APPENDIX D

Flood Impact Assessment Report

Prepared by:

Stormflood Engineering

FLOOD IMPACT ASSESSMENT REPORT

Proposed Mixed-Use Development
15 Anderson Street, Fortitude Valley QLD
Prepared for Property Projects Australia

Ref: SF-21-0149-002
Revision 1.2

Prepared by Stormflood Engineering Pty Ltd

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RPEQ Certification

As a Registered Professional Engineer of Queensland (RPEQ), engaged on behalf of Stormflood Engineering Pty Ltd, I certify that based on the provided data, and/or modelling undertaken as part of this projects requirements, that the assessment has been undertaken in accordance with the relevant assessment authorities, and in accordance with current engineering best practices.

RPEQ Name	RPEQ Number	Document Version	Signature
Martin Roushani-Zarmehri	22549	1.2	

Stormflood Engineering Pty Ltd
ACN: 92 641 668 484

L2/194 Varsity Parade
Varsity Lakes
QLD 4227

Email: Martin@Stormfloodeng.com
Website: www.stormfloodeng.com
Mobile: 0420 983 901

1 Executive Summary

This Flood Impact Assessment (FIA) Report has been prepared to outline the overland flood modelling approach and assessment undertaken to determine the suitability of a proposed mixed-use development for a Material Change of Use (MCU) at 15 Anderson Street, Fortitude Valley.

The anticipated major overland flow path has been modelled, to provide recommendations to Property Projects Australia. This assessment determines how to manage the flooding implications and provide a suitable floor level, to support a Development Application to Economic Development Queensland (EDQ), with consideration of the Brisbane City Council (BCC) Planning Scheme.

The BCC 'Central' sub-model for overland flooding has been adopted and updated for the purposes of a site-based assessment. Accordingly, it has been concluded that the proposed development is not deemed to create adverse impacts external to the site, during the BCC major design AEP overland flow event, and therefore no further investigation is required into overland flooding impacts.

It is noted that the proposed development has taken into consideration blockage of the downstream drainage system and the deemed level of overland ponding possible at the road frontage. The overall strategy is deemed to be appropriately designed in accordance with BCC's Flood Planning Scheme Policy requirements.

A flood hazard assessment has also been undertaken for the site to demonstrate flood risks within and external to the site. Overall, it has been determined that the flood risks are contained within the council road reserve, and nuisance impacts are not worsened externally.

This report outlines the adopted data, modelling approaches and outcomes which allows the above conclusion to be derived.

2 Background

2.1 General Information

Stormflood Engineering Pty Ltd has been commissioned by Property Projects Australia (here within the client) to undertake an overland flood assessment of the proposed development at 15 Anderson Street, Fortitude Valley, to determine its suitability for a Development Application to EDQ.

2.2 Assessment Objectives

This Flood Impact Assessment aims to assess the implications of the proposed development by undertaking modelling of the major peak design (2% AEP) overland flow path and determining the required considerations for the proposed development with regards to overland flooding impacts.

This assessment is limited to the information provided by the client and publicly available information by the Local Government Authority, being BCC and all other relevant government authorities.

3 Site Information

3.1 Site Background

The subject site is located at 15 Anderson Street, Fortitude Valley, formally known as L10 on SP208752 (here within known as the 'Subject Site'), which is within BCC LGA boundaries. The total subject site area is 0.2896ha (Source: BCC Interactive Mapping).

An aerial image of the site, surrounding properties and roads have been shown in Figure 1 below. The BCC City Plan 2014 Overland Flow Flood Planning Area has also been highlighted within Figure 1.

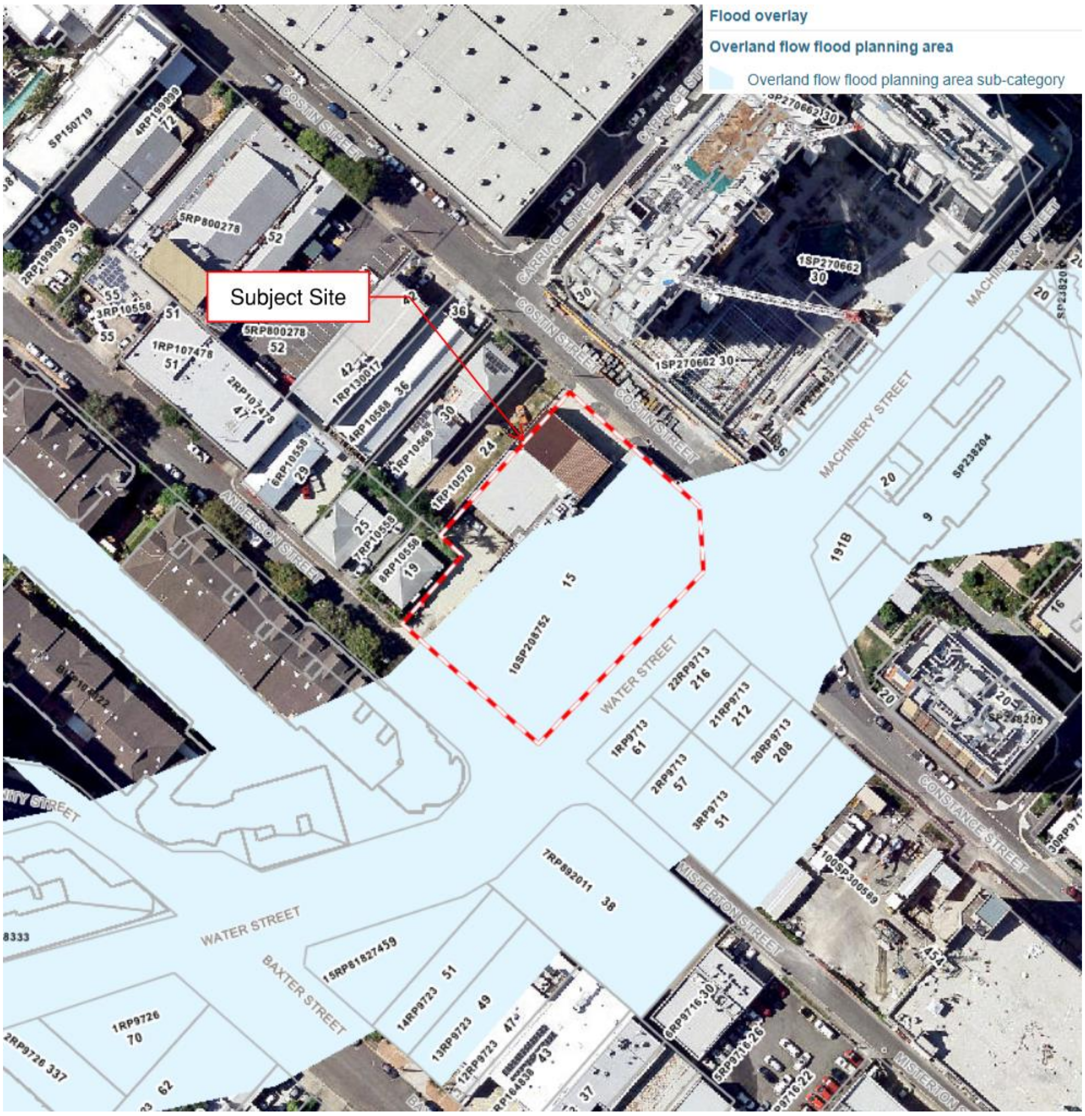


Figure 1: Aerial Imagery and BCC Overland Flow Flood Planning Area (Source: BCC)

3.2 Site Characteristics

Based off Publicly Available 2014 LiDAR Data, the site ranges from approximately RL 7.60mAHD to RL 9.80mAHD, with the lowest point of the site and deemed major Lawful Point of Discharge being the eastern corner of the site.

The subject site currently contains a set of commercial buildings, noting that the site has brick blockwork currently on the lowest side of the site to the boundary, as illustrated in Figure 2. Water Street is deemed to convey the major overland flow along the site frontage, which eventuates to an urban stormwater mitigation structure across from the site, as shown below in Figure 3. It is noted the current overland flow flood mapping does not consider this structure, however the updated flood assessment has considered this in the modelling.

Figure 2: Site Frontage (Source: Google Street View)

Figure 3: Urban Mitigation Structure – Machinery Street (Source: Google Street View)

3.3 Proposed Development

The proposed development is to comprise of a mixture of commercial properties at the ground level and residential units for the upper levels. The development includes multiple basement levels, driveway access, landscaping and rooftop garden. The current BCC City Plan demonstrates a flood planning overlay over the site and therefore consideration will be provided for overland flooding in accordance with BCC's Flood PSP requirement by providing:

- Freeboard considerations for the proposed development;
- Adhere to the minimum flood levels for flood resilience purposes; and
- Watertight structures around the perimeter of retaining structures (where applicable).

3.4 Adopted Data

In order to provide an adequate post-development hydraulic assessment for the site, the following data has been adopted for analysis:

- *Brisbane City Council Citywide Creek and Overland Flow Path Mapping – Final Report*, dated April 2017;
- Brisbane City Council's Citywide 'Central' Overland Flow Model (via data agreement);
- *Proposed Plans by Telha Clarke Architecture – 15 Anderson Street, Fortitude Valley*; and
- BCC City Plan 2014, Interactive Mapping and GIS Open Data.

4 Overland Flood Assessment

4.1 Methodology

In order to demonstrate the levels and extents of the anticipated overland flow path through the site, the following assumptions and model parameters have been adopted within the TUFLOW model.

4.1.1 Hydrology

Direct Rainfall modelling has been adopted as per the adopted BCC Citywide Overland Flow Path model, which adopts the ARR1987 rainfall data by BCC. This method is the preferred method, given the topography of the region, and ability to demonstrate concentration of flows within the area of interest.

An initial set of coarse-grid fast models were run and post-processed to confirm the critical duration for the site. It has been determined that the 60-minute duration in the 2% AEP design event dominated the site frontage, which was anticipated as per the BCC Citywide Overland Flow Path report, and hence was adopted as the critical duration for the 2% AEP assessment moving forward.

For an appreciation of the contributing catchment area, noting that a larger area was considered within the TUFLOW model, a contributing catchment topographical map has been provided below in Figure 4.

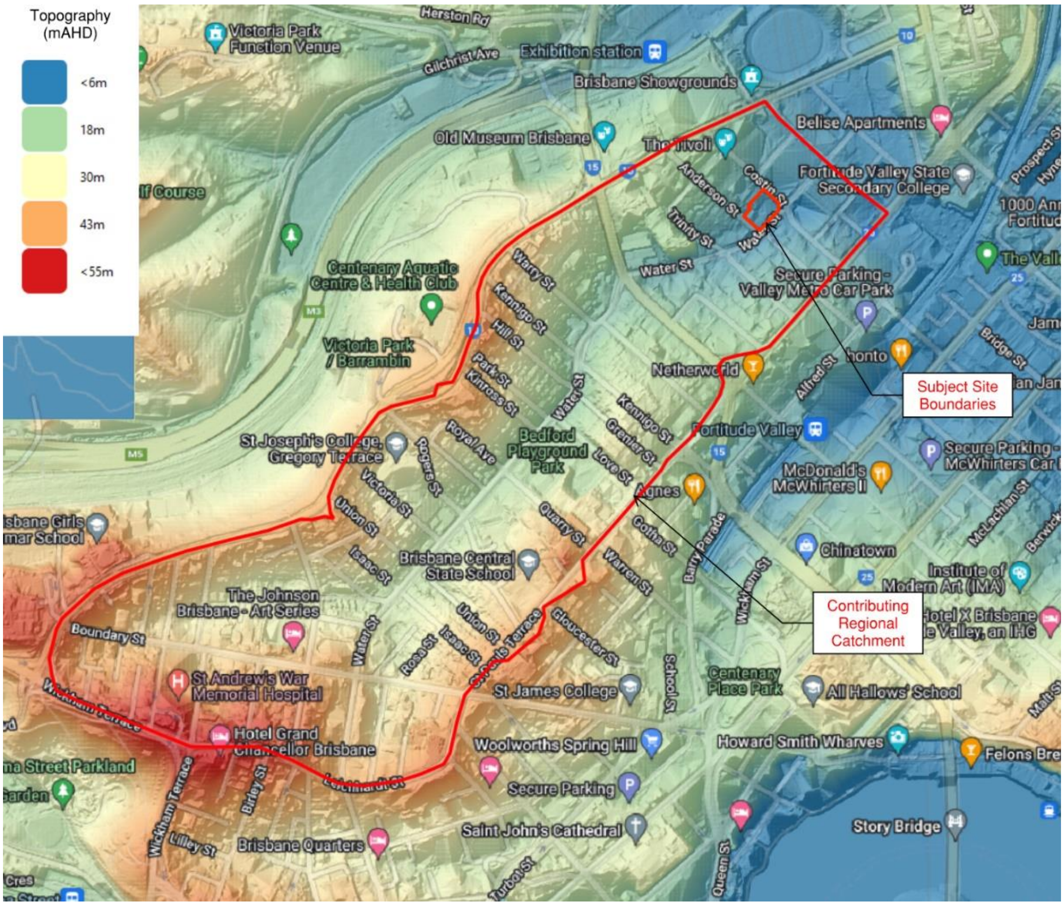


Figure 4: Contributing Catchment Topography (Source: DNRM LiDAR Data)

4.1.2 TUFLOW Hydraulic Model

The BCC Citywide Overland Flood 'Central' TUFLOW model (here within the 'BCC flood model') was adopted and updated to demonstrate the peak flood event's flood characteristics through the site, in accordance with industry standards. The model parameters have been summarised below.

4.1.3 Topography

The site has adopted the provided 2014 LiDAR data and the 2d_zsh topographical amendments as per the BCC flood model as the baseline model topography, with an adopted grid cell size of 2m.

An initial 5m grid cell size was run to determine the critical duration for the site across multiple durations, and also a 1m grid cell scenario was run to determine if there were any sensitivity in levels, however no noticeable changes were noted and therefore the default 2m cell size was deemed appropriate to adopt.

Minor amendments were undertaken to include the obstructive building form within the site, as well the surrounding building forms that are deemed obstructive to the incoming flows. This was based off a topography and street view analysis of built forms in the region.

The adopted obstructions within the region have been illustrated below in Figure 5 for an appreciation of the existing building obstructions modelled within and around the site.

Figure 5: Modelled Obstructions - Pre-Development Scenario (Source: TUFLOW Model)

An assessment of the proposed development has determined that a flood impact assessment is not deemed required, given the site aims to reduce the existing building footprint on the Water Street frontage, where peak overland flooding occurs from the regional catchment, by providing landscaping areas in this area. This reduction in building boundary, is deemed to reduce peak water levels along the site by some degree.

The trapped overland flows at the rear of the building are a result of the direct rainfall approach, and therefore not relevant to this assessment.

4.1.4 2D Surface Roughness and Adopted Infiltration Roughness

The roughness has been retained as per the BCC Flood Model data. Manning's 'n' roughness values were applied across the 2D grid based on land use. The study area was delineated based on the following land uses, manning's values and adopted infiltration values (Initial Losses and Continuing Losses):

- Buildings n = 0.013 < 0.02m, 0.10 > 0.05m IL = 0mm CL=0mm/hr
- Open Ground n = 0.2 < 0.02m, 0.029 > 0.09m IL = 0mm CL=1.5mm/hr
- Vegetation n = 0.2 < 0.02m, 0.10 > 0.09m IL = 0mm CL=1.5mm/hr
- Road Pavement n = 0.017 IL = 0mm CL=0mm/hr
- Bare Earth n = 0.1 < 0.02m, 0.035 > 0.09m IL = 0mm CL=1.5mm/hr
- Backyard n = 0.2 < 0.02m, 0.15 > 0.09m IL = 0mm CL=1.5mm/hr
- Water n = 0.02 IL = 0mm CL=0mm/hr

A visual representation has been provided in Figure 6 for an appreciation of the adopted manning's n roughness and losses applied to the catchment.

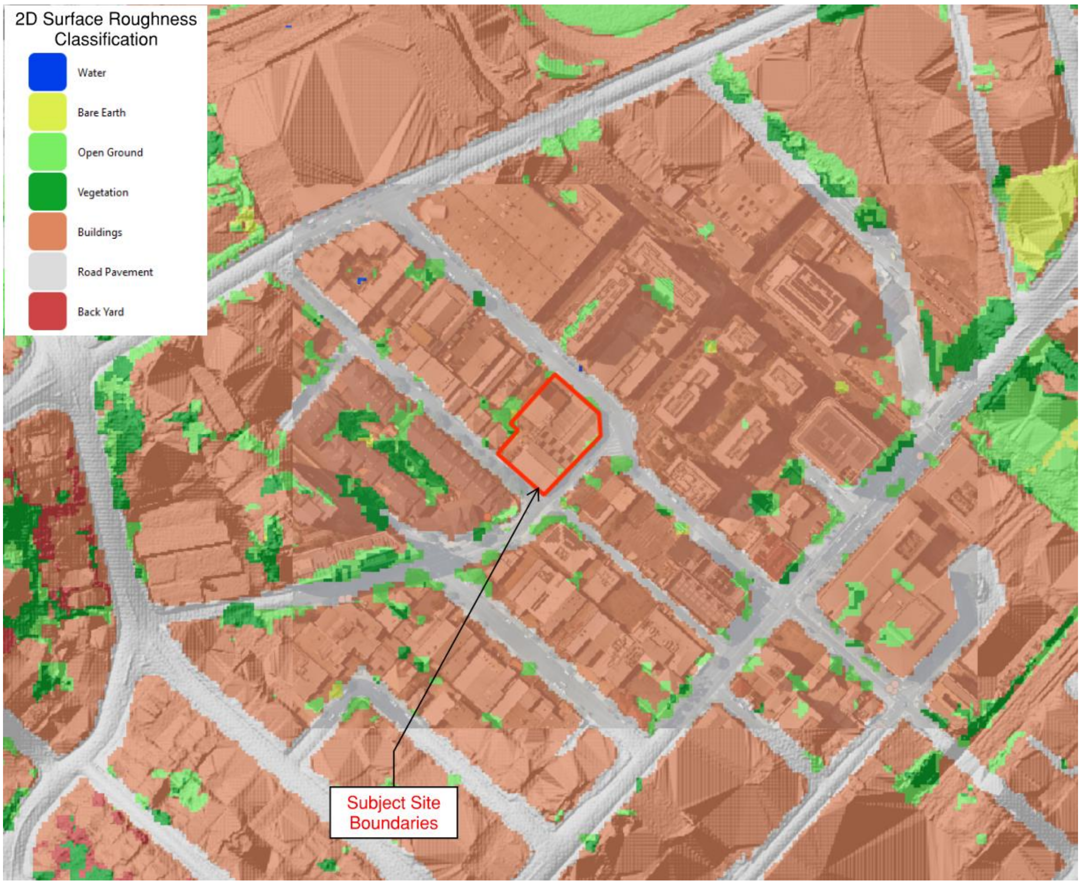


Figure 6: Adopted 2D manning's n roughness

4.1.5 Boundary Conditions

As noted previously, the model adopted a Direct Rainfall approach, with the design rainfall data provided via the BCC TUFLOW model data.

The TUFLOW model area has been reduced for a more efficient runtime, as illustrated in Figure 7 below.

A free outfall tailwater level condition has been adopted at the low points of the regional catchment boundary, as this is deemed appropriate given the type of assessment.

4.1.6 Hydraulic Infrastructure

Hydraulic infrastructure pertinent to the study area were included and retained as per the BCC Flood model, within the hydraulic model, being the existing BCC trunk infrastructure around the site. A virtual pit and pipe approach was adopted and retained.

It is noted that for the peak level determination for flood planning levels, the <u>no stormwater infrastructure scenario</u> was adopted (ie. 100% Blockage), as a conservative approach.

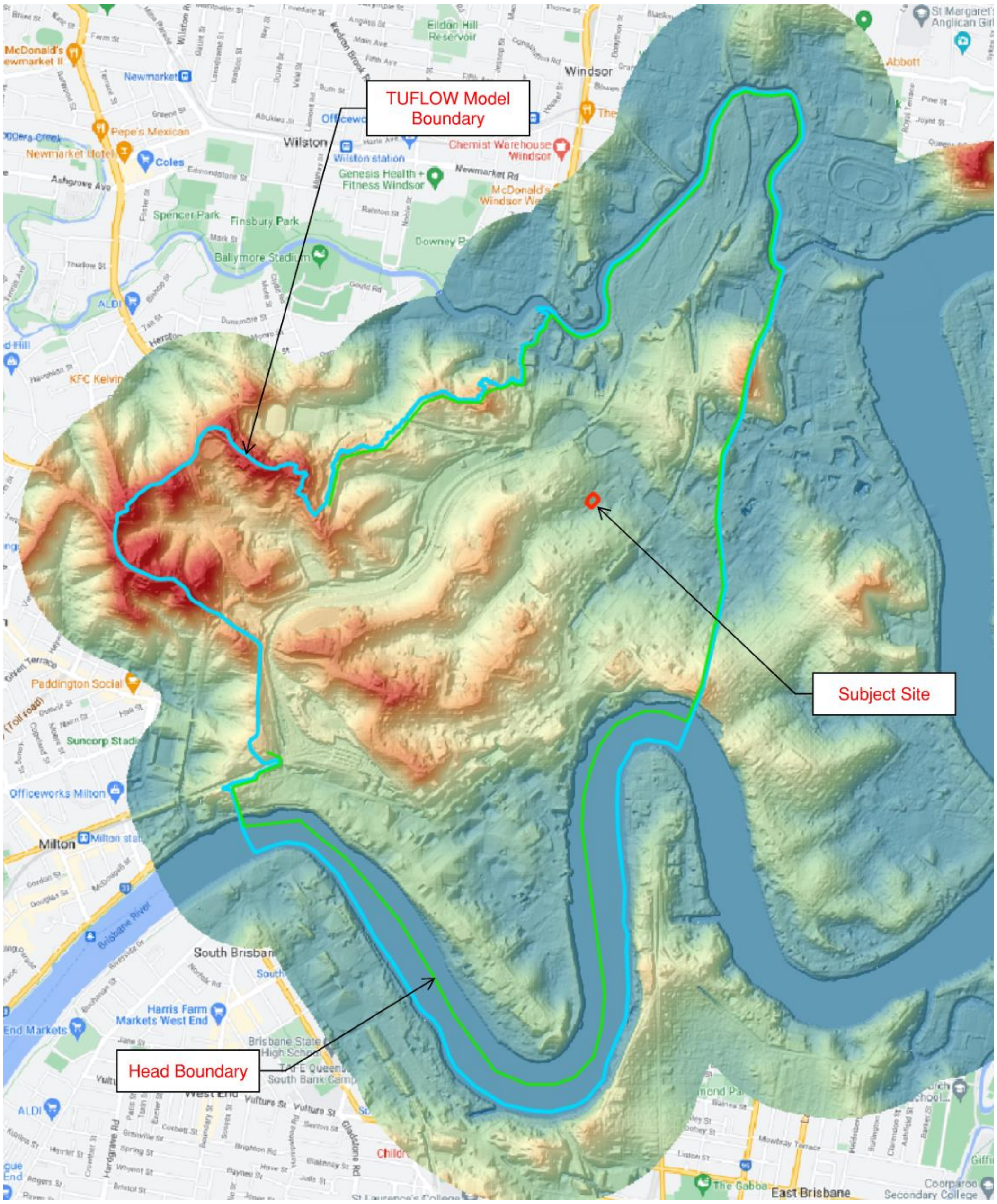


Figure 7: Adopted Model Boundary Conditions (Source: SF Flood Model)

4.2 Peak Flood Map Results and Processing

An initial critical duration assessment was undertaken to determine the appropriate event to adopt. As noted below in Figure 8, the critical duration event is the 60-minute duration, where the overland flood dominates within Water Street, which is in accordance with the BCC flood model report's assumption that the majority of the catchment's critical duration is the 60min event.

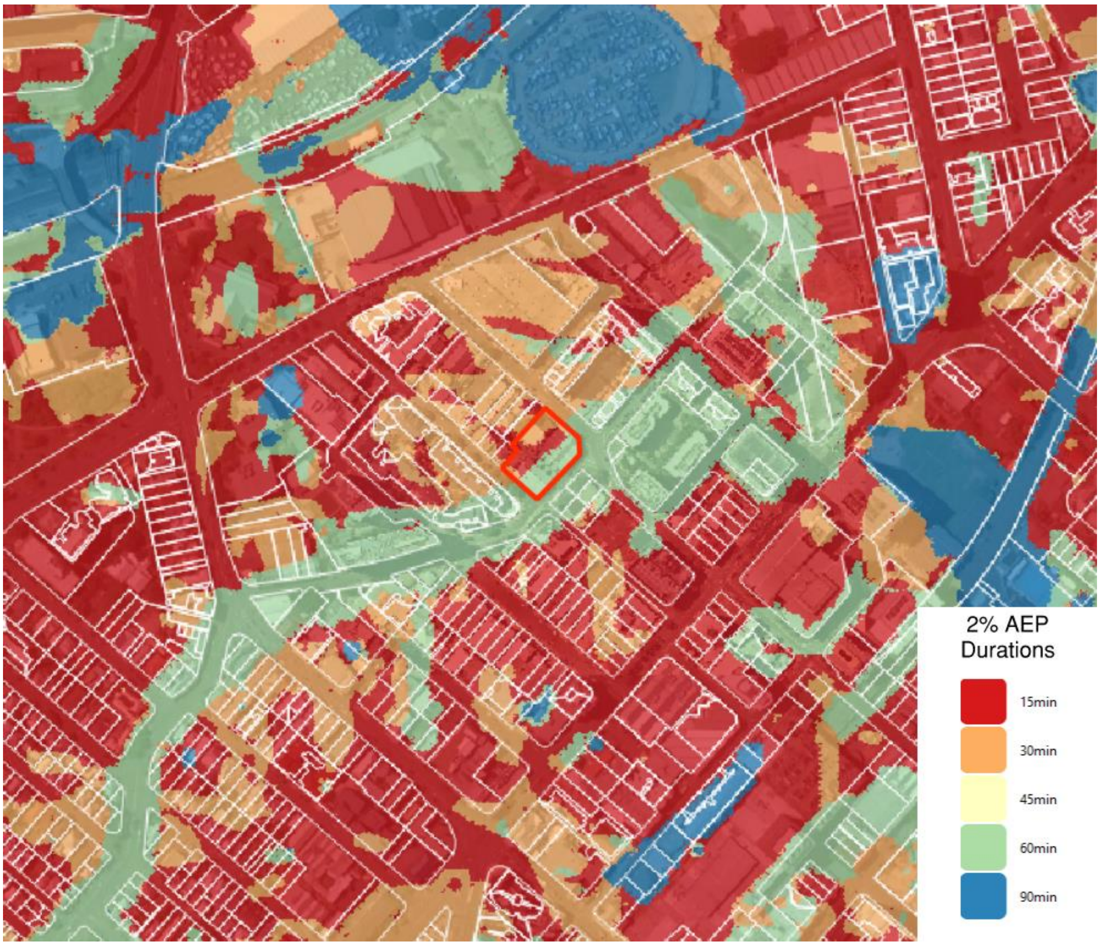


Figure 8: 2% AEP Critical Duration Assessment (Source: SF Flood Model)

4.2.1 Peak Flood Assessment

In accordance with industry standards, a depth threshold of 150mm was adopted to filter the results appropriately, given the Direct Rainfall approach. This follows the same procedure and recommendation as per the BCC flood report.

2D Flood mapping plots have been provided in Appendix B for the peak flood depth, velocity and depth-velocity product (DV) for the major 2% AEP overland flood event. It is noted these peak flood maps are based off the no stormwater infrastructure scenario, as a conservative approach.

5 Flood Planning Assessment

5.1 BCC Flood Mapping Overlay

In accordance with the BCC City Plan 2014's Overland Flow Flood Planning Area, the site contains a major overland flow path as shown in Figure 1, and therefore the Flood Overlay Code requirements are triggered.

In accordance with BCC's City Plan 2014 Planning Scheme requirements, the Flood Planning Scheme Policy (SC6.11) document is to be considered to address BCC's Flood Overlay Code (Section 8.2.11).

It is noted the site's land use is compatible with the proposed development, given it is only affected by the overland flow flood planning area sub-category.

5.1.1 Peak Flood Level Analysis

The 2% AEP post-development scenario peak overland flood levels have been utilised to determine the Defined Flood Event (DFE) level for the proposed development in accordance with BCC requirements and provided below in Table 1. This value was obtained from the highest overland flood level location around the site, where it was deemed the most appropriate level to adopt for flood-resilience purposes.

Table 1: Minimum Design Level for Subject Site

Defined Flood Type	Applicable Defined Level (mAHD)
DFE (For Proposed Building/Entrance on Costin Street)	8.31
DFE (For Proposed Building/Entrance on Anderson St)	9.27

Figure 9: Peak Flood Level Adoption – Subject Site (Source: TUFLOW Model)

5.1.2 Minimum Level Requirements

In accordance with Table 8.2.11.3.D of the BCC Flood Overlay Code, the applicable minimum Flood Planning level requirements for the proposed development is shown below in Table 1, based off the BCA Classes 1-4, 5,6-8 building classification. The highest of each category has been adopted for the flood planning level, as per BCC requirements.

It is noted that the building and driveway access levels can vary across the site, given the change in flood levels down the chainage. Two sets of levels have been provided for the Costin Street and Anderson Street sides, given the change in topography across the site.

It is deemed reasonable to adopt the carpark basement entrance level + freeboard, based on the road entrance side, being Costin Street (as per provided Architectural plans). The adopted DFL on the Anderson Street side is noted to be based off the 100% blockage scenario, hence conservative.

Table 2: Minimum Level Requirements (Based off Table 8.2.11.3.D)

Development Type	Category (Table 8.2.11.3.L of the BCC Flood Overlay Code)	Minimum Level Required (mAHD)
BCA Class 1 -4 Habitable Room	A	9.77
BCA Class 1 -4 Habitable Room	B	9.57
Class 5, 6, 8 Building Floor Level	C	9.27 (Anderson St) 8.31 (Costin St)
Garage or car park located in the building undercroft	C	9.27 (Anderson St) 8.31 (Costin St)
Vehicular access and manoeuvring areas, or Unroofed Carpark	D	9.27 (Anderson St) 8.31 (Costin St)
Basement Parking Entry	C + 300mm	8.61 (Costin St)
Essential Electrical Services	A	9.77

Accordingly, through consultation with the civil engineering and architectural consultant, these levels have been considered within the proposed development.

5.1.3 Impact Assessment

An impact assessment has been undertaken to determine if there are any adverse impacts that could be considered as actionable nuisance or additional risk to external properties.
As noted previously, the proposed building footprint shall be reduced on the Water Street side where the major overland flow path exists, and not deemed to create an adverse impact external to the site, therefore the impacts are deemed acceptable in accordance with BCC requirements.

5.1.4 Vehicular Flood Risk Assessment

It is noted that there is a high peak 2% AEP depth-velocity product within Water Street up to 2.40m^2/s in the 100% blockage scenario which is considered extreme. However, the vehicle entrance and exist points are flood free, with flood free access to Gregory Terrace. It is also noted that the peak major overland flood is deemed a short duration event, and therefore deemed to have a short cut-off time to Costin Street.

Overall, the proposed design is deemed an appropriate and desirable solution, as the site will be accessible during the peak major overland flood event.

5.2 BCC Overlay Code Assessment

The proposed development has been assessed against the BCC Flood Overlay Code.

Refer to Appendix C for responses to the BCC Flood Overlay Code responses, to demonstrate the proposal complies with BCC requirements.

6 Conclusion

Stormflood Engineering Pty Ltd has been commissioned by Property Projects Australia to prepare a Flood Impact Assessment Report for the proposed mixed-use development for a Material Change of Use (MCU) at 15 Anderson Street, Fortitude Valley.

The anticipated major design AEP overland flow path has been modelled and assessed via an appropriate 2D hydraulic model, in accordance with Brisbane City Council requirements. The BCC 'Central' Overland flood model has been adopted and modified as required, in order to provide recommendations to Property Projects Australia of how to manage the flooding implications and provide suitable floor levels.

It has been concluded that the proposed development will provide a reduction of the building footprint and therefore reduce obstructable area within the major overland flow path extents, and therefore deemed to not create adverse impacts external to the site. Therefore, no further investigation is required into overland flooding impacts.

The proposed development is compatible with the sites type use and flood source, and therefore no further flood risk assessment is deemed required in accordance with BCC's Flood Overlay Code.

Responses to the BCC Flood Overlay Code have been provided within the appendices of this report, to provide support to the application for approval.

Overall this assessment provides support for the Development Application to Economic Development Queensland (EDQ), which demonstrates adherence with the Local Government Authority's (BCC) Planning Scheme Policy requirements.

This report outlines the adopted data, modelling approaches and outcomes which allows the above conclusion to be derived.

Modelling which has informed the outcomes of this Report has been undertaken in accordance with Queensland Urban Drainage Manual (IPWEA 2016), Australian Rainfall & Runoff 1987 and Brisbane City Council's City Plan 2014 Planning Scheme.

7 Qualifications

Our analysis and overall approach has been specifically catered for the requirements of Property Projects Australia and may not be applicable beyond this scope. This report should not be read in isolation and for this reason, any other third parties are not authorised to utilise this Report without further input and advice from Stormflood Engineering.

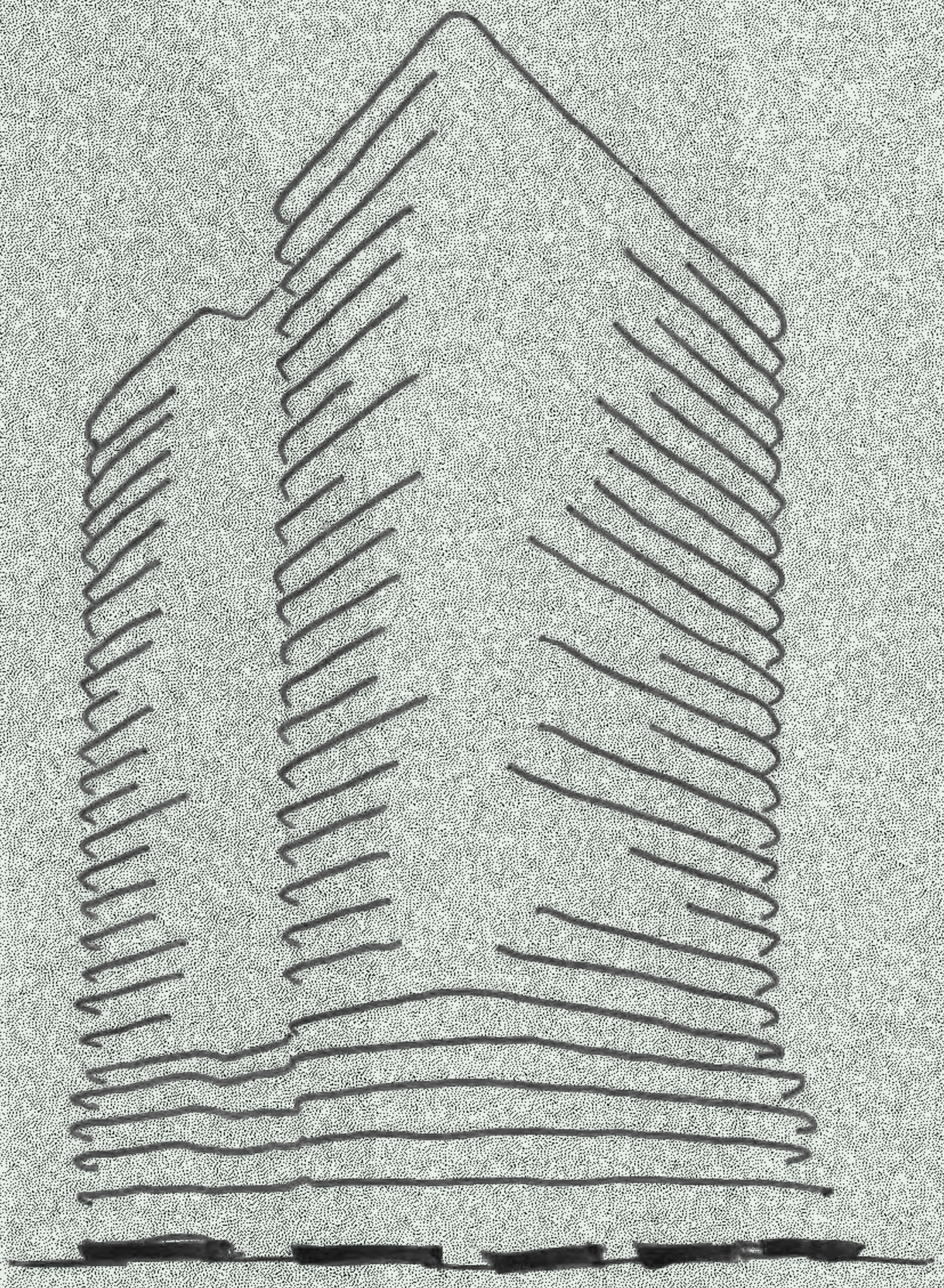
Stormflood Engineering has relied on the information as outlined in Section 3 of this Report, and therefore any information provided within this Report is limited to the data provided.

While Stormflood Engineering's Report assesses peak flows from design storms in accordance with best-practice and current industry standards and guidelines, future observed flows may vary from that predicted. For these reasons appropriate freeboards should be adopted.

Appendices

Appendix A

Proposed Architectural Plans



15 ANDERSON STREET

DEVELOPMENT APPLICATION
Revision: DA.01
Date: 4/8/2022

15 ANDERSON ST
FORTITUDE VALLEY
4006

DEVELOPMENT APPLICATION

59 CARDEN STREET
SOUTH YARRA

PH: 03 8672 5999
E: contact@telhaclarke.com.au

TELHA CLARKE
ARCHITECTURE & DESIGN

15 ANDERSON STREET

SITE CONTEXT

DEVELOPMENT APPLICATION
Revision: DA.01
Date: 4/8/2022

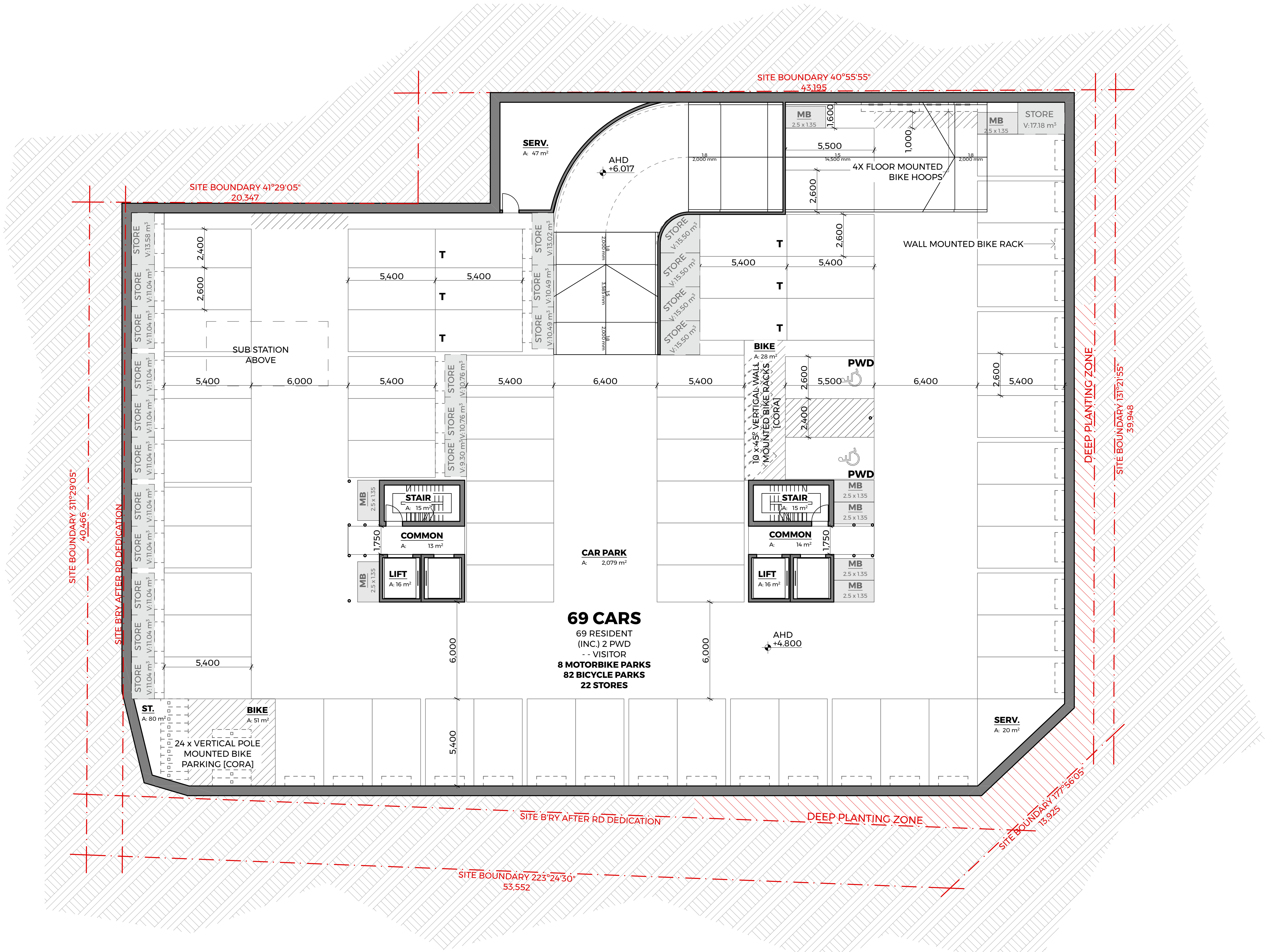
15 ANDERSON ST
FORTITUDE VALLEY
4006

DEVELOPMENT APPLICATION

59 GARDEN STREET
SOUTH YARRA

PH: 03 8672 5999
E: contact@telhaclarke.com.au

TELHA CLARKE
ARCHITECTURE & DESIGN



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TELHA CLARKE
59 GARDEN STREET
SOUTH YARRA
PH: 03 8672 5999
E: contact@telhaclarke.com.au

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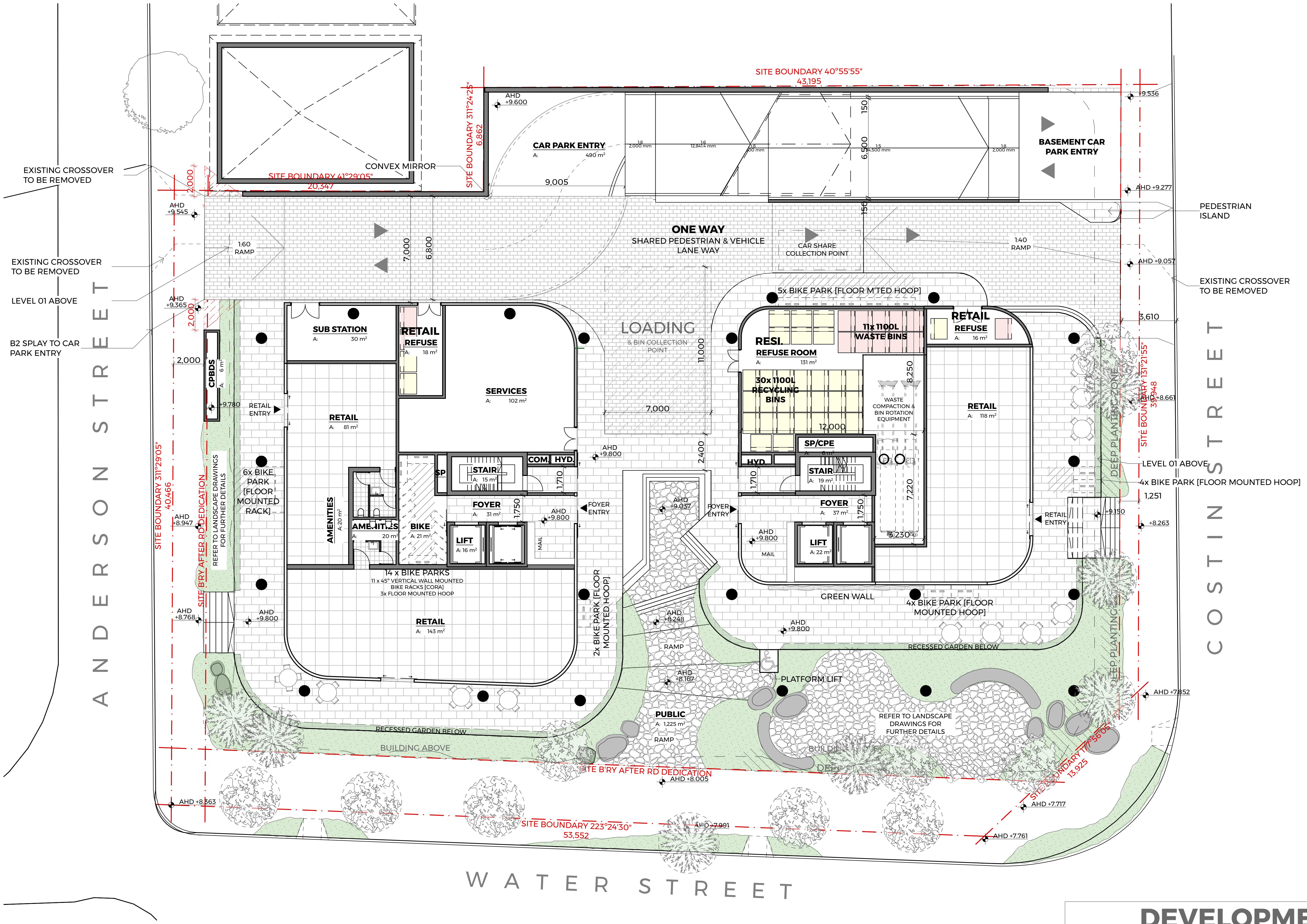

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TELHA CLARKE

59 GARDEN STREET
SOUTH YARRA
PH: 03 8672 5999
E: contact@telhaclarke.com.au

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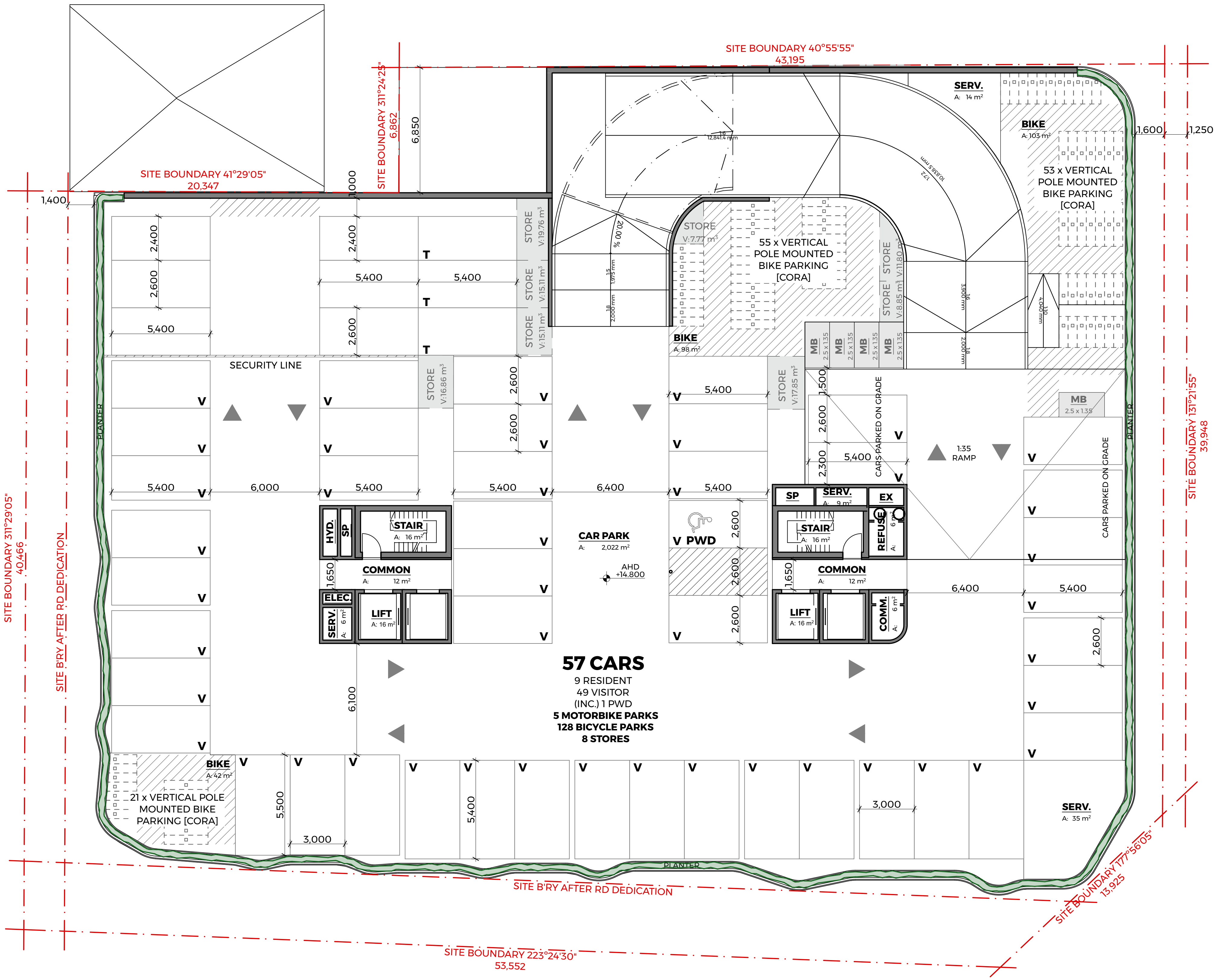

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TELHA CLARKE

59 GARDEN STREET
SOUTH YARRA
PH: 03 8672 5999
E: contact@telhaclarke.com.au

PROJECT: **15 ANDERSON STREET**
15 ANDERSON ST FORTITUDE VALLEY QLD 4006

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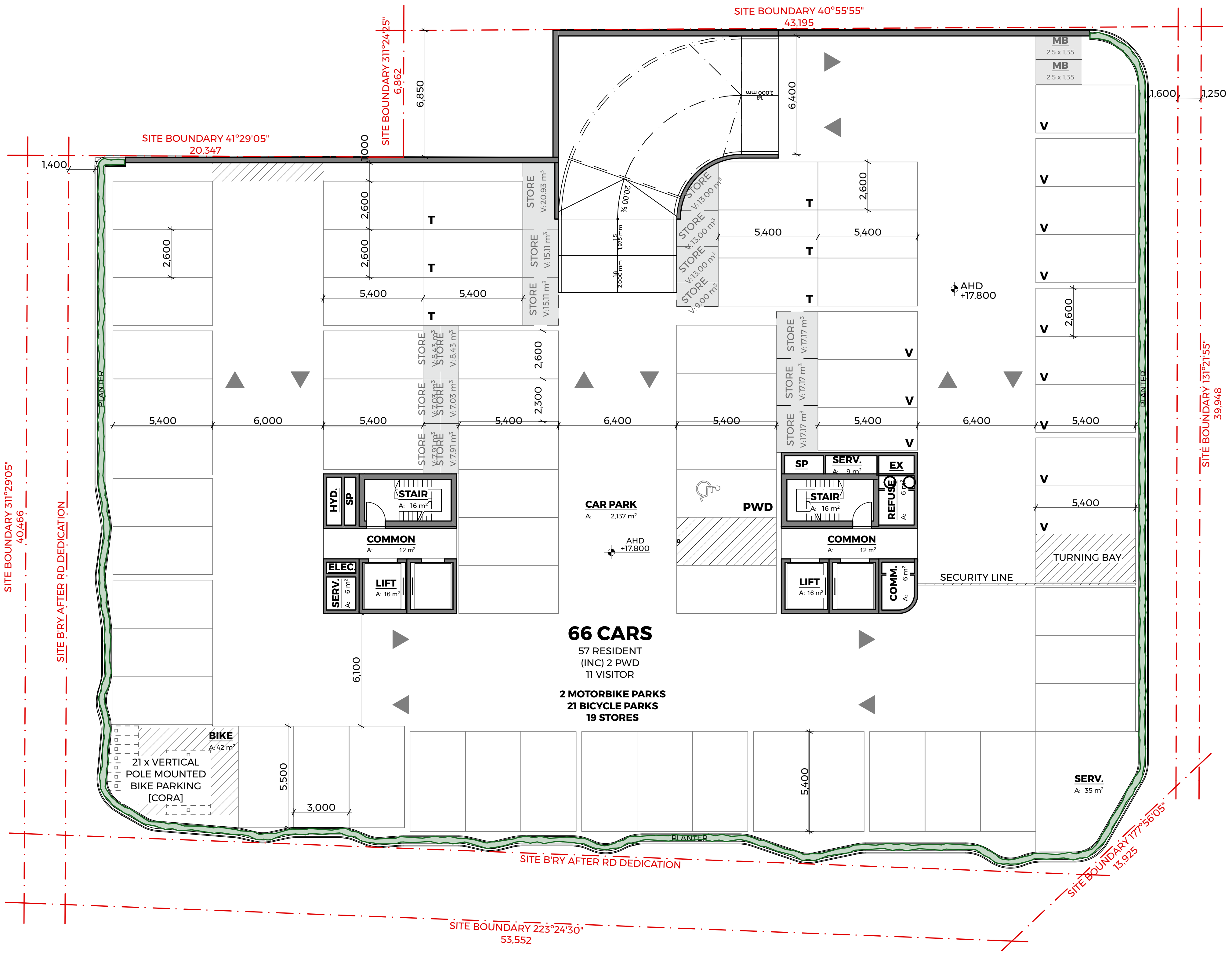

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TELHA CLARKE

59 GARDEN STREET
SOUTH YARRA
PH: 03 8672 5999
E: contact@telhaclarke.com.au

DEVELOPMENT APPLICATION

PROJECT
15 ANDERSON STREET
15 ANDERSON ST FORTITUDE VALLEY QLD 4006

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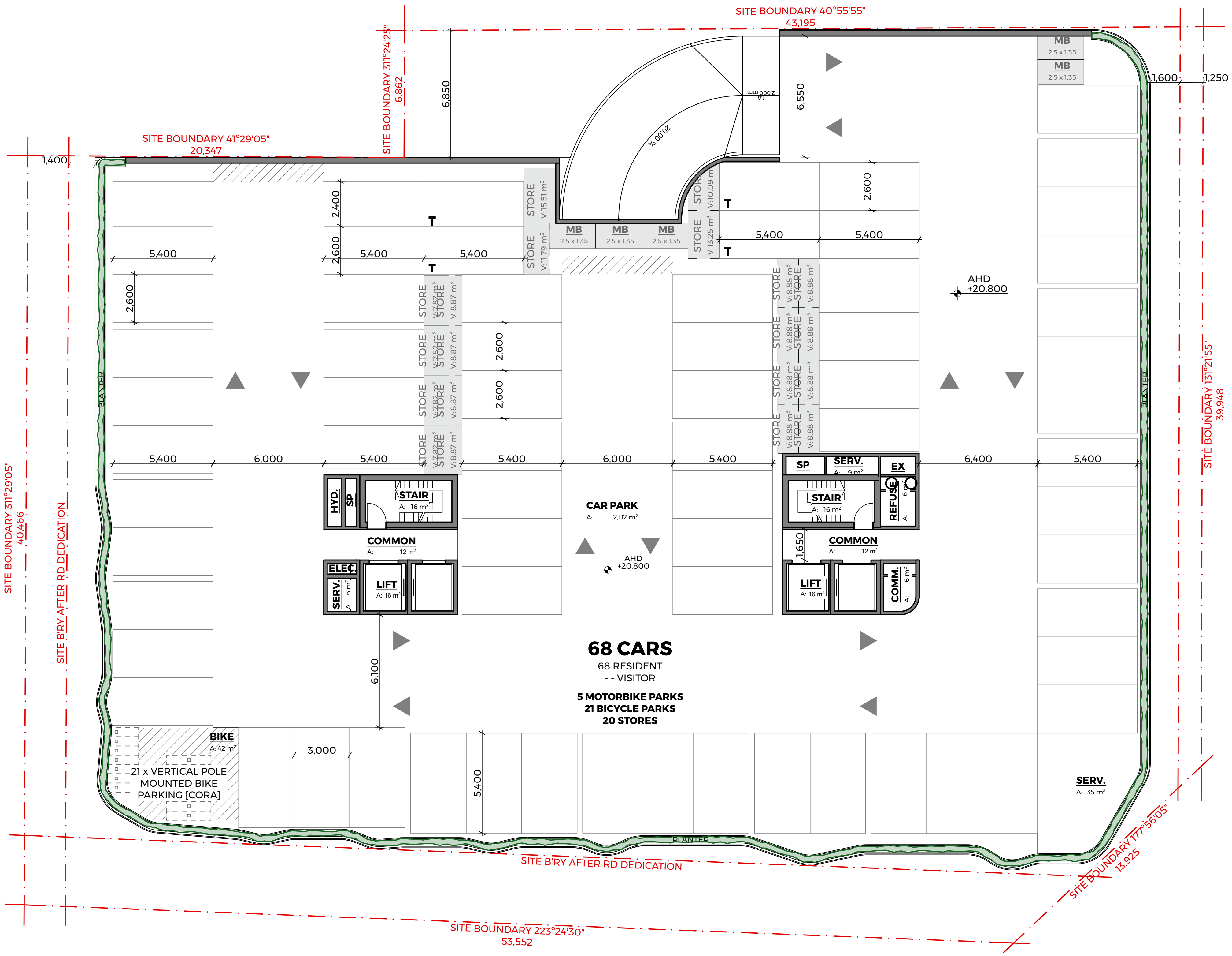

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TELHA CLARKE

59 GARDEN STREET
SOUTH YARRA
PH: 03 8672 5999
E: contact@telhaclarke.com.au

DEVELOPMENT APPLICATION

PROJECT
15 ANDERSON STREET
15 ANDERSON ST FORTITUDE VALLEY QLD 4006

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DA.01

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TELHA CLARKE

59 GARDEN STREET
SOUTH YARRA
PH: 03 8672 5999
E: contact@telhaclarke.com.au

PROJECT
15 ANDERSON STREET
15 ANDERSON ST FORTITUDE VALLEY QLD 4006

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TELHA CLARKE

59 GARDEN STREET
SOUTH YARRA
PH: 03 8672 5999
E: contact@telhaclarke.com.au

PROJECT: 15 ANDERSON STREET
15 ANDERSON ST FORTITUDE VALLEY QLD 4006

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TELHA CLARKE
59 GARDEN STREET
SOUTH YARRA
PH: 03 8672 5999
E: contact@telhaclarke.com.au

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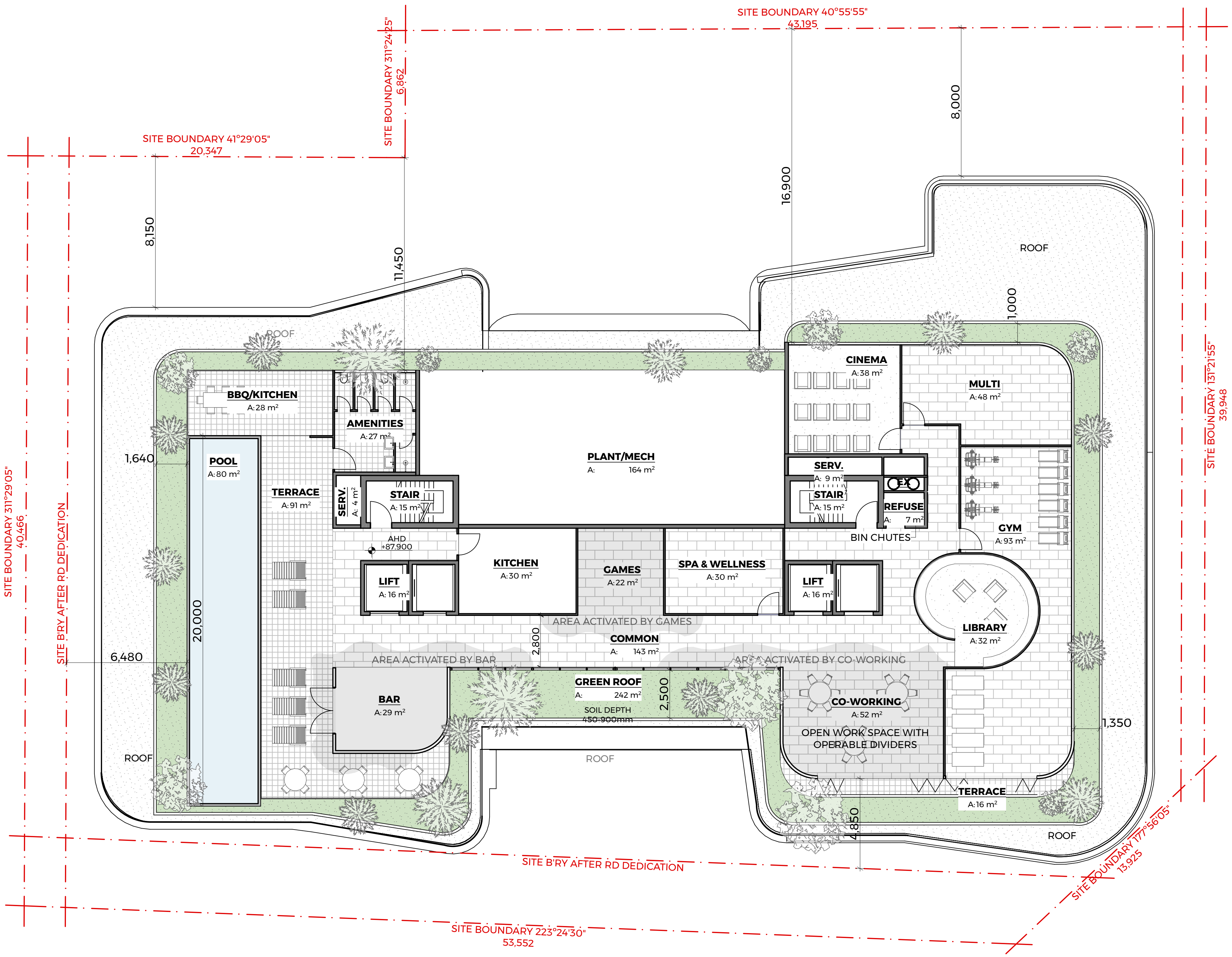

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TELHA CLARKE

59 GARDEN STREET
SOUTH YARRA
PH: 03 8672 5999
E: contact@telhaclarke.com.au

PROJECT
15 ANDERSON STREET
15 ANDERSON ST FORTITUDE VALLEY QLD 4006

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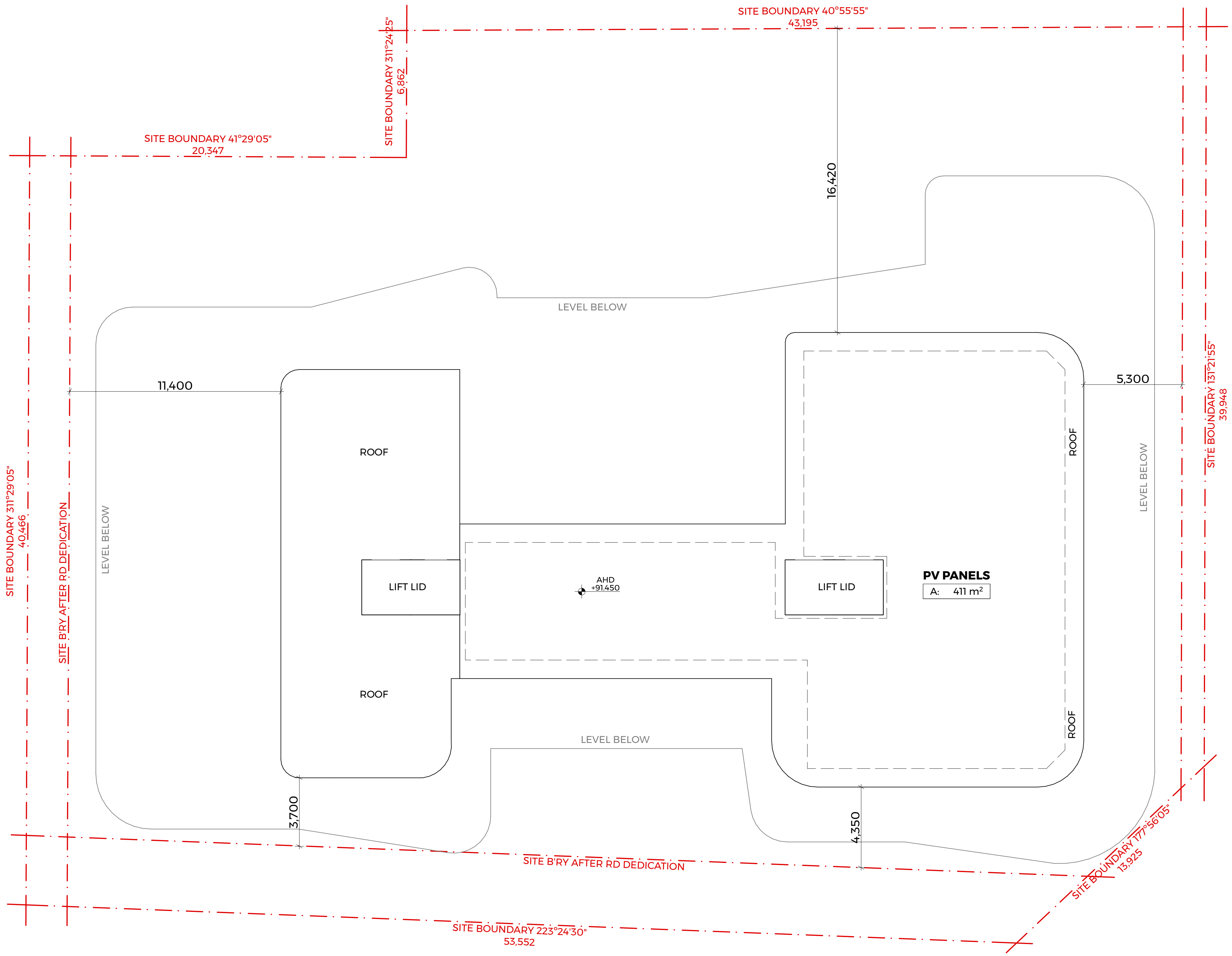

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TELHA CLARKE

59 GARDEN STREET
SOUTH YARRA
PH: 03 8672 5999
E: contact@telhaclarke.com.au

DEVELOPMENT APPLICATION

PROJECT
15 ANDERSON STREET
15 ANDERSON ST FORTITUDE VALLEY QLD 4006

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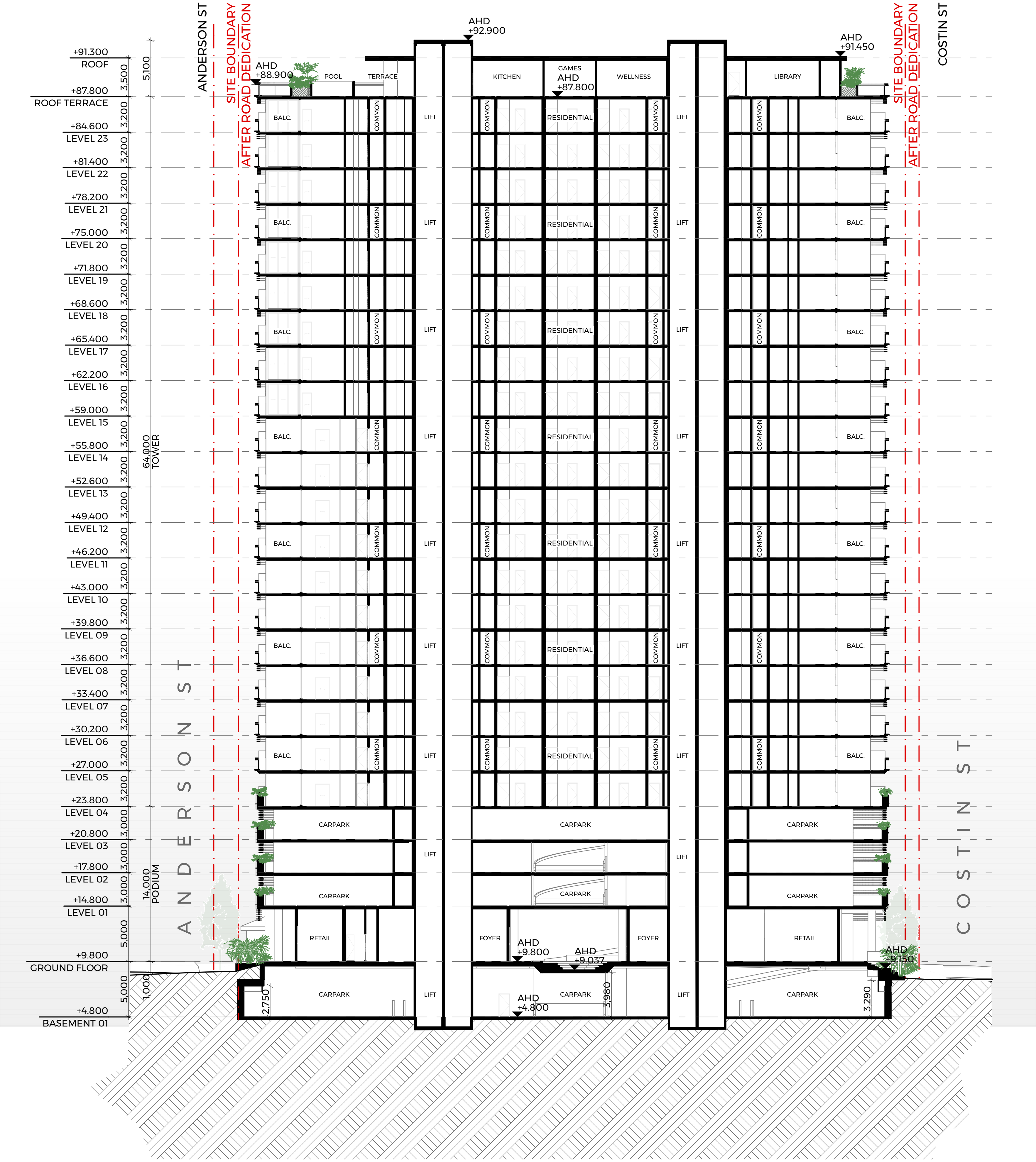
17/02/16	4/8/2022

DRAWN	CHECKED
CB	TC

JOB NO.	DRAWING NO.	REVISION
21026	**TP125**	**DA.01**



REV	DATE	ISSUED FOR	DRAWN	CHECKED
DA.01	4/8/2022	DEVELOPMENT APPLICATION	CB	TC

PROJECT
15 ANDERSON STREET

ADDRESS
15 ANDERSON ST
FORTITUDE VALLEY QLD
4006

DRAWING TITLE
SECTION A

DRAWING NO.
TP220

SCALE
1:400 @A3

PLOT DATE
01/03/22

DATE
4/8/2022

DRAWN
CB

CHECKED
TC

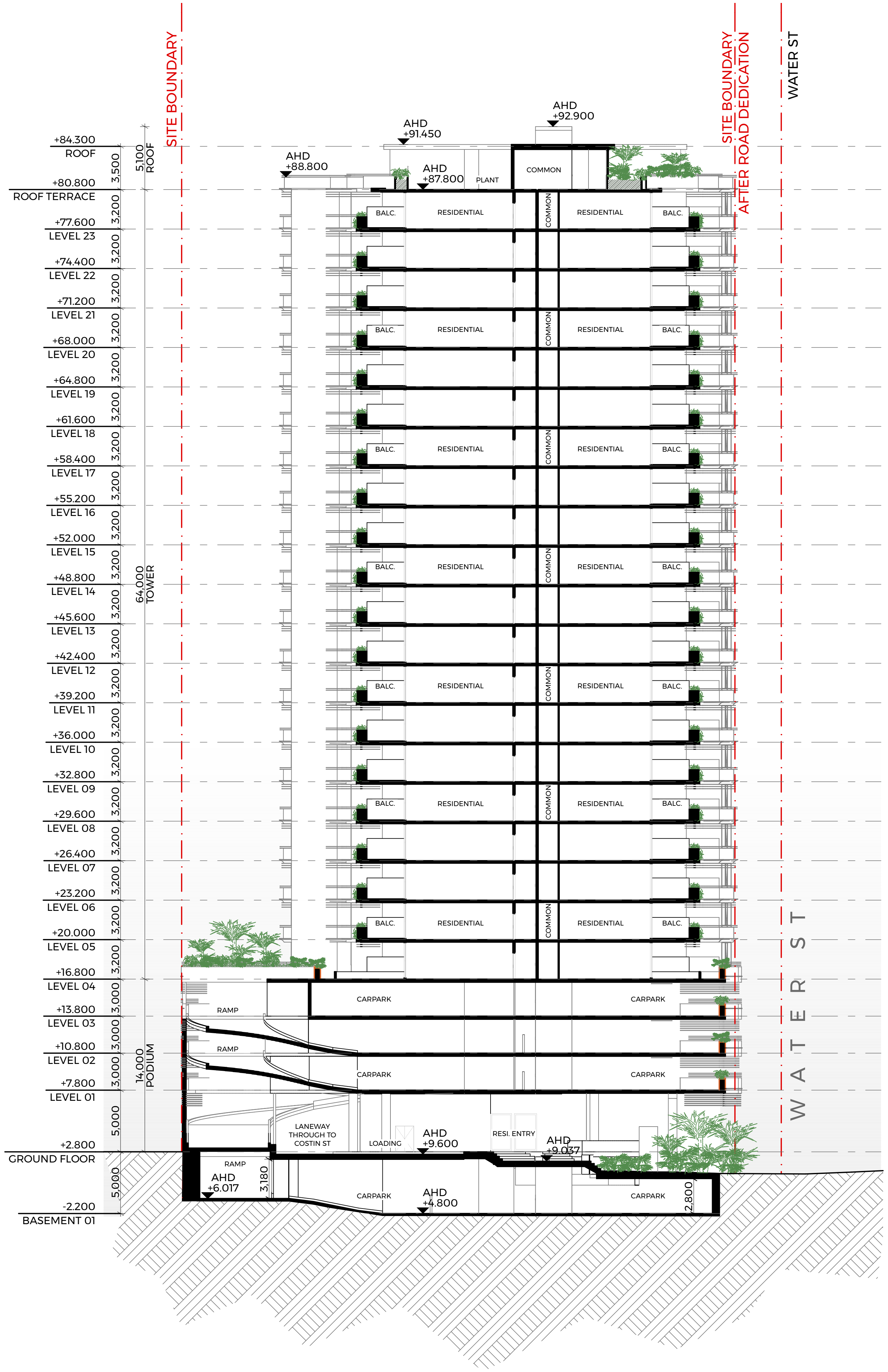
JOB NO.
21026

REVISION
DA.01

TELHA
CLARKE

59 GARDEN STREET, SOUTH YARRA
PH: 03 8672 5999
E: contact@telhaclarke.com.au

DEVELOPMENT APPLICATION



REV	DATE	ISSUED FOR	DRAWN	CHECKED
DA.01	4/8/2022	DEVELOPMENT APPLICATION	CB	TC

PROJECT
15 ANDERSON STREET

ADDRESS
15 ANDERSON ST
FORTITUDE VALLEY QLD
4006

DRAWING TITLE
SECTION B

DRAWING NO.
TP221

SCALE **1:400 @A3** | PLOT DATE **01/03/22** | DATE **4/8/2022**

DRAWN **CB** | CHECKED **TC**

JOB NO. **21026**

REVISION **DA.01**

TELHA CLARKE

59 GARDEN STREET, SOUTH YARRA
PH: 03 8672 5999
E: contact@telhaclarke.com.au

DEVELOPMENT APPLICATION

Appendix B

Peak Flood Mapping

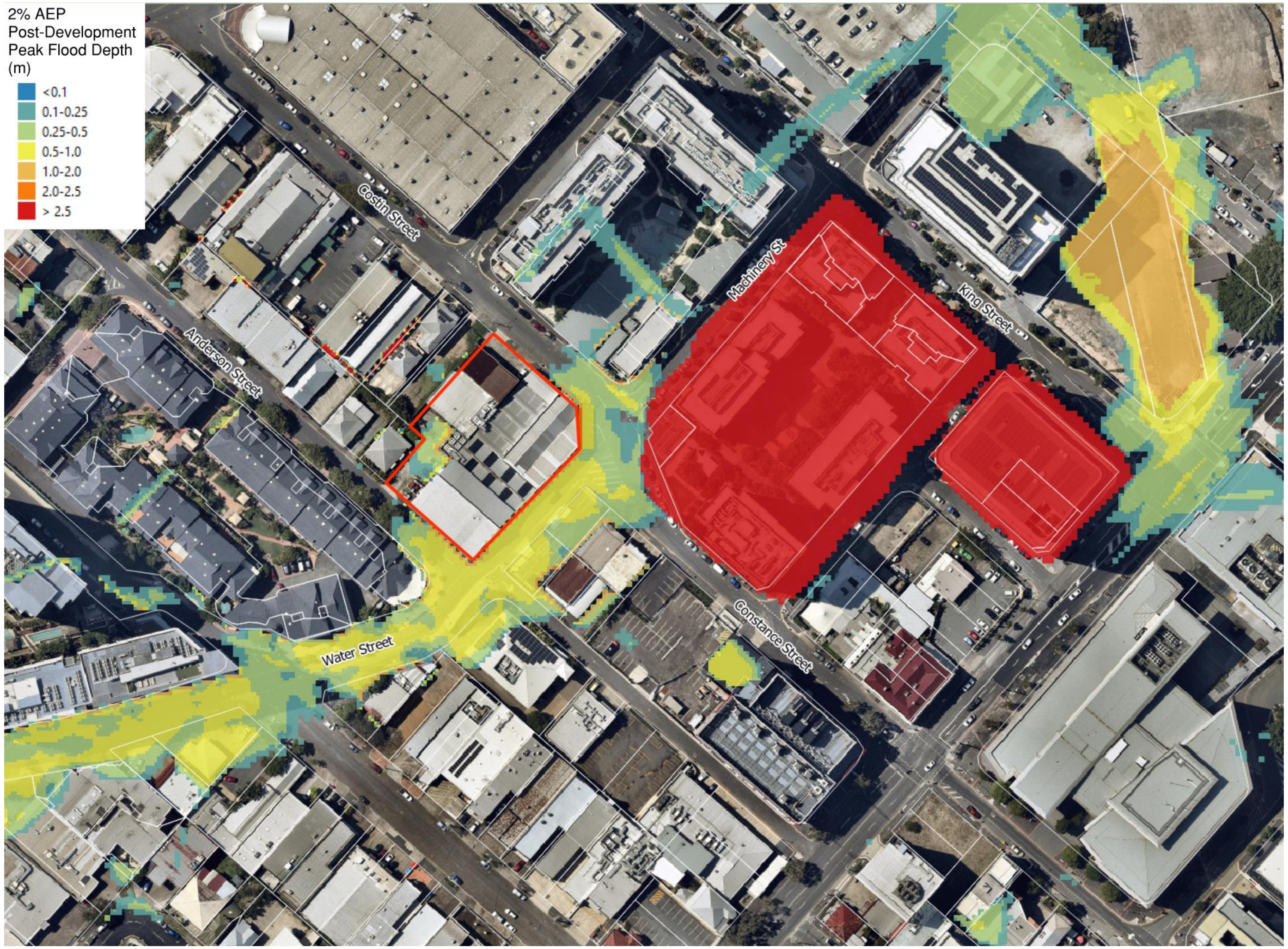


Figure B1 – 2% AEP Pre-Development Peak Water Depth

STORM FLOOD

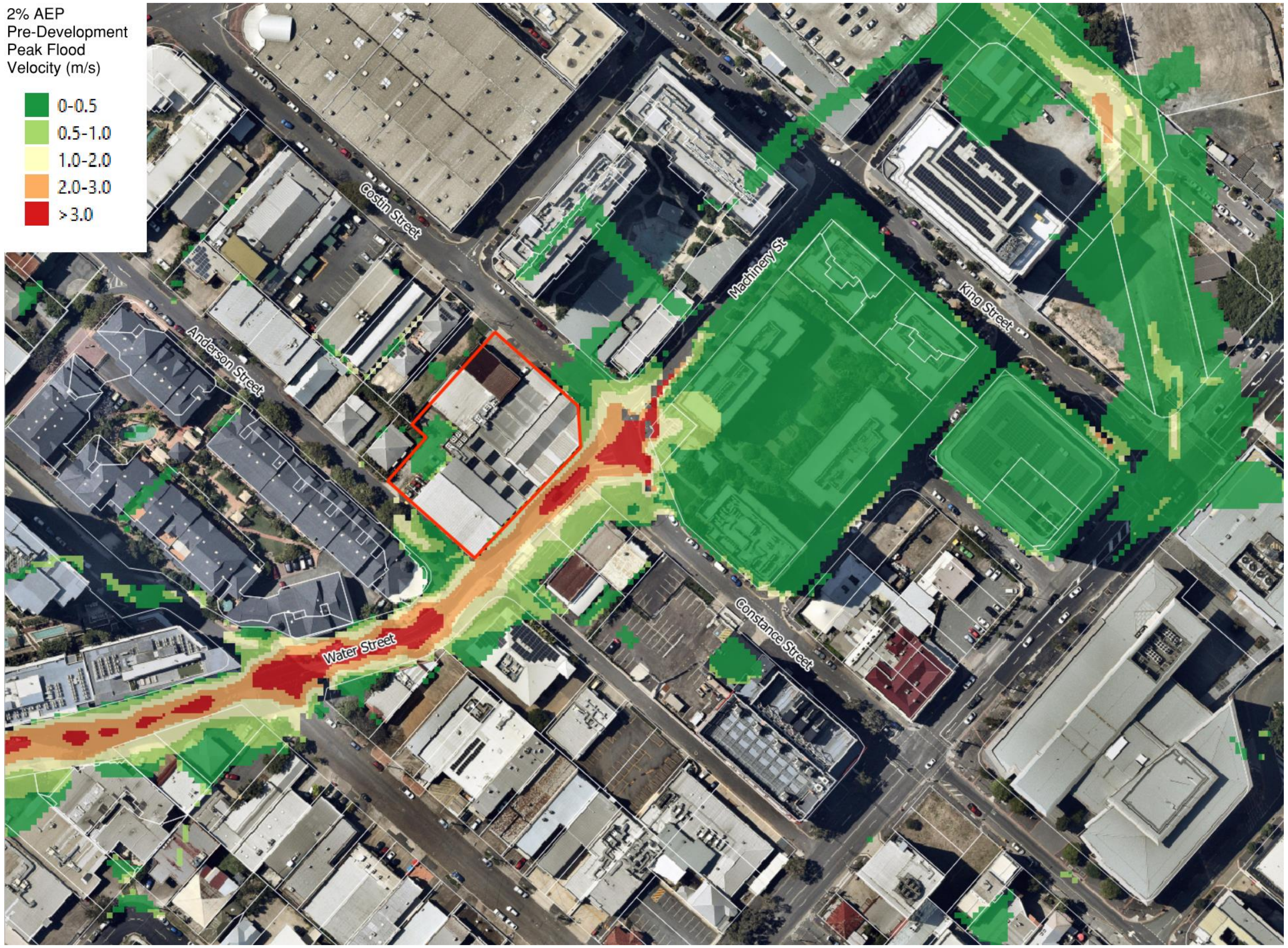


Figure B2 – 2% AEP Pre-Development Peak Water Velocity

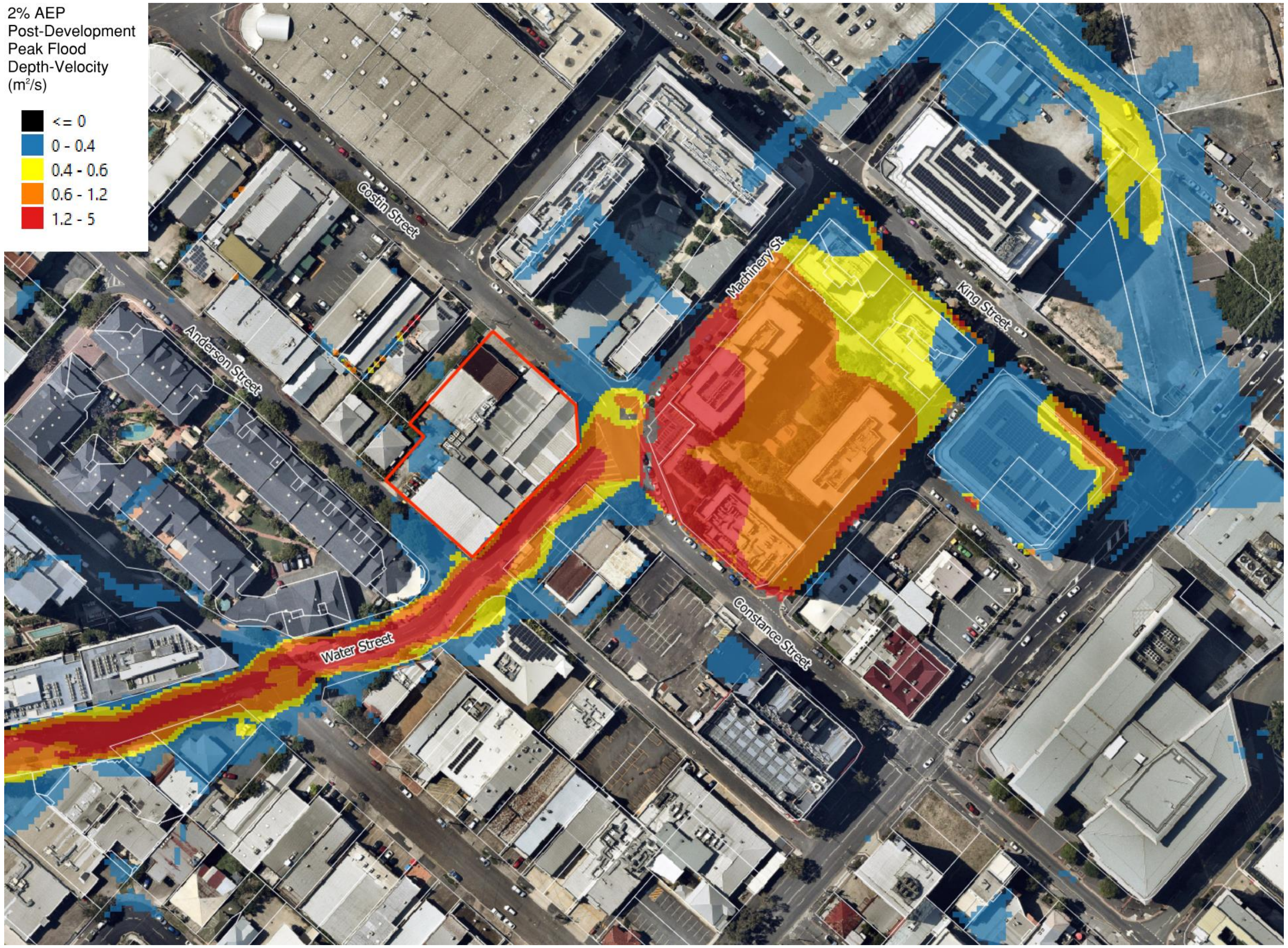


Figure B3 – 2% AEP Pre-Development Peak Water Depth-Velocity (DV) Product

Appendix C

BCC Flood Overlay Code Responses

Flood Overlay Code Responses (Applicable Sections Only)

Table 8.2.11.3.A—Performance outcomes and acceptable outcomes

Performance outcomes	Acceptable outcomes	Comments
Section B—If accepted development subject to compliance with identified requirements (acceptable outcomes only) or assessable development other than for a dwelling house or reconfiguring a lot Note—If development that is accepted development subject to compliance with identified requirements complies with the acceptable outcomes of this part, no further assessment against this code is required.		
PO3 Development: a. is compatible with flood hazard in a defined flood event; b. minimises the risk to people from flood hazard; c. does not reduce the ability of evacuation resources including emergency services to access and evacuate the site in a flood emergency, with consideration to the scale of the development; d. minimises impacts on property from flooding; e. minimises disruption to residents, business or site operations and recovery time due to flooding; f. minimises the need to rebuild structures after a flood event greater than the defined flood event. Note—Where Table 8.2.11.3.C identifies that a flood risk assessment is required, compliance with this performance outcome can be achieved by submitting a flood risk assessment, which may be included within a flood study, addressing the criteria within this performance solution. Preparing flood risk assessments and flood studies is required to be in accordance with the Flood planning scheme policy. Note—An emergency management plan prepared in accordance with the Flood planning scheme policy, which sets out procedures for evacuation due to flooding may be used to demonstrate compliance with this performance outcome.	**AO3** Development for a material change of use is identified in Table 8.2.11.3.C as compatible with the flood hazard in the relevant flood planning area.	The proposal is compatible.
PO4	**AO4.1**	Not Applicable.

Development for a park ensures that the design of a park and location of structures and facilities responds to the flood hazard and balances the safety of intended users with: a. maintaining continuity of operations; b. impacts of flooding on asset life and ongoing maintenance costs; c. efficient recovery after flood events; d. recreational benefits to the city; e. availability of suitable land within the park.	Development involving a building or structure in a park complies with the flood planning levels specified in Table 8.2.11.3.D. **AO4.2** Development involving a building or structure in a park where Table 8.2.11.3.D does not apply: a. is not located within the 20% AEP flood extent of any creek/waterway or overland flow path; or b. is located above the 20% AEP flood level of any creek/waterway or overland flow path.	
Section C—If for assessable development other than for a dwelling house		
PO5 Development is located and designed to: a. minimise the risk to people from flood hazard on the site; b. minimise flood damage to the development and contents of buildings up to the defined flood event; c. provide suitable amenity; d. minimise disruption to residents, recovery time and the need to rebuild structures after a flood event up to and including the defined flood event.	**AO5.1** Development complies with the flood planning levels specified in Table 8.2.11.3.D. Note—If located in an area with no Council-derived flood levels such as an overland flow path, a Registered Professional Engineer Queensland with expertise in undertaking flood studies is to derive the applicable flood level and certify that the development meets the required flood planning levels in Table 8.2.11.3.D. The study is to demonstrate that the development and engineering design methods conform to the principles within the Flood planning scheme policy and the Infrastructure design planning scheme policy. **AO5.2** Development is: a. not located in the: i. Brisbane River flood planning area 1, 2a, or 2b sub-categories; ii. Creek/waterway flood planning area 1 or 2 sub-categories; iii. Overland flow flood planning area sub-category; or b. only located in these sub-categories if a Registered Professional Engineer Queensland with expertise in undertaking flood studies certifies that: i. the development design, siting and any	Proposed Architectural Plans provided by Telha Clarke demonstrates the proposed development complies with Table 8.2.11.3.D. Refer to Flood Impact Assessment by Stormflood Engineering for further information and assessment of peak flood levels applicable for the site.

	mitigation measures will ensure the development is structurally adequate to resist hydrostatic, hydrodynamic and debris impact loads associated with flooding up to the defined flood event; and ii. the risk to people is managed to an acceptable level.	
PO6 Development involving essential electrical services or a basement storage area is suitably located and designed to ensure public safety and minimise flood recovery and economic consequences of damage during a flood.	**AO6.1** Development ensures that: a. all areas containing essential electrical services comply with the flood planning levels in Table 8.2.11.3.D; or b. if a basement contains essential electrical services or a private basement storage area, the basement is a waterproof structure with walls and floors impermeable to the passage of water with all entry points and services located at or above the relevant flood planning level in Table 8.2.11.3.D. Note—A basement storage area does not include a bike storage room, change room, building maintenance storage and non-critical electrical services. **AO6.2** Development involving a basement that relies on a pumping solution to manage floodwater ingress or for dewatering after a flood provides a secondary pump system with a backup power source for the pump.	The proposed development will comply with the Acceptable Outcomes.
PO7 Development does not directly or indirectly create a material adverse impact on flood behaviour or drainage on properties that are upstream, downstream or adjacent to the development.	**AO7.1** Development: a. does not block, or divert floodwaters for any area affected by creek/waterway or overland flow flooding, excluding storm-tide flooding and Brisbane River flooding sources; or b. does not result in a material increase in flood level or hydraulic hazard on upstream, downstream or	The proposed development is not considered to create adverse impacts external to the site, as a result of the proposed development. The proposed undercroft works are deemed to not materially worsen hydraulic hazard categories within the site, or external to the site.

	adjacent properties. Note—Compliance with this acceptable solution can be demonstrated by the submission of a flood study by a Registered Professional Engineer of Queensland with expertise in undertaking flood studies demonstrating that the development and engineering design methods conform to the principles within the Flood planning scheme policy and the Infrastructure design planning scheme policy. **AO7.2** Development retains existing overland flow paths and does not rely wholly on piped solutions to manage major flows.	The development retains existing overland flow path, and has demonstrated to not rely on a pipe solution to manage the overland flow path. Refer to Flood Impact Assessment by Stormflood Engineering for further information and the impact assessment of the overland flood source.
	AO7.3 Development which creates a new overland flow path or significantly modifies an existing overland flow path via earthworks does not materially worsen hydraulic hazard on the site from existing conditions. Note—Compliance with this acceptable solution can be demonstrated by the submission of a flood study by a Registered Professional Engineer of Queensland with expertise in undertaking flood studies demonstrating that the development and engineering design methods conform to the principles within the Flood planning scheme policy and the Infrastructure design planning scheme policy.	
PO8 Development for filling or excavation in an area affected by creek/waterway flooding does not directly, indirectly or cumulatively cause any material increase in flooding or hydraulic hazard or involve significant redistribution of flood storage from high to lower areas in the floodplain. Note—This can be demonstrated by undertaking earthworks in compliance with the Compensatory earthworks planning scheme policy. Note—This part of the code applies to all development other than a dwelling house and any secondary dwelling which involves filling or excavation, whether or not the development application comprises a separate development application for operational work involving filling or excavation.	**AO8** Development ensures that no filling or excavation greater than 100mm is located in the Creek/waterway flood planning area 1, 2 or 3 sub-categories if contained in the 5% AEP flood extent of any Creek/waterway flood planning area sub-category for which no waterway corridor has been mapped in the Waterway corridors overlay.	Not Applicable.
PO9 Development ensures that the building and site design:	**AO9.1** Development involving a building undercroft in the	The proposal complies with this outcome.

a. maintains the conveyance capacity of existing overland flow paths and creek/waterways; b. ensures floodwaters and flood debris can pass predominantly unimpeded under a structure or building to minimise property or building damage, including for a flood larger than the defined flood event; c. mitigates flood impacts by ensuring that filling, excavation and location of services are designed to allow for the conveyance of floodwater across the site. Note—The Flood planning scheme policy provides guidance on relevant considerations in determining minimum undercroft clearances and treatment of ground level in undercroft areas where floodwater conveyance is required underneath development.	Creek/waterway flood planning area sub-categories or the Overland flow flood planning area sub-category: a. complies with the minimum building undercroft clearance requirements in Table 8.2.11.3.E; b. not located directly above any part of a waterway corridor as mapped in the Waterway corridors overlay. **AO9.2** Development involving a building undercroft in the Creek/waterway flood planning area sub-categories or the Overland flow flood planning area sub category: a. has a ground level within the undercroft area that is free draining; b. does not involve excavation below ground level of more than 300mm within the undercroft area.	
PO10 Development for vulnerable uses, difficult to evacuate uses or assembly uses optimises vehicular access and efficient evacuation from the development to parts of the road network unaffected by flood hazard, in order to: a. protect safety of users and emergency services personnel; b. support efficient emergency services access and site evacuation with consideration to the scale of development. Note—A flood risk assessment may be required to address the performance outcomes or acceptable solutions which deal with evacuation and isolation arrangements, and the ability to take refuge. The Flood planning scheme policy provides information for undertaking flood risk assessments.	**AO10** Development for vulnerable uses, difficult to evacuate uses or assembly uses: a. is not isolated in any event up to the relevant flood planning level specified in Table 8.2.11.3.L; or b. has direct vehicle access to a critical route or interim critical route in the Critical infrastructure and movement network overlay for evacuation in a flood; or c. can achieve vehicular evacuation to a suitable flood-free location. Note—A suitable flood-free location is of a size and nature sufficient to provide for the size and characteristics of the population likely to need evacuation to that area.	The proposed development will comply with the Acceptable Outcomes.
PO11 Development has access which, having regard to hydraulic hazard, provides for safe vehicular and pedestrian movement and emergency services access to adjoining roads.	**AO11.1** Development provides an access or driveway into the site which is: a. trafficable during the defined flood event; b. not located in the Creek/waterway flood planning	The proposed development is deemed to comply with the Acceptable Outcomes. A flood free access route to Gregory Terrace is available for the site.

	area 1 sub-category; c. not located in the Overland flow flood planning area sub-category if the hydraulic hazard is unsafe in the defined flood event; d. the access or driveway is not inundated by a 10% AEP flood. **AO11.2** Development located in the Creek/waterway flood planning area 1, 2, 3 or 4 sub-categories locates any disabled access in the highest part of the site. Note—explanation of hydraulic hazard provided in the Flood planning scheme policy.	
PO12 Development involving a new road, a bridge or culvert is designed to minimise impacts to flood behaviour, minimise disruption to traffic during a flood and allow for emergency access.	**AO12** Development involving a new road complies with the flood planning levels in Table 8.2.11.3.F.	Not Applicable.
PO13 Development for pedestrian and cyclist paths: a. provides a suitable level of trafficability; b. manages the impacts of flooding on asset life and ongoing maintenance costs; c. balances route availability with recreational and transport connectivity benefits to the city.	**AO13.1** Development for cyclist and pedestrian facilities other than on public roads, including those traversing through a park and adjacent to a watercourse and overland flow path, are located above the 39% AEP (2 year ARI) flood immunity from all flooding sources. Note—If the site is subject to more than one type of flooding, the requirement that affords the greatest level of protection will apply. **AO13.2** All new on-road cyclist and pedestrian facilities comply with the flood planning levels and trafficability standards for the applicable category of road in Table 8.2.11.3.F or Table 8.2.11.3.K.	Not applicable.
PO14 Development which increases the residential population within the Brisbane River flood planning area sub-	**AO14** Development in the Brisbane River flood planning area sub-categories in areas where the residential flood level	Not Applicable

categories minimises the risk to people in all flood events with consideration to flood hazard, including warning time.	is greater than 12.8m AHD involving: a. an increase in the number of residential dwellings; or b. additional residential lots is not subject to an unsafe hydraulic hazard in the 0.2% AEP flood event. Note—Explanation of a hydraulic hazard is provided in the Flood planning scheme policy.	