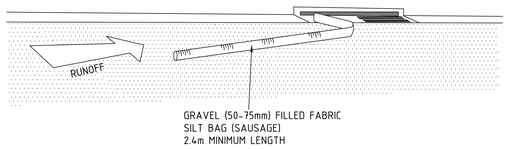
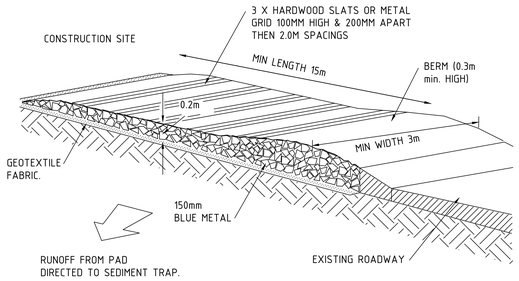
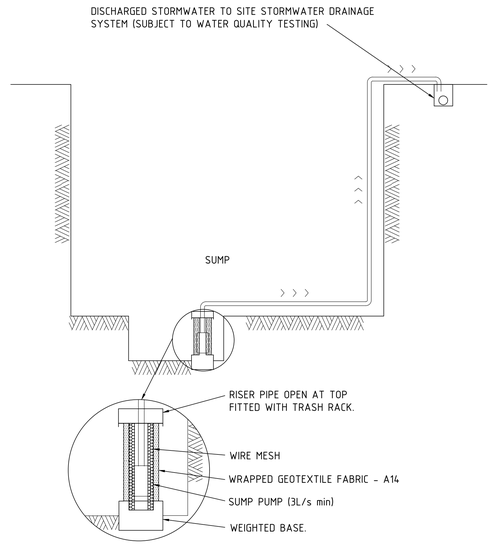


FABRIC STOCKING KERB INLET SEDIMENT TRAP



TEMPORARY CONSTRUCTION EXIT



STORMWATER SUMP AND OUTLET

DRAWING COLOUR CODED - PRINT ALL COPIES IN COLOUR

NOT FOR CONSTRUCTION

AMD	DESCRIPTION	DESIGNER SIGN./DATE	VERIFIED SIGN./DATE	APPROVED SIGN./DATE
F	UPDATED GUARANTEED MAXIMUM PRICE (GMP)	NR/20.04.18	LM/20.04.18	DH/20.04.18
E	UPDATED GUARANTEED MAXIMUM PRICE (GMP)	NR/16.03.18	LM/16.03.18	16.03.18
D	CCB2 SUBMISSION	NR/03.10.17	LM/03.10.17	NS/03.10.17
C	CCB2 DRAFT SUBMISSION	NR/06.09.17	LM/06.09.17	NS/06.09.17
B	SPACE PROOFED SET - DRAFT	NR/04.08.17	LM/04.08.17	NS/04.08.17

CO-ORDINATE SYSTEM: MGA | HEIGHT DATUM: AHD | SCALE: NOT TO SCALE

NSW GOVERNMENT Transport for NSW

ARUP

This drawing and the related information have been prepared by, or at the request of, Transport for NSW for a specific purpose and may not be used for any purpose other than the purpose intended by Transport for NSW. Transport for NSW does not provide any warranties and accepts no liability arising out of the use of this drawing or any of the related information for any purpose other than the intended purpose. This drawing is protected by copyright and no part of this drawing may be reproduced in any form without the express written permission of Transport for NSW.

ARUP
ARUP CIVIL SERVICES
JOB # 247838

DRAWN	CHARLIE FANNER	20.04.18
DESIGNED	NICHOLAS ROUGGOS	20.04.18
DRG CHECK	KANE ELLIS	20.04.18
DESIGN CHECK	LOUISE MILLWARD	20.04.18
APPROVED	DAVID HARDING	20.04.18

METRO MARTIN PLACE
SYDNEY METRO
STATION
CIVIL SERVICES
SEDIMENT & EROSION CONTROL DETAILS

FILE No. | SHEET: 1 OF 1 | A0
STATUS: GATE 4 | ©
DRG No. CSWSMP-MAC-SMP-CE-DRG-309002 | F | EDMS No.

CP 15-KF8K1

File Pathname: C:\Users\josh.eaton\Desktop\PRINT\CSWSMP-MAC-SMP-CE-DRG-309002.dwg
Plot Date & Time: 9/5/2018 2:44 PM
Plotted by:JOSH EATON

Appendix B

Flood Mapping

Memorandum

ARUP

To	Holly Rhoades – Savills	Date	02 July 2018
Copies	Nick Suslak	Reference number	247838/NR
From	Nicholas Rouggos	File reference	Flood Management
Subject	Flood Protection Requirements and Management Strategy		

1 Introduction

This memorandum provides details of the current flood planning requirements for the Metro Martin Place precinct entrances/exits (Station and Towers/ OSD), how flood levels have been determined and how appropriate threshold levels have been achieved. The details below are provided to clarify the SWTC and City of Sydney Council requirements, and proposed design approach for compliance.

2 Requirements

2.1 Metro station

In the EIS/CSSI completed and approved for the 'Sydney Metro City & Southwest Sydenham to Bankstown Upgrade - Flooding and Hydrology' the requirement for flood protection is 'To avoid flooding impacts on project infrastructure, station entries aboveground rail system facilities would be located above the Probable Maximum Flood level and at least 0.5 metres above the 100-year recurrence interval flood level, where feasible and reasonable. Where not feasible and reasonable to meet these design criteria, design would consider the need for sumps and pumps to manage any potential inflows into project infrastructure'.

There are some areas where meeting this requirement is not reasonable, as flood modelling suggests that in these locations flooding is limited to less than 100mm and is confined to the road corridor (refer Attachment B). Note flooding around the majority of entrances (Surrounding South Tower and along Castlereagh Street) is minor and sufficient freeboard has been provided in line with both the SWTC and City of Sydney guidelines where relevant.

The specific requirement to be met for this Metro station is as follows:

<u>SWTC Metro Requirement (Appendix 22)</u>

> *The threshold level of all entrances, ventilation openings, tunnel portals and other openings into underground railway infrastructure must be set above the Probable Maximum Flood level (PMF) and at least 300 mm higher (crest protection) than the surrounding finished ground level or sufficient to prevent local flash flooding entering the underground structures. At station entrances, this requirement must be met by sloping the surface away from the threshold and not by a step.*

The PMF is;

- as defined in Australian Rainfall and Runoff,
- in accordance with the Department of Environment and Climate Change (DECC) Floodplain Risk Management Guideline – Practical Consideration of Climate Change, version 1 October 2007; and
- in accordance with DECC's Draft Sea Level Rise Policy Statement, February 2009.

For the determination of the 'surrounding finished ground level', levels shown on the attached sketches (Attachment A) are taken as the boundary level (of the regraded footpaths) which is a conservative position (noting CoS have provided advice to Arup on another project that the 'surrounding finished ground level' for a similar development should be taken as the invert of gutter).

2.1.1 Freeboard Criteria (Metro Entrances)

For all Metro Entrances/ Openings the criteria used to assess compliance are:

a) Primary Criteria: CSSI (must comply with both)

   a. PMF

   b. 100yr ARI + 0.5m (*where feasible and reasonable*)

b) Secondary Criteria: SWTC

   a. PMF

   b. 300mm higher than surrounding ground levels, currently taken as the boundary level of the regraded footpaths.

2.2 North and South Towers

For all entrances/ accesses into the towers/OSD (without access to underground levels), the requirement that dictates levels is the City of Sydney Interim Floodplain Management Policy 'Industrial and Commercial'- Business and Retail Flood Level. This policy requires the threshold level to be at the 1:100yr flood level or higher. These floors must not have any connections to the Metro Station (louvers, doors or otherwise).

For other entrances/ accesses with access to underground levels the higher of 1:100yr flood level + 0.5m or PMF (City of Sydney Interim Floodplain Management Policy 'Below ground garage') should be used.

2.2.1 Freeboard Criteria (North and South Tower Entrances)

For all North & South Tower Entrances (<u>with no access to underground levels</u>) in line with other commercial buildings within CoS LGA.

a) CoS Interim Floodplain Management Policy

   a. 100yr ARI

For all North & South Tower Entrances (with access to underground levels) in line with other commercial buildings within CoS LGA.

a) CoS Interim Floodplain Management Policy (must comply with both)
    a. PMF
    b. 100 ARI + 0.5m

3 Determination of Flood Levels

To determine flood levels around the site a 2D TUFLOW model was created. The terrain data used for the analysis is LIDAR information for the entire Sydney Catchment (provided by City of Sydney Council). When developing a site-specific flood study such as this, the site survey is added to provide additional accuracy to the model.

Initially to assist in the design development the current survey available at the time (Plan of Detail & Levels at No 39 & 50 Martin Place & No 1-19 Elizabeth Street Sydney by Linker 16.12.16) was used for modelling leading to levels provided up to the end of 2017. In November 2017 (NWRLSRT-RPS-SMP-SR-DWG-000041_MARTIN_PLACE-A) a new, more detailed, survey was provided by Sydney Metro, and subsequently the model was revised to add the new survey. The results of this study led to negligible changes to threshold/ entry levels. This comparison is discussed in the Arup memo issued to Tactix on 20/04/18.

The flood study is attached as Attachment B.

4 Freeboard Achievement

To achieve the freeboard requirements, the design has included internal ramping from the site boundary for main station entrances, steps up for basement exit routes, and flood gates at entrances. Flood gates are only included where there is no requirement for the particular access to be used for disabled access or fire egress.

Note that the flood gates would not be required if the design is based only on the SWTC requirement for Metro entrances.

5 Flood Level Results

The attached marked-up sketches (Attachment A) show the location of all entrances surrounding the proposed development, the various flood planning level criteria that apply, whether they are currently achieved.

6 Attachments

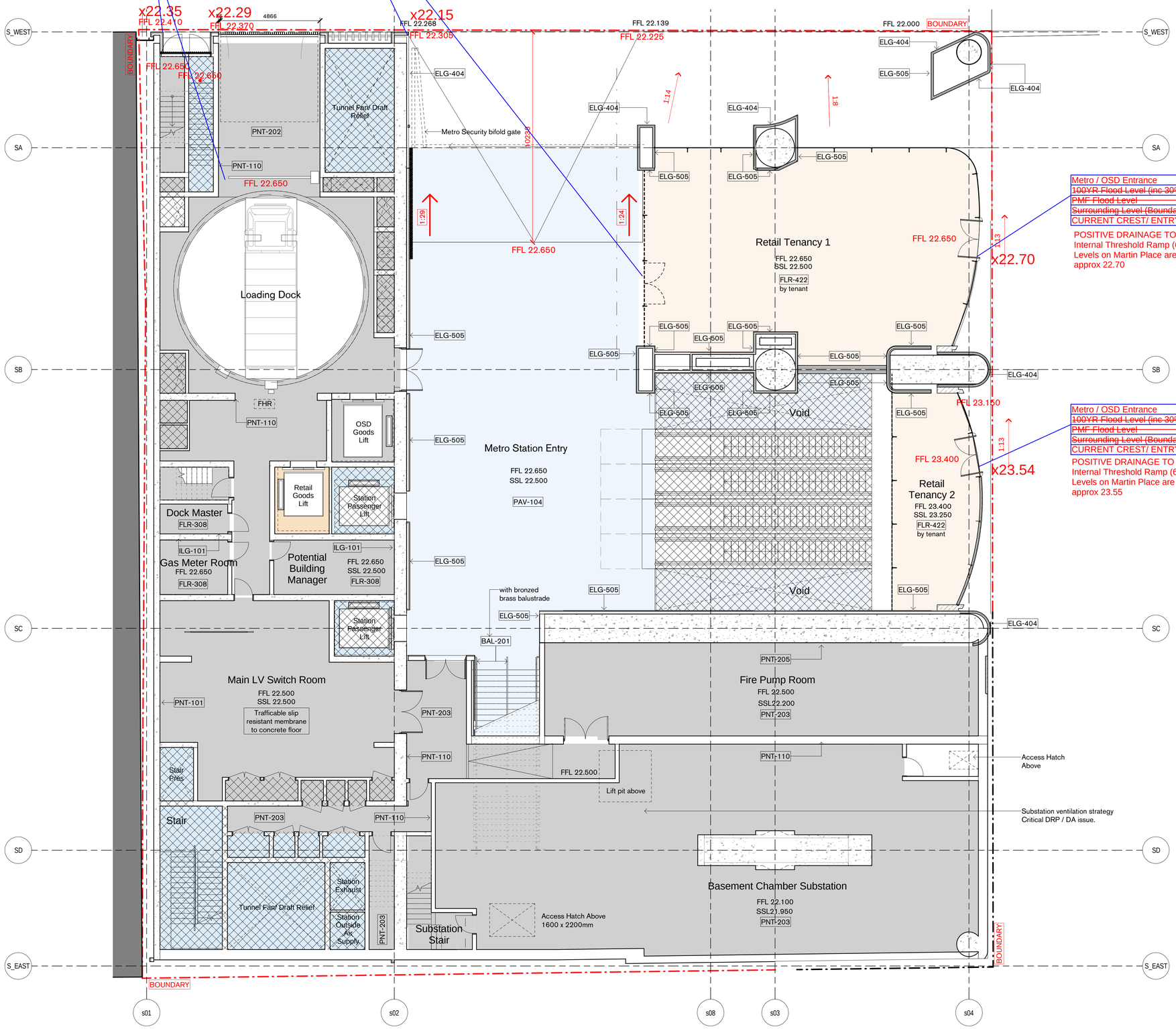
Attachment A: Combined Food Study (Metro and Tower Entrances)

Attachment B: Combined Flood Maps

Metro / OSD Entrance	Metro
~~100YR Flood Level (inc 30% Climate Change) +0.5m~~	~~22.50~~
PMF Flood Level	22.15
Surrounding Level (Boundary) + 0.3m	22.45
CURRENT CREST/ ENTRY LEVEL	22.65

Metro / OSD Entrance	OSD
100YR Flood Level (inc 30% Climate Change) +0.5m	22.70
PMF Flood Level	22.24
Surrounding Level (Boundary) + 0.3m	22.65
CURRENT CREST/ ENTRY LEVEL	22.65

Minor Flooding - 120mm in this area in PMF.



Metro / OSD Entrance	Retail
~~100YR Flood Level (inc 30% Climate Change) +0.5m~~	~~N/A~~
~~PMF Flood Level~~	~~N/A~~
~~Surrounding Level (Boundary) + 0.3m~~	~~N/A~~
CURRENT CREST/ ENTRY LEVEL	22.65

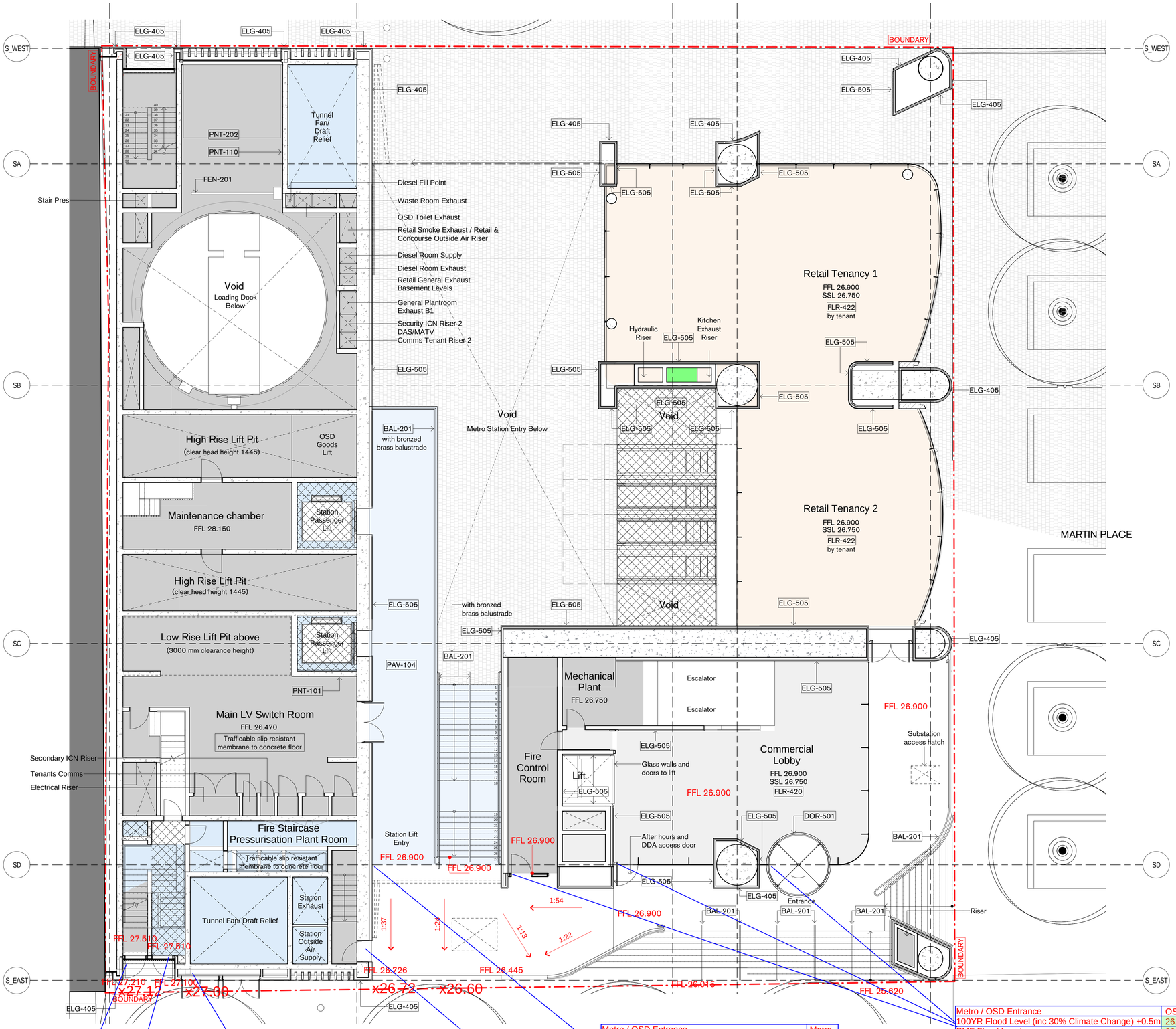
x22.70

POSITIVE DRAINAGE TO MARTIN PLACE ONLY (NO FLOODING).
Internal Threshold Ramp (65mm is sufficient)
Levels on Martin Place are still to be confirmed; Current External Level approx 22.70

Metro / OSD Entrance	Retail
~~100YR Flood Level (inc 30% Climate Change) +0.5m~~	~~N/A~~
~~PMF Flood Level~~	~~N/A~~
~~Surrounding Level (Boundary) + 0.3m~~	~~N/A~~
CURRENT CREST/ ENTRY LEVEL	23.40

x23.54

POSITIVE DRAINAGE TO MARTIN PLACE ONLY (NO FLOODING).
Internal Threshold Ramp (65mm is sufficient)
Levels on Martin Place are still to be confirmed; Current External Level approx 23.55



Metro / OSD Entrance	OSD
~~100YR Flood Level (inc 30% Climate Change) +0.5m~~	~~27.40~~
PMF Flood Level	26.94
Surrounding Level (Boundary) + 0.3m	27.42
CURRENT CREST/ ENTRY LEVEL	27.51

Metro / OSD Entrance	OSD
100YR Flood Level (inc 30% Climate Change) +0.5m	27.40
PMF Flood Level	26.94
Surrounding Level (Boundary) + 0.3m	27.42
CURRENT CREST/ ENTRY LEVEL	27.51

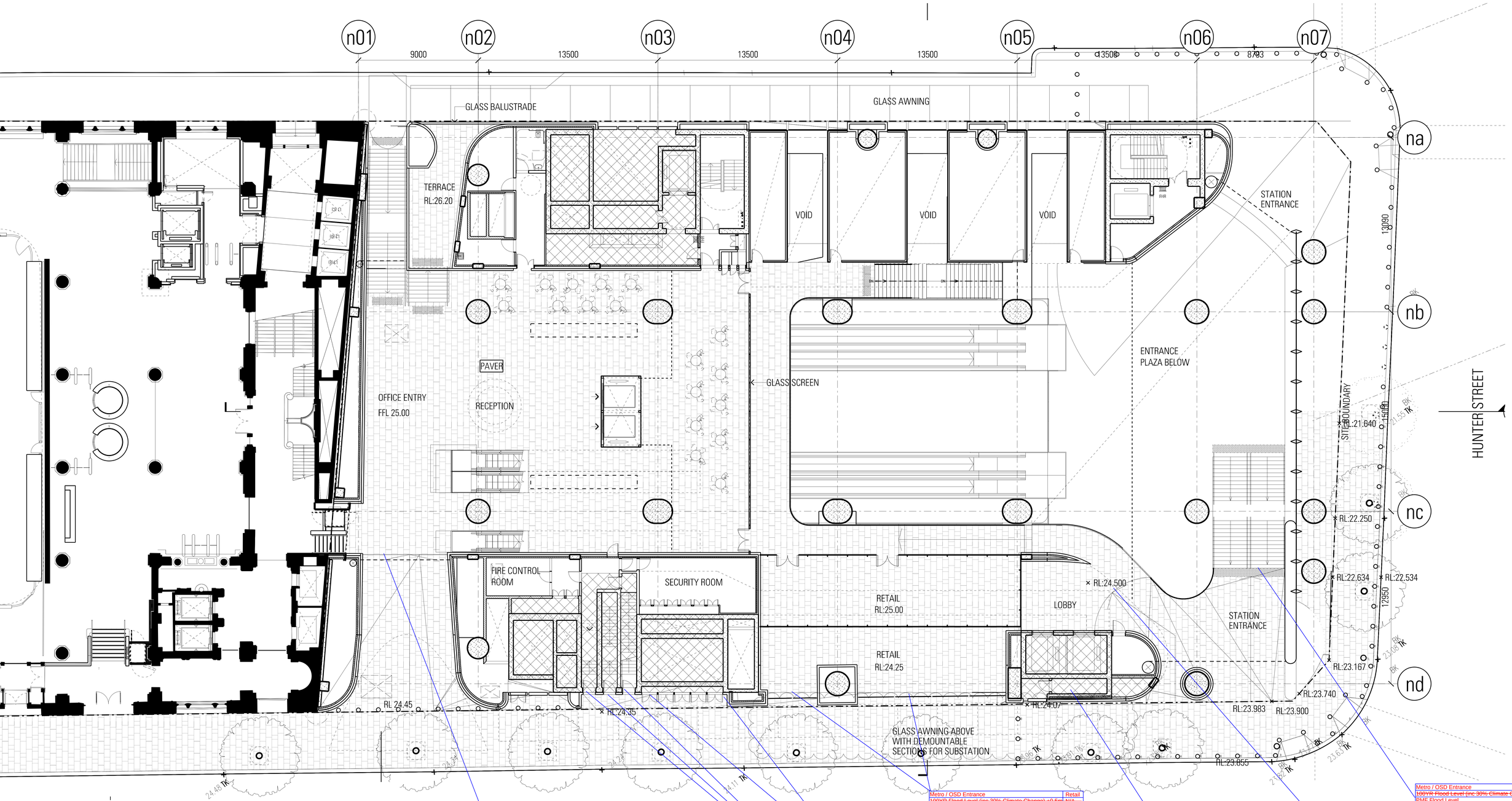
Metro / OSD Entrance	Metro
~~100YR Flood Level (inc 30% Climate Change) +0.5m~~	~~27.29~~
PMF Flood Level	26.94
Surrounding Level (Boundary) + 0.3m	27.30
CURRENT CREST/ ENTRY LEVEL	27.30 min

Metro / OSD Entrance	Metro
~~100YR Flood Level (inc 30% Climate Change) +0.5m~~	~~26.99~~
PMF Flood Level	26.53
Surrounding Level (Boundary) + 0.3m	27.02
CURRENT CREST/ ENTRY LEVEL	26.90

SWTC Clause of PMF + sufficient to prevent flash flooding would be relevant for this area to very limited street flooding and at the top of the catchment

Metro / OSD Entrance	AUSGRID ONLY
~~100YR Flood Level (inc 30% Climate Change) +0.5m~~	~~26.99~~
~~PMF Flood Level~~	~~26.53~~
~~Surrounding Level (Boundary) + 0.3m~~	~~27.02~~
CURRENT CREST/ ENTRY LEVEL	26.72

Metro / OSD Entrance	OSD
100YR Flood Level (inc 30% Climate Change) +0.5m	26.77
PMF Flood Level	26.30
~~Surrounding Level (Boundary) + 0.3m~~	~~26.78~~
CURRENT CREST/ ENTRY LEVEL	26.90



Metro / OSD Entrance	Retail
~~100YR Flood Level (inc 30% Climate Change) +0.5m~~	~~N/A~~
PMF Flood Level	24.29
~~Surrounding Level (Boundary) + 0.3m~~	~~N/A~~
CURRENT CREST/ ENTRY LEVEL	24.25

100YR FLOOD LEVEL 24.17 (Therefore compliant)

Metro / OSD Entrance	Metro
~~100YR Flood Level (inc 30% Climate Change) +0.5m~~	~~24.51~~
PMF Flood Level	24.18
Surrounding Level (Boundary) + 0.3m	24.30
CURRENT CREST/ ENTRY LEVEL	24.50

Metro / OSD Entrance	Metro
~~100YR Flood Level (inc 30% Climate Change) +0.5m~~	~~24.71~~
PMF Flood Level	24.32
Surrounding Level (Boundary) + 0.3m	24.61
CURRENT CREST/ ENTRY LEVEL	24.75 min

Metro / OSD Entrance	OSD
100YR Flood Level (inc 30% Climate Change) +0.5m	24.96
PMF Flood Level	24.51
Surrounding Level (Boundary) + 0.3m	24.97
CURRENT CREST/ ENTRY LEVEL	25.00

Metro / OSD Entrance	Metro
~~100YR Flood Level (inc 30% Climate Change) +0.5m~~	~~24.75~~
PMF Flood Level	24.36
Surrounding Level (Boundary) + 0.3m	24.64
CURRENT CREST/ ENTRY LEVEL	25.00

Metro / OSD Entrance	Metro
~~100YR Flood Level (inc 30% Climate Change) +0.5m~~	~~24.57~~
PMF Flood Level	24.24
Surrounding Level (Boundary) + 0.3m	24.37
CURRENT CREST/ ENTRY LEVEL	24.60

Metro / OSD Entrance	Metro
~~100YR Flood Level (inc 30% Climate Change) +0.5m~~	~~24.54~~
PMF Flood Level	24.21
Surrounding Level (Boundary) + 0.3m	24.30
CURRENT CREST/ ENTRY LEVEL	24.50

Metro / OSD Entrance	OSD
100YR Flood Level (inc 30% Climate Change) +0.5m	20.22
PMF Flood Level	20.05
Surrounding Level (Boundary) + 0.3m	20.16
CURRENT CREST/ ENTRY LEVEL	20.22

Metro / OSD Entrance	Metro + OSD
100YR Flood Level (inc 30% Climate Change) +0.5m	19.98
PMF Flood Level	19.53
Surrounding Level (Boundary) + 0.3m	19.98
CURRENT CREST/ ENTRY LEVEL	20.00

Metro / OSD Entrance	OSD
100YR Flood Level (inc 30% Climate Change) +0.5m	19.97
PMF Flood Level	19.45
Surrounding Level (Boundary) + 0.3m	19.90
CURRENT CREST/ ENTRY LEVEL	20.00

Metro / OSD Entrance	OSD
100YR Flood Level (inc 30% Climate Change) +0.5m	19.95
PMF Flood Level	19.57
Surrounding Level (Boundary) + 0.3m	19.95
CURRENT CREST/ ENTRY LEVEL	20.00

Metro / OSD Entrance	Metro
~~100YR Flood Level (inc 30% Climate Change) +0.5m~~	~~20.12~~
PMF Flood Level	19.53
Surrounding Level (Boundary) + 0.3m	20.04
CURRENT CREST/ ENTRY LEVEL	20.05 min

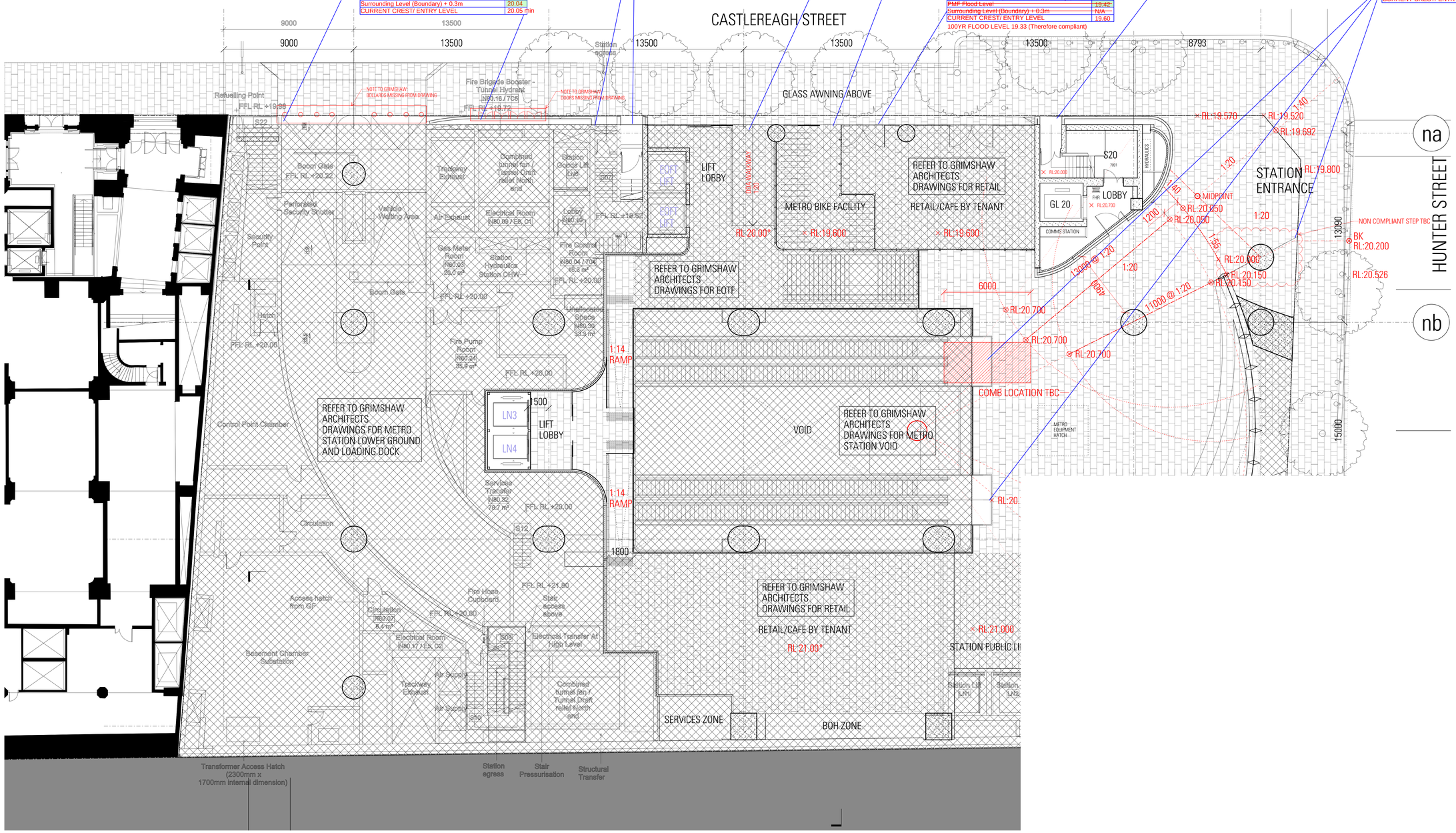
Metro / OSD Entrance	Metro
~~100YR Flood Level (inc 30% Climate Change) +0.5m~~	~~19.95~~
PMF Flood Level	19.43
Surrounding Level (Boundary) + 0.3m	19.88
CURRENT CREST/ ENTRY LEVEL	19.60

Argument that this is not a Metro Entrance, but a connected facility

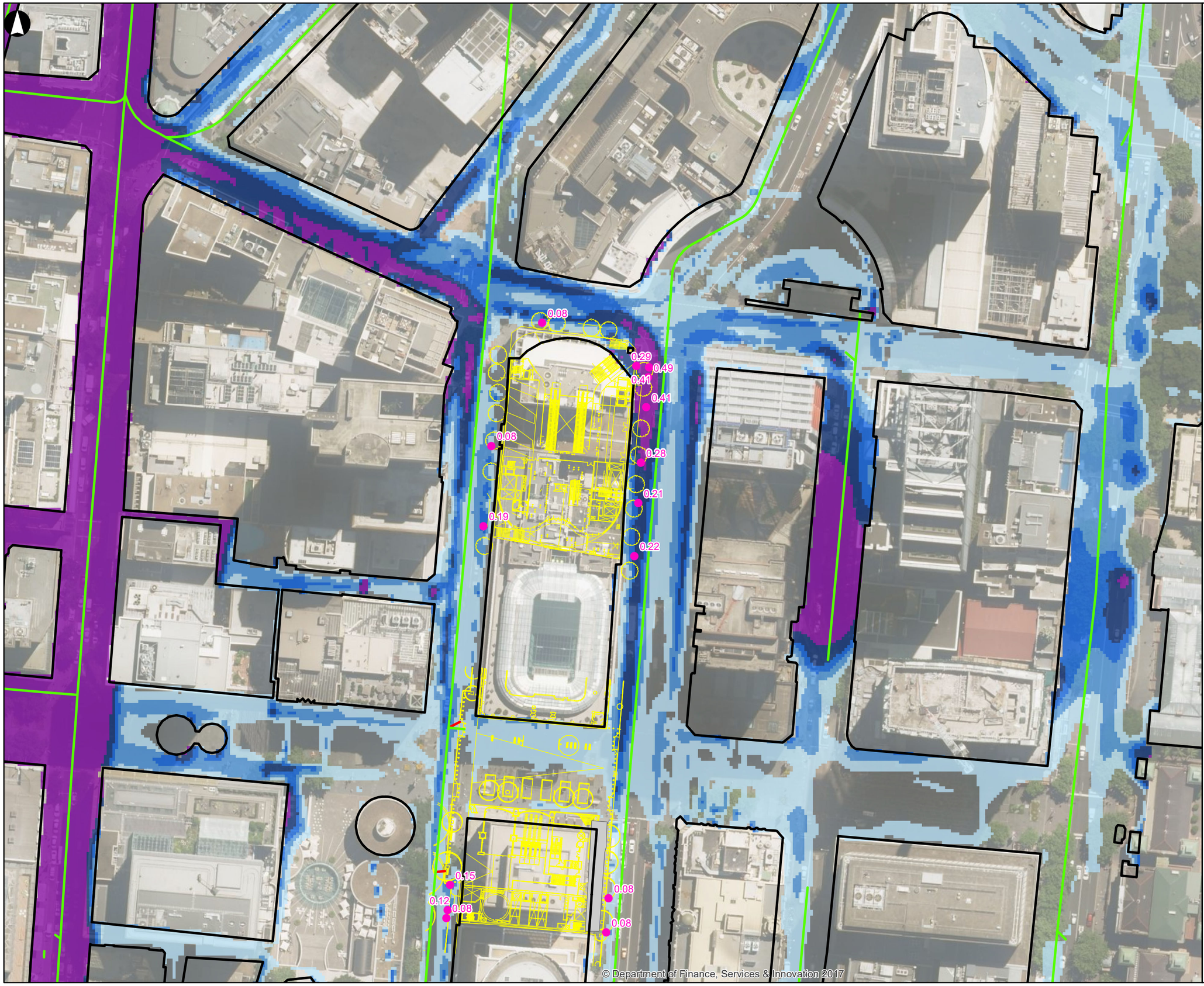
Metro / OSD Entrance	Retail
~~100YR Flood Level (inc 30% Climate Change) +0.5m~~	~~N/A~~
~~PMF Flood Level~~	~~19.42~~
~~Surrounding Level (Boundary) + 0.3m~~	~~N/A~~
CURRENT CREST/ ENTRY LEVEL	19.60

100YR FLOOD LEVEL 19.33 (Therefore compliant)

Metro / OSD Entrance	Metro
~~100YR Flood Level (inc 30% Climate Change) +0.5m~~	~~20.78~~
PMF Flood Level	20.28
Surrounding Level (Boundary) + 0.3m	20.50
CURRENT CREST/ ENTRY LEVEL	20.70



A3



Legend

- Building Footprint
- Design Layout
- Des08_Results_Tri...
- Flood Depth (m)
- Proposed Pipes
- Sub-surface Drainage

Peak Flood Depth (m)

- 0.00- 0.05
- 0.05 - 0.10
- 0.10 - 0.15
- 0.15 - 0.20
- 0.20 - 0.30
- >0.30

© Copyright Information

Issue	Date	By	Chkd	Appd
P2	31-01-18	TF	IVS	NR

Metres
0 15 30 60

ARUP

201 Kent Street
Sydney 2000
Tel +61 2 9320 9320 Fax +61 2 9320 9321
www.arup.com

Client
Macquarie

Job Title
Metro Martin Place

Peak Flood Depths
Design Conditions With Site Survey
PMF Design Event

Scale at A3
NTS

Job No
247838-00

Figure Status
For Informatiion

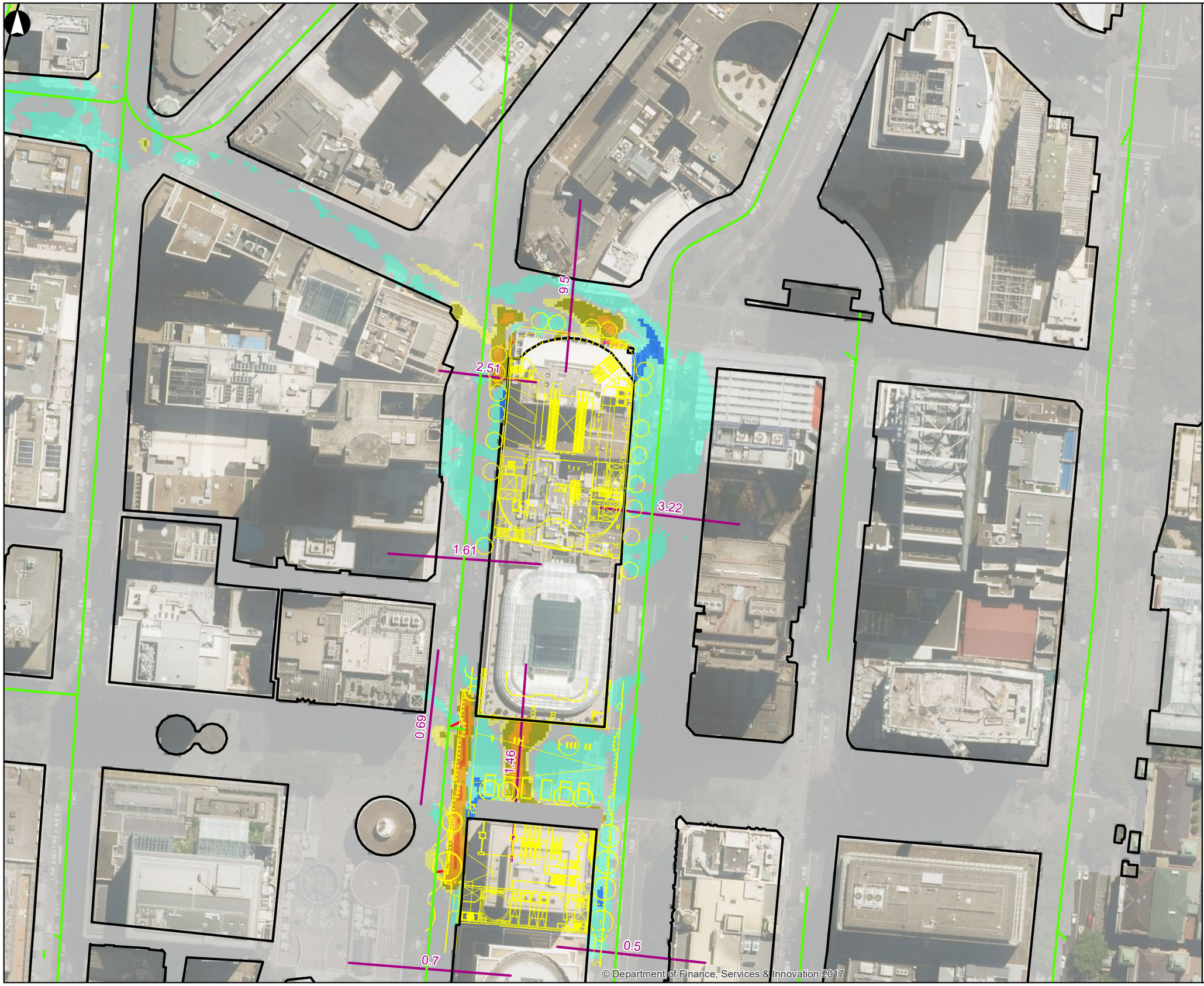
Figure No
01

Issue
P2

MXD Location

© Arup

A3



Legend

- A-ANNO-REVC_poly...
- Building Footprint
- Proposed Pipes
- Design Layout
- Sub-surface Drainage
- Overland Flow (m3/s)

Peak Flood Level Impact (m)

- <-0.10
- -0.10 - -0.01
- No Impact
- 0.01 - 0.02
- 0.02 - 0.05
- 0.05 - 0.10
- 0.10 - 0.20
- >0.20

© Copyright Information

Issue	Date	By	Chkd	Appd
P2	31-01-18	TF	IVS	NR

Metres
0 15 30 60

ARUP

201 Kent Street
Sydney 2000
Tel +61 2 9320 9320 Fax +61 2 9320 9321
www.arup.com

Client
Macquarie

Job Title
Metro Martin Place

PMF Peak Flood Level Impact

Scale at A3
NTS

Job No
247838-00

Figure Status
For Information

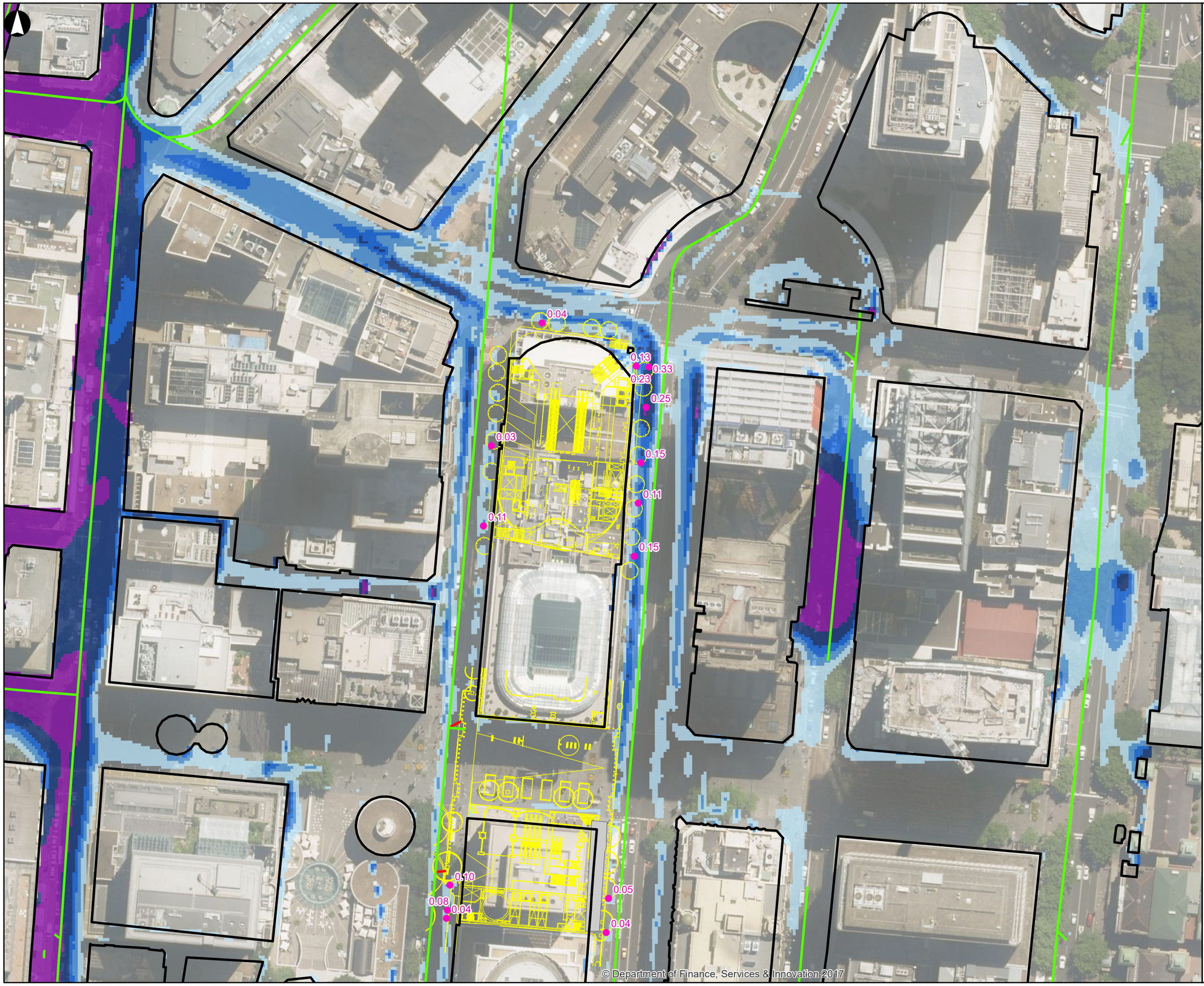
Figure No
02

Issue
P2

MXD Location

© Arup

A3



Legend

- Building Footprint
- Design Layout
- Des08_Results_Tri...
- Flood Depth (m)
- Proposed Pipes
- Sub-surface Drainage

Peak Flood Depth (m)

- 0.00- 0.05
- 0.05 - 0.10
- 0.10 - 0.15
- 0.15 - 0.20
- 0.20 - 0.30
- >0.30

© Copyright Information

Issue	Date	By	Chkd	Appd
P2	31-01-18	TF	IVS	NR

Metres
0 15 30 60

ARUP

201 Kent Street
Sydney 2000
Tel +61 2 9320 9320 Fax +61 2 9320 9321
www.arup.com

Client
Macquarie

Job Title
Metro Martin Place

Peak Flood Depths
Design Conditions With Site Survey
30% Rainfall Increase of 100 Year ARI

Scale at A3
NTS

Job No
247838-00

Figure Status
For Informatiion

Figure No
03

Issue
P2

MXD Location

© Arup