COCKLE BAY PARK REDEVELOPMENT

Appendix CC Stormwater and Flood Management Report

STATE SIGNIFICANT DEVELOPMENT,
DEVELOPMENT APPLICATION (SSD DA)

Prepared for: DPT Operator Pty Ltd and DPPT Operator Pty Ltd
By: enstruct group pty ltd
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COCKLE BAY PARK REDEVELOPMENT

STORMWATER AND FLOOD MANAGEMENT SSDA REPORT

ISSUE AUTHORISATION

PROJECT: COCKLE BAY PARK
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1	8/10/21	SSDA submission	TAH	PAL	PAL

Contents

1 Introduction

This report has been prepared to accompany a detailed State Significant Development (SSD) Development Application (DA) (Stage 2) for a commercial mixed use development, Cockle Bay Park, which is submitted to the Minister for Planning and Public Spaces pursuant to Part 4 of the Environmental Planning and Assessment Act 1979 (EP&A Act). The development is being conducted in stages comprising the following planning applications:

- Stage 1 – Concept Proposal setting the overall 'vision' for the redevelopment of the site including the building envelope and land uses, as well as development consent for the carrying out of early works including demolition of the existing buildings and structures. This stage was determined on 13 May 2019, and is proposed to be modified to align with the Stage 2 SSD DA.

- Stage 2 – detailed design, construction, and operation of Cockle Bay Park pursuant to the Concept Proposal.

1.1 The Site

The site is located at 241-249 Wheat Road, Sydney to the immediate south of Pyrmont Bridge, within the Sydney CBD, on the eastern side of the Darling Harbour precinct. The site encompasses the Cockle Bay Wharf development, parts of the Eastern Distributor and Wheat Road, Darling Park and Pyrmont Bridge.

The Darling Harbour Precinct is undergoing significant redevelopment as part of the Sydney International Convention, Exhibition and Entertainment Precinct (SICEEP) including Darling Square and the W Hotel projects. More broadly, the western edge of the Sydney CBD has been subject to significant change following the development of the Barangaroo precinct.

Figure 1 Location Plan

This report has been prepared in response to the Secretary's Environmental Assessment Requirements (SEARS) dated 12 November 2020 for SSD-9978934. Specifically, this report has been prepared to respond to those SEARS summarised in Table 1.

Table 1 SEARs requirements

Item	Description of Requirement	Section Reference (this report)
14. Flooding	The EIS must assess any potential flooding impacts associated with the proposed development and consider the relevant provisions of the NSW Floodplain Development Manual, including the potential impacts of climate change, sea level rise and increase in rainfall intensity.	4.3 Flooding
16. Stormwater and drainage	The EIS must: · include a stormwater and drainage management report in accordance with Council's relevant policies or guidelines · include a stormwater and drainage management plan and MUSIC Link certificate/report (showing compliance with Council's MUSIC Link Model) · assess water supply and quality impacts of the proposal, including any downstream impacts for both surface and groundwater, demonstrating how the development contributes to the NSW Government's Water Quality Objectives.	4.1 Legal Point of Discharge 4.6 Stormwater Quality

This report has also been prepared in response to the following Stage 1 (SSD 7684) conditions of consent summarised in Table 2.

Table 2 Concept approval of Conditions of Consent

Item	Description of Requirement	Section Reference (this report)
Hydrology C32	Future Development Application(s) shall consider potential flooding, stormwater, climate change/sea level rise and water quality	4 Stormwater Design 4.3 Flooding 4.4 Flooding and the proposed development
Construction C34 g)	Water Quality Impact Assessments and an Erosion and Sediment Control Plan (including water discharge considerations)	4.7 Erosion and Sediment Control
Erosion and Sediment Control B15.	Soil erosion and sediment control measures shall be designed in accordance with the document Managing Urban Stormwater – Soils & Construction Volume 1 (2004) by Landcom. Details are to be submitted to the satisfaction of the Certifying Authority prior to commencement of above ground works involving vegetation removal or soil disturbance	4.7 Erosion and Sediment Control
Erosion and Sediment Control C 12	All erosion and sediment control measures are to be effectively implemented and maintained at or above design capacity for the duration of the construction works and until such time as all ground disturbed by the works has been stabilised and rehabilitated so that it no longer acts as a source of sediment.	4.7 Erosion and Sediment Control

2 The Existing Site

2.1 Existing Stormwater

Existing stormwater drainage is generally located to the east of the site and includes assets owned and maintained by the City of Sydney (CoS) and Sydney Water Corporation (SWC). Two main underground drainage lines convey flows through the property including a 1500 mm diameter line in the central part of the site and an 1800 mm diameter line in the southern part of the site.

Due to the location of the proposed building core, the 1500 mm diameter line will need to be relocated (Figure 2). This line is registered as S.W.C No 30L by Sydney Water and was amplified in 1974. The line is currently located under the existing Cockle Bay Wharf podium building on the site and is independent of the existing building. 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.

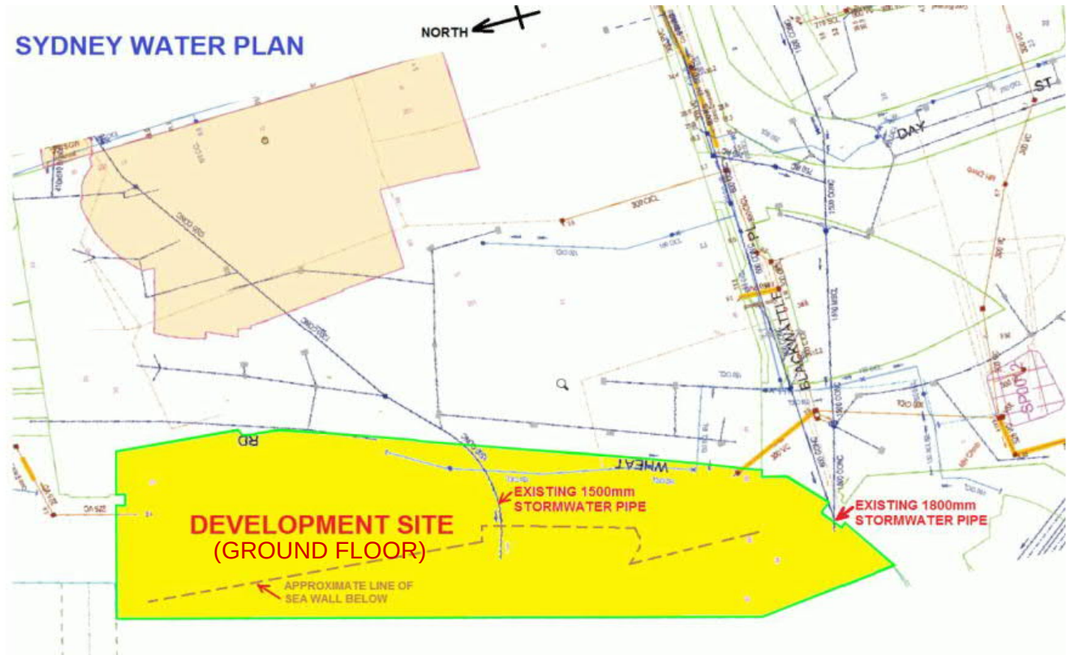

Figure 2 Sydney Water Hydraplot Record of Existing Stormwater Mains.

As part of the process to relocate a Sydney Water Corporation Asset, an investigation, concept design and liaison with Sydney Water was undertaken.

The investigation found the S.W.C No 30L asset captured water from York Street down to Darling Harbour. Its catchment was approximately 7.33ha of urban property. The pipe was straight down Market Street to Harbour Street where it was curved to meet the sea wall under Cockle Bay Wharf.

As part of the concept design process, enstruct has held numerous discussions with, and provided presentations to, Sydney Water to obtain approval 'In Principle' to relocate the Sydney Water Asset. This resulted in the concept design showing a new interception pit at the existing pit in the raised median between the north and south bound roads on Harbour Street, constructing a pipe across Harbour Street and constructing an integrated void under the ground floor slab of the building.

This proposal has been accepted 'In Principle' by Sydney Water's representatives, on 6 April 2021. The conditional approval has been included as Appendix D.

3 Proposed Development

Cockle Bay Park will be a new vibrant mixed-use waterfront neighbourhood destination for Sydney, which will realise the original vision for the site to connect the Harbour with its workers, residents and visitors; directly to the commercial core of our magnificent City.

Central to the development will be a contemporary commercial office tower designed for the future of workplace in Sydney. Situated at the western edge of the Central Business District (CBD), occupying a significant waterfront location overlooking Darling Harbour, the tower will be prominent and an elegant addition to the Sydney skyline, viewed from the western city approaches.

In addition to the commercial office tower the project will include a retail podium development along the Cockle Bay foreshore and a Landbridge structure spanning the Western Distributor Road corridor that separates the city from the harbour to the west.

Through the construction of the Landbridge elevated above the Western Distributor motorway, it will allow the city to reconnect to the harbour. A key public benefit created by the development will be the Landbridge and park that spans the Western Distributor and provides improved pedestrian accessibility from the City to the harbour. This public domain will re-vitalise this harbourfront location and contribute to the enrichment of the Darling Harbour.

The multi-level podium will provide a vibrant and diverse retail and entertainment destination which will define and activate the waterfront.

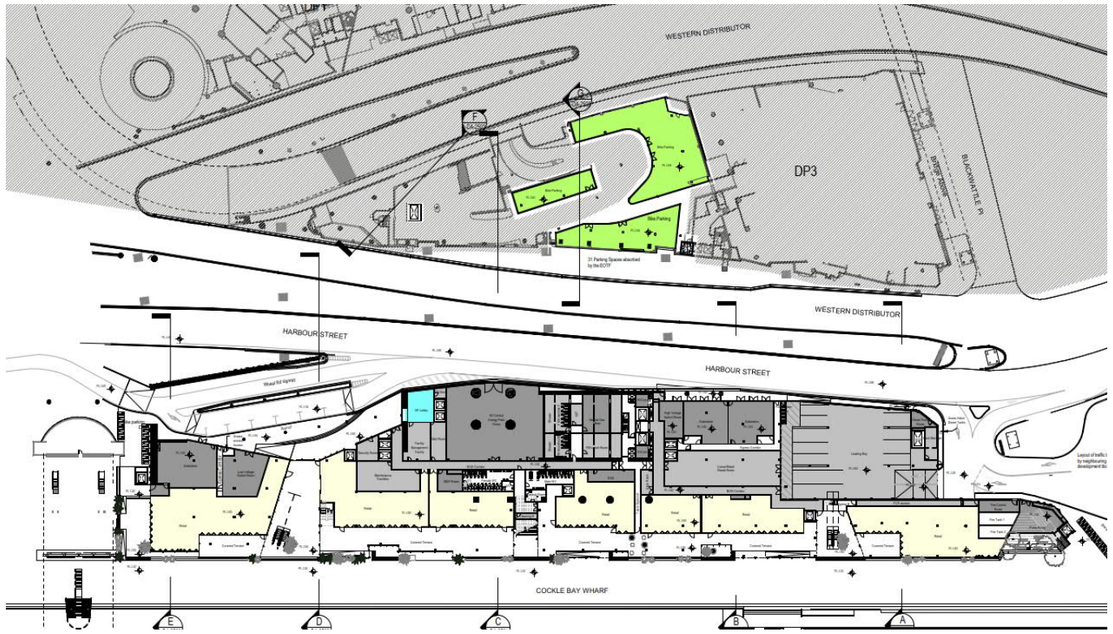

Figure 3 Proposed Ground Floor Plan (Source: Henning Larsen)

4 Stormwater Design

The stormwater design must be in accordance with relevant Australian Standards, CoS Technical Specifications for Stormwater Management, Sydney Water, Australian Rainfall and Runoff (2019), and the NSW Environment Protection Authority (EPA).

In general, all drainage pipework and pits will be designed to satisfy the minimum provisions of AS 3500.3. They must be designed to convey, at least, the 5% AEP flows. Where pipe capacity is exceeded i.e. greater than 5% AEP, stormwater will be conveyed as overland flow. Overland flow paths are to be designed to convey at the minimum 1% AEP stormwater flows with a Velocity x Depth to be less than $0.4m^2/s$. Any drainage affecting road assets is to be designed and constructed in accordance with AustRoad Design Guidelines - Drainage - Part 5, and Road Design Guidelines - Standard Drawings- Part 9.

Prior to stormwater pipeline design, enstruct will confirm soil classification from a geotechnical assessment. Pipeline design will provide minimum cover relevant to selected material.

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 re-aligned with a slip road off Harbour Street 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 cross falls associated with the road design layout.

The key design criteria and Council requirements for stormwater drainage design are as follows:

- Stormwater Network:
    - Site stormwater network is to be designed for the 5% AEP storm event
    - Stormwater is to drain by gravity to the bay
    - Gross pollutant traps are required to treat water from vehicle drop off, loading dock and hardstand areas which will be discussed in Section 4.6.
- Tower:
    - Roof runoff will be stored in rainwater tanks for re-use. The rainwater collection and re-use system is by the hydraulic engineer.
    - Excess water will drain by gravity to the site’s stormwater system.
- Landbridge:
    - Stormwater draining from impervious areas will be collected using grated drains.
    - Stormwater draining from pervious areas will be drained using a subsoil drainage system and drainage cells.
    - The stormwater captured via the grated drains and drainage cells will be collected by pipes up to 225 mm diameter. The pipes will run on the bridge deck. The grade of the pipes will follow the grade of the bridge planks. The pipes will fall from east to west to the western head stock. The pipes will then fall vertically down to the Harbour Street level. There will be no pipe penetration through the bridge deck as per the requirement by Transport for NSW (TfNSW).
    - The landbridge pipe network is designed for a 1% AEP storm event.
    - The landbridge will be graded such that during a storm event that exceeds the capacity of the in-ground stormwater system, overland flow will be directed to the north-west corner of the bridge and discharge via an overflow between the building and Pyrmont Bridge. Part of the landbridge overland flow will be directed to the south west corner of the site and discharge via an overflow to the loading dock driveway.
- Crescent Garden:
    - The crescent garden stormwater will be managed as part of the hydraulic drainage system, to be discharged to the existing building hydraulic network.
- Retail Podiums:
    - Podium roof water will be collected and directed to the rainwater tanks for re-use (by hydraulic engineer)
    - Surface areas to be collected via floor drains to the site’s stormwater system.
    - Floor levels are to be set as per Section 4.4.1of this report
    - WSUD treatment is proposed utilising rain gardens. The design will be developed in conjunction with the landscape architect for the podiums.
- Roads:
    - Harbour Street and the adjacent Western Distributor Freeway drainage system will remain.
    - Upon finalising the design, we anticipate minor relocation of piping or silt traps.
    - New site access from Harbour Street will require connection to the site stormwater system for collections and drainage. Overland flow for Wheat Road will be unobstructed to drain to Harbour Street.
    - Note that the landbridge will intercept rainfall and therefore reduce the amount of stormwater on Wheat Road, Harbour Street, and the Western Distributor.

Drainage for this site will be designed in accordance with the methods outlined in “Australian Rainfall and Runoff”, Institution of Engineers. The software package DRAINS was used to design the new stormwater network.

Gutters, floor drains, and downpipes associated with the buildings will be designed by the Hydraulic Engineer. The roof drainage system of gutters, downpipes and associated pipework is to be designed in accordance with AS/NZS 3500.3 Plumbing and Drainage Part 3: Stormwater Drainage.

Courtyards, terraces at ground level, and surface water will be collected and conveyed via a downpipe system and floor pits to the stormwater drainage system. The stormwater drainage system will collect surface water flows and discharge to a stormwater filter chamber, and then to the harbour via an outlet pipe installed through the seawall / embankment at the northern end of the site and utilising the existing 1800mm connection to the harbour at the southern end of the

site. The stormwater drainage network will be a gravity system which utilises the natural level change from the proposed site to the point of discharge.

The Landbridge stormwater will be designed by enstruct through liaison with the Landscape Architect, while all other courtyards and terraces on the podium will be designed by the Hydraulic Engineer.

The stormwater drainage system is to be designed to protect the buildings and the environment from damage from stormwater and floodwater.

Stormwater drainage outlets and pipes shall be positioned to prevent water ponding outside the building or on roads or paved areas.

The design will, in the event of blockage or other failure of the stormwater system, divert water from buildings entrances by providing escape flow routes over adjoining paved or ground surfaces in the manner of the major/ minor system recommended by “Australian Rainfall and Runoff”.

The minor drainage design storm will be the 5% AEP design storm. Setting this as the minor design storm means that rainfall runoff from all storm events up to and including the 5% AEP design storm will be conveyed through formalised in ground drainage structures to controlled points of discharge.

For all storms greater than the 5% AEP, an overland flow path will be designed to cater for the water to ensure no building will be inundated by stormwater.

Table 3 Stormwater Design Criteria

Element	Criteria
Pipe Class	Minimum Class 3
Design Loading	SM1600 – Traffic Loading T44, CAT16H – Construction Loading
Minimum Pipe Size	Private Property – 150mm diametre minimum Local Roads – 375mm diametre minimum 450 x 450 mm
Minimum Pit Size	600 x 600mm
Maximum spacing of pits	Desirable – 70m Absolute 120m
Pit blockage allowance	On grade – 0.5 Sag – 1.0
Minimum pipe cover	600mm
Design storm	Minor – 5% AEP Major – 1% AEP
Minor storm pit freeboard	Desirable – 150mm Absolute – 100mm
Minor storm flow widths	1m width of flow into travel lane in 10% AEP
Allowable velocities	Max. – 6.0m/s for 10% AEP Min. – 0.6m/s for 0.5% AEP

4.1 Legal Point of Discharge

The site drainage from the new development is to be discharged into the Cockle Bay harbour through the existing sea wall in a similar manner to the current outlet discharge arrangement.

4.2 Onsite Stormwater Detention (OSD)

OSD is not required as the site is discharging to the harbour and not to any existing stormwater systems.

As part of Green Star requirements, peak ARI event discharge is to be no larger than pre development flows. Whilst OSD will not be provided for the site, when the post development site characteristics are compared to the existing conditions which are nearly 100% impervious, the landscaped landbridge will slow stormwater and reduce peak discharge as rain will be captured in the vegetation and soil profile. At a minimum, there will be no increase in peak flows compared to existing conditions.

4.3 Flooding

enstruct has prepared a flooding report as a separate document “Cockle Bay Park Civil Engineering Flood Report” (August 2021) to detail the flood analysis and planning considerations for the site. The report has been submitted to City of Sydney, and is included as Appendix A. The following section provides a summary of the flood analysis and findings.

4.3.1 Flood Modelling

A Flood Assessment was undertaken for the City of Sydney and is presented in the “Darling Harbour Catchment Flood Study” dated October 2014, prepared by BMT WBM. enstruct has obtained the TUFLOW flood model from Council.

The flood model covers an area from Hyde Park, to Central Station and Pyrmont. To undertake the site-specific flood study for CPB, the model was updated in the following ways:

- Survey information from the point-cloud survey was added to the terrain model.
- The F-type barriers (jersey kerbs) were added to the model based on field survey and site observations
- The Pyrmont area was removed from the model to optimise model run times

Figure 4 shows a comparison between the terrain data in the flood model as provided by Council, and the detailed point cloud survey added to the flood model as part of the model updates. The survey provides more detail including the raised median, Harbour Street levels, the Pyrmont Bridge abutment.

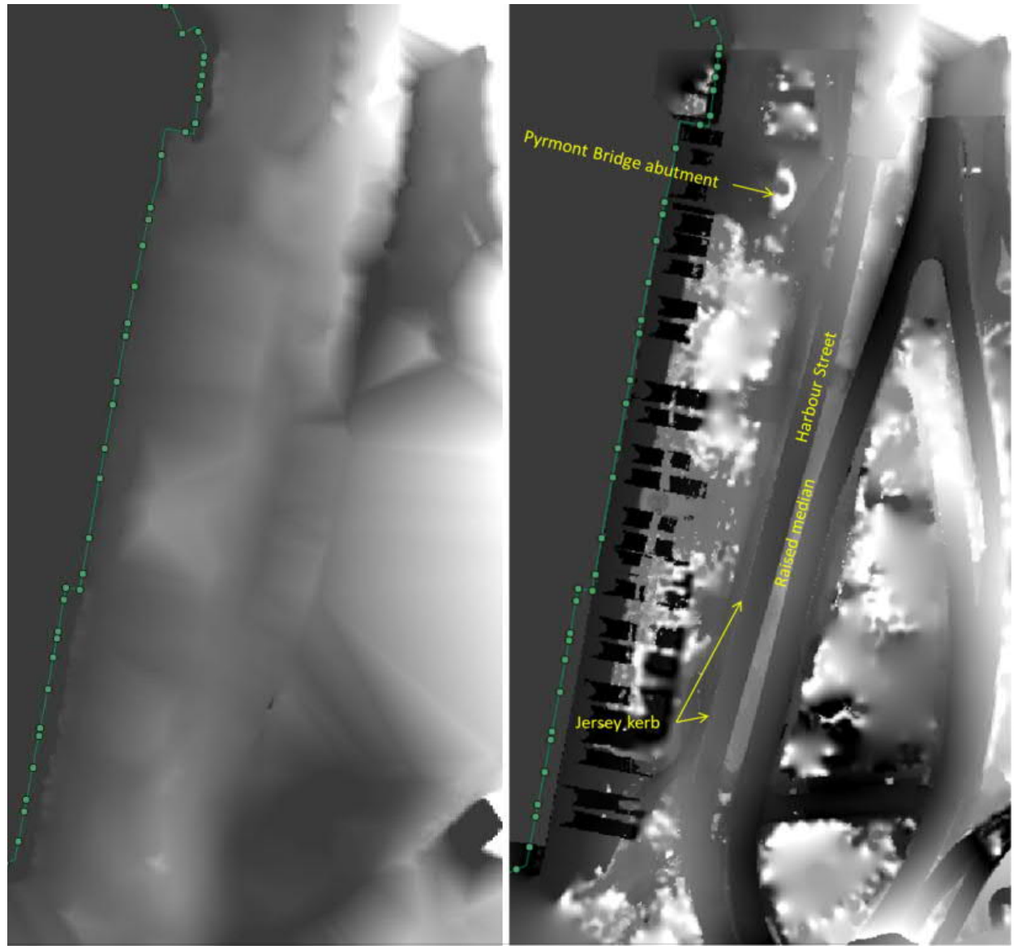

Figure 4 Existing Council terrain data Updated terrain data

4.3.2 Rainfall Distribution

The model uses a rainfall-on-grid approach. This approach ignores the fact that Harbour Street is largely protected from rain by the overhead Western Distributor. The rainfall layer in the model was modified to exclude the elevated roadways.

4.3.3 Rainfall Patterns

The Council model is based on Australian Rainfall and Runoff (ARR) published in 1997 as the basis for the hydrology. This publication was the current guideline and considered best-practice for flood estimation at the time the flood model was prepared. CoS require that any site-specific flood study needs to adopt industry best practice.

In 2016, the 4th Edition of Australian Rainfall and Runoff (ARR 2016) was released. As part of the update design flood inputs have been revised including Intensity Frequency Duration (IFD)

depths, Losses, Areal Reduction Factors and Temporal Patterns. A further minor revision was released in 2019. For Sydney, the new IFD patterns generally result in a reduction in rainfall intensities of approximately 20% for the 1% AEP storm.

Note there are no changes to the Probable Maximum Flood (PMF) as the methodology for calculating the PMF follows a separate guideline published by the Bureau of Meteorology, last updated in 2003.

A report on the sensitivity of the 1% AEP behaviour comparing ARR1997 with ARR2016 was prepared by WMA Water on behalf of OEH "ARR 2016 Case Study – Urban Report on Sensitivity to ARR 2016 Approaches". The study used the nearby Woolloomooloo catchment as a case study. The analysis found that across most of the catchment, the reduction in flood levels due to reduced rainfall depths is less than 100mm, however at a few trapped low points the reduction in flood levels was in the range 200-400mm.

In order to meet the current industry best practice, the flood model was updated to reflect ARR2019. ARR2019 recommends an ensemble approach to flood modelling, where 10 storm events are modelled for each storm duration to represent the variability in observed rainfall patterns. ARR2019 states: "It is not recommended that the temporal pattern that represents the worst (or best) case be used by itself for design. Testing has demonstrated that on most catchments large number of events in the ensemble patterns are clustered around the mean and median". The recommendation is that the median storm is selected for the purpose of flood analysis.

Undertaking this analysis involved 40 simulations to determine the critical duration storm and the median storm for that duration as per the ARR 2019 guidelines. The critical duration storm for a 1% AEP event was found to be the 45-minute storm (Figure 5).

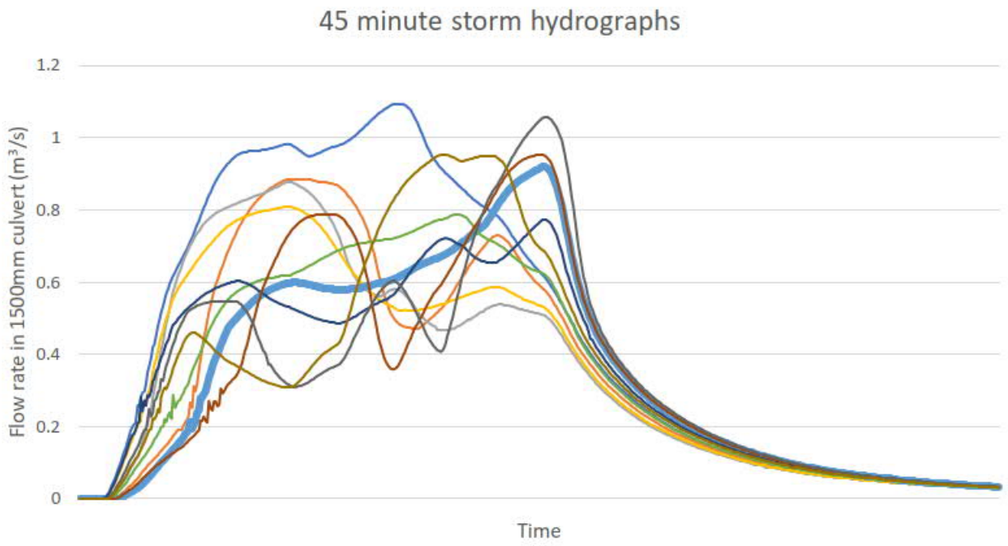

Figure 5 Results for an ensemble of 45 minute 1% AEP storms with the median storm highlighted

4.3.4 Stormwater Pit Blockage

The flood modelling adopted the blockage of pits as outlined in the City of Sydney Development control Plan (Figure 6). These blockage factors have been used in all scenarios, existing and proposed.

(4) The site-specific flood study is to assume the 'worst case scenario' conditions for blockages to pipes, culverts and other infrastructure, such that:

(a) kerb inlets are assumed to be 50% blocked;

(b) sag pits are assumed to be 100% blocked; and

(c) culverts and bridges with an open area less than six metres, measured on the diagonal, are assumed to be 50% blocked.

Figure 6 Blockage factors

4.3.5 Existing Conditions Flood Model Results

4.3.5.1 Impact of model updates on the existing conditions model

The following figures present the flood modelling results for the critical duration 1% AEP storm event under the existing conditions as described in the previous chapter.

- Figure 7– Shows the original 1% AEP flood extent with unedited terrain data
- Figure 8– Shows the flood extent using the revised terrain data and ARR2019 rainfall data

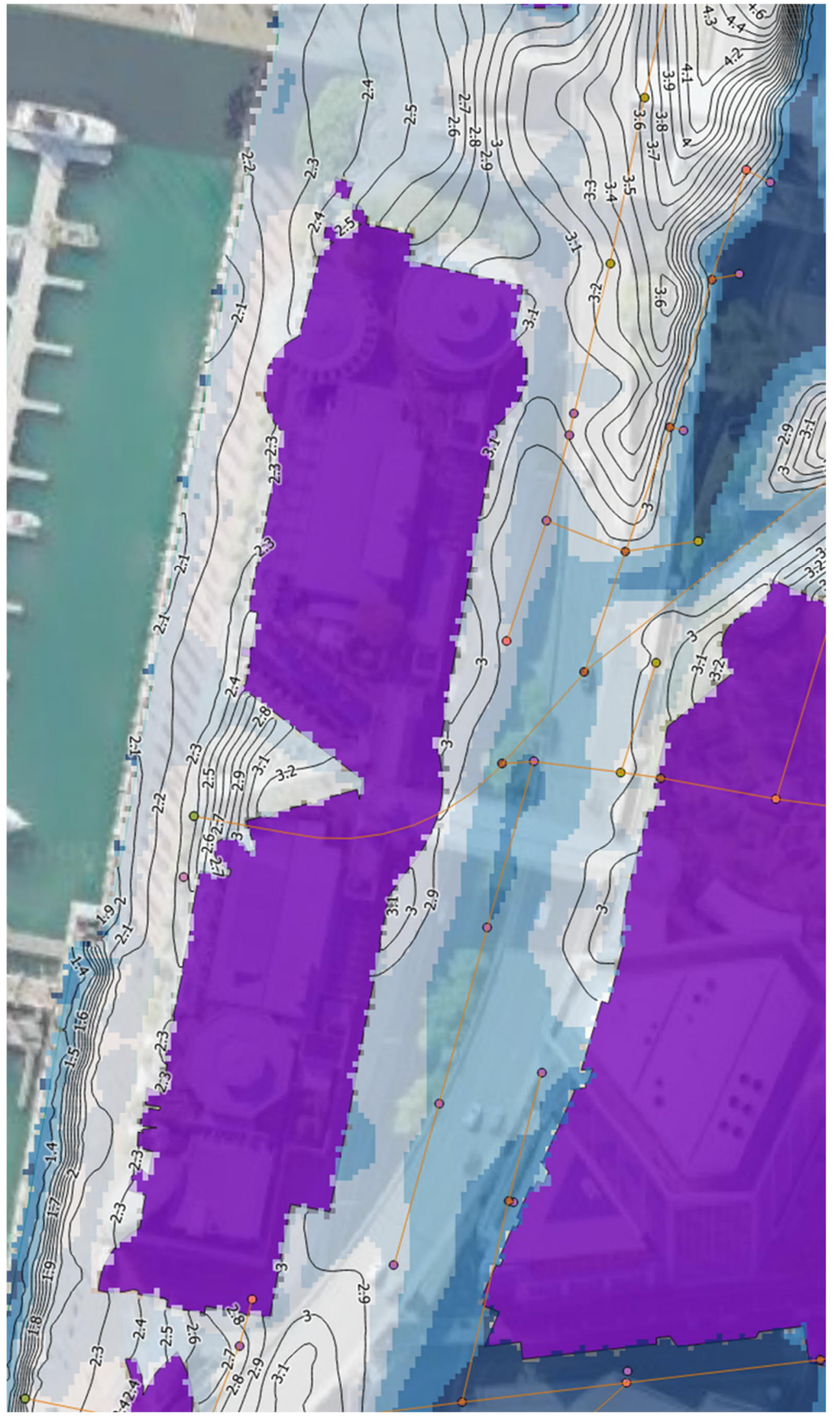

Figure 7 Unedited model 1% AEP flood results

The refined survey shows a better representation of flooding on the roadways, providing a more accurate baseline result (Figure 8)

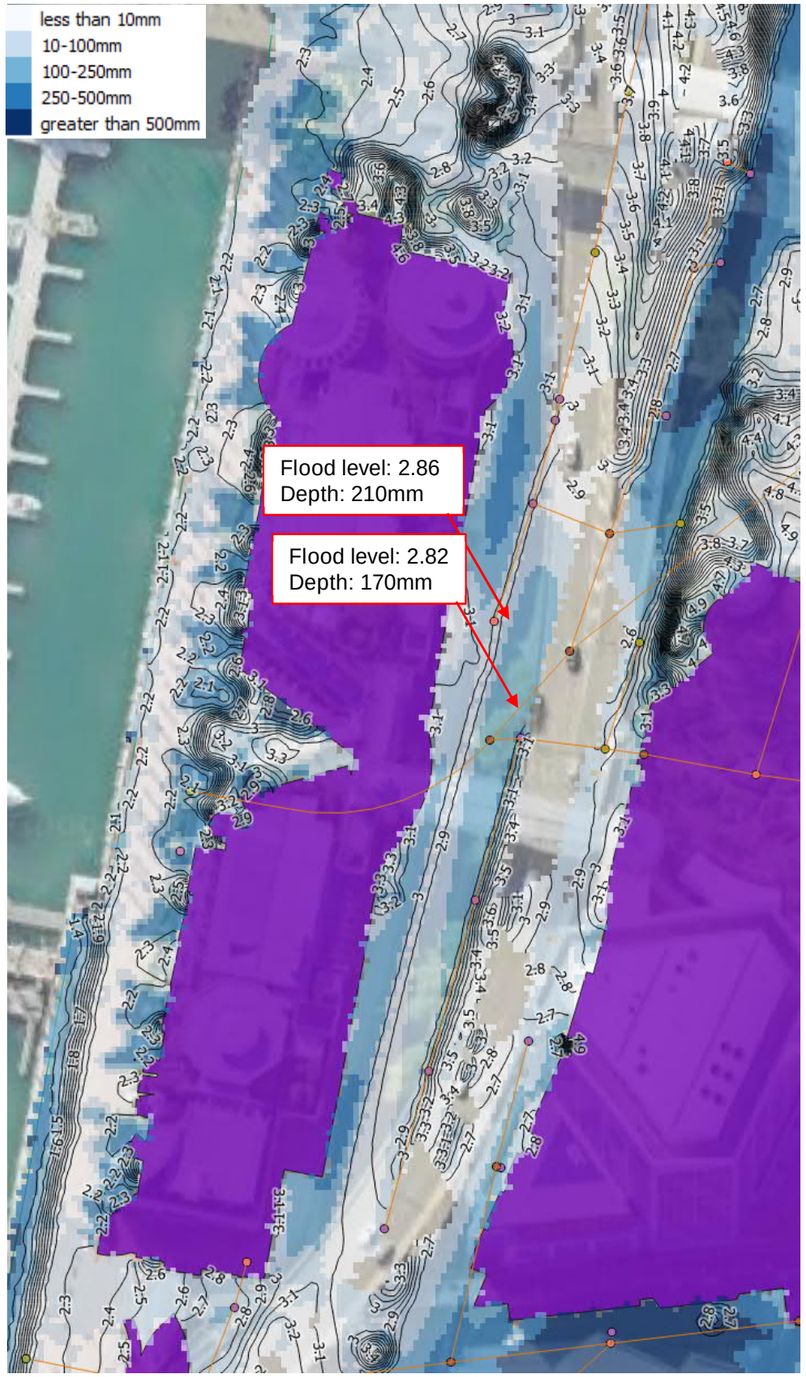

Figure 8 New existing conditions model with ARRR 2019 rainfall

This model has been adopted as the new existing conditions model for the purpose of this report.

The impact of updating the rainfall to ARR2019 shows a slight decrease in flood depths as expected. The reduction in flood levels on Harbour Street is approximately 35mm at the sag point.

4.4 Flooding and the proposed development

The proposed conditions model takes the new existing conditions model and adds in the changes to the site as a result of the proposed development:

- Relocation of Jersey kerbs and some road grading
- New building layout (at the ground plane)
- Proposed culvert
- Consideration of proposed land bridge capturing rainfall

The results of the analysis are show in Figure 9

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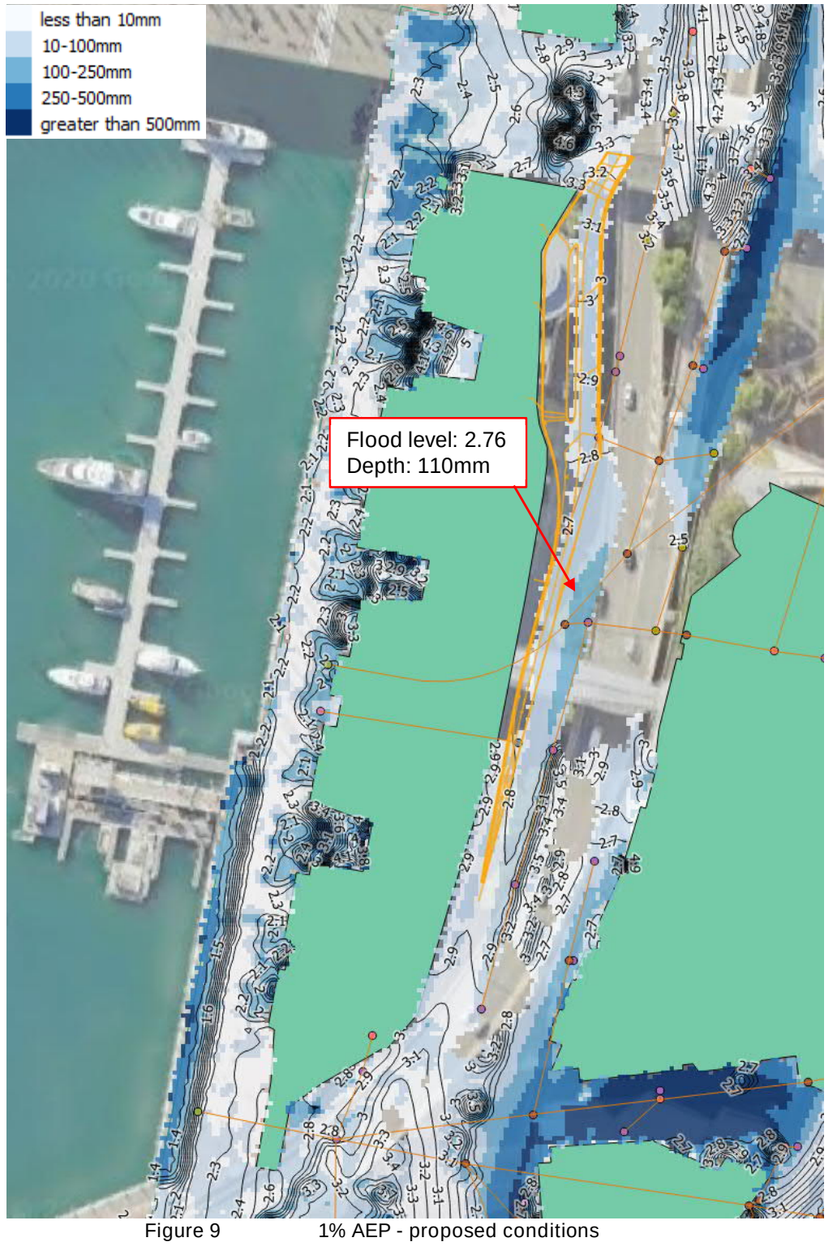


Figure 9 1% AEP - proposed conditions

Further information on flooding, including Probable Maximum Flood (PMF) analysis, the impact of ARR2019, and the impact of climate change with respect to flooding at this site is addressed in the “Cockle Bay Park Civil Engineering Flood Report” included as Appendix A.

4.4.1 Freeboard

Policy

The City of Sydney’s “Interim Floodplain Management Policy” approved on 12 May 2014 outlines the requirements for flood planning levels at the site:

Industrial or Commercial	Business	Mainstream or local drainage flooding	Merits approach presented by the applicant with a minimum of the 1% AEP flood level

Consideration should be given to providing flood protection via a freeboard above the minimum floor level. This can be provided through F-type barriers along the Harbour St frontage, and maintaining a minimum 300mm high crest between the slip road and the vehicle drop off area. Consideration should also be given to the PMF level.

The City of Sydney accepts zero freeboard for Business and Retail developments however it should be noted that the proposal must demonstrate a reasonable balance between flood protection and urban design outcomes for street level activation. Upon revision of the flood modelling results for the proposed development, it is noted that the only flooding issues are related to overland flow passing the drop off area and the loading dock area.

It should be noted that in Council’s Interim Floodplain Management Policy, when considering habitable rooms in residential developments subject to local drainage flooding, there is an option for the Flood Planning Level to be two times the depth of flow with a minimum of 300mm above the surrounding surface if the depth of flow in the 1% AEP flood is less than 250mm.

Vehicle Drop Off Area

Overland Flow depth on the access road outside the vehicle access areas is less than 50mm in a 100-year event.

Under the flood policy, the minimum floor level is the 100-year flood level of 3.06mAHD.

In order to achieve a higher level of flood protection the vehicle drop off area targets a flood planning level to meet the requirement of a habitable room in a residential development. Using this approach, a Flood Planning Level of 3.35mAHD achieves a 300mm level difference to the adjacent access road. This level also provides protection from a PMF event.

Loading Dock

Based on preliminary grading, the 100-year flood level is 2.90 mAHD, and the PMF 3.10 mAHD at the loading dock entry.

Given flow depth and levels, a 300mm high crest between the access road and the loading dock has been included to prevent overland flow entering the building.

Summary

Based on the ground floor of the development being commercial and retail comprising of non-habitable rooms, the reasons for the recommended freeboard are:

- There is no flooding of the site under the proposed conditions
- The only stormwater passing the site is local overland flow
- The overland flow depth near the vehicle drop off is 50mm
- The overland flow depth at the loading dock entry is 90mm
- The Probable maximum Flood level at the vehicle drop off is RL3.07 AHD and loading dock is RL 3.10m AHD
- The general freeboard for non-habitable rooms is 300mm above the 1% AEP
- CoS Interim Floodplain Management Policy, for habitable rooms in residential developments, for local drainage flooding can be a minimum of 300mm above the surrounding surface

Therefore, the following the assessment of the above, the recommended freeboard is 0.3m above the surrounding surface being RL3.35AHD at the vehicle drop off and RL 3.11AHD at the loading dock.

A summary of results is presented below, along with recommended flood planning levels.

Location	Existing conditions 1% AEP level	Proposed conditions 1% AEP level	Existing conditions PMF level	Proposed conditions PMF level	Minimum flood planning level	Adopted Flood Planning Level
Vehicle Drop Off	3.10	3.06	3.32	3.29	3.06	3.35
Loading Dock Entry	(2.90)	2.90	(3.10)	3.10	2.90	3.11 (300mm above the adjacent road level of 2.81)
Substation	2.82	2.76	3.32	3.29	3.06	Agency advice to confirm minimum freeboard

Table 4 Flood Planning Levels

4.4.2 Climate Change

The impact of climate change on flooding at the development has been modelled to demonstrate the resilience of the proposed development to the impacts of climate change with respect to flooding.

Information on increase rainfall intensities and ocean levels is provided by the CSIRO's climate futures tool (CSIRO and Bureau of Meteorology, Climate Change in Australia website (http://www.climatechangeinaustralia.gov.au/))

The climate futures tool gives an ocean level of 2.28 mAHD and a rainfall intensity increase of 19.7% under the Representative Concentration Pathway (RCP) 8.5 in 2090 scenario.

The proposed development was found to be resiliant to potential climate change impacts on rainfall and flooding, and to ocean level rises. Changes to flood behaviour in the vicinity of the site are expected to be minor (less than 10mm). The ground floor of the building has a finished floor level of 3.25m AHD, which gives 970mm freeboard to a predicted 1% AEP high tide under the 2090 RCP8.5 condition.

Further information is provided in Appendix A.

4.5 Overland Flow Paths

If the piped in-ground stormwater system fails due to blockage or other obstruction, stormwater flows will be required to be conveyed as overland flow. The overland flow is to be directed away from buildings and towards the site's boundary. The landbridge will be graded such that during a storm event that exceeds the capacity of the in-ground stormwater system, overland flow will be directed to the north-west corner of the bridge and discharge via an overflow between the building and Pyrmont Bridge. Part of the landbridge overland flow will be directed to the south west corner of the site and discharge via an overflow to the loading dock driveway. The paths shall also not exceed safe Depth x Velocity products of 0.4m^2/s for pedestrians and vehicles.

4.6 Stormwater Quality

The Stormwater Management Strategy proposed for site development has been prepared with consideration of the above objectives, CoS Council requirements, and Green Star requirements and guidelines. The strategy focuses on minimising the impacts of the development on the adjoining properties and maximising the environmental, social and economic benefits achievable by utilising responsible and sustainable stormwater management practices. At present, the extent of the site consists of approximately 90% impervious surfaces. The new development will not increase the percentage of impervious area. The new development will require pollution reduction measures incorporated within the design to remove potential contaminants from the system.

The WSUD Strategy proposed for the development will utilise a treatment train approach, consisting of the following: rainwater tank, pit inserts and filtration devices. Due to the site constraints, treatments such as vegetated buffers, bioretention swales, and bioretention tree pits cannot be utilised in the Northern Park and Park Plaza. Secondary hydraulic systems to the Crescent Garden and Sussex Plaza can be found in the Hydraulic Engineer's report.

To meet stormwater quality and quantity objectives for this development, a stormwater management system will be proposed that utilises the available landscape area where possible to treat the surface runoff.

The following design system has been proposed for the treatment of site runoff:

1. Pavements and all landscape areas will be graded toward various drainage infrastructure, e.g. drains, grated trenches and grated pits to mitigate the site runoff.
2. Roof drainage will be collected and retained in a storage tank to be re-used on site.
3. The stormwater from the drainage infrastructure will be combined and passed through a proprietary treatment device to achieve Green Star pollution reduction targets, which are more stringent than Council standards.

These systems are preferred as it will be able to achieve pollutant reductions required, is easily maintained, and does not require large open areas or pose a risk to safety for the site inhabitants.

Pollutant removal rates will be in accordance with the Green Star Column C pollutant reduction targets which are identified in Table 5. These stormwater reduction targets are the more stringent of the stormwater treatment targets required and will assist in the development achieving 6 Green Stars. This is the highest level in Greenstar for water quality and therefore it demonstrates the site is meeting the NSW Government water quality objectives.

Table 5 Stormwater Pollution Reduction Targets

Pollutant	Green Star Column C Reduction targets (% of typical urban annual load)	City of Sydney Reduction targets (% of typical urban annual load)
Total Suspended Solids	90%	85%
Gross pollutants	95%	90%
Total Nitrogen	60%	45%
Total Phosphorous	70%	65%
Total Hydrocarbons	90%	-
Free Oils	98%	-

The removal rates are also to be in accordance with:

- The EPA's manual on Managing Urban Stormwater (Treatment Techniques)
- The relevant Australian Standards for pollution control devices.

4.6.1 MUSIC Model

A preliminary water quality analysis has been undertaken by enstruct to develop the WSUD strategy for the proposed development, and to assess its ability at meeting Council stormwater quality targets. The water quality modelling for this study was undertaken using the industry standard software model MUSIC (Model for Urban Stormwater Improvement Conceptualisation) Version 6.3.0. The MUSIC model layout representing the proposed WSUD strategy for the development and results are shown in Figure 10 and Table 6. The catchments to be considered in the water quality analysis are:

- Tower
- Podium retail
- Public domain
- Access road to site.

Roads in immediate vicinity of the site (Harbour Street and Western Distributor Freeway) are not included in the stormwater quality assessment. The road drainage and quality treatment system are proposed to remain unchanged. It should be noted however, that the volume of stormwater on the roads will be reduced by the landbridge above intercepting any rainfall.

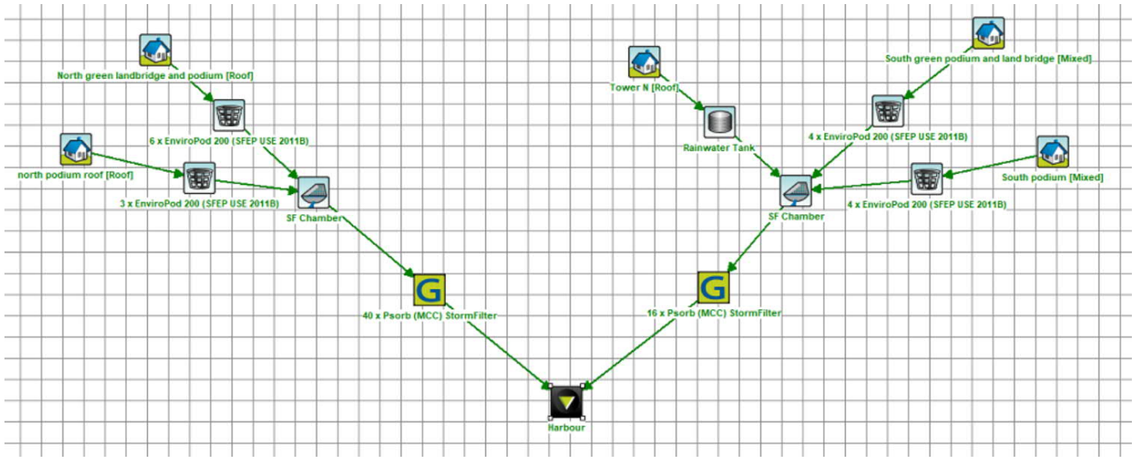


Figure 10 MUSIC Model Layout

Table 6 MUSIC pollutant reduction results

Pollutant	Reduction	Achievement
Total Suspended Solids	92.2%	PASS
Total Phosphorous	82.2%	PASS
Total Nitrogen	60.0%	PASS
Gross Pollutants	~100%	PASS

The analysis indicates that 40 x 690mm StormFilter cartridges, with a treatment flow rate of 0.9L/s each, incorporated into the in-ground stormwater system will suitably treat the stormwater from the north podium roof and north green landbridge areas to Green Star Column C stormwater pollutant requirements, prior to site discharge. Likewise, 16 x 690mm StormFilter cartridges used to manage stormwater pollutants in the stormwater from the southern podium and southern landbridge area is required. Alongside these cartridges, 9 Enviropod pit inserts incorporated into the northern in ground stormwater system, and 8 pit inserts for the southern portion of the site will manage gross pollutants capture.

The number and choice of WSUD measures is subject to further detailed design, and the WSUD plan for the site may change if the catchment areas to each filtration chamber are altered.

4.6.2 Filter Cartridges

Mechanical filtration devices can be used as a substitute where bioretention systems (e.g. bioretention swales and raingardens) are not possible or need augmentation. As a best management practice treatment option, such engineered devices are designed to remove a range of target pollutants including fine solids, soluble heavy metals, oils and nutrients. Apart from meeting stringent regulatory requirements, these filtration systems (e.g. Ocean Protect's StormFilter) are usually installed below ground allowing savings in land space and hence increase development yield and more efficient maintenance and management.

Water quality filters are proposed inside two separated filter chambers on site to service the stormwater on the site from both the northern and southern sections of the site as noted in section 4.6.1. Cartridges draw stormwater into the filter media to facilitate treatment to reduce contaminants of Nitrogen, Phosphorous and Suspended Solids before discharge from the OSD tank onto the downstream system. Incoming stormwater will be directed into a filtration chamber to be treated by the cartridges, prior to discharging into the harbour.

Both filter tank locations can be serviced by a maintenance vehicle. Refer to the manufacturer for a maintenance schedule for filter cartridge cleaning and replacement.

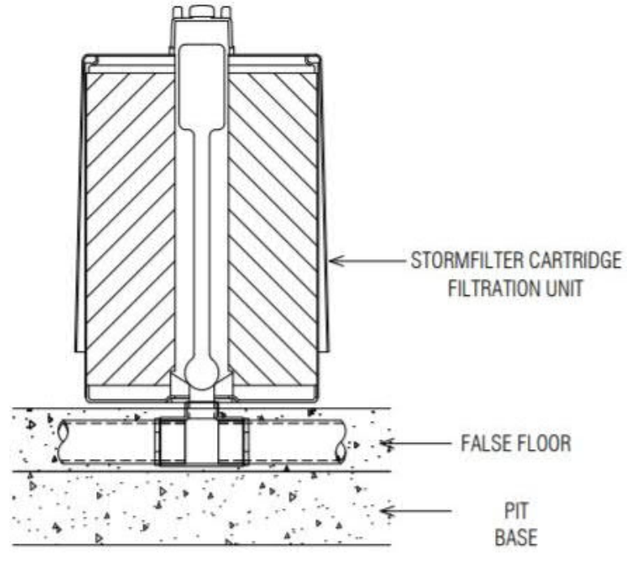


Figure 11 StormFilter Cartridge Detail

4.6.3 Rainwater tanks

In addition to water savings, rainwater tanks will help reduce runoff volume from the proposed development during small storms and associated stormwater pollutants that would discharge from the site. Overflows from the rainwater tanks will discharge into the filtration chamber for further treatment.

The rainwater tank design will be managed by the hydraulic engineer. Rainwater tank servicing the Tower roof will have a catchment area of 2,160m^2, whilst the podium roof will service a catchment area of 3,000m^2. The Rainwater Reuse tank is planned to on the ground floor mezzanine level as shown on drawing CBP-SK-ENS-CIV-DRW-40-1006

4.6.4 Pit Inserts

Pit inserts, also known as litter baskets, are considered as an at-source primary treatment solution. It is an efficient and cost-effective pre-screening primary treatment system that captures and retains gross pollutants at drainage entry points. Pit inserts, consisting of a capture basket and a filter mesh liner, are usually fitted below the road invert or surface of the pit and hence are visually unobtrusive.

Pit inserts can be customised to fit almost any stormwater inlet pit and the mesh liner opening could vary depending on the targeted capture of solids, sediment and attached pollutants. Cleaning of the pit inserts is undertaken either manually or using a small vacuum truck. The cleaning frequency depends on the catchment type, size and expected pollutant loading.

Pit inserts have been proposed for the pits along the roads to treat runoff from the landscaped and impervious areas fronting the development.

4.7 Erosion and Sediment Control

During construction and while the site is disturbed, erosion prevention and sediment control measures will be required. Erosion prevention generally involves managing stormwater by diverting overland flow around construction areas as well as collecting stormwater within the construction zone and directing to sediment control devices. Devices likely to be incorporated are silt removal fences, hay bales, catch drains, and water flow dissipation and discharge control devices such as sand bags, pollution mattresses, and basins.

Erosion prevention and sediment removal strategies need to be inspected regularly during construction works, cleaned and maintained after storm events, and modified to suit construction work progress, decanting and demolition.

The erosion and sediment control measures adopted for the development during the construction phase and set as part of the approved Stage 1 works will be designed in accordance with Council guidelines and Soils and Construction – Managing Urban Stormwater (Landcom).

5 Consultation

enstruct has held discussions with the following Authorities:

5.1 Sydney Water

enstruct has held discussions with Sydney Water to obtain ‘Approval in Principle’ to re-align the Sydney Water stormwater culvert from Harbour Street to the Harbour through the site. Sydney Water provided the approval on 06/04/2021. Refer to Section 2.1 for details on the stormwater realignment, and Appendix D for the conditional approval.

5.2 City of Sydney

enstruct has held discussions with Council’s Acting Principal Engineer Water Assets to obtain flood levels within the site. Council provided the TUFLOW flood model on 16 April 2020. Council confirmed on 22/03/2021 that a report justifying any changes to the model should be provided to Council. This report was issued to Council on 9/08/21, and is attached as an Appendix A

5.3 TfNSW

enstruct has held discussions with TfNSW to obtain ‘Approval in Principle’ for the drainage of the landbridge over Harbour Street. The TfNSW advised that there was to be no drainage pipes discharging into Harbour Street. To date, we have been presenting to and replying to comments from TfNSW, but as yet have not received written confirmation. Refer to Section 4 for details on the stormwater design.

6 Conclusion

This report responds to the flooding and stormwater requirements as part of the proposed Cockle Bay Park development. As part of these works, significant consultation and coordination with authorities has been undertaken to ensure support for the development is provided by the relevant authorities. enstruct liaised with Sydney Water regarding the diversion of the stormwater main that currently crosses the site throughout concept design, and with City of Sydney with respect to flooding.

This report summarises the review of the Council flood model and how it has been brought up to current best practices, change and recommendation of Flood Planning Levels. The report also summarises the drainage strategy for the Landbridge and the relocation of the Sydney Water Asset which was developed through the concept design works. The stormwater design includes provisions for stormwater quality to help achieve Green Star rating points and exceed the City of Sydney stormwater quality requirements.

enstruct are satisfied that the SEARS Requirements and the Concept approval of Conditions of Consent tabulated in Section 1 of this document will be achieved.

APPENDIX A

Cockle Bay Park Civil Engineering Flood Report, enstruct (October 2021)

COCKLE BAY PARK REDEVELOPMENT

CIVIL ENGINEERING FLOOD REPORT

Prepared for: DPT Operator Pty Ltd and DPPT Operator Pty Ltd
By: enstruct group pty ltd
Revision: 1

COCKLE BAY PARK REDEVELOPMENT

CIVIL ENGINEERING FLOOD REPORT

ISSUE AUTHORISATION

PROJECT: COCKLE BAY PARK REDEVELOPMENT
Project No: 6054

Rev	Date	Purpose of Issue / Nature of Revision	Prepared by	Reviewed by	Issue Authorised by
1	8/10/21	SSDA Submission	TAH	PAL	PAL

Executive Summary

enstruct has been engaged by DPT Operator Pty Ltd and DPPT Operator Pty Ltd to undertake structural and civil engineering design for the concept design for the Cockle Bay Park development. This report outlines the flood analysis and requirements associated with flooding undertaken for the Cockle Bay Park Redevelopment Project.

Cockle Bay Park will be a new vibrant mixed-use waterfront neighbourhood destination for Sydney, which will realise the original vision for the site to connect the Harbour with its workers, residents and visitors, directly to the commercial core of our magnificent City.

This report summarises the review of the Council flood model and how it has been brought up to current best practices, impact of climate change and recommendation of Flood Planning Levels.

The proposed development meets and exceeds minimum flood planning level requirements and is shown to be resilient to climate change with respect to flooding.

Contents

1 Introduction

This report has been prepared to accompany a detailed State Significant Development (SSD) Development Application (DA) (Stage 2) for a commercial mixed use development, Cockle Bay Park, which is submitted to the Minister for Planning and Public Spaces pursuant to Part 4 of the Environmental Planning and Assessment Act 1979 (EP&A Act). It addresses flooding in the vicinity of the site at Cockle Bay, and the planning considerations for the site. It reviews the City of Sydney Council flood model and how it has been brought up to current best practices, impact of climate change and recommendation of Flood Planning Levels.

The development is being conducted in stages comprising the following planning applications:

- Stage 1 – Concept Proposal setting the overall 'vision' for the redevelopment of the site including the building envelope and land uses, as well as development consent for the carrying out of early works including demolition of the existing buildings and structures. This stage was determined on 13 May 2019, and is proposed to be modified to align with the Stage 2 SSD DA.

- Stage 2 – detailed design, construction, and operation of Cockle Bay Park pursuant to the Concept Proposal.

1.1 The Site

The site is located at 241-249 Wheat Road, Sydney to the immediate south of Pyrmont Bridge, within the Sydney CBD, on the eastern side of the Darling Harbour precinct. The site encompasses the Cockle Bay Wharf development, parts of the Eastern Distributor and Wheat Road, Darling Park and Pyrmont Bridge.

The Darling Harbour Precinct is undergoing significant redevelopment as part of the Sydney International Convention, Exhibition and Entertainment Precinct (SICEEP) including Darling Square and W Hotel projects. More broadly, the western edge of the Sydney CBD has been subject to significant change following the development of the Barangaroo precinct.

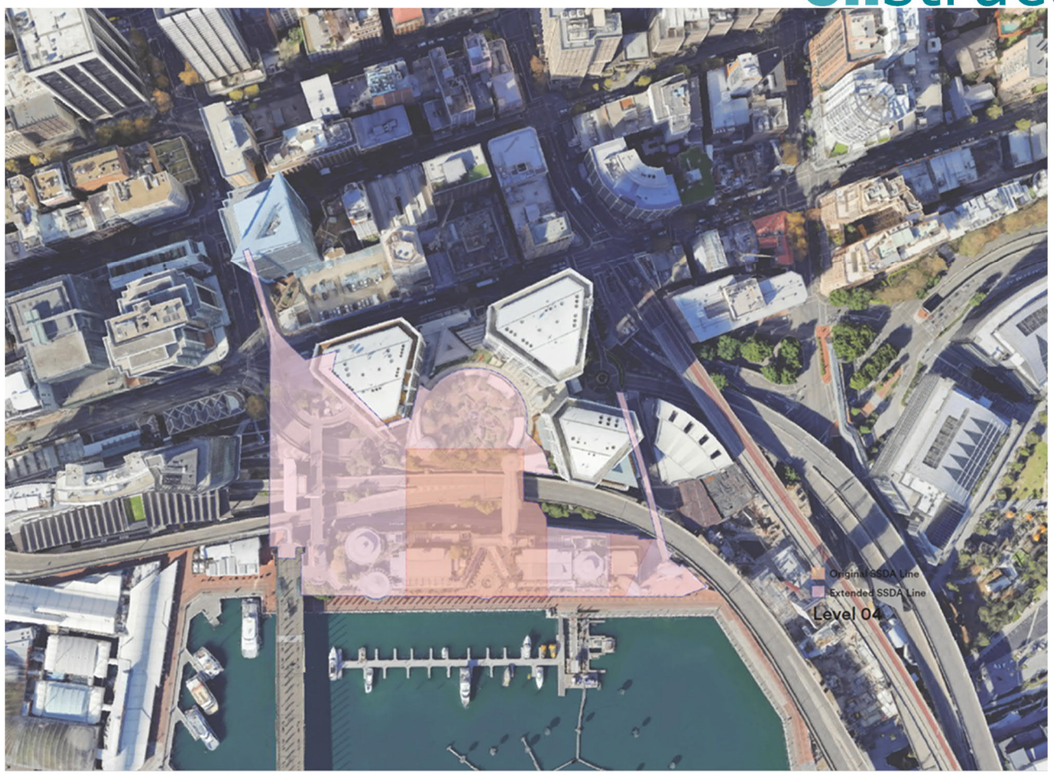


Figure 1 Location Plan

2 Existing Flood Model

A Flood Assessment was undertaken for the City of Sydney Council (CoS) and is presented in the “Darling Harbour Catchment Flood Study” dated October 2014, prepared by BMT WBM. enstruct has obtained the TUFLOW flood model from Council.

2.1 Digital Terrain Model

The flood model covers an area from Hyde Park, to Central Station and Pyrmont. To undertake the site-specific flood study for CBP, the model was updated in the following ways:

- Survey information from a point-cloud survey was added to the terrain model.
- The F-type barriers (jersey kerbs) were added to the model based on field survey and site observations
- The Pyrmont area was removed from the model to optimise model run times

Figure 2 shows a comparison between the terrain data in the flood model as provided by Council, and the detailed point cloud survey added to the flood model as part of the model updates. The survey provides more detail including the raised median, Harbour Street levels, the Pyrmont Bridge abutment.

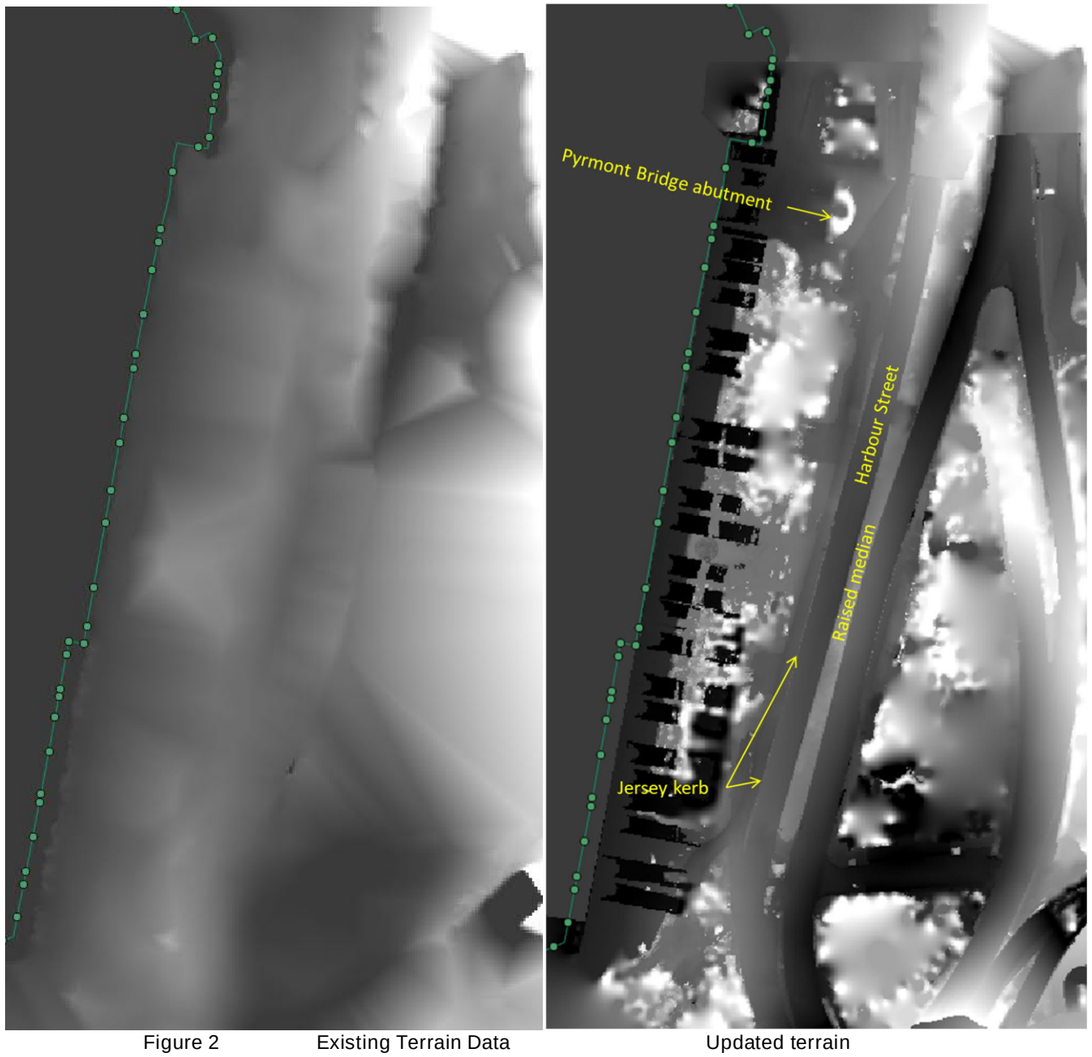


Figure 2 Existing Terrain Data Updated terrain

2.2 Rainfall Distribution

The model uses a rainfall-on-grid approach. This approach ignores the fact that Harbour Street is largely protected from rain by the overhead Western Distributor. The rainfall layer in the model was modified to exclude the elevated roadways.

2.3 Rainfall Patterns

The Council model is based on Australian Rainfall and Runoff (ARR) published in 1997 as the basis for the hydrology. This publication was the current guideline and considered best-practice for flood estimation at the time the flood model was prepared. CoS requested that any site-specific flood study needs to adopt industry best practice.

In 2016, the 4th Edition of Australian Rainfall and Runoff (ARR 2016) was released. As part of the update design flood inputs have been revised including Intensity Frequency Duration (IFD) depths, Losses, Areal Reduction Factors and Temporal Patterns. A further minor revision was released in 2019. For Sydney, the new IFD patterns generally result in a reduction in rainfall intensities of approximately 20% for the 1% AEP storm.

Note there are no changes to the Probable Maximum Flood (PMF) as the methodology for calculating the PMF follows a separate guideline published by the Bureau of Meteorology, last updated in 2003.

A report on the sensitivity of the 1% AEP behaviour comparing ARR1997 with ARR2016 was prepared by WMA Water on behalf of OEH “ARR 2016 Case Study – Urban Report on Sensitivity to ARR 2016 Approaches”. The study used the nearby Woolloomooloo catchment as a case study. The analysis found that across most of the catchment, the reduction in flood levels due to reduced rainfall depths is less than 100mm, however at a few trapped low points the reduction in flood levels was in the range 200-400mm.

In order to meet the current industry best practice, the flood model was updated to reflect ARR 2019. ARR2019 recommends an ensemble approach to flood modelling, where 10 storm events are modelled for each storm duration to represent the variability in observed rainfall patterns. ARR2019 states: “It is not recommended that the temporal pattern that represents the worst (or best) case be used by itself for design. Testing has demonstrated that on most catchments large number of events in the ensemble patterns are clustered around the mean and median”. The recommendation is that the median storm is selected for the purpose of flood analysis.

Undertaking this analysis involved 40 simulations to determine the critical duration storm and the median storm for that duration as per the ARR2019 guidelines. The critical duration storm for a 1% AEP event was found to be the 45-minute storm.

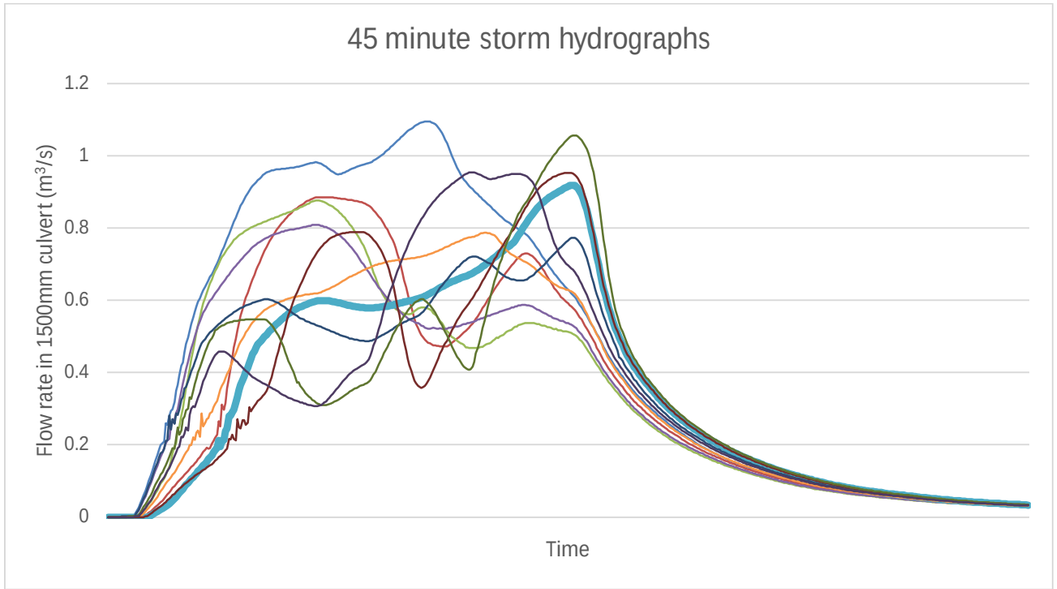


Figure 3 Results for an ensemble of 45-minute 1% AEP storms with the median storm highlighted

2.4 Stormwater Pit Blockage

The flood modelling adopts the blockage of pits as outlined in the CoS DCP:

> (4) The site-specific flood study is to assume the ‘worst case scenario’ conditions for blockages to pipes, culverts and other infrastructure, such that:
>
> (a) kerb inlets are assumed to be 50% blocked;
>
> (b) sag pits are assumed to be 100% blocked; and
>
> (c) culverts and bridges with an open area less than six metres, measured on the diagonal, are assumed to be 50% blocked.

These blockage factors have been used for all scenarios, existing and proposed.

3 Existing Conditions Flood Model Results

3.1 Impact of model updates on the existing conditions model

The following figures present the flood modelling results for the critical duration 1% AEP storm event under the existing conditions as described in the previous chapter.

- Figure 4– Shows the original 1% AEP flood extent with unedited terrain data
- Figure 5 – Shows the flood extent with the revised terrain data
- Figure 6 – Shows the flood extent using the ARR2019 rainfall data
- Figure 7 – shows the impact of using the ARR 2019 rainfall data against the original flood extent for the 1% AEP
- Figure 8– shows the original PMF flood extent data
- Figure 9 – shows the revised PMF using the revised terrain data and ARR 2019 rainfall data

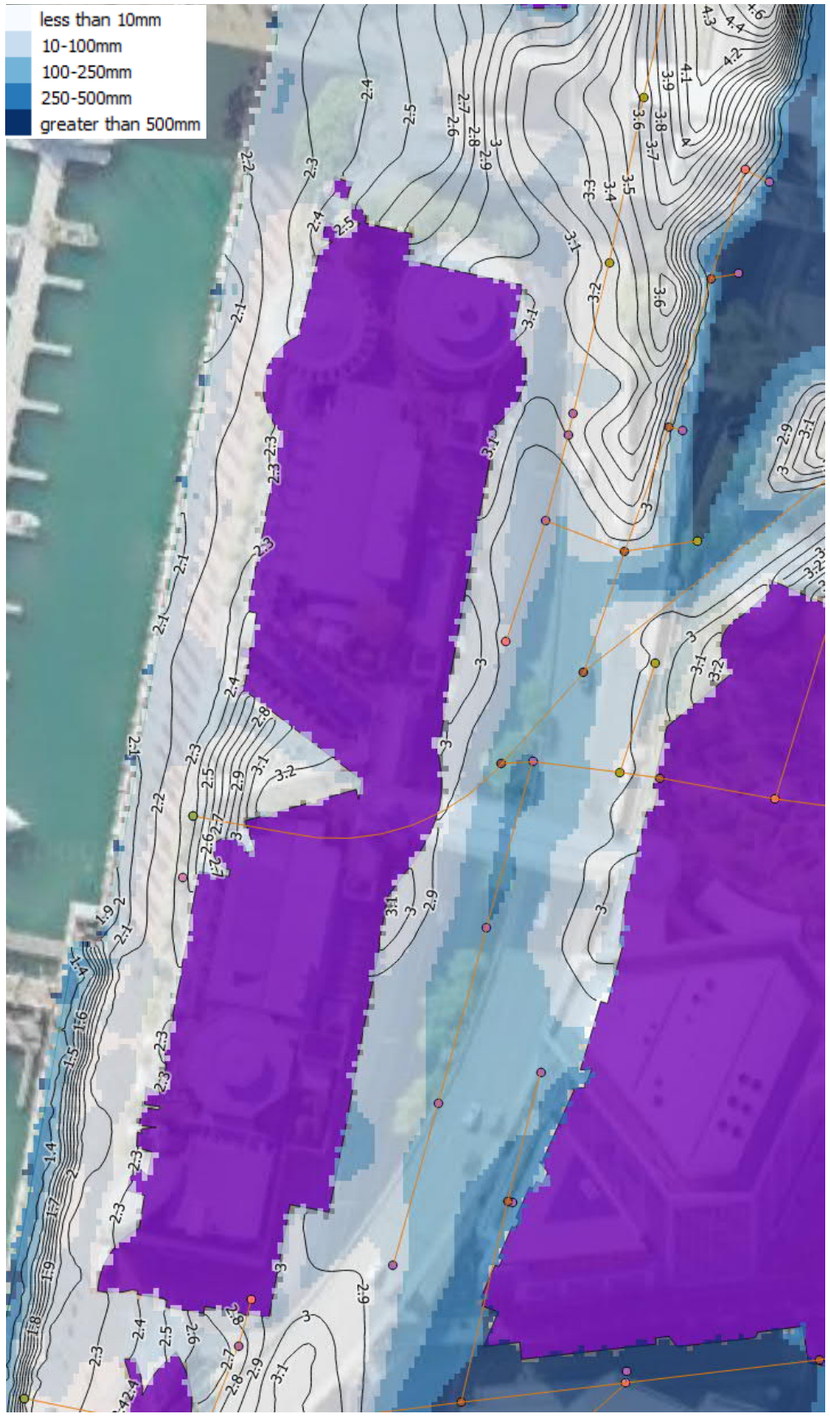


Figure 4 Unedited model 1% AEP flood results

Figure 5 1% AEP flood results with refined survey

The refined survey shows a better representation of flooding on the roadways, providing a more accurate baseline result (Figure 5)

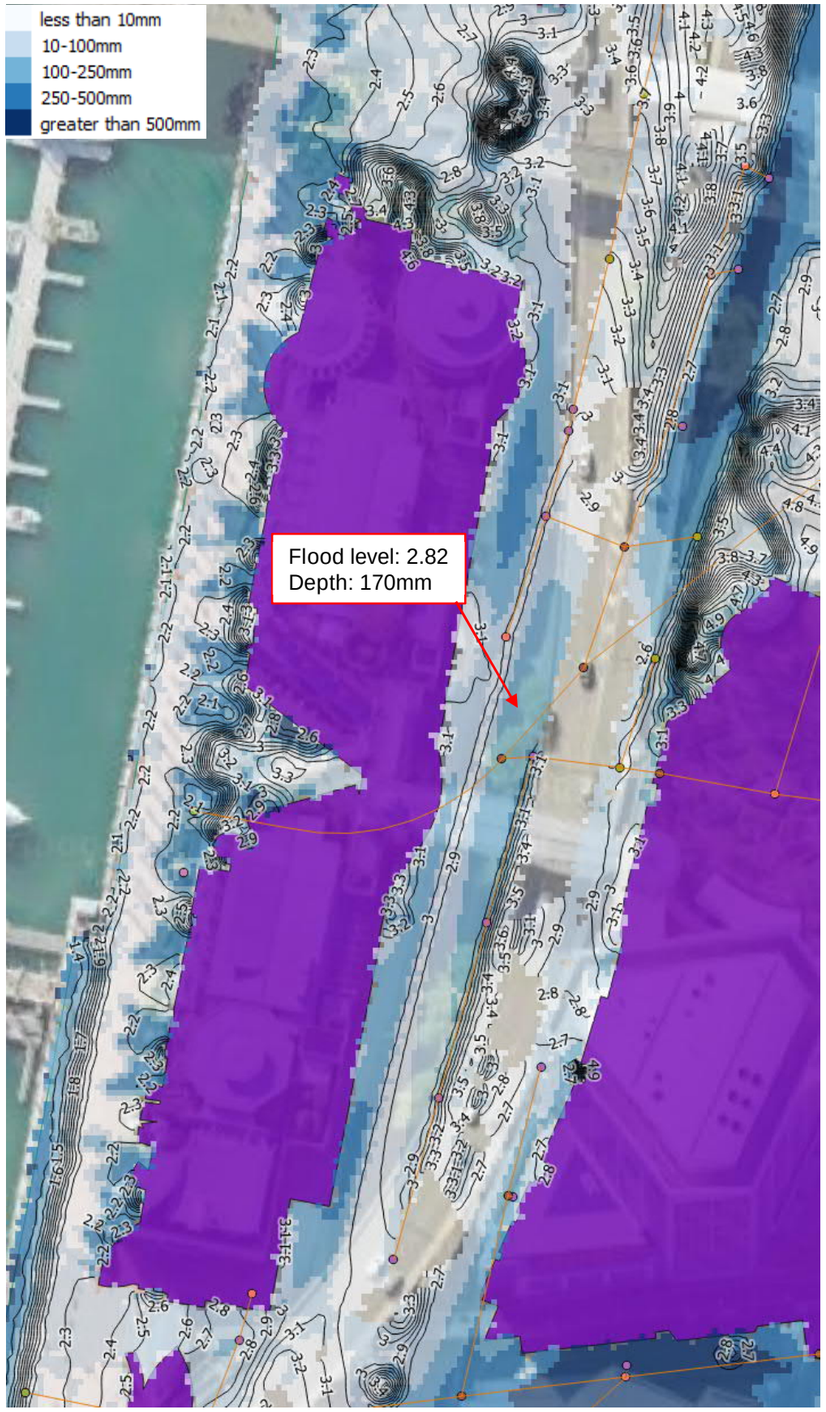


Figure 6 New existing conditions model with ARRR 2019 rainfall

The impact of updating the rainfall to ARR2019 shows a slight decrease in flood depths as expected. The reduction in flood levels on Harbour Street is approximately 35mm at the sag point.

This model has been adopted as the new existing conditions model for the purpose of this report.

The impact of updating the rainfall to ARR2019 shows a slight decrease in flood depths as expected. The reduction in flood levels on Harbour Street is approximately 35mm at the sag point. Refer to Figure 7.

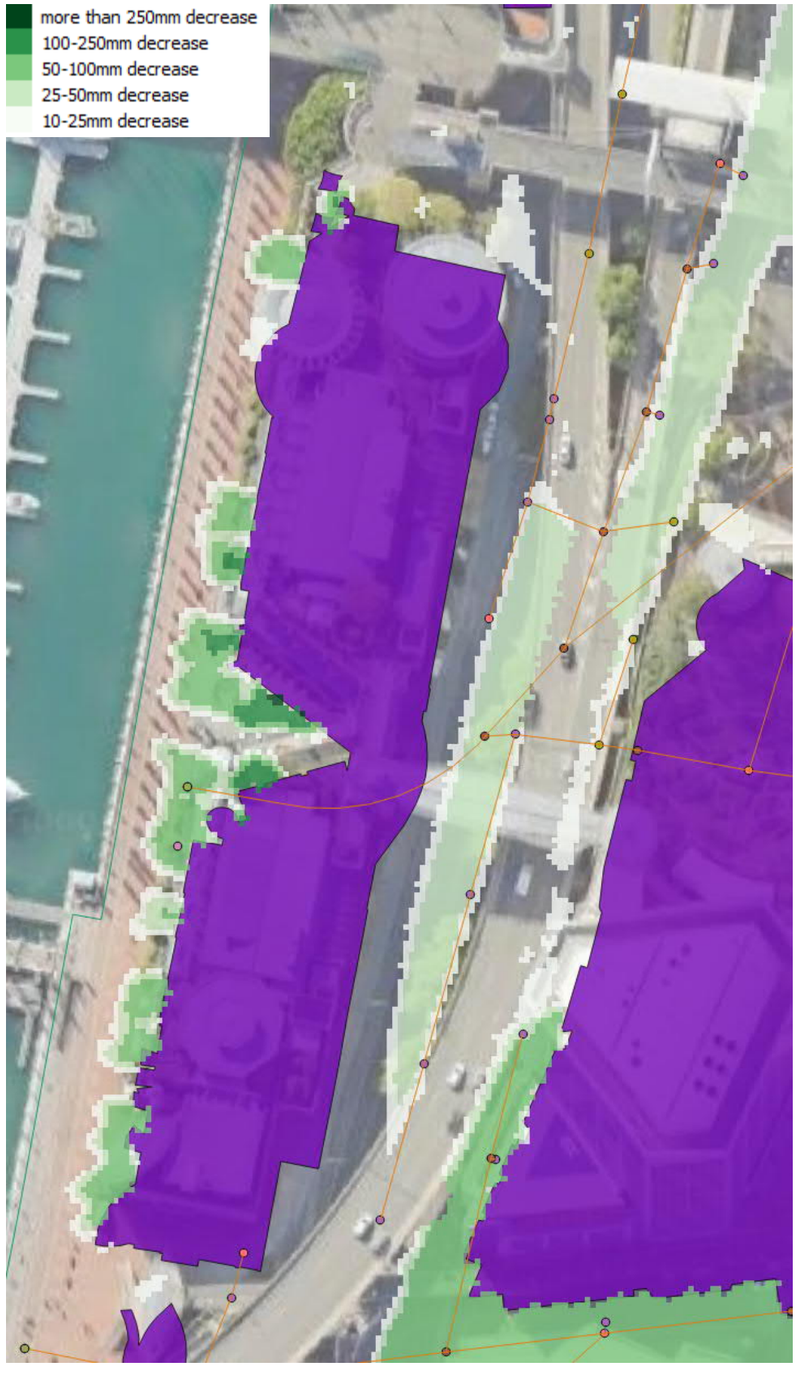


Figure 7 Impact of ARR2019 on existing conditions model results (1% AEP)

3.2 PMF modelling results

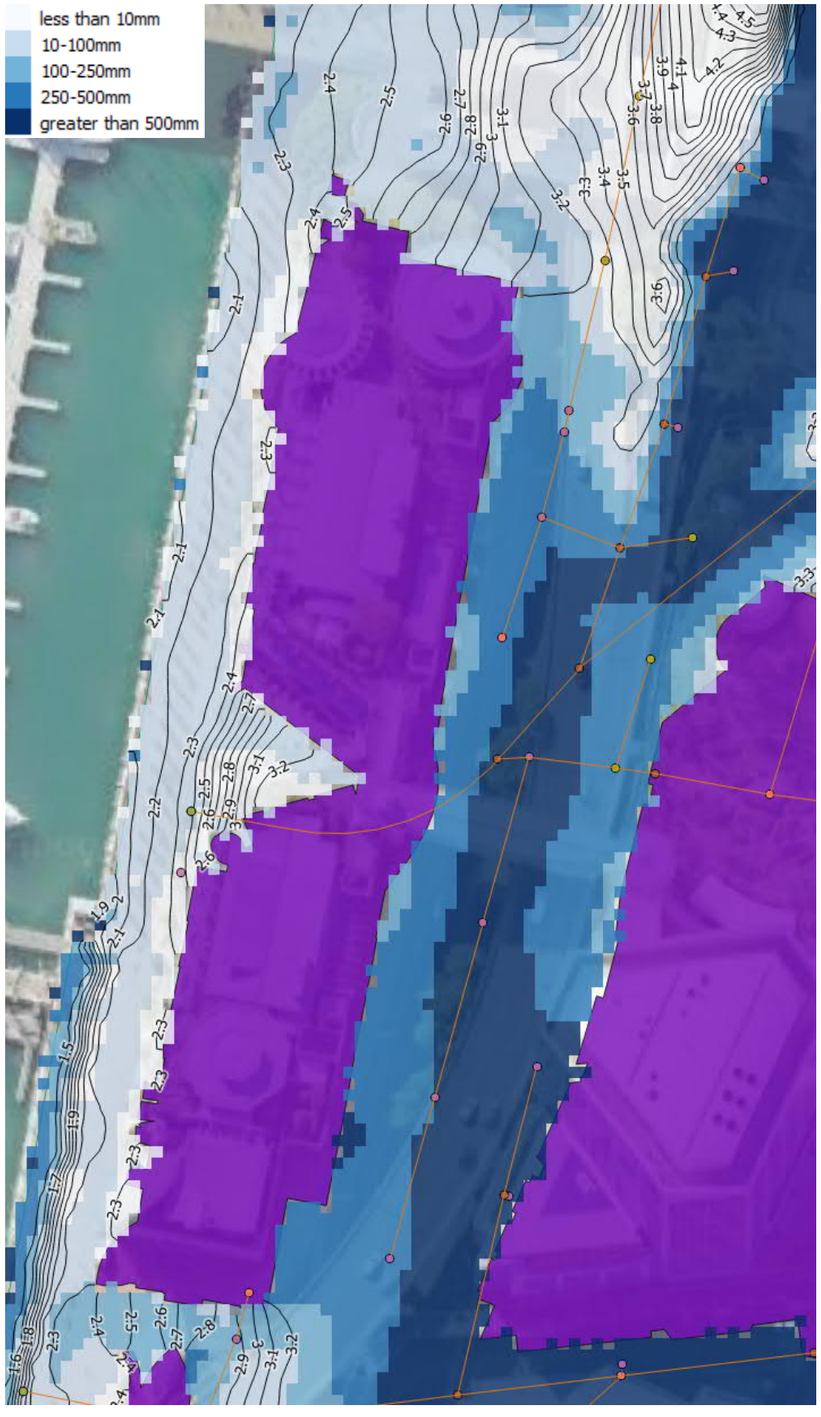


Figure 8 PMF from the Council model

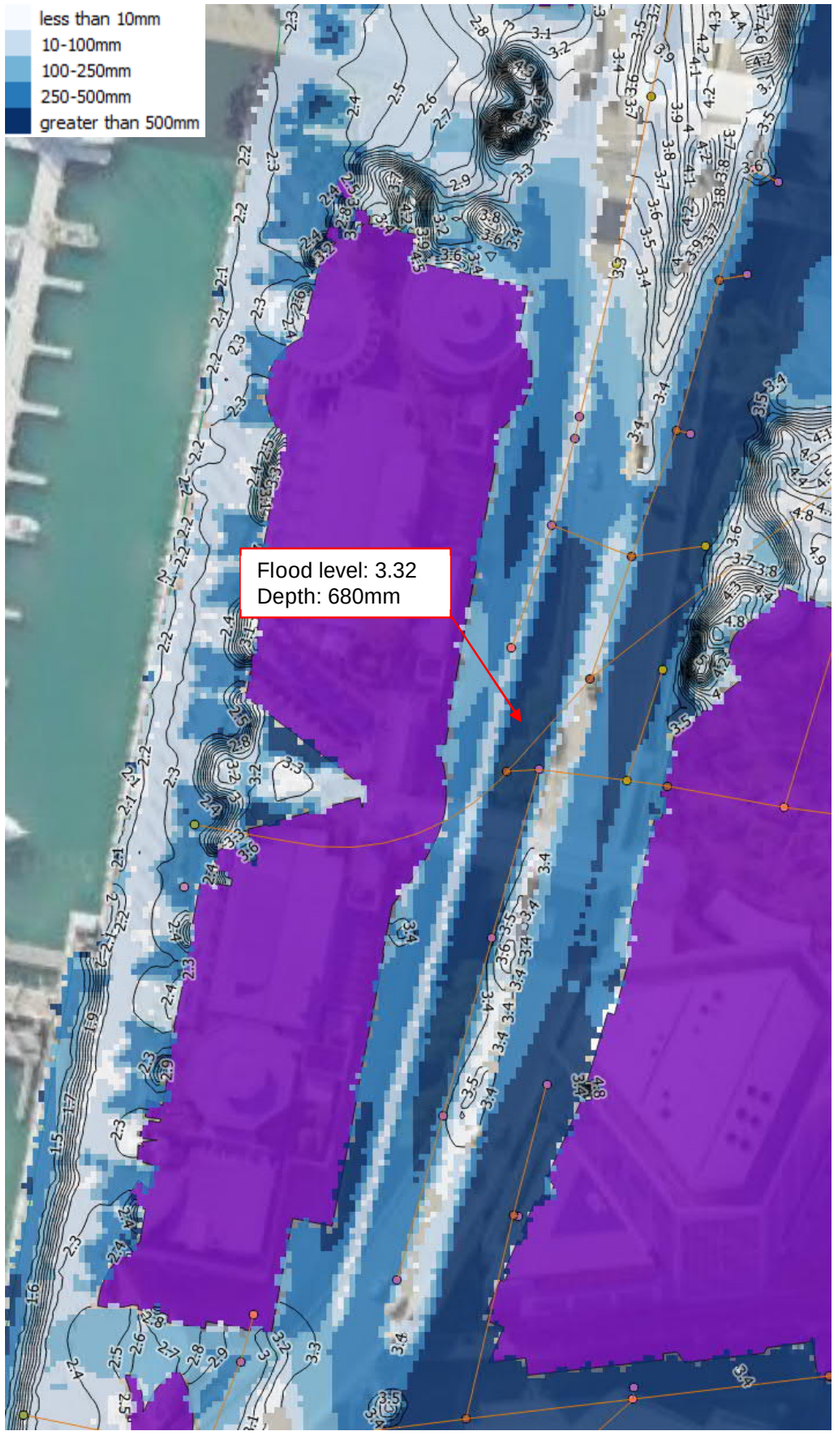


Figure 9 PMF with updated terrain and rainfall distribution

4 Proposed Conditions

4.1 Flooding and the proposed CBP development

The proposed conditions model takes the new existing conditions model and adds in the changes to the site as a result of the proposed development:

- Relocation of Jersey kerbs and some road grading
- New building layout (at the ground plane)
- Proposed culvert
- Consideration of proposed land bridge capturing rainfall

4.2 Wheat Road and Harbour Street changes

The development proposal includes the removal of Wheat Road, which will be replaced by a slip lane on Harbour Street.

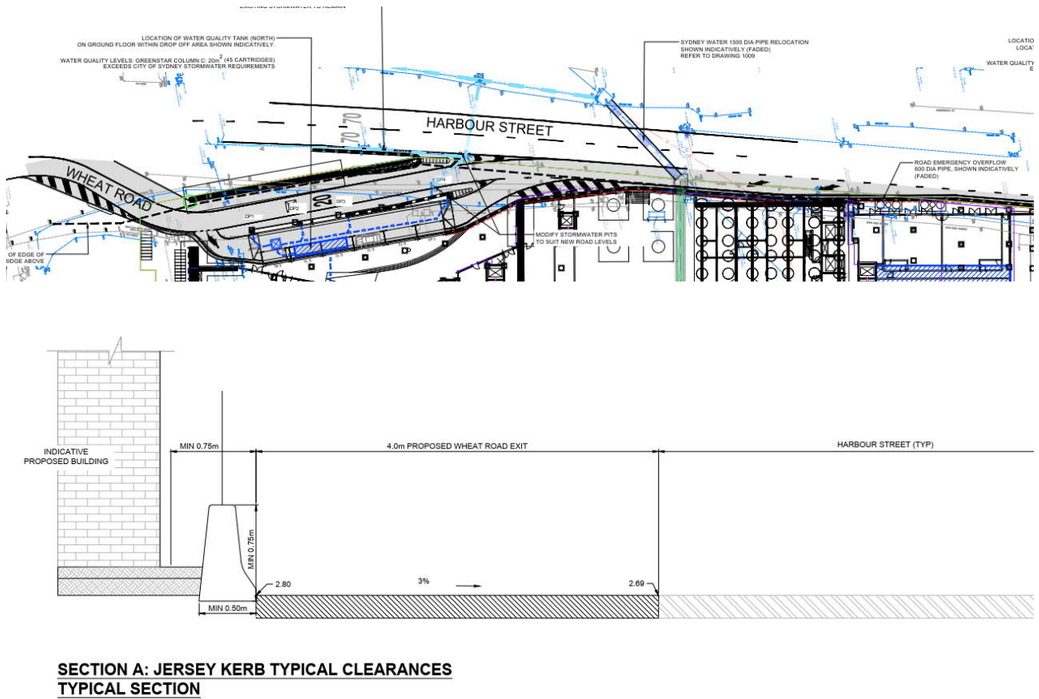


Figure 10 Proposed slip road and vehicle drop off area

A Digital Terrain Model was created for the proposed road works, and the F-type barriers relocated as per the proposed design.

4.3 Building and Land Bridge

The proposed development includes a land bridge over the western distributor and a new building fronting the Cockle Bay Wharf.

Figure 11 Land bridge (Source: McGregor Coxall)

The land bridge will be designed such that all stormwater, both piped and overland flow, will be directed towards the harbour. This stormwater will not discharge to Harbour Street below. The impact of the land bridge was included in the model by removing rainfall from the area outlined by the land bridge extents.

The new building at the ground plane was “blocked out” of the model, consistent with the treatment for all other buildings in the model.

4.4 Proposed Culvert

A new 600mm diameter pipe is proposed to reduce existing flooding on Harbour Street. This culvert has been included in the proposed conditions flood model.

The re-alignment and upgrade of the existing 1500mm Sydney Water culvert has not been included in the flood modelling excise at this stage as the design for the diversion has not yet been finalised at the time of writing.

The basis of the design is that the proposed culvert matches the capacity of the existing culvert structure. In principle agreement has been achieved with Sydney Water.

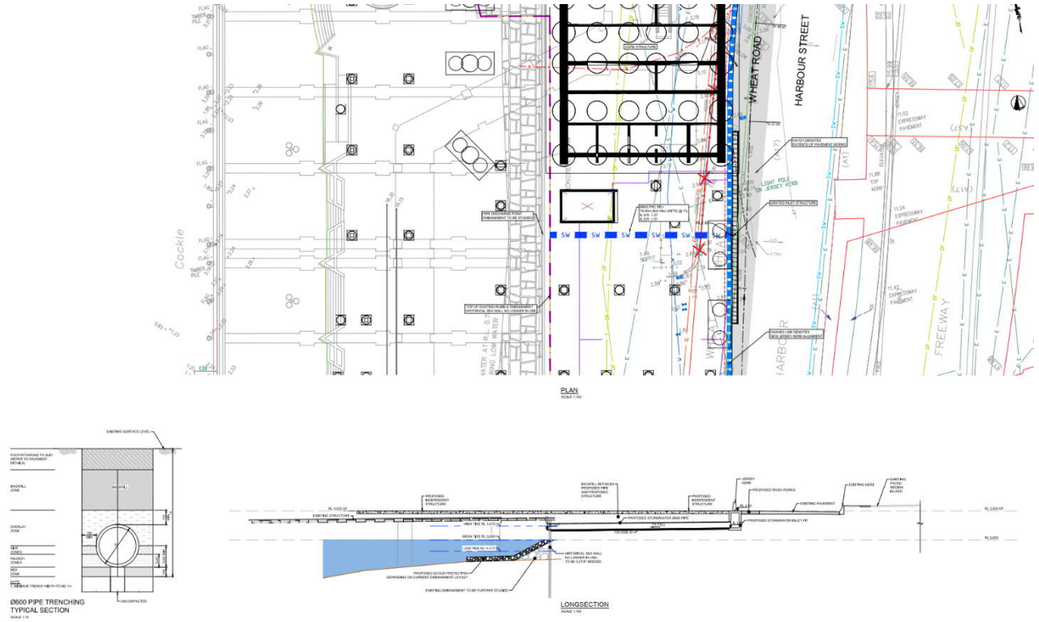


Figure 12 Proposed Drainage Culvert

Loading Dock

The loading dock is located at the southern end of the proposed development

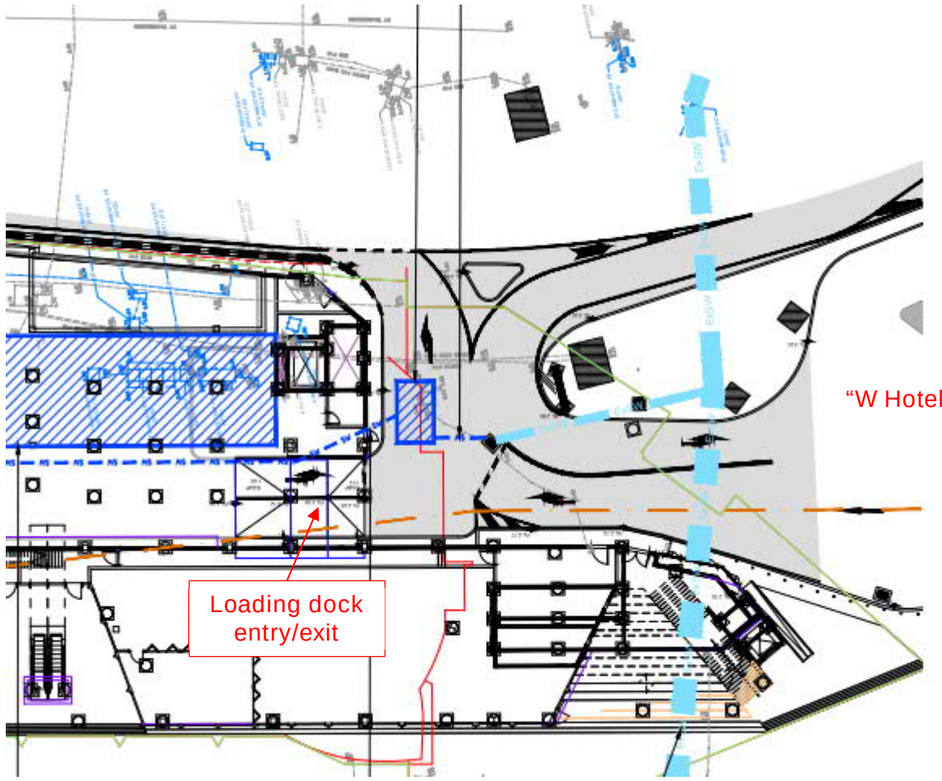


Figure 12 Proposed loading dock

The loading dock incorporates a crest at the entry to prevent flood water entering the dock.

5 Flood Model Results

The flood model was updated to reflect the design conditions presented in Section 4.

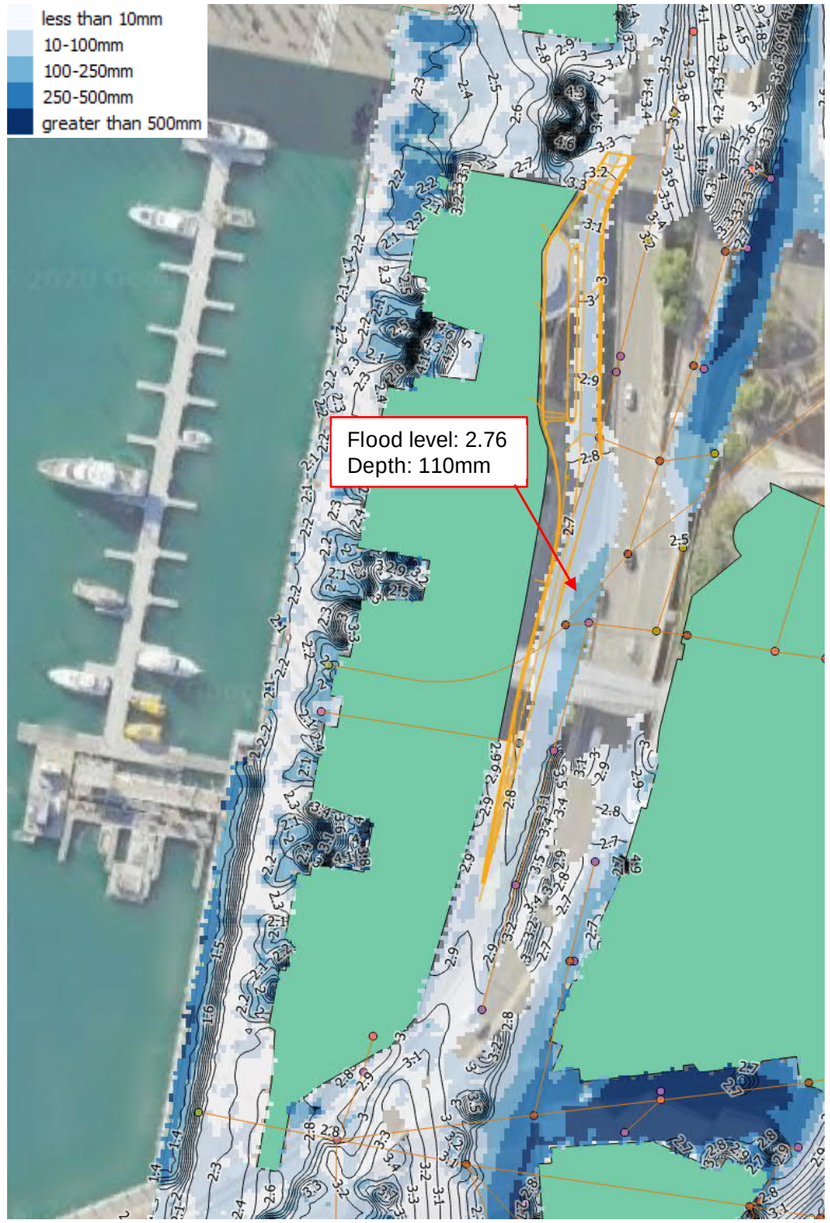


Figure 13 1% AEP - proposed conditions

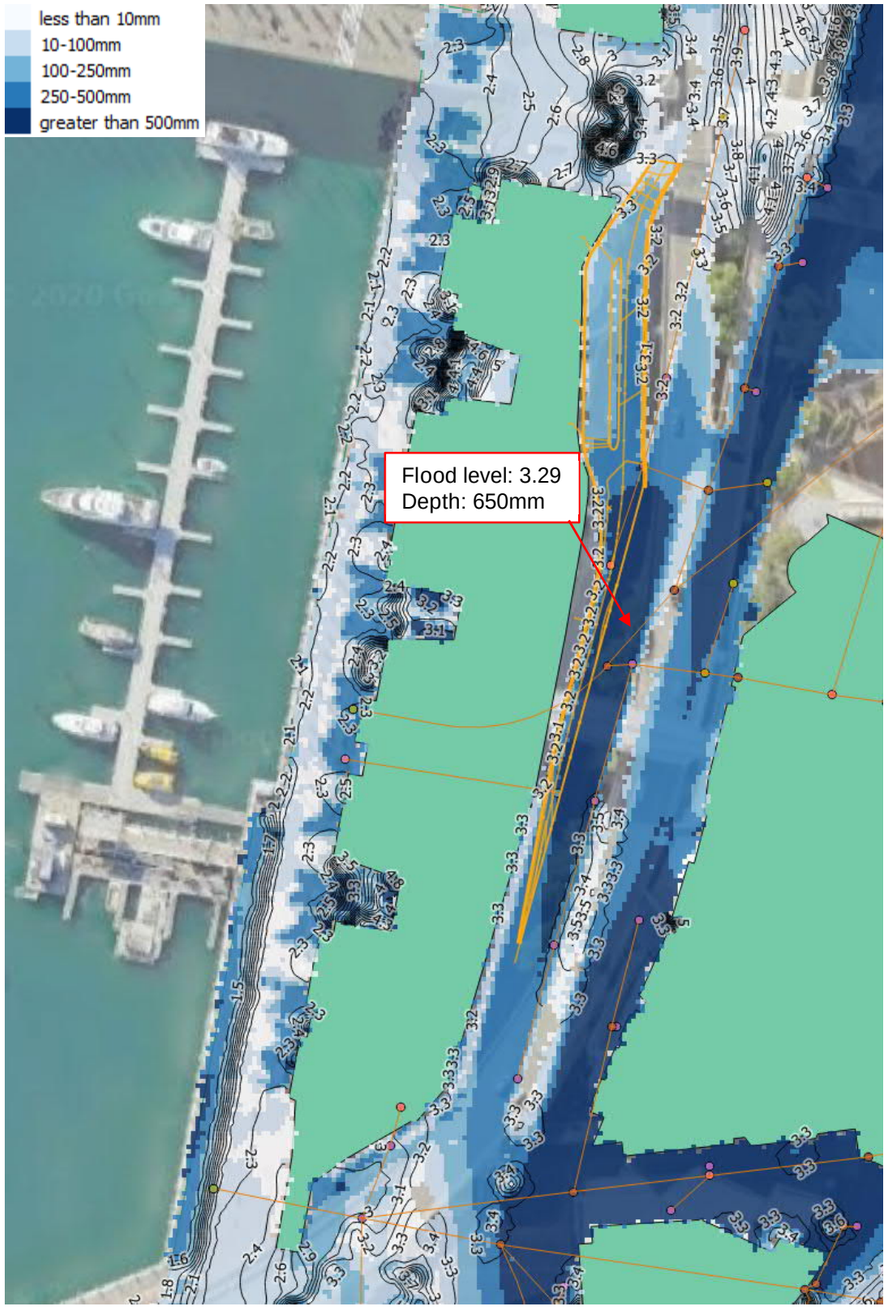


Figure 14 PMF proposed conditions

The flood modelling results show a small improvement in flood levels over the existing conditions model. The flood level in the sag point on Wheat Road is up to 60mm lower in the 1% AEP storm event, and 30mm lower in a PMF event. There is a net improvement in flooding for the surrounding area.

5.1 Climate Change

The impact of climate change on flooding at the development has been modelled to demonstrate the resilience of the proposed development to the impacts of climate change with respect to flooding.

ARR2019 give guidance on modelling the future climate scenarios. It recommends an analysis is done on two Representative Concentration Pathways (RCPs), RCP4,5 and RCP8.5, which represent a future reduction in greenhouse emissions, and a “business-as-usual” increase in emissions respectively. In order to review the impact of climate change on the development, the worst case scenario RCP8.5 has been analysed.

Information on increase rainfall intensities and ocean levels is provided by the CSIRO’s climate futures tool (CSIRO and Bureau of Meteorology, Climate Change in Australia website (http://www.climatechangeinaustralia.gov.au/))

The climate futures tool gives an ocean level of 2.28 mAHD and a rainfall intensity increase of 19.7% under the RCP8.5 2090 scenario.

The impact of climate change in terms of flooding on CPB was found to be very low. The change in depth of the overland flow path near the vehicle drop off was found to be less than 10mm in a 1% AEP event. A similarly small change in flood levels is seen on Harbour Street and at the loading dock entry.

The proposed development was found to be resiliant to potential climate change impacts on rainfall and flooding, and to ocean level rises. Changes to flood behaviour in the vicinity of the site are expected to be minor (less than 10mm). The ground floor of the building has a finished floor level of 3.25m AHD, which gives 970mm freeboard to a predicted 1% AEP high tide under the 2090 RCP8.5 condition.

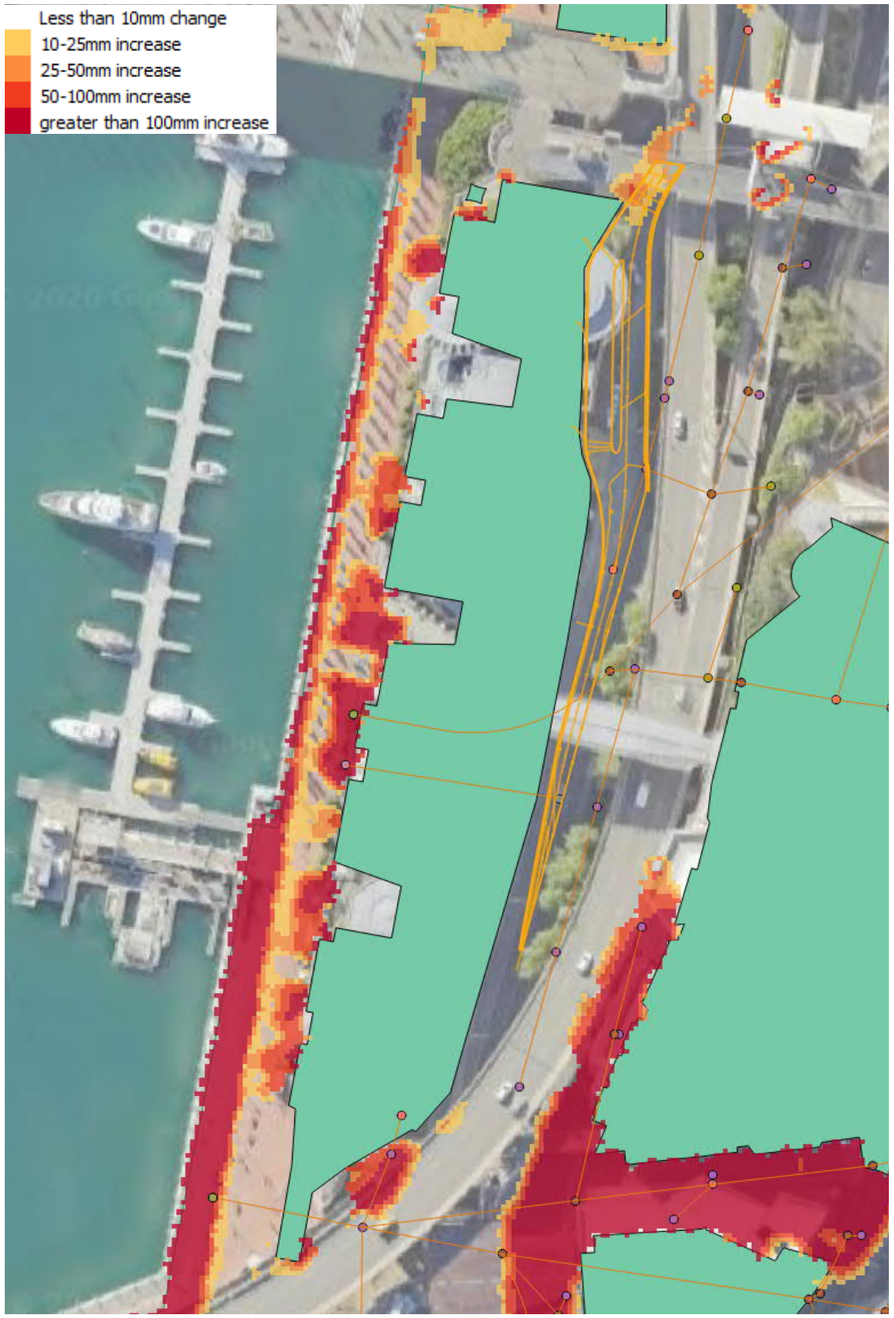


Figure 15 Impact of Climate Change - proposed conditions

6 Flood Planning Levels

6.1 Policy

The City of Sydney Council's "Interim Floodplain Management Policy" approved on 12 May 2014 outlines the requirements for flood planning levels at the site:

Industrial or Commercial	Business	Mainstream or local drainage flooding	Merits approach presented by the applicant with a minimum of the 1% AEP flood level

Consideration should be given to providing flood protection via a freeboard above the minimum floor level. This can be provided through F-type barriers along the Harbour St frontage, and maintaining a minimum 300mm high crest between the slip road and the vehicle drop off area. Consideration should also be given to the PMF level.

The City of Sydney Council accepts zero freeboard for Business and Retail developments however it should be noted that the proposal must demonstrate a reasonable balance between flood protection and urban design outcomes for street level activation. Upon revision of the flood modelling results for the proposed development, it is noted that the only flooding issues are related to overland flow passing the drop off area and the loading dock area.

It should be noted that in Council's Interim Floodplain Management Policy, when considering habitable rooms in residential developments subject to local drainage flooding, there is an option for the Flood Planning Level to be two times the depth of flow with a minimum of 0.3m above the surrounding surface if the depth of flow in the 1% AEP flood is less than 0.25m.

6.2 Vehicle Drop Off Area

Overland Flow depth on the access road outside the vehicle access areas is less than 50mm in a 100-year event.

Under the flood policy, the minimum floor level is the 100-year flood level of 3.06mAHD. Using a merits-based approach, a Flood Planning Level of 3.35mAHD achieves a 300mm level difference to the adjacent access road, as well as protection from a PMF event.

6.3 Loading Dock

Based on preliminary grading, the 100-year flood level is 2.90 mAHD, and the PMF 3.10 mAHD at the loading dock entry.

Given flow depth and levels, we recommend a 300mm high crest between the access road and the loading dock to prevent overland flow entering the building.

6.4 Summary

Based on the ground floor of the development being commercial and retail comprising of non-habitable rooms, the reasons for the recommended freeboard are:

- There is no flooding of the site under the proposed conditions
- The only stormwater passing the site is local overland flow
- The overland flow depth near the vehicle drop off is 50mm
- The overland flow depth at the loading dock entry is 90mm
- The Probable maximum Flood level at the vehicle drop off is RL3.07m AHD and loading dock is RL 3.10m AHD
- The general freeboard for non-habitable rooms is 300mm above the 1% AEP
- CoS Interim Floodplain Management Policy, for habitable rooms in residential developments, for local drainage flooding can be a minimum of 0.3m above the surrounding surface

Therefore, the following the assessment of the above, the recommended freeboard is 0.3m above the surrounding surface being RL3.35m AHD at the vehicle drop off and RL 3.11m AHD at the loading dock.

A summary of results is presented below, along with recommended flood planning levels.

Location	Existing conditions 1% AEP level	Proposed conditions 1% AEP level	Existing conditions PMF level	Proposed conditions PMF level	Minimum flood planning level	Adopted Finished Floor Level
Vehicle Drop Off	3.10	3.06	3.32	3.29	3.06	3.35
Loading Dock Entry	(2.90)	2.90	(3.10)	3.10	2.90	3.11 (300mm above the adjacent road level of 2.81)
Sub-station	2.82	2.76	3.32	3.29	3.06	Agency advice to confirm min freeboard

7 Conclusion

Flood modelling was undertaken based on the existing flood model prepared by BMT WBM on behalf of Council. To undertake a site specific flood study, a new existing conditions model was created based on the existing model, with the following changes:

- Incorporate local survey data;
- Adjust rainfall layers to account for elevated roadways;
- Update rainfall data to reflect current best practice of ARR2019.

The proposed conditions model includes:

- Adjusting the terrain and buildings to match the design conditions
- Adjust rainfall layers to account for the proposed land bridge.
- Checking for resilience to climate change.

The results of the analysis have informed the design, which achieves the minimum flood planning levels in Council's "Interim Floodplain Management Policy".

APPENDIX B

Stormwater Drainage Design Plans

A0

LEGEND

- SW — PIPE AT MINIMUM 1% FALL TYPICAL
- THIN SLOT SURFACE DRAIN TO COLLECT SURFACE DRAINAGE
- SURFACE DRAINAGE FLOW PATH
- DP — DOWNPIPE APPROXIMATE LOCATIONS
- LANDSCAPE ARCHITECT BACKGROUND OVERLAY FROM CAD FILE: "210709_CBP Landscape.dwg" RECEIVED ON 21/07/2021

NOTES
- ALL DOWNPIPES TO BE WITHIN COLUMNS.
- FOR OVERLAND FLOW REFER TO SEPARATE DRAWING 1005.
- FOR WATER QUALITY TANKS LOCATED ON GROUND FLOOR REFER TO DRAWING 1007.
- FOR DOWNPIPE CONNECTIONS REFER TO DRAWING 1006.
- DESIGN DISPLAYED IS FOR INFORMATION PURPOSES ONLY AND IS SUBJECT TO CHANGE AS DESIGN PROGRESSES.

FOR ALL STORMWATER DETAILS FOR SUSSEX PLAZA REFER TO HYDRAULIC DRAWINGS

FOR ALL STORMWATER DETAILS FOR CRESCENT GARDEN REFER TO HYDRAULIC DRAWINGS

RIDGE

EXTENTS OF LANDBRIDGE CATCHMENT

STRUCTURAL JOINT (PIPES NOT TO CROSS THIS LINE)

2X Ø100 DIA @ 1%

2X Ø100 DIA @ 1%

4X Ø100 DIA @ 1%

4X Ø100 DIA @ 1%

Ø150 DIA @ 1%

5 X Ø100 DIA @ 1%

3X Ø100 DIA @ 1%

Ø200 DIA @ 1%

Ø250 DIA @ 1%

Ø200 DIA @ 1%

Ø250 DIA @ 1%

Ø200 DIA @ 1%

DP1 115 L/S

DP2 138 L/S

DP3 60 L/S

DP4 90 L/S

1%

1%

0.5%

0.5%

0.7%

0.5%

RIDGE

BUILDING ENVELOPE OVER THE LANDBRIGE

EXTENTS OF LANDBRIDGE

BUILDING ENVELOPE LEVEL 03

DP

OVERLAND FLOW LOCATED WHERE NO WATER FALL OVER WHEAT ROAD

EXTENTS OF TERRACE AREA BEYOND THE LANDBRIGE INCORPORATED AS PART OF THE CATCHMENT

EXTENTS OF TERRACE AREA BY OTHERS

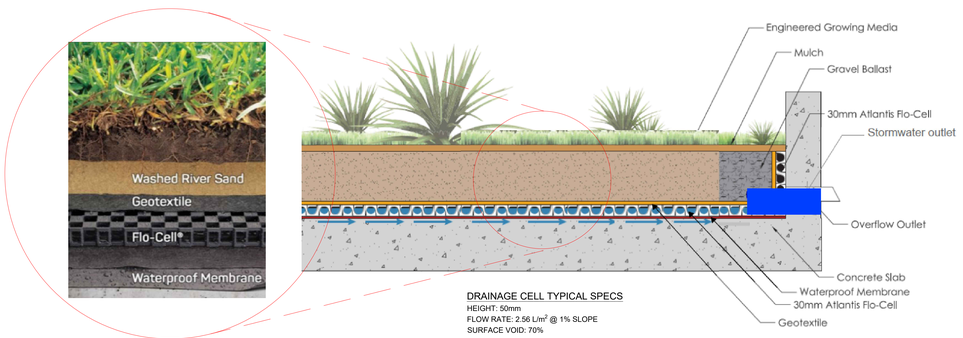
EXTENTS OF TERRACE AREA BY OTHERS

SCALE 1:250

0 5 10 15 m

LEVEL 3 - LANDBRIDGE PLAN - CIVIL WORKS

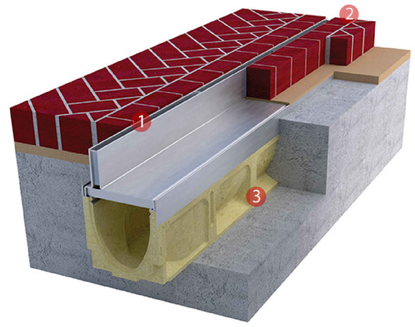
SCALE 1:250



DRAINAGE CELL TYPICAL SPECS
HEIGHT: 50mm
FLOW RATE: 2.56 L/m² @ 1% SLOPE
SURFACE VOID: 70%

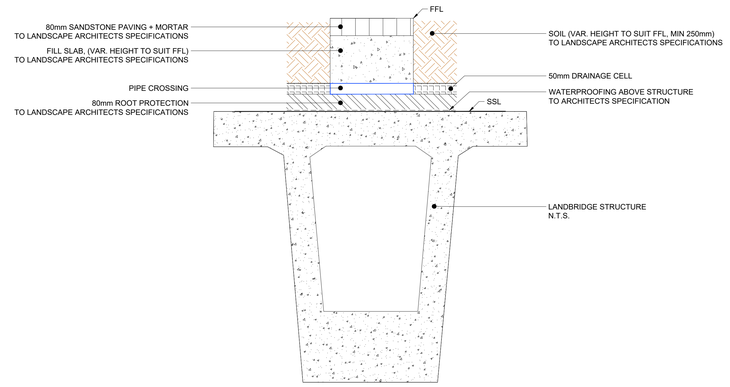
DRAINAGE CELL TYPICAL DETAIL

SCALE N.T.S.



SLOT DRAIN (SCHEMATIC ONLY)

SCALE N.T.S.



TYPICAL SECTION (SCHEMATIC ONLY)

SCALE N.T.S.

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CLIENT
GPT The GPT Group
AMP CAPITAL

Rev.	Date	Description
01	**.**.**	PRELIMINARY

PROJECT NAME
COCKLE BAY PARK
PROJECT NUMBER: 6054

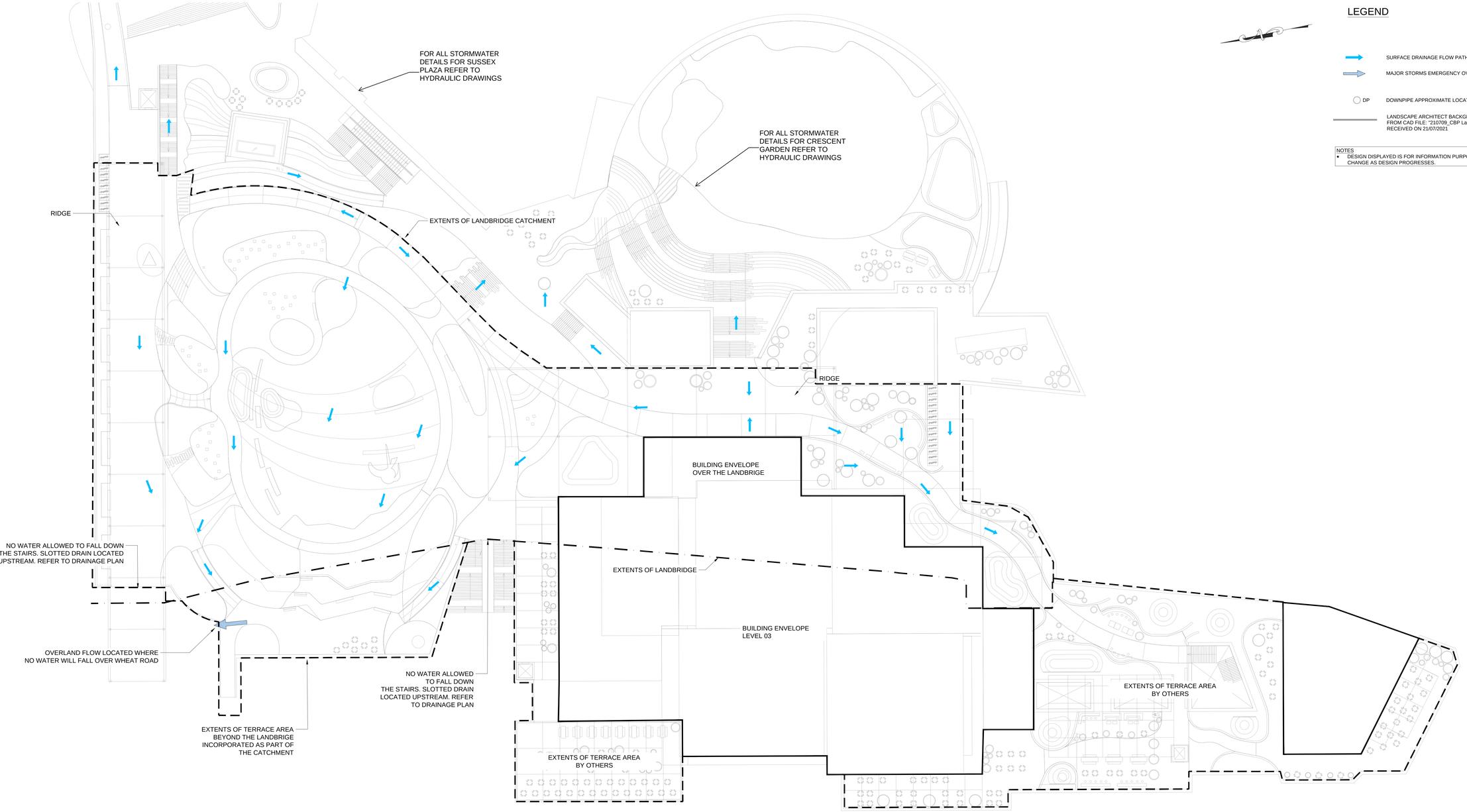
DRAWING TITLE
STORMWATER STRATEGY PLAN
SCALE AT A1: 1 : 250 | DRAWN BY: JAF | CHECKED BY: PAL

DRAWING STATUS
FOR INFORMATION

DRAWING NUMBER
CBP-SK-ENS-CIV-DRW-40-1004

REV.
01

A0



LEGEND

- SURFACE DRAINAGE FLOW PATH
- MAJOR STORMS EMERGENCY OVERLAND FLOW
- DP — DOWNPIPE APPROXIMATE LOCATIONS
- LANDSCAPE ARCHITECT BACKGROUND OVERLAY FROM CAD FILE: "210709_CBP Landscape.dwg" RECEIVED ON 21/07/2021

NOTES
- DESIGN DISPLAYED IS FOR INFORMATION PURPOSES ONLY AND IS SUBJECT TO CHANGE AS DESIGN PROGRESSES.

SCALE 1:250

0 5 10 15 m

LEVEL 3 - LANDBRIDGE OVERLAND FLOW

SCALE 1:250

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Rev.	Date	Description
01	**.**.**	PRELIMINARY

PROJECT NAME
COCKLE BAY PARK

PROJECT NUMBER: 6054

DRAWING TITLE
STORMWATER OVERLAND FLOW

SCALE AT A1: 1 : 250 | DRAWN BY: JAF | CHECKED BY: PAL

DRAWING STATUS
FOR INFORMATION

DRAWING NUMBER
CBP-SK-ENS-CIV-DRW-40-1005

REV.
01

A0

LEGEND

- CIVIL ENGINEERING BACKGROUND OVERLAY FOR GROUND LEVEL, SHOWN BEYOND. AS PER CURRENT DESIGN DATED AUG 2021
- LANDSCAPE BACKGROUND OVERLAY FOR LAND BRIDGE LEVEL AS PER 30/06/2021
- STRUCTURAL BACKGROUND OVERLAY FOR LAND BRIDGE LEVEL
- DP — DOWNPIPE APPROXIMATE LOCATIONS

NOTES
- ALL DOWNPIPES TO BE WITHIN COLUMNS.
- FOR OVERLAND FLOW REFER TO SEPARATE DRAWING 1005.
- FOR WATER QUALITY TANKS LOCATED ON GROUND FLOOR REFER TO DRAWING 1007.
- DESIGN DISPLAYED IS FOR INFORMATION PURPOSES ONLY AND IS SUBJECT TO CHANGE AS DESIGN PROGRESSES.

FOR ALL STORMWATER DETAILS FOR SUSSEX PLAZA REFER TO HYDRAULIC DRAWINGS

FOR ALL STORMWATER DETAILS FOR CRESCENT GARDEN REFER TO HYDRAULIC DRAWINGS

BUILDING ENVELOPE OVER THE LANDBRIGE

EXTENTS OF LANDBRIDGE (WEST)

WHEAT ROAD

DOWNPIPE

DOWNPIPE

DOWNPIPE

DOWNPIPE

HARBOUR STREET

EXTENTS OF TERRACE AREA BEYOND THE LANDBRIGE. TO BE DESIGNED AS PART OF THE BUILDING'S DRAINAGE, BY OTHERS

BUILDING ENVELOPE AS PART OF LEVEL 3

BUILDING ENVELOPE AS PART OF LEVEL 3

EXTENTS OF TERRACE AREA BEYOND THE LANDBRIGE TO BE DESIGN AS PART OF CIVIL SCOPE

WATER QUALITY TANK (NORTH) ON GROUND FLOOR SHOWN INDICATIVELY

EXTENTS OF TERRACE AREA TO BE DESIGN AS PART OF THE BUILDING'S DRAINAGE, BY OTHERS

WATER REUSE TANK ON GROUND FLOOR MEZZANINE LEVEL SHOWN INDICATIVELY

WATER QUALITY TANK (SOUTH) ON GROUND FLOOR SHOWN INDICATIVELY

DOWNPIPE LOCATIONS - CIVIL WORKS

SCALE 1:250

SCALE 1:250
0 5 10 15 m

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Rev.	Date	Description
01	05.08.21	PRELIMINARY

PROJECT NAME
COCKLE BAY PARK
PROJECT NUMBER: 6054

DRAWING TITLE
STORMWATER STRATEGY PLAN - DOWNPIPE LOCATIONS
SCALE AT A1: 1 : 250 | DRAWN BY: JAF | CHECKED BY: PAL

DRAWING STATUS
FOR INFORMATION

DRAWING NUMBER
CBP-SK-ENS-CIV-DRW-40-1006

REV.
01

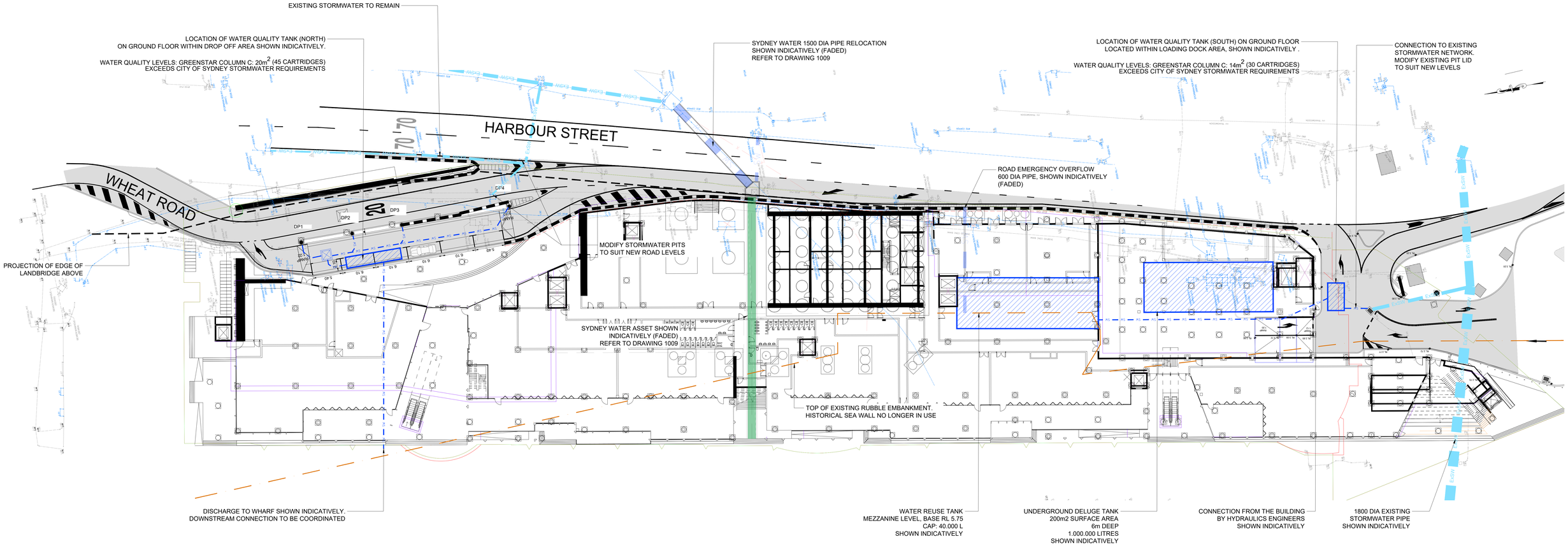
A0

LEGEND

- SW — UNDERGROUND PIPE AT MINIMUM 1% FALL TYPICAL
- EXISTING PIPES FROM UTILITIES SURVEY, DATED MAY 2021, PROVIDED BY 'LCG GROUP'
- ARCHITECT BACKGROUND OVERLAY FOR PODIUM GROUND LEVEL, SHOWN BEYOND. FROM CAD FILE: "CBP-ARC-POD-M3D-A-0001 - Sheet - A-DA1000 - General Arrangement Plan Podium Master - Level 00.dwg" RECEIVED ON 22/06/2021
- CIVIL ENGINEERING BACKGROUND OVERLAY FOR PODIUM GROUND LEVEL, SHOWN BEYOND. AS PER CURRENT DESIGN DATED AUG 2021
- DP — DOWNPIPE APPROXIMATE LOCATIONS

NOTES
- ALL DOWNPIPES TO BE WITHIN COLUMNS.
- SIZE AND LOCATION OF FILTER CHAMBERS IS SUBJECT TO COORDINATION WITH HYDRAULIC ENGINEERS:
  - TOWER AND PODIUM CATCHMENT DISTRIBUTION AND DISCHARGE POINTS
  - RAINWATER CAPTURE AND RE-USE. RAINWATER TANK SIZES AND DEMAND
- FOR OVERLAND FLOW REFER TO SEPARATE DRAWING 1005.
- FOR DOWNPIPE CONNECTIONS REFER TO DRAWING 1006.
- DESIGN DISPLAYED IS FOR INFORMATION PURPOSES ONLY AND IS SUBJECT TO CHANGE AS DESIGN PROGRESSES.

Pollutant	Green Star Column C Reduction targets (% of typical urban annual load)	City of Sydney Council Reduction targets (% of typical urban annual load)
Total Suspended Solids	90%	85%
Gross pollutants	95%	90%
Total Nitrogen	60%	45%
Total Phosphorous	70%	65%
Total Hydrocarbons	90%	-
Free Oils	98%	-



GROUND FLOOR DRAINAGE PLAN

SCALE 1:250

SCALE 1:250
0 5 10 15 m

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Rev.	Date	Description
01	05.08.21	PRELIMINARY

PROJECT NAME
COCKLE BAY PARK
PROJECT NUMBER: 6054

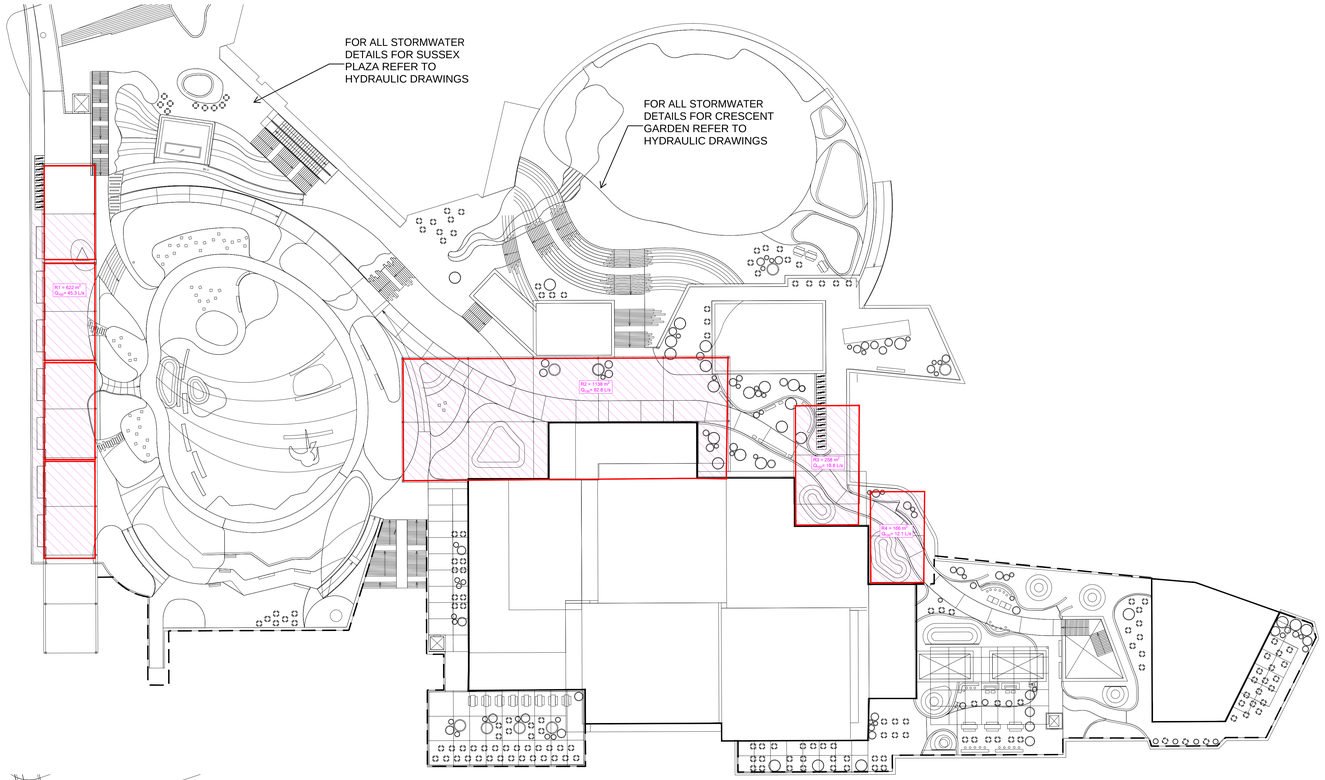
DRAWING TITLE
STORMWATER STRATEGY PLAN - GROUND FLOOR DRAINAGE PLAN
SCALE AT A1: 1 : 250 | DRAWN BY: JAF | CHECKED BY: PAL

DRAWING STATUS
FOR INFORMATION

DRAWING NUMBER
CBP-SK-ENS-CIV-DRW-40-1007

REV.
01

A0

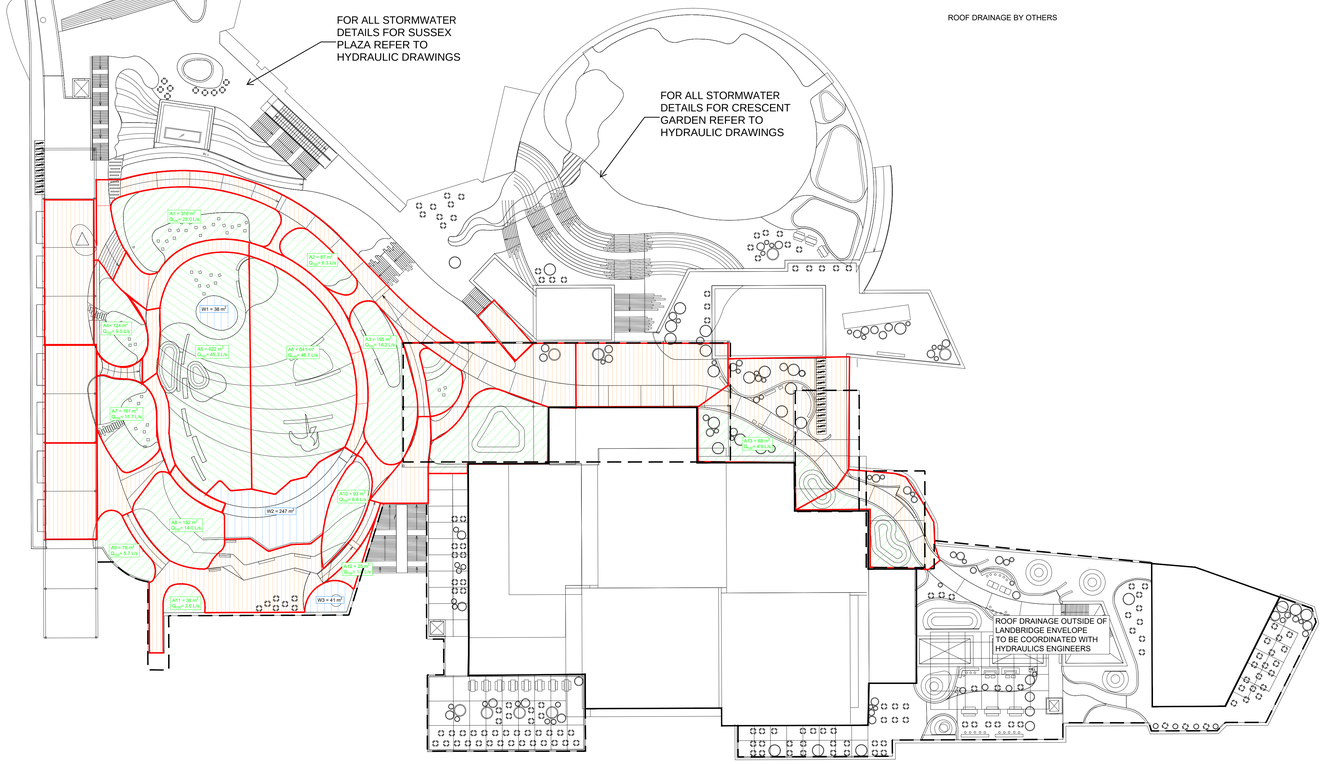


LEGEND

- LANDSCAPE PERVIOUS SURFACE
- IMPERVIOUS FOOTPATH
- IMPERVIOUS ROOF

LEVEL 3 - LANDBRIDGE PLAN - ROOF CATCHMENTS

SCALE 1:400



LEVEL 3 - LANDBRIDGE PLAN - BRIDGE CATCHMENTS

SCALE 1:400

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Rev.	Date	Description
01	**.**.**	PRELIMINARY

PROJECT NAME: COCKLE BAY PARK

PROJECT NUMBER: 6054

DRAWING TITLE: STORMWATER CATCHMENT PLAN

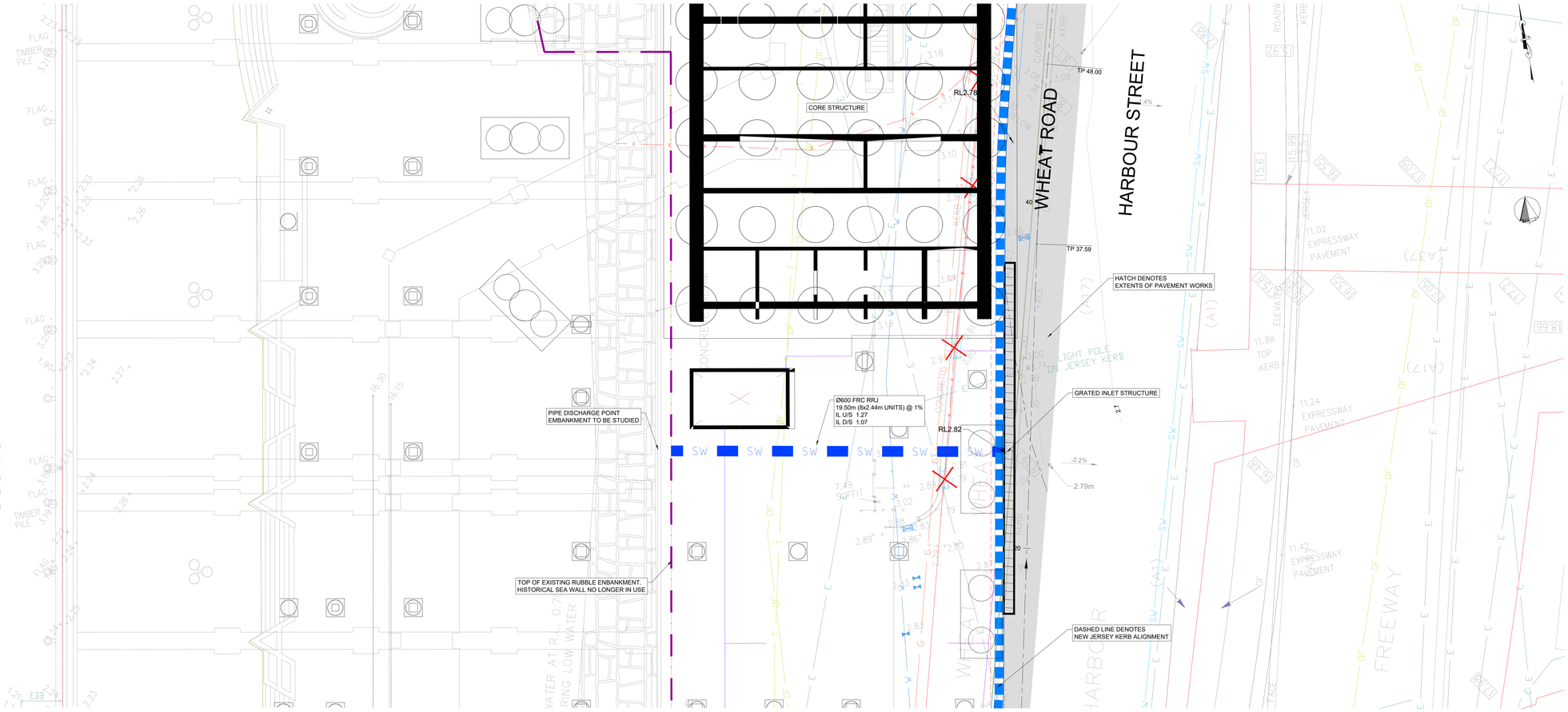
SCALE AT A1: 1 : 200 | DRAWN BY: JAF | CHECKED BY: PAL

DRAWING STATUS: FOR INFORMATION

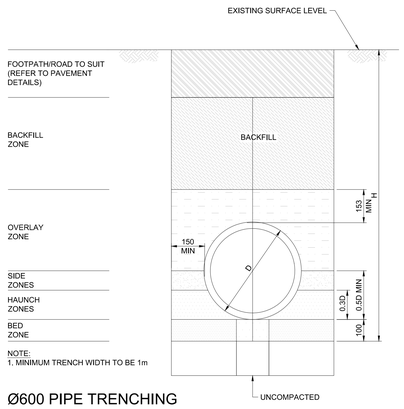
DRAWING NUMBER: CBP-SK-ENS-CIV-DRW-40-1009

REV: 01

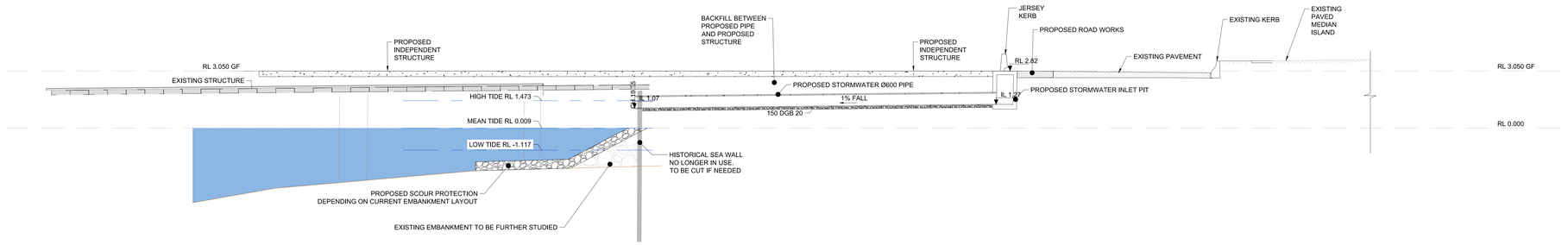
A0



PLAN
SCALE 1:100



Ø600 PIPE TRENCHING TYPICAL SECTION
SCALE 1:10



LONGSECTION
SCALE 1:100

SCALE 1:100

0 1 2 3 4 5 m

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Rev.	Date	Description
01	26.06.20	PRELIMINARY

PROJECT NAME
COCKLE BAY PARK
PROJECT NUMBER: 6054

DRAWING TITLE
STORMWATER PLAN - HARBOUR STREET DRAINAGE
SCALE AT A1: 1 : 100 | DRAWN BY: JAF | CHECKED BY: PAL

DRAWING STATUS
FOR INFORMATION

DRAWING NUMBER
CBP-SK-ENS-CIV-DRW-60-0001

REV.
01

APPENDIX C

Sydney Water Stormwater Pipe Re-Alignment Plan

A0

LEGEND

- UNDERGROUND PIPE AT MINIMUM 1% FALL TYPICAL
- EXISTING PIPES FROM UTILITIES SURVEY, DATED MAY 2021, PROVIDED BY 'LCG GROUP'
- ARCHITECT BACKGROUND OVERLAY FOR PODIUM GROUND LEVEL, SHOWN BEYOND. FROM CAD FILE: "CBP-ARC-POD-M3D-A-0001 - Sheet - A-DA1000 - General Arrangement Plan Podium Master - Level 00.dwg" RECEIVED ON 22/06/2021
- CIVIL ENGINEERING BACKGROUND OVERLAY FOR PODIUM GROUND LEVEL, SHOWN BEYOND. AS PER CURRENT DESIGN DATED AUG 2021
- DP — DOWNPIPE APPROXIMATE LOCATIONS

NOTES
- ALL DOWNPIPES TO BE WITHIN COLUMNS.
- SIZE AND LOCATION OF FILTER CHAMBERS IS SUBJECT TO COORDINATION WITH HYDRAULIC ENGINEERS:
  - TOWER AND PODIUM CATCHMENT DISTRIBUTION AND DISCHARGE POINTS
  - RAINWATER CAPTURE AND RE-USE. RAINWATER TANK SIZES AND DEMAND
- FOR OVERLAND FLOW REFER TO SEPARATE DRAWING 1005.
- FOR DOWNPIPE CONNECTIONS REFER TO DRAWING 1006.
- DESIGN DISPLAYED IS FOR INFORMATION PURPOSES ONLY AND IS SUBJECT TO CHANGE AS DESIGN PROGRESSES.

HARBOUR STREET

SYDNEY WATER 1500 DIA PIPE RELOCATION

ROAD EMERGENCY OVERFLOW ROUTE TO BE CAPTURED WITH LINEAR DRAINAGE ADJACENT TO JERSEY KERB

600 DIA UNDERGROUND PIPE

THE EXISTING SYDNEY WATER PIPELINE THAT BECOMES REDUNDANT IS TO BE DEMOLISHED AND REMOVED FROM SITE OR SEALED AND FILLED TO SYDNEY WATER REQUIREMENTS

TOP OF EXISTING RUBBLE ENBANKMENT. HISTORICAL SEA WALL NO LONGER IN USE

TOP OF EXISTING RUBBLE EMBANKMENT SHOWN INDICATIVELY

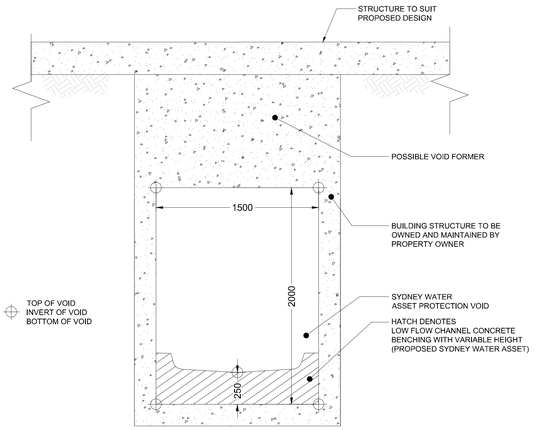
SYDNEY WATER ASSET REFER TO TYPICAL SECTION

GROUND FLOOR STAIRS DO NOT INTERRUPT STRUCTURE, SHOWN INDICATIVELY

WATER REUSE TANK
BOTTOM RL 5.75
CAP: 40.000 L
SHOWN INDICATIVELY

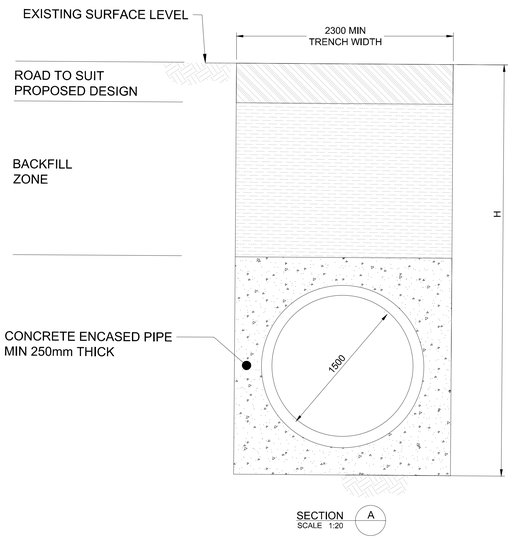
SCALE 1:100
0 1 2 3 4 5 m

GROUND FLOOR - SYDNEY WATER REALIGNMENT PLAN
SCALE 1:100



SECTION B
SCALE 1:20

SYDNEY WATER ASSET PROTECTION VOID TYPICAL DETAIL



SECTION A
SCALE 1:20

TYPICAL SECTION UNDER ROAD

SCALE 1:20
0 200 400 600 800 1000mm

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Rev.	Date	Description
01	05.08.21	PRELIMINARY

PROJECT NAME
COCKLE BAY PARK
PROJECT NUMBER: 6054

DRAWING TITLE
STORMWATER STRATEGY PLAN -
GROUND FLOOR SYDNEY WATER REALIGNMENT PLAN
SCALE AT A1: SHOWN | DRAWN BY: JAF | CHECKED BY: PAL

DRAWING STATUS
FOR INFORMATION

DRAWING NUMBER
CBP-SK-ENS-CIV-DRW-40-1008

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01

APPENDIX D

Sydney Water Stormwater Pipe Re-Alignment Correspondence

Case Number: 188945

April 6, 2021

DPT AND DPPT OPERATOR PTY LTD
c/- WARREN SMITH & PARTNERS PTY LTD

LETTER of CONDITIONS
For
ADJUSTMENT/ DEVIATION OF A SYDNEY WATER ASSET

Applicant: **DPT AND DPPT OPERATOR PTY LTD**
Your reference: **6683000**
Property location: **Cockle Bay Wharf, Darling Harbour**
Your application date: **March 18, 2021**

Note: **Level 1 water restrictions are now in place,** which limits how and when water can be used outdoors. This can impact you and your contractors in the activities relating to this proposal.
Using water to suppress dust is not restricted, but this does mean that you/your contractors will need to apply for an exemption permit to use water for most outdoor uses including:

- Cleaning equipment
- Drilling and boring, and
- Batching concrete on-site

Fines for deliberate breaches of restriction rules apply from 1 September 2019.
For more information on the restrictions and for applying for an exemption, visit our web site at http://www.sydneywater.com.au/SW/water-the-environment/what-we-re-doing/water-restrictions/index.htm
The more water everyone saves, the longer we can stave off the progression to stricter restrictions or emergency measures.
Please provide this information to your contractors and delivery partners to inform them of their obligations.

Dear Applicant

Your application to deviate the storm water main at the above location is approved provided you do the following things:

1. You must enter into an agreement with Sydney Water in the form of the enclosed Deed.

2. You must engage your current or another authorised Water Servicing Coordinator (Coordinator) to manage the design and construction of the required works to Sydney Water's standards and procedures. Before you engage another Coordinator you must write and tell Sydney Water.

   For a list of authorised Coordinators either visit **www.sydneywater.com.au** > Plumbing, building & developing > Developing > Providers > Lists or call 13 20 92. Coordinators will give you a quote or information about costs for services/ works including Sydney Water costs.

   The Coordinator generally will be the single point of contact between you and Sydney Water. They can answer most questions you might have about our process and charges.

3. After you engage a Coordinator, you and your accredited Developer Infrastructure Providers (Providers) will need to sign and lodge both copies of the enclosed Deed with your nominated Coordinator. After Sydney Water has signed the documents, one copy will be returned to the Coordinator.

   The Deed sets out for this project:
   - your responsibilities;
   - Sydney Water's responsibilities; and
   - the Provider's responsibilities.

   You must do all the things that we ask you to do in that Deed.

If Sydney Water does not receive the signed Deed for our signing by April 6, 2022 you will need to re-apply (and pay another application fee).

Note: The Coordinator must be fully authorised by us for the whole time of the Deed.

4. If you need to enter a neighbouring property, you must have the written permission of the relevant property owners and tenants. You must use Sydney Water's **Permission to Enter** form(s) for this. You can get copies of these forms from your Coordinator or the Sydney Water website. Your Coordinator can also negotiate on your behalf.

   Please make sure that you address all the items on the form(s) including payment of compensation and whether there are other ways of designing and constructing that could avoid or reduce their impacts. You will be responsible for all costs of mediation involved in resolving any disputes. Please allow enough time for entry issues to be resolved.

5. You must not start work on the existing storm water main or the proposed adjustment/deviation until Sydney Water advises your Coordinator. This includes the placement of any temporary pipework. Before you can do this pipework, you must engage your Coordinator to lodge an application that must include appropriate temporary pipework detail as well as the design of the proposed deviation/adjustment.

   Sydney Water will then assess both designs and advise your Coordinator when they are approved and of any conditions to be met before pipe placement.

   One condition will be:
   - the lodgement of an unconditional security bond from an acceptable financial institution that will cover Sydney Water's risk for this work; and
   - your acceptance in writing to bonding conditions that we will provide in another agreement.

   If any work on our assets is carried out without that advice or final approval, Sydney Water will take action to have work on the site stopped. We will apply the provisions of Section 45 of the Sydney Water Act 1994.

6. Construction of these works will require you to pay project management, survey, design and construction costs **directly to your Providers**. Additional costs payable to Sydney Water may include:
   - water main shutdown and disinfection;
   - connection of new water mains to Sydney Water system(s);
   - design and construction audit fees;

- contract administration, Operations Area Charge & Customer Redress prior to project finalisation;
- creation or alteration of easements etc.;
- water usage charges where water has been supplied for building activity purposes prior to disinfection of a newly constructed water main.

Note: Payment for any Goods and Services (including Customer Redress) provided by Sydney Water will be required prior to the release of the Bank Guarantee or Cash Bond.

Your Coordinator can tell you about these costs.

7. Because this work involves construction on a “live” Sydney Water storm water main, you must also:
   - Have your Building Plans are approved prior to temporary pipework and excavation,
   - Submit your temporary pipework design (if required) with your permanent wastewater deviation design for approval,
   - Accept in writing to bonding conditions that will be provided in the Bond Agreement,
   - Submit your Bond and signed Bond Agreement,
   - Submit the Construction Commencement Notice for construction of the temporary pipework,
   - Have your temporary pipework constructed by a listed provider, and then
   - Complete your permanent deviation works.

   After we receive a copy of the successful tender for the work, we can calculate the amount of this bond. We will then send you that other agreement which will tell you this amount. You must lodge the bond and the completed agreement with Sydney Water before you start constructing the work.

   The bond will be released after you have completed the construction of the works. (This includes lodgement of Work As Constructed plans and production of documentation and reports at the completion of all the excavation and landscaping works needed for the total project.)

8. Work as Constructed (WAC) plans.

   - Preliminary WAC plans with the assumed connection construction shown must be submitted via email to the Case Manager at Sydney Water, prior to the joint Pre-connection inspection.

- The preliminary WAC plans are required to be accepted by the Case Manager prior to the connection being arranged.
- The ITP must be amended to include a hold point for the submission of preliminary WAC plans prior to the joint inspection and acceptance of the WAC plan prior to connection.

In addition, the following specific conditions apply:

The proposed stormwater deviation is to be as per the following agreed drawings:

- Drawing No CBP-SK-ENS-CIV-DRW-10-1012 Rev 07 Dated 28.07.20
- Drawing No CBP-SK-ENS-CIV-DRW-25-1012 Rev 05 Dated 28.07.20
- Drawing No CBP-SK-ENS-CIV-DRW-25-1022 Rev 05 Dated 28.07.20
- Drawing No CBP-SK-ENS-CIV-DRW-25-1032 Rev 05 Dated 28.07.20

Liaising with Council

The proponent is required to liaise with Council regarding this proposed deviation. Any requirements as determined by Council in addition to Sydney Water's requirements are to be complied with irrespective of Sydney Water's agreement/approval.

Liaising with Sydney Water

As the proposed deviation work is associated with major stormwater trunk drainage system, the proponents and their service providers are required to liaise with Sydney Water continuously until the ownership of the stormwater work is transferred to Sydney Water according to the Asset Creation Process.

Flow Management Plan and Safe Work Plan

It is the constructor's responsibility to ensure to maintain continuous stormwater flow through the existing pipes or through the new deviated stormwater pipe during the construction period. The nominated constructor is required to submit a Flow Management Plan and needs to obtain approval prior to commencement of any work on Sydney Water's stormwater assets.

Design and Construction

The design and construction of the work is to be in accordance to the Sewerage Code of Australia, Sydney Water's Technical Specification Civil Version 9 Dated 21/01/2020 / AUS-SPEC as appropriate.
The designer is to provide written confirmation that the design including pre-cast box culvert comply with the followings:

- Sydney Water technical specifications require design in accordance with AS3735 (Concrete Structures for retaining liquid).
- Design life of the new Culvert / pipe is to be 100 years.
- Design should comply with Table 10-5 of Technical Specification Civil for minimum durability requirements for typical exposure classifications to AS3735 for 100 year design life

Design of the proposed Stormwater pipe / Culvert / Access Chamber

The design of the proposed stormwater pipe / culvert / access chamber is to be carried out by relevant qualified professionals in accordance with the current Engineering Competency Standard.

Structural details of the deviation of the stormwater channel are to be submitted with the design drawings and would be referred to Sydney Water's Engineering Services for comments. Any requirements as determined by Engineering Services must be complied with.

Changing in Direction

Minimum internal radius of 6m is to be provided when there is a change in direction to the flow.

Construction of the Stormwater work

Construction of the stormwater work is to be carried out by Sydney Water accredited providers for construction for sewer or water and have the capability of S2, W2 or W3.

Creation of Easement

An easement is to be created for the new stormwater pipe / channel in favour of Sydney Water. If these new assets are not located in the land dedicated to public. The easement is to be 2m

wider (1m either side) than the stormwater assets. The proponent is required to liaise with Sydney Water's property services regarding this easement process.

For the stormwater protection void, appropriate coordinates are to be identified to define the void. The easement needs to be created for this void. Sydney Water property services would provide you the necessary guidance once the design is submitted with the void identification coordinates.

Direct Stormwater Connection

If direct stormwater connection is required to the Sydney Water's stormwater system, then the connection details should also be included in the design drawings and the connection must satisfy Sydney Water's connection requirements.

Proposed connections that are 300mm or more in diameter require a qualified structural engineer to design the connection details. Structural details of the connections are to be submitted with the design drawing. A structural engineer's certificate is to be attached with the design drawings.

Pre- Construction Dilapidation Survey / CCTV Inspection

Dilapidation survey/ CCTV inspection of the stormwater pipe/ channel in the upstream end is to be carried out prior to commencement of any work. The length of the inspection is to be at least 5m upstream from the upstream end of the deviation point.

Post - Construction Dilapidation Survey / CCTV Inspection

Upon completion of the new stormwater pipe/ channel construction and the completion of the construction work at the site, dilapidation survey / CCTV inspection is to be carried out for the full length of the new pipe/ culvert and 5m upstream from new culvert/ pipe.

Lodgement of a Bond

A Bond is required to be submitted, prior to releasing the design drawings for construction. The value of the Bond cannot be determined until the design is accepted and your providers have submitted their quotations for review. The amount of bond is assessed based on the likely risk

to Sydney Water due to the proposed Adjustment /deviation work. Please refer to Sydney Water's Bonding Guidelines/Policy for more information.

Refund of the bond is subject to the acceptance of the Work As Constructed drawing and the review of final CCTV inspection/ dilapidation report which is required to undertake upon completion of the construction work and payment of all outstanding fees.

Disconnected Pipes

Disconnected pipes are to be either completely removed or need to be sand filled. If the proponent decided to sand filled the disconnected pipe, then the ownership of the disconnected pipe/ culvert is to be transferred from Sydney Water to the owner of the property. The proponent is required to follow the transfer of ownership process.

Crossing the Services

Any service crossing across the Sydney Water's stormwater pipe/ culvert is to be perpendicular to the stormwater pipe/ culvert and must have minimum 500mm vertical clearance between the services and Sydney Water's stormwater assets.

Title of the drawing

Case No. 188945SW

City of Sydney Drainage
Market Street Branch SWC 30L
Drains to City Area SWC 30
Deviation

Review of Design

Review of the design by Sydney Water shall be not construed as relieving the Designer of their responsibility. Note, Sydney Water examine only the supplied information and provide comment for consideration. Sydney Water does not verify, approve or endorse the design. Design responsibility remains with the Designer.

END