

# BLIGH TANNER

101 Albert Street – Flood Engineering


CRR Albert Street Pty Ltd (CAN 660 319 693) as trustee for CRR Albert Street Trust

Date: 31 July 2023

PLANS AND DOCUMENTS  
referred to in the FDA  
DEVELOPMENT APPROVAL

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# TMR INFORMATION REQUEST

The Department of Transport and Main Roads (TMR) issued an information request on 07/07/2023 requesting clarifications and further information to assess the proposed development at 101 Albert Street, Brisbane City QLD, 4000. This report (Version 5) has been updated in response to the information request, and elements pertaining to flooding and our responses are summarised in Table 1 below.

**Table 1: TMR Information request and responses**

ID	Issue	Response
1	<p>The applicant is therefore requested to amend the 101 Albert Street – Flood Engineering report to provide revised flood modelling for all relevant design events (63.2%, 50%, 20%, 10%, 5%, 2% and 1% AEP) which adequately considers the potential flooding impacts on Cross River Rail. In particular, the following should be addressed:</p>	<p>Flood modelling adequately responds to requirements in the Brisbane City Plan 2014 by assessing the overland flow design flood event (2% AEP) as well as the 1% AEP. Proposed works create no adverse flood impacts to neighbouring properties relative to existing conditions as clearly shown in Appendix A10 of the subject flood report.</p> <p>The proposed development reduces encroachment onto the existing overland flow path relative to existing conditions by incorporating an additional set-back from the property boundary in the form of an open courtyard (i.e., 'civic space'), and it is by its nature conducive to alleviating overland flow flooding in the area. The nature of the proposed development (reducing encroachment onto the flow path) and the fact that it creates no adverse impacts during the 2% and 1% AEP floods makes it logical there will be negligible impacts during minor flood events, and modelling those additional minor non-critical storms adds additional approvals cost with no tangible benefit.</p> <p>This report therefore certifies that the proposed development at 101 Albert Street creates no adverse impacts to flood behaviour at the site of the future Albert Street Cross River Rail station (88 Mary Street, Brisbane City QLD 4000 / Lot 1 on RP 171563) for events ranging from the 63.2% AEP (1-year flood) to the 0.05% AEP (2000-year flood), including climate change considerations (represented by increasing rainfall by 20%).</p>



ID	Issue	Response
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Demonstrate that a pre-Cross River-Rail construction base case has been used for the flood modelling. It is unclear whether the base case used is pre-Cross River Rail construction (circa 2018) or whether what is modelled is there now (Cross River Rail temporary works). Section 3.2.4 states that they have cut into the existing model a 'detailed site survey' but the date of this survey is not provided. If the pre-construction base case has not been used, please contact the Cross River Rail Development Authority to obtain this (info@crossriverrail.qld.gov.au) and revise the model.

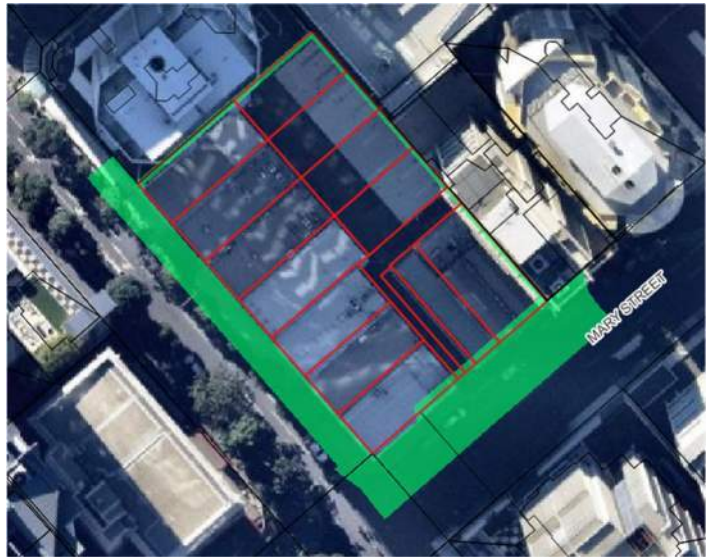
The flood modelling base case adopted for this flood impact assessment is as described in Section 3.2 of this report (Revised Existing Case Scenario), comprising a hybrid between:

- Existing site conditions (Cross River Rail temporary works) at the verge fronting the site, per a detailed site survey dated 17/05/2022,
- Pre-construction site conditions (LiDAR data from 2014) for the Albert Street carriageway.

This is a suitable baseline as it is a reasonable representation of the expected Albert Street corridor design once Cross River Rail works have been finalised.

The extent of the detailed site survey (dated 17/05/2022) is highlighted in green in Figure 1 below. The remaining flood model (excepting specific building modifications described in Section 3.2 of this report) is based on a LiDAR data from 2014, per the Brisbane City Council Citywide Creek & Overland Flow Path Mapping Central sub-model (TUFLOW), prepared by Brisbane City Council and GHD Pty Ltd in April 2017.

2



**Figure 1: Extent of detailed site survey (17/05/2022 / highlighted in green) adopted for the flood modelling base case scenario**

3	The Albert Street Station floor must have a minimum of 0.3m freeboard above the 1% AEP rainfall event (including climate change);	<p>The subject flood report evaluates the 1% AEP and demonstrates no impacts to the Albert Street Station site. There is no aspect of the proposed development that affects the ability of the Albert Street Station to meet its flood immunity requirements.</p> <p>The response to Issue 1 certifies no flood impacts up to the 0.05% AEP including climate change considerations.</p>
4	The Albert Street Station building floor must have an immunity of at least 0.05% AEP (including climate change);	<p>The proposed development responds to the Brisbane City Plan 2014 Flood Overlay Code, where there is no requirement to model the 0.05% AEP.</p> <p>Further to this, flood planning levels in the area are driven by Brisbane River Flooding (not Overland Flow Flooding), which are unaffected by proposed works.</p> <p>The response to Issue 1 certifies no flood impacts at the Albert Street Station site up to the 0.05% AEP including climate change considerations.</p>

ID	Issue	Response
5	(No worsening of) the absolute flood levels adjacent to the Albert Street Station southern entry (FFL 4.55m) taking into account the climate change scenario RCP 8.5 to 2090;	<p>The proposed development responds to the Brisbane City Plan 2014 Flood Overlay Code, where there is no requirement to account for climate change scenarios.</p> <p>The response to Issue 1 certifies no flood impacts at the Albert Street Station site up to the 0.05% AEP including climate change considerations (represented by assuming an increase in rainfall by 20%).</p>
6	(No worsening associated with) modelling of the sensitivity case involving the Albert Street Green Spine at 2% and 1% AEP.	<p>The proposed development is limited to works at 101 Albert Street (and necessary ancillary infrastructure works) and <b>does not</b> include the Albert Street Green Spine.</p> <p>This sensitivity analysis was included in the flood model as a contingency to establish flood levels at 101 Albert Street.</p> <p>It is expected that the Consultant developing the Albert Street Green Spine design will undertake adequate flood modelling to ensure no impacts the Albert Street Station, however this is not within the scope of this Development Application.</p>
7	Demonstrate that the velocity by depth product (hazard) shall be less than or equal to 0.4m <sup>2</sup> /s in the 1% AEP storm event (including climate change) where there is a risk of a pedestrian being swept away.	<p>Refer to Appendix A7 for depth product (hazard) mapping of the 1% AEP, amended to include further resolution.</p> <p>Overland flow hazard does not noticeably change as a result of the proposed development relative to existing conditions.</p> <p>During the Developed Case Scenario 1% AEP, the following flood hazard is observed:</p> <ul style="list-style-type: none"> <li>- Maximum flood hazard of 0.31 m<sup>2</sup>/s at the centreline of Albert Street fronting the site (within the road carriageway),</li> <li>- Maximum flood hazard values at the Albert Street and Mary Street verges fronting the site below 0.1 m<sup>2</sup>/s,</li> <li>- Maximum flood hazard values at the site's open civic space, where pedestrian traffic is expected, below 0.05 m<sup>2</sup>/s.</li> </ul>
8	Provide revised impact mapping (afflux, water level/depth and velocity impact maps) to clearly illustrate the pre-development scenario, and the post development impacts for all relevant design events on the Cross River Rail project. The impact maps should include labelled contours as the colour-coded maps are difficult to read due to the blue-green pallet with subtle differences between the bands. Unambiguous flood level maps are required.	<p>Flood impact maps exhibit two colours; grey, which indicates no impacts (+10mm); and blue, which indicates increased flood extents. The presentation of negligible flood impacts is clear and unambiguous.</p> <p>Appendix A3 of the flood report provides spot levels and clear indication of how the proposed development at 101 Albert Street comply with flood planning levels.</p> <p>Flood level mapping has been amended to include a different colour palette and inclusion of labelled water surface elevation contours.</p>

# EXECUTIVE SUMMARY

This report documents the findings of a flood study for 101 Albert Street, Brisbane City, QLD, 4000, in support of a Material Change of Use Development Application for a high-rise commercial tower and open civic space.

Key findings are:

1. **Proposed works do not noticeably alter overland flow flood levels, velocity, or hazard.**
2. **Proposed works do not create a material impact nor actionable nuisance to neighbouring properties associated with overland flow flooding,**
3. **Proposed architectural levels comply with the Brisbane City Plan 2014 Flood Overlay Code Flood Planning Levels for Brisbane River and Overland Flow flooding.**
  - a. **The northern retail entrance level adjacent to Albert Street has been set to enable connectivity with the Albert Street verge, resulting in an approximate 85 mm overland flow depth of negligible hazard during the 2% AEP (50-year ARI). This area will be designed to be free draining with flood resilient surfaces (e.g., no carpet), minimising disruption & recovery time after a flood event.**

## Methodology

Flood modelling is based on the Brisbane City Council Citywide Creek & Overland Flow Path Mapping Central sub-model (2017), modified to better represent existing conditions near the site at the year 2022.

The proposed development was represented in the flood model via amendments to the building form and representation of the open civic space.

As a sensitivity analysis, the Albert Street Green Spine proposed as part of the Albert Street Precinct Renewal Strategy (Brisbane City Council, 2020), was incorporated into the Developed Case flood model with a Manning's roughness of 0.035. Note the Albert Street Green Spine works do not form part of this Development Application.

## Flood Impacts

Flood impacts were calculated via an arithmetic subtraction of peak flood level surfaces comprising the Developed Case Scenario minus the Revised Existing Case Scenario.

Proposed works do not create a material impact nor actionable nuisance to neighbouring properties associated with overland flow flooding.

## Flood Planning Levels

Flood planning level requirements are based on Tables 8.2.11.3.D, 8.2.11.3.K, and 8.2.11.3.L of the Brisbane City Plan 2014 Flood Overlay Code.

Brisbane River Flood Levels are based on the property's FloodWise Property Report.

Overland flow flood levels are based on the highest of the "Developed Case Scenario" and "Albert Street Spine" sensitivity analysis.



# 1. INTRODUCTION

This report documents the findings of a flood study for 101 Albert Street, Brisbane City, QLD, 4000, in support of a Material Change of Use Development Application for a high-rise commercial tower with an open public civic space.

Proposed works will occur on the following lots:

- + 1/2/5 on RP621
- + 3/4/5/6/7/8/9 on RP59089
- + 11/12/13/14/15 on RP100887

This report addresses:

- + Site context,
- + Flood modelling methodology,
- + Flood results,
- + Flood Impacts,
- + Flood Immunity Requirements and Building Floor Levels.

## 2. SITE CONTEXT

### 2.1 Existing and Proposed Development

The existing site is fully developed, comprising an industrial steel shed utilised for the construction of the Cross River Rail Project.

The proposed development comprises a high-rise commercial tower with an open publicly accessible civic space, including landscaping and seating, on the western area of the site. Refer to DA architectural drawings for the proposed development.

### 2.2 Flooding

The site is affected by Overland Flow and Brisbane River flooding.

#### 2.2.1 Brisbane River Flooding

Brisbane River flooding comprises river water exceeding the river’s banks.

This flood is regional, associated with medium-intensity long-duration storms (or long wet periods) saturating the catchment, and has warning times ranging from 12 to 18 hours. Brisbane River flooding is also affected by tidal fluctuations and dam releases.

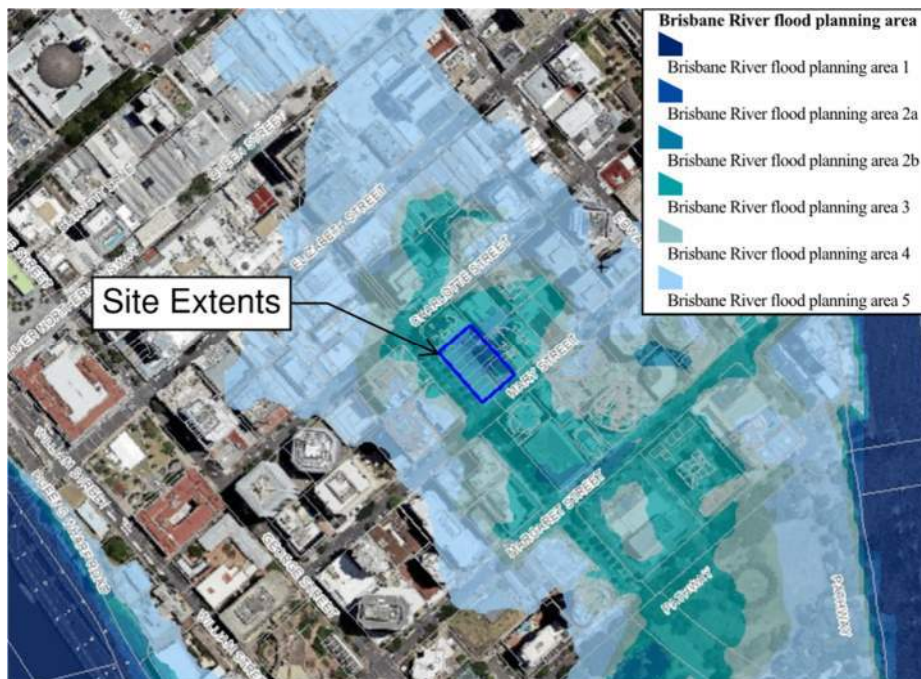


Figure 2: Brisbane River Flooding (Brisbane City Plan 2014)

### 2.2.2 Overland Flow Flooding

Overland flow flooding comprises stormwater runoff exceeding the conveyance capacity of the stormwater drainage system and flowing 'overland'.

This type of flooding is highly localised, associated with high-intensity short-duration storm bursts, and has short warning times.



Figure 3: Overland Flow Flooding (Brisbane City Plan 2014)



# 3. FLOOD MODELLING METHODOLOGY

## 3.1 Existing Flood Model

Flood modelling is based on the Brisbane City Council Citywide Creek & Overland Flow Path Mapping Central sub-model (TUFLOW), prepared by Brisbane City Council and GHD Pty Ltd in April 2017. Amendments to the existing model are described in Section 3.2 of this report.

Key characteristics of the existing model include:

- Two-dimensional direct rainfall hydraulic modelling approach, where rainfall hyetographs are directly applied to the hydraulic two-dimensional cells and routing undertaken automatically as a product of infiltration, surface roughness and topography. No hydrologic model is required with this approach.
- Hydraulic surface type classification based on 2014 catchment conditions
- Rainfall IFD data for the 2-year to 100-year ARI's (39% to 1% AEP) based on the BCC's Infrastructure Design Planning Scheme Policy – Chapter 7 Stormwater Drainage, derived using the ARR 1987 methodology for a location in the Brisbane CBD (74.475S, 153.025E), and obtained from the Bureau of Meteorology.
- Existing stormwater network represented using the 'Virtual Pipe' TUFLOW module in lieu of a 1D/2D coupled approach. This methodology can be used to simulate flow in a drainage network without full linking to a 1D model network. A depth relationship is applied at inlet locations and the flow is instantaneously transferred to the outlet location. GHD employed 'capping' of the inlet capacities as a proxy to represent hydraulic losses that would occur within the 1D network.
- Existing flood model has flood cell sizes of 2 m x 2 m.

### Model Calibration

The existing flood model was calibrated as follows:

1. A TUFLOW direct rainfall virtual pipes model was developed for the Norman Creek catchment and compared to the results of BCC's existing XP-RAFTS hydrologic model and MIKE FLOOD hydraulic model.
2. The TUFLOW direct rainfall model was validated against other detailed 1D/2D coupled TUFLOW models, developed as part of the Castlemaine Caxton, Stratton Street and Pashen Creek Local Stormwater Management Plans
3. The TUFLOW direct rainfall model was calibrated against seven locations across the BCC area with sufficient historic stream gauge and rainfall data.
4. Parameters utilised for the calibration process across the seven locations were then applied to the entire BCC area.

### Critical Storms

The 1% AEP (100-year ARI) and 2% AEP (50-year ARI) 60-minute duration storms produced the highest flood levels at the site.

## 3.2 Revised Existing Case Scenario

The Brisbane City Council Citywide Creek & Overland Flow Path Central sub-model was amended and refined to develop a revised ‘Existing Case Scenario’, suitable for undertaking a localised flood investigation.

Amendments are detailed in the sub-sections below.

### 3.2.1 Sub-model establishment

The Central overland flow path model covers an area of approximately 3111 hectares and many overland flow paths outside of the area of interest.

A smaller 160-hectare sub-model was established within the Central overland flow path model to assess overland flow paths affecting the area subject to works and optimise run times, as shown in Figure 4 below.

Model boundaries were defined based on contributing catchment areas.

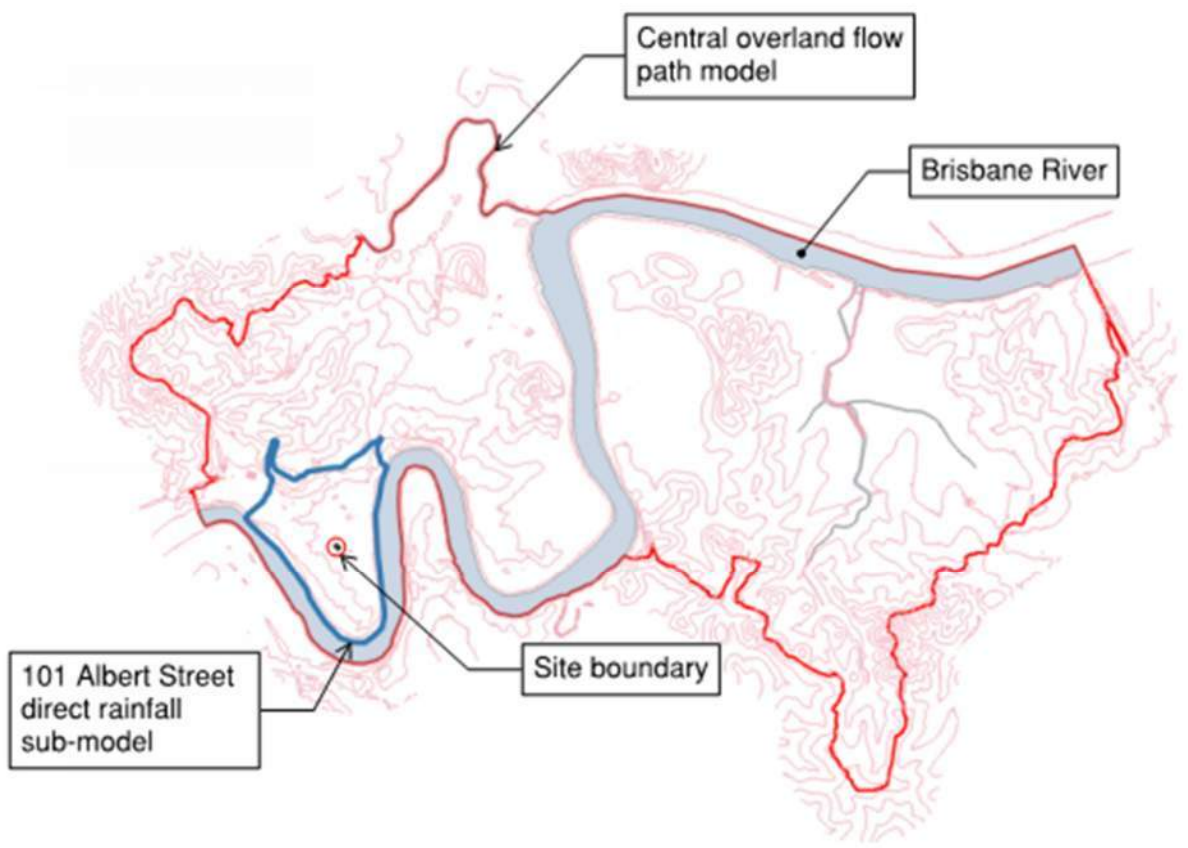


Figure 4: 101 Albert Street direct rainfall sub-model within the Central overland flow path model

### 3.2.2 Revision of Model Hydrology – WBNM Model Establishment

The existing model hydrology was revised to reflect ARR 2019 methodologies.

A WBNM hydrological model of the area of interest was developed to estimate critical storm durations and median temporal patterns.

Rainfall information and temporal patterns relevant to the site’s latitude, longitude and area were extracted from the Bureau of Meteorology IFD website and the Australian Rainfall and Runoff 2019 (ARR 2019) datahub, respectively.

Catchment conditions are based on © Nearmap 2022 aerial imagery.

This information was then input into a storm selection process that consisted of analysing 10 temporal patterns for every AEP and duration, including non-standard ones. Storm durations producing the highest peak flow at the upstream end of the site boundary were adopted as critical. Temporal patterns producing peak flows just above the median were selected.

Rainfall hyetographs derived from this analysis were incorporated into the TUFLOW direct rainfall model. Council’s rainfall loss parameters were maintained.

Selected critical storm durations & temporal patterns are summarised in Table 2 below.

**Table 2: Selected Critical Storms for revised model hydrology**

Frequency	Critical Storm Duration (minutes)	Temporal Pattern ID
2% AEP (50-year ARI)	30	5095
1% AEP (100-year ARI)	30	5238

Refer to Appendix A1 for the WBNM catchment plan.

#### 3.2.2.1 Validation of Model Hydrology

As a sensitivity analysis, longer storm durations (up to 24 hours) were also assessed in the Revised Existing Case Scenario. Temporal patterns for longer storms were also determined via the above WBNM analysis.

This analysis helped determine whether the overland flow flood levels are conveyance driven (based on peak flows along Albert Street), or volume driven, considering this area of the city acts as a large basin dewatered by stormwater drainage.

The 1% AEP (100-year ARI) and 2% AEP (50-year ARI) 30-minute duration storms produced the highest flood levels at the site, agreeing with the WBNM analysis.

### 3.2.3 Representation of Buildings

Council’s model represents buildings with a depth-variable Manning’s ranging from 0.013 at 2 mm depth (to allow for runoff contributions to the model), and 0.1 at 50 mm depth (to simulate the hydraulic restriction of flow through buildings).

Council’s methodology was amended to represented buildings as vertical blocks in lieu of Manning’s roughness to provide a better simulation of stormwater runoff behaviour around buildings.

Buildings were excluded from direct rainfall application to avoid model instabilities associated with the sudden vertical drop of runoff and building roof contributions were incorporated into the flood model as source area inflows. Refer Appendix A2 for the TUFLOW flood model layout.

### 3.2.4 Additional Modifications

- + A detailed site survey was overlaid over the existing flood model topography (LiDAR) as a digital elevation model file,
- + The model orientation was realigned for flood cells to align with Albert Street (major flow path).



### 3.3 Developed Case Scenario

Refer to DA architectural drawings for the proposed development.

The proposed development will replace a fully built site and reduce encroachment onto the existing overland flow path via provision of an open civic space along the Albert Street boundary.

The comparison between the existing site and the proposed development is seen in Figure 5 and Figure 6 below.

The proposed development was represented in the flood model via amendments to the building form and representation of the open civic space.

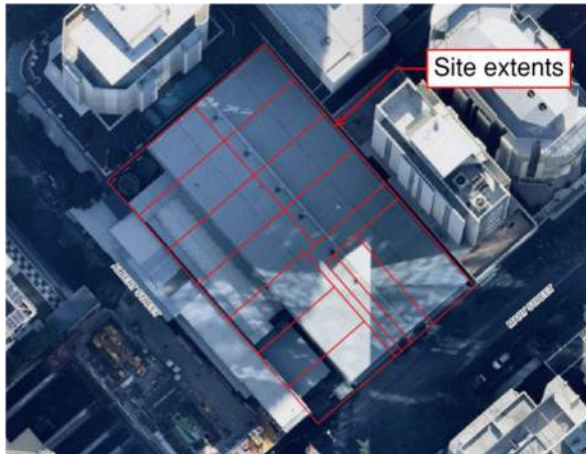


Figure 5: Existing site imagery (© 2022)

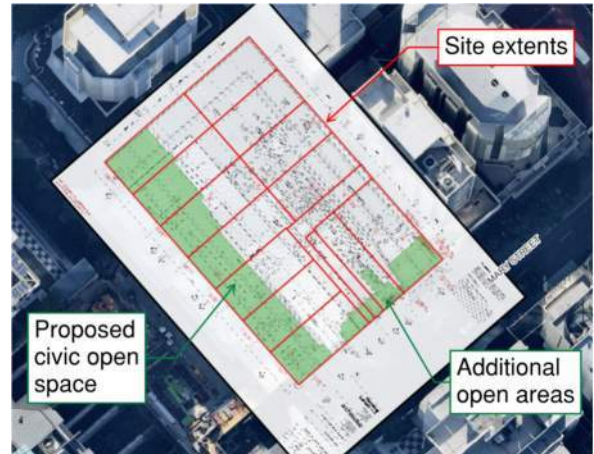


Figure 6: Proposed development – New civic open space & additional open areas reduce encroachment onto existing overland flow path

### 3.4 Sensitivity Analysis – Albert Street Spine

The Albert Street Precinct Renewal Strategy (Brisbane City Council, 2020) articulates the strategic aspirations for areas surrounding Cross River Rail station and proposes the redevelopment of Albert Street as a ‘green spine’ within a 5-to-10-year timeframe.

The proposed Green Spine upgrade (not part of this Development Application) was incorporated into the Developed Case flood model with a Manning’s roughness of 0.035.

Proposed building floor levels are based on the highest of the “Developed Case Scenario” and the “Albert Street Spine Scenario”

It is expected for future works to mitigate flood impacts, however this contingency provides certain tolerance to ensure proposed floor levels are suitable.



Figure 7: Albert Street Green Spine as represented in the flood model (Manning’s 0.035)

# 4. RESULTS

## 4.1 Brisbane River Flooding

Brisbane River flood levels are presented in Table 2 below.  
Results are from the property’s FloodWise Property Report (Refer Appendix A12).

**Table 3: Brisbane River Flood Levels**

Likelihood / Description	Level (m AHD)
February 2022 Flood	3.8
Defined Flood Level (DFL)	3.9
1% AEP (100-year ARI)	4.6
Residential Flood Level (RFL)	4.6
January 2011 Flood	4.7
0.2% AEP (500-year ARI)	7.3

Note the above levels are based on the current Brisbane River Flood study and do not include an allowance for climate change. A 20% increase in rainfall intensity and an 0.8 m sea level rise could result in water levels in the CBD being 2.5 m higher for the 1% AEP event.

## 4.2 Overland Flow Flooding

### 4.2.1 Revised Existing Case Scenario

#### 4.2.1.1 Comparison with Council’s Flood Model

The Revised Existing Case scenario exhibits a close match with Council’ model, typically indicating slightly higher flood levels (up to 110 mm higher in the 2% AEP and 80 mm higher in the 1% AEP, towards the upstream end of the site along Albert Street).

The increase in flood levels in the Revised Existing Case scenario can be attributed to representing existing buildings as physical blockages instead of hydraulic roughness, resulting in a slight concentration of overland flow within street corridors.

The Revised Existing Case Scenario is considered fit for purpose and slightly conservative.

See Appendix A9 for flood plots showing the comparison between the Revised Existing Case Scenario and Council’s flood model.

#### 4.2.1.2 Results

Flood depths surrounding the site area typically range between 50 mm to 400 mm during the 1% AEP, and 50 to 380 mm during the 2% AEP.

Flood hazard values (depth x velocity product) remain below 0.4 m<sup>2</sup>/s for both the 1% AEP and 2% AEP, indicating flow behaviour of ‘Low Hazard’ for children and adults according to Table 12.1.1 of QUDM (IPWEAQ, 2017).

See Appendices A6, A7, and A8 for flood depth, hazard, and level plots, respectively.

## 4.2.2 Developed Case Scenario

### 4.2.2.1 Flood Impact

Proposed works do not noticeably alter overland flow flood levels, velocity, or hazard.

There is a slight increase in flood extents within the site, associated with the open civic area. This does not extend outside of the site boundaries.

Proposed works do not create a material impact nor actionable nuisance to neighbouring properties associated with overland flow flooding.

See Appendix A10 for flood impact assessment plots indicating changes in flood behaviour between the Developed Case Scenario and the Revised Existing Case Scenario.

### 4.2.2.2 Results

Flood depths surrounding the site area typically range between 50 mm to 400 mm during the 1% AEP, and 50 to 380 mm during the 2% AEP.

Flood depths within the open civic area do not exceed 130 mm during the 1% AEP.

Flood hazard values (depth x velocity product) remain below 0.4 m<sup>2</sup>/s for both the 1% AEP and 2% AEP, indicating flow behaviour of 'Low Hazard' for children and adults according to Table 12.1.1 of QUDM (IPWEAQ, 2017).

See Appendices A6, A7, and A8 for flood depth, hazard, and level plots, respectively.

## 4.2.3 Sensitivity Analysis – Developed Case Scenario with Albert Street Green Spine

The sensitivity analysis for the Albert Street Green Spine (not part of this Development Application) resulted in the following flood changes, relative to the Developed Case Scenario.

- + Increased flood levels of up to 35 mm for the 1% AEP and 2% AEP along Albert Street,
- + Marginal increases in flood extents within the site's open civic space,
- + Decreases in flood levels of up to 70 mm for the 1% AEP and 2% AEP within the site, along Mary Street.

See Appendix A11 for flood impact assessment plots indicating changes in flood behaviour between the Developed Case Scenario with the Albert Street Green Spine works, and the Developed Case Scenario without the Albert Street Green Spine works.

Beyond the minor changes indicated above, flood behaviour during the Albert Street Green Spine scenario is very similar to the Developed Case Scenario.

## 4.2.4 Maximum Flood Levels

Flood modelling results indicates that the Sensitivity Analysis (Developed Case Scenario with Albert Street Green Spine) produces slightly higher flood levels at the upstream end of the site, and the Developed Case Scenario (without the Green Spine) produces higher flood levels at the downstream end of the site.

Flood level results for both scenarios were analysed in conjunction and processed to produce a single flood level surface comprised of the maximum flood level results. This surface was used to inform overland flow flood planning levels for the development.

See Appendix A4 for plots of maximum flood levels adopted for the development.

See Appendix A5 for plots indicating the sources of the maximum flood levels (Developed Case Scenario or Sensitivity Analysis).



# 5. FLOOD IMMUNITY REQUIREMENTS AND BUILDING FLOOR LEVELS

## 5.1 Building Classification

Elements of the proposed development are classified in accordance with the National Construction Code as follows:

- + Office Tower Above – Office (class 5) with some mixed use & amenities in the lower portion
- + Level 2 – Café / Restaurant (class 6) & Office Lobby
- + Level 1 – Retail / Restaurant (class 6) & services
- + Ground – Retail / Restaurant (class 6),
- + Basement – Basement Carpark (class 7a) / vehicle loading / bike parking

## 5.2 Brisbane City Plan 2014 Flood Planning Levels & Proposed Architectural Levels

Table 8.2.11.3.D, 8.2.11.3.K, and 8.2.11.3.L of the Brisbane City Plan 2014 Flood Overlay Code identify flood planning categories and design levels corresponding to different elements of the development.

Refer to Appendix A3 for a site plan assessing proposed developments elements with Brisbane City Plan 2014 requirements.

Brisbane River flood levels are from the property's FloodWise Property Report (See Appendix A12).

Overland flow flood levels are from the Maximum Developed Case Scenario flood levels (see Section 4.2.4 for details).

Most elements comply with the Brisbane City Plan 2014 Flood Overlay Code Acceptable Outcomes.

### 5.2.1 Performance Outcome

The northern retail entrance level adjacent to Albert Street has been set at 4.016 m AHD to enable connectivity with the Albert Street verge. The entrance is affected by approximately 85 mm overland flow depth of negligible hazard (less than 0.05 m<sup>2</sup>/s) during the 2% AEP.

This area will be designed to be free draining with flood resilient surfaces (e.g., no carpet), minimising disruption & recovery time after a flood event.

## 5.3 Basement Flood Gates

Operable flood gates are recommended to protect basement infrastructure, people and property. Flood gates should ideally be designed to protect against the 1% AEP Brisbane River Flood of 4.5 m AHD.

Consideration should also be given to protecting against rarer and larger flood events and incorporating climate change considerations into flood gate height, however there are a range of practical limitations to flood gates and the actual height of flood gates should be specified by the project architect and structural engineer.

## 6. EMERGENCY MANAGEMENT

We recommend that a Flood Emergency Management Plan is developed by a qualified RPEQ engineer to assess potential flood risk to site users and recommend management strategies to reduce risk to an acceptable level. The plan should be developed prior to issue of Certificate of Occupancy/Final Inspection.

The plan should provide advice on:

- + Estimates of warning time,
- + Evacuation triggers,
- + Evacuation routes,
- + Risk of isolation,
- + Legibility and considerations for people with limited mobility (elderly, disabled),
- + Signage.

# **A1. WBNM CATCHMENT PLAN**





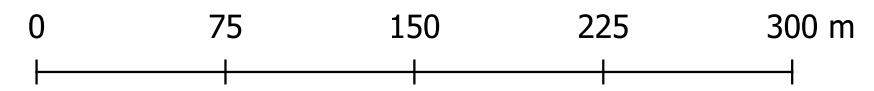
**Legend**

- Local Catchment Upstream of Site
- Catchment Outlet
- Flow Paths
- Site Boundary

Google Maps ©

Title:

**Catchment Layout Plan**



Level 9, 269 Wickham St  
 PO Box 612 Fortitude Valley Qld  
 4006 Australia  
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Project. CRR Albert Street  
 Job # 2022.0408  
 Engineer. C.G  
 Date. 19/10/2022  
 Filepath: \\bt-data\Company Data\Projects\2022\2022.0408-CRR Albert Street\2 Project\5 GIS\2022.0408-CRR Albert Street GIS.qgz



Scale 1:3000 at A3



## **A2. TUFLOW FLOOD MODEL LAYOUT**





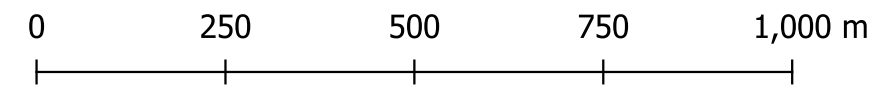
Title:

**TUFLOW Flood Model Layout**

Project. CRR Albert Street  
Job # 2022.0408

Engineer. C.G  
Date. 19/10/2022

Filepath: \\bt-data\Company Data\Projects\2022\2022.0408-CRR Albert Street\2 Project\5 GIS\2022.0408-CRR Albert Street GIS.qgz



Scale 1:10,000 at A3

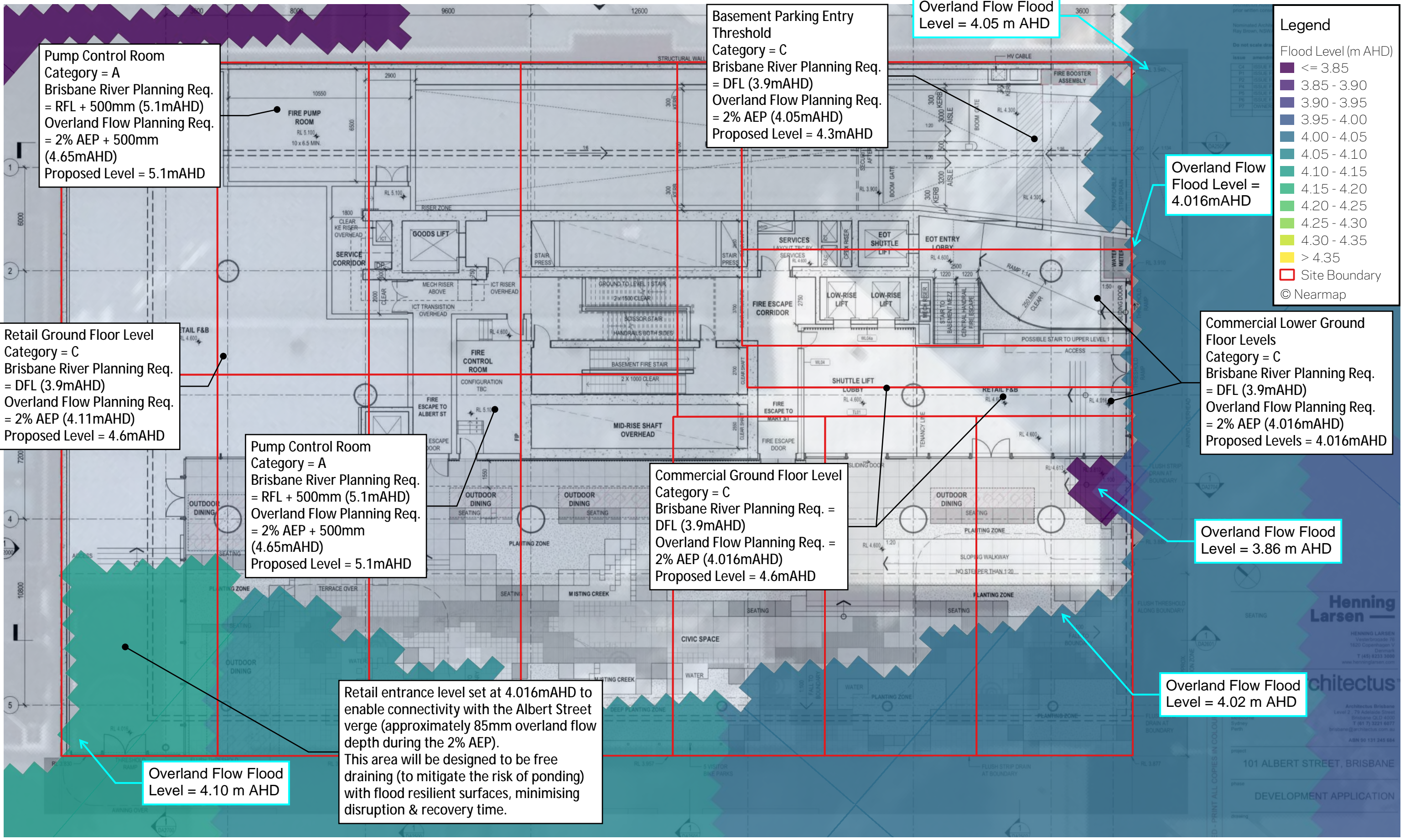


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4006 Australia  
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# **A3. FLOOD PLANNING LEVEL ASSESSMENT**





**Legend**

Flood Level (m AHD)

- <= 3.85
- 3.85 - 3.90
- 3.90 - 3.95
- 3.95 - 4.00
- 4.00 - 4.05
- 4.05 - 4.10
- 4.10 - 4.15
- 4.15 - 4.20
- 4.20 - 4.25
- 4.25 - 4.30
- 4.30 - 4.35
- > 4.35
- Site Boundary

© Nearmap

**Pump Control Room**  
 Category = A  
 Brisbane River Planning Req. = RFL + 500mm (5.1m AHD)  
 Overland Flow Planning Req. = 2% AEP + 500mm (4.65m AHD)  
 Proposed Level = 5.1m AHD

**Basement Parking Entry**  
 Threshold  
 Category = C  
 Brisbane River Planning Req. = DFL (3.9m AHD)  
 Overland Flow Planning Req. = 2% AEP (4.05m AHD)  
 Proposed Level = 4.3m AHD

Overland Flow Flood Level = 4.05 m AHD

Overland Flow Flood Level = 4.016m AHD

**Retail Ground Floor Level**  
 Category = C  
 Brisbane River Planning Req. = DFL (3.9m AHD)  
 Overland Flow Planning Req. = 2% AEP (4.11m AHD)  
 Proposed Level = 4.6m AHD

**Pump Control Room**  
 Category = A  
 Brisbane River Planning Req. = RFL + 500mm (5.1m AHD)  
 Overland Flow Planning Req. = 2% AEP + 500mm (4.65m AHD)  
 Proposed Level = 5.1m AHD

**Commercial Ground Floor Level**  
 Category = C  
 Brisbane River Planning Req. = DFL (3.9m AHD)  
 Overland Flow Planning Req. = 2% AEP (4.016m AHD)  
 Proposed Level = 4.6m AHD

**Commercial Lower Ground Floor Levels**  
 Category = C  
 Brisbane River Planning Req. = DFL (3.9m AHD)  
 Overland Flow Planning Req. = 2% AEP (4.016m AHD)  
 Proposed Levels = 4.016m AHD

Overland Flow Flood Level = 3.86 m AHD

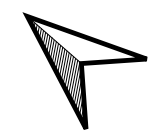
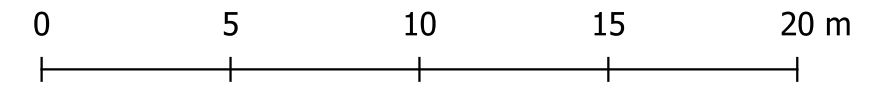
Retail entrance level set at 4.016m AHD to enable connectivity with the Albert Street verge (approximately 85mm overland flow depth during the 2% AEP). This area will be designed to be free draining (to mitigate the risk of ponding) with flood resilient surfaces, minimising disruption & recovery time.

Overland Flow Flood Level = 4.10 m AHD

Overland Flow Flood Level = 4.02 m AHD



Title: Flood Planning Level Assessment - 2% AEP (50-year ARI)  
 Project: CRR Albert Street  
 Job # 2022.0408  
 Engineer: Carlos Gambirazio  
 Date: 9/12/2022  
 Filepath: \\lbt-data\Company Data\Projects\2022\2022.0408-CRR Albert Street\2 Project\5 GIS\2022.0408-Flood Planning Level Assessment.qgz



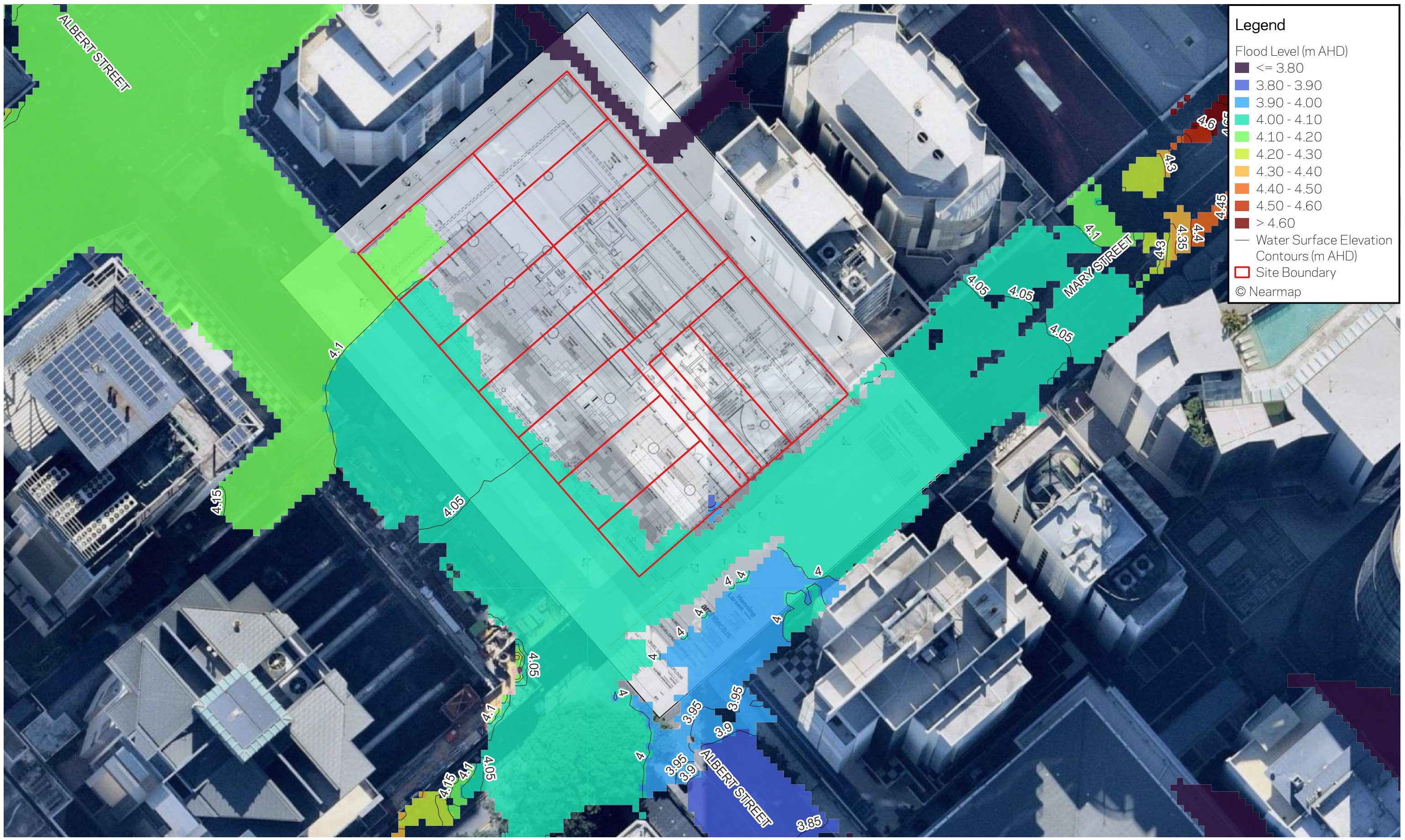
Scale 1:200 at A3

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## **A4. MAXIMUM FLOOD LEVELS**





**Legend**

Flood Level (m AHD)

- <= 3.80
- 3.80 - 3.90
- 3.90 - 4.00
- 4.00 - 4.10
- 4.10 - 4.20
- 4.20 - 4.30
- 4.30 - 4.40
- 4.40 - 4.50
- 4.50 - 4.60
- > 4.60

— Water Surface Elevation Contours (m AHD)

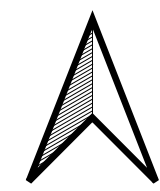
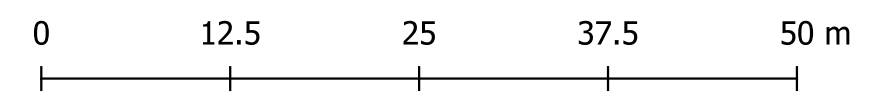
□ Site Boundary

© Nearmap



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 4006 Australia  
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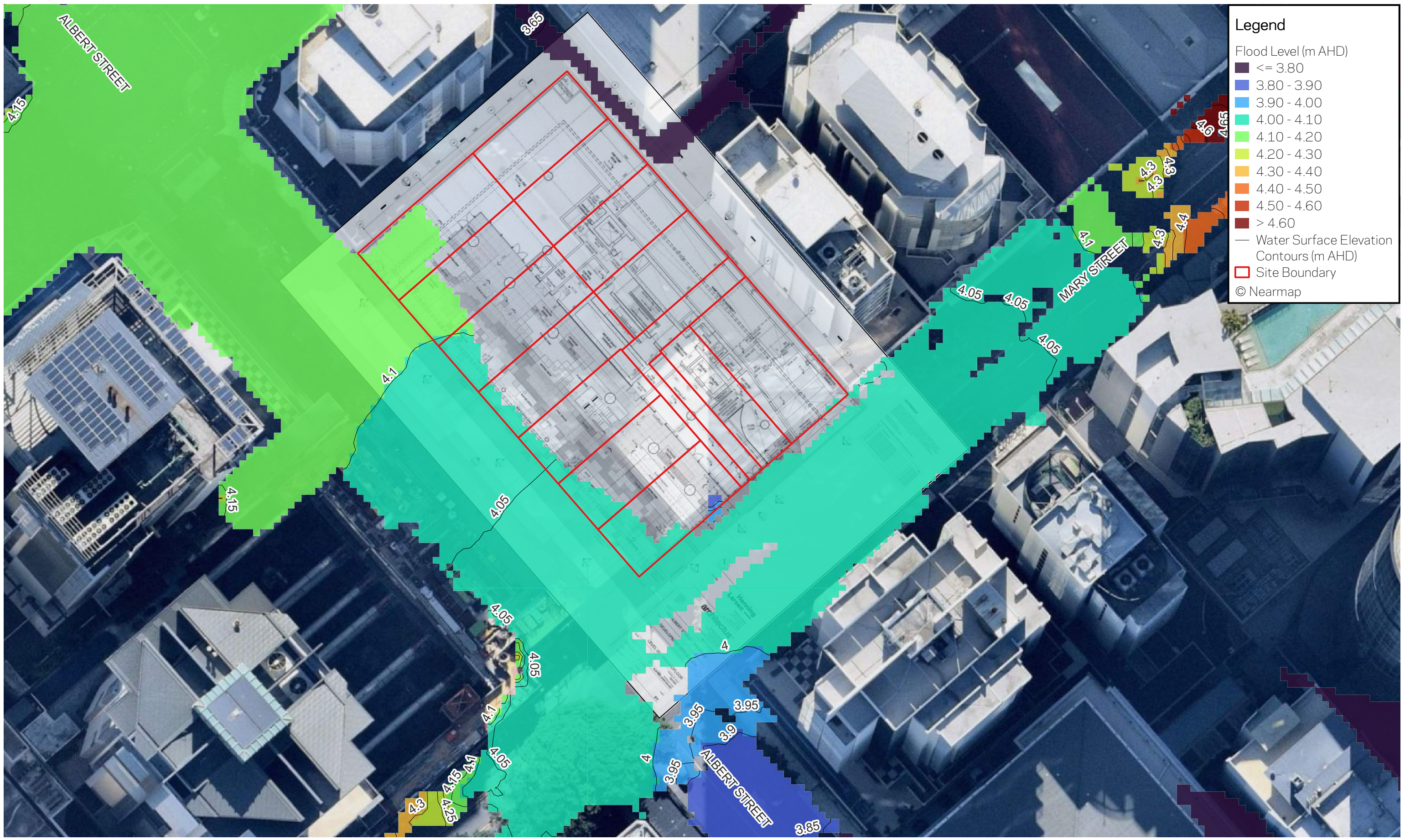
Title:  
**Max Developed Flood Level - 2% AEP (50-year ARI)**  
 Project. CRR Albert Street  
 Job # 2021.0566  
 Engineer. Carlos Gambirazio  
 Date. 26/7/2023  
 Filepath: \\bt-data\Company Data\Projects\2022\2022.0408-CRR Albert Street\2  
 Project\5 GIS\2022.0408-CRR Albert Street\_GIS.qgz



Scale 1:500 at A3

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**Legend**

Flood Level (m AHD)

- <= 3.80
- 3.80 - 3.90
- 3.90 - 4.00
- 4.00 - 4.10
- 4.10 - 4.20
- 4.20 - 4.30
- 4.30 - 4.40
- 4.40 - 4.50
- 4.50 - 4.60
- > 4.60

— Water Surface Elevation Contours (m AHD)

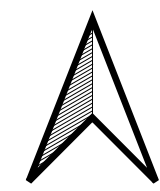
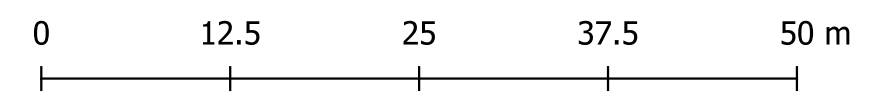
□ Site Boundary

© Nearmap



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 PO Box 612 Fortitude Valley Qld  
 4006 Australia  
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Title: **Max Developed Flood Level - 1% AEP (100-year ARI)**  
 Project: CRR Albert Street  
 Job # 2021.0566  
 Engineer: Carlos Gambirazio  
 Date: 26/7/2023  
 Filepath: \\bt-data\Company Data\Projects\2022\2022.0408-CRR Albert Street\2  
 Project\5 GIS\2022.0408-CRR Albert Street\_GIS.qgz



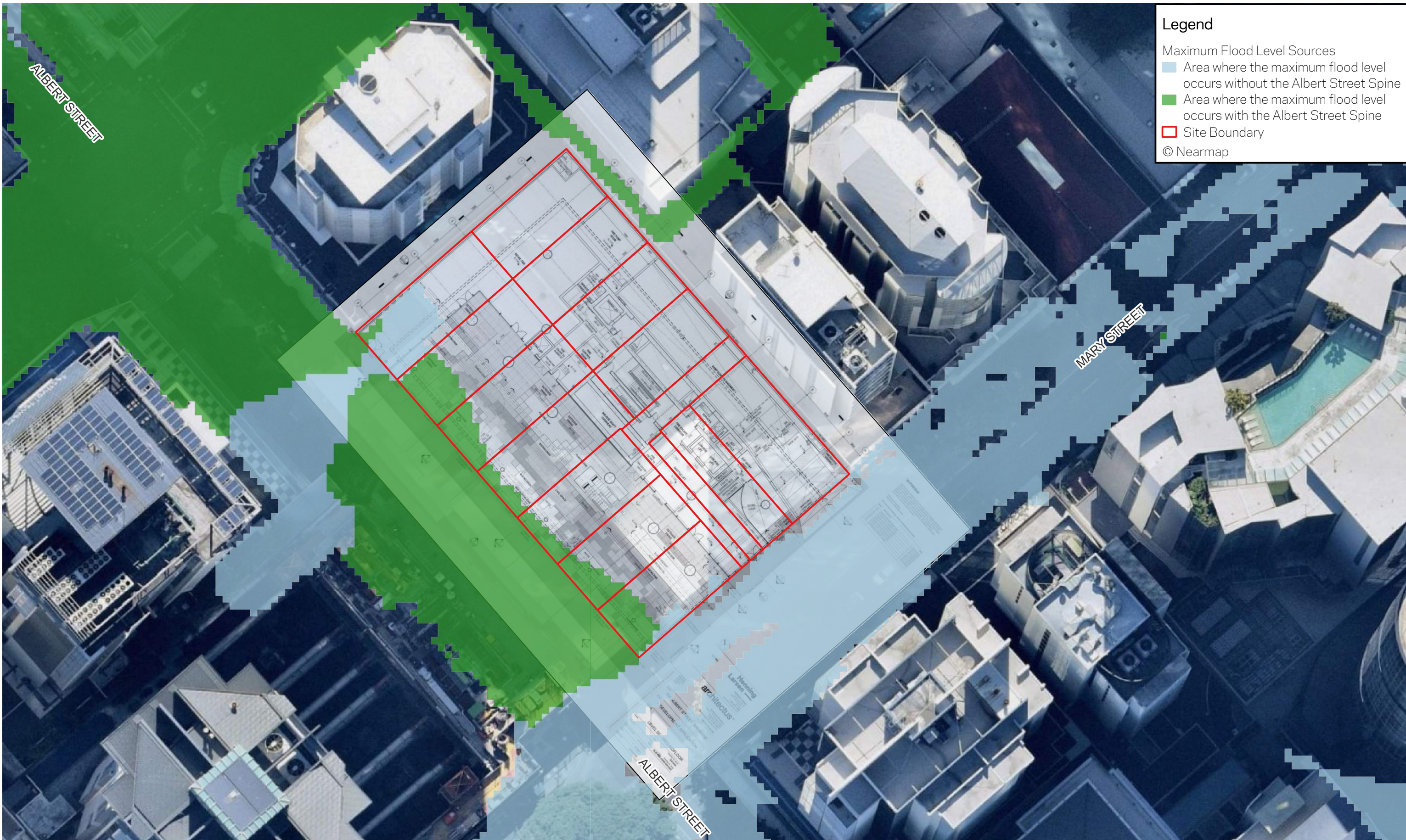
Scale 1:500 at A3

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# **A5. MAXIMUM FLOOD LEVEL SOURCES**





**Legend**

Maximum Flood Level Sources

- Area where the maximum flood level occurs without the Albert Street Spine
- Area where the maximum flood level occurs with the Albert Street Spine
- Site Boundary

© Nearmap

**BLIGH  
TANNER**

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4006 Australia  
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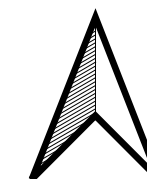
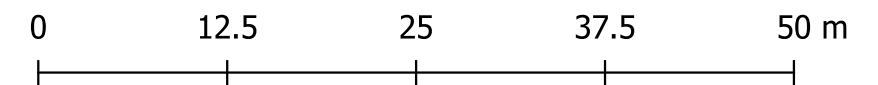
Title:  
**Max Developed Flood Level Sources - 1% AEP (100-year ARI)**

Project. CRR Albert Street  
Job # 2022.0408

Engineer. Carlos Gambirazio  
Date. 26/7/2023

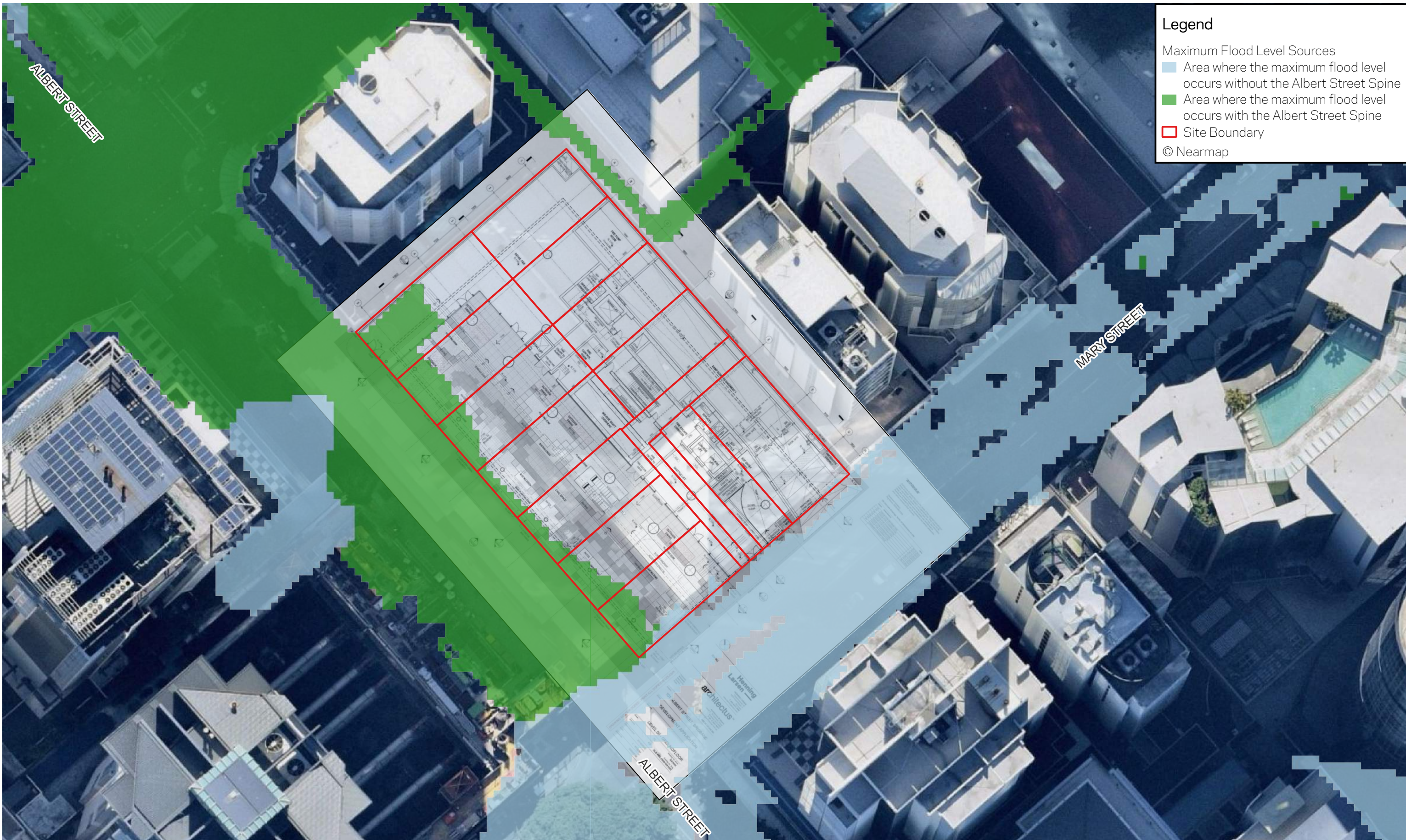
Filepath: \\bt-data\Company Data\Projects\2022\2022.0408-CRR Albert Street\2  
Project\5 GIS\2022.0408-CRR Albert Street\_GIS.qgz

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Scale 1:500 at A3





**Legend**

Maximum Flood Level Sources

- Area where the maximum flood level occurs without the Albert Street Spine
- Area where the maximum flood level occurs with the Albert Street Spine
- Site Boundary

© Nearmap

**BLIGH  
TANNER**

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PO Box 612 Fortitude Valley Qld  
4006 Australia  
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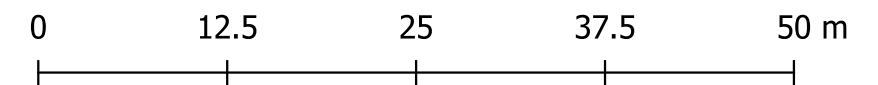
Title:  
**Max Developed Flood Level Sources - 2% AEP (50-year ARI)**

Project. CRR Albert Street  
Job # 2022.0408

Engineer. Carlos Gambirazio  
Date. 26/7/2023

Filepath: \\bt-data\Company Data\Projects\2022\2022.0408-CRR Albert Street\2  
Project\5 GIS\2022.0408-CRR Albert Street\_GIS.qgz

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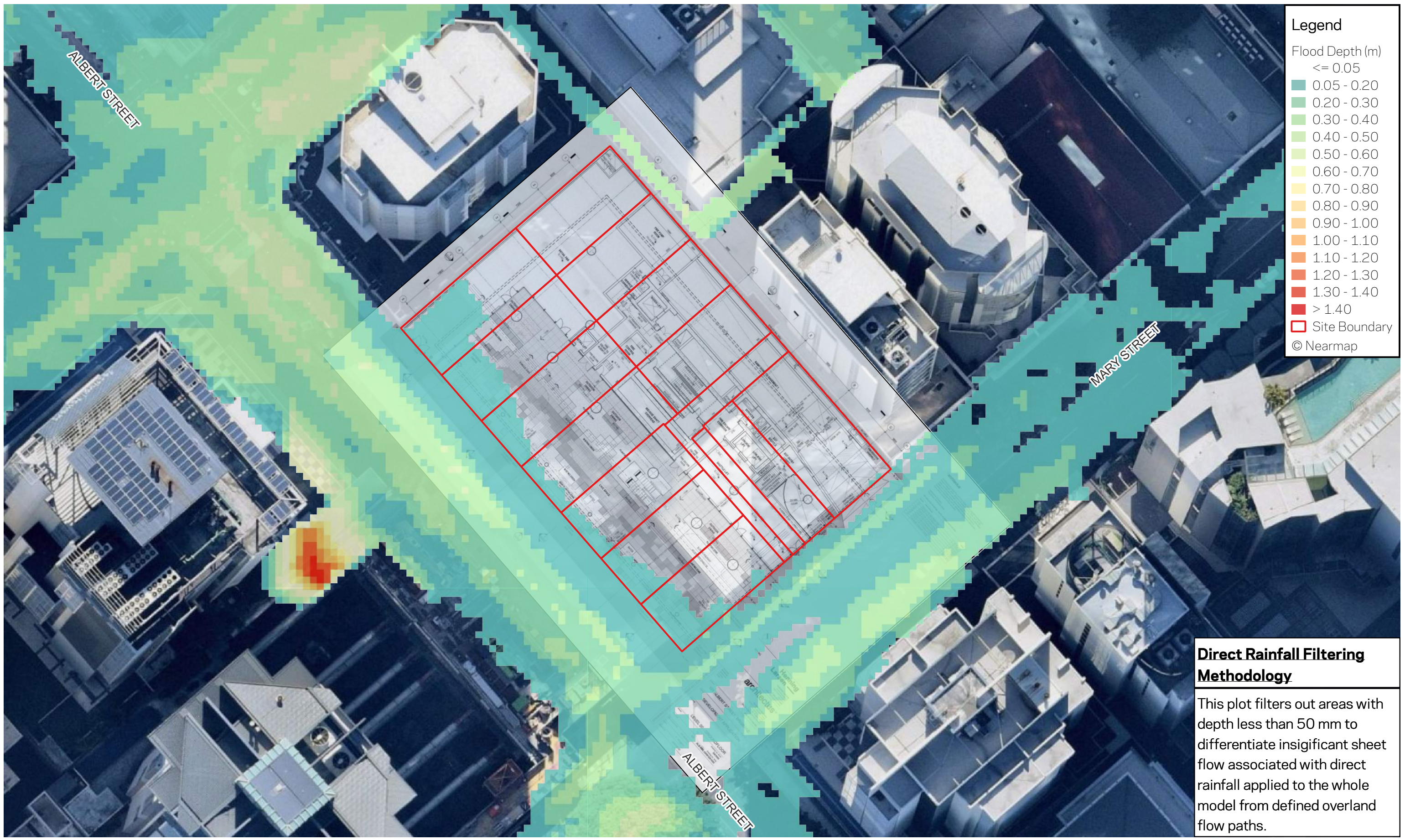


Scale 1:500 at A3



# **A6. OVERLAND FLOW FLOOD DEPTHS**





**Legend**

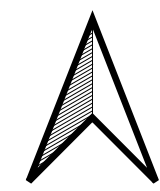
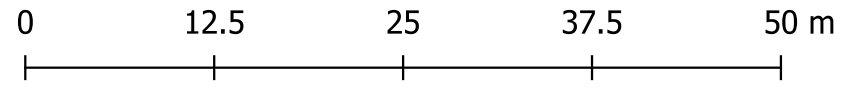
Flood Depth (m)

- <= 0.05
- 0.05 - 0.20
- 0.20 - 0.30
- 0.30 - 0.40
- 0.40 - 0.50
- 0.50 - 0.60
- 0.60 - 0.70
- 0.70 - 0.80
- 0.80 - 0.90
- 0.90 - 1.00
- 1.00 - 1.10
- 1.10 - 1.20
- 1.20 - 1.30
- 1.30 - 1.40
- > 1.40
- Site Boundary

© Nearmap

**Direct Rainfall Filtering Methodology**

This plot filters out areas with depth less than 50 mm to differentiate insignificant sheet flow associated with direct rainfall applied to the whole model from defined overland flow paths.



Scale 1:500 at A3

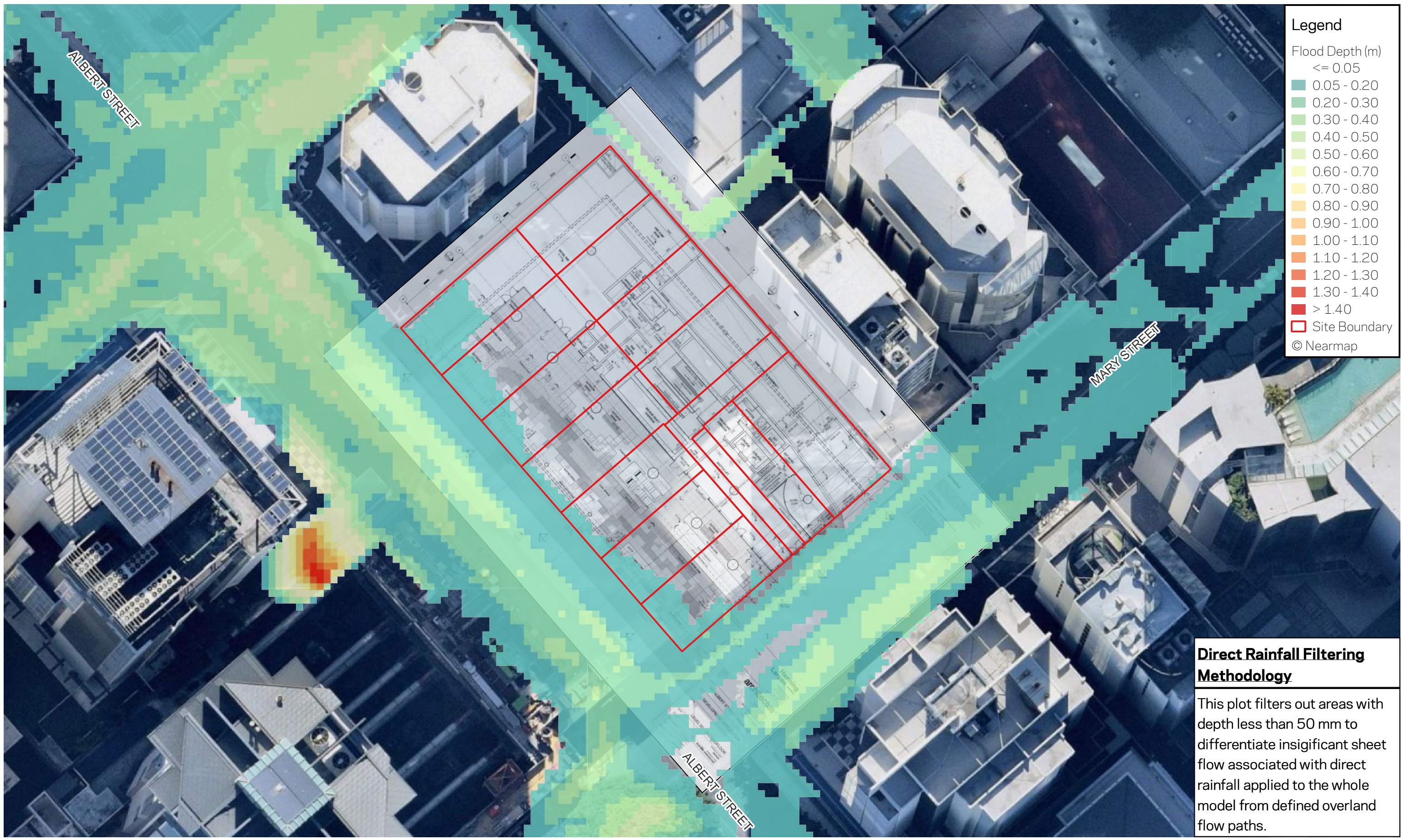


Level 9, 269 Wickham St  
 PO Box 612 Fortitude Valley Qld  
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Title: Flood Depth - Developed - 1% AEP (100-year ARI)  
 Project: CRR Albert Street  
 Job # 2022.0408  
 Engineer: Carlos Gambirazio  
 Date: 6/11/2023  
 Filepath: \\bt-data\Company Data\Projects\2022\2022.0408-CRR Albert Street\2  
 Project\5 GIS\2022.0408-CRR Albert Street\_GIS.qgz

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**Legend**

Flood Depth (m)

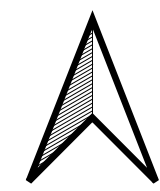
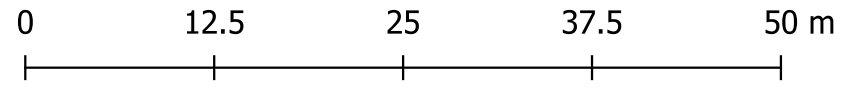
- <= 0.05
- 0.05 - 0.20
- 0.20 - 0.30
- 0.30 - 0.40
- 0.40 - 0.50
- 0.50 - 0.60
- 0.60 - 0.70
- 0.70 - 0.80
- 0.80 - 0.90
- 0.90 - 1.00
- 1.00 - 1.10
- 1.10 - 1.20
- 1.20 - 1.30
- 1.30 - 1.40
- > 1.40

Site Boundary

© Nearmap

**Direct Rainfall Filtering Methodology**

This plot filters out areas with depth less than 50 mm to differentiate insignificant sheet flow associated with direct rainfall applied to the whole model from defined overland flow paths.



Scale 1:500 at A3

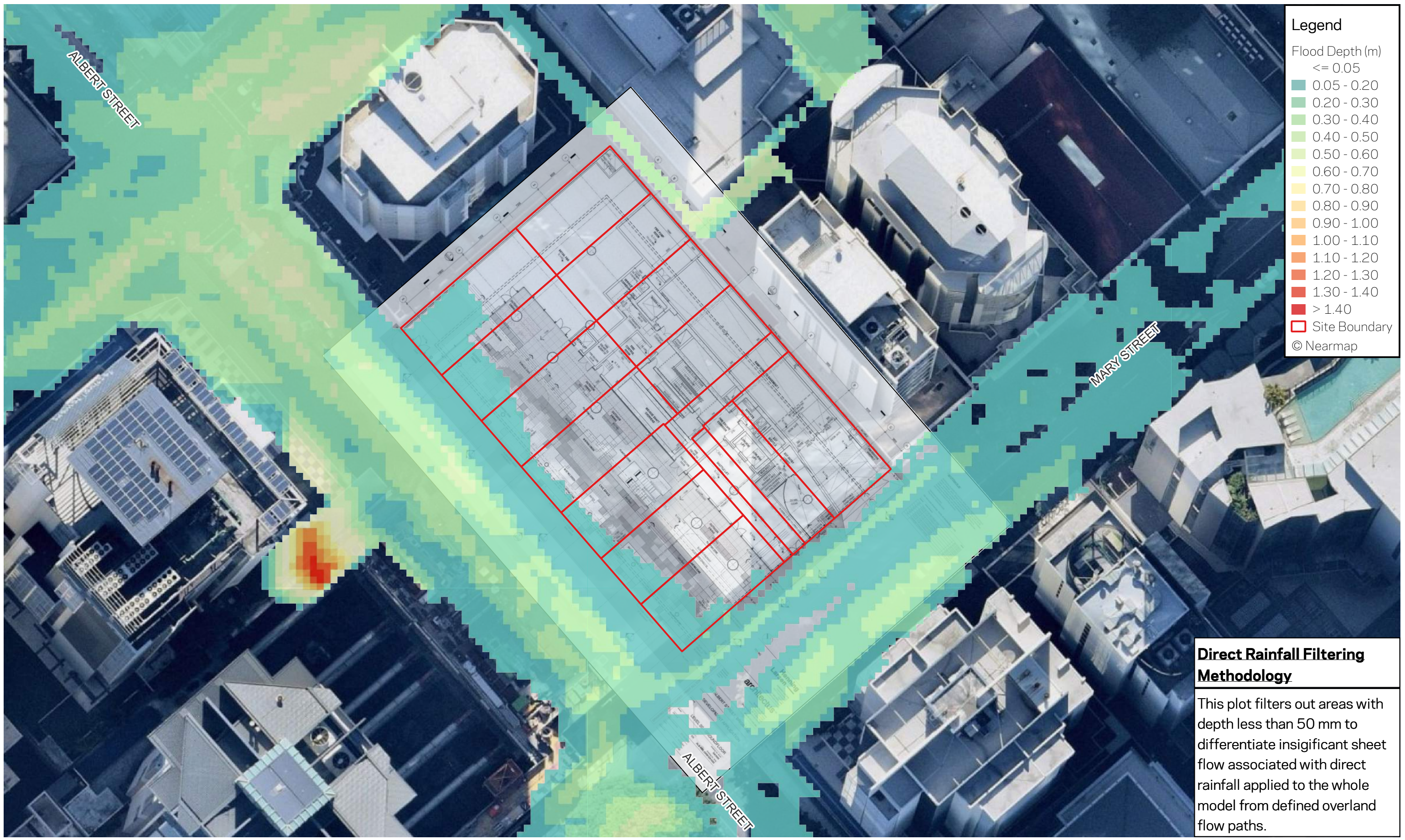


Level 9, 269 Wickham St  
 PO Box 612 Fortitude Valley Qld  
 4006 Australia  
 T +61 7 3251 8555

Title: **Flood Depth - Developed - 2% AEP (50-year ARI)**  
 Project: CRR Albert Street  
 Job # 2022.0408  
 Engineer: Carlos Gambirazio  
 Date: 6/11/2023  
 Filepath: \\bt-data\Company Data\Projects\2022\2022.0408-CRR Albert Street\2  
 Project\5 GIS\2022.0408-CRR Albert Street\_GIS.qgz

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**Legend**

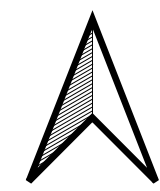
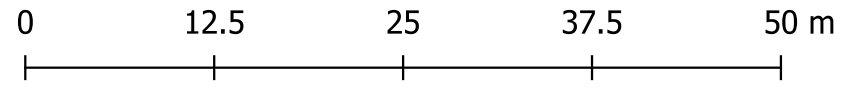
Flood Depth (m)

- <= 0.05
- 0.05 - 0.20
- 0.20 - 0.30
- 0.30 - 0.40
- 0.40 - 0.50
- 0.50 - 0.60
- 0.60 - 0.70
- 0.70 - 0.80
- 0.80 - 0.90
- 0.90 - 1.00
- 1.00 - 1.10
- 1.10 - 1.20
- 1.20 - 1.30
- 1.30 - 1.40
- > 1.40
- Site Boundary

© Nearmap

**Direct Rainfall Filtering Methodology**

This plot filters out areas with depth less than 50 mm to differentiate insignificant sheet flow associated with direct rainfall applied to the whole model from defined overland flow paths.



Scale 1:500 at A3

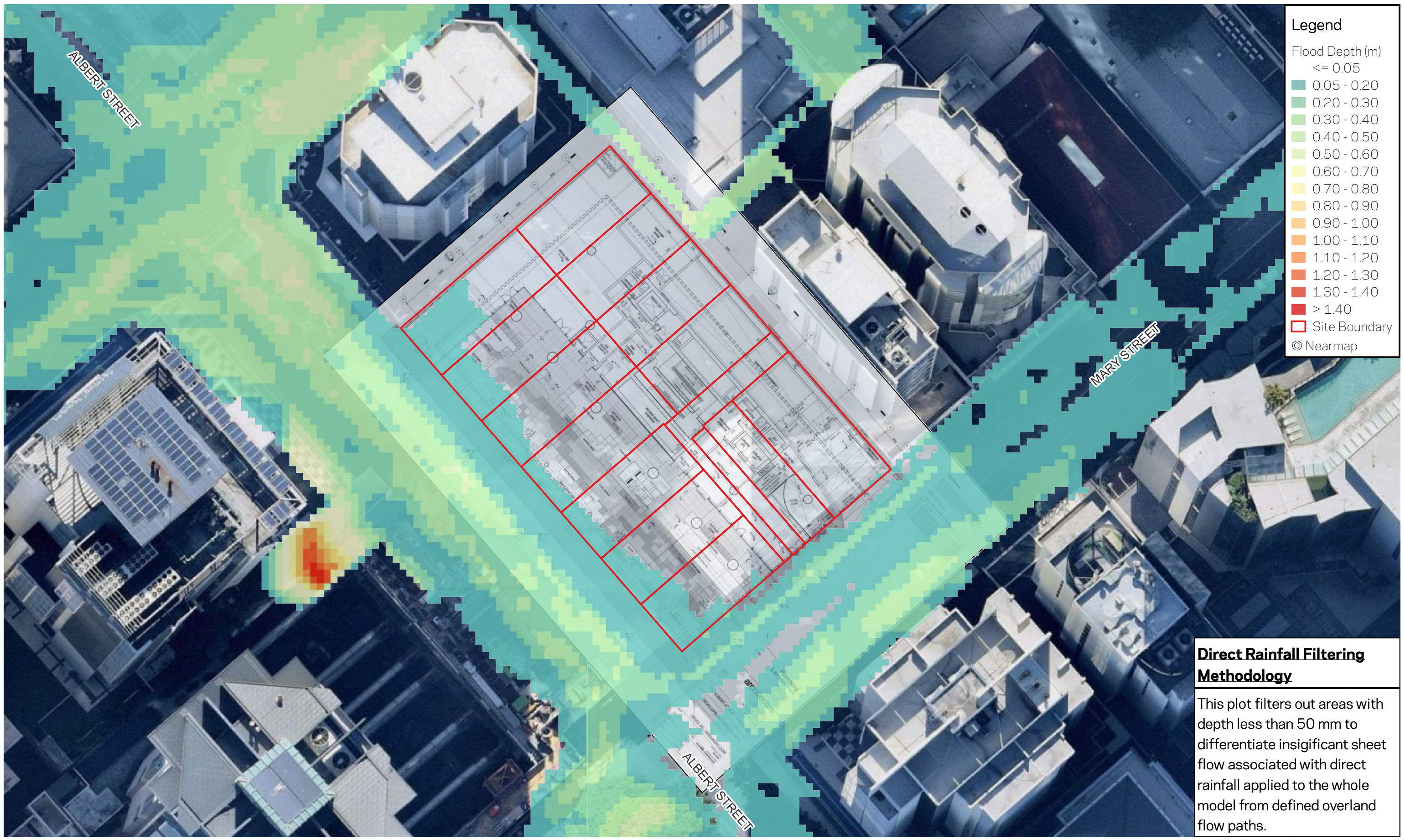


Level 9, 269 Wickham St  
 PO Box 612 Fortitude Valley Qld  
 4006 Australia  
 T +61 7 3251 8555

Title: Flood Depth - Developed and Albert Street Spine - 1% AEP (100-year ARI)  
 Project: CRR Albert Street  
 Job # 2022.0408  
 Engineer: Carlos Gambirazio  
 Date: 6/11/2023  
 Filepath: \\bt-data\Company Data\Projects\2022\2022.0408-CRR Albert Street\2  
 Project\5 GIS\2022.0408-CRR Albert Street\_GIS.qgz

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**Legend**

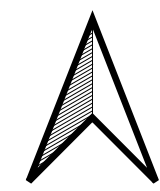
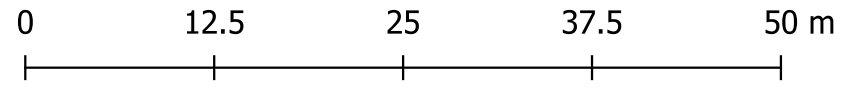
Flood Depth (m)

- <= 0.05
- 0.05 - 0.20
- 0.20 - 0.30
- 0.30 - 0.40
- 0.40 - 0.50
- 0.50 - 0.60
- 0.60 - 0.70
- 0.70 - 0.80
- 0.80 - 0.90
- 0.90 - 1.00
- 1.00 - 1.10
- 1.10 - 1.20
- 1.20 - 1.30
- 1.30 - 1.40
- > 1.40
- Site Boundary

© Nearmap

**Direct Rainfall Filtering Methodology**

This plot filters out areas with depth less than 50 mm to differentiate insignificant sheet flow associated with direct rainfall applied to the whole model from defined overland flow paths.



Scale 1:500 at A3

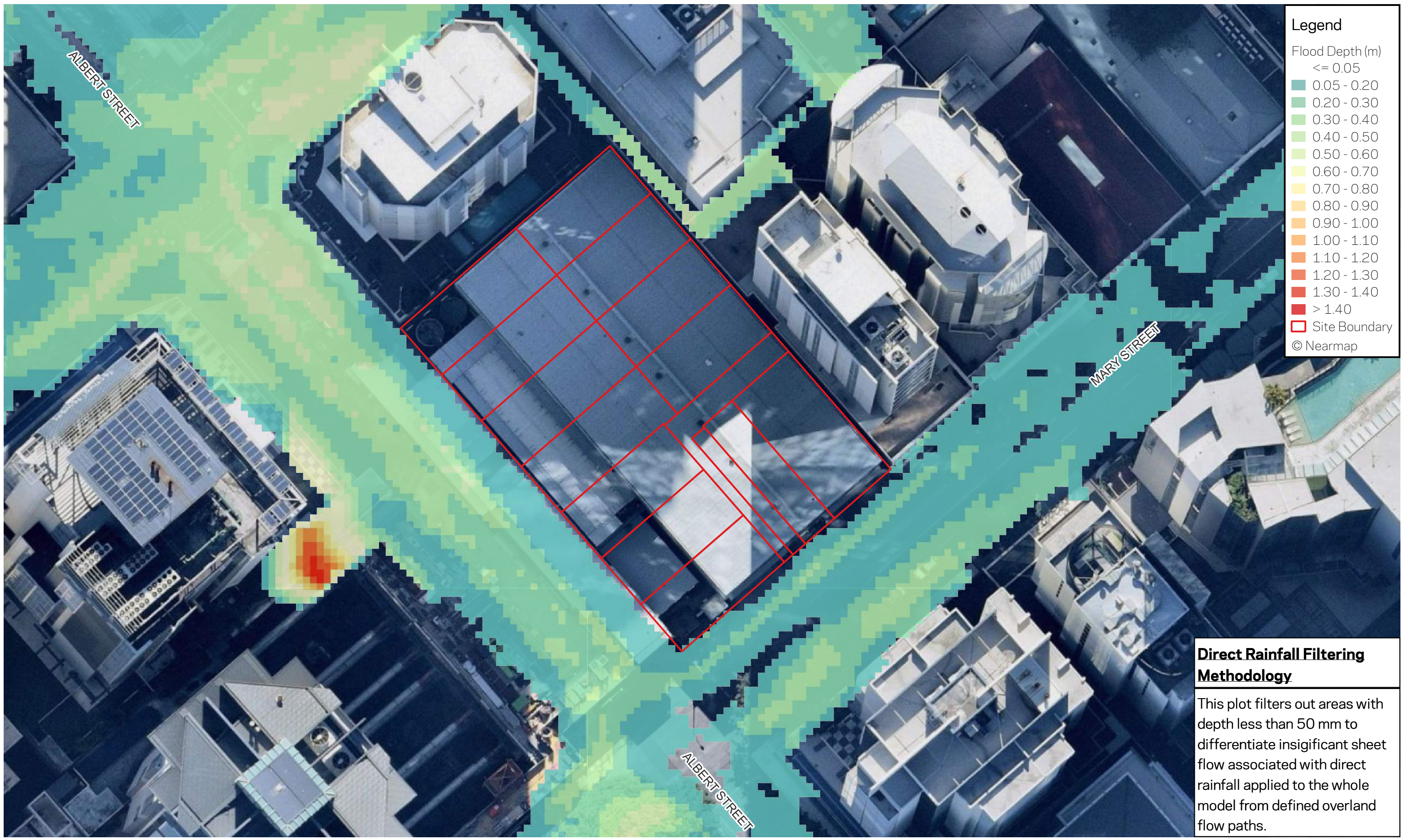


Level 9, 269 Wickham St  
 PO Box 612 Fortitude Valley Qld  
 4006 Australia  
 T +61 7 3251 8555

Title: Flood Depth - Developed and Albert Street Spine - 2% AEP (50-year ARI)  
 Project: CRR Albert Street  
 Job # 2022.0408  
 Engineer: Carlos Gambirazio  
 Date: 6/11/2023  
 Filepath: \\bt-data\Company Data\Projects\2022\2022.0408-CRR Albert Street\2  
 Project\5 GIS\2022.0408-CRR Albert Street\_GIS.qgz

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**Legend**

Flood Depth (m)

- $\le 0.05$
- 0.05 - 0.20
- 0.20 - 0.30
- 0.30 - 0.40
- 0.40 - 0.50
- 0.50 - 0.60
- 0.60 - 0.70
- 0.70 - 0.80
- 0.80 - 0.90
- 0.90 - 1.00
- 1.00 - 1.10
- 1.10 - 1.20
- 1.20 - 1.30
- 1.30 - 1.40
- > 1.40
- Site Boundary

© Nearmap

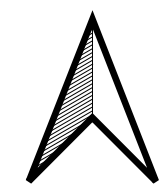
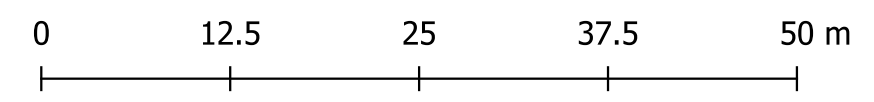
**Direct Rainfall Filtering Methodology**

This plot filters out areas with depth less than 50 mm to differentiate insignificant sheet flow associated with direct rainfall applied to the whole model from defined overland flow paths.



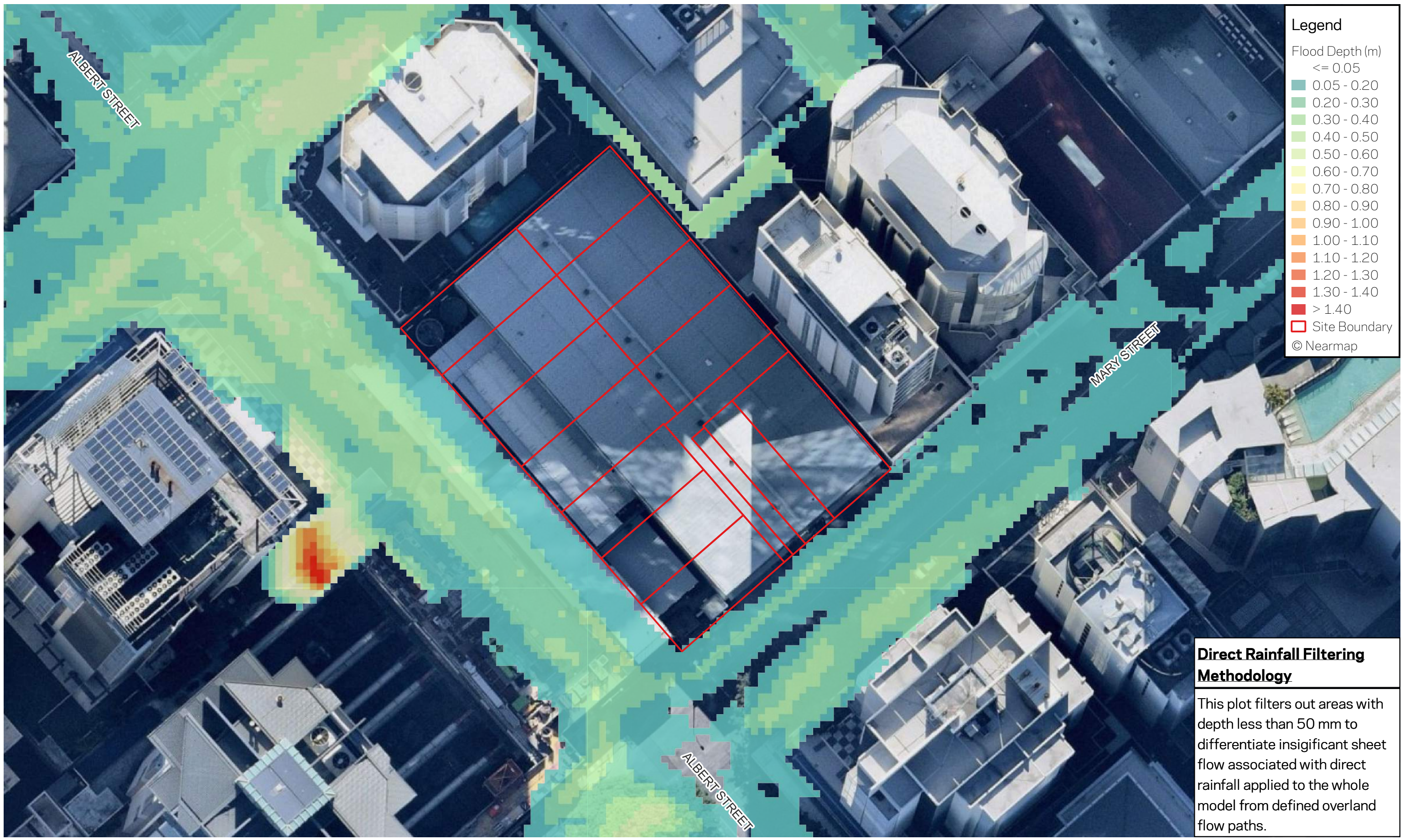
Level 9, 269 Wickham St  
 PO Box 612 Fortitude Valley Qld  
 4006 Australia  
 T +61 7 3251 8555

Title: Flood Depth - Revised Existing - 1% AEP (100-year ARI)  
 Project: CRR Albert Street  
 Job # 2022.0408  
 Engineer: Carlos Gambirazio  
 Date: 6/11/2023  
 Filepath: \\bt-data\Company Data\Projects\2022\2022.0408-CRR Albert Street\2  
 Project\5 GIS\2022.0408-CRR Albert Street\_GIS.qgz



Scale 1:500 at A3





**Legend**

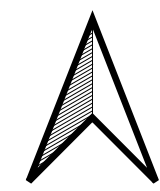
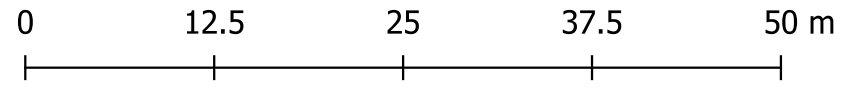
Flood Depth (m)

- <= 0.05
- 0.05 - 0.20
- 0.20 - 0.30
- 0.30 - 0.40
- 0.40 - 0.50
- 0.50 - 0.60
- 0.60 - 0.70
- 0.70 - 0.80
- 0.80 - 0.90
- 0.90 - 1.00
- 1.00 - 1.10
- 1.10 - 1.20
- 1.20 - 1.30
- 1.30 - 1.40
- > 1.40
- Site Boundary

© Nearmap

**Direct Rainfall Filtering Methodology**

This plot filters out areas with depth less than 50 mm to differentiate insignificant sheet flow associated with direct rainfall applied to the whole model from defined overland flow paths.



Scale 1:500 at A3



Level 9, 269 Wickham St  
 PO Box 612 Fortitude Valley Qld  
 4006 Australia  
 T +61 7 3251 8555

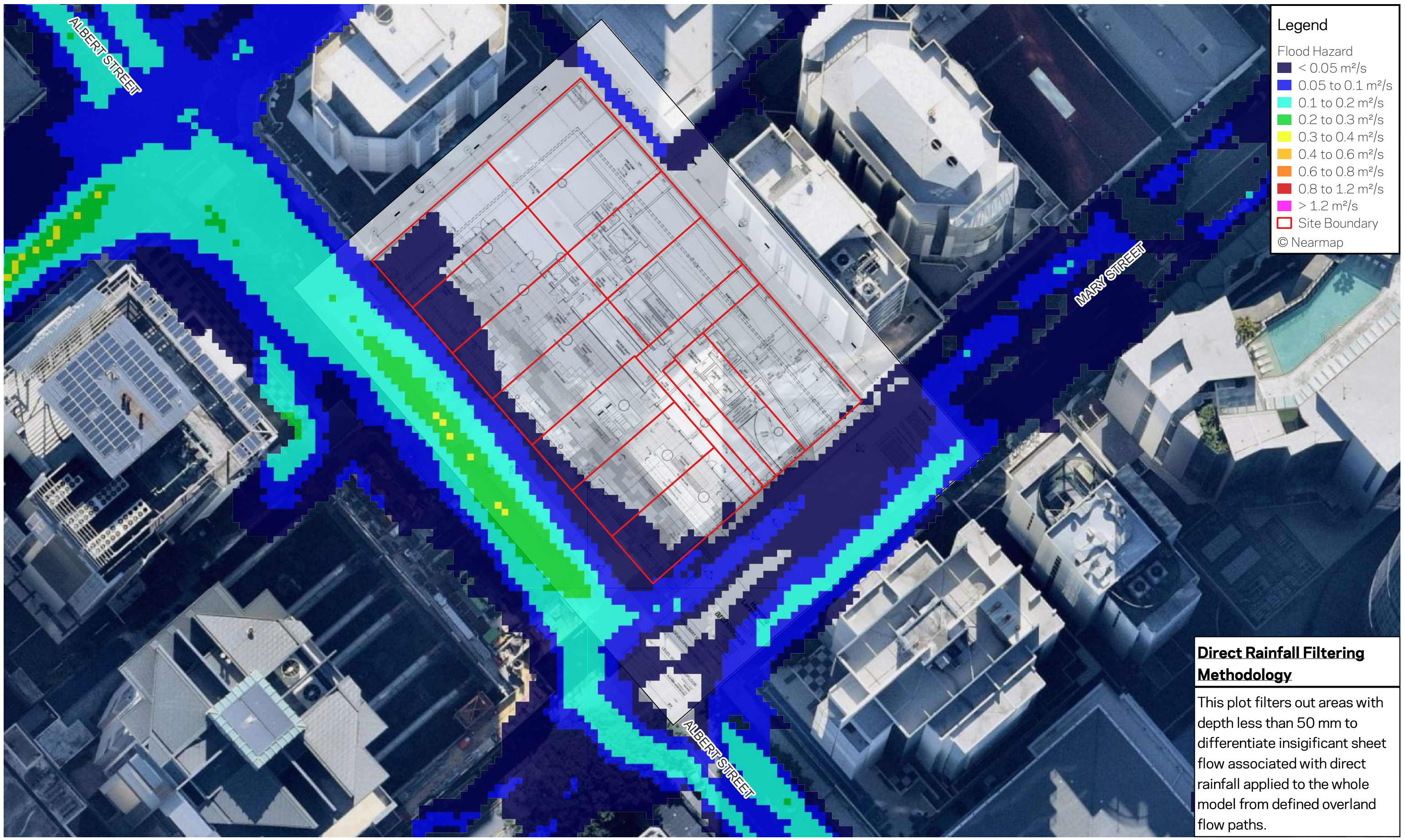
Title: Flood Depth - Revised Existing - 2% AEP (50-year ARI)  
 Project: CRR Albert Street  
 Job # 2022.0408  
 Engineer: Carlos Gambirazio  
 Date: 6/11/2023  
 Filepath: \\bt-data\Company Data\Projects\2022\2022.0408-CRR Albert Street\2  
 Project\5 GIS\2022.0408-CRR Albert Street\_GIS.qgz

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# **A7. OVERLAND FLOW FLOOD HAZARDS**





**Legend**

Flood Hazard

- < 0.05 m<sup>2</sup>/s
- 0.05 to 0.1 m<sup>2</sup>/s
- 0.1 to 0.2 m<sup>2</sup>/s
- 0.2 to 0.3 m<sup>2</sup>/s
- 0.3 to 0.4 m<sup>2</sup>/s
- 0.4 to 0.6 m<sup>2</sup>/s
- 0.6 to 0.8 m<sup>2</sup>/s
- 0.8 to 1.2 m<sup>2</sup>/s
- > 1.2 m<sup>2</sup>/s
- Site Boundary

© Nearmap

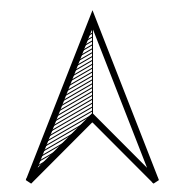
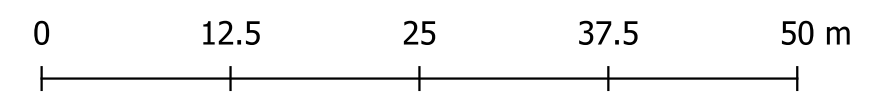
**Direct Rainfall Filtering Methodology**

This plot filters out areas with depth less than 50 mm to differentiate insignificant sheet flow associated with direct rainfall applied to the whole model from defined overland flow paths.



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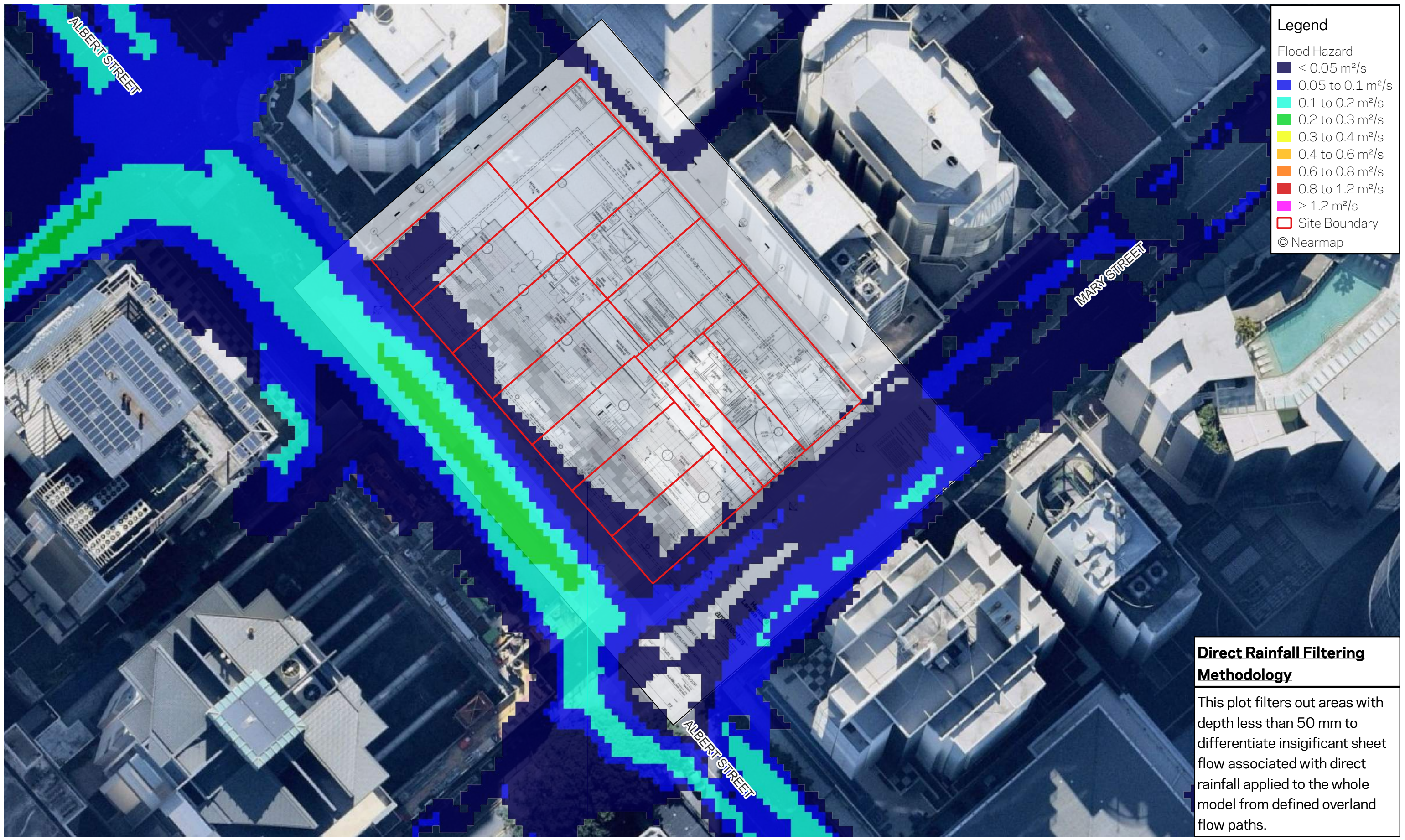
Title: Flood Hazard - Developed - 1% AEP (100-year ARI)  
 Project: CRR Albert Street  
 Job # 2022.0408  
 Engineer: Carlos Gambirazio  
 Date: 26/7/2023  
 Filepath: \\bt-data\Company Data\Projects\2022\2022.0408-CRR Albert Street\2  
 Project\5 GIS\2022.0408-CRR Albert Street\_GIS.qgz



Scale 1:500 at A3

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**Legend**

Flood Hazard	< 0.05 m <sup>2</sup> /s
	0.05 to 0.1 m <sup>2</sup> /s
	0.1 to 0.2 m <sup>2</sup> /s
	0.2 to 0.3 m <sup>2</sup> /s
	0.3 to 0.4 m <sup>2</sup> /s
	0.4 to 0.6 m <sup>2</sup> /s
	0.6 to 0.8 m <sup>2</sup> /s
	0.8 to 1.2 m <sup>2</sup> /s
	> 1.2 m <sup>2</sup> /s
	Site Boundary
© Nearmap	

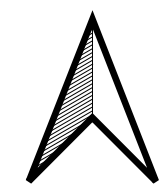
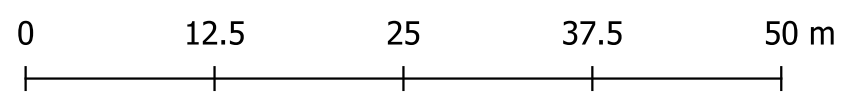
**Direct Rainfall Filtering Methodology**

This plot filters out areas with depth less than 50 mm to differentiate insignificant sheet flow associated with direct rainfall applied to the whole model from defined overland flow paths.



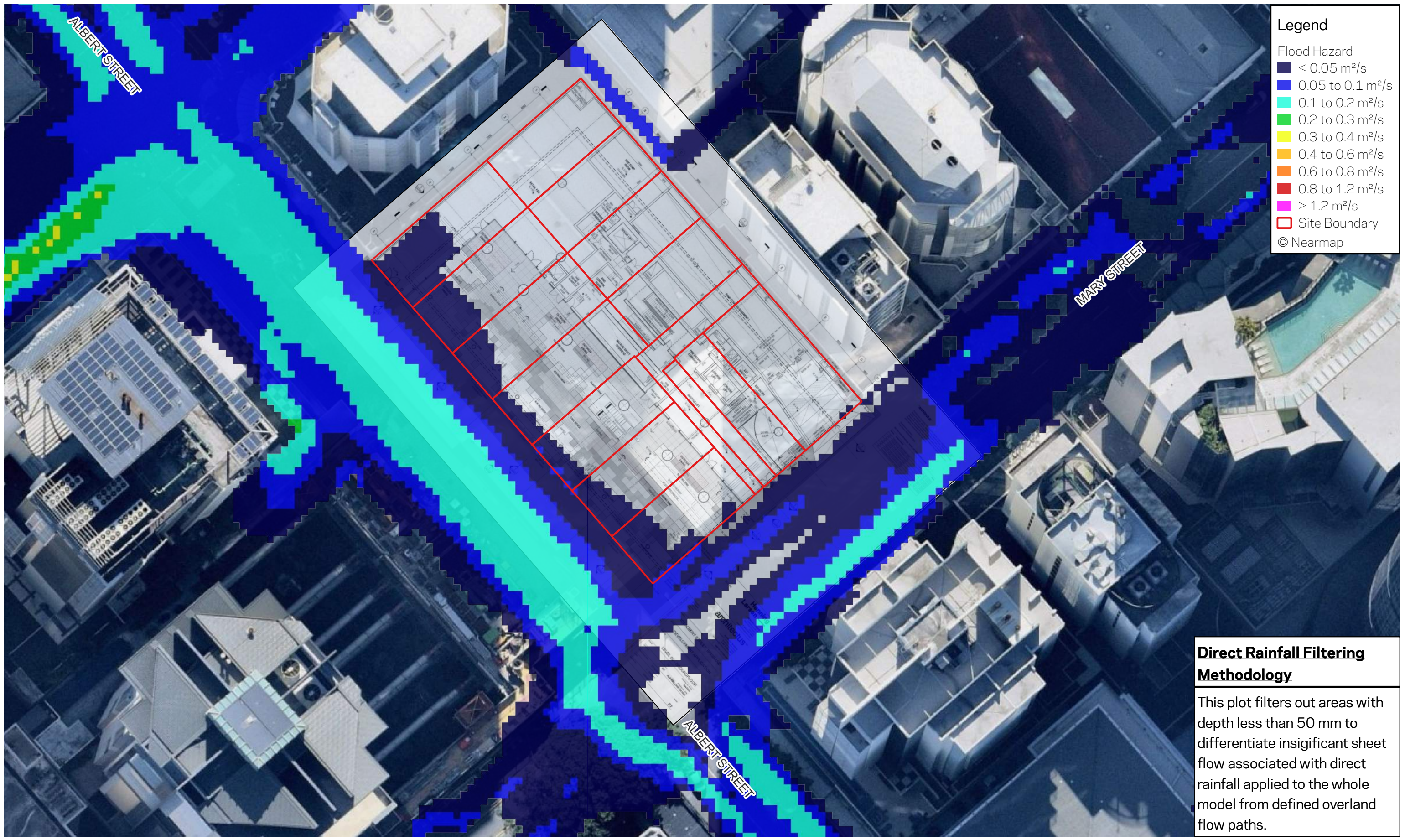
Level 9, 269 Wickham St  
 PO Box 612 Fortitude Valley Qld  
 4006 Australia  
 T +61 7 3251 8555

Title: Flood Hazard - Developed - 2% AEP (50-year ARI)  
 Project: CRR Albert Street  
 Job # 2022.0408  
 Engineer: Carlos Gambirazio  
 Date: 26/7/2023  
 Filepath: \\bt-data\Company Data\Projects\2022\2022.0408-CRR Albert Street\2  
 Project\5 GIS\2022.0408-CRR Albert Street\_GIS.qgz



Scale 1:500 at A3





**Legend**

- Flood Hazard
- <math>< 0.05 \text{ m}^2/\text{s}</math>
- 0.05 to 0.1  $\text{m}^2/\text{s}$
- 0.1 to 0.2  $\text{m}^2/\text{s}$
- 0.2 to 0.3  $\text{m}^2/\text{s}$
- 0.3 to 0.4  $\text{m}^2/\text{s}$
- 0.4 to 0.6  $\text{m}^2/\text{s}$
- 0.6 to 0.8  $\text{m}^2/\text{s}$
- 0.8 to 1.2  $\text{m}^2/\text{s}$
- > 1.2  $\text{m}^2/\text{s}$
- Site Boundary

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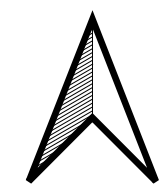
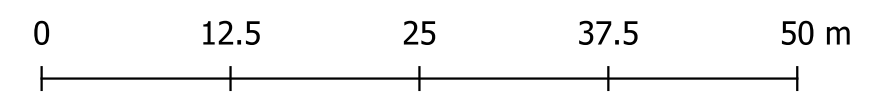
**Direct Rainfall Filtering Methodology**

This plot filters out areas with depth less than 50 mm to differentiate insignificant sheet flow associated with direct rainfall applied to the whole model from defined overland flow paths.



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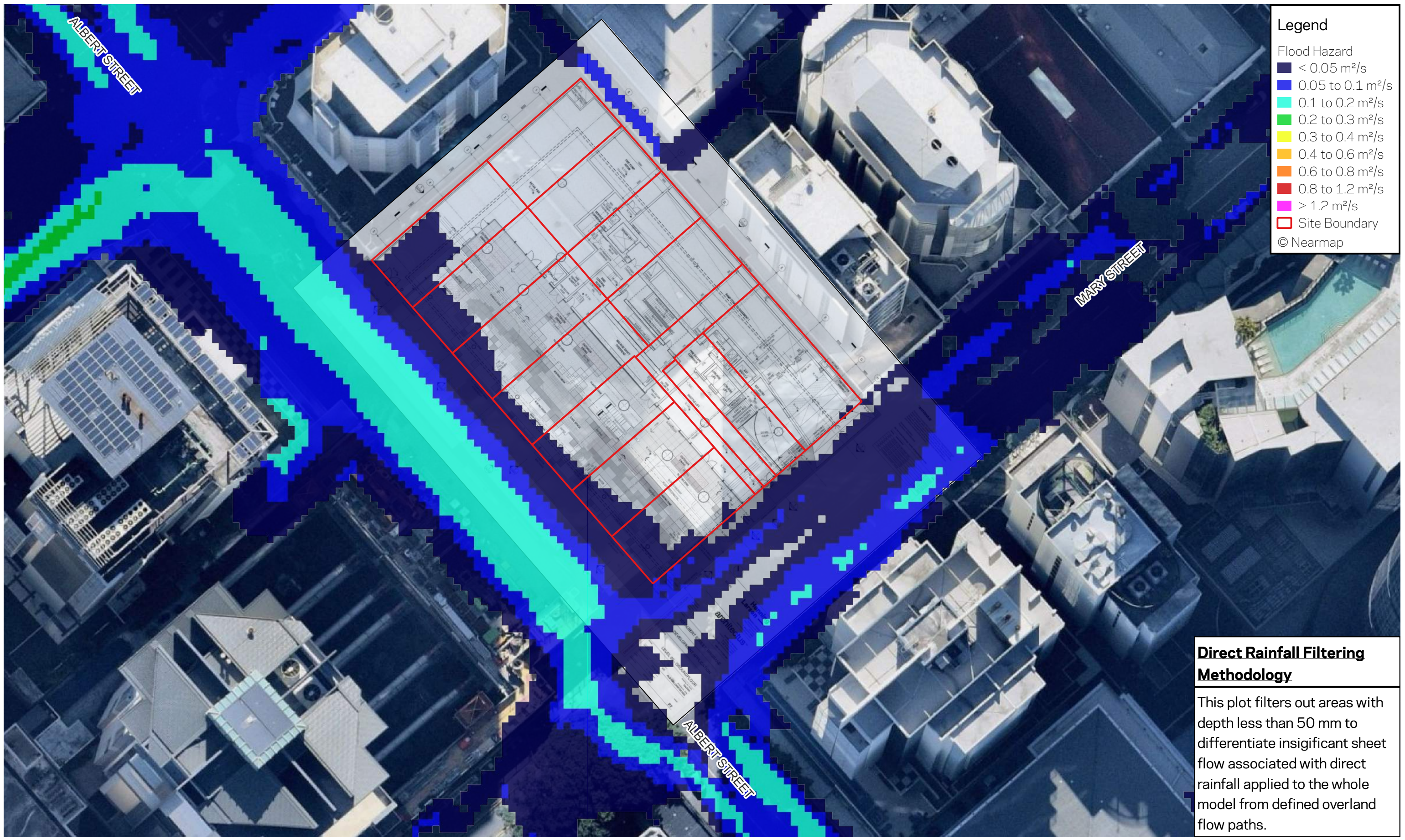
Title: Flood Hazard - Developed & Albert Street Spine - 1% AEP (100-year ARI)  
 Project: CRR Albert Street  
 Job # 2022.0408  
 Engineer: Carlos Gambirazio  
 Date: 26/7/2023  
 Filepath: \\bt-data\Company Data\Projects\2022\2022.0408-CRR Albert Street\2  
 Project\5 GIS\2022.0408-CRR Albert Street\_GIS.qgz



Scale 1:500 at A3

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**Legend**

- Flood Hazard
- <math>< 0.05 \text{ m}^2/\text{s}</math>
- 0.05 to 0.1  $\text{m}^2/\text{s}$
- 0.1 to 0.2  $\text{m}^2/\text{s}$
- 0.2 to 0.3  $\text{m}^2/\text{s}$
- 0.3 to 0.4  $\text{m}^2/\text{s}$
- 0.4 to 0.6  $\text{m}^2/\text{s}$
- 0.6 to 0.8  $\text{m}^2/\text{s}$
- 0.8 to 1.2  $\text{m}^2/\text{s}$
- > 1.2  $\text{m}^2/\text{s}$
- Site Boundary
- © Nearmap

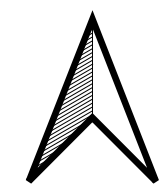
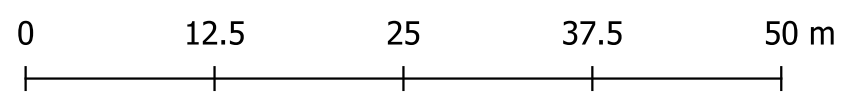
**Direct Rainfall Filtering Methodology**

This plot filters out areas with depth less than 50 mm to differentiate insignificant sheet flow associated with direct rainfall applied to the whole model from defined overland flow paths.



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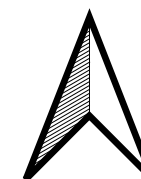
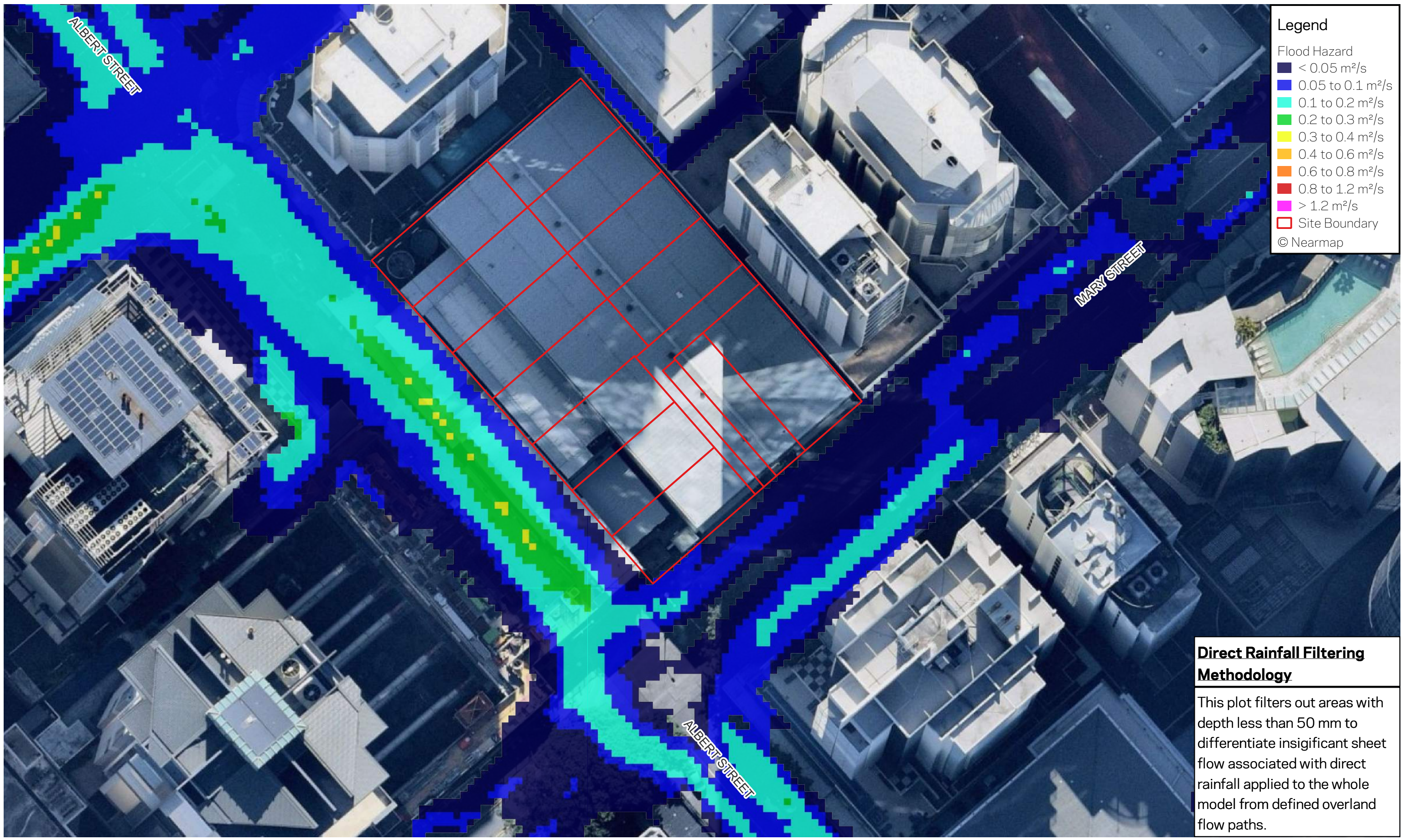
Title: Flood Hazard - Developed & Albert Street Spine - 2% AEP (50-year ARI)  
 Project: CRR Albert Street  
 Job # 2022.0408  
 Engineer: Carlos Gambirazio  
 Date: 26/7/2023  
 Filepath: \\bt-data\Company Data\Projects\2022\2022.0408-CRR Albert Street\2  
 Project\5 GIS\2022.0408-CRR Albert Street\_GIS.qgz



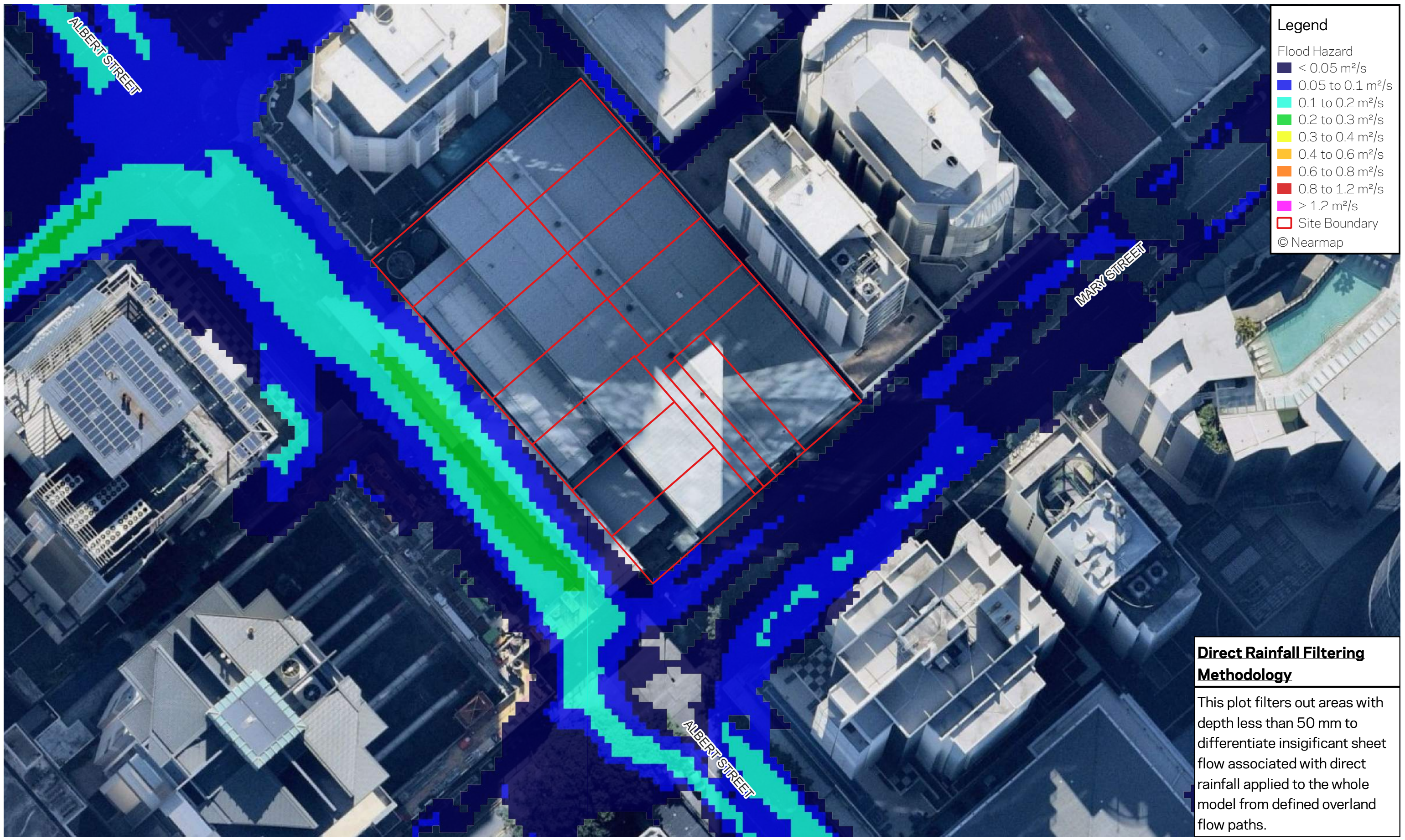
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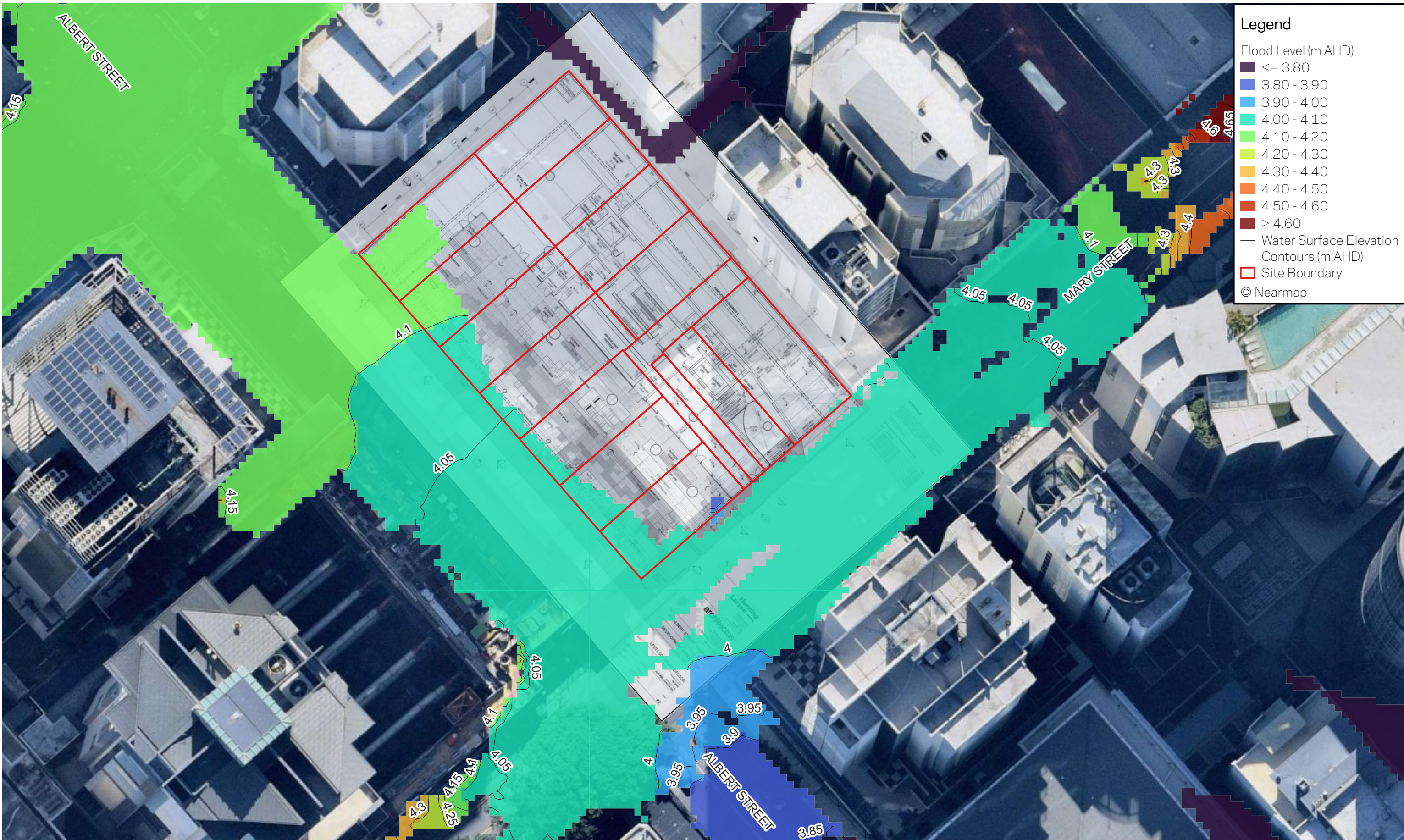






# **A8. OVERLAND FLOW FLOOD LEVELS**





**Legend**

Flood Level (m AHD)

- ≤ 3.80
- 3.80 - 3.90
- 3.90 - 4.00
- 4.00 - 4.10
- 4.10 - 4.20
- 4.20 - 4.30
- 4.30 - 4.40
- 4.40 - 4.50
- 4.50 - 4.60
- > 4.60

— Water Surface Elevation Contours (m AHD)

□ Site Boundary

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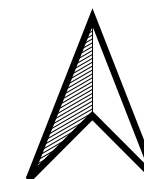
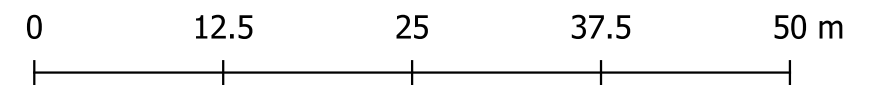
Title:  
**Flood Level - Developed - 1% AEP (100-year ARI)**

Project. CRR Albert Street  
 Job # 2021.0566

Engineer. Carlos Gambirazio  
 Date. 26/7/2023

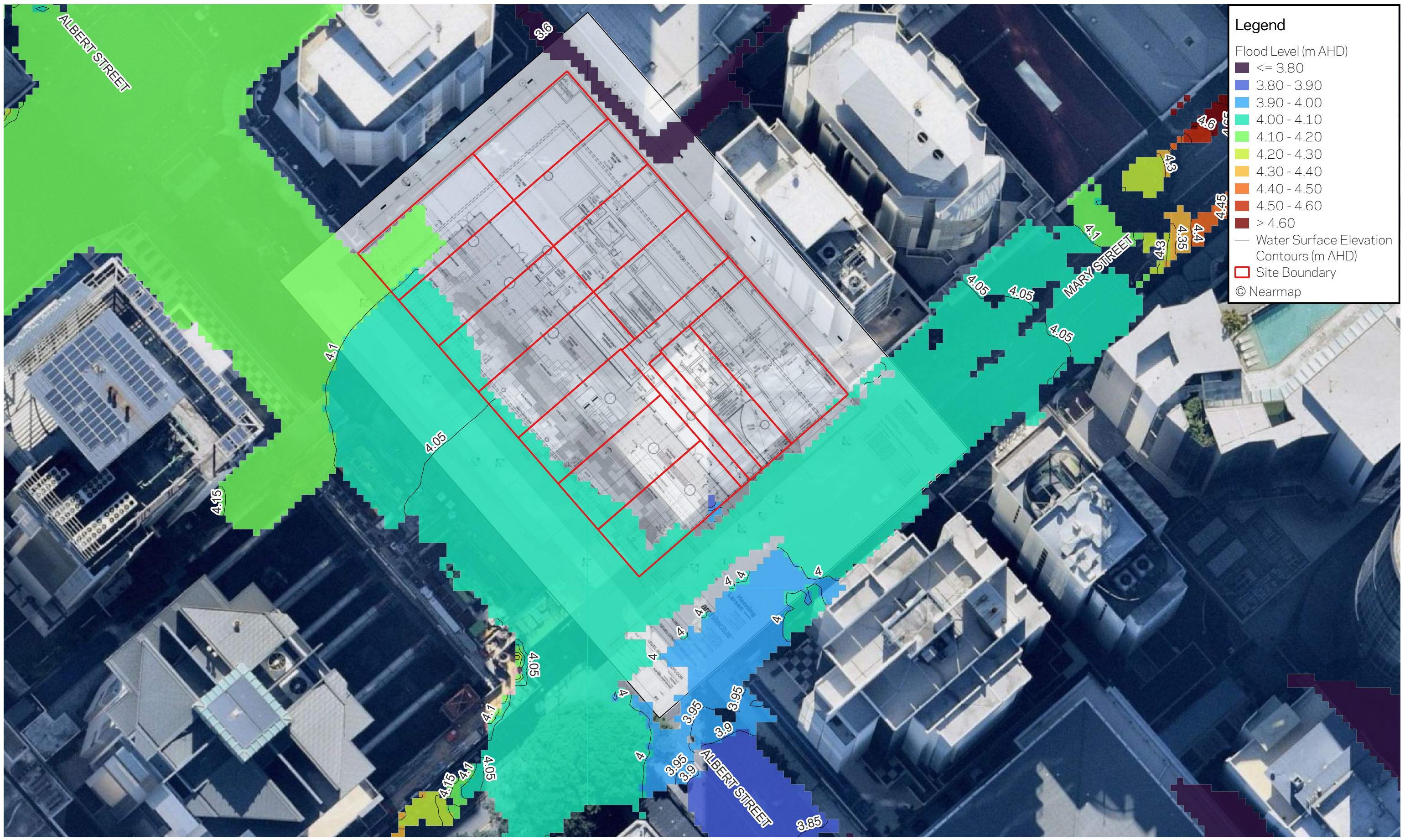
Filepath: \\bt-data\Company Data\Projects\2022\2022.0408-CRR Albert Street\2  
 Project\5 GIS\2022.0408-CRR Albert Street\_GIS.qgz

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Scale 1:500 at A3





**Legend**

Flood Level (m AHD)

- <= 3.80
- 3.80 - 3.90
- 3.90 - 4.00
- 4.00 - 4.10
- 4.10 - 4.20
- 4.20 - 4.30
- 4.30 - 4.40
- 4.40 - 4.50
- 4.50 - 4.60
- > 4.60

— Water Surface Elevation Contours (m AHD)

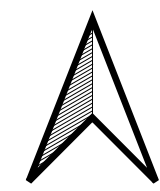
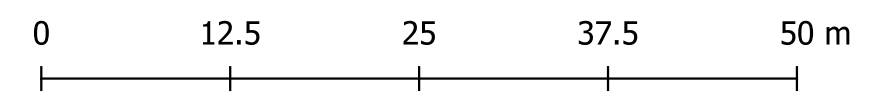
□ Site Boundary

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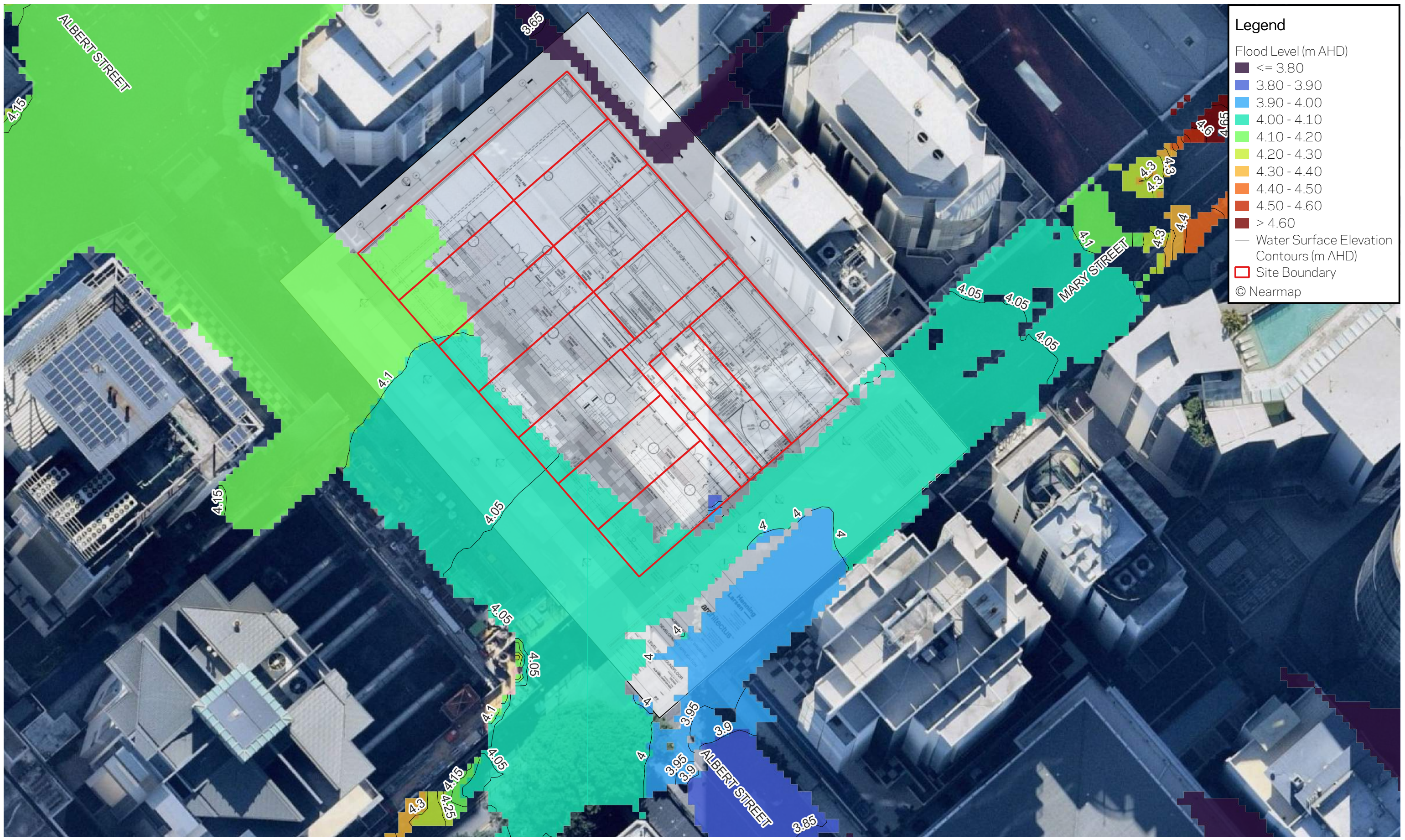
Title:  
**Flood Level - Developed - 2% AEP (50-year ARI)**  
 Project. CRR Albert Street  
 Job # 2021.0566  
 Engineer. Carlos Gambirazio  
 Date. 26/7/2023  
 Filepath: \\bt-data\Company Data\Projects\2022\2022.0408-CRR Albert Street\2  
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Scale 1:500 at A3

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**Legend**

Flood Level (m AHD)

- ≤ 3.80
- 3.80 - 3.90
- 3.90 - 4.00
- 4.00 - 4.10
- 4.10 - 4.20
- 4.20 - 4.30
- 4.30 - 4.40
- 4.40 - 4.50
- 4.50 - 4.60
- > 4.60

— Water Surface Elevation Contours (m AHD)

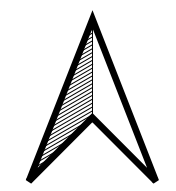
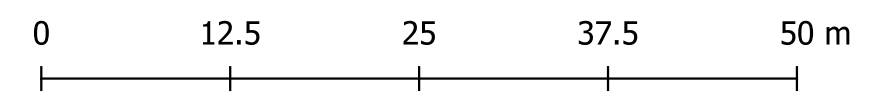
□ Site Boundary

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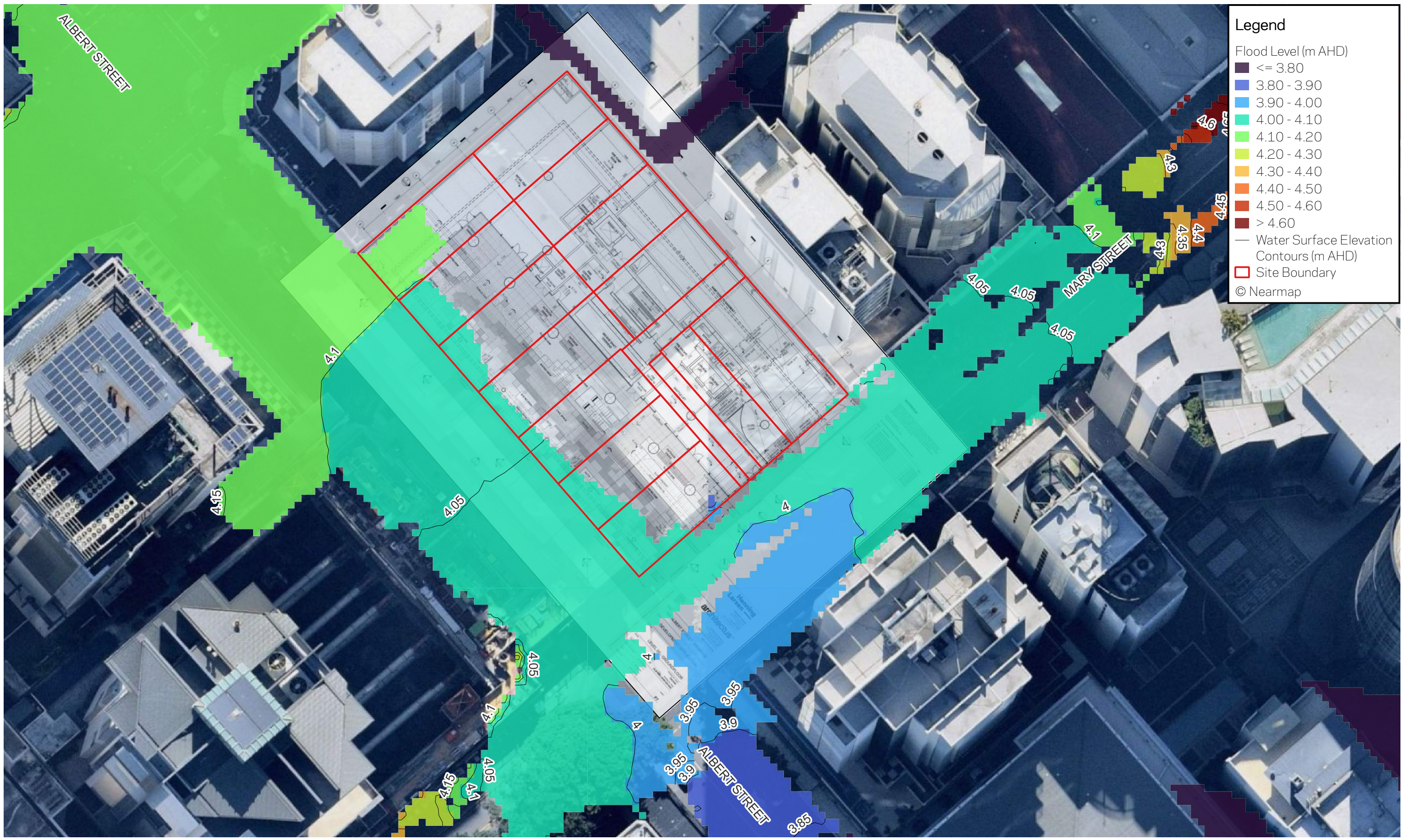
Title:  
**Flood Level - Developed & Albert Street Spine - 1% AEP (100-year ARI)**  
 Project. CRR Albert Street  
 Job # 2021.0566  
 Engineer. Carlos Gambirazio  
 Date. 26/7/2023  
 Filepath: \\bt-data\Company Data\Projects\2022\2022.0408-CRR Albert Street\2  
 Project\5 GIS\2022.0408-CRR Albert Street\_GIS.qgz



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**Legend**

Flood Level (m AHD)

- <= 3.80
- 3.80 - 3.90
- 3.90 - 4.00
- 4.00 - 4.10
- 4.10 - 4.20
- 4.20 - 4.30
- 4.30 - 4.40
- 4.40 - 4.50
- 4.50 - 4.60
- > 4.60

— Water Surface Elevation Contours (m AHD)

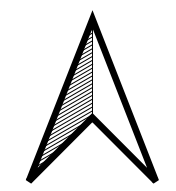
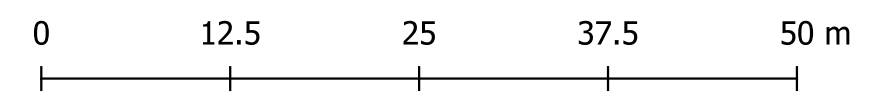
□ Site Boundary

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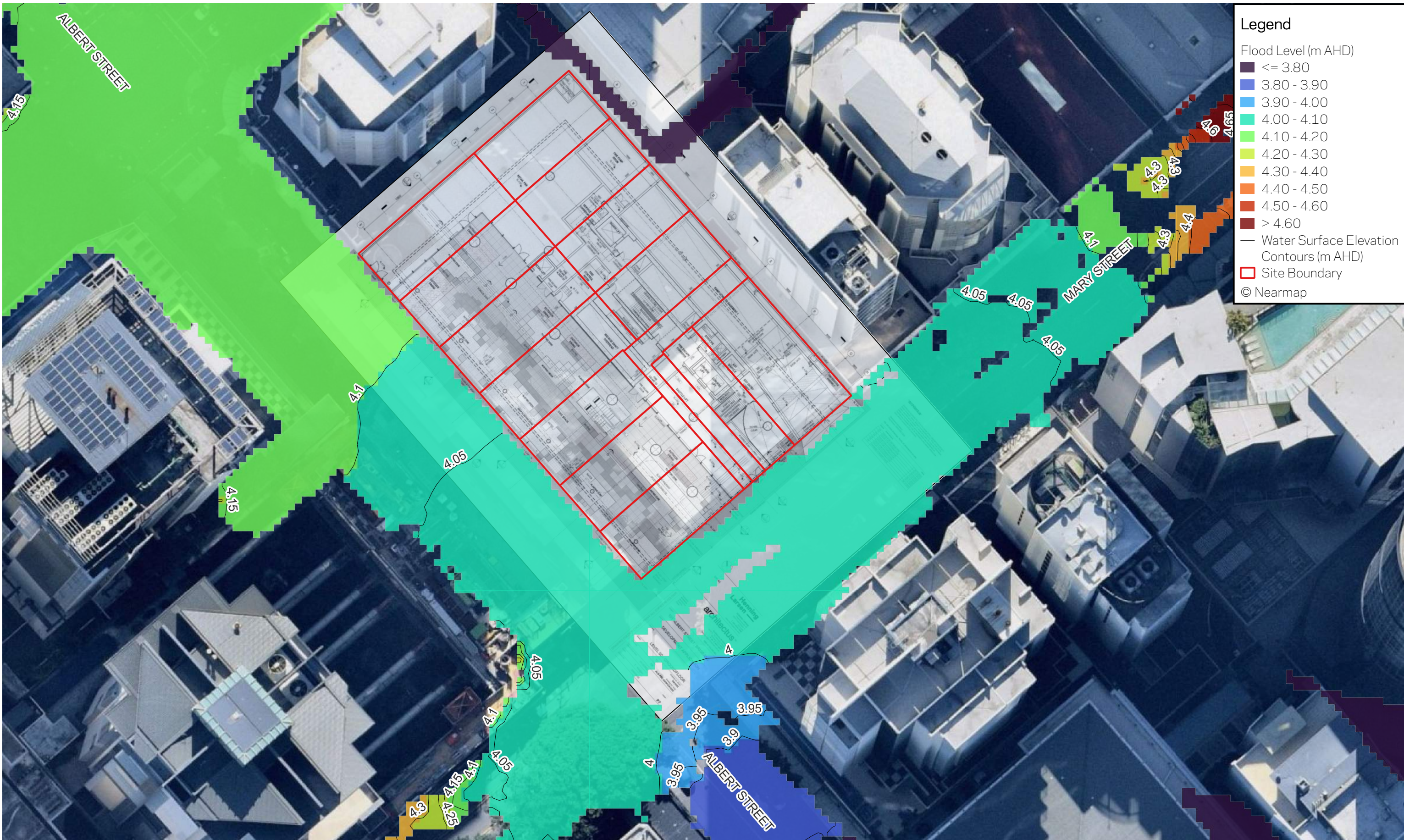
Title: Flood Level - Developed & Albert Street Spine - 2% AEP (50-year ARI)  
 Project: CRR Albert Street  
 Job # 2021.0566  
 Engineer: Carlos Gambirazio  
 Date: 26/7/2023  
 Filepath: \\bt-data\Company Data\Projects\2022\2022.0408-CRR Albert Street\2  
 Project\5 GIS\2022.0408-CRR Albert Street\_GIS.qgz



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**Legend**

Flood Level (m AHD)

- ≤ 3.80
- 3.80 - 3.90
- 3.90 - 4.00
- 4.00 - 4.10
- 4.10 - 4.20
- 4.20 - 4.30
- 4.30 - 4.40
- 4.40 - 4.50
- 4.50 - 4.60
- > 4.60

— Water Surface Elevation Contours (m AHD)

□ Site Boundary

© Nearmap



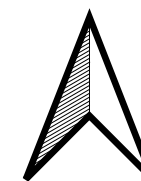
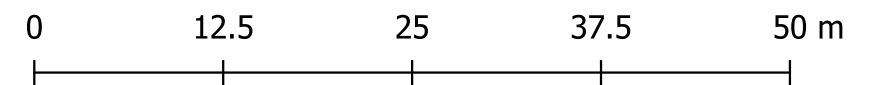
Level 9, 269 Wickham St  
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 4006 Australia  
 T +61 7 3251 8555

Title:  
**Flood Level - Revised Existing - 1% AEP (100-year ARI)**

Project. CRR Albert Street  
 Job # 2021.0566

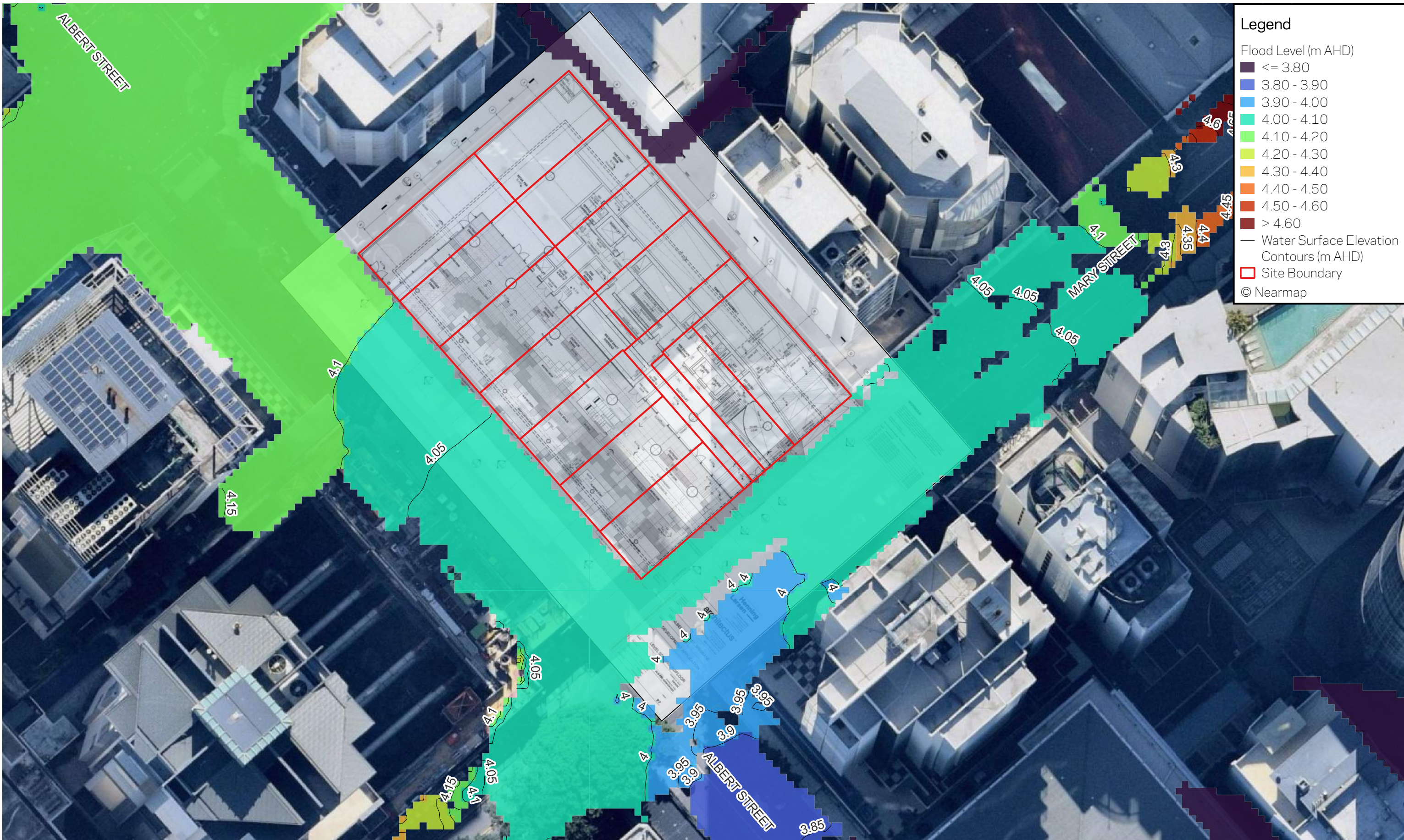
Engineer. Carlos Gambirazio  
 Date. 26/7/2023

Filepath: \\bt-data\Company Data\Projects\2022\2022.0408-CRR Albert Street\2  
 Project\5 GIS\2022.0408-CRR Albert Street\_GIS.qgz



Scale 1:500 at A3





**Legend**

Flood Level (m AHD)

- ≤ 3.80
- 3.80 - 3.90
- 3.90 - 4.00
- 4.00 - 4.10
- 4.10 - 4.20
- 4.20 - 4.30
- 4.30 - 4.40
- 4.40 - 4.50
- 4.50 - 4.60
- > 4.60

— Water Surface Elevation Contours (m AHD)

□ Site Boundary

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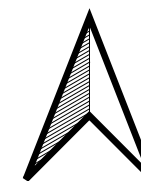
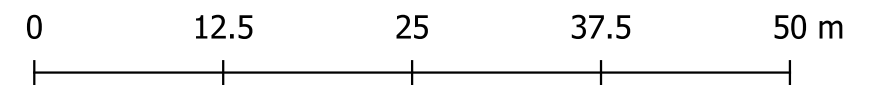
Title:  
**Flood Level - Revised Existing - 2% AEP (50-year ARI)**

Project. CRR Albert Street  
Job # 2021.0566

Engineer. Carlos Gambirazio  
Date. 26/7/2023

Filepath: \\bt-data\Company Data\Projects\2022\2022.0408-CRR Albert Street\2  
Project\5 GIS\2022.0408-CRR\_Albert\_Street\_GIS.qgz

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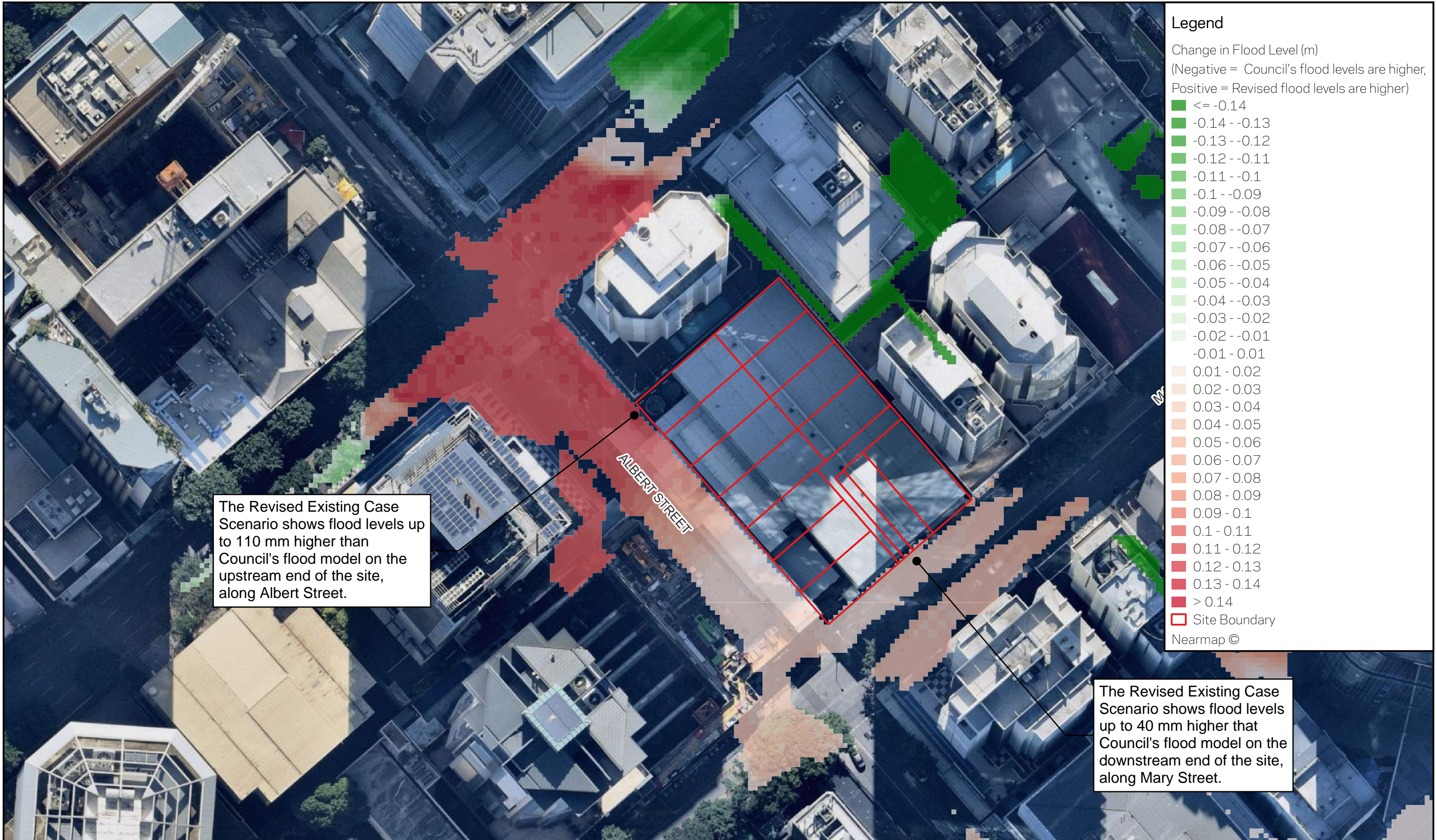


Scale 1:500 at A3

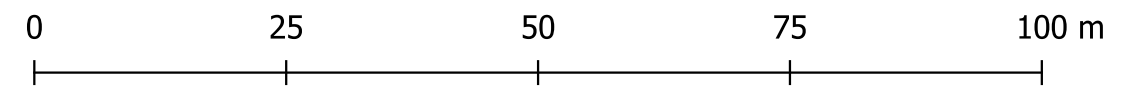


# **A9. COMPARISON WITH COUNCIL'S FLOOD MODEL**





Title:  
 Comparison between Revised Existing Case Scenario and Council's  
 Overland Flow Flood Model - 2% AEP (50-year ARI)



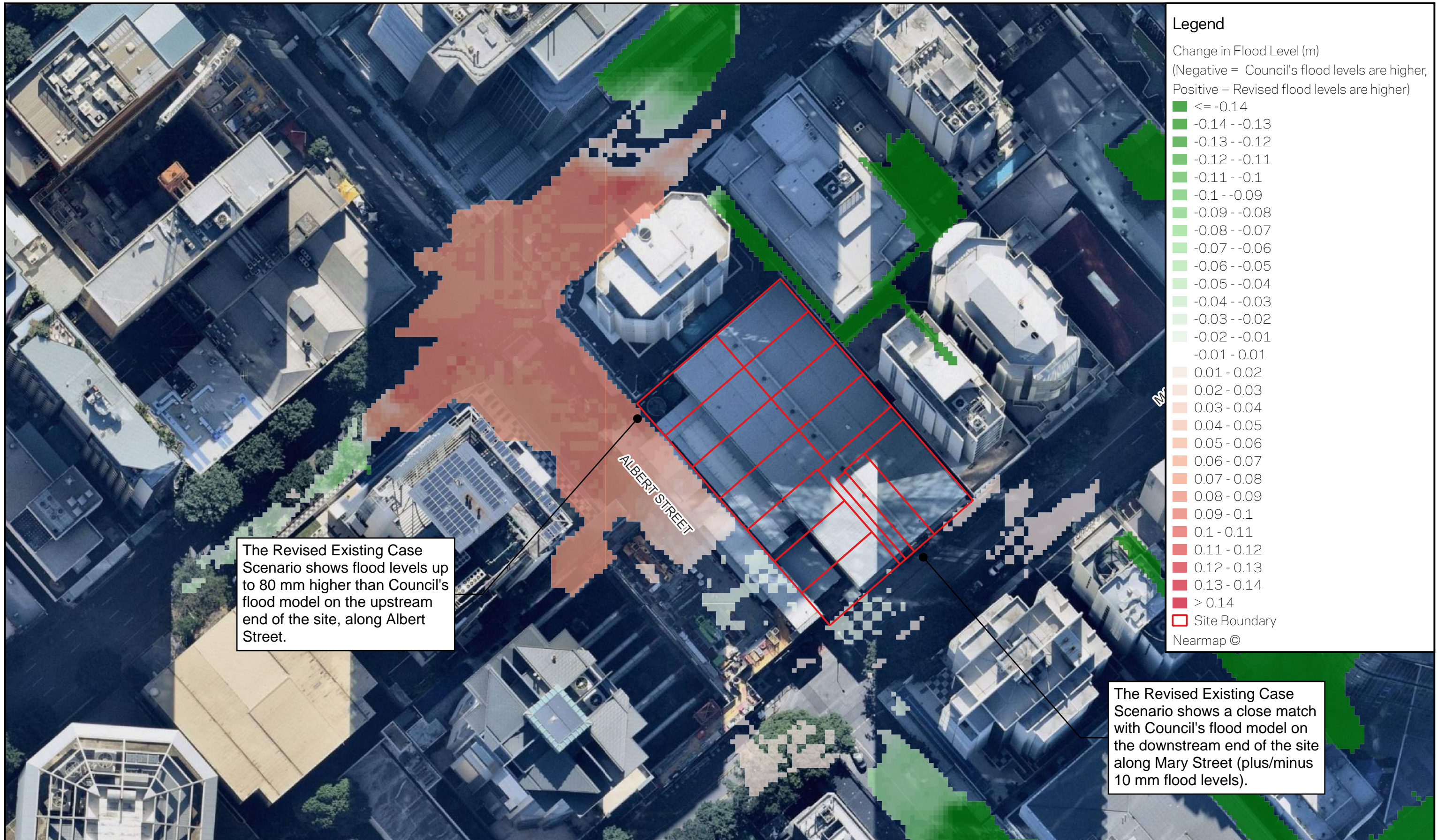
Level 9, 269 Wickham St  
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Project. CRR Albert Street  
 Job # 2022.0408  
 Engineer. C.G  
 Date. 18/10/2022  
 Filepath: \\bt-data\Company Data\Projects\2022\2022.0408-CRR Albert Street\2 Project\5 GIS\2022.0408-CRR Albert Street GIS.qgz



Scale 1:750 at A3





The Revised Existing Case Scenario shows flood levels up to 80 mm higher than Council's flood model on the upstream end of the site, along Albert Street.

The Revised Existing Case Scenario shows a close match with Council's flood model on the downstream end of the site along Mary Street (plus/minus 10 mm flood levels).

**Legend**

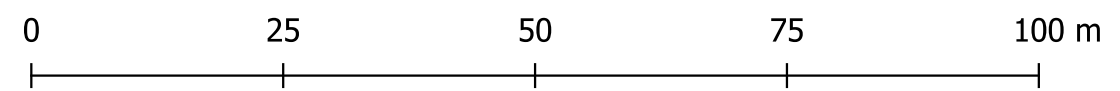
Change in Flood Level (m)  
 (Negative = Council's flood levels are higher,  
 Positive = Revised flood levels are higher)

- <= -0.14
- 0.14 -- -0.13
- 0.13 -- -0.12
- 0.12 -- -0.11
- 0.11 -- -0.1
- 0.1 -- -0.09
- 0.09 -- -0.08
- 0.08 -- -0.07
- 0.07 -- -0.06
- 0.06 -- -0.05
- 0.05 -- -0.04
- 0.04 -- -0.03
- 0.03 -- -0.02
- 0.02 -- -0.01
- 0.01 -- 0.01
- 0.01 -- 0.02
- 0.02 -- 0.03
- 0.03 -- 0.04
- 0.04 -- 0.05
- 0.05 -- 0.06
- 0.06 -- 0.07
- 0.07 -- 0.08
- 0.08 -- 0.09
- 0.09 -- 0.1
- 0.1 -- 0.11
- 0.11 -- 0.12
- 0.12 -- 0.13
- 0.13 -- 0.14
- > 0.14

Site Boundary

Nearmap ©

Title:  
 Comparison between Revised Existing Case Scenario and Council's  
 Overland Flow Flood Model - 1% AEP (100-year ARI)



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 Job # 2022.0408  
 Engineer. C.G  
 Date. 18/10/2022  
 Filepath: \\bt-data\Company Data\Projects\2022\2022.0408-CRR Albert Street\2 Project\5 GIS\2022.0408-CRR Albert Street GIS.qgz

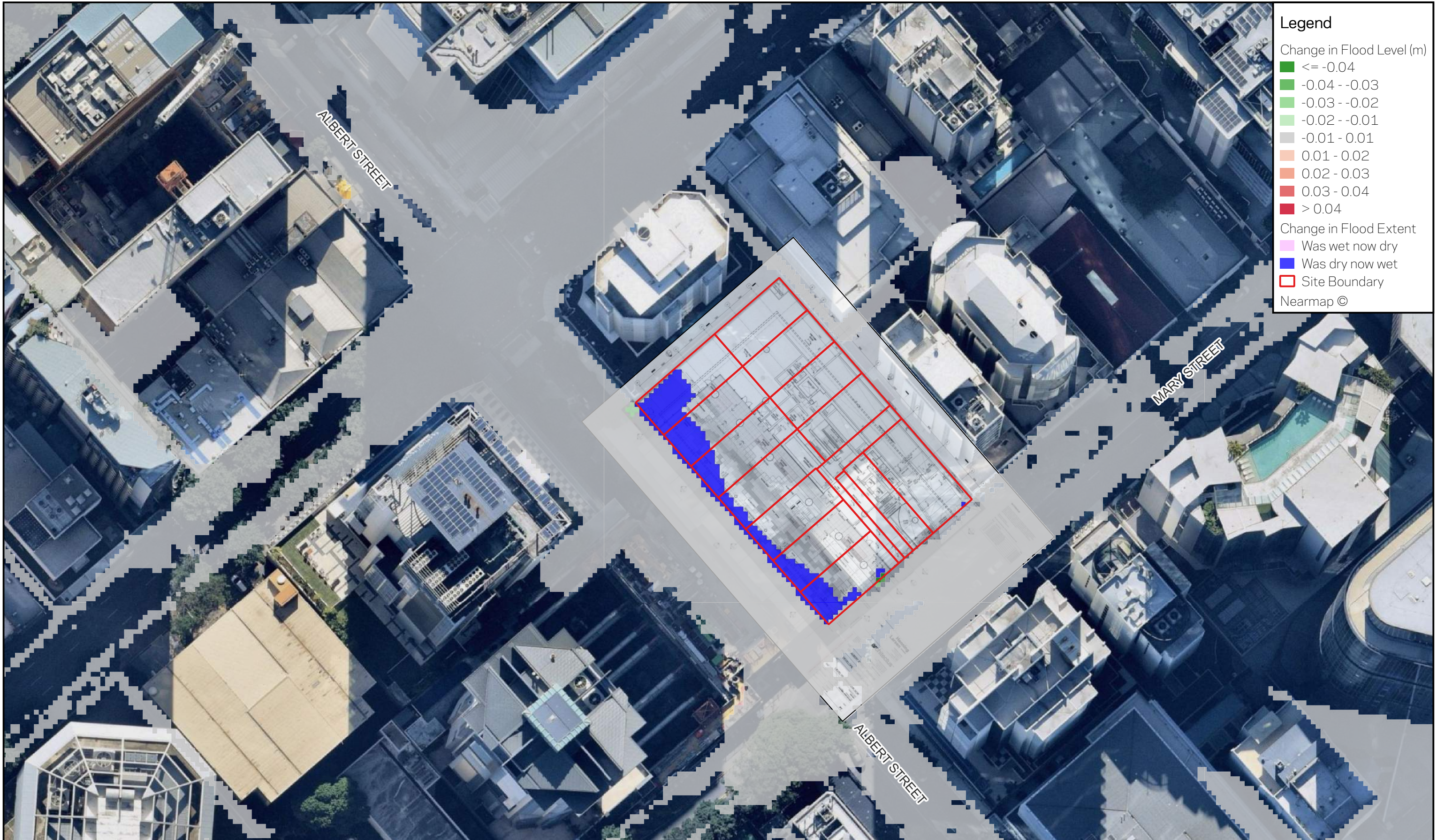


Scale 1:750 at A3



# **A10. DEVELOPED CASE SCENARIO FLOOD IMPACT ASSESSMENT**





**Legend**

Change in Flood Level (m)

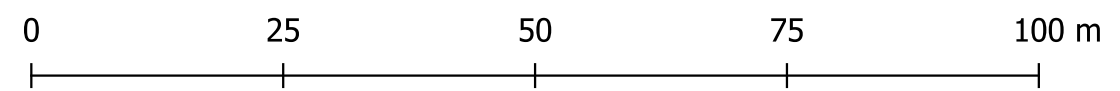
- <= -0.04
- -0.04 - -0.03
- -0.03 - -0.02
- -0.02 - -0.01
- -0.01 - 0.01
- 0.01 - 0.02
- 0.02 - 0.03
- 0.03 - 0.04
- > 0.04

Change in Flood Extent

- Was wet now dry
- Was dry now wet
- Site Boundary

Nearmap ©

Title:  
**Flood Impact Assessment - Developed vs Revised Existing - 1% AEP (100-year ARI)**



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 Job # 2022.0408  
 Engineer. C.G  
 Date. 26/7/2023  
 Filepath: \\bt-data\Company Data\Projects\2022\2022.0408-CRR Albert Street\2 Project\5 GIS\2022.0408-CRR Albert Street GIS.qgz



Scale 1:750 at A3





**Legend**

Change in Flood Level (m)

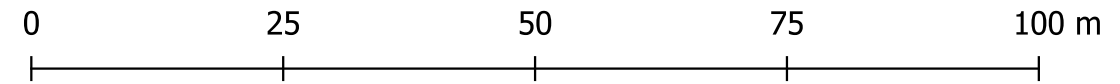
- <= -0.04
- -0.04 - -0.03
- -0.03 - -0.02
- -0.02 - -0.01
- -0.01 - 0.01
- 0.01 - 0.02
- 0.02 - 0.03
- 0.03 - 0.04
- > 0.04

Change in Flood Extent

- Was wet now dry
- Was dry now wet
- Site Boundary

Nearmap ©

Title:  
 Flood Impact Assessment - Developed vs Revised Existing - 2% AEP (50-year ARI)



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 4006 Australia  
 T +61 7 3251 8555

Project. CRR Albert Street  
 Job # 2022.0408  
 Engineer. C.G  
 Date. 26/7/2023  
 Filepath: \\bt-data\Company Data\Projects\2022\2022.0408-CRR Albert Street\2 Project\5 GIS\2022.0408-CRR Albert Street GIS.qgz

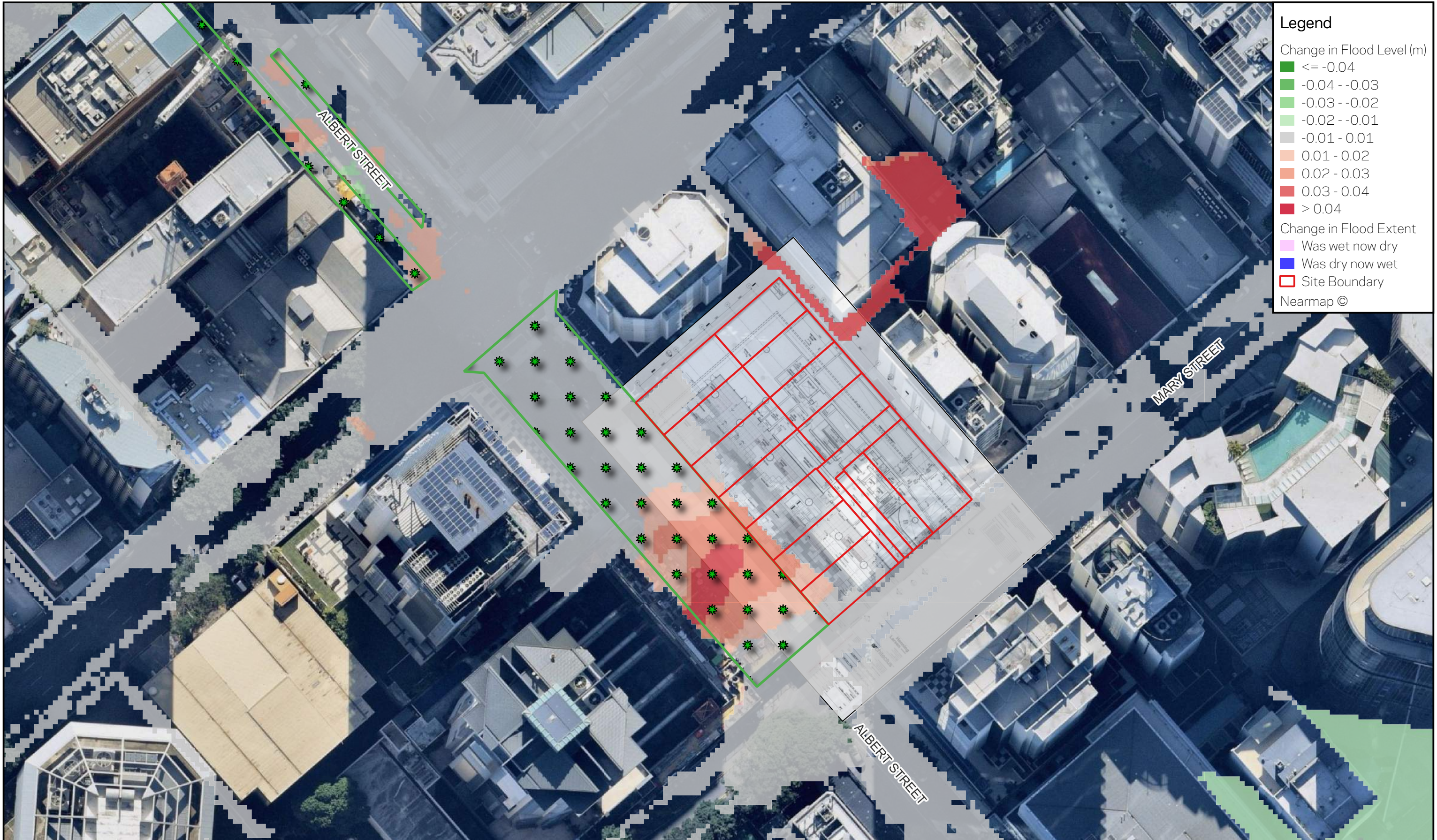


Scale 1:750 at A3



# **A11. SENSITIVITY ANALYSIS FLOOD IMPACT ASSESSMENT**





**Legend**

Change in Flood Level (m)

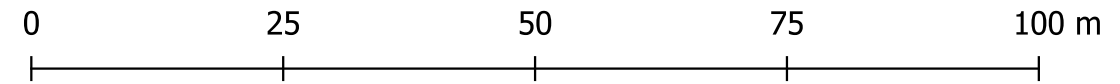
- <= -0.04
- -0.04 - -0.03
- -0.03 - -0.02
- -0.02 - -0.01
- -0.01 - 0.01
- 0.01 - 0.02
- 0.02 - 0.03
- 0.03 - 0.04
- > 0.04

Change in Flood Extent

- Was wet now dry
- Was dry now wet
- Site Boundary

Nearmap ©

Title:  
 Flood Impact Assessment - Developed with Albert Street Green Spine vs Developed -  
 1% AEP (100-year ARI) - Not part of Development Application



**BLIGH  
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Project. CRR Albert Street  
 Job # 2022.0408  
 Engineer. C.G  
 Date. 26/7/2023  
 Filepath: \\bt-data\Company Data\Projects\2022\2022.0408-CRR Albert Street\2 Project\5 GIS\2022.0408-CRR Albert Street GIS.qgz



Scale 1:750 at A3





**Legend**

Change in Flood Level (m)

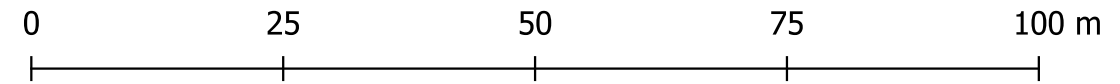
- $\leq -0.04$
- $-0.04 - -0.03$
- $-0.03 - -0.02$
- $-0.02 - -0.01$
- $-0.01 - 0.01$
- $0.01 - 0.02$
- $0.02 - 0.03$
- $0.03 - 0.04$
- $> 0.04$

Change in Flood Extent

- Was wet now dry
- Was dry now wet
- Site Boundary

Nearmap ©

Title:  
 Flood Impact Assessment - Developed with Albert Street Green Spine vs Developed -  
 2% AEP (50-year ARI) - Not part of Development Application



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Project. CRR Albert Street  
 Job # 2022.0408  
 Engineer. C.G  
 Date. 26/7/2023  
 Filepath: \\bt-data\Company Data\Projects\2022\2022.0408-CRR Albert Street\2 Project\5 GIS\2022.0408-CRR Albert Street GIS.qgz



Scale 1:750 at A3



# **A12. FLOODWISE PROPERTY REPORT**





# Brisbane City Council FloodWise Property Report

Report Reference

1660026454436

09/08/2022 16:27:34

Dedicated to a better Brisbane

## THIS REPORT IS FOR BUILDING AND DEVELOPMENT PURPOSES ONLY

The FloodWise Property Report provides property or lot-based flood information for building and development requirements. This report provides information on estimated flood levels, habitable floor level requirements and more technical information on the four sources of flooding: river, creek / waterway, storm tide and overland flow. Refer to the Useful Definitions section for a glossary of terms.

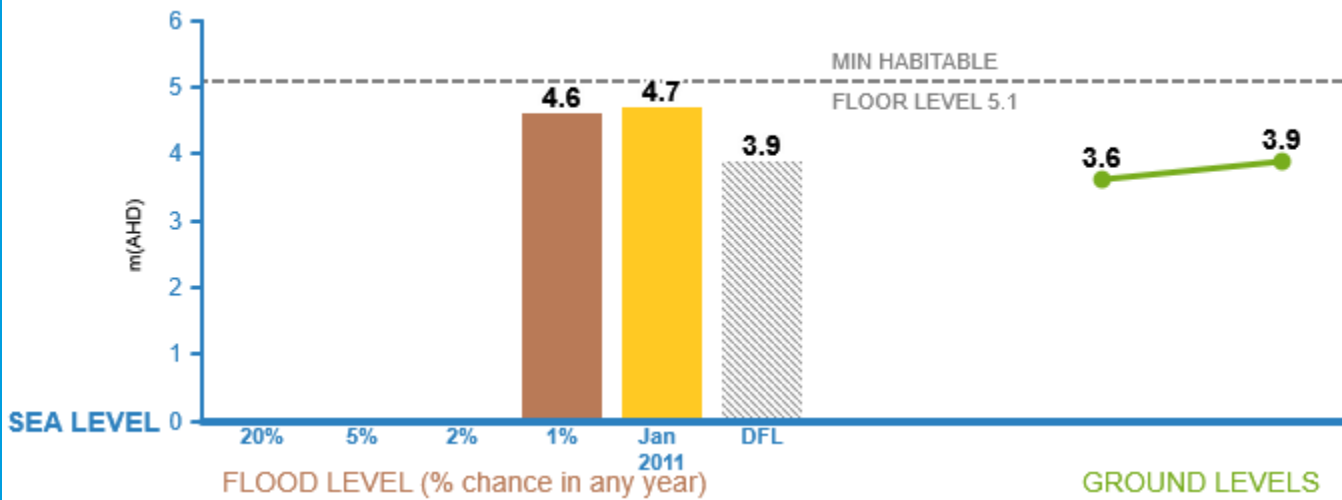
To find out more about how the contents of this report may affect building or development on this property, please visit [www.brisbane.qld.gov.au/planning-building](http://www.brisbane.qld.gov.au/planning-building). For more general information about understanding your flood risk and how to prepare your property, family or business for potential flooding visit [www.brisbane.qld.gov.au/beprepared](http://www.brisbane.qld.gov.au/beprepared)

### THIS IS A REPORT FOR:

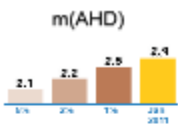
Rateable Address: 83 ALBERT ST, BRISBANE CITY QLD 4000

Lot Details: L.9 RP.59089

### FLOOD LEVEL INFORMATION



### EXPLANATION



*m(AHD)* - Metres Australia Height Datum. The level of 0.0m AHD is approximately mean sea level.

*Flood Levels* - The Flood level bar chart above shows the possible flooding level and percentage chance of that level being reached or exceeded in any year. If an orange bar shows, it is the calculated January 2011 flood level at this address or lot. Refer to 'Useful Definitions' for further information.

*Minimum Habitable Floor Level* - Applies to residential development only. Please refer to Council's planning scheme to learn how this may affect you. If a property is in an overland flow path, or a large allotment, a minimum habitable floor level cannot be provided. Refer flood and planning development flags below.

*Ground Levels* - The green line above shows this property's approximate lowest and highest ground levels based on latest available information (2019 airborne laser survey) to Council. If you are building, please confirm with a surveyor.

For further information and definitions please refer to the Useful Definitions page





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## TECHNICAL SUMMARY

This section of the FloodWise Property Report contains more detailed flood information for this property so surveyors, builders, certifiers, architects and engineers can plan and build in accordance with Council's planning scheme. For more information about building and development in Brisbane please visit [www.brisbane.qld.gov.au/planning-building](http://www.brisbane.qld.gov.au/planning-building) or talk to a Development Assessment Planning Information Officer via Council's Contact Centre on (07) 3403 8888.

### THIS IS A REPORT FOR:

Rateable Address: 83 ALBERT ST, BRISBANE CITY QLD 4000

Lot Details: L.9 RP.59089

### PROPERTY INFORMATION (Summary)

The following table provides a summary of flood information for this property. More detailed flood level information is provided in the following sections of this report.

PROPERTY SUMMARY	LEVEL (mAHD)
Minimum Ground Level	3.6
Maximum Ground Level	3.9
Min Habitable Floor Level	5.1
Residential Flood Level (RFL)	4.6
Residential Flood Level Source	RIVER
Source of Highest Flooding	RIVER
Flooding may also occur from	RIVER

### ESTIMATED PEAK FLOODING LEVELS

The table below displays the peak estimated flood levels by probability for this property. Estimated flood level data should be used in conjunction with applicable planning scheme requirements - Refer to Flood Planning Development Information.

Note that the overland flow flooding level maybe higher than the levels below from other sources.

DESCRIPTION	LEVEL (mAHD)	SOURCE
20% AEP	N/A*	
5% AEP	N/A*	
2% AEP	N/A*	
1% AEP	4.6	RIVER
January 2011	4.7	RIVER
DFL	3.9	RIVER
RFL	4.6	RIVER

\* Council does not hold flood levels for this probability event.



## FLOOD PLANNING DEVELOPMENT INFORMATION

This section of the FloodWise Property Report contains information about Council's planning scheme overlays. Overlays identify areas within the planning scheme that reflect distinct themes that may include constrained land and/or areas sensitive to the effects of development.

### FLOOD OVERLAY CODE

The Flood overlay code of Council's planning scheme uses the following information to provide guidelines when developing properties. The table below summarises the Flood Planning Areas (FPAs) that apply to this property. Development guidelines for the FPAs are explained in Council's planning scheme, which is available from [www.brisbane.qld.gov.au/planning-building](http://www.brisbane.qld.gov.au/planning-building).

FLOOD PLANNING AREAS (FPA)		
RIVER	CREEK/WATERWAY	OVERLAND FLOW
FPA3		Not Applicable

### COASTAL HAZARD OVERLAY CODE

There are currently no Coastal Hazard Overlays that apply to this property.





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#### Useful Definitions

*Australian Height Datum (AHD)* - The reference level for defining ground levels in Australia. The level of 0.0m AHD is approximately mean sea level.

*Annual Exceedance Probability (AEP)* - The probability of a flood event of a given size occurring in any one year, usually expressed as a percentage annual chance.

*Defined Flood Level (DFL)* - The DFL for Brisbane River flooding is a level of 3.7m AHD at the Brisbane City Gauge based on a flow of 6,800 m<sup>3</sup>/s.

*Maximum and Minimum Ground Level* - Highest and lowest ground levels on the property based on available ground level information. A Registered Surveyor can confirm exact ground levels.

*Minimum Habitable Floor Level* - The minimum level in metres AHD at which habitable areas of development (generally including bedrooms, living rooms, kitchen, study, family and rumpus rooms) must be constructed.

*Council's Planning Scheme* - The City Plan (planning scheme) has been prepared in accordance with the Sustainable Planning Act as a framework for managing development in a way that advances the purpose of the Act. In seeking to achieve this purpose, the planning scheme sets out the Council's intention for future development in the planning scheme area, over the next 20 years.

*Residential Flood Level (RFL)* - Residential flood level (RFL) for the Brisbane River flooding equates to the 1% Annual Exceedance Probability flood level.

*Rateable Address* - A Lot or Property may have more than one street address. The address shown on this report is the address used by Council for the Lot or property selected.

*Property* - A property will contain 1 or more lots. The *Multiple Lot Warning* is shown if you have selected a property that contains multiple lots.

#### Brisbane City Council's Online Flood Tools

Council provides a number of online flood tools:

- to guide planning and development
- to help residents and businesses understand their flood risk and prepare for flooding.

#### Planning and Development Online Flood Tools

Council's online flood tools for planning and development purposes include:

- FloodWise Property Report
- Flood Overlay Code

For more information on Council's planning scheme and online flood tools for planning and development:

- phone 07 3403 8888 to talk to a Development Assessment Customer Liaison Officer
- visit [www.brisbane.qld.gov.au/planning-building](http://www.brisbane.qld.gov.au/planning-building)
- visit a Regional Business Centre.

#### Helping residents and businesses be prepared for flooding

Council has a range of free tools and information to help residents and businesses understand potential flood risks and how to be prepared. This includes:

- Flood Awareness Map
- Flooding in Brisbane – A Guide for Residents
- Flooding in Brisbane – A Guide for Businesses
- Early Warning Alert Service. Visit [www.brisbane.qld.gov.au/earlywarning](http://www.brisbane.qld.gov.au/earlywarning) to register for email, home phone or SMS severe weather alert updates.

Note: The Flood Awareness Map shows four levels of flood likelihood from high likelihood (flooding is very likely to occur) through to very low likelihood (very rare and extreme flood events).

For more information on Council's online flood tools for residents and business:

- Visit [www.brisbane.qld.gov.au/beprepared](http://www.brisbane.qld.gov.au/beprepared)
- Phone (07) 3403 8888.





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## Disclaimer

1. Defined Flood Levels and Residential Flood Levels, and the Minimum Habitable Floor Levels are determined from the best available information to Council at the date of issue. These flood levels, for a particular property, may change if more detailed information becomes available or changes are made in the method of calculating flood levels.
2. Council makes no warranty or representation regarding the accuracy or completeness of a FloodWise Property report. Council disclaims any responsibility or liability in relation to the use or reliance by any person on a FloodWise Property Report.



## Planning to build or renovate?

For information, guidelines, tools and resources to help you track, plan or apply for your development visit [www.brisbane.qld.gov.au/planning-building](http://www.brisbane.qld.gov.au/planning-building)

You can also find the Brisbane City Plan 2014 and Neighbourhood Plans as well as other information and training videos to help with your building and development plans.



# **A13. FLOOD OVERLAY CODE**



# FLOOD OVERLAY CODE

Brisbane City Plan 2014

Performance outcomes	Acceptable outcomes	SOLUTION	COMMENT
Section A—If for self-assessable or assessable development for a dwelling house including any secondary dwelling			
<b>Note—Development for a dwelling house does not require assessment against any other sections of this code.</b>			
PO1	AO1.1	N/A	<i>Not applicable</i>
<p><b>Development involving any habitable or non-habitable part of a dwelling house, including any secondary dwelling, is located and designed to:</b></p> <p>(a) minimise the risk to people from flood hazard;</p> <p>(b) achieve acceptable flood immunity;</p> <p>(c) minimise property impacts from a flood event up to and including the defined flood event;</p> <p>(d) minimise disruption to residents, recovery time and rebuilding or restoration costs after a flood event up to and including the defined flood event.</p>	<p><b>Development for a dwelling house including any secondary dwelling:</b></p> <p>(a) is not located in the Brisbane River flood planning area 1, 2a or 2b sub-categories or the Creek/waterway flood planning area 1 or 2 sub-categories; or</p> <p>(b) is only located in these sub-categories, if a Registered Professional Engineer Queensland certifies that the dwelling house and any secondary dwelling are structurally designed to be able to resist hydrostatic and hydrodynamic loads associated with flooding up to and including the defined flood event.</p>		
	AO1.2	N/A	<i>Not applicable</i>
	<p><b>Development for a dwelling house and any secondary dwelling complies with the minimum flood planning levels in Table 8.2.11.3.B.</b></p> <p>Note—If located in an area that has no flood level information available from the Council such as an overland flow path, a Registered Professional Engineer of Queensland with expertise in undertaking flood studies is to certify that the flood level and development levels for the dwelling house and any secondary dwelling achieve the required flood planning levels in Table 8.2.11.3.B.</p>		
	AO1.3	N/A	<i>Not applicable</i>
	<p><b>Development involving a building undercroft complies with the minimum clearance requirements in Table 8.2.11.3.E.</b></p>		

<sup>1</sup> Solution:    ✓    Acceptable Solution  
                   A/S    Alternative Solution  
                   N/A    Not applicable to this proposal



# FLOOD OVERLAY CODE

Brisbane City Plan 2014

Performance outcomes	Acceptable outcomes	SOLUTION	COMMENT
	<p>Editor's note—For creek/waterway, storm-tide and river flooding, applicable flood planning information is available from Council's FloodWise Property Report.</p> <p>Note—The Flood planning scheme policy provides guidance on undercroft design.</p>		
<p>PO2</p> <p><b>Development within the Creek/waterway flood planning area sub-categories or Overland flow flood planning area sub-category:</b></p> <p>(a) maintains the conveyance of flood waters to allow them to pass predominantly unimpeded through the site;</p> <p>(b) does not concentrate, intensify or divert floodwater onto upstream, downstream or adjacent properties;</p> <p>(c) will not result in a material increase in flood levels or flood hazard on upstream, downstream or adjacent properties.</p>	<p>AO2</p> <p><b>Development:</b></p> <p>(a) is not located within the Creek/waterway flood planning area 1, 2 or 3 sub-categories or the Overland flow flood planning area sub-category; or</p> <p>(b) provides an open undercroft area from natural ground level to habitable floor level for any area inundated by the defined flood event; or</p> <p>Note—This undercroft area is not suitable for providing non-habitable rooms, secure storage of valuables, or future enclosing for storage or car parking. The clear area may include structural elements such as columns and floor substructure. The Flood planning scheme policy provides guidance on undercroft design.</p> <p>Editor's note—An open undercroft design may be achieved through a 'valance' treatment around the perimeter of an otherwise internally clear undercroft.</p> <p>Editor's note—For Creek/waterway, storm-tide and river flooding, applicable flood planning information is available from Council's FloodWise Property Report.</p> <p>(c) a report from a Registered Professional Engineer Queensland certifies that the development in the Creek/waterway flood planning area or Overland flow flood planning area sub-categories will not result in a material increase in flood</p>	N/A	Not applicable.

<sup>1</sup> Solution: ✓ Acceptable Solution  
 A/S Alternative Solution  
 N/A Not applicable to this proposal



# FLOOD OVERLAY CODE

Brisbane City Plan 2014

Performance outcomes	Acceptable outcomes	SOLUTION	COMMENT
	<p>level or flood hazard on upstream, downstream or adjacent properties.</p> <p>(d) Note—Flood studies 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.</p>		
<p>Section B—If self-assessable or assessable development other than for a dwelling house or reconfiguring a lot</p> <p>Note—If self-assessable development complies with the acceptable outcomes of this part, no further assessment against this code is required.</p>			
<p>PO3</p> <p><b>Development:</b></p> <p>(a) is compatible with flood hazard in a defined flood event;</p> <p>(b) minimises the risk to people from flood hazard;</p> <p>(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;</p> <p>(d) minimises impacts on property from flooding;</p> <p>(e) minimises disruption to residents, business or site operations and recovery time due to flooding;</p> <p>(f) minimises the need to rebuild structures after a flood event greater than the defined flood event.</p>	<p>AO3</p> <p><b>Development for a material change of use complies with Table 8.2.11.3.C.</b></p>	<p>A/S</p>	<p><i>A Flood Emergency Management Plan will be developed by a qualified RPEQ engineer to assess potential Brisbane River flood risk to site users and recommend management strategies to reduce risk to an acceptable level. The plan will be developed prior to issue of Certificate of Occupancy/Final Inspection.</i></p>
<p>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</p>			

<sup>1</sup> Solution:    ✓    Acceptable Solution  
                   A/S    Alternative Solution  
                   N/A    Not applicable to this proposal



# FLOOD OVERLAY CODE

Brisbane City Plan 2014

Performance outcomes	Acceptable outcomes	SOLUTION	COMMENT
<p>assessments and flood studies is required to be in accordance with the Flood planning scheme policy.</p> <p>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.</p>			
<p>PO4</p> <p><b>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:</b></p> <p>(a) maintaining continuity of operations;</p> <p>(b) impacts of flooding on asset life and ongoing maintenance costs;</p> <p>(c) efficient recovery after flood events;</p> <p>(d) recreational benefits to the city;</p> <p>(e) availability of suitable land within the park.</p>	<p>AO4.1</p> <p><b>Development involving a building or structure in a park complies with the flood planning levels specified in Table 8.2.11.3.D.</b></p>	N/A	<i>Not applicable.</i>
	<p>AO4.2</p> <p><b>Development involving a building or structure where Table 8.2.11.3.D does not apply:</b></p> <p>(a) is not located within the 20% AEP flood extent of any creek/waterway or overland flow path; or</p> <p>(b) is located above the 20% AEP flood level of any creek/waterway or overland flow path.</p>	N/A	<i>Not applicable.</i>
<p><b>Section C—If for assessable development other than for a dwelling house</b></p>			
<p>PO5</p> <p><b>Development is located and designed to:</b></p> <p>(a) minimise the risk to people from flood hazard on the site;</p> <p>(b) minimise flood damage to the development and contents of buildings up to the defined flood event;</p> <p>(c) provide suitable amenity;</p>	<p>AO5.1</p> <p><b>Development complies with the flood planning levels specified in Table 8.2.11.3.D.</b></p> <p>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</p>	A/S	<p><i>The development is subject to Brisbane River flooding and Overland Flow flooding. Bligh Tanner developed an RPEQ certified overland flow flood study to derive applicable flood levels. Brisbane River flood levels were informed by the corresponding FloodWise property report.</i></p> <p><i>Most of the development complies with AO5.1, as indicated in Appendix A3 of the flood study report.</i></p>

<sup>1</sup> Solution: ✓ Acceptable Solution  
 A/S Alternative Solution  
 N/A Not applicable to this proposal



# FLOOD OVERLAY CODE

Brisbane City Plan 2014

Performance outcomes	Acceptable outcomes	SOLUTION	COMMENT
(d) <b>minimise disruption to residents, recovery time and the need to rebuild structures after a flood event up to and including the defined flood event.</b>	the Flood planning scheme policy and the Infrastructure design planning scheme policy.		<i>A small portion of ground level retail is subject to 85 mm of overland flow during the 2% AEP (subject DFL), with negligible flood hazard (less than 0.05 m<sup>2</sup>/s). This area will be designed to be free draining with flood resilient surfaces (e.g., no carpet), minimising disruption to residents &amp; recovery time after the flood.</i>
	<p>AO5.2</p> <p><b>Development is:</b></p> <p><b>(a) not located in the:</b></p> <p><b>(i) Brisbane River flood planning area 1, 2a, or 2b sub-categories;</b></p> <p><b>(ii) Creek/waterway flood planning area 1 or 2 sub-categories;</b></p> <p><b>(iii) Overland flow flood planning area sub-category; or</b></p> <p><b>(b) only located in these sub-categories if a Registered Professional Engineer Queensland with expertise in undertaking flood studies certifies that:</b></p> <p><b>(i) the development design, siting and any 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</b></p> <p><b>(ii) the risk to people is managed to an acceptable level.</b></p>	A/S	<p><i>The structural suitability of the building shall be assessed by a Registered Professional Engineer Queensland during Detailed Design Development.</i></p> <p><i>A Flood Emergency Management Plan will be developed by a qualified RPEQ engineer to assess potential Brisbane River flood risk to site users and recommend management strategies to reduce risk to an acceptable level. The plan will be developed prior to issue of Certificate of Occupancy/Final Inspection.</i></p>

<sup>1</sup> Solution: ✓ Acceptable Solution  
 A/S Alternative Solution  
 N/A Not applicable to this proposal



# FLOOD OVERLAY CODE

Brisbane City Plan 2014

Performance outcomes	Acceptable outcomes	SOLUTION	COMMENT
<p>PO6</p> <p>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.</p>	<p>AO6.1</p> <p>Development ensures that:</p> <p>(a) all areas containing essential electrical services comply with the flood planning levels in Table 8.2.11.3.D; or</p> <p>(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.</p> <p>Note—A basement storage area does not include a bike storage room, change room, building maintenance storage and non-critical electrical services.</p>	✓	<p>The basement parking entry threshold is located at 4.3 m AHD, 250 mm higher than the overland flow flood level DFL (2% AEP – 4.05 m AHD), and 400 mm higher than the Brisbane River DFL (3.9 m AHD).</p>
	<p>AO6.2</p> <p>Development involving a basement that relies on a pumping solution to manage floodwater ingress or for dewatering after a flood provides a redundant pump system with a backup power source for those pumps.</p>	✓	<p>Complies with Acceptable Outcome. A redundant pump system with a backup power source will be provided, to be detailed during further design development.</p>
<p>PO7</p> <p>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.</p>	<p>AO7.1</p> <p>Development:</p> <p>(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</p> <p>(b) does not result in a material increase in flood level or hydraulic hazard on upstream, downstream or adjacent properties.</p>	✓	<p>The development does not create a material change in flood behaviour as shown in the Flood Study.</p>

<sup>1</sup> Solution: ✓ Acceptable Solution  
 A/S Alternative Solution  
 N/A Not applicable to this proposal



# FLOOD OVERLAY CODE

Brisbane City Plan 2014

Performance outcomes	Acceptable outcomes	SOLUTION	COMMENT
	<p>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.</p>		
	<p><b>AO7.2</b>  <b>Development retains existing overland flow paths and does not rely wholly on piped solutions to manage major flows.</b></p>	✓	<i>Development retains overland flow paths as shown in the Flood Study.</i>
	<p><b>AO7.3</b>  <b>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.</b></p>	✓	The development does not create a material change in flood behaviour as shown in the Flood Study.
	<p>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.</p>		
<p><b>PO8</b>  <b>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.</b></p>	<p><b>AO8</b>  <b>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.</b></p>	N/A	<i>Not applicable</i>
	<p>Note—This can be demonstrated by undertaking earthworks in compliance with the Compensatory earthworks planning scheme policy.</p>		

<sup>1</sup> Solution: ✓ Acceptable Solution  
 A/S Alternative Solution  
 N/A Not applicable to this proposal



# FLOOD OVERLAY CODE

Brisbane City Plan 2014

Performance outcomes	Acceptable outcomes	SOLUTION	COMMENT
<p>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.</p>			
<p>PO9</p> <p><b>Development ensures that the building and site design:</b></p> <p>(a) maintains the conveyance capacity of existing overland flow paths and creek/waterways;</p> <p>(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;</p> <p>(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.</p>	<p>AO9.1</p> <p><b>Development involving a building undercroft in the Creek/waterway flood planning area sub-categories or the Overland flow flood planning area sub-category:</b></p> <p>(a) complies with the minimum building undercroft clearance requirements in Table 8.2.11.3.E;</p> <p>(b) not located directly above any part of a waterway corridor as mapped in the Waterway corridors overlay.</p>	N/A	<i>No undercroft proposed.</i>
<p>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.</p>	<p>AO9.2</p> <p><b>Development involving a building undercroft in the Creek/waterway flood planning area sub-categories or the Overland flow flood planning area sub category:</b></p> <p>(a) has a ground level within the undercroft area is free draining;</p> <p>(b) does not involve excavation below ground level of more than 300mm within the undercroft area.</p>	N/A	No undercroft proposed.
<p>PO10</p> <p><b>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:</b></p>	<p>AO10</p> <p><b>Development for vulnerable uses, difficult to evacuate uses or assembly uses:</b></p> <p>(a) is not isolated in any event up to the relevant flood planning level specified in Table 8.2.11.3.L; or</p>	N/A	<i>Not applicable</i>

<sup>1</sup> Solution:    ✓    Acceptable Solution  
                   A/S    Alternative Solution  
                   N/A    Not applicable to this proposal



# FLOOD OVERLAY CODE

Brisbane City Plan 2014

Performance outcomes	Acceptable outcomes	SOLUTION	COMMENT
<p>(a) protect safety of users and emergency services personnel;</p> <p>(b) support efficient emergency services access and site evacuation with consideration to the scale of development.</p> <p>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.</p>	<p>(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</p> <p>(c) can achieve vehicular evacuation to a suitable flood-free location.</p> <p>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.</p>		
<p>PO11</p> <p>Development has access which, having regard to hydraulic hazard, provides for safe vehicular and pedestrian movement and emergency services access to adjoining roads.</p>	<p>AO11.1</p> <p>Development provides an access or driveway into the site which is:</p> <p>(a) trafficable during the defined flood event;</p> <p>(b) not located in the Creek/waterway flood planning area 1 sub-category;</p> <p>(c) not located in the Overland flow flood planning area sub-category if the hydraulic hazard is unsafe in the defined flood event;</p> <p>(d) the access or driveway is not inundated by a 10% AEP flood.</p>	A/S	<p><i>The site is subject to Brisbane River and Overland flow flooding. Vehicular access into the site is from Mary Street via a driveway crossover into basement carparking. The basement threshold complies with the relevant flood planning level at Table 8.2.11.3.D.</i></p> <p><i>During the Overland Flow Defined Flood Event (2% AEP), Mary Street is subject to flood depths below 300 mm and flood hazards below 0.3 m<sup>2</sup>/s, indicating suitable trafficability in accordance with Table 7.4.3 of QUDM 2017.</i></p> <p><i>During the Brisbane River Defined Flood Event, Mary Street is not trafficable. Brisbane River flood risk will be managed via timely evacuation prior to the onset of flood waters, to be detailed in a Flood Emergency Management Plan, developed prior to issue of Certificate of Occupancy/Final Inspection.</i></p>
	<p>AO11.2</p> <p>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.</p>	N/A	Not applicable

<sup>1</sup> Solution: ✓ Acceptable Solution  
A/S Alternative Solution  
N/A Not applicable to this proposal



# FLOOD OVERLAY CODE

Brisbane City Plan 2014

Performance outcomes	Acceptable outcomes	SOLUTION	COMMENT
	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.	N/A	<i>Not applicable</i>
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.	N/A	<i>Not applicable</i>
	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.	N/A	<i>Not applicable</i>
PO14 Development which increases the residential population within the Brisbane River flood planning area sub-categories minimises the risk to people in all flood events with consideration to flood hazard, including warning time.	AO14 Development in the Brisbane River flood planning area sub-categories in areas where the residential flood level is greater than 12.8m AHD involving: (a) an increase in the number of residential dwellings; or (b) additional residential lots; or	N/A	<i>Not applicable</i>

<sup>1</sup> Solution:    ✓    Acceptable Solution  
                   A/S    Alternative Solution  
                   N/A    Not applicable to this proposal



# FLOOD OVERLAY CODE

Brisbane City Plan 2014

Performance outcomes	Acceptable outcomes	SOLUTION	COMMENT
	<p>(c) is not subject to an unsafe hydraulic hazard in the 0.2% AEP flood event.</p> <p>Note—Explanation of a hydraulic hazard is provided in the Flood planning scheme policy.</p>		
Additional criteria for essential community infrastructure			
<p>PO15</p> <p><b>Development involving essential community infrastructure:</b></p> <p>(a) remains functional to serve community need during and immediately after a flood event, or is part of a network that is able to maintain the function of the essential community infrastructure when parts of the development are unable to function during or after a flood;</p> <p>(b) is designed, sited and operated to avoid adverse impacts on the community or the environment due to the impacts of flooding on infrastructure, facilities or access and egress routes;</p> <p>(c) is able to remain functional or is part of a network which is able to remain functional even when other infrastructure or services (such as electricity supply) may be compromised in a flood event;</p> <p>(d) contains mitigation measures which are not entirely dependent on human activation to respond to a flood event.</p> <p>Note—Protection of function is required up to and including the flood event in Table 8.2.11.3.G.</p>	<p>AO15</p> <p><b>Development involving essential community infrastructure:</b></p> <p>(a) is ancillary to and not relied upon for the provision of the essential service during a flood; or</p> <p>(b) is located above the flood planning levels in Table 8.2.11.3.G;</p> <p>(c) has access to or provides the necessary back-up emergency electricity and communications supply in times of flood;</p> <p>(d) is designed and constructed to resist hydrostatic and hydrodynamic forces as a result of inundation by the flood event listed for the development type in Table 8.2.11.3.G;</p> <p>(e) that services a local area:</p> <p>(i) is able to be accessed in times of flood to service local community needs up to the event listed for that development type in Table 8.2.11.3.G; or</p> <p>(ii) has a service continuity plan that demonstrates the continued provision of service during the relevant flood event.</p>	N/A	<i>Not applicable</i>

<sup>1</sup> Solution: ✓ Acceptable Solution  
 A/S Alternative Solution  
 N/A Not applicable to this proposal



# FLOOD OVERLAY CODE

Brisbane City Plan 2014

Performance outcomes	Acceptable outcomes	SOLUTION	COMMENT
Additional criteria if development involves the processes in Table 8.2.11.3.H			
<p>PO16</p> <p><b>Development involving the storage and handling of hazardous materials avoids or minimises risks to public health and safety and the environment, by:</b></p> <p>(a) protecting underground tanks for hazardous materials against the forces of buoyancy, velocity flow and debris impacts;</p> <p>(b) securing above-ground tanks for hazardous materials against flotation and lateral movement;</p> <p>(c) preventing damage to hazardous materials pipework or entry of floodwater into hazardous materials pipework;</p> <p>(d) preventing damage to or off-site release of packages, drums or containers storing hazardous materials.</p> <p>Note—A chemical hazards flood risk report prepared in accordance with the Management of hazardous chemicals in flood prone areas planning scheme policy can assist in demonstrating achievement of this performance outcome.</p> <p>Note—A pump drainage system is not an acceptable measure to meet the performance outcome.</p>	<p>AO16</p> <p>(a) <b>Development does not include the storage or handling of hazardous chemicals that are equivalent to or exceed the threshold quantities in Table 8.2.11.3.M.</b></p> <p>(b) <b>Development involving the processes listed in Table 8.2.11.3.H:</b></p> <p>(i) where located in the Flood overlay area, occurs only in the Creek/waterway flood planning area 5 sub-category or the Brisbane River flood planning area 5 sub-category; or</p> <p>(ii) is consistent with the standards contained in the Management of hazardous chemicals in flood prone areas planning scheme policy and can operate without risk of environmental harm during a flood event.</p> <p>Note—The Management of hazardous chemicals in flood prone areas planning scheme policy sets out further information and processes including risk assessment for the management of hazardous chemicals in flood planning areas.</p>	✓	<i>Negligible hazardous materials stored on-site.</i>
Additional criteria for reconfiguring a lot			
<p>PO17</p> <p><b>Development locates and designs all lots resulting from reconfiguring a lot to:</b></p>	<p>AO17.1</p> <p><b>Development creating new lots is to comply with Table 8.2.11.3.I.</b></p>	N/A	<i>Not applicable</i>

<sup>1</sup> Solution: ✓ Acceptable Solution  
 A/S Alternative Solution  
 N/A Not applicable to this proposal



# FLOOD OVERLAY CODE

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Performance outcomes	Acceptable outcomes	SOLUTION	COMMENT
<p>(a) minimise the risk to people from flood hazard;</p> <p>(b) minimise damage to property from flood hazard;</p> <p>(c) facilitate safe and efficient evacuation.</p> <p>Note—</p> <ul style="list-style-type: none"> <li>Consideration of all floods up to the probably maximum flood is relevant to minimising the risk to people.</li> <li>Flood warning time is not considered sufficient in the Creek/waterway planning area sub-categories or the Overland flow flood planning area sub-category.</li> <li>Filling above the flood planning level for a flood event greater than the defined flood event cannot be assumed to mitigate the flood hazard.</li> </ul>	<p>AO17.2</p> <p><b>Development provides for reconfiguring a lot design that achieves a road and lot layout which:</b></p> <p>(a) provides trafficable vehicular egress for evacuation during a defined flood event;</p> <p>(b) optimises hazard-free movement away from sources of flood hazard within the development.</p> <p>Note—Further advice on road and lot layout is contained in the Flood planning scheme policy.</p>	N/A	<i>Not applicable</i>
	<p>AO17.3</p> <p><b>Development which creates a new residential lot in an area subject to Brisbane River flooding, if the residential flood level is greater than 12.8m AHD is not subject to a hydraulic hazard greater than 0.6m<sup>2</sup>/s DV or 0.6m deep in a 0.2% AEP flood.</b></p> <p>Note—Refer to the Flood planning scheme policy for further explanation on the 0.2% AEP flood.</p>	N/A	<i>Not applicable</i>
<p>PO18</p> <p><b>Development involving reconfiguring a lot:</b></p> <p>(a) minimises the risk to people from flood hazard;</p> <p>(b) creates safe evacuation routes or avoids isolation of the development during a flood greater than the defined flood event;</p>	<p>AO18.1</p> <p><b>Development involving reconfiguring a lot ensures:</b></p> <p>(a) all lots comply with the flood planning levels in Table 8.2.11.3.J;</p> <p>(b) a new road complies with the flood planning levels in Table 8.2.11.3.F.</p>	N/A	<i>Not applicable</i>

<sup>1</sup> Solution:    ✓    Acceptable Solution  
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Performance outcomes	Acceptable outcomes	SOLUTION	COMMENT
(c) minimises damage to property and services;	AO18.2	N/A	<i>Not applicable</i>
(d) provides lots and roads that are not frequently flooded or subject to nuisance ponding or seepage;	<p><b>Development involving reconfiguring a lot creating more than 6 residential lots or a lot for industry ensures the flood planning levels of a dedicated road fronting the development or providing primary access within 200m of the development:</b></p> <p>(a) complies with Table 8.2.11.3.K; or</p> <p>(b) has acceptable trafficability in accordance with the requirements in the Flood planning scheme policy and the Queensland Urban Drainage Manual.</p> <p>Note—The Flood planning scheme policy contains supporting information about trafficability on existing roads and serviceability during floods.</p>	N/A	<i>Not applicable</i>
(e) ensures lots created for park or private open space minimise the risk to people from flood hazard and are fit for purpose;			
(f) provides a lot that is not substantially burdened by flood mitigation infrastructure.			
	AO18.3	N/A	<i>Not applicable</i>
	<p><b>Development protects the conveyance of flood hazard area by providing an easement over the:</b></p> <p>(a) 2% AEP flood extent for overland flow flooding;</p> <p>(b) 1% AEP flood extent for creek/waterway flooding.</p>		

<sup>1</sup> Solution: ✓ Acceptable Solution  
 A/S Alternative Solution  
 N/A Not applicable to this proposal



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