

Our Ref: 59919077-L001: BCP/bcp  
Contact: Dr Brett C Phillips

3<sup>rd</sup> March 2019

The Manager  
CityState Property  
Level 32, 200 George Street  
**SYDNEY NSW 2000**

Attention: Mr Mark Maryska

Dear Mark,

**FLOOD IMPACT ASSESSMENT FOR 3 MYRTLE ST AND 3-5 CARRINGTON RD,  
MARRICKVILLE**

We are pleased to provide you with our report summarising our flood impact assessment of the proposed amended development at 3 Myrtle Street and 3-5 Carrington Road, Marrickville in the Inner West Local Government Area (LGA). This report has been prepared in support of a Planning Proposal for The Myrtle Street Creative Common comprising a unique live and work concept, offering housing a range of creative spaces alongside a mix of housing aimed at young people. It will also include a mix of break-out spaces, rooftop communal areas and amenity spaces for the public and residents.

This study has been undertaken using the previous version of the Inner West Council 2D TUFLOW model created for the Marrickville Valley Flood Study (WMA Water and Storm Consulting, 2013) with modifications applied to tailor the model for the requirements of the current study.

**1. BACKGROUND**

**1.1 Subject Site**

The site is located in the suburb of Marrickville in the Inner West LGA. The site is comprised of three existing allotments, referred to as 3 Myrtle Street and 3-5 Carrington Road. The site is currently developed, with two industrial buildings (refer **Figure 1**).

The sites are subject to flooding by overland flows under existing conditions. The Sydney Water owned and operated Central Channel is located between the two sites to convey the overland flows. This stormwater channel, together with a network of pipes and pump stations, conveys flood waters into the Cooks River.

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Figure 1 Locality Plan

### 1.2 Proposed Development

The proposed development comprises two 9 storey buildings providing for light industrial, live/work spaces, studios and 1 and 2 bedroom apartments with underground parking. A plan of the ground floor of the proposed development is shown in **Figure 2**.

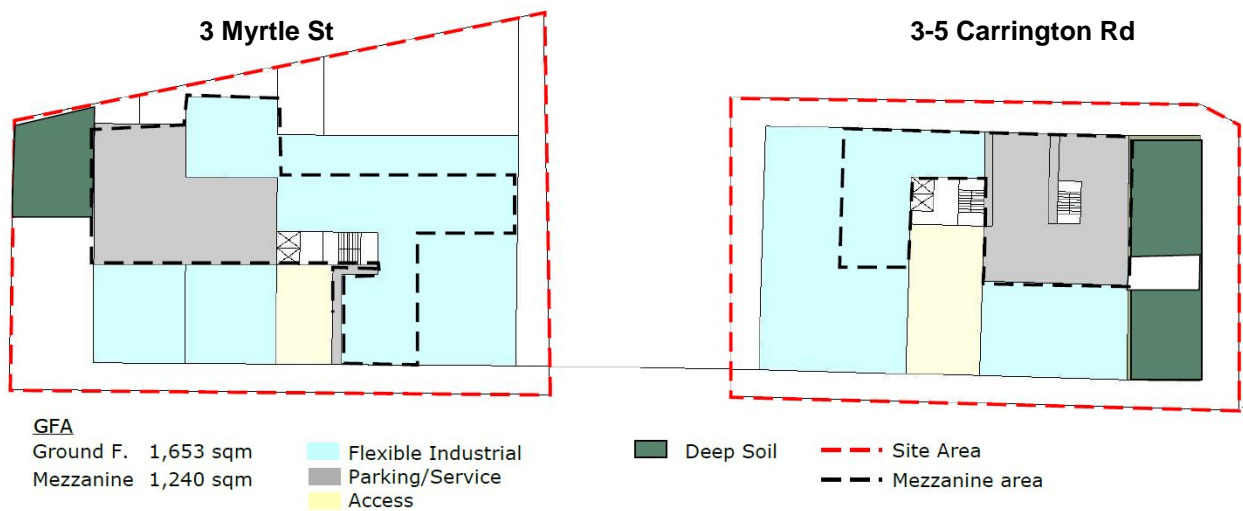


Figure 2 Proposed Development Layout



## 2. OBJECTIVE

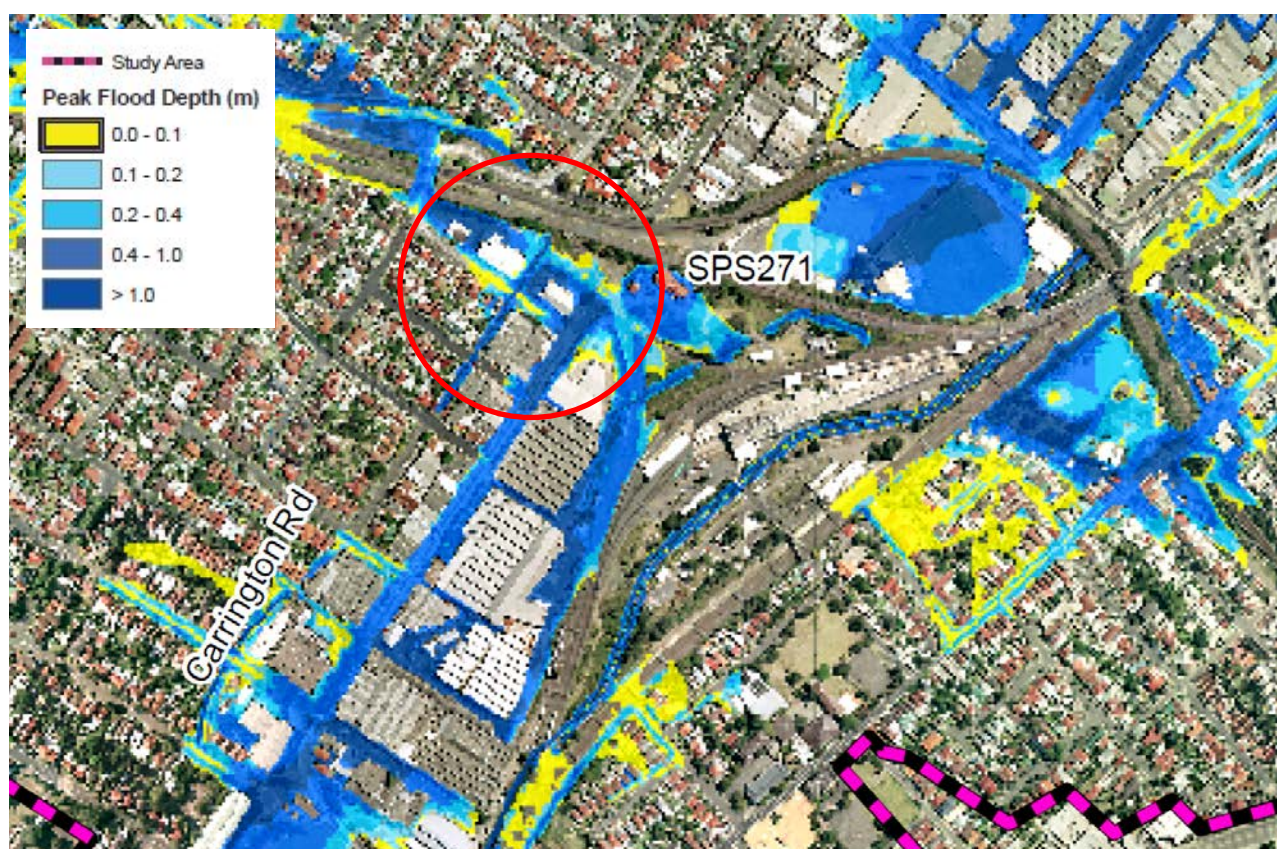
The objective of this letter report is to present the findings of an assessment of the impacts of the proposed development on flooding in the site as well as surrounding areas.

## 3. PREVIOUS STUDY

In 2013, the former Marrickville Council engaged WMAwater and Storm Consulting to undertake a Flood Study of Marrickville Valley under the NSW State Government's Floodplain Risk Management Program. The objective of this study was to provide an understanding of the existing flood behaviour and provide a basis for the development of a subsequent Floodplain Risk Management Study and Plan (WMAwater and Storm Consulting, 2013<sup>1</sup>).

The indicative 100 year Average Recurrence Interval (ARI) flood extents for the site are shown in **Figure 3**, extracted from the Marrickville Valley Flood Study report (WMAwater and Storm Consulting, 2013). The DCP Marrickville 2011 maps:

- 3 Myrtle and 3-5 Carrington Rd as Flood Liable Land;
- 3 Myrtle Street as Flood Planning Area (Overland Flow); and
- 3-5 Carrington Rd as Flood Planning Area (Cooks River) and Flood Planning Area (Overland Flow)



**Figure 3 100 year ARI Flood Extents from the Marrickville Valley Flood Study (2013)**

<sup>1</sup> WMAwater and Storm Consulting (2013). Marrickville Valley Flood Study, *Final Report*, prepared for Marrickville Council, April, 41 pp +Apps

In relation to Cooks River flood classification areas, the DCP Marrickville 2011 identifies the Carrington Road area (Marrickville) as Low Hazard.

The present study has included detailed ground survey data for the development sites and surrounding lands to provide a more accurate presentation of the existing topography at the study area. Therefore it will provide a more accurate simulation of the flood behaviour in the area.

## 4. HYDROLOGICAL AND HYDRAULIC MODELLING

### 4.1 Available Data

The following data was used to inform the modelling:

- Hydrology (DRAINS) / Hydraulic (TUFLOW) model inputs from Marrickville Valley Flood Study (WMA Water and Storm Consulting, 2013). The provided models include the LIDAR data, stormwater drainage network and rainfall data;
- Ground Survey of the study area undertaken by Lockley LTS (attached as **Attachment A**) and;
- Proposed ground floor footprint for the site (see **Figure 2**).

### 4.2 Modelling Approach

The existing TUFLOW model from the Marrickville Valley Flood Study was updated with the provided survey data and run for both existing and future scenarios. Assessing the results revealed some instability issues in the vicinity of the study area caused by the 1D channel (Central Channel) on either side of Myrtle Street. It was decided that a truncated model be developed for the study area for the purposes of undertaking this flood impact assessment to firstly resolve the issues in the original model and secondly reduce the model run times.

The same building blockages used in the Marrickville model were adopted in the truncated model.

The truncated model was run to estimate the flood extents, depth, velocity and hazard around the study area in existing conditions. The proposed development was then included in the model to assess its impact on the flood behaviour in the study area.

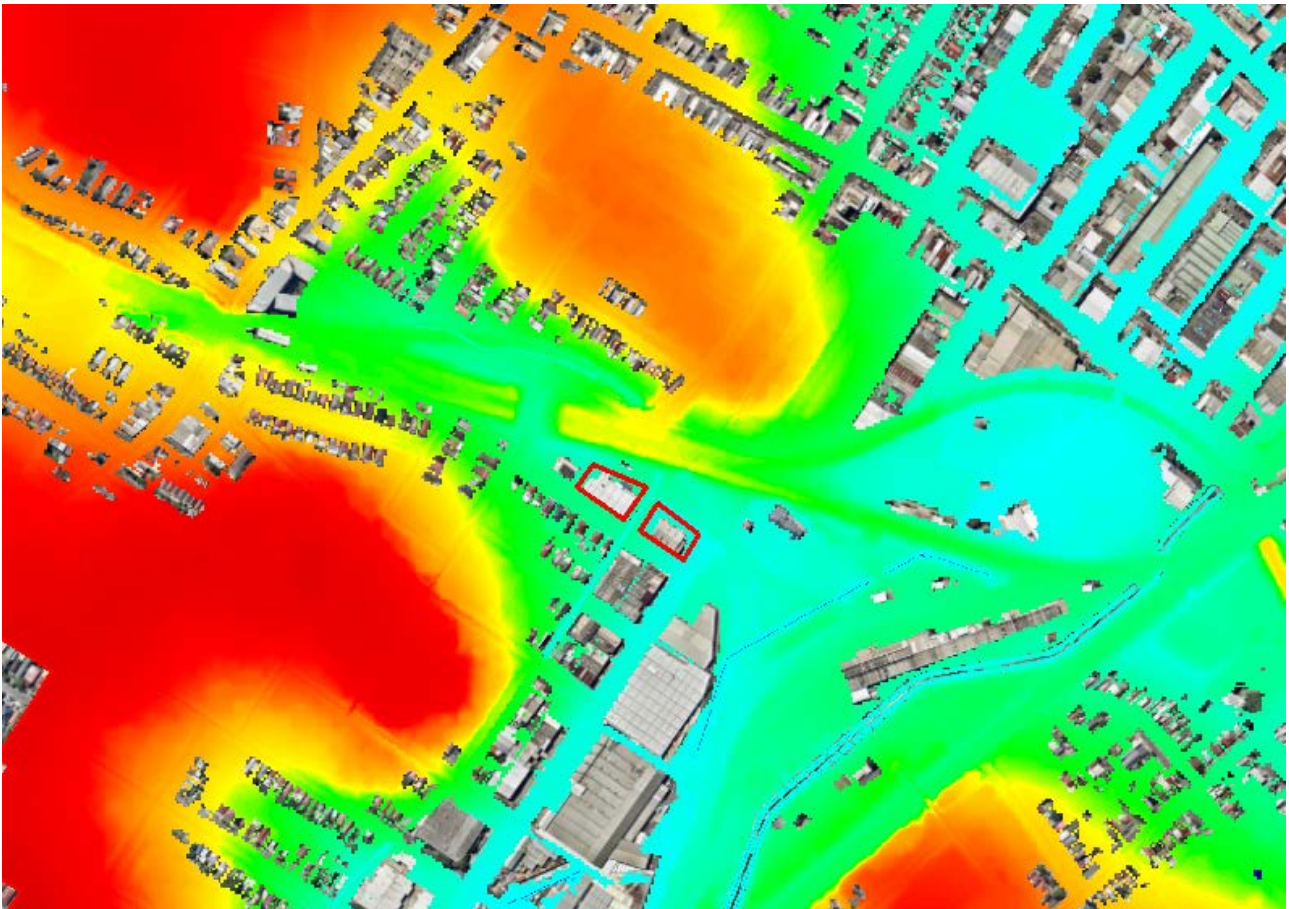
#### 4.2.1 Model Topography

A grid size of 3 m x 3 m was adopted in the original model. However, the truncated model was developed on a 1.5 m x 1.5 m grid base. The truncated model extends to the intersection of Charlotte Avenue and Myrtle Street in the west, the railway line in the north, Schwebel Street in the south, and Carrington Road in the east. The truncated model consists of over 36,000 active 2D cells. Furthermore, the stormwater channel could be modelled in 2D accurately due to the smaller grid resolution, which removed the source of some instability.

The model terrain grid was developed from applying the ground survey data into the LiDAR levels provided by Council. The civil and surveying package 12d was used to generate a detailed 3D surface (digital terrain model) of the study area.

The base terrain created from the survey and LIDAR data for the study area is shown in **Figure 4**. As can be seen in this figure, the site is generally located in a local depression, which confirms the results of the Marrickville Flood Study identifying the area as flood affected.





**Figure 4 Terrain created from Survey and LiDAR Data**

#### 4.2.2 Hydrology

The same process as adopted in the Marrickville Valley Flood Study model was followed to apply hydrographs into the hydraulic model. In this approach, design flows from the DRAINS model were input at pit locations and used as inflows into the 2D model runoff (WMAwater and Storm Consulting, 2013).

#### 4.2.3 Rainfall

The design rainfall was adopted per the Marrickville Valley Flood Study ie. design rainfalls and temporal patterns were obtained from Australian Rainfall and Runoff (WMAwater and Storm Consulting, 2013).

#### 4.2.4 Surface Roughness

Hydraulic surface roughness have been modelled in the 2D TUFLOW model using spatially distributed roughness ("n") values adopted by the Marrickville Valley Flood Study (WMAwater and Storm Consulting, 2013).

#### 4.2.5 1D Hydraulics

The 1D hydraulic network including the channels and the stormwater pit and pipe network were included in the TUFLOW model as per those applied in the Marrickville Valley Flood Study (WMAwater and Storm Consulting, 2013). The open section of the Central Channel on both sides of Myrtle Street and Harriet Street was modelled in the 2D domain. A combination of gully lines and averaging of grid values drawn from the original 1D setup of the channel was considered. Given the resolution of the grid cell, the underlying channel data, and potential for model stability the adopted 2D gridded representation of the channel was preferable.

#### 4.2.6 Boundary Conditions

The upstream boundary conditions in the truncated model were time series inflows at three discrete locations. Downstream boundary conditions comprised water level time series. The flow and water level time series were derived from the overall Marrickville Valley Flood Study model (WMAwater and Storm Consulting, 2013).

### 4.3 Results

Cardno assessed flood behaviour of 100 year ARI event under existing and proposed conditions.

#### 4.3.1 Flood Behaviour under Existing Conditions

Consistent with the results of the Marrickville Valley Flood Study, this detailed investigation found that the site is flood affected. The site is affected by flows arriving from Victoria Rd, to the west. The estimated 100 year ARI event peak flood level contours and depth under Existing Conditions are shown in **Figures 5 to 8**.

#### 4.3.2 Flood Behaviour under Proposed Conditions

The proposed development modelling was based on ground floor footprint for the site shown in **Figure 2**. Modelled results of the proposed development have been mapped for peak flood level contours and depth for the 100 year ARI event (**Figures 9 to 12**).

## 5. ASSESSMENT

### 5.1 Flood-Related Development Controls

According to the Marrickville Development Control Plan 2011 the proposed development should meet the following criteria:

#### General Controls

- The proposed development should not increase the flood hazard or risk to other properties.

#### Controls for new residential development

- Floor levels (Flood Planning Levels) of habitable rooms must be a minimum of 500 mm above the standard flood level at that location. For areas of minor overland flow (a depth of 300 mm or less or overland flow of 2cum/sec or less) a lower freeboard of 300 mm may be considered on its merits;
- Flood free access must be provided where practicable.

## Controls for filling of land within the Flood Planning Area

- Filling the land for the purpose of development should not increase the flood levels by more than 100 mm;
- Proposed filling should not increase the downstream velocities by more than 10% ;
- Proposed filling should not redistribute flows by more than 15%;
- The filling should create no local drainage flow/runoff problems.

This study provides assessment of the proposed development against the above criteria.

## 5.2 Assessment against Development Controls

Associated development controls are outlined in **Section 5.1** and are addressed below.

### 5.2.1 Flood Hazard

**Figure 8** and **Figure 12** show the provisional flood hazard under existing and proposed conditions. A comparison reveals minor change except in the vicinity of the Myrtle St / Carrington Rd intersection where the areal extent has increased to a degree.

### 5.2.2 Floor Levels

The proposed ground flood level for the building at 3 Myrtle St should be set 0.5 m higher than the 100 yr ARI flood level determined from **Table 1** based on the location of entries to the ground floor which provide a pathway for floodwaters to enter the ground floor. Similarly the proposed ground flood level for the building at 3-5 Carrington Rd should be set 0.5 m higher than the 100 yr ARI flood level determined from **Table 1** based on the location of entries to the ground floor which provide a pathway for floodwaters to enter the ground floor.

### 5.2.3 Flood Free Access

Due to the existing flooding conditions at the site, with flooding on both Myrtle Street and Carrington Road, it is not considered feasible to provide flood free access to 3-5 Carrington Road. However, with the updated modelling, 3 Myrtle Street may be provided with flood free access in the 100 year ARI event.

### 5.2.4 Water Levels

The 100 year ARI flood levels at the reference locations under Existing and Proposed Conditions are shown in **Table 1**.

The aim is for the development to not cause any additional filling of land at the site however, minor local changes may be associated with the changes to the footprints. The impact of the development on flooding was assessed by comparing the peak water levels under existing and proposed conditions. **Figure 13** identifies a series of reference locations around both proposed buildings. **Figure 14** shows the 100 year ARI flood level differences which disclose the estimated impact of the planned development.

It is noted that there are both local reductions and increases in the 100 year ARI flood levels arising from the planned development. There are no adverse increases in the 100 year ARI flood level on any adjoining developed properties.

**Table 1: 100 Year ARI Flood Levels under Existing and Proposed Conditions**

Reference Location	100 year ARI Flood Levels		Difference (cm) (b)-(a)
	Existing (m AHD) (a)	Future (m AHD) (b)	
P1	4.43	4.41	-2
P2	4.44	4.41	-2
P3	4.44	4.41	-3
P4	4.35	4.34	-1
P5	4.28	4.26	-2
P6	4.09	4.06	-3
P7	3.81	3.84	3
P8	3.76	3.80	3
P9	3.77	3.79	3
P10	4.44	4.42	-2
P11	4.44	4.42	-2
P12	-	-	-
P13	-	-	-
P14	3.78	3.80	2
P15	3.58	3.78	20
P16	3.51	3.78	27
P17	3.50	3.70	20
P18	3.16	3.25	8
P19	3.13	3.12	-1
P20	3.10	3.11	1
P21	3.07	3.04	-3
P22	3.59	3.51	-8
P23	3.10	3.09	0
P24	3.46	3.56	11

It is also noted that there are local decreases in the 100 year ARI flood levels in the vicinity of the southwestern corner of the eastern building. These reductions are attributed to a local redistribution of flood flow and a possible local change in flow regime.

#### 5.2.5 Flow Velocities

**Figure 7** and **Figure 11** show the flow velocities under existing and proposed conditions. A comparison is provided in **Figure 15**, which shows the percentage change. There are some areas where significant velocity increases and decreases are observed. In the context of the existing flood hazard of the area, the minimal changes to building footprints, and the acceptable water level differences, these changes could be considered acceptable. It is further noted that due to the fine model resolution, localised changes are more apparent.



### 5.2.6 Flow Distribution

**Figure 13** identifies a series of flow locations around both proposed buildings. **Table 2** presents the flows under existing and proposed conditions.

**Table 2: 100 Year ARI Flows under Existing and Proposed Conditions**

Location	Existing Flow (m <sup>3</sup> /s)	Proposed Flow (m <sup>3</sup> /s)
1. North of Building A	14.9	13.04
2. North of Building B	19.0	14.3
3. South of Building B	11.9	17.1
4. South of Building A	-	0.03
5. Central Channel at South	8.1	8.1

Note: Building A located on 3 Myrtle St  
Building B located on 3-5 Carrington Rd

Due to the changes to building footprints, there is some redistribution of flows in the 100 year ARI event on 3-5 Carrington Road. More flow is passing on the southern side of the building and less on the northern side. The changes in the total flow discharging west to east around Building A and Building B are -12% and +2% respectively which complies with Council's control.

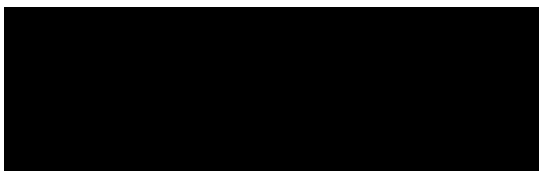
### 5.2.7 Local Drainage

It is not anticipated that the development would cause local drainage flow/runoff problems. The site impervious fraction or hardstand area is not anticipated to increase. Drainage design would be required for future development assessment.

## 6. CONCLUSION

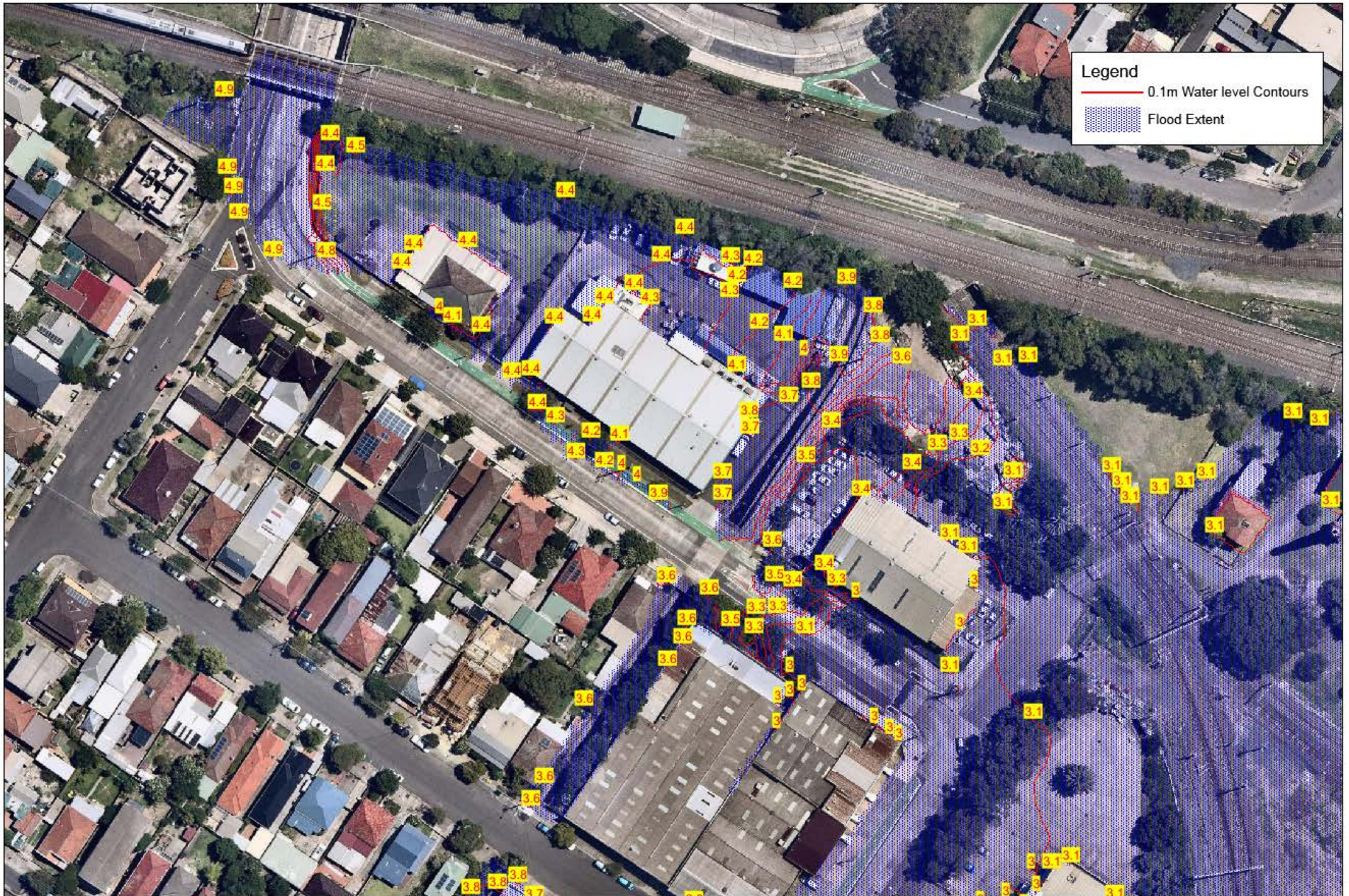
It is concluded that the flood impact assessment demonstrates that the development will not have any unacceptable flood impacts, notwithstanding any comments noted in detail above.

Yours faithfully,



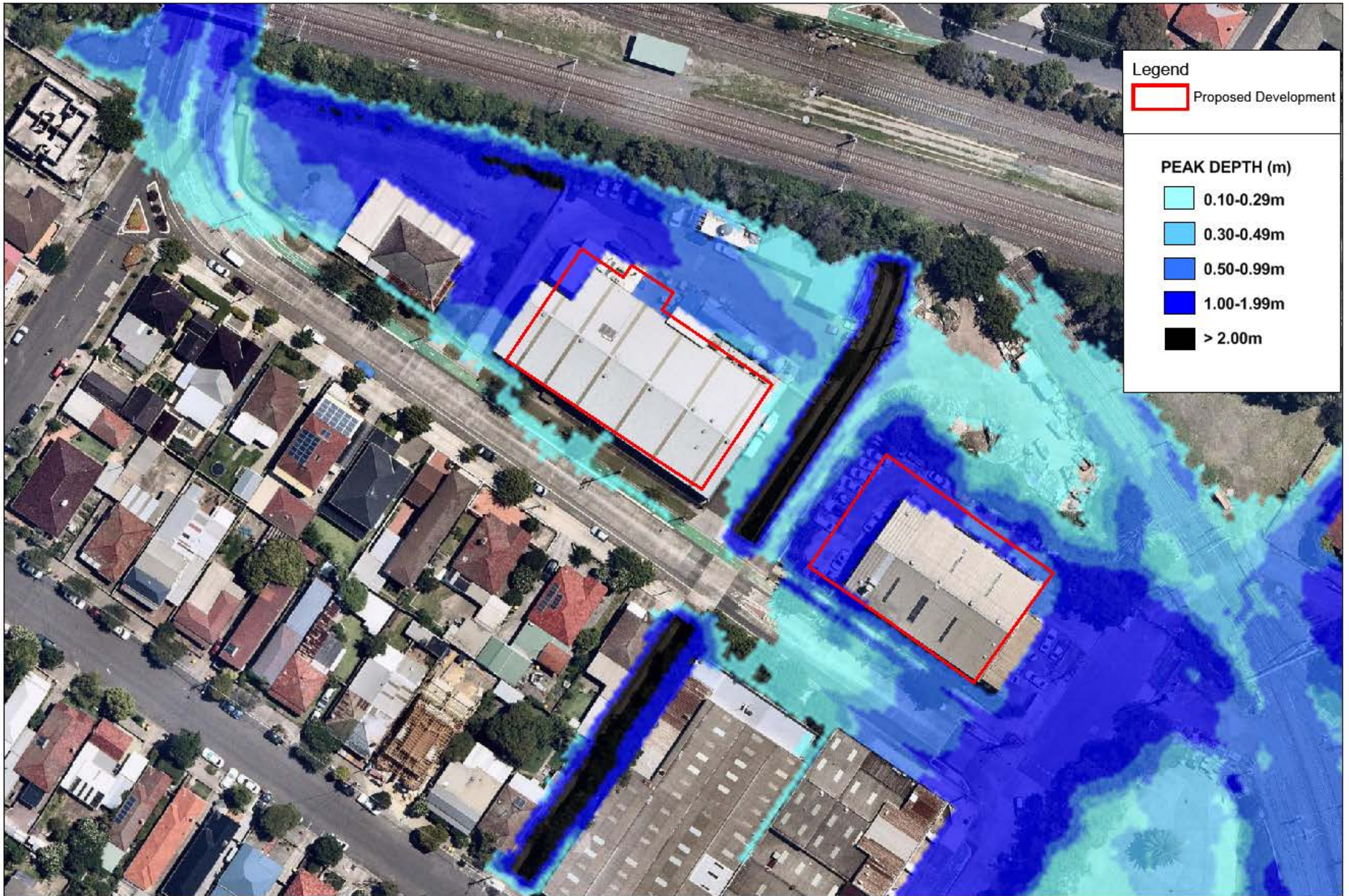
*Dr Brett C Phillips*  
Director, Water Engineering  
for **Cardno**





**Figure 5 - 100yr ARI Flood Level Contours - Existing Conditions**

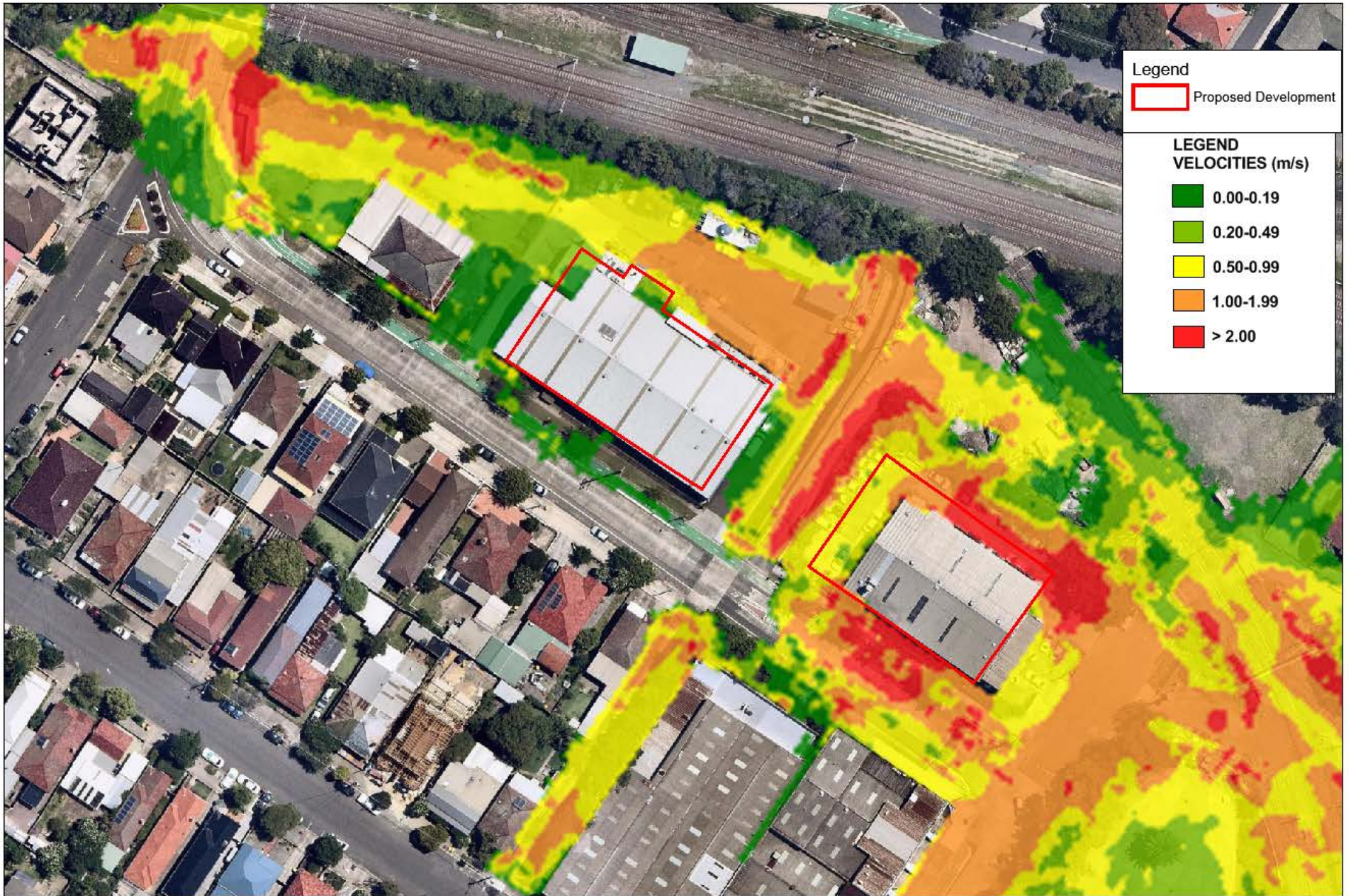




Cardno job 59916144  
1 March 2019

Figure 6 - 100yr ARI Flood Depth - Existing Conditions

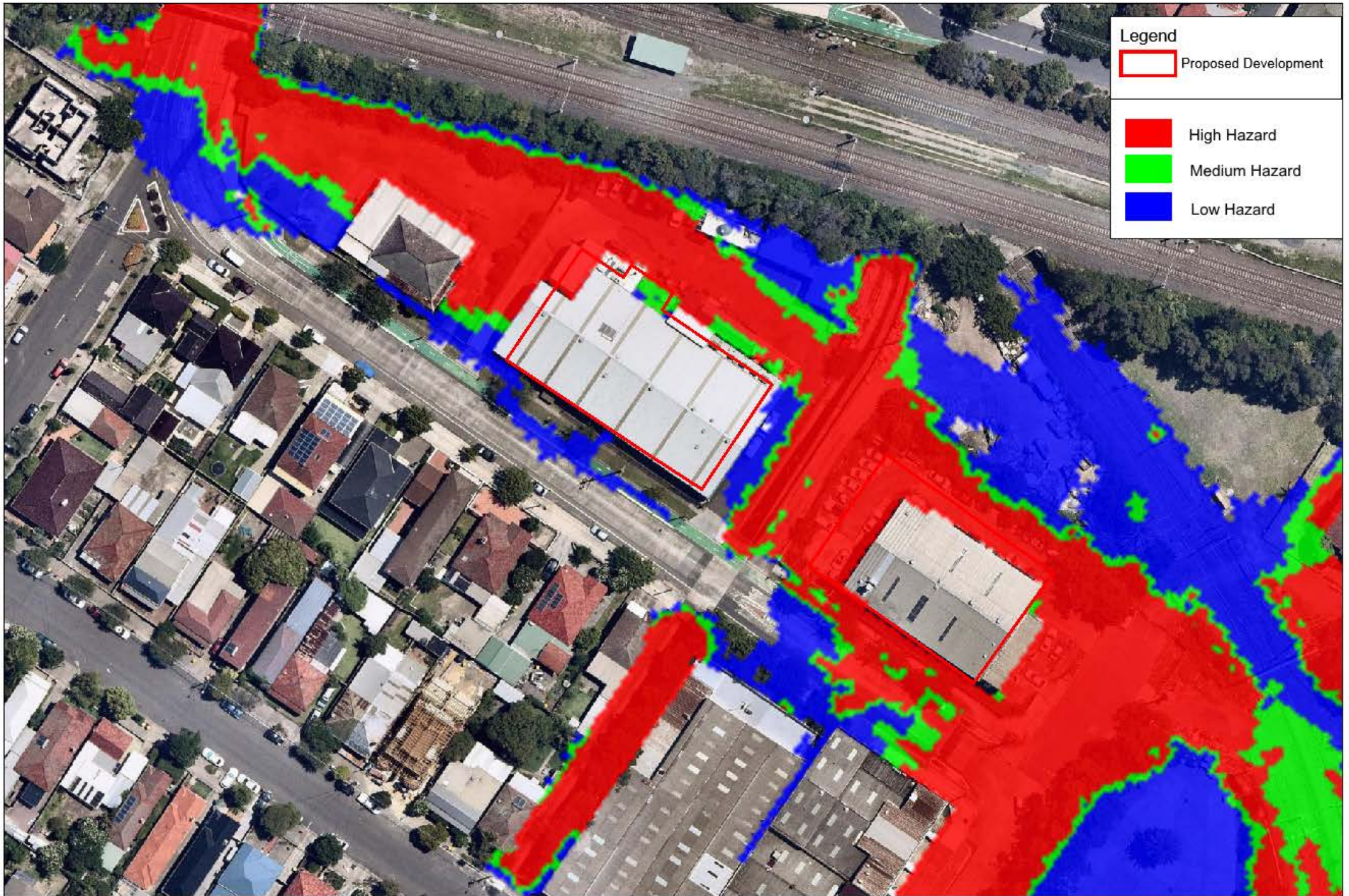




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Figure 7 - 100yr ARI Flood Velocity - Existing Conditions





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4 March 2019

Figure 8 - 100yr ARI Flood Hazard - Existing Conditions





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1 March 2019

**Figure 9 -100yr ARI Flood Level Contours - Future Conditions**



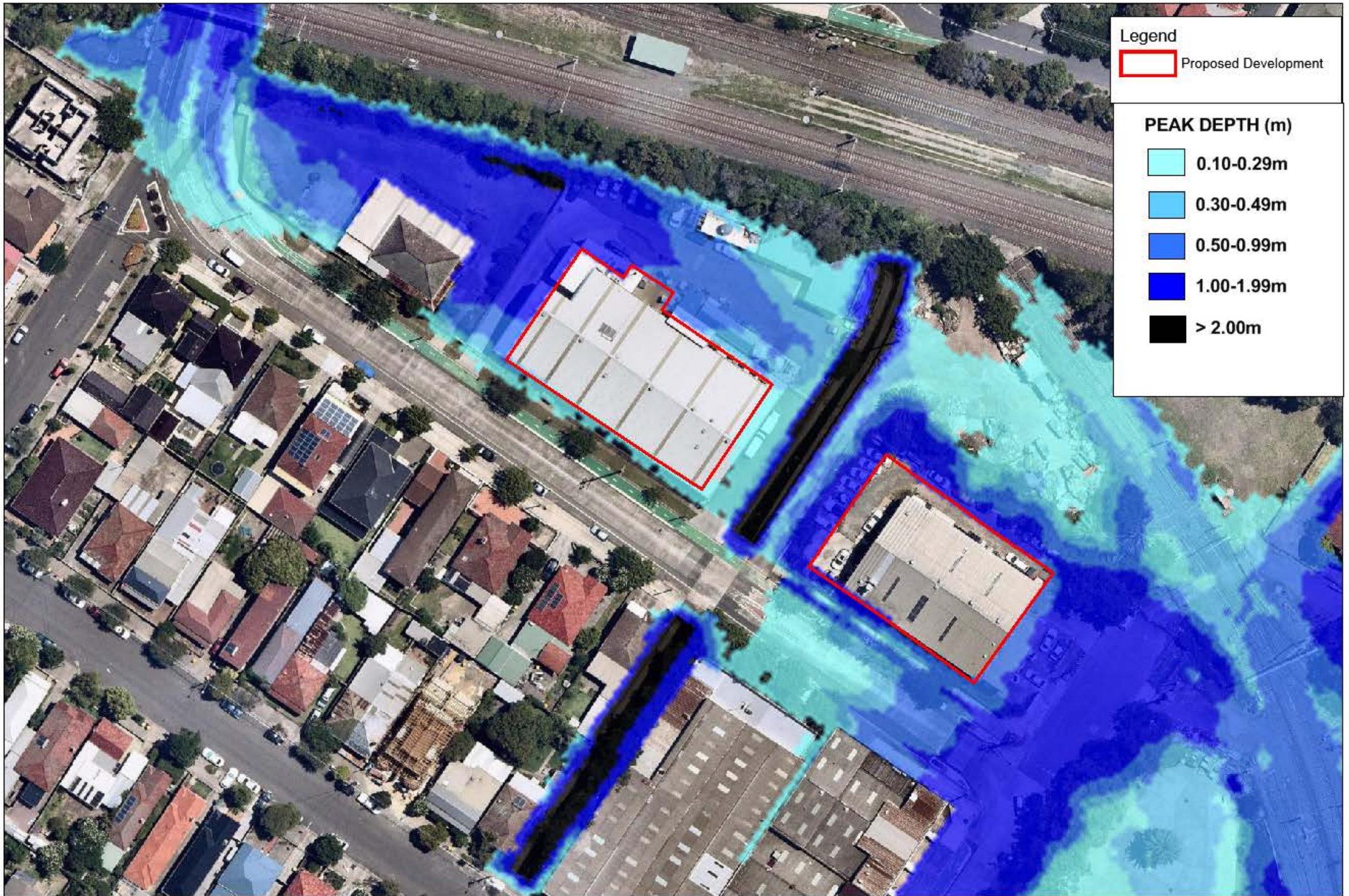


Figure 10 - 100yr ARI Flood Depth - Future Conditions



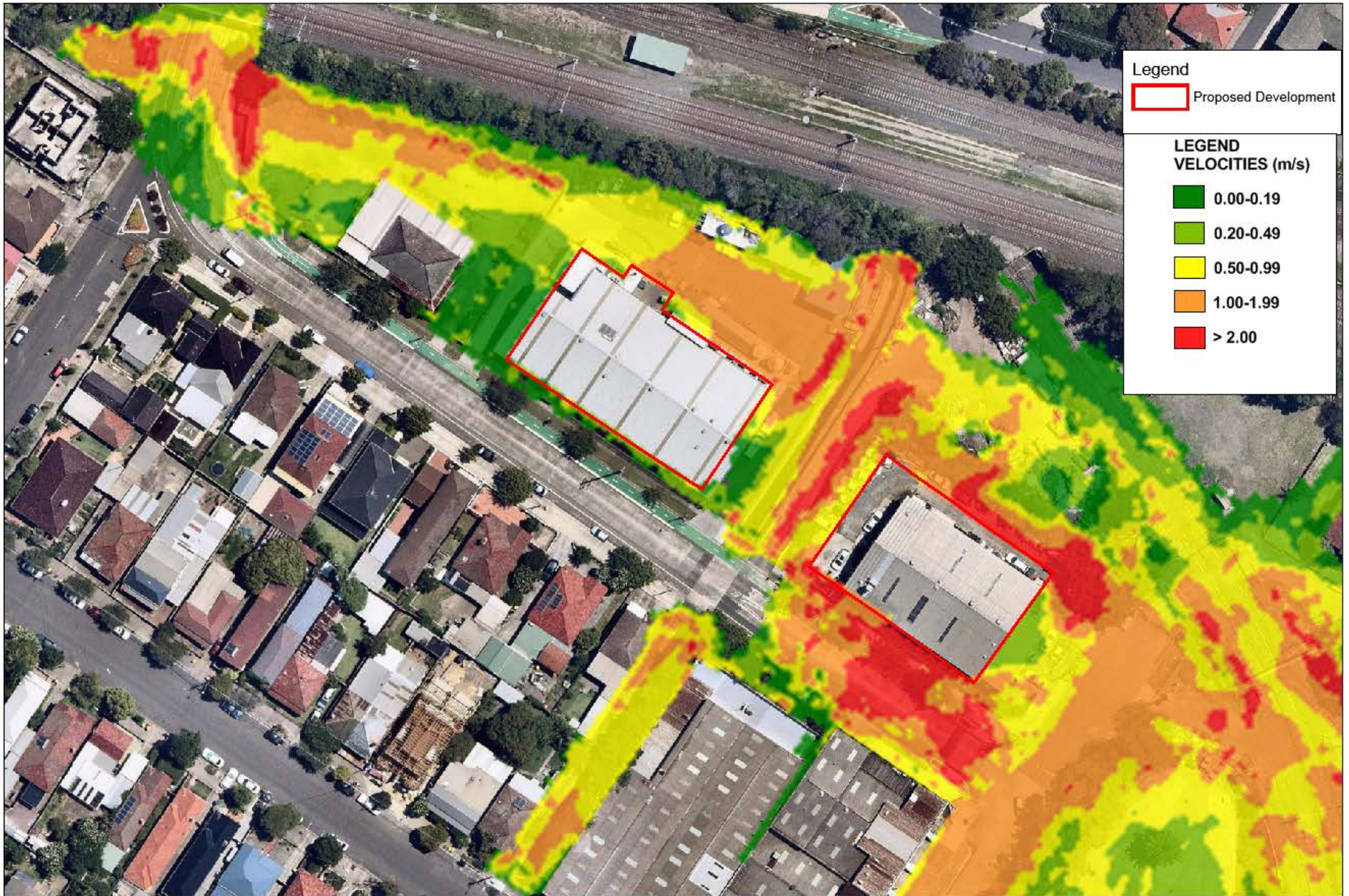


Figure 11 - 100yr ARI Flood Velocity - Future Conditions



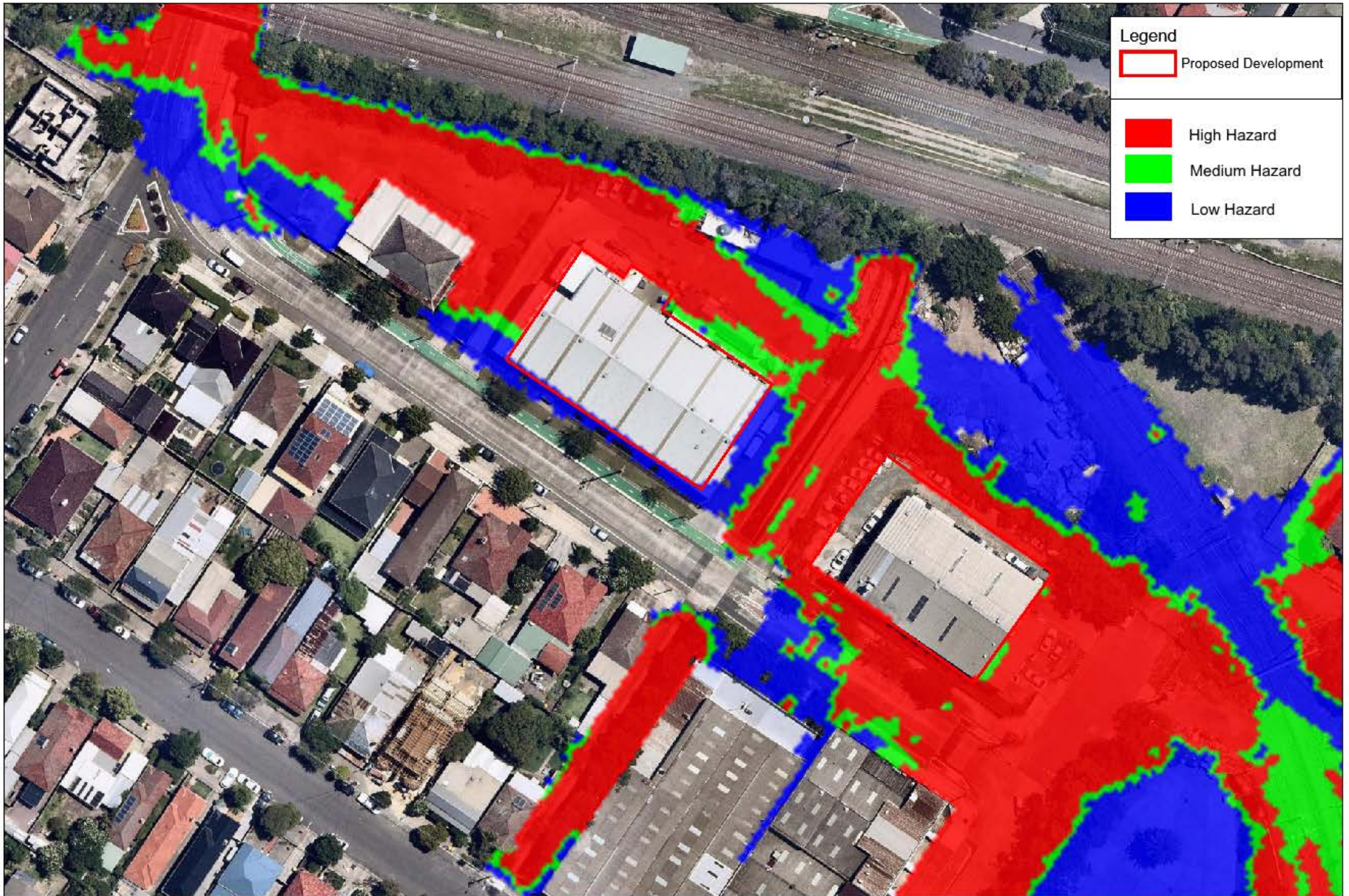


Figure 12 - 100yr ARI Flood Hazard - Future Conditions



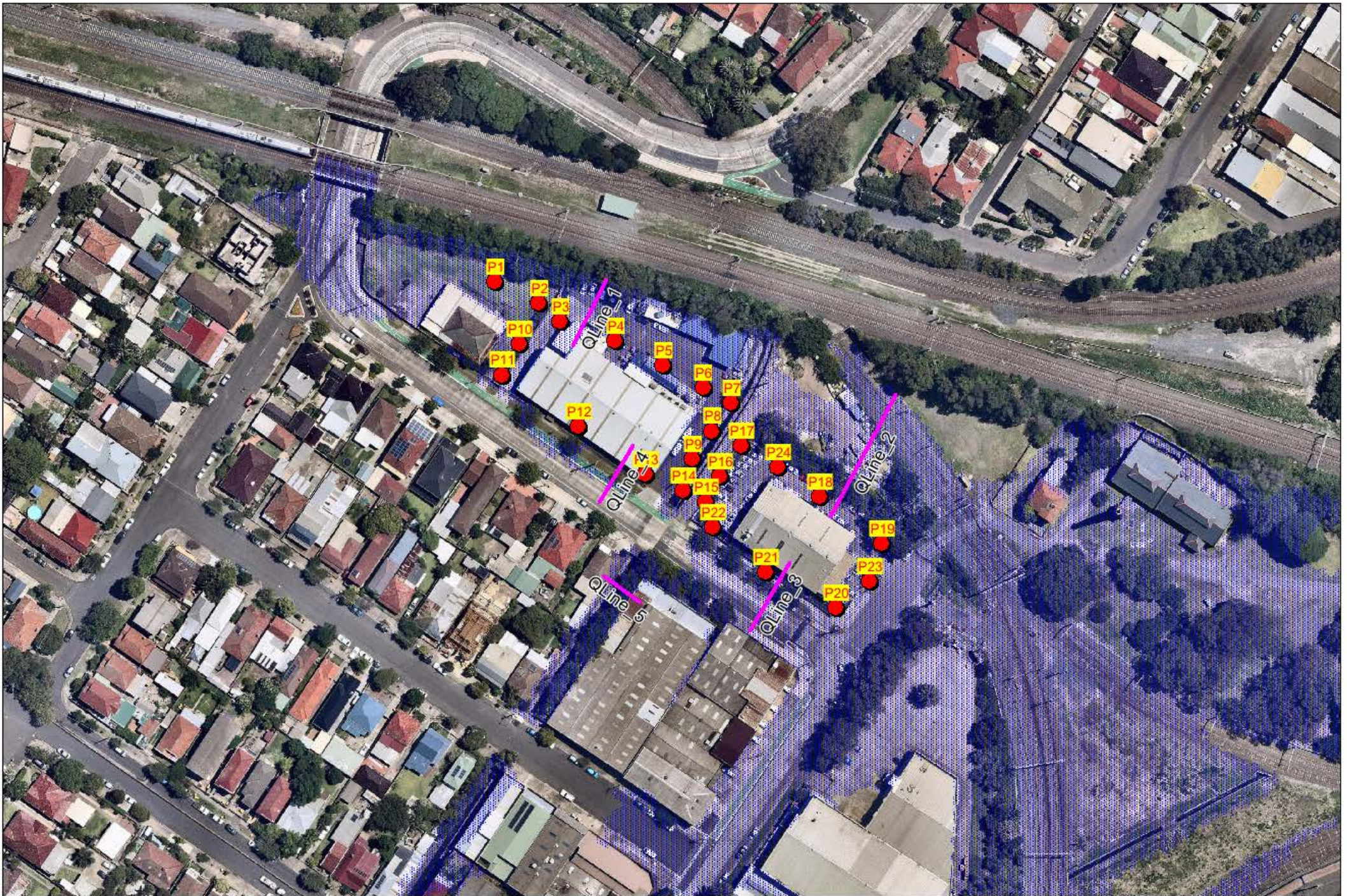
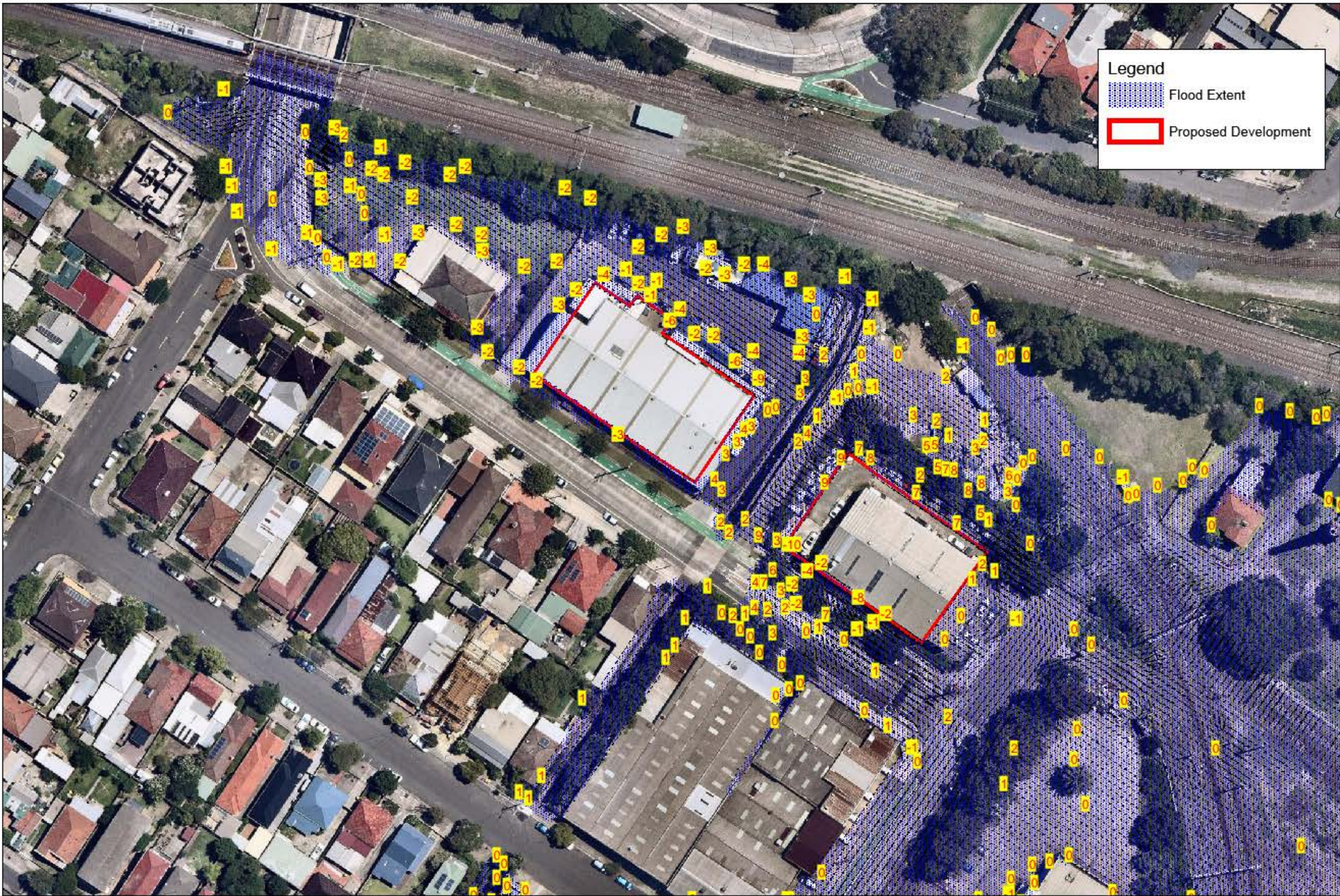


Figure 13 - Reference Points





**Figure 14 - 100yr ARI Flood Level Difference (cm)- Developed vs Existing**



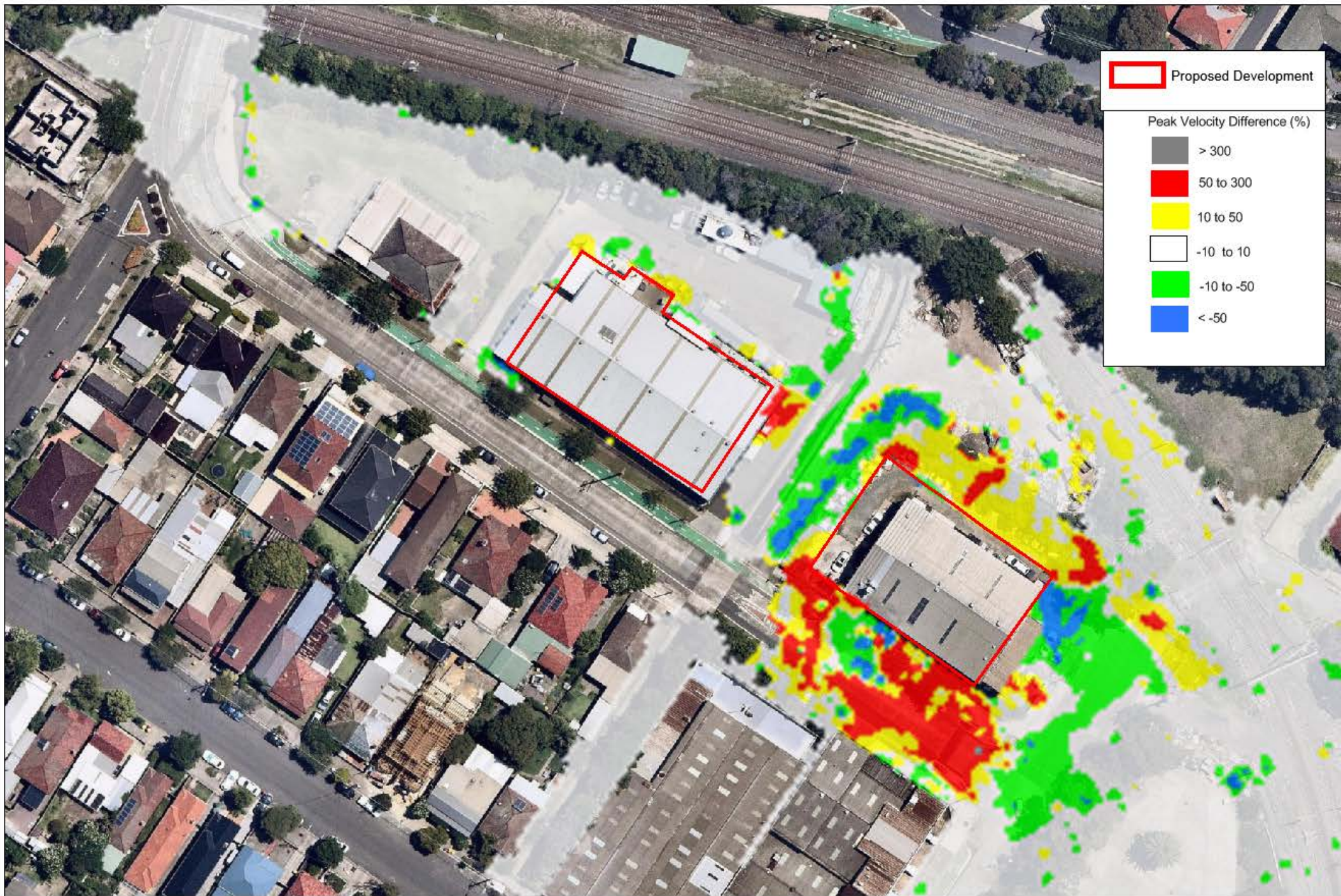
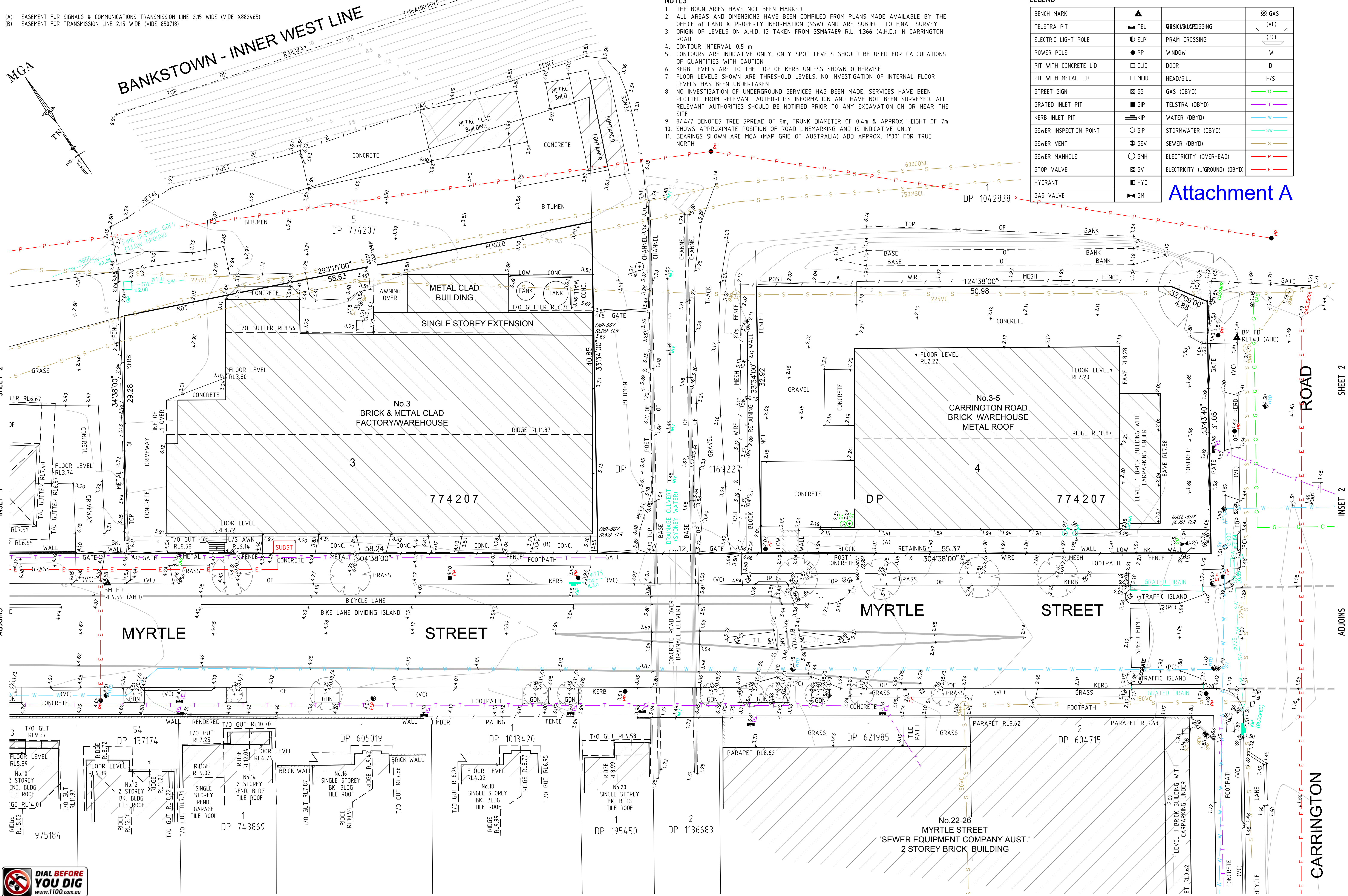


Figure 15 - 100yr ARI Flood Velocity Difference (%) - Developed vs Existing



(A) EASEMENT FOR SIGNALS & COMMUNICATIONS TRANSMISSION LINE 2.15 WIDE (VIDE X882465)  
 (B) EASEMENT FOR TRANSMISSION LINE 2.15 WIDE (VIDE 850718)



- NOTES**
1. THE BOUNDARIES HAVE NOT BEEN MARKED
  2. ALL AREAS AND DIMENSIONS HAVE BEEN COMPILED FROM PLANS MADE AVAILABLE BY THE OFFICE OF LAND & PROPERTY INFORMATION (NSW) AND ARE SUBJECT TO FINAL SURVEY
  3. ORIGIN OF LEVELS ON A.H.D. IS TAKEN FROM SSM47489 R.L. 1.366 (A.H.D.) IN CARRINGTON ROAD
  4. CONTOUR INTERVAL 0.5 m
  5. CONTOURS ARE INDICATIVE ONLY. ONLY SPOT LEVELS SHOULD BE USED FOR CALCULATIONS OF QUANTITIES WITH CAUTION
  6. KERB LEVELS ARE TO THE TOP OF KERB UNLESS SHOWN OTHERWISE
  7. FLOOR LEVELS SHOWN ARE THRESHOLD LEVELS. NO INVESTIGATION OF INTERNAL FLOOR LEVELS HAS BEEN UNDERTAKEN
  8. NO INVESTIGATION OF UNDERGROUND SERVICES HAS BEEN MADE. SERVICES HAVE BEEN PLOTTED FROM RELEVANT AUTHORITIES INFORMATION AND HAVE NOT BEEN SURVEYED. ALL RELEVANT AUTHORITIES SHOULD BE NOTIFIED PRIOR TO ANY EXCAVATION ON OR NEAR THE SITE
  9. 8/4/7 DENOTES TREE SPREAD OF 8m, TRUNK DIAMETER OF 0.4m & APPROX HEIGHT OF 7m
  10. SHOWS APPROXIMATE POSITION OF ROAD LINEMARKING AND IS INDICATIVE ONLY
  11. BEARINGS SHOWN ARE MGA (MAP GRID OF AUSTRALIA) ADD APPROX. 1°00' FOR TRUE NORTH

**LEGEND**

BENCH MARK	▲	⊗ GAS
TELSTRA PIT	■ TEL	⊗ V/C CROSSING
ELECTRIC LIGHT POLE	● ELP	⊗ PRAM CROSSING
POWER POLE	● PP	⊗ WINDOW
PIT WITH CONCRETE LID	□ CLID	⊗ DOOR
PIT WITH METAL LID	□ MLID	⊗ HEAD/SILL
STREET SIGN	⊗ SS	⊗ GAS (DBYD)
GRATED INLET PIT	⊗ GIP	⊗ TELSTRA (DBYD)
KERB INLET PIT	⊗ KIP	⊗ WATER (DBYD)
SEWER INSPECTION POINT	○ SIP	⊗ STORMWATER (DBYD)
SEWER VENT	● SEV	⊗ SEWER (DBYD)
SEWER MANHOLE	○ SMH	⊗ ELECTRICITY (OVERHEAD)
STOP VALVE	⊗ SV	⊗ ELECTRICITY (U'GROUND) (DBYD)
HYDRANT	■ HYD	
GAS VALVE	▲ GM	

Attachment A

SHEET 2

SHEET 2

INSET 1

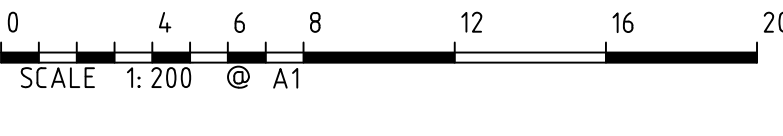
INSET 2

ADJOINS

ADJOINS



REFER TO NOTES AND LEGEND



Revision	Date	Description
D	00/00/00	-
C	00/00/00	-
B	00/00/00	-
A	00/00/00	-

THIS IS THE PLAN REFERRED TO IN MY LETTER DATED:  
 Registered Surveyor NSW

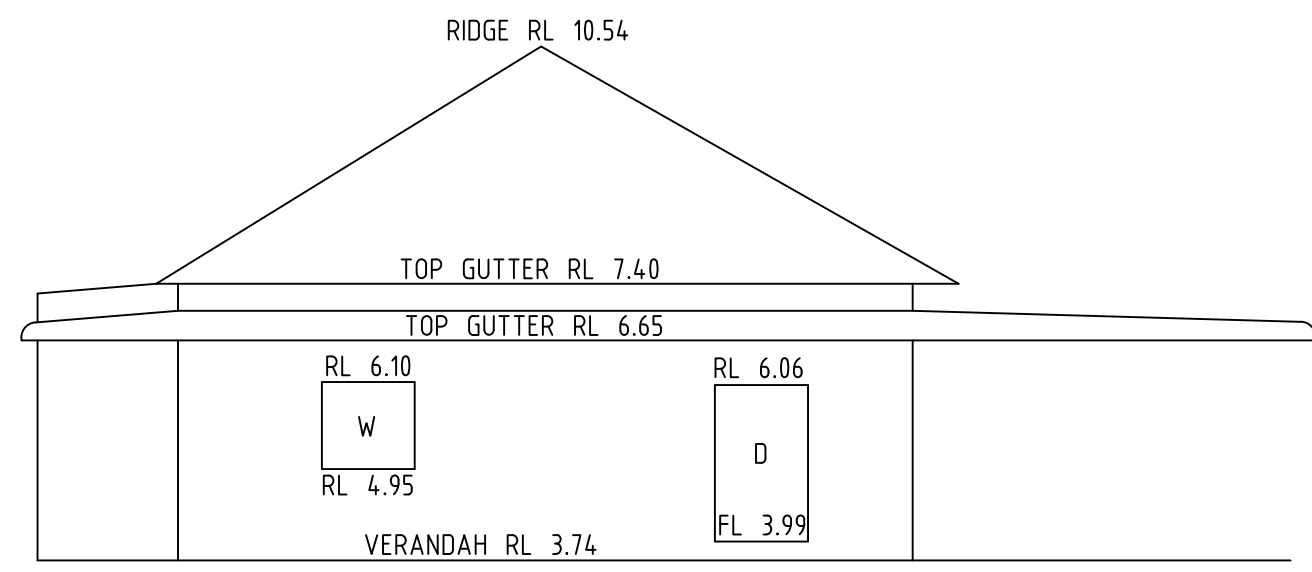


Client CITYSTATE PROPERTY PTY LTD  
 Drawing title  
 PLAN OF DETAIL AND LEVELS OVER LOTS 3 & 4 IN DP774207 KNOWN AS 3-5 CARRINGTON ROAD & 3 MYRTLE STREET, MARRICKVILLE

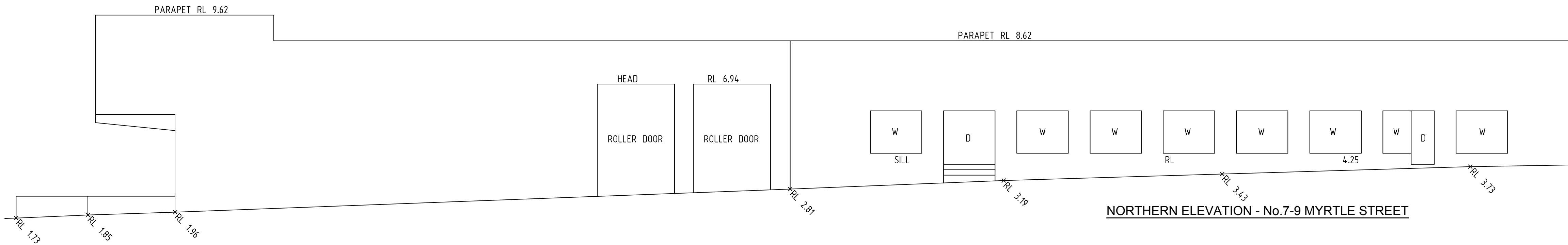
datum AHD  
 site Area 3851m<sup>2</sup>  
 LGA MARRICKVILLE  
 project number 1:200 @A1  
 reference number 43041DT date of survey 18/03/16  
 SHEET 3 OF 3



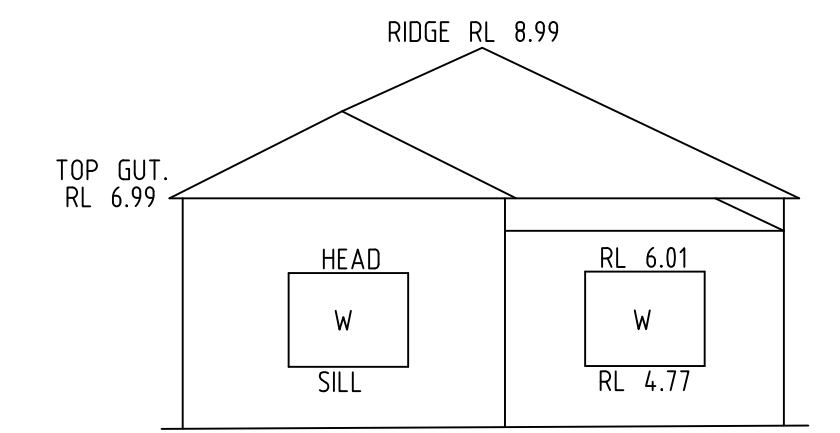




WESTERN ELEVATION - No.1 MYRTLE STREET

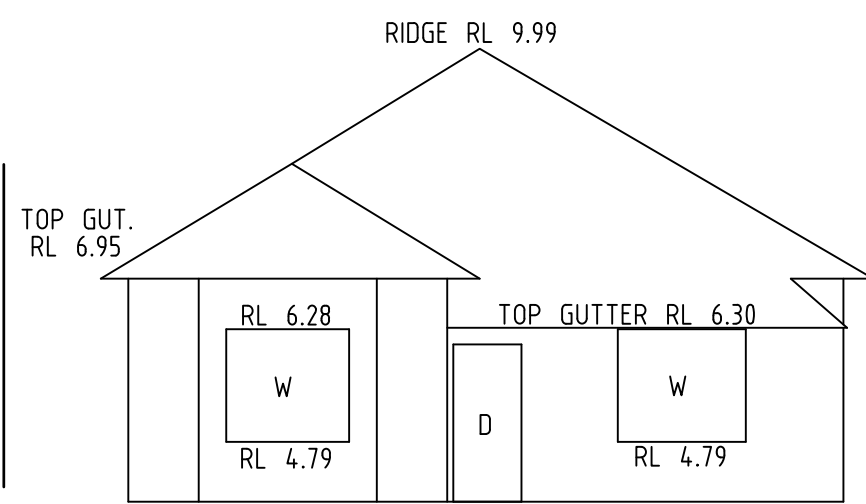


NORTHERN ELEVATION - No.7-9 MYRTLE STREET

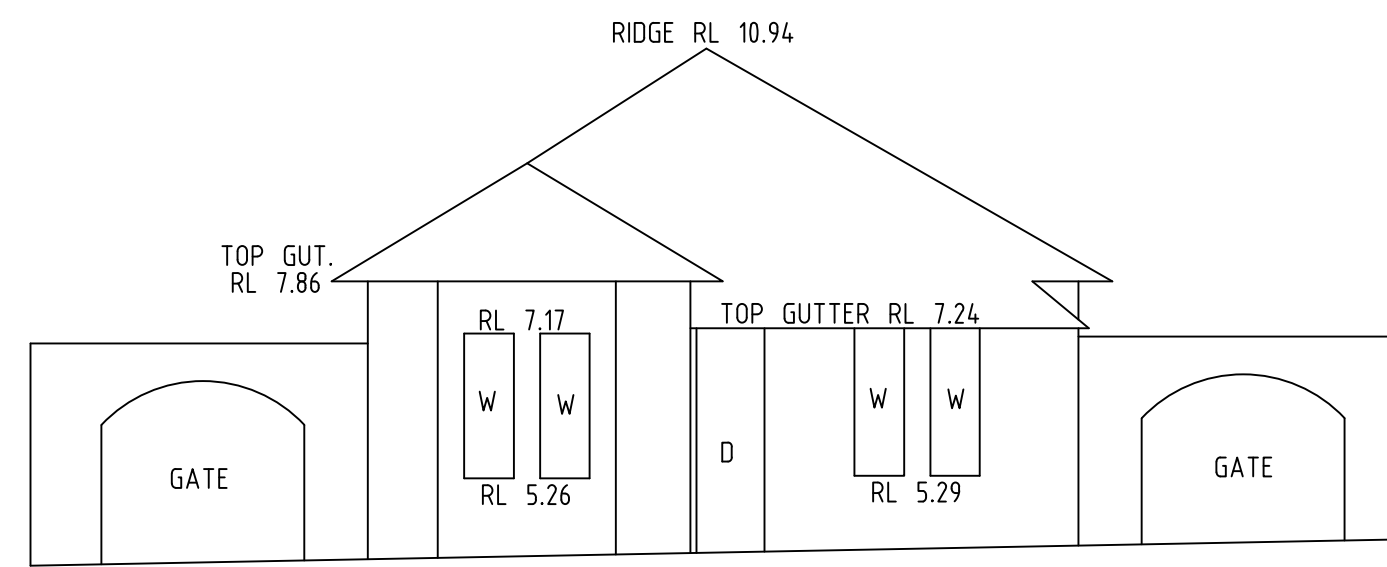


NORTHERN ELEVATION - No.20 MYRTLE STREET

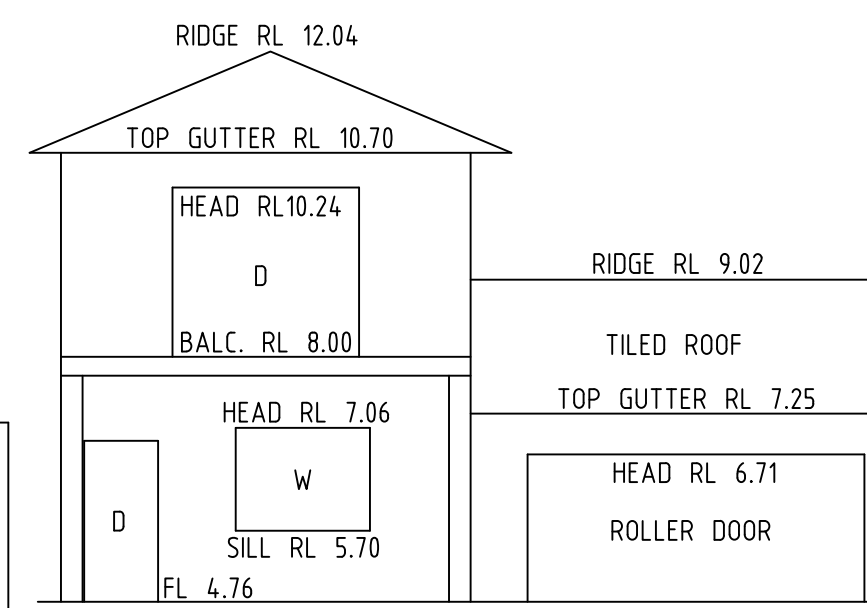
ADJOINS BELOW



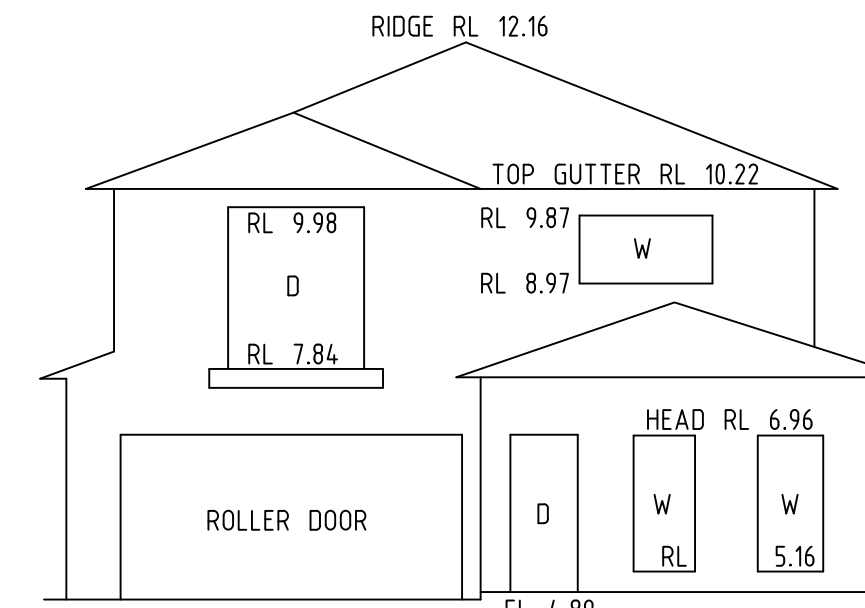
NORTHERN ELEVATION - No.18 MYRTLE STREET



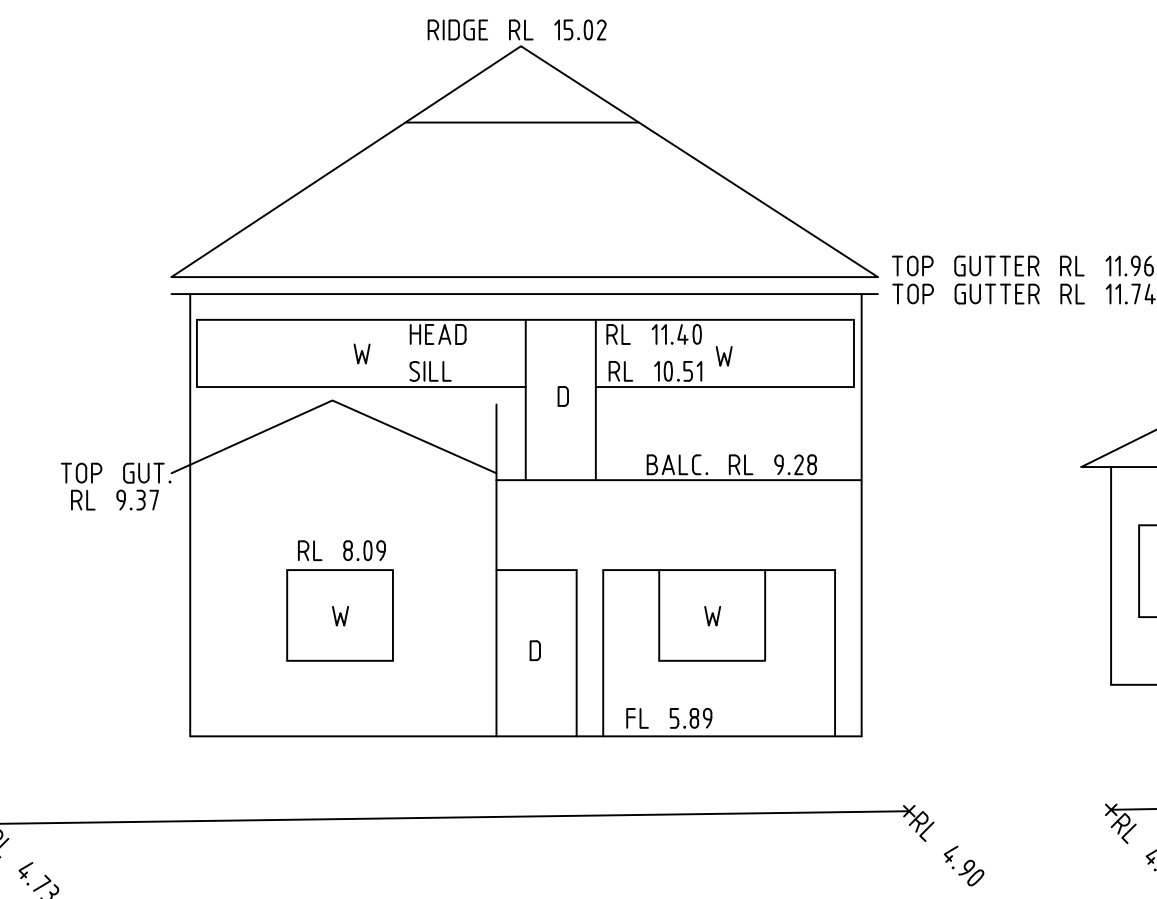
NORTHERN ELEVATION - No.16 MYRTLE STREET



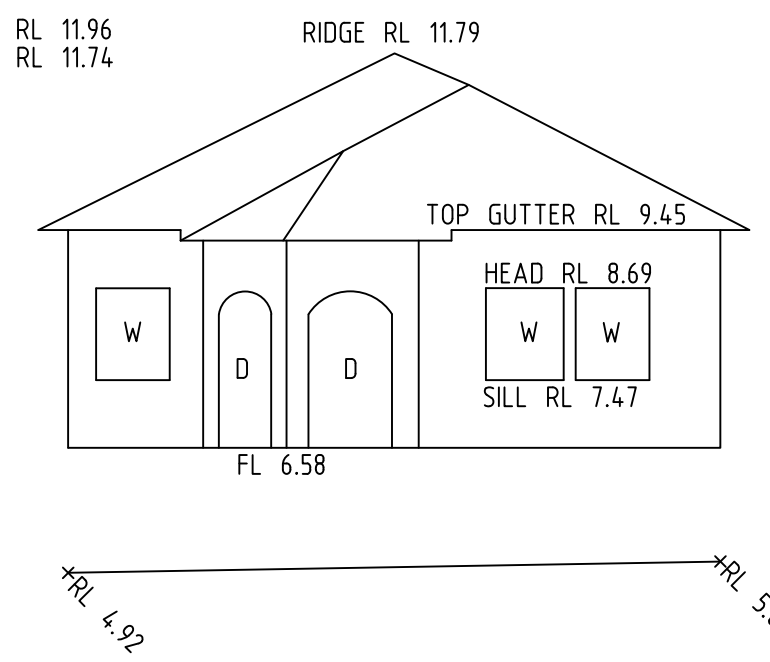
NORTHERN ELEVATION - No.14 MYRTLE STREET



NORTHERN ELEVATION - No.12 MYRTLE STREET



NORTHERN ELEVATION - No.10 MYRTLE STREET



NORTHERN ELEVATION - No.8 MYRTLE STREET

ADJOINS ABOVE



REFER TO NOTES AND LEGEND



Revision	Date	Description	Reference
D	00/00/00	-	00
C	00/00/00	-	00
B	00/00/00	-	00
A	00/00/00	-	00

THIS IS THE PLAN REFERRED TO IN MY LETTER DATED:

Registered Surveyor NSW



Suite 1, Level 1  
810 Pacific Highway  
Gordon NSW 2072  
Locked Bag 5  
Gordon NSW 2072  
P 1300 587 000  
F 02 9499 7760

Client CITYSTATE PROPERTY PTY LTD  
Drawing title  
PLAN OF DETAIL AND LEVELS OVER LOTS 3 & 4 IN  
DP774207 KNOWN AS 3-5 CARRINGTON ROAD & 3  
MYRTLE STREET, MARRICKVILLE

datum AHD  
site Area 3851m<sup>2</sup>  
LGA MARRICKVILLE  
project number -  
scale 1:100 @A1  
reference number 43041DT  
date of survey 18/03/16  
SHEET 3 OF 3