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Newcastle Art Gallery

Section 4.55 Stormwater Management Plan

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Issue | 2 November 2021

This report takes into account the particular instructions and requirements of our client. It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number 278551

Arup Pty Ltd ABN 18 000 966 165

Arup Level 5 151 Clarence Street Sydney NSW 2000 Australia www.arup.com

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Document verification

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Stormwater Plan

Appendix B

Rainwater Harvesting and OSD Strategy

1 Introduction

In preparation for the Section 4.55 submission, the previously approved civil design has been interrogated to ensure that it continues to adhere to the City of Newcastle Council (CoNC) development guidelines. Given the design changes that have been proposed alongside this submission, the cut and fill volumes were recalculated and adherence to flood planning levels was reconfirmed. A major alteration to the original proposal is the stormwater strategy being employed for the site. The OSD tank that was previously located in the basement has been relocated to the northern extent of the building to allow for a better outcome in regard to stormwater discharge. Arup has also proposed that the kerb along Darby Street be raised to allow for better conveyance of runoff, as well as providing an opportunity to upgrade the public domain surrounding the art gallery and allow CoNC to include an optional new stormwater alignment beneath the newly raised kerb. The following report demonstrates adherence to the CoNC DCP guidelines.

Arup has prepared a set of drawings to reflect design changes since the original DA submission in 2010. Refer to Appendix A for the Stormwater Connection Plan and Appendix B for OSD details.

2 Standards and Regulations

The City of Newcastle Development Control Plan (DCP) 2012 outlines planning requirements for new developments. DCP Section 4.01 Flood Management dictates that;

- Floor levels of all occupiable rooms of all buildings are not set lower than the flood planning level (FPL)
- Garage floor levels are no lower than the 1% AEP flood level. However, it is recognised that this may be impractical due to vehicular access constraints, in which case levels must be as high as practicable.
- Basement garages may be acceptable where all potential water entry points are at or above the probably maximum flood (PMF) level, excepting that vehicular entry points can be at the FPL.

DCP Section 7.06 Stormwater provides guidance on the stormwater management requirements for new developments. This includes site discharge controls and water quality targets which should typically be achieved.

DCP Section 7.07 Water efficiency provides guidance on water efficiency and how this should be applied to the project. This includes maximum fixture flow rates and the requirement for dual purpose rainwater harvesting and OSD systems.

3 Stormwater

The proposed stormwater strategy will seek to discharge stormwater to the existing pit at the corner of Darby Street and Laman Street via an OSD tank. This tank will reside underneath the gallery cafe and will aim to collect most of the roof catchment. For areas of the building roof which cannot be articulated to the OSD tank, it is proposed that local kerb outlets be established along Queen Street. This aligns with the existing strategy, where multiple kerb outlets have been established draining from the existing art gallery building roof. Sections of the roof area which do not drain to the OSD will be discharged directly to the kerb and gutter.

In addition to the internal stormwater management strategy, it is also proposed that the kerb heights along Darby Street be amended to allow better conveyance of runoff along the road corridor. Due to the restrictive kerb height, Arup have proposed to the City of Newcastle Council the potential for raising the existing kerb to achieve a standard kerb height of 150 mm. This would have the added advantage of increasing gutter flow capacities and potentially reducing flood risk to the building during very rare and extreme flood events. The works will provide greater opportunity to explore the option of implementing a new stormwater alignment and associated drainage inlets beneath the newly raised kerb, if desired.

Raising the kerb will require that the external footpath be regraded from the new top of kerb height, creating a key opportunity to improve the public domain in preparation for the new gallery space. The raised kerb and regraded footpath would be further developed in future design stages in coordination with the urban design. Figure 1 shows the short kerb height that is currently present along Darby Street.



Figure 1: Reduced Kerb Height along Darby St (Google Streetview, 2020)

Given the proposed development will not result in a notable change in impervious area (new impermeable roof area will replace existing impermeable car park area) and will improve the post-development site discharge compared to the existing site discharge due to the introduction of a rainwater tank, the City of Newcastle Council has advised that stormwater quality treatment devices will not be required as part of this development. This approach was agreed upon in a consultation meeting with the CoNC Development Engineer on the 18th December 2020. The use of conventional methods to treat stormwater runoff would be difficult to integrate due to the minimal level difference between the proposed building level and the existing kerb and gutter, especially as water quality treatment devises also exert hydraulic head losses.

4 Flooding

A Flood Certificate was obtained from City of Newcastle Council on the 4th of December 2020. Excerpts of the Council flood model were obtained, indicating the flood depths and levels in both the 1% Annual Exceedance Probability (AEP) (1 in 100 year) design storm event and the Probable Maximum Flood (PMF) event. Figure 2 and Figure 3 indicate the extent of flooding and flood levels on site as calculated by the CoNC flood model for the 1% AEP event and PMF event respectively.



Figure 2: 1% AEP Flood Levels at Intersection of Queen and Darby St (NCC Flood Model)



Figure 3: PMF Levels at Intersection of Queen and Darby St (NCC Flood Model)

The Flood Certificate provided establishes the 1% AEP flood level on-site to be considered as a single value of 8.4 mAHD across the project area, which also requires an additional 500 mm freeboard for occupiable levels. This indicates a Flood Planning Level (FPL) of 8.9 mAHD to be used for the development. The Flood Certificate also establishes the PMF level on-site to be considered as a single value of 8.6 mAHD across the project area.

It is important to consider, however, that flood levels are not equal across the site (as indicated in Figure 2), which demonstrates that flood levels in the 1% AEP event at the southern extent of the site are closer to 8.3 mAHD, while flood levels during the PMF at the same location are closer to 8.46 mAHD (as shown in Figure 3).

The building floor levels have therefore taken the closest provided flood level into consideration to ensure there are no detrimental impacts to the building during a 1% AEP design storm event. The Flood Certificate does not require shelter-in-place flood evacuation facilities to be provided as part of the development.

As included in DCP Section 4.01.03, garage floor levels are to be no lower than the 1% AEP flood level wherever possible. The proposed gallery extension includes a loading dock and garage within the southern extent of the building with the access level proposed at 8.14 mAHD. This design level is higher than the 1% AEP flood level at this location, with flood levels reaching a maximum of 8.05 mAHD. Therefore this FPL condition of the DCP has been met.

Two basement access points are present in the design along the southern edge of the building, with a staircase leading down from the loading dock at 8.25 mAHD, and a set of stairs and an elevator leading down to the basement from 8.5 mAHD. These basement access points are both above the PMF levels at these locations, which reach 8.19 mAHD and 8.36 mAHD respectively. These PMF levels are shown in Figure 4.

Given the basement access points have been designed above local PMF levels, the DCP basement FPL requirements has been met.



Figure 4: PMF Levels Compared to Finished Floor Levels of Basement

4.1 Rainwater Harvesting and OSD

A combined rainwater harvesting and on-site detention system will be provided in accordance with the DA phase discussions held with The City of Newcastle, City of Newcastle Technical Manual and Development Control Plan 2012 Sections 7.06 and 7.07, the requirements of which as we understand them are outlined below.

Stormwater and Water Efficiency for Development Technical Manual Rev April 2019

- Dual reticulation should be provided for all greenfield and infill redevelopments which are located in planned recycled water reticulation zones *we don't believe this applies to the development*.
- Underground drainage to 5% AEP (1 in 20 year ARI)
- Roads and major system to 1% AEP (1 in 100 year ARI)
- All development site except residential to be provided with litter control
- All rainwater tanks to be fitted with first flush device
- All roof areas for proposed new works to be connected to the tank *a* minor area of the new roof may unable to drain to the tank within the current limitations of the architectural layout and site constraints, this was agreed in a previous meeting with The City of Newcastle however we will endevour to take the equivalent of the new roof area to the tank.

City of Newcastle DCP 7.06 Stormwater Rev 3 2017

- Objective to match post development runoff to the pre development runoff regime & prevent pollutants from entering waterways. No change to the impervious area of the site, so existing building roof area can be excluded from new collection system
- New rainwater harvesting system improves existing site runoff condition
- Storage of 25mm per m2 required for site with 100% impervious area
- Maximise roof area directed to rainwater tank
- Storage drawn down to be reused on site (0.023L/s per 1000m2) or discharged to council stormwater (0.5L/s per 1000m2)

City of Newcastle DCP 7.07 Water Efficiency Rev 4 2017

• Rainwater tank to be provided for the purpose of water re-use and on site detention. Rainwater tank volume can be used to offset any additional discharge control storage that is required under DCP 7.06 and the technical manual.



Figure 5: Concept Rainwater Harvesting and OSD Strategy

The flow conditions expected at the council stormwater pit based on the above strategies are summarised in the below table and are subject to design development.

Base Desig	n Condition	20%	AEP	5%	AEP	1% /	AEP
Total Roof Area draining to OSD + Rainwater Tank (m2)	Kerb gutter discharge limit via pumps or orifice plate (L/s)	Rainwate r tank inflow (L/s)	Tank Overflow (L/s) *	Rainwater tank inflow (L/s)	Tank Overflow (L/s) *	Rainwater tank inflow (L/s)	Tank Overflow (L/s) *
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*Overflow to pit includes full inflow + orifice discharge.

Appendix A

Stormwater Plan



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NOTE:

- 1. FOR GENERAL NOTES REFER DRG No.
- NAG-ARP-CV-DG-00102.
- 2. REFER TO NAG-ARP-CV-DG-00301 FOR EXISTING SERVICES PLAN
- 3. REFER TO NAG-ARP-CV-DG-00491 FOR KERB OUTLET
- DETAILS4. REFER TO HYDRAULIC ENGINEER DWGS FOR OSD
- DETAILS.5. REFER TO HYDRAULIC ENGINEER DWGS FOR DOWN PIPE DETAILS.

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Arup, Level 5, 151 Clarence St Sydney, NSW, 2000 Tel +61 (02) 9320 9320 Fax +61 (02) 9320 9321 www.arup.com

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Appendix B

Rainwater Harvesting and OSD Strategy



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