structure, suitable temporary sediment basins within the demolished site areas will be provided to capture all runoff from disturbed areas.

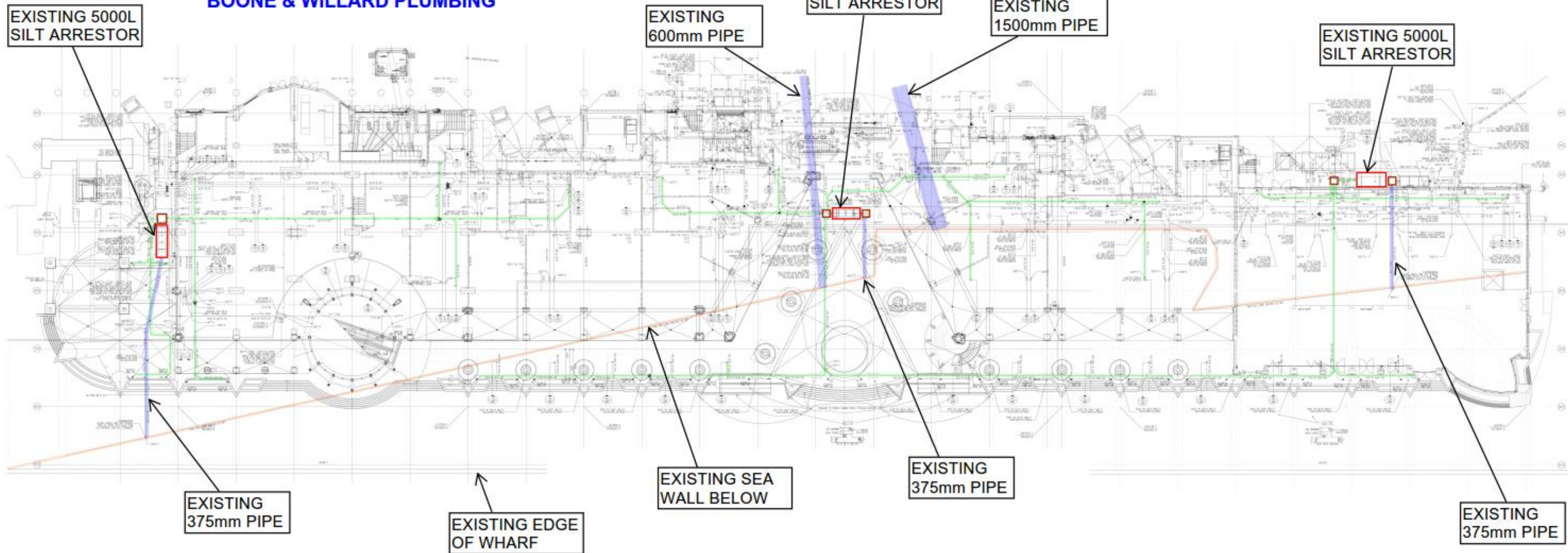
Additional measures such as sediment fences surrounding disturbed areas, sand bags around existing pit inlets and a truck shaker grid at the point of access to the work area are to be included where appropriate in the Contractor's detailed soil and water management plan, to be submitted for approval prior to commencement of any work on the site.

APPENDIX A

EXISTING STORMWATER PLAN

**AS-BUILT STORMWATER DRAINAGE PLAN
DATED 12 DECEMBER 1998, PREPARED BY
HARRIS PAGE & ASSOCIATES FOR
BOONE & WILLARD PLUMBING**

NORTH 



COCKLE BAY

APPENDIX B

EROSION AND SEDIMENT CONTROL PLAN

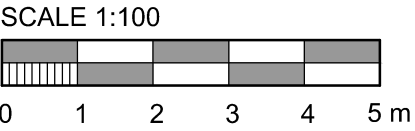
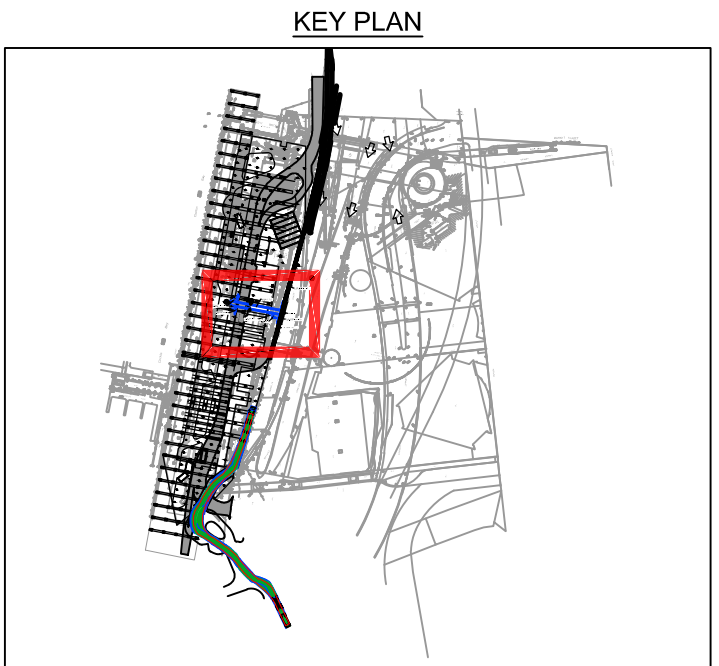
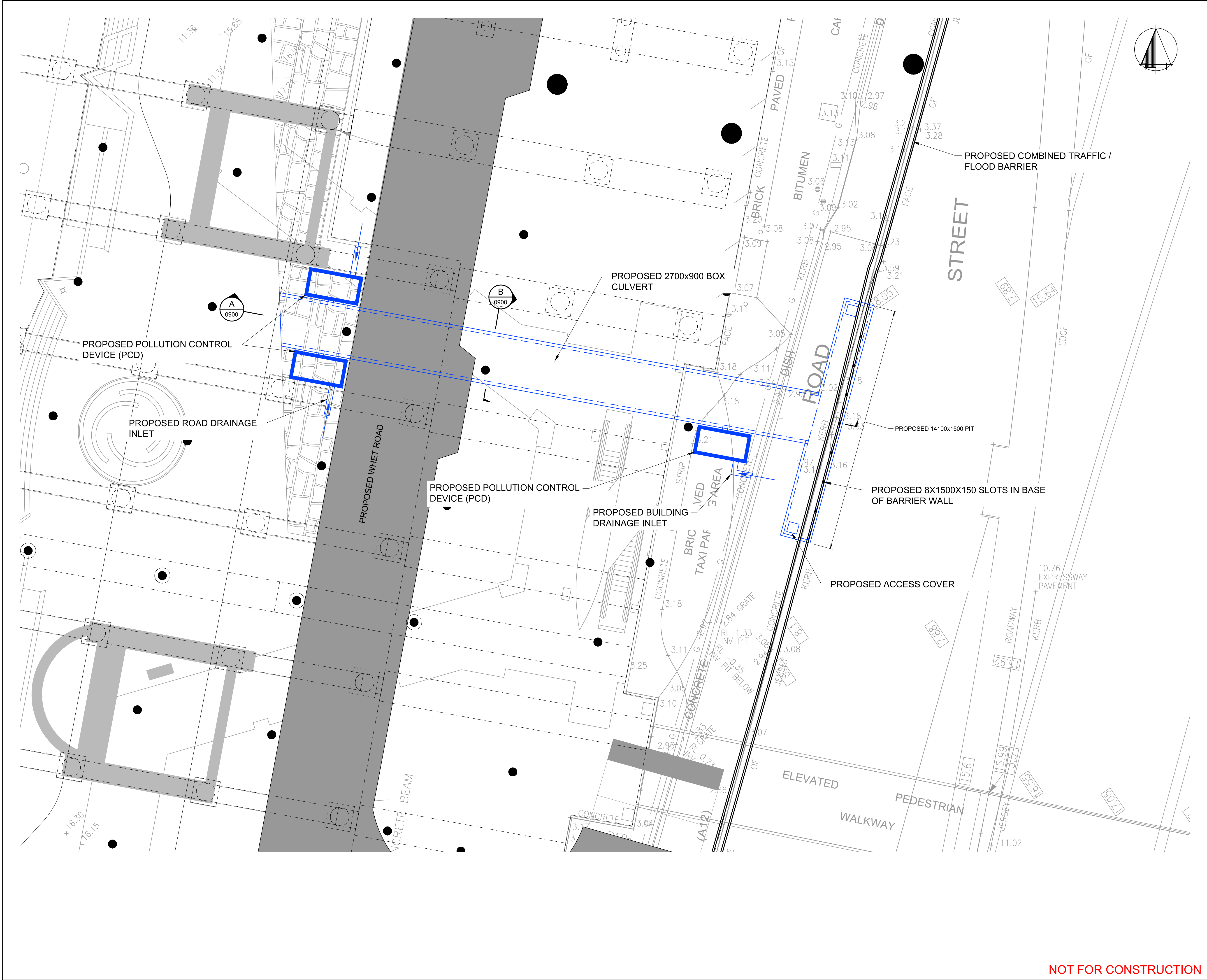
APPENDIX C

STORMWATER CONCEPT DRAWINGS

STRATEGIC CONCEPT STORMWATER DRAINAGE ARRANGEMENT SHEET 1

STRATEGIC CONCEPT STORMWATER DRAINAGE ARRANGEMENT SHEET 2

STRATEGIC CONCEPT CIVIL DRAINAGE DETAILS



1	23/09/16	PRELIMINARY DA ISSUE	CF	GH
rev	date	description	dm	ch'k

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project
**COCKLE BAY WHARF
REDEVELOPMENT**

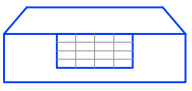
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STORMWATER DRAINAGE
ARRANGEMENT
SHEET 1**

status
FOR INFORMATION ONLY

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project no. 4886	drawing no. CV-0100	rev. 1	

NOT FOR CONSTRUCTION

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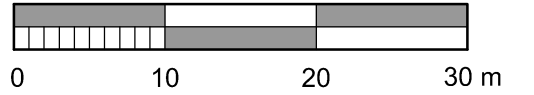
PROPOSED KERB INLET WITH
GRATED COVER



PROPOSED OSD TANK

NOTE
PROPOSED ROAD DRAINAGE SYSTEM TO
DISCHARGE INTO BOX CULVERT

SCALE 1:500



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1	23/09/16	PRELIMINARY DA ISSUE	CF	GH
rev	date	description	drn	ch'k

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project

COCKLE BAY WHARF REDEVELOPMENT

drawing title

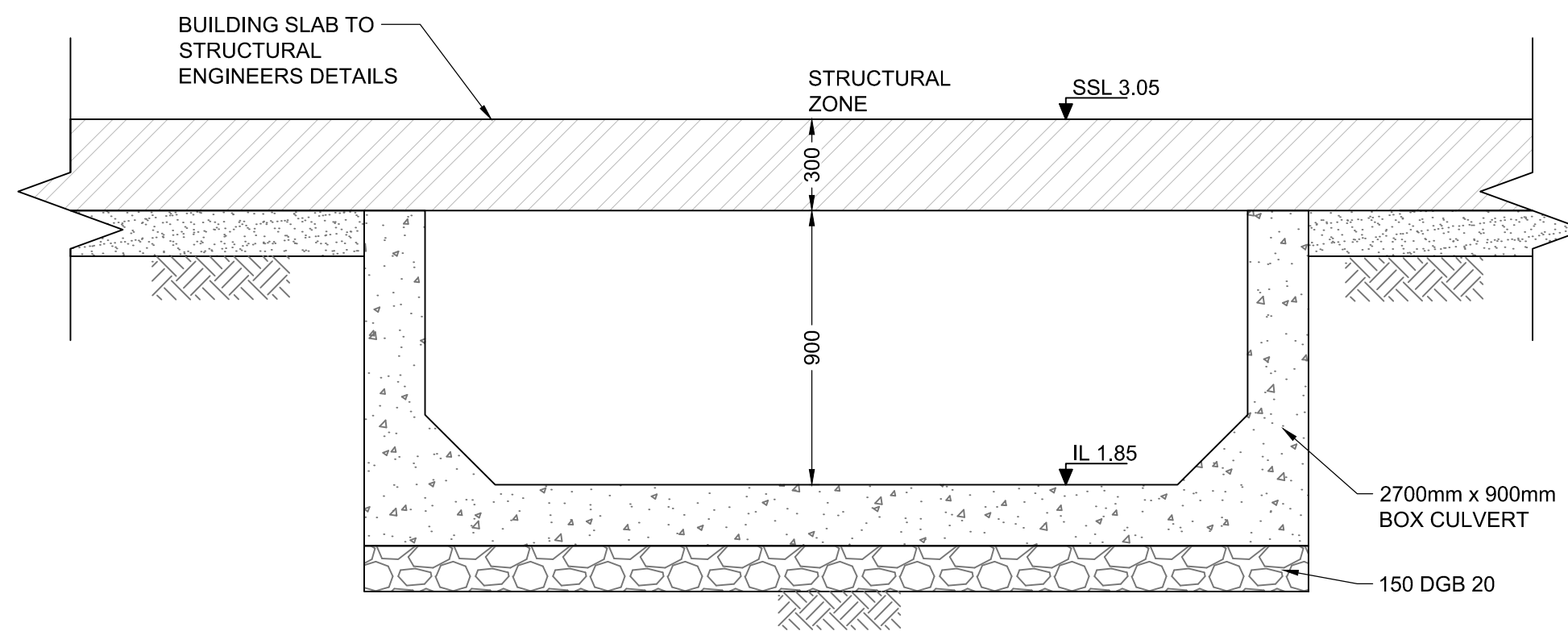
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STORMWATER DRAINAGE
ARRANGEMENT
SHEET 2

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FOR INFORMATION ONLY

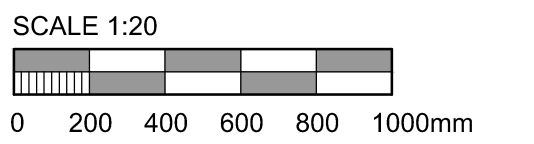
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SECTION A
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SECTION
SCALE 1:20

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REDEVELOPMENT

drawing title

STRATEGIC CONCEPT
CIVIL DRAINAGE DETAILS

status **FOR INFORMATION ONLY**

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APPENDIX D

FLOODING INFORMATION

7 DESIGN FLOOD RESULTS

A range of design flood events were modelled, the results of which are presented and discussed below. The simulated design events included the 2 year ARI, 5 year ARI, 10% AEP, 5% AEP, 2% AEP, 1% AEP, 0.2% AEP and PMF events for catchment derived flooding and the 1 year ARI Harbour level for the tidal inundation mapping.

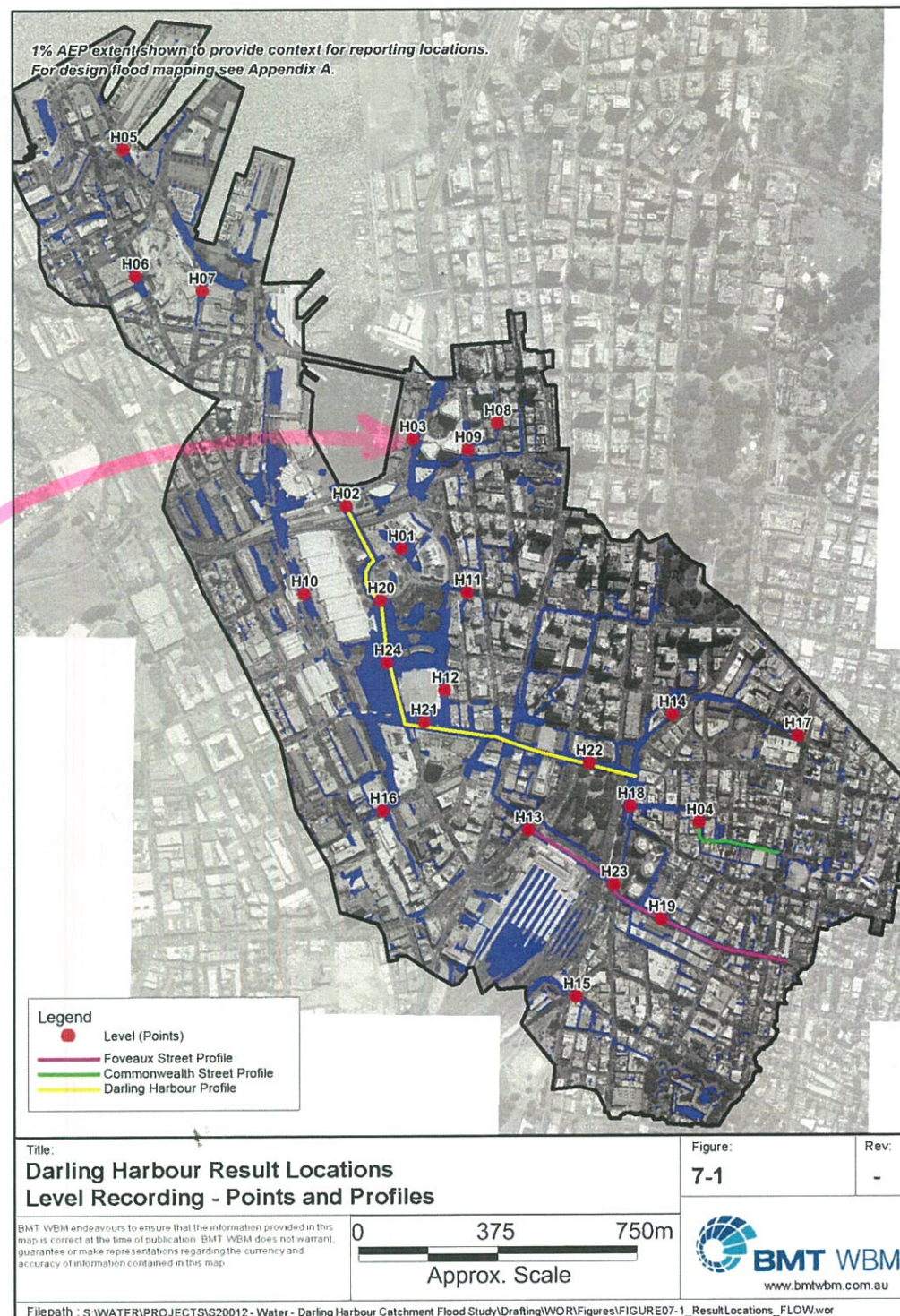
A range of design event storm durations have been simulated for each event. The design results presented in the remainder of the report represent the maximum values across all durations (peak envelope) for each design event simulated.

A series of design flood maps are provided in Appendix A. Supplementary to mapped results output, tabular results of peak flood behaviour have been provided for all design events in Table 7-1 and Table 7-2. The locations of flooding behaviour reported in Table 7-1 and Table 7-2 are shown in Figure 7-1 and Figure 7-2, respectively.

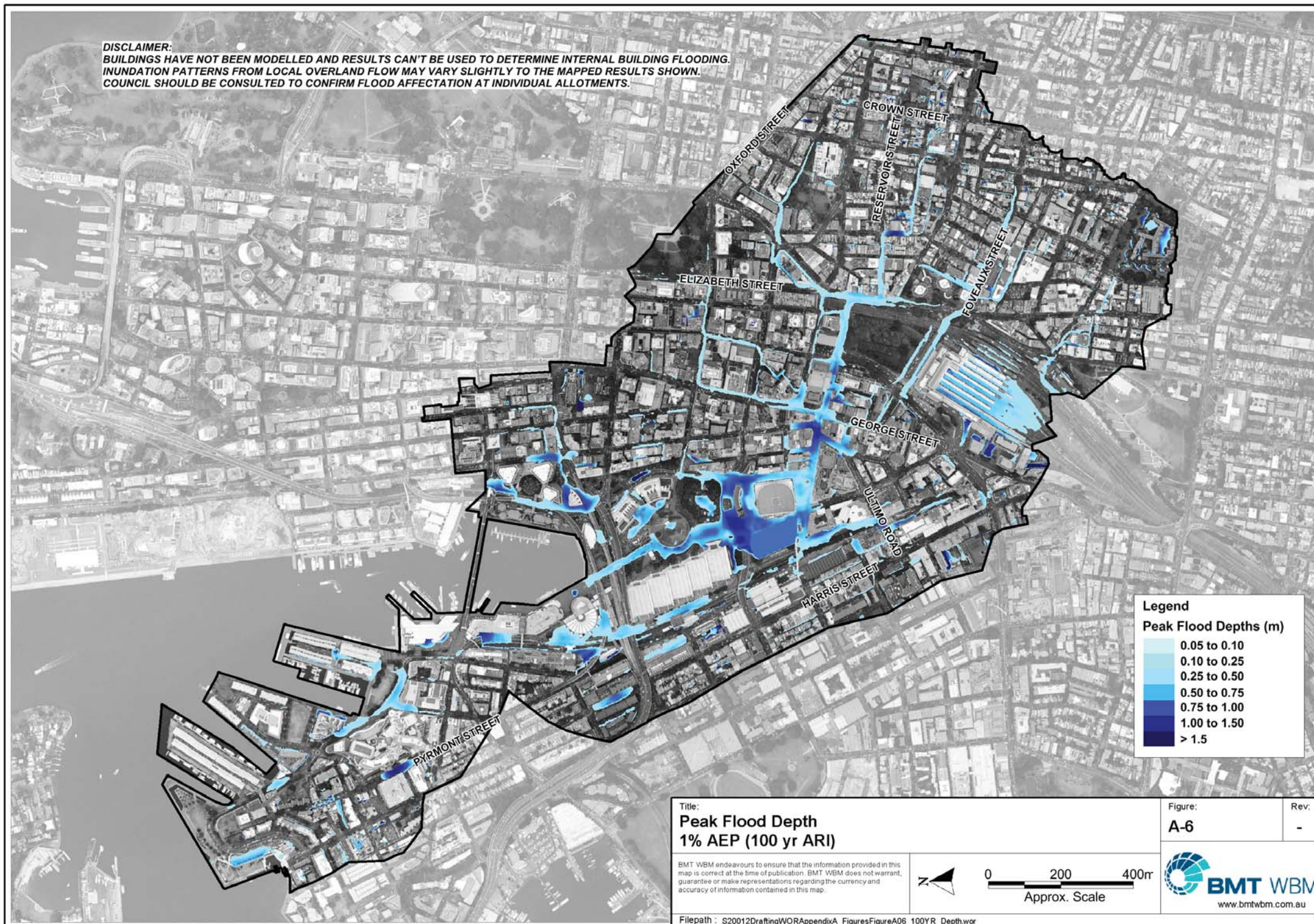
Table 7-1 Peak design flood levels

Location [#]	2yr ARI	5yr ARI	10% AEP	5% AEP	2% AEP	1% AEP	0.2% AEP	PMF
H01	3.38	3.40	3.42	3.42	3.43	3.44	3.45	4.29
H02	2.43	2.44	2.45	2.46	2.60	2.69	2.83	3.50
H03	2.76	2.76	2.76	2.77	2.82	2.87	2.95	3.34
H04	16.54	16.60	17.23	17.32	17.39	17.45	17.57	18.09
H05	2.60	2.63	2.68	2.73	2.76	2.79	2.85	3.00
H06	6.47	6.55	7.23	7.32	7.42	7.53	7.77	10.81
H07	2.54	2.60	2.75	2.79	2.82	2.85	2.90	3.16
H08	11.34	11.36	11.37	11.38	11.39	11.40	11.42	11.57
H09	5.40	5.51	5.62	5.69	5.73	5.77	5.87	6.24
H10	2.77	2.85	2.89	2.95	3.02	3.09	3.18	4.47
H11	6.82	6.83	6.85	6.88	6.89	6.90	6.92	6.99
H12	2.88	3.01	3.08	3.14	3.18	3.23	3.43	4.62
H13	11.49	11.52	11.53	11.54	11.55	11.56	11.58	11.72
H14	17.06	17.09	17.10	17.11	17.12	17.13	17.14	17.31
H15	24.37	24.39	24.40	24.42	24.42	24.43	24.46	24.66
H16	4.45	4.52	4.57	4.60	4.63	4.67	4.74	5.22
H17	35.06	35.07	35.07	35.09	35.09	35.10	35.11	35.25
H18	11.24	11.28	11.35	11.41	11.45	11.49	11.59	12.33
H19	19.50	19.53	19.55	19.57	19.58	19.61	19.65	19.90
H20	2.67	2.67	2.68	2.85	3.03	3.16	3.40	4.54
H21	3.15	3.21	3.28	3.34	3.38	3.43	3.53	4.68
H22	7.61	7.64	7.66	7.69	7.72	7.75	7.83	8.28
H23	16.25	16.27	16.29	16.30	16.30	16.31	16.33	16.54
H24	2.48	2.48	2.74	2.91	3.06	3.19	3.43	4.63

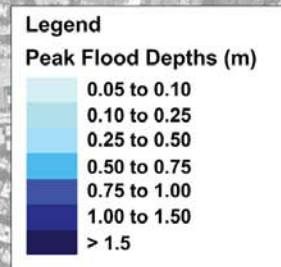
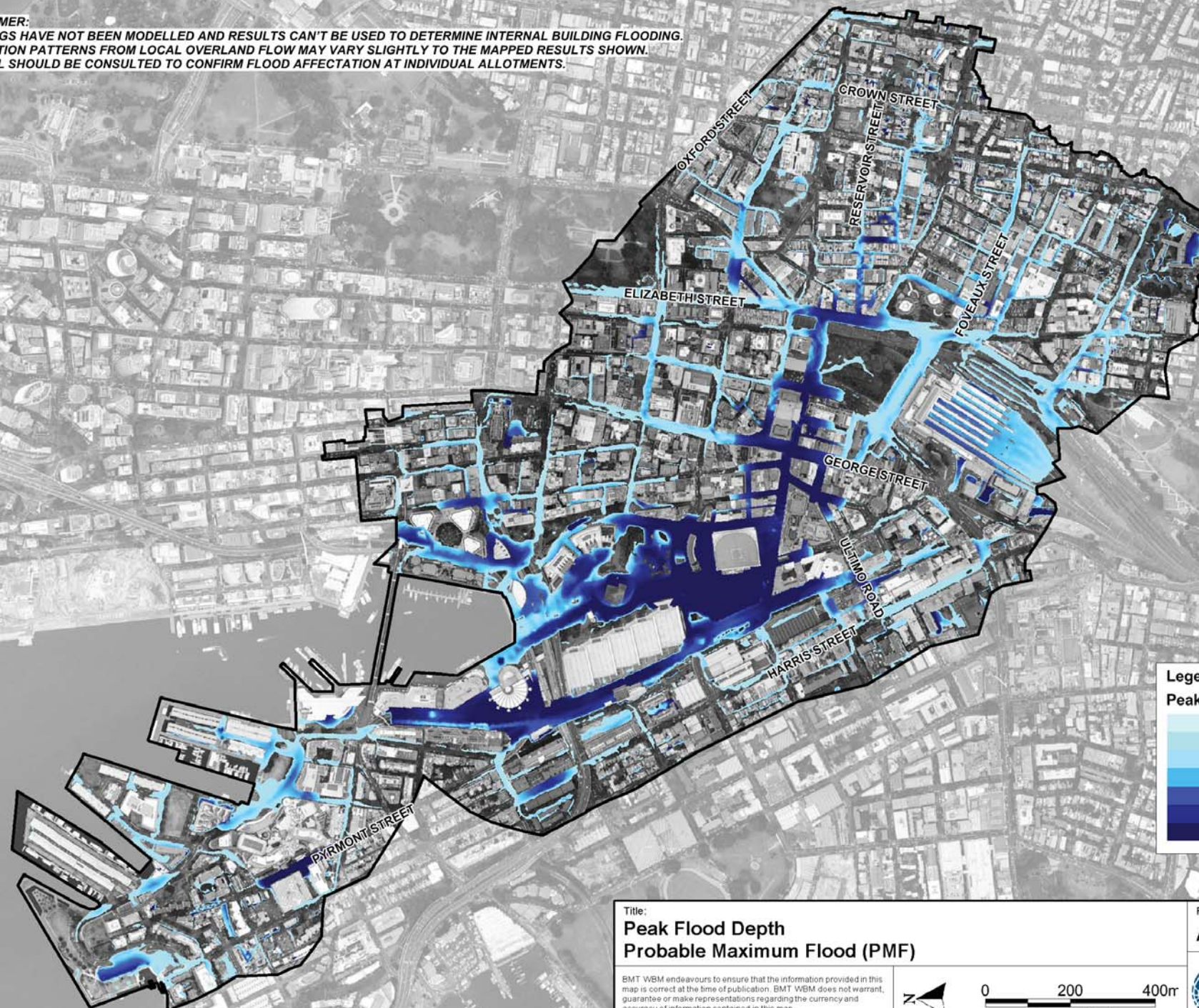
[#] Refer to Figure 7-1 for the reporting locations



DISCLAIMER:
 BUILDINGS HAVE NOT BEEN MODELLED AND RESULTS CAN'T BE USED TO DETERMINE INTERNAL BUILDING FLOODING.
 INUNDATION PATTERNS FROM LOCAL OVERLAND FLOW MAY VARY SLIGHTLY TO THE MAPPED RESULTS SHOWN.
 COUNCIL SHOULD BE CONSULTED TO CONFIRM FLOOD AFFECTATION AT INDIVIDUAL ALLOTMENTS.



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Title:
Peak Flood Depth
Probable Maximum Flood (PMF)

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 Approx. Scale

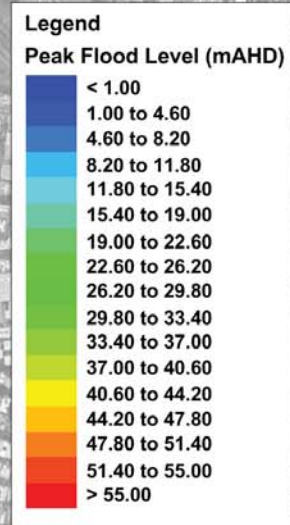
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 INUNDATION PATTERNS FROM LOCAL OVERLAND FLOW MAY VARY SLIGHTLY TO THE MAPPED RESULTS SHOWN.
 COUNCIL SHOULD BE CONSULTED TO CONFIRM FLOOD AFFECTATION AT INDIVIDUAL ALLOTMENTS.



Title:
**Peak Flood Level
 1% AEP (100 yr ARI)**

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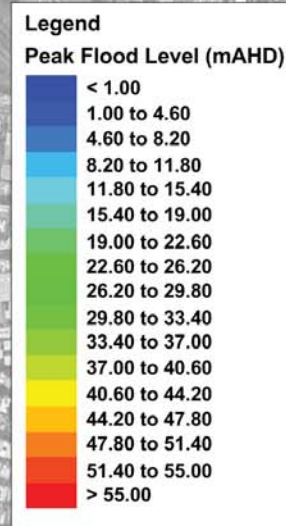
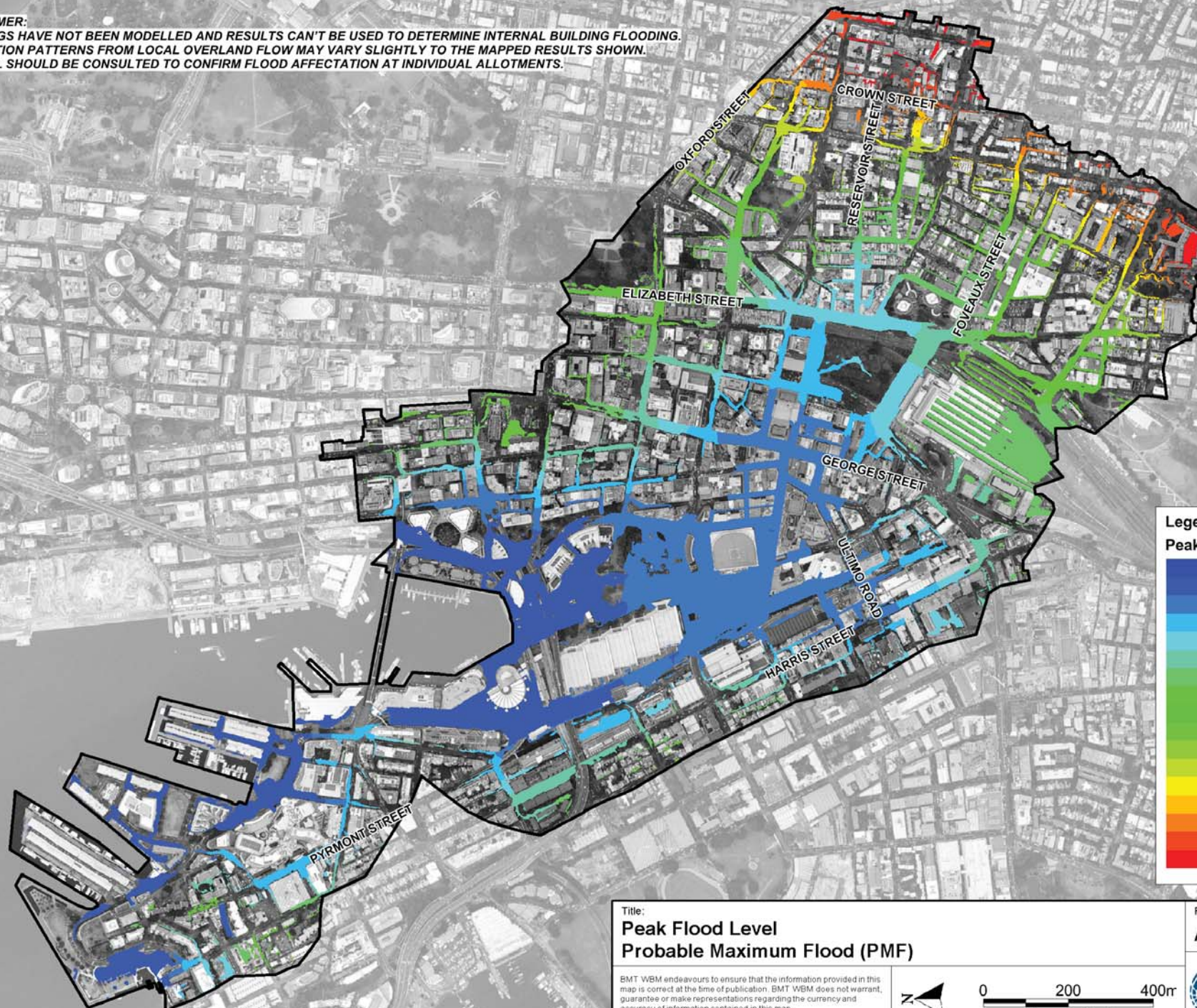
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 COUNCIL SHOULD BE CONSULTED TO CONFIRM FLOOD AFFECTATION AT INDIVIDUAL ALLOTMENTS.



Title:
**Peak Flood Level
 Probable Maximum Flood (PMF)**

BMT WBM endeavours to ensure that the information provided in this map is correct at the time of publication. BMT WBM does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.



0 200 400m
 Approx. Scale

Figure:
A-16

Rev:
 -



Filepath : S20012DraftingWORAppendixA_FiguresFigureA16_PMF_Level.wor