To:	Department of Planning, Industry and Environment
Produced:	Michele Zornitta (Associate Water Resources Engineer -WSP)
Reviewed:	John Pickering (Associate Engineer - WSP)
Subject:	**Waterloo Metro Quarter OSD** **SSD-10440 Northern Precinct – Response to submission comments**
Date:	15 February 2021

Introduction

This note has been prepared to respond to the comments dated 25 November 2020 raised by the Environment, Energy and Science Group (EES) to the Department of Planning, Industry and Environment (DPIE) public exhibition period for Waterloo Metro Quarter Over Station Development (OSD).

Specifically, this note responds to the comments for the Northern Precinct detailed SSD DA (SSD-10440). Figure 1 below represents a schematisation of Waterloo Metro Quarter OSD - areas in purple identify the proposed Northern Precinct (SSD-10440).

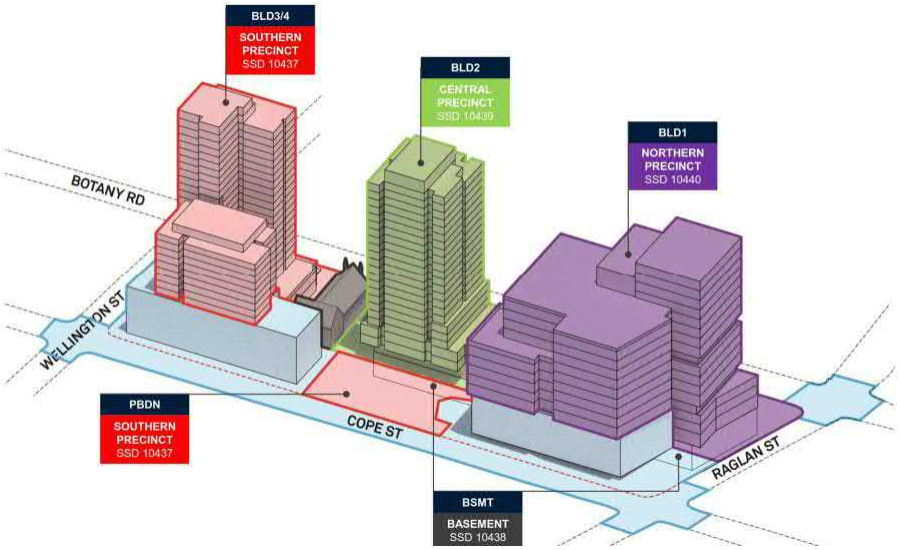

Figure 1: Waterloo Metro Quarter site, with sub-precincts identified

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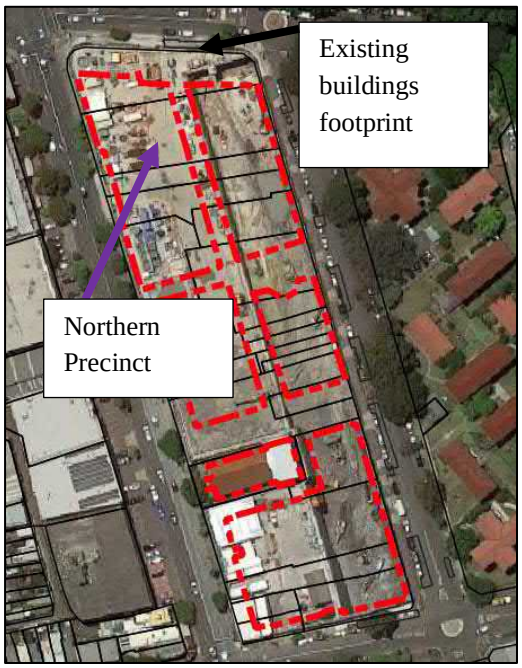
Comment		Response
Floodplain risk management		
1	The reports have not included flood level mapping for any scenarios, except the 1% AEP flood event plus climate change. This is a significant omission. This mapping, including water level contours at appropriate intervals, must be provided as a minimum for the 5% and 1% AEP flood events and the PMF event. It is not possible to verify any of the flood level information quoted in the report without this mapping. A proper review of the submission cannot be completed until this has been provided. The frequency of typographical and grammatical errors does not give the reader any confidence that the appropriate degree of checking and verification has been completed in general.	Maximum flood levels for the 1%AEP, 1% AEP + Climate Change (CC) and PMF flood events are included in *Table 4: Design flood planning levels – Building Floor Levels of the Stormwater Management Strategy and Flood Impact Assessment – SSD-10440 Northern Precinct report*; flood levels included in Table 4 represent the maximum water levels for the 1%AEP,1% AEP+CC and PMF flood events in correspondence to relevant building areas. Table 4 is now superseded by table included in Appendix B of this response. Flood levels for the 5% AEP flood event was not originally included in the flood impact assessment report as not relevant in the determination of flood planning levels; flood planning levels have been informed by the 1% AEP, 1% AEP+CC and PMF maximum flood levels. Water level contour maps (with a 50mm contour interval) for the 5%AEP,1% AEP and PMF flood events have been prepared and attached to this response as requested by the EES reviewer (Appendix A). The report and technical work developed for Waterloo Metro Quarter OSD has been reviewed and approved by the appropriate WSP flood engineers; the Flood Impact Assessment report has also been reviewed and approved by Waterloo OSD representatives.
	Flood impacts of the proposed development	
2	The individual buildings of the over station development are not expected to cause any flood impacts; however, the ancillary road works are predicted to cause unacceptable impacts.	As noted by the EES reviewer the individual buildings of the OSD are not expected to cause any negative flood impacts. This is due to the footprint occupied by the proposed buildings and Cope Street plaza that is less than the existing buildings as shown in figure below.

		 Northern Precinct development (SSD-10440) do not affect topography levels outside the existing buildings footprint (i.e. pre-development conditions prior to any work associated with the metro station construction). As such, it is not possible for the Northern Precinct to negatively affect flood conditions to the adjacent land because the building footprint is less than the pre-development footprint.
3	The report notes that the Council of the City of Sydney was consulted and noted that an acceptable tolerance for flood level increase would be 10mm. This is considered reasonable and within the level of accuracy of current best practice flood modelling. The Concept Water Quality, Flooding and Stormwater Report of 2018 showed flood level increases that were within the limit of 10mm. It appears that road works were not included in the concept stage modelling.	Noted. As indicated in response 2 the northern precinct is not expected to generate flood impacts. We advise that further consultations on flood impacts (i.e. in September and October 2020) have been held with the CoS as part of the metro station Critical State Significant Infrastructure (CSSI) application. We anticipate that CoS would accept the flood impact generated by metro station Critical State Significant Infrastructure (CSSI) application; this has not yet been issued by CoS.

4	The current report documents flood level increases that are well in excess of the 10mm tolerance. Increases of up to 100mm are documented for both the 1% and 5% AEP flood events. It appears that an attempt has been made to justify allowing the increase in levels on the premise that these occur for a short period of time, which is not appropriate. Limited detail has been provided on the topographical changes that would cause the predicted increase. A reduced carriageway width and reconfiguration of two intersections are changes noted in the flood report. Reference is made to the "civil design report for a detailed discussion on the proposed development topography" however, no such discussion is available in that report The report states that mitigation measures to ameliorate the flood impacts are under development. This work would need to be finalised and submitted for review by EES before a recommendation could be given supporting the project. If impacts cannot be reduced to a tolerable level, a detailed investigation of the affected properties, including at least three residential buildings on the other side of Cope St, including floor level survey would allow proper assessment of the impacts.	As indicated in response 2 above the Northern Precinct development is not expected to exacerbate flood risk to the adjacent land.

	Flood risk for the development – Flood Planning Levels	
5	The Concept Water Quality, Flooding and Stormwater Report of 2018 recommended Flood Planning Levels (FPLs) of either the 1% AEP flood level plus 500mm freeboard or the PMF level. This present 2020 report has adopted lower FPLs for retail areas of the 1% AEP flood level (without freeboard). The apparent justification for this change in strategy is that this is consistent with City of Sydney policy, which is not unreasonable.	We understand that criteria used to define FPLs has been accepted. We confirm that the following guidelines and policies have been reviewed to inform the FPLs: 1) Interim Floodplain Management Policy, City of Sydney; and, 2) Waterloo Metro Quarter (WMQ)– Design and Amenity Guidelines, 2020 New South Wales Government – Sydney Metro. Consultation with Council flood engineer has also been held to confirm project requirements.
6	It appears that all the floor levels meet the requirements. Generally, floor levels are above the 1% AEP flood level and generally above the PMF level. Where required at entries to basements, 500 mm freeboard to the 1% AEP flood level appears to have been provided.	Noted. We confirm that project requirements are met.
7	However, the report has not adequately documented all the proposed finished floor levels (FFLs) to enable their comparison to the proposed FPLs. As a minimum, the FFLs need to be provided in Table 4 alongside the FPLs. A possible source of confusion is that the column in the table titled FPL may in fact be FFL. In any case, the FPL should be clearly stated, alongside the FFL. Area 10 FFLs are not visible on the plan provided at Appendix 15.	Refer to Appendix B (Building Floor Levels) for the updated FFLs and FPLs. We advise that building layout has been updated since the last submission.

7	It appears that there are discrepancies and errors in report e.g. the1% AEP plus climate change flood at Area 10 is quoted as 0.5m higher than the 1% AEP flood level without climate change, which is vastly inconsistent with the other levels and would require careful reconsideration of FPL level and FFL if that is the case. Consequently, it is recommended that all the flood levels should be checked to ensure no further errors are present	FFLs and flood levels have been updated as indicated in Appendix B.
	Flood risk for the development – Residual Risk and Emergency Management	
9	While it has been asserted, that "Safe refuge can be provided within the proposed development", this has not been demonstrated. There are several issues regarding residual risk that have not been addressed and require amendments to the design. It is recommended that the proponent engage a suitably qualified and experienced professional to develop an appropriate strategy for flood emergency management. The Alexandra Canal Floodplain Risk Management Study and Plan should be considered along with all relevant emergency management documents by the SES.	It is considered that proposed finished floor levels for the Northern Precinct provide adequate flood protection in case of a flood emergency. **Area 1(retail area):** proposed floor level is at 16.790 m AHD which is 176 mm above the 1%AEP flood level. In an extreme flood event (i.e. PMF) water depth in Area 1 would be 2 cm. Thus, flood risk is considered low. Although evacuation from Area 1 is not considered necessary, occupants of Area 1 can internally access Area 2 which has a floor level above PMF and the 1%AEP+500mm freeboard flood event. **Area 1b (lobby):** Area 1b is not affected by flooding in the 1%AEP and 1%AEP+CC flood events. Proposed floor level is at 16.75 m AHD which is 7 cm below the PMF flood level.

		Occupants of Area 1b can access Area 2 which has a floor level above the PMF and 1%AEP+500 mm freeboard flood event. **Area 2 (lobby):** proposed floor level for area 2 is above PMF and 1%AEP+500 mm freeboard flood event. Thus, no evacuation is necessary for occupants of Area 2 in case of a flood emergency. **Area 3 (loading dock):** proposed floor level for area 3 is above the PMF flood level. Thus, no evacuation is necessary for occupants of area 3 in case of a flood emergency. **Area 4 (substation):** proposed floor level for Area 4 is above PMF flood level. No evacuation is necessary for occupants of area 4 in case of a flood emergency. **Area 5 and 5b (community area):** proposed floor level for area 5 is above the 1%AEP flood level. Proposed floor level for area 5b is above the PMF flood level. Occupants of Area 5 can access area 5b (within the building) in case of a flood emergency. Area 5b can be used as shelter. **Area 6 (retail area)** proposed floor level for area 6 is above the PMF flood level. Thus, no evacuation is necessary for occupants of area 6 in case of a flood emergency. **Area 7 (retail area):** area 7 is not affected by flooding up to and including the PMF flood event. Proposed floor level for area 7 is above the nearest PMF flood level. Thus, no evacuation is necessary for occupants of area 7 in case of a flood emergency. **Area 8 (egress from basement):** egress level is proposed above PMF and 100 ARI+ 500 mm to protect the basement from flooding. **Area 9 (fire control room):** proposed floor level is above PMF. Occupants of area 9 can easily access Area 3 (above PMF flood level)

		Area 11 and Area 10 (egress from upper floors). Area 11 and Area 10 are stairs that provide access to the upper floors.
10	The discussion regarding timing of flooding in relation to evacuation has not demonstrated an understanding of the principles involved and is not consistent with current available guidelines. Before the proposal moves to the next stage, a proper assessment of the flood behaviour as it relates to emergency management is required, together with the development of a strategy for flood emergency management. Detailed information on the timing/duration of extreme events should be considered and presented. Shorter and longer durations should be considered for emergency planning, not only the duration that generates the peak flood level.	A flood emergency management plan will be provided at a later stage prior to occupation of the building. Different storm durations have been considered for the 1% AEP, 1%AEP+CC and PMF events to determine the critical storm durations that were used to define appropriate finish floor levels. This is as per the accepted industry standard industry approach. As indicated within the flood study report, storm durations tested are the same as what was considered in the Alexandra Canal Catchment flood model which is currently adopted by CoS.; An additional storm duration of 90 minutes was also considered for the 1% AEP flood event. The site area is located at the top of the catchment and only events with short duration and high intensity rainfall are relevant in terms of flood protection/flood emergency
11	An attempt has been made to identify areas where occupants could shelter in place. However, no consideration has been given to the number of persons at risk and whether there is enough space for these individuals in the nominated shelter areas. Any persons in external licenced seating areas, must be accounted for in emergency planning.	Emergency management procedures are not included in the flood study; flood emergency management procedures will be provided at a later stage, prior to occupation of the building. Seating areas are not affected by flooding up to and including the PMF flood event.
12	Lifts and escalators may not be operational during extreme floods. It is not considered acceptable for persons coming from the basement to exit onto the street in extreme floods. Direct stair access must be provided to refuge internal to the building.	Occupants of the basement are protected by flooding as access to the basement are above PMF and 1%AEP + 500 mm freeboard flood level. Furthermore, egress form the basement is provided via the southern core to Cope St Plaza.
	Emergency response planning must consider human behaviour. It is not considered appropriate to expect a worker to remain alone inside a small	Emergency management procedures are not included in the flood study; flood emergency management procedures will be provided at a later stage, prior to occupation of the building.

	meter room or similar until an extreme flood event passes. Consideration should be given to possible medical evacuations necessary during an extreme flood event.	There are no small meter rooms where workers would remain alone in a flood event.
12	The City of Sydney policy requires a raised area to be provided above the PMF level for shelter in place purposes. The reports have demonstrated cases where the raised area would only be above the 1% AEP flood level. In this case, alternative provisions must be in place for evacuation during extreme floods, specifically internal access to a shelter.	As indicated in Response 9 all areas in the Norther Precinct can provide adequate flood protection in case of a flood emergency.
13	Consistent with the City of Sydney policy and the concept report, a raised area above the PMF level has been provided in the community area, which is otherwise below the PMF level. This area also provides internal access to other areas of the building. This is consistent with previous reporting and provides an outcome that is sensitive to needs of both urban design and flood emergency response	Noted.

	All the retail tenancies are above the PMF and have internal access, which appears to be able to be used to reach upper levels in extreme flood events. The proponent needs to confirm the suitability of the shelter in place provisions.	As indicated in Response 9 above the northern building layout has been updated since the last submission. It is not necessary to reach upper levels for shelter in an extreme flood event as all areas at ground floor can provide adequate flood protection. Refer to Response 9 and table in Appendix B for further detail on FFLs and flood levels.
14	Section 6 states that the Northern Precinct includes external licenced seating areas, but these are not discussed and not visible on the attached plans. Confirmation is required. The persons in this area must be accounted for in emergency planning.	Licensed seating areas in Raglan Walk are not affected by flooding up to and including the PMF flood event. Emergency management procedures are not included in the flood study; flood emergency management procedures will be provided at a later stage, prior to occupation of the building.

APPENDIX A – WATER LEVEL MAPS

FOR INFORMATION ONLY

Rev.	Date	ISSUE	Prepare	Approve
B	03/02/21	SECOND ISSUE	MZ	AV

WSP Australia Pty Limited
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Sydney, NSW
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Waterloo - OSD

Proposed Scenario - 5% AEP

Water Level

Scale: 1:1000 | 03/02/21

Project Number: PS119449

KEY:

- Station Building
- Northern Precinct
- Central Precinct
- Southern Precinct
- Waterloo Congregational Church
- Contour Level (m AHD)

Water Level (m AHD)

- <= 1
- 1 - 15.75
- 15.75 - 16
- 16 - 16.5
- 16.5 - 16.75
- 16.75 - 17
- 17 - 20

0 15 30 45 m

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Rev.	Date	ISSUE	Prepare	Approve
B	03/02/21	SECOND ISSUE	MZ	AV

WSP Australia Pty Limited
680 George Street
Sydney, NSW
2000 Australia
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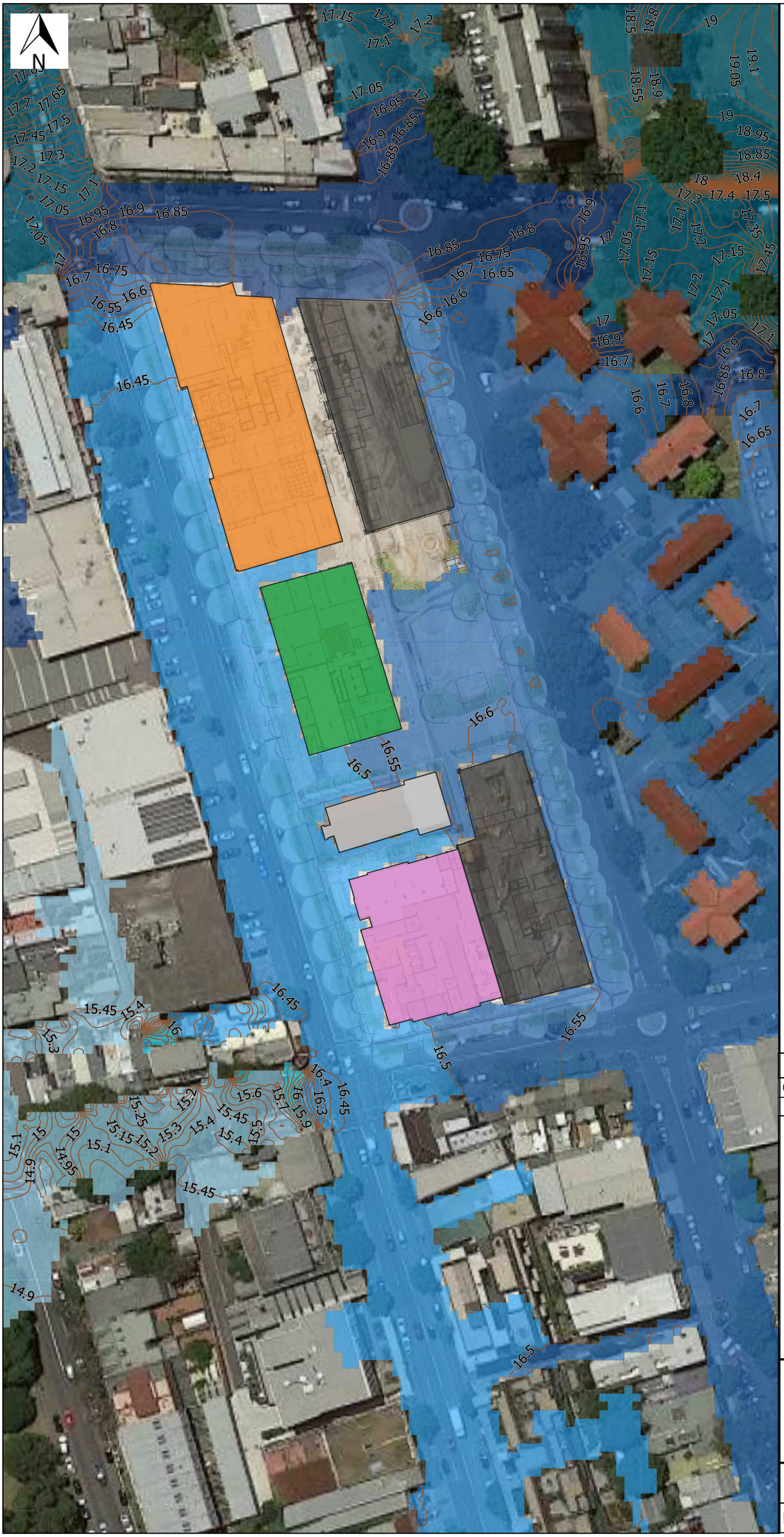
Waterloo - OSD

Proposed Scenario - 1% AEP

Water Level

Scale: 1:1000 | 03/02/21

Project Number: PS119449



KEY:

- Station Building
- Northern Precinct
- Central Precinct
- Southern Precinct
- Waterloo Congregational Church
- Contour Level (m AHD)

Water Level (m AHD)

- <= 1
- 1 - 15.75
- 15.75 - 16
- 16 - 16.5
- 16.5 - 16.75
- 16.75 - 17
- 17 - 20

0 15 30 45 m

FOR INFORMATION ONLY

Rev.	Date	ISSUE	Prepare	Approve
B	03/02/21	SECOND ISSUE	MZ	AV

WSP Australia Pty Limited
680 George Street
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Waterloo - OSD

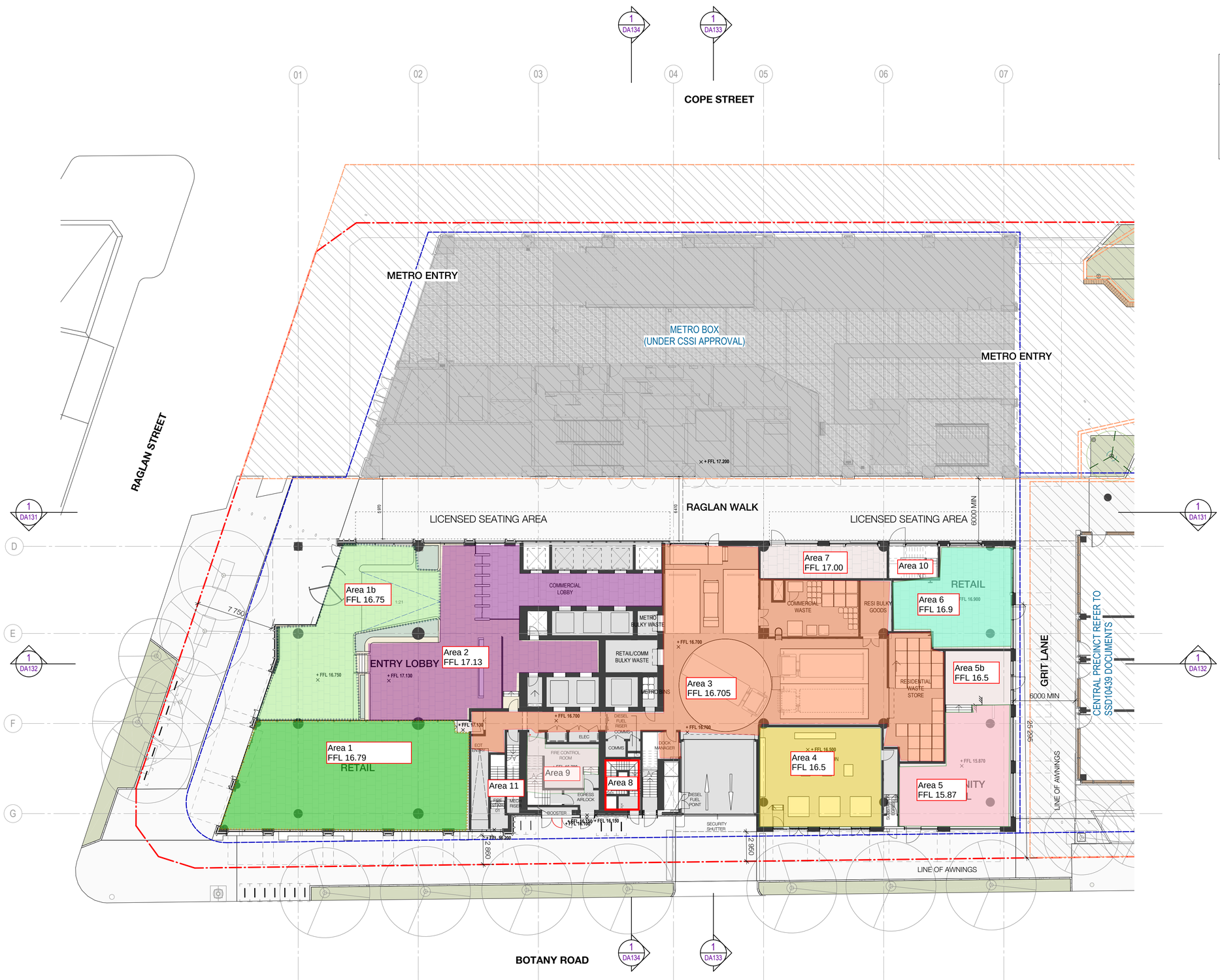
Proposed Scenario - PMF

Water Level

Scale: 1:1000 | 03/02/21

Project Number: PS119449

APPENDIX B – BUILDING FLOOR LEVELS



LEGEND

- PROPERTY LINE
- PLANNING ENVELOPE PROFILE
- SSD DA PRECINCT BOUNDARY

Recent revision history

#	Status	Description	Date
A		FOR INFORMATION (DA)	15.07.20
B		FOR APPROVAL	31.07.20
C		FOR APPROVAL	28.08.20
D		FOR APPROVAL	25.09.20
E		FOR INFORMATION	28.01.21
F		FOR APPROVAL	15.03.21

Current Revision Amendments

#	Mark	Comments
F	1	LAYOUT UPDATED
F	2	LIFT UPDATED TO GROUND
F	3	FIRE STAIR RELOCATED

Key Plan

NP

North Point

Client

Waterloo Integrated Station Development
A Joint Venture Project
JOHN HOLLAND
mirvac

NSW GOVERNMENT
sydney METRO

Consultant

W–B™
WOODS BAGOT

Project
WATERLOO METRO QUARTER DEVELOPMENT

Project number	Size check
121234	25mm

Checked	Approved	Sheet size	Scale
SJ	PM	A1	1 : 200

Sheet title
SSD10440
BUILDING 1 - FLOOR PLAN - LEVEL GROUND

Status
FOR APPROVAL

Sheet number **WMQ-BLD1-WBG-AR-DRG-DA100** Revision F

Area	Classification	Flood Levels as per hydraulic model results (m AHD)	Project Requirements	Flood Planning Level (m AHD)	Proposed FFLs (m AHD)	Compliant
1	Retail area	PMF= 16.810 100ARI+500= 17.115 100 ARI= 16.614 (project requirement) 100 ARI + CC= 16.618	100-year ARI flood	16.614	16.790	Yes
1b	Commercial Lobby	PMF= 16.850 100ARI+500=17.115 **100 ARI= 16.615 not affected by flooding; **100 ARI + CC= 16.616 not affected by flooding;	Area 1b is not affected by flooding up to and including the 100 ARI event. The nearest 100 ARI flood level has been considered to inform the flood planning level.	16.615	16.750	Yes
1c	Access to Area 3	PMF= 16.810 100ARI+500= 17.115 100 ARI= 16.614 (project requirement) 100 ARI + CC= 16.618	Acess from area 1 to area 3 is raised above PMF and 100 ARI+500mm flood level to further protect the lift area.	NA	17.130	Yes
2	Entry Lobby/ Commercial lobby	PMF= 16.850 100ARI+500=17.115 100 ARI= 16.615 (project requirement) 100 ARI + CC= 16.616	Area 2 is not directly affected by flooding. Water could enter the building from Area 1 and Area 1b.	16.615 for Area 2 A higher FPL of 17.115 has been considered to protect the lift area.	17.130	Yes
3	Loading dock and access to below ground car park	PMF= 16.453 100 ARI +0.5 m= 16.646 (project requirement) 100 ARI=16.146 100 ARI+ CC= 16.157	1% AEP / 100-year ARI flood level + 0.5 m or the PMF (whichever is the higher) to protect the lift area.	16.646	16.705	Yes
4	Substation	PMF= 16.457 100ARI+500= 16.478 100 ARI= 15.978 100 ARI+CC= 15.989	1% AEP / 100-year ARI flood.	15.978	16.500	Yes
5	Community area	PMF= 16.463 100ARI+500= 16.357 100 ARI=15.857 (project requirements)	1% AEP / 100-year ARI	15.857	15.870	Yes

Area	Classification	Flood Levels as per hydraulic model results (m AHD)	Project Requirements	Flood Planning Level (m AHD)	Proposed FFLs (m AHD)	Compliant
		100 ARI+CC= 15.866				
5b	Community Area	PMF= 16.463 100ARI+500= 16.357 100 ARI=15.857 (project requirements) 100 ARI+CC= 15.866	Area 5b is connected to Area 5. Area 5b provides shelter for area 5 in case of flood emergency. Floor level for Area 5b is proposed above the PMF flood level.	15.857	16.500	Yes
6	Retail area	PMF= 16.463 **100ARI+500= 16.357 **100 ARI=15.857 **100 ARI+CC= 15.866 ** not affected by flooding;	Area 6 is not affected by flooding in the 100 ARI event. Floor level for Area 6 is proposed above the PMF flood level.	15.857	16.900	Yes
7	Retail area	Area outside flood extent. Not affected by PMF flood level or 100 ARI+500mm flood level.			17.000	Yes
8	Egress stair from basement	PMF= 16.453 100 ARI +0.5 m= 16.646 (project requirement) 100 ARI=16.146 100 ARI+ CC= 16.157	100 ARI + 500mm	16.646	16.700	Yes
9	Fire control room	PMF= 16.453 100 ARI +0.5 m= 16.646 (project requirement) 100 ARI=16.146 100 ARI+ CC= 16.157	100 ARI + 500mm	16.646	16.700	yes
10	Egress stair from upper floors	Area 10 are stairs from the upper floors (no access to basement area) 100 ARI=16.146			16.150	Yes
11	Egress stair from upper floors	Area 11 is stairs from the upper floors (no access to basement area) 100 ARI=16.146			16.150	Yes