

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**
SD-10439 Central Precinct – Response to submission comments
Date: 4 March 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) during the public exhibition period for Waterloo Metro Quarter Over Station Development (OSD).

Specifically, this note responds to the comments for the Central Precinct SSD DA (SSD-10439). Figure 1 below represents a schematisation of Waterloo Metro Quarter OSD – the area in green identifies the proposed Central Precinct.

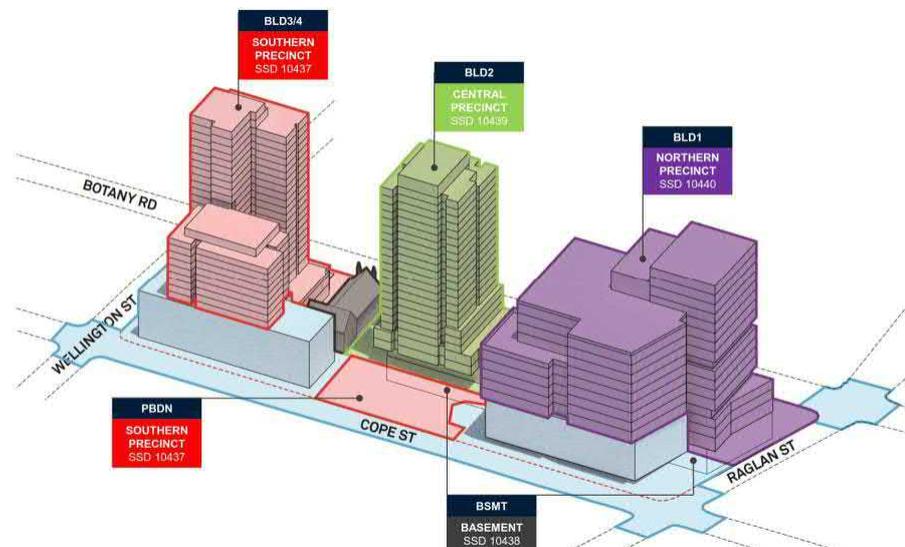
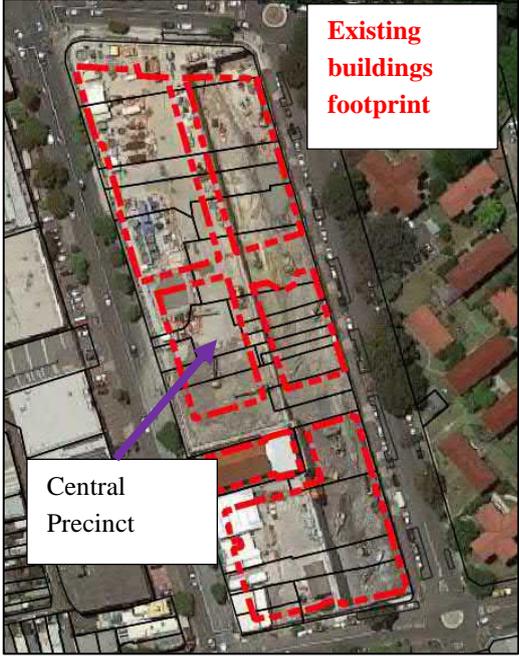


Figure 1: Waterloo Metro Quarter site, with sub-precincts identified

| Comment | Response |
|--|--|
| Floodplain risk management | |
| 1 | <p>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.</p> |
| | <p>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-10439 Central 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.</p> <p>Flood levels for the 5% AEP flood event were not originally included in the flood impact assessment report as they were 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.</p> <p>Water level contour maps (with a 50 mm 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.</p> <p>The report and technical work developed for Waterloo Metro Quarter OSD has been reviewed and approved by the appropriate WSP flood engineers.</p> |
| Flood impacts of the proposed development | |
| 2 | <p>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.</p> |
| | <p>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 being less than the existing buildings as shown in the figure below.</p> |

| | | |
|---|--|---|
| | |  <p>The Central Precinct development does 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 Central Precinct to negatively affect flood conditions to the adjacent land.</p> <p>Flood impacts described in the Stormwater Management Strategy and Flood Impact Assessment – SSD-10439 Central Precinct report are caused by the proposed road works along Cope Street that forms part of the metro station Critical State Significant Infrastructure (CSSI) application scope. The road works along Cope Street are not part of this development application (SSD-10439).</p> |
| 3 | <p>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.</p> | <p>Noted.</p> <p>We advise that 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 will accept the flood impact generated by metro station Critical State Significant Infrastructure (CSSI) application.</p> |

| | | |
|--|---|---|
| <p>4</p> | <p>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.</p> <p>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</p> <p>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.</p> <p>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.</p> | <p>As indicated in response 2, above the Central Precinct development is not expected to generate negative flood impacts to the adjacent land.</p> |
| <p>Flood risk for the development – Flood Planning Levels</p> | | |
| <p>5</p> | <p>The Concept Water Quality, Flooding and Stormwater Report of 2018 recommended Flood Planning Levels (FPLs) of either the 1% AEP flood level plus 500 mm 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</p> | <p>We understand that the EES reviewer accepted the criteria adopted for defining the FPLs included in Table 3 of the Stormwater Management Strategy and Flood Impact Assessment SSD-10439 Central Precinct report. We confirm that the following guidelines and policies have been reviewed to inform the FPLs:</p> <p>1) Interim Floodplain Management Policy, City of Sydney; and,</p> |

| | | |
|---|--|--|
| | <p>Sydney policy, which is not unreasonable.</p> | <p>2) Waterloo Metro Quarter (WMQ)– Design and Amenity Guidelines, 2020 New South Wales Government – Sydney Metro.</p> <p>Consultation with Councils flood engineer has also been held to confirm project requirements.</p> |
| 6 | <p>Except for Area 11, the floor levels appear to generally comply with the requirements. However, the concept report indicated raised areas leading to internal access to a higher area for shelter in place, which have not been included in the design.</p> <p>Floor levels for Areas 1, 5, 7-10, 12 and 15 are above the PMF level. Areas 2-4 and 14 (community area) are above the 1% AEP flood level. Area 6 comprises an entry area below the 1% AEP flood level and an area above. Area 10 is the basement carpark entry ramp, which rises to a level above the PMF and the 1% AEP flood level plus 0.5 m freeboard, which meets the requirements.</p> | <p>The finished floor levels for Area 6 and Area 11 have been changed to 15.70 m AHD which is above the 1% AEP flood level.</p> <p>As indicated by the EES reviewer area 1,5,7,8,9,10,12 and 15 have finish floor levels above the PMF; as such, we understand that proposed floor levels are accepted by the EES reviewer.</p> <p>As indicated by the EES reviewer areas 2,3,4 and 14 have finish floor levels above the 1% AEP flood level. Consequentially, we understand that proposed floor levels for areas 2,3,4 and 14 are accepted by the EES reviewer.</p> |
| 7 | <p>Area 11 comprises three retail tenancies with a proposed floor level approximately 0.5 m below the 1% AEP flood level, which does not comply with the requirements. The report has not attempted to quantify the frequency of flooding at this location. Flood depth mapping for the 5% AEP suggests 0.3 – 0.5m depths immediately outside these tenancies. Proper analysis would need to be undertaken to confirm the flood frequency, but the data provided suggest these tenancies would flood every 2 to 5 years on average. This would be an unacceptable outcome for a newly constructed building. The design must be reconsidered.</p> | <p>As indicated in response 6 above, floor levels for Area 11 has been changed to RL 15.70m AHD which is above the 1% AEP flood level.</p> |
| 8 | <p>An FFL for Area 13 has not been provided. A connection is open to the south to Church Square which is flooded in the PMF.</p> | <p>FFL for Area 13 (fire control room) is 16.58 m AHD which is above the PMF flood level.</p> |

| Flood risk for the development – Residual risk and emergency management | | |
|---|--|--|
| 9 | <p>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.</p> <p>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.</p> | <p>A flood emergency management plan will be provided at a later stage prior to occupation of the building.</p> <p>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 floor levels. This is as per the accepted industry standard.</p> <p>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.</p> <p>The site area is located at <u>the top of the catchment</u> and only events with short duration and high intensity rainfall are relevant in terms of flood protection/flood emergency.</p> <p>It is considered that the finished floor levels proposed for the Central Precinct provided adequate and sufficient flood protection in case of a flood emergency.</p> <p>Area 1: Floor level for area 1 is above the PMF flood level, no evacuation is necessary in case of a flood emergency.</p> <p>Area 2: Floor level for area 2 is above the 1%AEP+670mm freeboard; In an extreme flood event (i.e. PMF) water depth is expected to be up to 12 cm. Flood risk is low. No emergency evacuation is deemed necessary for occupants of Area 2.</p> <p>Area 3: Floor level for area 3 is above the 1%AEP+660mm freeboard; In an extreme flood event (i.e. PMF) water depth is expected to be up to 13 cm. Flood risk is considered low.</p> <p>Area 4: Floor level for area 4 is above the 1%AEP+390mm freeboard; In an extreme flood event (i.e. PMF) water depth is expected to be up to 40 cm. Flood risk is considered low.</p> <p>If necessary, occupants of area 4 can easily access areas located at a higher ground (i.e. above the PMF) outside the central precinct (refer to Appendix B). Details of emergency</p> |

| | | |
|----|--|--|
| | | <p>response will be provided at a later stage, prior to occupation of the building.</p> <p>Area 5, 7, 8, 9, 12, 13, 15: Floor levels are above the PMF flood level, no emergency evacuation is necessary in case of a flood emergency.</p> <p>Area 6 and Area 11: As indicated in response 6 above, finish floor levels for Area 6 and Area 11 have been changed to 15.7 m AHD which is above the 1% AEP flood level. <u>If necessary</u>, in an extreme flood event evacuation to areas above the PMF flood level is possible outside the precinct as indicated in Appendix B of this note.</p> <p>Area 14: Floor level for area 14 is above the 1% AEP+751mm freeboard; In an extreme flood event (i.e. PMF) water depth is expected to be up to 9 cm. Flood risk is considered low; no evacuation is necessary in case of a flood emergency.</p> <p>Further details on evacuation procedures will be provided at a later stage, prior to occupation of the building.</p> |
| 11 | <p>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.</p> | <p>Refer to response 9 above.</p> <p>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.</p> |
| 12 | <p>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.</p> | <p>Occupants of the basement are protected by flooding as accesses to the basement are above PMF and 1% AEP + 500 mm freeboard flood level.</p> |
| 13 | <p>Emergency response planning must consider human behaviour. It is not considered appropriate to expect a worker to remain alone inside a small meter room or similar until an extreme flood event passes. Consideration should be given to possible medical</p> | <p>Area 8 (gas meter room – 41 m²) has finish floor level above the PMF. No flooding is expected in Area 8.</p> <p>The footpath outside area 6 has floor levels above the 1% AEP flood event; footpath outside area 6 can lead to higher ground area above the PMF outside the precinct.</p> |

| | | |
|----|--|---|
| | <p>evacuations necessary during an extreme flood event.</p> | <p>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.</p> |
| 14 | <p>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</p> | <p>As indicated in response 9 floor levels are proposed to be above the 1% AEP flood level + freeboard. This limit the residual risk for flood event larger than the 1%AEP event.</p> <p>In a PMF flood event Area 6 and Area 11 would have flood depth up to 40cm. If necessary, evacuation for area 6 and area 11 can be provided outside the building as demonstrated in the map included in Appendix B. Emergency evacuation route is above the 1%AEP flood level. The residual risk for flood event larger than the 1%AEP flood event for Area 6 and Area 11 is considered acceptable.</p> |
| 15 | <p>Areas 1, 5, 7-10, 12 and 15 are above the PMF level. Areas 2-4 and 14 (community area) are above the 1% AEP flood level, but do not have internal access to reach upper levels and are below the PMF level. Area 6 comprises an entry area below the 1% AEP flood level and an area above. The internal raised area provided should be above the PMF if internal access to a refuge area cannot be provided</p> | <p>As noticed by the EES reviewer, Area 1,5,7,8,9,10,12 and 15 have finish floor levels above the PMF.</p> <p>As demonstrated in the response 9 above Area 2, 3, 4 and 14 have finish floor levels above 1%AEP+ freeboard flood level. Although for Area 2,3,4 and 14 finish floor levels are below the PMF flood level the residual risk for flood event larger than the 1% AEP is considered low.</p> <p>As indicated in response 9 above emergency evacuation can be provided (if necessary) for Area 6 and area 11.</p> |
| 16 | <p>Area 11 comprises three retail tenancies with a proposed floor level approximately 0.5m below the 1% AEP flood level, which does not comply with the requirements. The report has demonstrated a lack of effective warning time to evacuate persons from these tenancies. With an average frequency of flooding in the order of 2 to 5 years and a lack of warning time, this proposal would introduce unacceptable risk to life and limb. This design must be reconsidered. None of the retail areas have internal access to reach upper</p> | <p>As indicated in the response 6 above floor level for Area 11 has been raised to 15.70 m AHD which is above the 1% AEP flood level.</p> |

| | | |
|-----------|--|--|
| | <p>levels, with only Area 15 having access to fire stairs.</p> | |
| <p>17</p> | <p>The emergency response section of the report has not demonstrated suitable consideration of the issues. It is not acceptable to consider the 1% AEP only and state that occupants can ‘remain safe’. The full range of floods must be considered. It is not appropriate to use an outdoor area as a shelter during an extreme rainfall event.</p> | <p>It is considered that the finished floor levels proposed for the Central Precinct provided adequate and sufficient flood protection in case of a flood emergency.</p> <p>Area 1: Floor level for area 1 is above the PMF flood level, no evacuation is necessary in case of a flood emergency.</p> <p>Area 2: Floor level for area 2 is above the 1% AEP+670mm freeboard; In an extreme flood event (i.e. PMF) water depth is expected to be up to 12 cm. Flood risk is low. No emergency evacuation is deemed necessary for occupants of Area 2.</p> <p>Area 3: Floor level for area 3 is above the 1% AEP+660mm freeboard; In an extreme flood event (i.e. PMF) water depth is expected to be up to 13 cm. Flood risk is considered low.</p> <p>Area 4: Floor level for area 4 is above the 1% AEP+390mm freeboard; In an extreme flood event (i.e. PMF) water depth is expected to be up to 40 cm. Flood risk is considered low.</p> <p>If necessary, occupants of area 4 can easily access areas located at a higher ground (i.e. above the PMF) outside the central precinct (refer to Appendix B). Details of emergency response will be provided at a later stage, prior to occupation of the building.</p> <p>Area 5, 7, 8, 9, 12, 13, 15: Floor levels are above the PMF flood level, no emergency evacuation is necessary in case of a flood emergency.</p> <p>Area 6 and Area 11: As indicated in response 6 above, finish floor levels for Area 6 and Area 11 have been changed to 15.7 m AHD which is above the 1% AEP flood level. <u>If necessary</u>, in an extreme flood event evacuation to areas above the PMF flood level is possible outside the precinct as indicated in Appendix B of this note.</p> <p>Area 14: Floor level for area 14 is above the 1% AEP+751mm freeboard; In an extreme flood event (i.e. PMF) water depth is expected to be up to 9 cm. Flood risk is considered low; no</p> |

| | | |
|----|--|---|
| | | <p>evacuation is necessary in case of a flood emergency.</p> <p>Further details on evacuation procedures will be provided at a later stage, prior to occupation of the building.</p> <p>Also refer to response 6 above.</p> |
| 18 | <p>The emergency response provisions for the proposed childcare facility require consideration of medical evacuation</p> | <p>The childcare facility is not affected by flooding. Emergency management procedures are not included in the flood study and rather, will be provided at a later stage prior to occupation of the building.</p> <p>It is important to note that during a flood event (i.e. 1%AEP and PMF), vehicular road access is typically unviable. This is the case across the City. Notwithstanding, this site is benefitted by an onsite Metro station where access, despite a flood event, could be maintained.</p> |



APPENDIX A – WATER LEVEL MAPS



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



FOR INFORMATION ONLY

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



WSP Australia Pty Limited
 680 George Street
 Sydney, NSW
 2000 Australia
 www.wsp.com

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



FOR INFORMATION ONLY

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

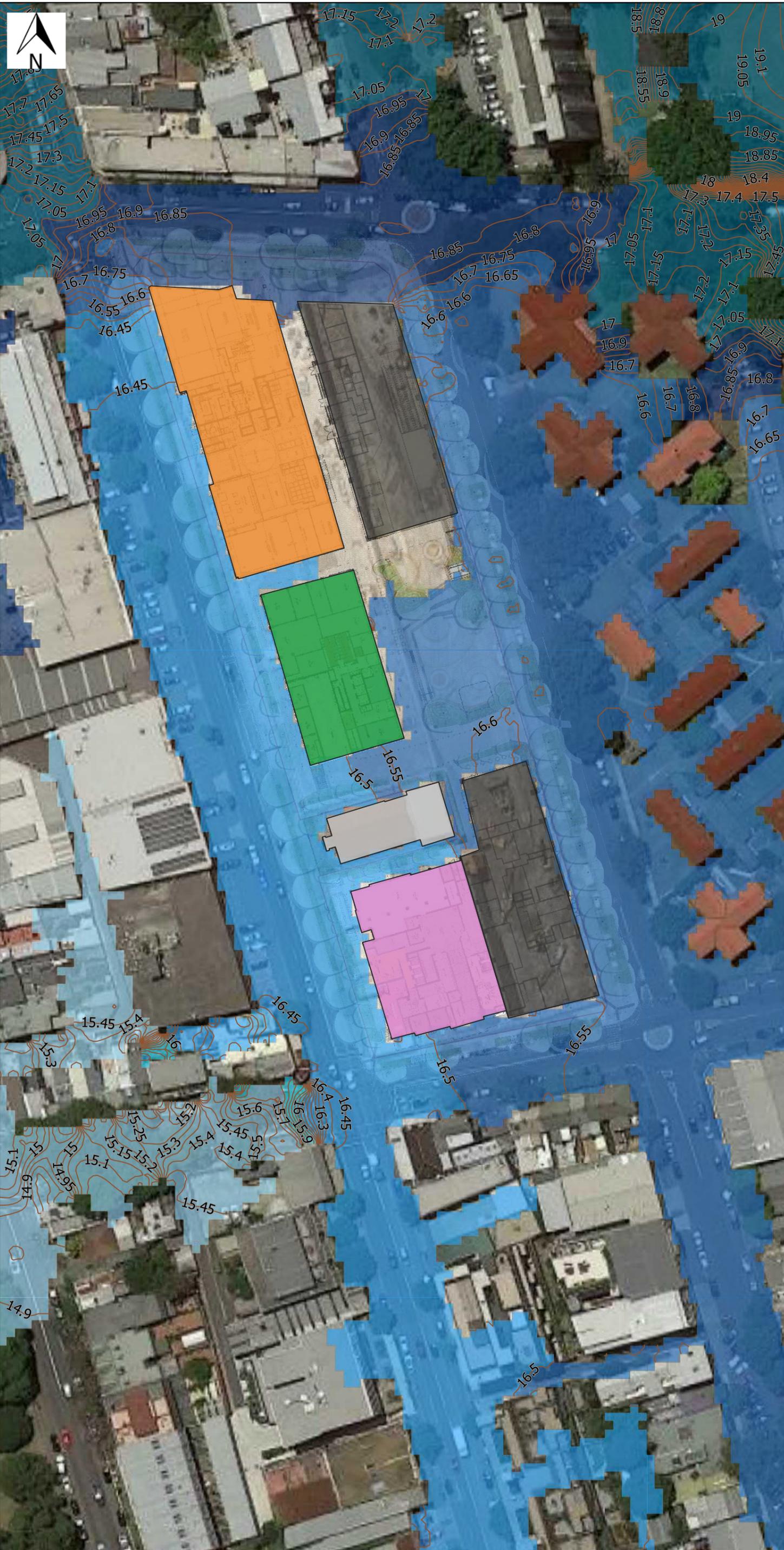


WSP Australia Pty Limited
 680 George Street
 Sydney, NSW
 2000 Australia
 www.wsp.com

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



FOR INFORMATION ONLY

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



WSP Australia Pty Limited
 680 George Street
 Sydney, NSW
 2000 Australia
 www.wsp.com

Waterloo - OSD
 Proposed Scenario - PMF
 Water Level

Scale: 1:1000 03/02/21

Project Number: PS119449



APPENDIX B – EVACUATION



KEY:

- Central Precinct
- Area above PMF flood level
- PMF Flood Extent

Area above 1%AEP Flood level

Area above PMF flood level

910 square meters

Evacuation



FOR INFORMATION ONLY

| Rev. | Date | ISSUE | Prepare | Approve |
|------|----------|--------------|---------|---------|
| B | 25/02/21 | SECOND ISSUE | MZ | AV |



WSP Australia Pty Limited
 680 George Street
 Sydney, NSW
 2000 Australia
 www.wsp.com

Waterloo - OSD
 Proposed Scenario - PMF
 Flood Extent

Scale: 1:1000 25/02/21

Project Number: PS119449