NORTHROP

TOGA CENTRAL DEVELPOMENT

Flood Risk Assessment Report

Prepared for Toga Development & Construction

Level 5, 45 Jones Street

Ultimo NSW 2007

Flood Risk Assessment Report

Date	Revision	Issue	Prepared By	Reviewed By
23/06/2022	A	Draft for Client Review	A Brien	A Brien
15/07/2022	B	For Approval	A Brien	A Brien

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1. Executive Summary

This Flood Risk Assessment has been prepared by Northrop Consulting Engineers to accompany a detailed State Significant Development (SSD) development application (DA) for the mixed-use redevelopment proposal at TOGA Central, located at 2 & 8A Lee Street, Haymarket (the site). The site is legally described as Lot 30 in Deposited Plan 880518 and Lot 13 in Deposited Plan 1062447. The site is also described as 'Site C' within the Western Gateway sub-precinct at the Central Precinct.

This report has been prepared to address the Secretary's Environmental Assessment Requirements (SEARs) issued for the SSD DA (SSD 33258337).

This report concludes that the proposed mixed-use redevelopment is suitable and warrants approval subject to the implementation of the following mitigation measures.

- Design development of the stormwater solution to collect surface runoff and convey to the discharge point.
- Connection of all stormwater drainage to the existing Sydney Water asset traversing the site.
- Selection of surface levels at entrances to the building and potential access points to lower levels to prevent the ingress of water into these areas.
- Development of emergency response measures to raise flood awareness and promote on-site refuge / vertical evacuation.

Following the implementation of the above mitigation measures, the remaining impacts are appropriate.

1.1 Associated Reports

This Flood Risk Assessment report should be read in conjunction with the following supplementary documents:

1. *Plan Showing Boundaries and Selected Detail for Flood Study Purposes at No. 2 Lee Street, Haymarket & Surrounds,* Norton Survey Partners, 8 April 2022.
2. *Civil SSDA Report* (Atlassian Development at 8-10 Lee Street, Haymarket), TTW, 2020.
3. *Civil and Stormwater Management Statement – DA Report (Central Place Sydney)*, Arup, 2021.
4. *Integrated Water Cycle Management Report,* Northrop, 2022.

Images and limited text in these documents have been reproduced in this report.

2. The Development

2.1 Introduction

This report has been prepared to accompany a SSD DA for the for the mixed-use redevelopment proposal at TOGA Central, located at 2 & 8A Lee Street, Haymarket.

The Minister for Planning, or their delegate, is the consent authority for the SSD DA and this application is lodged with the NSW Department of Planning and Environment (DPE) for assessment.

The purpose of the SSD DA is to complete the restoration of the heritage-listed building on the site, delivery of new commercial floorspace and public realm improvements that will contribute to the realisation of the Government's vision for an iconic technology precinct and transport gateway. The application seeks consent for the conservation, refurbishment and adaptive re-use of the Adina Hotel building (also referred to as the former Parcel Post building (fPPb)), construction of a 45-storey tower above and adjacent to the existing building and delivery of significant public domain improvements at street level, lower ground level and within Henry Deane Plaza. Specifically, the SSD DA seeks development consent for:

- Site establishment and removal of landscaping within Henry Deane Plaza.
- Demolition of contemporary additions to the fPPb and public domain elements within Henry Deane Plaza.
- Conservation work and alterations to the fPPb for retail premises, commercial premises, and hotel and motel accommodation. The adaptive reuse of the building will seek to accommodate:
  - Commercial lobby and hotel concierge facilities,
  - Retail tenancies including food and drink tenancies and convenience retail with back of house areas,
  - 4 levels of co-working space,
  - Function and conference area with access to level 7 outdoor rooftop space, and
  - Reinstatement of the original fPPb roof pitch form in a contemporary terracotta materiality.
- Provision of retail floor space including a supermarket tenancy, smaller retail tenancies, and back of house areas below Henry Deane Plaza (at basement level 1 (RL12.10) and lower ground (RL 16)).
- Construction of a 45-storey hotel and commercial office tower above and adjacent to the fPPb. The tower will have a maximum building height of RL 202.28m, and comprise:
  - 10 levels of hotel facilities between level 10 – level 19 of the tower including 204 hotel keys and 2 levels of amenities including a pool, gymnasium and day spa to operate ancillary to the hotel premises. A glazed atrium and hotel arrival is accommodated adjacent to the fPPb, accessible from Lee Street.
  - 22 levels of commercial office space between level 23 – level 44 of the tower accommodated within a connected floor plate with a consolidated side core.
  - Rooftop plant, lift overrun, servicing and BMU.
- Provision of vehicular access into the site via a shared basement, with connection points provided to both Block A (at RL 5) and Block B (at RL5.5) basements. Primary access will be accommodated from the adjacent Atlassian site at 8-10 Lee Street, Haymarket, into 4 basement levels in a split-level arrangement. The basement will accommodate:
  - Car parking for 106 vehicles, 4 car share spaces and 5 loading bays.
  - Hotel, commercial and retail and waste storage areas.

  - Plant, utilities and servicing.
- Provision of end of trip facilities and 165 employee bicycle spaces within the fPPb basement, and an additional 72 visitor bicycle spaces within the public realm.
- Delivery of a revitalised public realm across the site that is coordinated with adjacent development, including an improved public plaza linking Railway Square (Lee Street), and Block B (known as 'Central Place Sydney'). The proposal includes the delivery of a significant area of new publicly accessible open space at street level, lower ground level, and at Henry Deane Plaza, including the following proposed elements:
  - Provision of equitable access within Henry Deane Plaza including stairways and a publicly accessible lift.
  - Construction of raised planters and terraced seating within Henry Deane Plaza.
  - Landscaping works within Henry Deane Plaza.
- Utilities and service provision.
- Realignment of lot boundaries.

This report has been prepared in response to the requirements contained within the Secretary's Environmental Assessment Requirements (SEARs) dated 17 December 2021 and issued for the SSD DA. Specifically, this report has been prepared to respond to the SEARs requirement issued below.

Item	Description of requirement	Section reference
16. Flooding Risk	1. Identify any flood risk on-site having regard to adopted flood studies, the potential effects of climate change, and any relevant provisions of the NSW Floodplain Development Manual. 2. Assess the impacts of the development, including any changes to flood risk on-site or off-site, and detail design solutions and operational procedures to mitigate flood risk where required.	Section 4.6 to 4.8

2.2 The Site

The site is located within the City of Sydney Local Government Area (LGA). The site is situated 1.5km south of the Sydney CBD and 6.9km north-east of the Sydney International Airport within the suburb of Haymarket.

The site is located within the Western Gateway sub-precinct, an area of approximately 1.65ha that is located immediately west of Central Station within Haymarket on the southern fringe of the Sydney CBD. Immediately north of Central Station is Belmore Park, to the west is Haymarket (including the University of Technology, Sydney and Chinatown), to the south and east is rail lines and services and Prince Alfred Park and to the east is Elizabeth Street and Surry Hills.

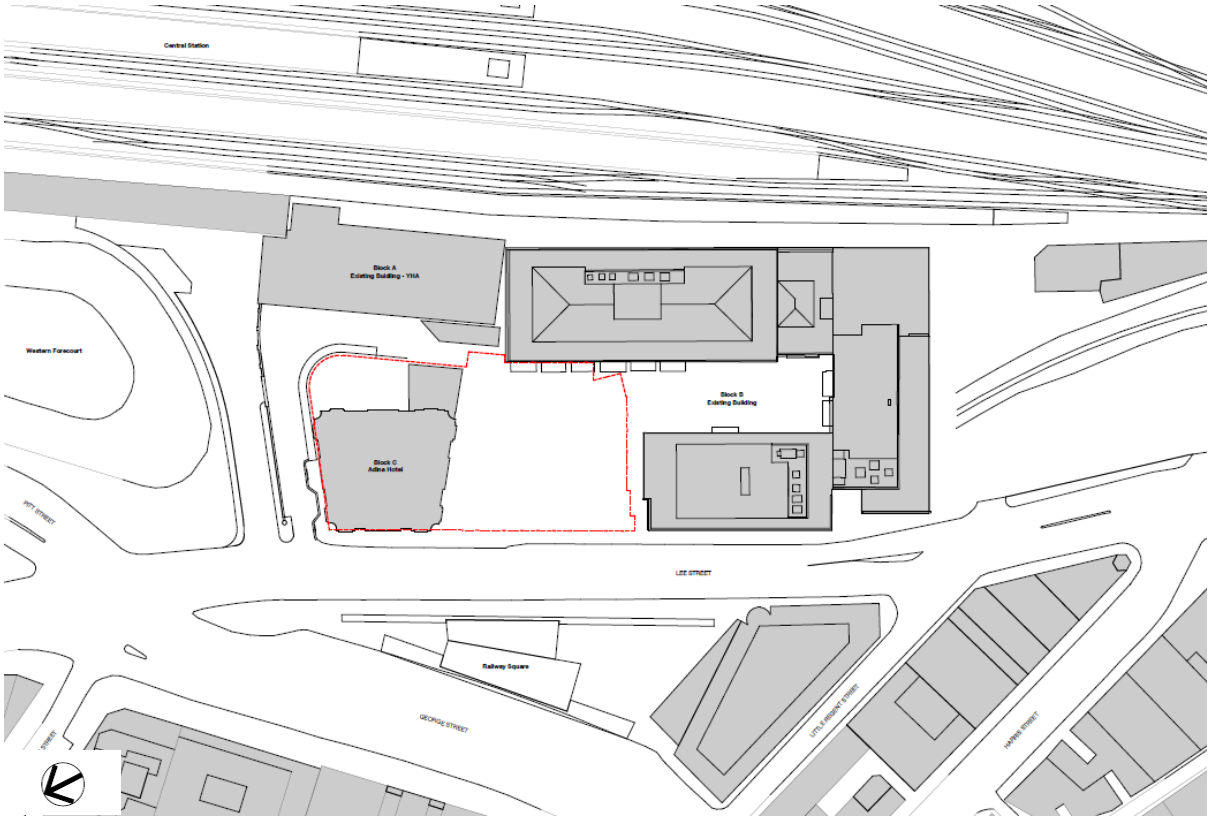
Central Station is a public landmark, heritage building, and the largest transport interchange in NSW. With regional and suburban train services, connections to light rail, bus networks and to Sydney Airport, the area around Central Station is one of the most-connected destinations in Australia.

The site is located at 2 & 8A Lee Street, Haymarket and is legally described as Lot 30 in Deposited Plan 880518, Lot 13 in Deposited Plan 1062447 and part of Lot 14 in Deposited Plan 1062447.

The land that comprises the site under the Proponent's control (either wholly or limited in either height or depth) comprises a total area of approximately **4,159sqm**.

The location of the TOGA Central site is illustrated in **Figure 1**.

Figure 1 – Site Identification Plan



Source: Bates Smart

The site currently comprises the following existing development:

- Lot 30 in Deposited Plan 880518 (Adina Hotel building): the north-western lot within the Western Gateway sub-precinct accommodates a heritage-listed building which was originally developed as the Parcels Post Office building. The building has been adaptively re-used and is currently occupied by the Adina Hotel Sydney Central. The eight-storey building provides 98 short-stay visitor apartments and studio rooms with ancillary facilities including a swimming pool and outdoor seating at the rear of the site.
- Lot 13 in Deposited Plan 1062447 and part of Lot 14 in Deposited Plan 1062447 (Henry Deane Plaza): the central lot within the Western Gateway sub-precinct adjoins Lot 30 to the south. It accommodates 22 specialty food and beverage, convenience retail and commercial service tenancies. The lot also includes publicly accessible space which is used for pop-up events and a pedestrian thoroughfare from Central Station via the Devonshire Street Tunnel. At the entrance to Devonshire Street Tunnel is a large public sculpture and a glazed structure covers the walkway leading into Railway Square. This area forms part of the busy pedestrian connection from Central Station to Railway Square and on to George and Pitt Streets, and pedestrian subways.

The site is listed as an item of local significance under Schedule 5 of the *Sydney Local Environmental Plan 2012* 'Former Parcels Post Office including retaining wall, early lamp post and building interior', Item 855.

The site is also included within the Central Railway Station State heritage listing. This is listed on the State Heritage Register 'Sydney Terminal and Central Railway Station Group', Item SHR 01255, and in Schedule 5 of the *Sydney Local Environmental Plan 2012* 'Central Railway Station group including buildings, station yard, viaducts and building interiors' Item 824.

The site is not however listed independently on the State Heritage Register. There is an array of built forms that constitute Central Station, however the Main Terminal Building (particularly the western frontage) and associated clocktower constitute key components in the visual setting of the Parcel Post building.

3. Methodology

3.1 Summary

This assessment has been undertaken using the following general methodology.

- Idenitification of compliance framework and strategic direciton to address compliance framework.
- Gather data on existing flood behaviour and adjoining development.
- Prepare site specific model to test the impact of the proposed development on flood behaviour.
- Assessment of architectural scheme and public domain concept with respect to compliance framework.
- Reporting.

3.2 Compliance Framework

The *Sydney Local Environmental Plan 'LEP'(2012)*, *Sydney City Development Control Plan 'DCP' (2012)* (*Chapter 3.7*), *Interim Floodplain Management Policy (2014),* as well as Section 3.4.2 of the *Western Gateway Sub-Precinct Design Guide (2021)* identifies the following in relation to Flooding.

Local Environmental Plan 2012

5.21 Flood planning

(1) The objectives of this clause are as follows—

(a) to minimise the flood risk to life and property associated with the use of land,

(b) to allow development on land that is compatible with the flood function and behaviour on the land, taking into account projected changes as a result of climate change,

(c) to avoid adverse or cumulative impacts on flood behaviour and the environment,

(d) to enable the safe occupation and efficient evacuation of people in the event of a flood.

(2) Development consent must not be granted to development on land the consent authority considers to be within the flood planning area unless the consent authority is satisfied the development—

(a) is compatible with the flood function and behaviour on the land, and

(b) will not adversely affect flood behaviour in a way that results in detrimental increases in the potential flood affectation of other development or properties, and

(c) will not adversely affect the safe occupation and efficient evacuation of people or exceed the capacity of existing evacuation routes for the surrounding area in the event of a flood, and

(d) incorporates appropriate measures to manage risk to life in the event of a flood, and

(e) will not adversely affect the environment or cause avoidable erosion, siltation, destruction of riparian vegetation or a reduction in the stability of riverbanks or watercourses.

(3) In deciding whether to grant development consent on land to which this clause applies, the consent authority must consider the following matters—

(a) the impact of the development on projected changes to flood behaviour as a result of climate change,

(b) the intended design and scale of buildings resulting from the development,

(c) whether the development incorporates measures to minimise the risk to life and ensure the safe evacuation of people in the event of a flood,

(d) the potential to modify, relocate or remove buildings resulting from development if the surrounding area is impacted by flooding or coastal erosion.

(4) A word or expression used in this clause has the same meaning as it has in the Considering Flooding in Land Use Planning Guideline unless it is otherwise defined in this clause.

(5) In this clause—

Considering Flooding in Land Use Planning Guideline means the *Considering Flooding in Land Use Planning Guideline* published on the Department's website on 14 July 2021.

flood planning area has the same meaning as it has in the Floodplain Development Manual.

Floodplain Development Manual means the *Floodplain Development Manual* (ISBN 0 7347 5476 0) published by the NSW Government in April 2005.

Western Gateway Sub-Precinct Design Guide (2021)

The following design guidance is extracted from Section 3.4.2 – Water Management.

2. Development is to manage and mitigate flood risk and must not exacerbate the potential for flood damage or hazard to development and to the public domain (including publicly accessible managed space).

5. Building flood planning levels will be set above the 1% AEP flood level.

6. Car park entrances are ramped up to above the 1% AEP flood level + 0.5m, or the probable maximum flood level (whichever is the higher).

Development Control Plan 2012

The aforementioned design guideline replaces the provisions of the Sydney Development Control Plan 2012 to the extent that it relates to the same subject matter as a provision of the Sydney Development Control Plan 2012 applying to the Western Gateway sub-precinct. The following objectives from Clause 3.7 are provided for reference only and generally reflect the requirements of the LEP with respect to flooding. Clause 3.7.1 references preparation of a site-specific flood study which has been undertaken in this instance.

Objectives

1. Assist in the management of stormwater to minimise flooding and reduce the effects of stormwater pollution on receiving waterways.

2. Ensure that development manages and mitigates flood risk, and does not exacerbate the potential for flood damage or hazard to existing development and to the public domain.

3. Ensure that development above the flood planning level as defined in the Sydney LEP 2012 will minimise the impact of stormwater and flooding on other developments and the public domain both during the event and after the event.

4. Ensure that flood risk management addresses public safety and protection from flooding.

Interim Floodplain Management Policy 2014

Aims and Objectives of the Policy

- To inform the community of the City's Policy with regard to the use of flood prone land;
- To establish guidelines for the development of flood prone land that are consistent with the NSW Flood Policy and NSW Floodplain Development Manual (2005) as updated by the Floodplain Management Guides;
- To control development and activity within each of the individual floodplains within the City having regard to the characteristics and level of information available for each of the floodplains;
- To minimise the risk to human life and damage to property by controlling development on flood prone land;
- To apply a merit based approach to all development decisions taking into account ecological, social and environmental considerations;
- To ensure that the development or use of floodplains does not adversely impact upon the aesthetic, recreational and ecological values of the waterway corridors;
- To ensure that all land uses and essential services are appropriately sited and designed in recognition of all potential floods;
- To ensure that all development on the floodplain complies with Ecologically Sustainable Development (ESD) principles and guidelines; and
- To promote building design that considers requirements for the development of flood prone land and to ensure that the development of flood prone land does not have significant impacts upon the amenity of an area.

Application Requirements

Applications must include information that addresses all relevant controls listed within this document and the following matters as applicable:

- Development applications affected by this Policy shall be accompanied by a survey plan showing: (i) the position of the existing building/s or proposed building/s; (ii) the existing ground levels and features to Australian Height Datum around the perimeter of the site and contours of the site; and (iii) the existing or proposed floor levels to Australian Height Datum.
- Applications for earthworks, filling of land, infrastructure and subdivision shall be accompanied by a survey plan (with a minimum contour interval of 0.25m) showing relative levels to Australian Height Datum.
- For large scale developments, or developments that in the opinion of the City are in critical situations, where an existing catchment based flood study is not available, a flood assessment report prepared by a suitably qualified engineer using a hydrologic and hydraulic dynamic one or two dimensional computer model.
- Where the controls for a particular development proposal require an assessment of structural soundness during potential floods, the following impacts must be addressed: (iv) hydrostatic pressure; (v) hydrodynamic pressure; (vi) impact of debris; and vii buoyancy forces.

Development Provisions

The development must address items outlined in the LEP, and performance criteria outlined below.

Performance Criteria

- is compatible with the established flood hazard of the land. In areas where flood hazard has not been established through previous studies or reports, the flood hazard must be established in accordance with the Floodplain Development Manual considering the following: (i) Impact of flooding and flood liability is to be managed ensuring the development does not divert floodwaters

or interfere with flood storage or the natural function of the waterway; (ii) Flood behaviour (for example, flood depths reached, flood flow velocities, flood hazard, rate of rise of floodwater); (iii) Duration of flooding for a full range of events; (iv) Appropriate flood mitigation works; (v) Freeboard; (vi) Council's duty of care – Proposals to address or limit; and (vii) Depth and velocity of flood waters for relevant flood events.

- will not significantly adversely affect flood behaviour resulting in detrimental increases in the potential flood affectation of other development or properties.
- incorporates appropriate measures to manage risk to life from flood considering the followings: (i) The proposed development should not result in any increased risk to human life (ii) Controls for risk to life for floods up to the Flood Planning Level (iii) Controls for risk to life for floods greater than the Flood Planning Level, (iv) Existing floor levels of development in relation to the Flood Planning Level and floods greater than the Flood Planning level (v) Council's duty of care – Proposals to address and limit (vi) What level of flooding should apply to the development e.g. 1 in 100 year, etc (vii) Effective flood access and evacuation issues (viii) Flood readiness – Methods to ensure relative flood information is available to current and future occupants and visitors.
- will not significantly adversely affect the environment or cause avoidable erosion, siltation, destruction of riparian vegetation or a reduction in the stability of creek or channel banks or watercourses.
- is not likely to result in unsustainable social and economic costs to the community as a consequence of flooding.
- is consistent with the principles of Ecologically Sustainable Development; and
- adequately considers the impact of climate change.

Heritage Considerations

The City acknowledges that certain buildings or structures require preservation due to their heritage significance. Developments with heritage significance can be assessed on a merit-based approach provided the following requirements are satisfied:

- Expert assessment has identified the structure or development as having heritage conservation value; Interim Floodplain Management Policy Page 9 of 17 Approved: May 2014.
- Planning instruments have specifically identified the existing development as having heritage conservation value and provide the appropriate level of statutory protection.
- The highest practical level of flood protection is provided while maintaining an appropriate balance with heritage conservation.
- The proposed development will not be subject to frequent flooding risk that may jeopardise the long-term viability or heritage conservation of the development. Comprehensive assessment would be required where the development is subject to flooding in storms more frequent than the 5% AEP flood.
- A restriction shall be placed on the property title, identifying the flooding risk and requiring conservation of heritage values.

General Requirements

General requirements include selection of fencing type, impacts of the development on flood behaviour and filling of flood prone land, selection of finished floor levels and basement openings, and storage of hazardous substances.

Flood Planning Levels

For commercial or retail floor levels, a minimum of the 1% AEP and for below ground garages or carparking, the 1% AEP plus 500mm freeboard.

Flood Compatible Materials

A list of flood compatible materials is provided for where they are required.

3.3 Summary of Strategic Context

For assessment purposes, this report and future accompanying detailed drawings are to discuss compliance with the City of Sydney *DCP* 2012, City of Sydney Interim Floodplain Management Policy (2014), *Western Gateway Sub-Precinct Design Guide (2021)* and Sydney Water requirements as a minimum. Alternative solutions may be provided in lieu of compliance.

The adopted policy framework can be used for assessment of future detailed design submissions.

4. Assessment and Findings

4.1 Catchment Context

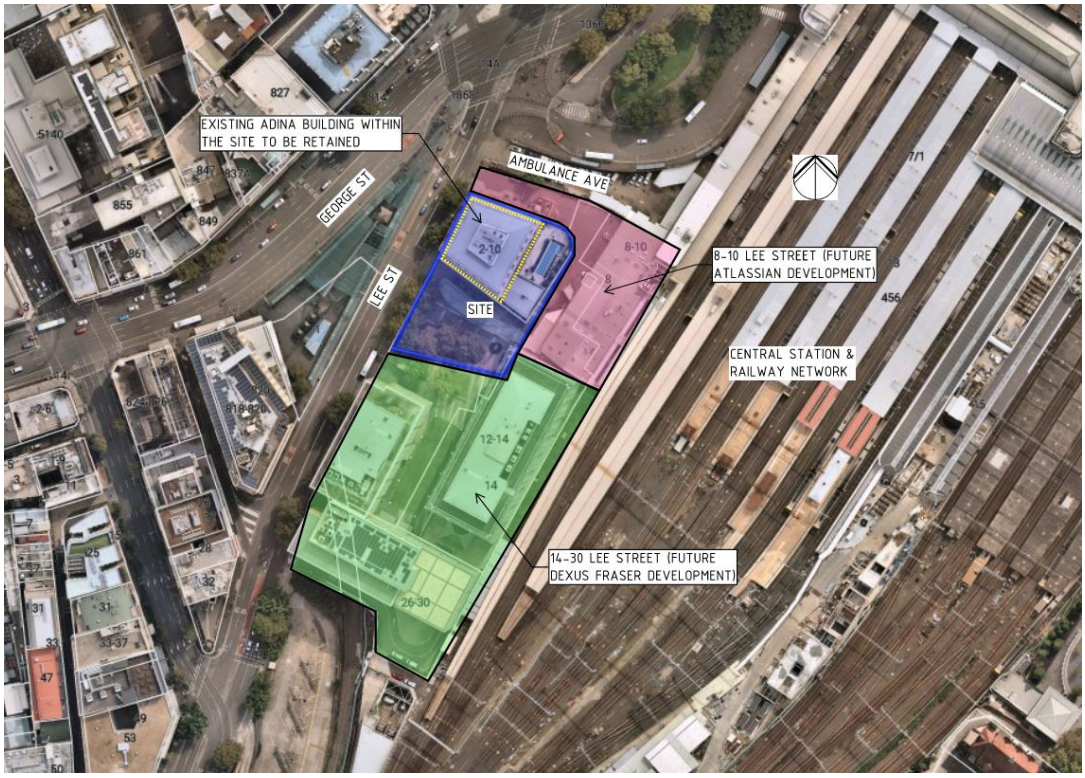
Toga Central falls under Sydney Water's jurisdiction of catchment areas. Per the Sydney Water Interactive Map, it is part of "City Area 30 Catchment" (see *Figure 1*). As well as this, the catchment area is part of City of Sydney Council, meaning drainage design and stormwater management must refer to the relevant Council design control plan as discussed in Section 3.

Figure 1 – Sydney Water Catchment Map (Sydney Water, 2022)

4.2 Existing Environment

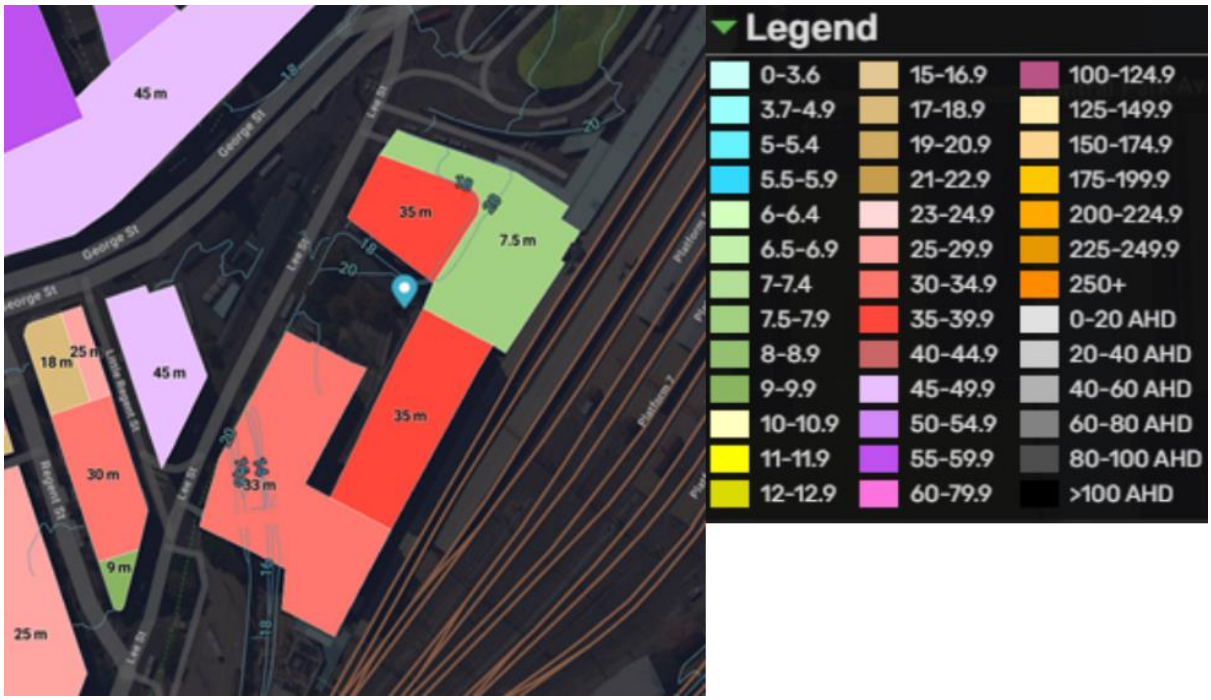
Proposed works for Toga Central are situated in the heart of Sydney's CBD, situated next to Central Station. The existing rail line runs behind the southeast edge of the site, with the remainder of the site surrounded by Lee Street, Ambulance Avenue and various buildings. The site is bound by adjoining properties which will undergo future development as part of the Atlassian development to the north (8-10 Lee Street) and Dexus Fraser development to the south (14-30 Lee Street). Refer to Figure 2 for local surrounds.

Figure 2 – Existing Surrounds (Nearmap, 2022)



The terrain is primarily densely populated urban zone, with small areas of greenery towards the north and trees sparsely in-between buildings and sidewalks. Figure *3* illustrates the elevation of existing buildings above the ground surface.

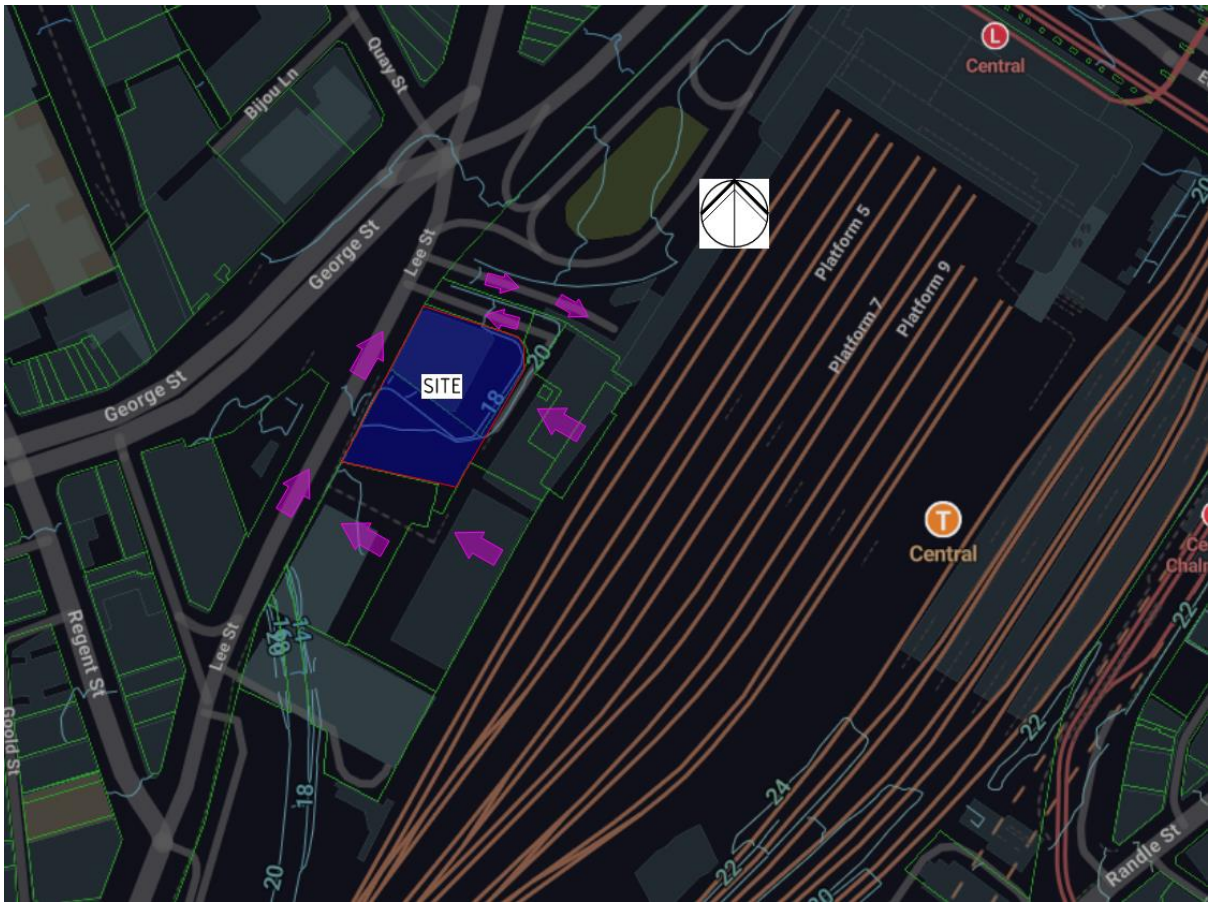
Figure 3 – Existing Surrounding Elevation (Mecone, 2022)



4.3 Topography and Flow Paths

With the site being located in such a dense urban environment, existing topography information is relatively scarce with very little open area apparent due to the number of buildings and industrial areas present near the site. Site survey undertaken by Norton Survey Partners on 8 April 2022 *Plan Showing Boundaries and Selected Detail for Flood Study Purposes at No. 2 Lee Street; Haymarket & Surrounds* (provided in Appendix A) indicates the existing open plaza within the site has a very gentle slope but generally falls in a westerly direction. Surface runoff from this plaza area appear to be captured by a series of grated trench drains prior to the Lee Street pedestrian tunnel entrance, which are then eventually piped into a 1500mm Sydney Water stormwater culvert traversing east-west under the Lee Street tunnel. All other flows from the site are primarily roof run off, with little upstream catchment present due to the site backing onto Central Station. Refer to Figure 4 for overall catchment topography (with overland flow arrows indicating flow path).

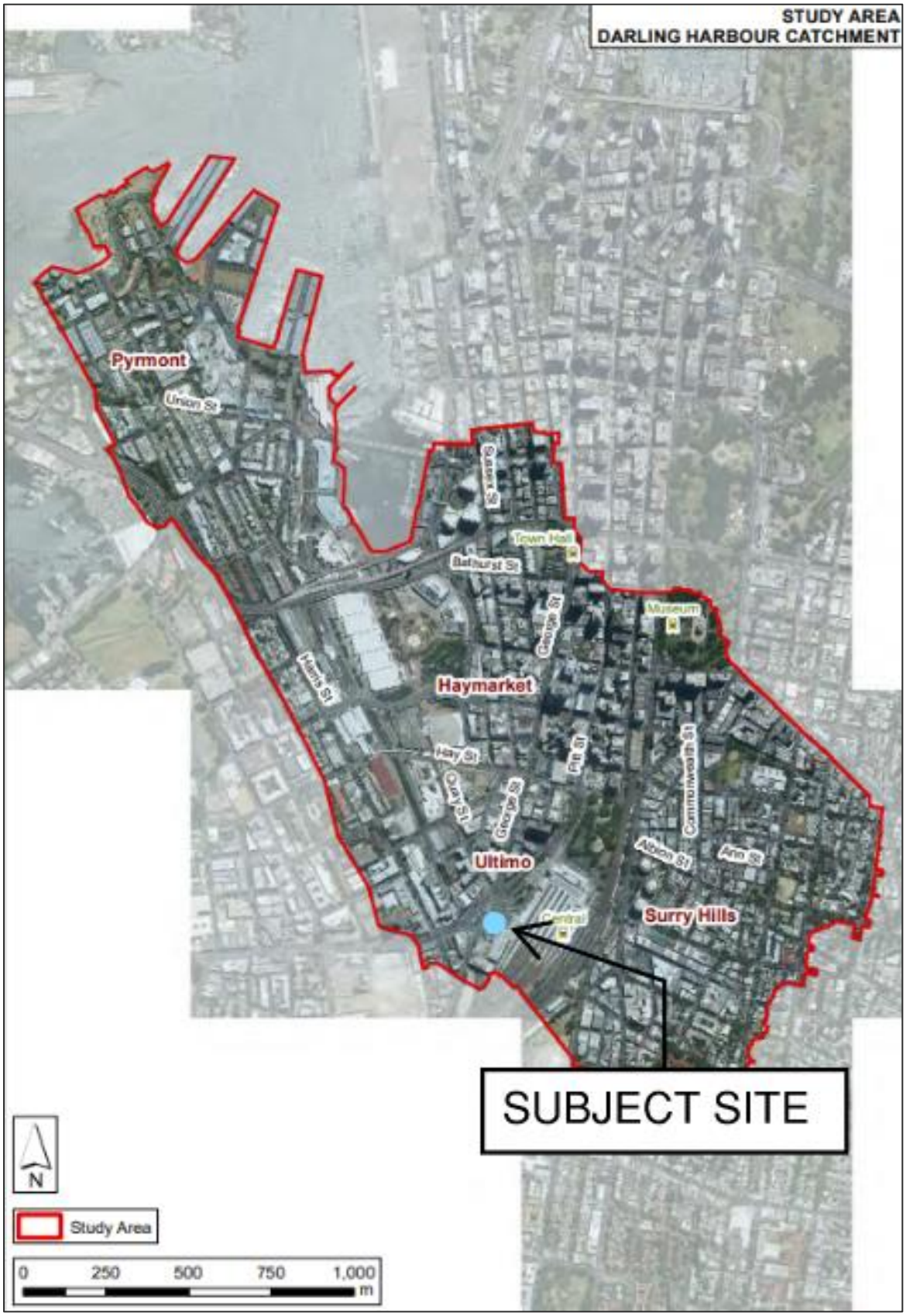
Figure 4 – Existing Topography (Mecone, 2022)



4.4 Existing Flooding Data

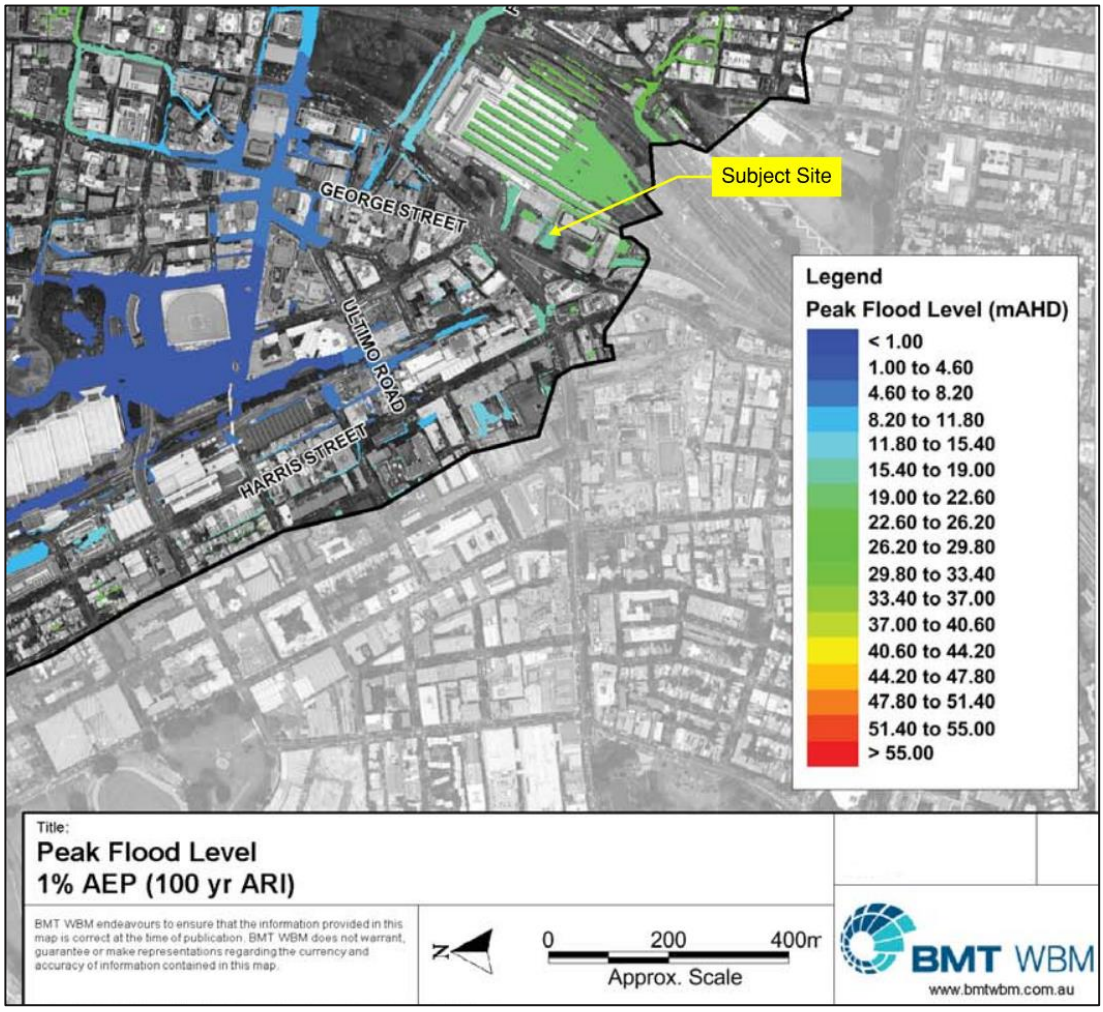
The site is covered by an existing Council flood model – the *Darling Harbour Floodplain Risk Management Study (2018)* prepared by WMA Water. A figure showing the extent of Council's model with respect to the subject site is presented below in Figure 6.

Figure 5 - Location of Site within the Catchment



An extract of the results from this assessment is presented below in Figure 7. More detailed imagery is presented from this assessment in Figures B1, B2, C1 and C2.

Figure 6 – 1% AEP Levels, Council Flood Study

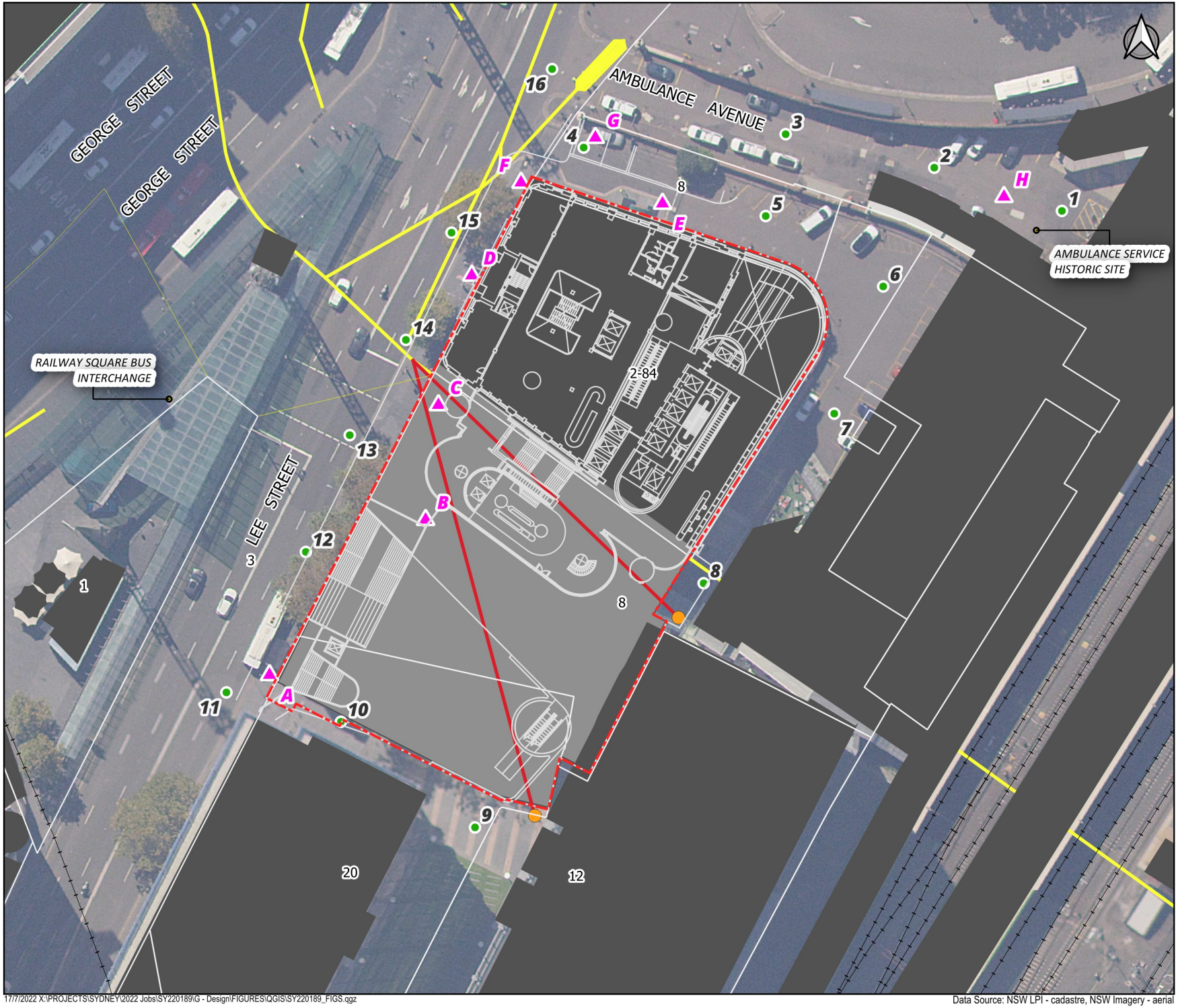


It appears Lee Street is subject to local overland flooding characterised by relatively low depths. This is expected due to the low contributing catchment. Ambulance Avenue appears to be a trapped low point with runoff from Lee Street and the local catchment contributing. Henry Deane Plaza acts as a storage zone and discharges through a number of grated drains.

4.5 Site Specific Model Development

A site-specific model was developed to reduce run time and incorporate detailed elements of the proposal. As a part of this investigation, the model was run using TUFLOW HPC (Heavy Parallelised Compute) solver. Refined building footprints in the vicinity of the subject site were also updated in the model.

The site-specific model modifications and reporting points are presented overleaf in Figure A1. The full extent of the subject site was modelled as a hypothetical roof with runoff directed to the proposed drainage pits. The proposed pits are located at the low-lying areas and capture flood waters from surrounding areas. The proposed 575mm pipes are connected to the Sydney Water stormwater pipe and have been sized to convey 1% AEP and PMF flows. This arrangement is indicative only and subject to detailed design.



Legend

- Reporting Points
- Modelled Existing Buildings
- Proposed Building
- Existing Pipes
- Proposed Pits
- Proposed Pipes
- Ground Floor Plan
- Potential Ingress Points

0 10 20 Metres

1:750

Figure A1

Proposed Development

Toga Central
2 Lee Street, Haymarket

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Data Source: NSW LPI - cadastre, NSW Imagery - aerial

4.6 Results

Flood Behaviour

The model shows water reaching its peak level in under 30 minutes, which is to be expected given the highly urbanised nature of this catchment. Flood depths are generally low, which reflect the small catchment area, and there is generally a small difference between the 1% AEP and PMF. These events are orders of magnitude apart when it comes to likelihood and this indicates the model is not sensitive to changes in rainfall (climate change, model assumptions), and is likely to be highly sensitive to changes the model topography, or kerb and gutter. Ambulance Avenue and Henry Dean Plaza act as flood storage areas in the existing case.

The results obtained in this model are generally consistent with the Council study.

Flood Depth and Levels

Results for the 1% AEP and PMF existing case are presented overleaf in Figure B1 and B2 respectively. The developed case is presented in Figures C1 and C2 for the same events. Flood levels and depths for the developed case at the reporting points are presented below in Table 1.

Table 1 - Water level and depth at reporting points

Point	Reference	Ground Elevation (m AHD)	1% AEP Depth (m)	1% AEP Level (m AHD)	PMF Depth (m)	PMF Elevation (m AHD)
1*	Ambulance Ave	14.88	1.00	15.88	1.16	16.04
2*	Ambulance Ave	15.23	0.65	15.88	0.81	16.04
3*	Ambulance Ave	15.49	0.39	15.88	0.55	16.04
4	Adina Driveway	16.26	0.02	16.28	0.03	16.29
5	Adina Driveway	18.55	0.02	18.57	0.03	18.58
6	Adina Driveway	19.92	0.01	19.93	0.02	19.94
7	Adina Driveway	19.96	0.01	19.97	0.01	19.97
8	Adina Driveway	16.58	0.04	16.62	0.06	16.64
9	Henry Deane South	19.43	0.02	19.45	0.04	19.47
10	Henry Deane South	19.12	0.04	19.16	0.06	19.18
11	Lee Street	18.71	0.02	18.72	0.03	18.73
12	Lee Street	18.06	0.03	18.09	0.04	18.10
13	Lee Street	17.55	0.02	17.57	0.03	17.58
14	Lee Street	17.12	0.03	17.15	0.04	17.16
15	Lee Street	16.65	0.03	16.68	0.04	16.69
16	Lee Street	15.95	0.03	15.98	0.08	16.03

* These flood levels are subject to change based on external stormwater upgrades undertaken by the Atlassian development and the wider Central Station precinct upgrade.

Flood Velocity and Hazard

Peak flood velocity and hazard are presented for the developed case 1% AEP and PMF in Figures C3, C4, C5, and C6 overleaf.

Impacts

Due to direct connection to the Sydney Water pipeline, negligible impact on flood behaviour was observed in the 1% AEP.

Climate Change

The development considers the PMF as a proxy for climate change. Whilst Council's study considers a 30% increase from the 1% AEP for climate change, the PMF is several orders of magnitude rarer and well over a 100% increase in rainfall intensity. Given the small difference in flood level, we believe the development has the capacity to respond to increased rainfall intensity due to climate change.

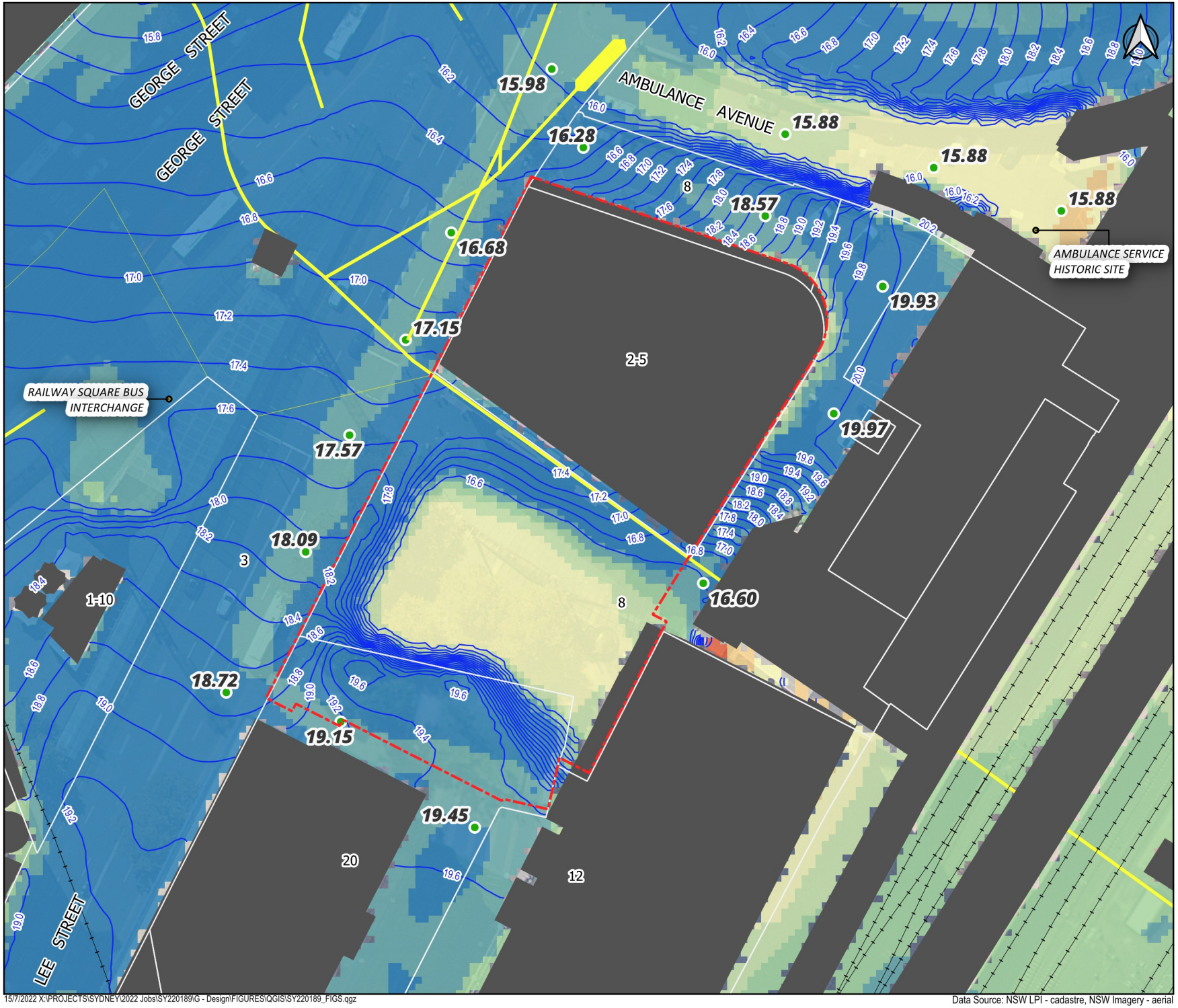
Relationship with Adjoining Developments

The site will be subject to a common link with adjoining developments, in particular the Atlassian development to the north and east. Potential water ingress points from the basement ramp and access from Ambulance Avenue have been considered as part of *Civil SSDA Report* (Atlassian Development at 8-10 Lee Street, Haymarket), TTW, 2020. This report refers to a reference design for the area which aims to exclude floodwater from entering Ambulance Avenue from Lee Street; and works to store and pump out stormwater from this trapped low point from the local Ambulance Avenue catchment. That development also proposes gravity stormwater drainage to the Sydney Water pipeline. A reduction in flood levels is expected for this area which justifies the pedestrian link adopted levels. The levels for the TOGA development are higher and rely on the works proposed in the Atlassian development to be compliant.

Further commentary is provided in Section 4.8.

Capacity of Existing Infrastructure

Review of the flood model indicate the existing Sydney Water stormwater network shows maximum water levels within the 1D network well below the surface levels in the 1% AEP event. This indicates sufficient capacity for the purpose of connecting additional ground level surface inlets to this system.



Legend

- Reporting Points
- Modelled Existing Buildings
- Existing Pipes

Depth (m)

- <= 0.02
- 0.02 - 0.10
- 0.10 - 0.25
- 0.25 - 0.50
- 0.50 - 1.00
- 1.00 - 1.50
- 1.50 - 2.00
- 2.00 >
- 0.2m Contours(mAHD)

0 10 20 Metres

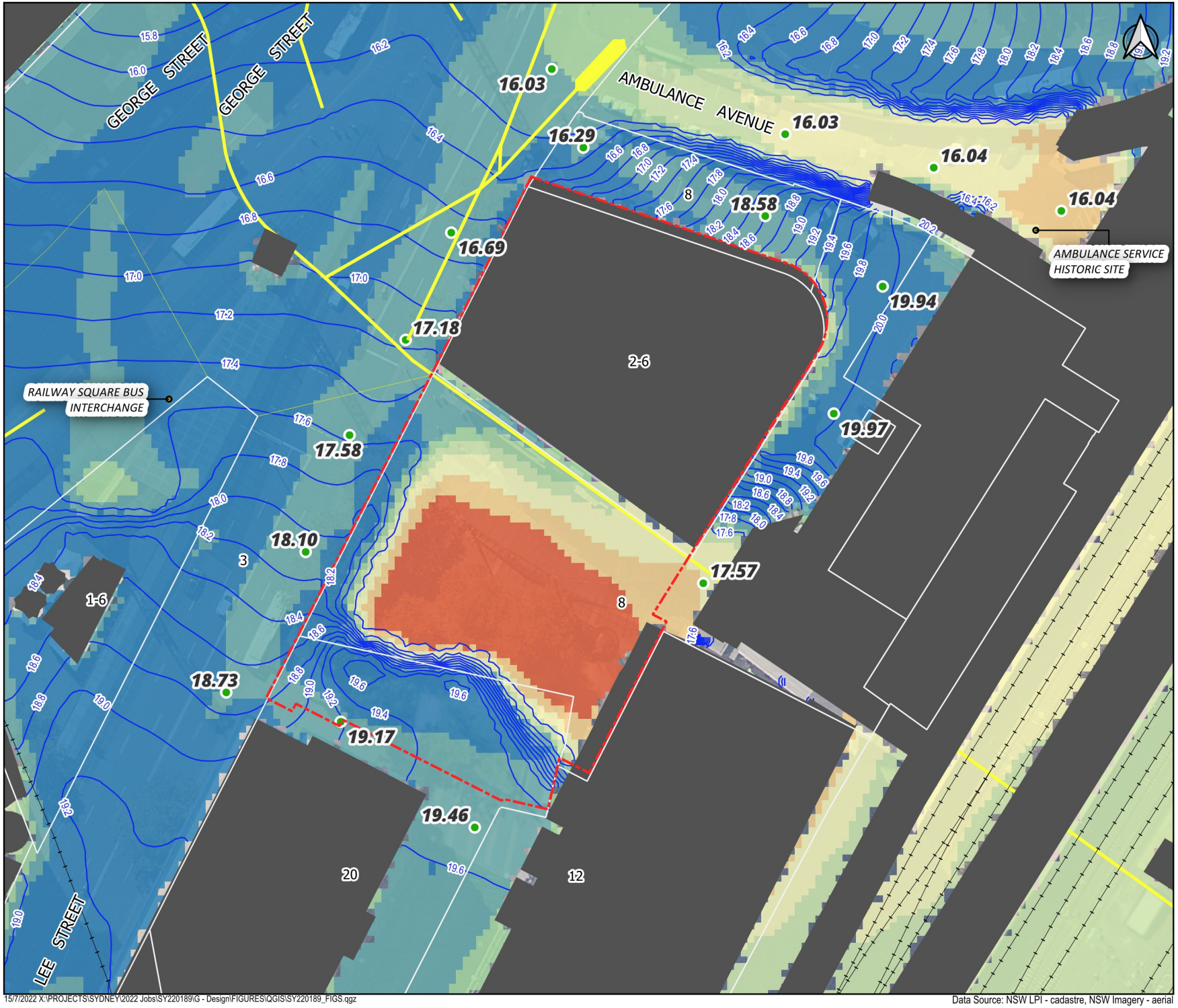
1:750

Figure B1

1% AEP Existing Depth and Elevation

Toga Central
2 Lee Street, Haymarket

NORTHROP



Legend

- Reporting Points
- Modelled Existing Buildings
- Existing Pipes

Depth (m)

- <= 0.02
- 0.02 - 0.10
- 0.10 - 0.25
- 0.25 - 0.50
- 0.50 - 1.00
- 1.00 - 1.50
- 1.50 - 2.00
- 2.00 >
- 0.2m Contours(mAHD)

0 10 20 Metres

1:750

Figure B2

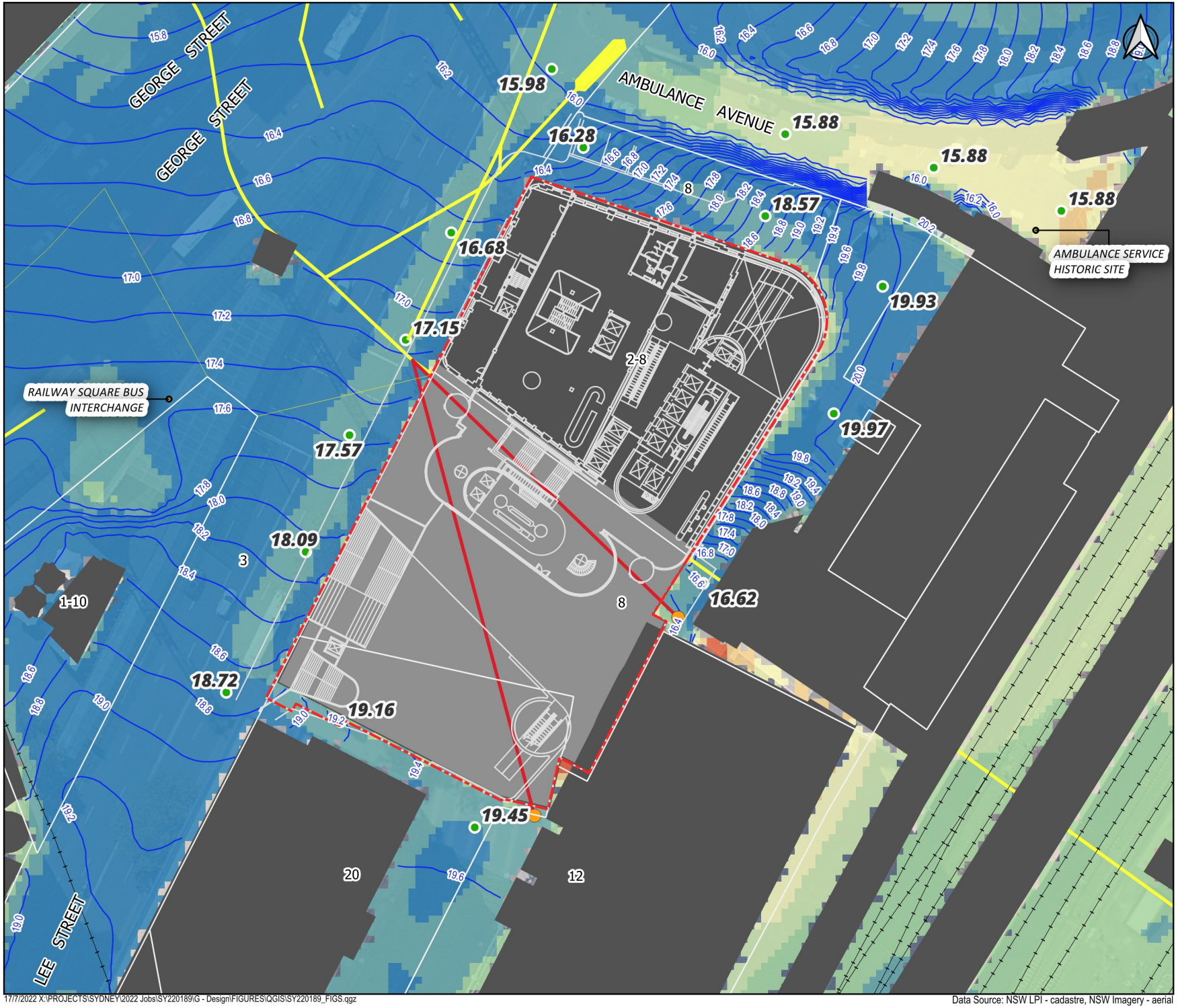
PMF Existing Depth and Elevation

Toga Central
2 Lee Street, Haymarket

NORTHROP

15/7/2022 X:\PROJECTS\SYDNEY\2022 Jobs\SY220189\G - Design\FIGURES\QGIS\SY220189_FIGS.qgz

Data Source: NSW LPI - cadastre, NSW Imagery - aerial



Legend

- Reporting Points
- Modelled Existing Buildings
- Proposed Building
- Existing Pipes
- Proposed Pits
- Proposed Pipes
- Ground Floor Plan

Depth (m)

- <= 0.02
- 0.02 - 0.10
- 0.10 - 0.25
- 0.25 - 0.50
- 0.50 - 1.00
- 1.00 - 1.50
- 1.50 - 2.00
- 2.00 >
- 0.2m Contours(mAHD)

0 10 20 Metres

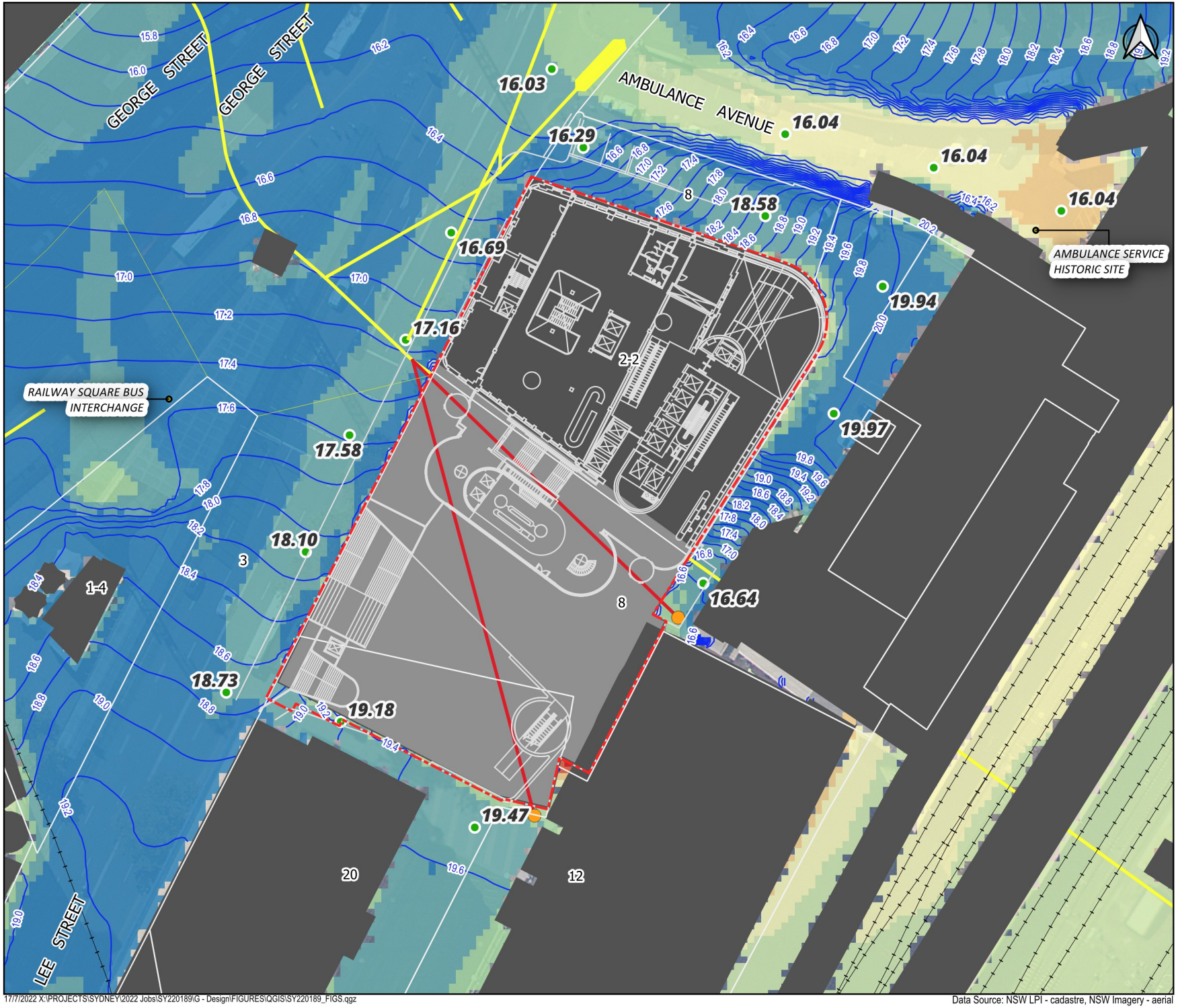
1:750

Figure C1

1% AEP Developed Depth and Elevation

Toga Central
2 Lee Street, Haymarket

NORTHROP



Legend

- Reporting Points
- Modelled Existing Buildings
- Proposed Building
- Existing Pipes
- Proposed Pits
- Proposed Pipes
- Ground Floor Plan

Depth (m)

- <= 0.02
- 0.02 - 0.10
- 0.10 - 0.25
- 0.25 - 0.50
- 0.50 - 1.00
- 1.00 - 1.50
- 1.50 - 2.00
- 2.00 >
- 0.2m Contours(mAHD)

0 10 20 Metres

1:750

Figure C2

PMF Developed Depth and Elevation

Toga Central
2 Lee Street, Haymarket

NORTHROP

17/7/2022 X:\PROJECTS\SYDNEY\2022 Jobs\SY220189\G - Design\FIGURES\QGIS\SY220189_FIGS.qgz

Data Source: NSW LPI - cadastre, NSW Imagery - aerial

Legend

- Reporting Points
- Modelled Existing Buildings
- Proposed Building
- Existing Pipes
- Proposed Pits
- Proposed Pipes
- Ground Floor Plan

Velocity (m/s)

- <= 0.5000
- 0.5000 - 1.0000
- 1.0000 - 1.5000
- 1.5000 - 2.0000
- > 2.0000

0 10 20 Metres

1:750

Figure C3

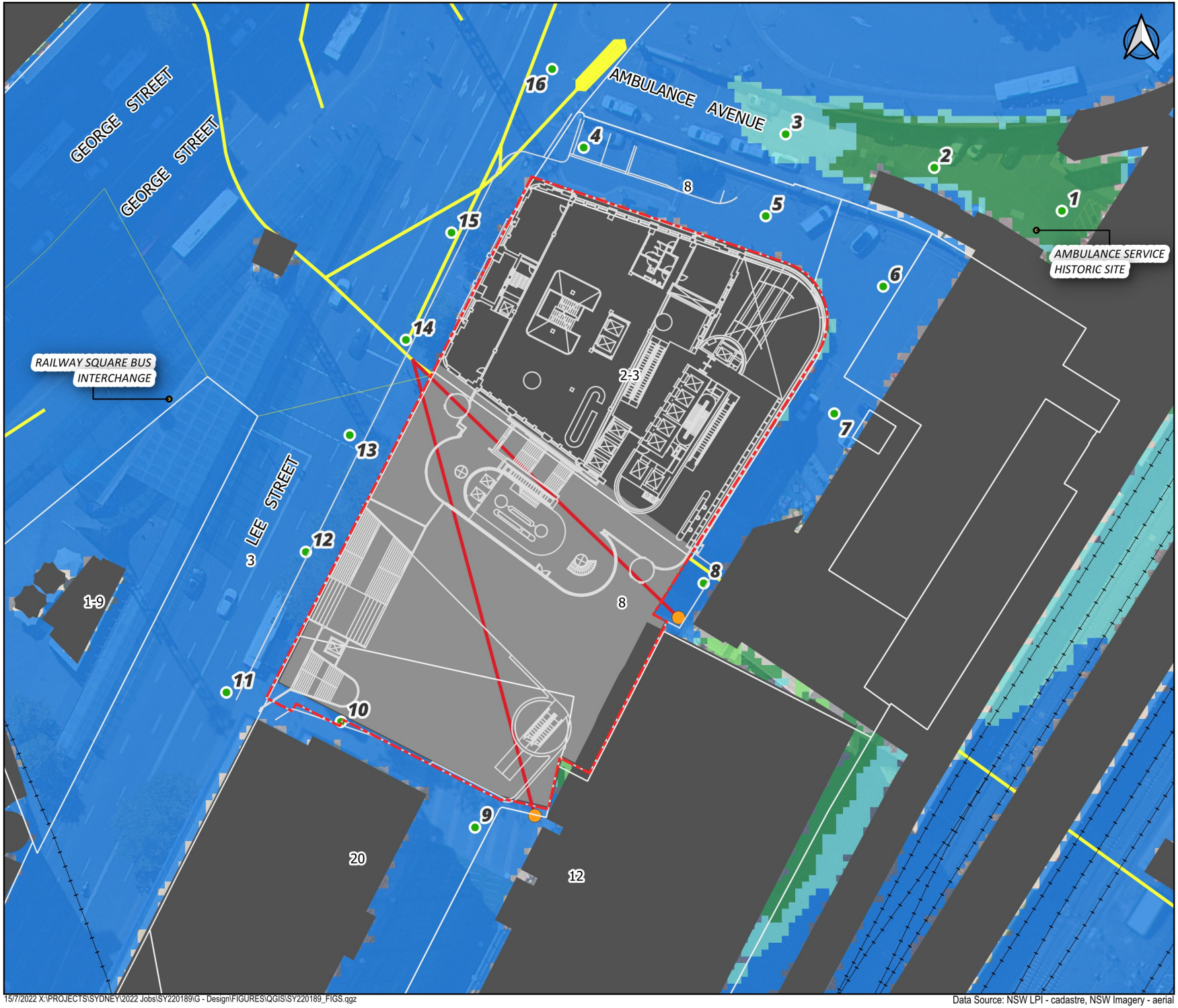
1% AEP Developed Velocity

Toga Central
2 Lee Street, Haymarket

NORTHROP

15/7/2022 X:\PROJECTS\SYDNEY\2022 Jobs\SY220189\G - Design\FIGURES\QGIS\SY220189_FIGS.qgz

Data Source: NSW LPI - cadastre, NSW Imagery - aerial



Legend

- Reporting Points
- Modelled Existing Buildings
- Proposed Building
- Existing Pipes
- Proposed Pits
- Proposed Pipes
- Ground Floor Plan

Hazard (ARR2019)

- H1
- H2
- H3
- H4
- H5
- H6

0 10 20 Metres

1:750

Figure C4

1% AEP Developed Hazard

Toga Central
2 Lee Street, Haymarket

NORTHROP

Data Source: NSW LPI - cadastre, NSW Imagery - aerial

Legend

- Reporting Points
- Modelled Existing Buildings
- Proposed Building
- Existing Pipes
- Proposed Pits
- Proposed Pipes
- Ground Floor Plan

Velocity (m/s)

- <= 0.5000
- 0.5000 - 1.0000
- 1.0000 - 1.5000
- 1.5000 - 2.0000
- > 2.0000

0 10 20 Metres

1:750

Figure C5

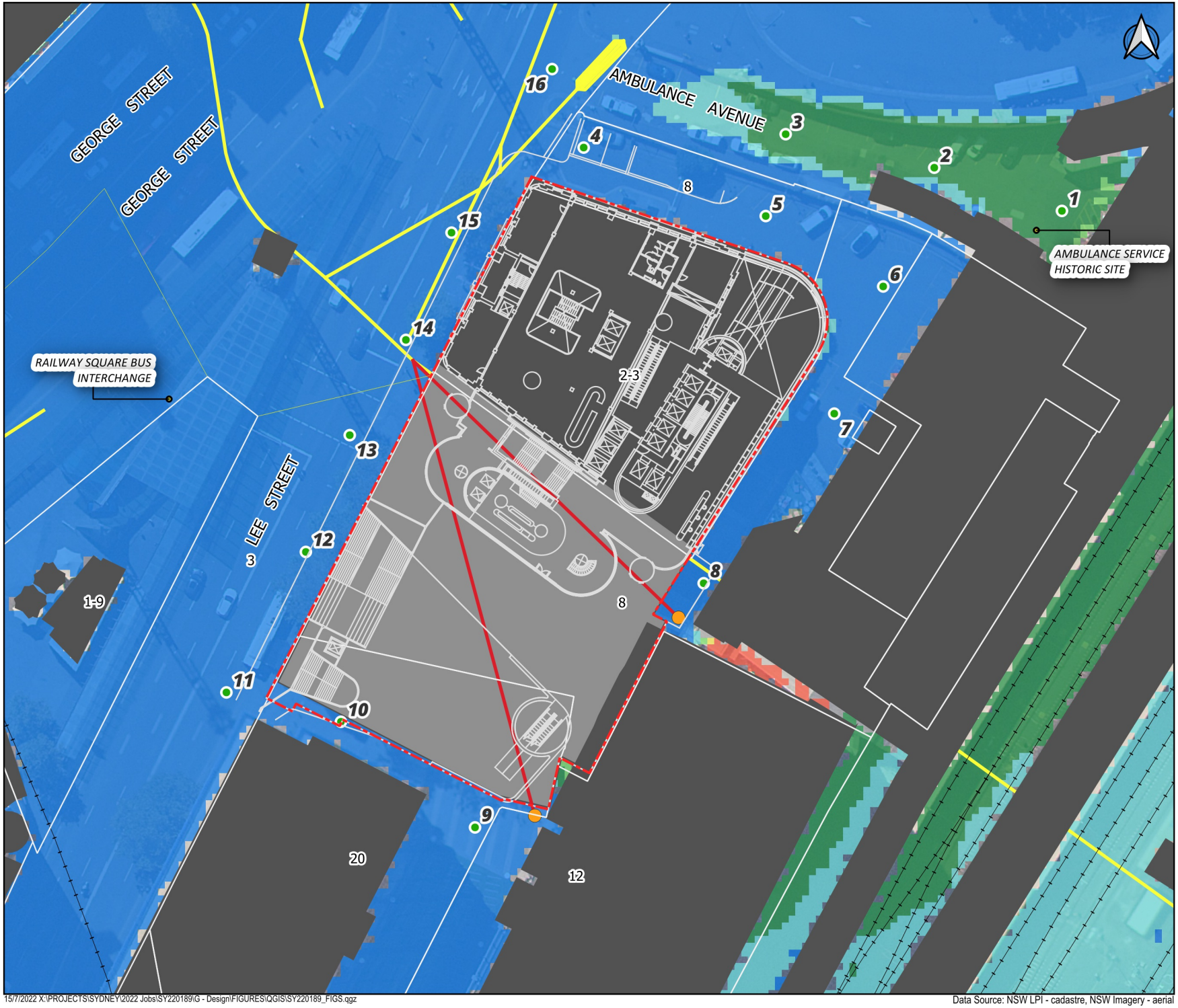
PMF Developed Velocity

Toga Central
2 Lee Street, Haymarket

NORTHROP

15/7/2022 X:\PROJECTS\SYDNEY\2022 Jobs\SY220189\G - Design\FIGURES\QGIS\SY220189_FIGS.qgz

Data Source: NSW LPI - cadastre, NSW Imagery - aerial



Legend

- Reporting Points
- Modelled Existing Buildings
- Proposed Building
- Existing Pipes
- Proposed Pits
- Proposed Pipes
- Ground Floor Plan

Hazard (ARR2019)

- H1
- H2
- H3
- H4
- H5
- H6

0 10 20 Metres

1:750

Figure C6

PMF Developed Hazard

Toga Central
2 Lee Street, Haymarket

NORTHROP

Data Source: NSW LPI - cadastre, NSW Imagery - aerial

4.7 Compliance Discussion

LEP

Table 2 - LEP response

Requirement	Response
(1) The objectives of this clause are as follows	
(a) to minimise the flood risk to life and property associated with the use of land,	Measures to minimise risk to property include setting of finished floor levels and flood protection to lower levels. These are summarized below in Table 6. Measures to minimise risk to life include selection of surface levels to be higher than predicted flood levels at entry points to the lower levels and providing opportunities to seek refuge on-site in all flood events at a higher level.
(b) to allow development on land that is compatible with the flood function and behaviour on the land, taking into account projected changes as a result of climate change,	The proposed development is compatible with the flood function of the land being generally flood fringe. Consideration has been given to the PMF in this context.
(c) to avoid adverse or cumulative impacts on flood behaviour and the environment,	No adverse or cumulative impacts are expected from the proposed development due to the existing urban and impervious context of the site. An integrated water cycle management plan report has also been prepared to address the stormwater requirements of the development (*IWCMP, Northrop (2022*).
(d) to enable the safe occupation and efficient evacuation of people in the event of a flood.	The subject site is primarily affected by local overland flow. The proposed development is likely to provide adequate refuge to facilitate vertical evacuation. This method of response is advocated in the *Darling Harbour Catchment Floodplain Risk Management Study (2016), WMA Water.*
(2) Development consent must not be granted to development on land the consent authority considers to be within the flood planning area unless the consent authority is satisfied the development	
(a) is compatible with the flood function and behaviour on the land, and	The proposed development is compatible with the flood function of the land being generally flood fringe.
(b) will not adversely affect flood behaviour in a way that results in detrimental increases in the	Flood impact has been considered and is outlined in Section 4.6. This concludes there are

Requirement	Response
potential flood affectation of other development or properties, and	no significant adverse impacts in adjacent properties in a 1% AEP flood event.
(c) will not adversely affect the safe occupation and efficient evacuation of people or exceed the capacity of existing evacuation routes for the surrounding area in the event of a flood, and	The subject site is primarily affected by local overland flow. The proposed development provides opportunity for on-site refuge within the levels above those interfacing with Lee Street. This is otherwise known as vertical evacuation. This method of response is advocated in the *Darling Harbour Catchment Floodplain Risk Management Study (2016), WMA Water.* Detail regarding areas for assembly and emergency response procedures are to be explored during design development.
(d) incorporates appropriate measures to manage risk to life in the event of a flood, and	The development provides on-site refuge to minimise the risk to life. Given the managed nature of the site, there is opportunity to implement private Flood Emergency Response Plans (FERP) to raise awareness of flooding and suggest response measures.
(e) will not adversely affect the environment or cause avoidable erosion, siltation, destruction of riparian vegetation or a reduction in the stability of riverbanks or watercourses.	The development is unlikely to affect erosion and siltation from a flooding perspective. A water cycle management plan report has also been prepared to address the stormwater requirements of the development (*IWCMP, Northrop (2022*).
(3) In deciding whether to grant development consent on land to which this clause applies, the consent authority must consider the following matters	
(a) the impact of the development on projected changes to flood behaviour as a result of climate change,	The PMF has been considered as a climate change condition. Due to the low difference between this event and the 1% AEP, we believe the increase in rainfall intensity due to climate change will not significantly affect the flood protection measures proposed.
(b) the intended design and scale of buildings resulting from the development,	The scale of the proposed development is consistent with the wider precinct proposal.
(c) whether the development incorporates measures to minimise the risk to life and ensure the safe evacuation of people in the event of a flood,	The development provides on-site refuge to minimise the risk to life. Given the managed nature of the site, there is opportunity to implement private Flood Emergency Response Plans (FERP) to raise awareness of flooding and suggest response measures.

Requirement	Response
(d) the potential to modify, relocate or remove buildings resulting from development if the surrounding area is impacted by flooding or coastal erosion.	The subject site is not in proximity to the coast. It is likely buildings could potential be removed if impacted by flooding in the future. This is unlikely.

DCP

Table 3 - DCP response

Reference Clause	Requirement	Response	Compliant
3.7 (c)	Assist in the management of stormwater to minimise flooding and reduce the effects of stormwater pollution on receiving waterways.	Flood impact has been considered and is outlined in Section 4.6.	**Yes**
3.7 (d)	Ensure that development manages and mitigates flood risk, and does not exacerbate the potential for flood damage or hazard to existing development and to the public domain.	Flood impact has been considered and is outlined in Section 4.6. Floor levels and protection is considered below in Section 4.8. The development provides on-site refuge to minimise the risk to life. Given the managed nature of the site, there is opportunity to implement private Flood Emergency Response Plans (FERP) to raise awareness of flooding and suggest response measures.	**Partial – Comments in Section 4.8**
3.7 (e)	Ensure that development above the flood planning level as defined in the Sydney LEP 2012 will minimise the impact of stormwater and flooding on other developments and the public domain both during the event and after the event.	Flood impact has been considered and is outlined in Section 4.6.	**Yes**
3.7 (f)	Ensure that flood risk management addresses public safety and protection from flooding.	Floor levels and protection is considered below in Section 4.8. The development provides on-site refuge to minimise the risk to life. Given the managed nature of the site, there is opportunity to implement private Flood Emergency Response	**Partial – Comments in Section 4.8**

Reference Clause	Requirement	Response	Compliant
		Plans (FERP) to raise awareness of flooding and suggest response measures.	
3.7.1	Site specific flood study	The subject site is covered by a regional flood model. A site-specific model has been prepared with reference to this study.	**Yes**

Interim Floodplain Management Policy

Table 4 - Interim Floodplain Management Policy response

Reference Clause	Requirement	Response	Compliant
Section 3 Performance criteria	• If a proposal does not meet the requirements of the relevant Prescriptive Provisions (Section 4), consent must not be granted to development unless the consent authority is satisfied with the following the provision and assessment of information relating to the development.	An assessment of the Prescriptive Provisions (Section 4) is undertaken below. A performance-based assessment is presented in Section 4.8.	**Yes**
Section 4 General Requirements Fencing	• Fencing is to be designed and constructed in such a manner that it will not modify the flow of floodwaters and cause damage to surrounding land.	The public domain minimises the use of fencing, and where this has been incorporated, it is of an open style where there is potential to modify the overland flow path.	**Yes**
Section 4 General Requirements Industrial and Commercial Properties	• The City may consider merits-based approaches presented by the applicant. The proposed industrial or commercial buildings must meet the Flood Planning Level Requirements detailed in Section 5; and • The proposed industrial or commercial development should not increase the likelihood of flooding on other developments, properties or infrastructure.	Existing floor levels to be maintained in the heritage building. Clause 3.3 notes the balance of heritage with flooding for floor levels. Lower floor levels to be protected to the PMF plus nominal freeboard to minimise the likelihood of flood ingress. The development does not show significant adverse impacts in flood levels off-site. A direct connection to the existing	**Yes**

Reference Clause	Requirement	Response	Compliant
		Sydney Water infrastructure is proposed. Refer to Northrop IWCMP Report (2022) for further details.	
Section 4 General Requirements Car parking	• The proposed car park should not increase the risk of vehicle damage by flooding inundation; • The proposed garage or car park should not increase the likelihood of flooding on other developments, properties or infrastructure; • The proposed garage or car park must meet the Flood Planning Level Requirements detailed in Section 5; and • Open car parking - The minimum surface level of open space car parking subject to inundation should be designed giving regard to vehicle stability in terms of depths and velocity during inundation by flood waters. Where this is not possible, it shall be demonstrated how the objectives will be met.	The proposed basement is protected to the PMF.	**Partial – Comments in Section 4.8**
Section 4 General Requirements Filling of Flood Prone Land	• Unless a floodplain risk management plan for the catchment has been adopted, which allows filling to occur, filling for any purpose, including the raising of a building platform in flood-prone areas is not permitted without Council approval. Application for any filling must be supported by a flood assessment report from a suitably qualified engineer which certifies that the filling will not increase flood affectation elsewhere.	Additional building extents have the potential to obstruct flow and stormwater systems should be designed to adequately convey water around the development and away from internal floor levels. This will be accounted for in design development. It is considered compliant at this stage on the basis there are likely to be several engineering solutions available.	**Yes**

Reference Clause	Requirement	Response	Compliant
Section 4 General Requirements On-site Sewer Management	• The treatment facility must be located above the 1% AEP flood level and must comply with Flood Planning Level requirements, or are otherwise protected and may function if below this level.	No on-site sewer treatment works are proposed.	Not applicable
Section 4 General Requirements Storage of Hazardous Substances	• The storage of products which, in the opinion of the City, may be hazardous or pollute floodwaters, must be placed above the 1% AEP flood level or placed within an area protected by bunds or levels such that no flood waters can enter the bunded area and must comply with the Flood Planning Level requirement for such a facility.	Garbage and storage rooms are located in areas protected to at least the 1% AEP. Refer to Table 6 for a summary of ingress points.	**Yes**
Section 4 General Requirements Climate Change	• For those developments which have a lifespan of more than fifty years the impact due to sea level rise and impacts due to increased rainfall intensities shall be considered. • Meet the allowances for sea level rise as recommended in the NSW Government Coastal Planning Guideline: Adopting Sea Level Rise 2010 (recently withdrawn from publication). Specifically, this shall include and allowance of 40cm by 2050 and a 90cm by 2100 from the 2009 Mean Sea Level. • Where in the opinion of the City the proposed development is of reasonable impact to regional or catchment trunk drainage, the drainage system design shall allow	Protection has been provided to the PMF. This is an order of magnitude higher in change of intensity compared to the 1% AEP and this has been used as a proxy for climate change.	**Yes**

Reference Clause	Requirement	Response	Compliant
	for a minimum of 10% increased rainfall.		
Section 5 Flood Planning Level Industrial or Commercial Retail Floor Levels	Merits approach presented by the applicant with a minimum of the 1% AEP flood. The proposal must demonstrate a reasonable balance between flood protection and urban design outcomes for street level activation.	Existing floor levels to be maintained in the heritage building. This is considered acceptable under the policy which allows for merit assessment of heritage structures. Lower floor levels to be protected to the PMF plus nominal freeboard to minimise the likelihood of flood ingress.	**Partial – Comments in Section 4.8**
Section 5 Flood Planning Level Below ground carparking	1% AEP flood level plus 500mm freeboard or the PMF (whichever is the higher). This applies to all possible ingress points (vehicle entrance /exit, lift shaft, risers, stairwells, ventilation, windows)	The proposed basement is protected to the PMF.	**Partial – Comments in Section 4.8**
Section 6 Flood compatible materials	A selection of flood compatible material is outlined on page 15 of the policy.	The building is of robust construction, and it is considered feasible to implement flood compatible material in the final building palette.	**Yes**

Western Gateway Sub-Precinct Design Guide

Table 5 - Western gateway sub-precinct design guide response

Reference Clause	Requirement	Response	Compliant
3.4.2 (2)	Development is to manage and mitigate flood risk and must not exacerbate the potential for flood damage or hazard to development and to the public domain (including publicly accessible managed space).	Measures to mitigate flood risk to property and life are proposed. An assessment of the development impact has been undertaken and it was determined the development is unlikely to increase flood impacts in the 1% AEP.	**Yes**
3.4.2 (5)	Building flood planning levels will be set above the 1% AEP flood level.	Flood protection is provided to the 1% AEP. This has been selected based on the heritage nature of the development.	**Yes**
3.4.2 (6)	Car park entrances are ramped up to above the 1% AEP flood	Lower floor levels to be protected to the PMF plus	**No – Comments**

Reference Clause	Requirement	Response	Compliant
	level + 0.5m, or the probable maximum flood level (whichever is the higher).	nominal freeboard to minimise the likelihood of flood ingress. This is lower than the 1% AEP + 500mm freeboard. The alternative has been proposed because of the low difference between the 1% AEP and PMF in entry locations.	in Section 4.8

4.8 Performance-based Assessment

City of Sydney DCP Template

a) *is compatible with the established flood hazard of the land. In areas where flood hazard has not been established through previous studies or reports, the flood hazard must be established in accordance with the Floodplain Development Manual considering the following:*
   - *i) Impact of flooding and flood liability is to be managed ensuring the development does not divert floodwaters or interfere with flood storage or the natural function of the waterway;*
   - *ii) Flood behaviour (for example, flood depths reached, flood flow velocities, flood hazard, rate of rise of floodwater);*
   - *iii) Duration of flooding for a full range of events;*
   - *iv) Appropriate flood mitigation works;*
   - *v) Freeboard;*
   - *vi) Council's duty of care – Proposals to address or limit; and*
   - *vii) Depth and velocity of flood waters for relevant flood events.*

The flood hazard has been established using Council and site specific flood studies as discussed above. The development proposes retail areas set or protected to the 1% AEP and basement areas protected to the PMF plus a nominal 100mm freeboard. We believe this approach is appropriate as it allows for a theoretical event several orders of magnitude rarer than the 1% AEP and provides an allowance for wave action for vehicles traversing flood waters. A summary of the potential access points for flood water as part of the TOGA and Atlassian developments is presented below in Table 6.

b) *will not significantly adversely affect flood behaviour resulting in detrimental increases in the potential flood affectation of other development or properties.*

The impact has been estimated as negligible in the 1% AEP event.

c) *incorporates appropriate measures to manage risk to life from flood considering the followings:*
   - *i) The proposed development should not result in any increased risk to human life*
   - *ii) Controls for risk to life for floods up to the Flood Planning Level*
   - *iii) Controls for risk to life for floods greater than the Flood Planning Level*
   - *iv) Existing floor levels of development in relation to the Flood Planning Level and floods greater than the Flood Planning level*
   - *v) Council's duty of care – Proposals to address and limit*
   - *vi) What level of flooding should apply to the development e.g., 1 in 100 year, etc.*
   - *vii) Effective flood access and evacuation issues*
   - *viii) Flood readiness – Methods to ensure relative flood information is available to current and future occupants and visitors.*

Flood protection has been incorporated to minimize risk to property. Due to the managed nature of the development, it is considered feasible to implement private FERPs to manage risk to life. On-site refuge is provided to facilitate vertical evacuation in a flood event. This on-site refuge is evident due to the high-rise nature of the development. Specifics of refuge locations can be identified during design development.

d) *will not significantly adversely affect the environment or cause avoidable erosion, siltation, destruction of riparian vegetation or a reduction in the stability of creek or channel banks or watercourses.*

It is not expected the development will result in these impacts due to the existing disturbed nature of the site.

e) is not likely to result in unsustainable social and economic costs to the community as a consequence of flooding.

It is not expected the development will result in these impacts due to the existing disturbed nature of the site.

f) is consistent with the principles of Ecologically Sustainable Development; and

This is considered by others.

g) adequately considers the impact of climate change.

The development considers the PMF as a proxy for climate change. Whilst Council's study considers a 30% increase from the 1% AEP for climate change, the PMF is several orders of magnitude rarer and well over a 100% increase in rainfall intensity. Given the small difference in flood level, we believe the development has the capacity to respond to increased rainfall intensity due to climate change.

Flood Protection at Potential Ingress Points

The following Table 6 is a summary of potential ingress points considered as part of this assessment. We note there may be additional ingress points introduced as design development progresses and adjoining developments and regional schemes are finalised. An assessment of flood protection should be carried out prior to construction documentation being finalised to capture this additional information.

Table 6 - Flood ingress points

Point	Reference	Threshold Elevation (m AHD)	1% AEP Level (m AHD)	PMF Elevation (m AHD)	Comments
A	Lee Street South Stairs	18.84	18.60	18.61	Landscape drawings show level at top of stairs. 230mm freeboard to PMF.
B	Lee Street Service Access	17.98	17.79	17.81	Landscape drawings show level adjacent to doorway. 170mm freeboard to PMF.
C	Lee Street Central	17.50	17.39	17.40	Internal floor level which includes openings to lower levels. 100mm freeboard provided to PMF.
D	Existing Adina Lee Street	22.89	16.68	16.69	Complies with flood planning level of higher of 1% AEP plus 500mm freeboard or PMF.
E	Existing Adina North	22.89	19.93	19.94	Opening removed as part of scheme.
F	Heritage Windows	Varies	Varies	Varies	Windows to be replaces and designed to resist the force of floodwater and debris.
G	Atlassian Basement Ramp	16.15	16.28	16.29	Non-compliant without additional protection. A self-activated floodgate is proposed in this location to protect the basement to

Point	Reference	Threshold Elevation (m AHD)	1% AEP Level (m AHD)	PMF Elevation (m AHD)	Comments
					the Flood Planning Level of the 1% AEP plus 500mm freeboard. It is noted in the TTW report this is a temporary arrangement once alternative basement access is proposed and this area will have stairs going to a higher level, removing this point of potential ingress.
H	Atlassian Link Entry Ambulance Avenue	15.35	15.88	16.04	The TTW report notes stormwater augmentation in Ambulance Avenue which lowers the 1% AEP to 14.95m AHD and the PMF to 15.45m AHD. The lower ground level from the Atlassian development raises internally to 15.45m AHD which complies with the flood planning level requirements of 1% AEP plus 500mm freeboard or the PMF. The subject site has a lower ground of 16m AHD and is higher than the adjoining lower ground level. This relies on the stormwater augmentations carried out by either TfNSW or Atlassian.

5. Conclusion

Northrop Consulting Engineers has prepared this Flood Risk Assessment report in response to SEARs Item No. 16.

We note that the primary outcomes of this stormwater scheme are as follows:

- **Flood Impacts** – the development results in no significant impacts to flooding in the 1%AEP. This has been achieved through discharge to the Sydney Water trunk drainage line running through the site.
- **Risk to Property** – Risk to property has been minimised through selection of finished floor levels, threshold levels and flood protection walls.
- **Risk to Life** – Risk to life has been minimised through selection of entry levels to lower levels, provision of on-site flood refuge, and potential to implement a flood emergency response plan for the development.