Attachment A6

Flood Impact & Risk Assessment – Parramatta Road Precinct

Parramatta Road, Forest Lodge – Flood Impact & Risk Assessment

Final Draft Report



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Parramatta Road Forest Lodge Flood Impact & Risk Assessment

Final Draft Report

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EXECUTIVE SUMMARY

This report sets out a Flood Risk Assessment undertaken by GRC Hydro on behalf of City of Sydney, for the Parramatta Road Forest Lodge site. The assessment has been undertaken as part of a Council planning proposal for rezoning of the site. The planning proposal has been developed to increase the housing supply in the area via increased density. The site consists of a 300 m stretch of land on the north side of Parramatta Road, extending to Arundel Street to the north.

The assessment uses flooding information from a new Johnstons Creek catchment-wide model that was built concurrently to the FIRA. This new modelling includes a DRAINS hydrologic model and a TUFLOW hydraulic model which both use design rainfall and other parameters from Australian Rainfall and Runoff version 4.2 (the most recent version at the time of writing). The flood information is used to assess flooding at the site. Design flood behaviour has been assessed with regard to depths and level, flood hazard categories and hydraulic categories, while rate of rise, duration and other factors have also been considered.

Flood risk across the site is moderate at the western end and low to negligible towards the eastern end. While no creek or watercourse is present at the site, historically a creek would have been present at the western edge of the site, draining the University of Sydney's Camperdown campus towards Blackwattle Bay. Flooding on this natural drainage path now occurs when the stormwater pit and pipe network is full, as happens in relatively common flood events. Buildings on Parramatta Road and Bridge Road to the north both block overland flow and exacerbate flooding. These features lead to significant depths of inundation, specifically at the western side of the site, that can lead to property damage and pose a risk to pedestrians or vehicles.

The assessment found that proposed higher density in the area is suitable from a flood risk perspective, so long as certain measures are put in place including lot amalgamation (see below). Council's DCP and LEP, and relevant state government policies have been considered with respect to development of flood-prone areas. The report sets out relevant planning controls that are currently in the DCP that will manage flood risk, but notes that additional measures are required, specifically in regards to lot amalgamation at the western end of the site. These controls will ensure flood risk is incorporated into the design of new buildings and associated development, and that flooding outside of the site is not impacted as a result of the development. These are set out in Section 5.7 and include 1) higher FPLs incorporating climate change (SSP5-8.5 for the year 2130) and PMF protection for residential habitable areas 2) amalgamation of the seven lots with a building entry at the SE lot corner 3) maintain flow conveyance through the building and/or demonstrate the development will not result in detrimental flood impacts and 4) CoS must exclude sensitive uses from the amalgamated lot including primary schools, secondary schools, child care centres and aged care.

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1. INTRODUCTION

Planning is being undertaken to increase housing supply in the City of Sydney to help meet the needs of Sydney's growing population. One such site, located on Parramatta Road at Forest Lodge, is the subject of a planning proposal that seeks to introduce residential development to the site and significantly intensify its use through high-density mixed-use development comprising commercial and residential uses.

This flood risk assessment has been prepared to support the planning proposal. The assessment examines existing flood behaviour affecting the site and surrounding area, considers the implications of the proposed rezoning and future development, and identifies any flood mitigation measures and planning controls required to ensure flood risk is appropriately managed.

The flood assessment has been based on a new Johnstons Creek catchment-wide flood model that includes the site. The current study assesses design flood behaviour in the area for a range of design flood events, using hydrologic and hydraulic models. The study then models and assesses a high-level schematisation of a future development case, including its impact on flood behaviour. The study then reviews and recommends necessary flood mitigation measures including planning controls.

2. BACKGROUND

2.1 Study Area

The study area, referred to as the site, is bounded by Parramatta Road to the south, Arundel and Sparkes Street to the north and contains Ross Street running through it. The site is currently fully-developed with a series of commercial buildings, to around a 4-storey height. The site is located near the centre of the Johnstons Creek catchment, a fully developed catchment in Sydney's inner west. Features of the site include:

- Parramatta Road on the upstream/south side of the site, with around a 7 lane width and footpaths. The road slopes down from east (high) to west (low) with a general sag near the west edge of the site, with elevations of ~27 mAHD at the east end and ~17 mAHD at the sag.
- Arundel Street runs parallel to Parramatta Road but has a steeper grade, dropping to around 12 mAHD at the west edge of the site. Like Parramatta Road, there is a topographic sag point on Arundel Street that then forms part of a wider sag at the north end of Larkin Street.
- Ross Street runs south to north through the site and is relatively flat at around 24 mAHD.
- Lots in the study area have existing buildings that generally extend all the way to the lot boundary, and all abut each other (i.e. no side passageways or similar).

The site can be split into two flood mechanisms. The western end of the site, both Arundel and Parramatta Road, form part of the overland flowpath that drains a large area to the south, including the University of Sydney campus up to City Road (catchment area of approximately 60 ha). Whereas the eastern half of the site is not affected by this flowpath and has a very limited catchment of approximately 2 ha. In addition, the site is affected by the sag formed around Larkin Street, Sparkes Street and Arundel Street, due to Bridge Road being significantly raised from natural ground levels.

2.2 Flooding Mechanisms

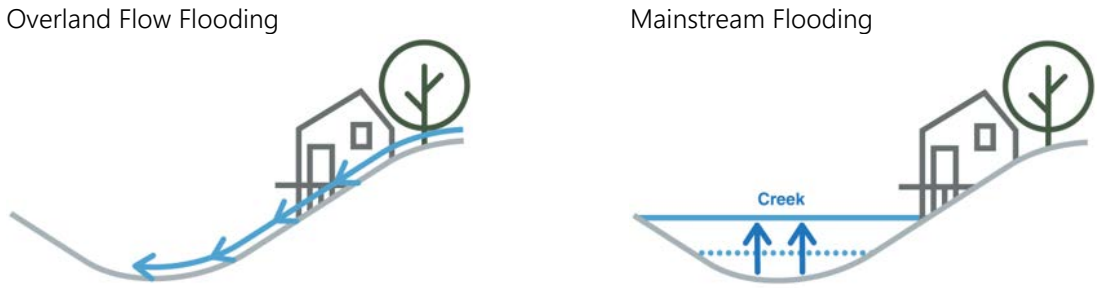
The catchment overviews provided above refer to overland flow flooding. The other common type of flooding is mainstream flooding. These are types of flooding as set out in the NSW Flood Risk Management Manual (2023) and earlier guidelines.

Mainstream flooding occurs from rising water on a defined watercourse causing the watercourse to break its banks and inundate areas that are usually dry. This mechanism typically occurs over a long period of time and generally results in deep, slow moving floodwaters. Image 1 (right hand side) depicts this mechanism. In the City of Sydney LGA, mainstream flooding occurs when either a natural creek or concrete stormwater channel floods the adjacent land.

Overland flow flooding occurs when runoff has not yet reached the creek or channel. In urban areas it most commonly occurs along topographic sags which are typically serviced by a pit and pipe network. When the pipes' capacity is exceeded, above-ground flowpaths form. Overland flow is typically shallower and faster moving than mainstream flooding and occurs with less warning. NSW guidelines note that the two types of flooding can be indistinguishable to people experiencing

flooding and that overland flow can cause significant property damage and flood risk, despite not originating from a major watercourse.

Image 1: Flood Mechanisms in the Study Area



3. AVAILABLE DATA

3.1 Overview

The current study utilised a number of data sets in defining and assessing existing flood behaviour in the study area. This data largely consists of previous studies and Council GIS data. The study then assessed future development based on the planning proposal for the site. A summary of each data set is provided below.

3.2 Previous Studies

3.2.1 Johnstons Creek Floodplain Risk Management Study and Plan (WMAwater, 2015)

The study was undertaken by WMAwater on behalf of City of Sydney and assessed flooding across the catchment, following on from the earlier flood study. The study used a TUFLOW model with hydrology based on Australian Rainfall and Runoff 1987 parameters. The study identifies the sag points on Parramatta Road, and downstream of the site on Larkin Street, as areas of flood risk. The study modelled six design flood events including the 1% AEP and PMF. The study then assessed a range of flood mitigation measures for the catchment.

Section 4.1 of this report describes how the 2015 flood modelling was used by the current study in developing a new catchment-wide model for Johnstons Creek.

3.2.2 Sydney Biomedical Accelerator SSD, Flood Assessment (GRC Hydro, 2024)

The study assessed flooding in the University of Sydney, as part of ongoing development there. The 2015 Johnstons Creek TUFLOW model was used but given significant updates to the model's 'existing case' within the campus, were undertaken, to reflect recent developments. These included:

- The University Oval 2 was formalised as a detention basin during the Grandstand development during 2015 and 2016.

- Science Rd then had stormwater upgrades in 2016 which divert overland flows into University Oval 2.
- Refined representation of the Charles Perkins Centre in the model
- The new Susan Wakil Health Building which has an overland flow beneath it
- Incorporation of Western Avenue Carpark, beneath St Andrews Oval, in the model
- Recently built buildings at St Andrews College as part of the Thyne Reid Link Development

These model layers have each been incorporated into the new catchment-wide model for the current study. More details are provided in Appendix B Model Update.

3.3 GIS Data

GIS data was provided by Council and was used to confirm or update model features in the areas of interest. The following data was provided:

- Drainage pipes GIS layer via the CoS Datahub website. This was used in the new flood modelling.
- Built form (buildings) GIS layer, this was used in defining buildings in the new flood modelling.

3.4 Site Visit

Site visit was undertaken in May 2026 to confirm above-ground features across the site, and to familiarise with the broader catchments. Photos of features observed are provided in Image 2 below. Beyond confirming modelled overland flowpaths against the actual topography and built features (kerbs, buildings, etc.) the main utility was adjusting building footprints in the model. Compared to the previous modelling, two buildings were found to likely convey overland flow, between Parramatta Road and Arundel Street. This is further described in the model update section.



Looking west on Parramatta Road. The building at right will convey overland flow through the openings shown



Looking east on Arundel Street, away from the sag point



Parramatta Road shopfronts/entrances had raised sections which would have less flood liability.



Looking north into the Larkin Street sag point, downstream/north of the site

Image 2: Selection of photos from site visit

3.5 Current Planning Proposal

The current assessment has been undertaken as part of a planning proposal for the site. At this stage the planning proposal consists of:

- Rezoning the site to MU1 Mixed Use from E3 Productivity Support.
- Both commercial and residential use, likely with a combination of both in each new building.
- Significant increase in density is expected, with significant increase in residential usage.
- Amalgamation of the seven western-most lots is proposed. This is specifically to manage flood risk by creating a relatively flood-free access path to the combined lot. The findings of this assessment will no longer apply if the lots are not amalgamated (i.e. they will be unsafe to develop, see Section 5.7 for more information)

The flood modelling assumes building footprints extend to the lot boundaries. Any additional setbacks in the final built form would likely reduce flood impacts on surrounding sites but this impact on flooding would be assessed in detail at the development application stage.

The most pertinent features with regards to flooding are the change in zoning to allow for higher density residential/commercial development, maintaining the existing building footprints which are largely boundary-to-boundary, and the amalgamated lot at the western end. The assessment of the planning proposal is presented in Section 5.

4. DESIGN FLOOD MODELLING

4.1 Overview

New catchment modelling was used to define flood behaviour at the site. The modelling generally follows the previously established design flood information from the 2015 Council study, but is updated to include revised design rainfall, revised climate change estimates including present day and future climate change, and also incorporates various catchment changes. Appendix B sets out the new modelling that was undertaken, including comparison to the 2015 results.

4.2 Design Events

The design events of interest were the 20% AEP, 5% AEP, 1% AEP, 0.2% AEP and Probable Maximum Flood, representing a range of design flood behaviour. The following design model events were run:

- 20% AEP 45 mins storm (storm 8 temporal pattern)
- 5% AEP 30 mins storm (storm 6 temporal pattern)
- 1% AEP 25 mins storm (storm 1 temporal pattern) and 1% AEP 45 mins storm (storm 3 temporal pattern)
- 0.2% AEP 20 mins storm (storm 7 temporal pattern) and 0.2% AEP 45 mins storm (storm 3 temporal pattern)
- PMF 60 mins and 120 mins storm

The critical duration was considered both across the catchment and specifically at Parramatta Road. The 25 minute duration produced higher flood levels than the 45 minute, with the exception of flood storage areas such as Larkin Street, the University of Sydney oval, and also areas of mainstream flooding i.e. the Johnstons Creek channel.

4.2.1 Climate Change

The hydrologic and hydraulic models were adjusted to assess the effect of climate change on design flood behaviour. Climate change is expected to worsen flood risk over time as higher greenhouse gas concentrations lead to increases in high intensity rainfall and sea levels. The assessment used the IPCC (Intergovernmental Panel on Climate Change) greenhouse gas concentration scenarios and subsequent modelling estimating each scenario's effect on rare rainfall events. There are four IPCC greenhouse gas concentration projections named RCP 2.5, 4.5, 6.0 and 8.5, with the RCP 2.5 being the most optimistic (emissions plateau and then decline) and 8.5 the least optimistic (emissions continue to grow). For the RCP4.5 and 8.5 scenarios, the projected increase in precipitation intensity were obtained from the ARR Data Hub and shown in Table 1. Based on direction from City of Sydney, the SSP5-8.5 scenario was modelled. The years of 2080 and 2130 were modelled to represent 50 year and 100 year planning horizons.

Table 1: Climate Change Factors – Percentage Increase in Rainfall Intensity in 2080 and 2130

Year	SSP2- 4.5	SSP3- 7.0	SSP5- 8.5
2080	+35%	+48%	+61%
2130	+52%	+83%	+109%

Sea level rise as a result of climate change affects the catchment's tailwater conditions at the catchment outlets in Sydney Harbour and can affect flood behaviour in the lower catchment. An estimate of sea level rise is 0.4 m by 2050 and 0.9 m by 2100, as set out in the NSW government Practical Consideration of Climate Change guideline (2007). These sea level rise (SLR) scenarios were modelled for the 1% AEP and PMF events.

For each scenario the peak flood levels were then tabulated and compared to the base case (i.e., no climate change), as presented in Section 4.3.8.

4.3 Model Results – Existing Case

4.3.1 Flood Behaviour – Depth and Levels

The models were used to produce flood mapping for a range of outputs and design events, for the site. Peak flood depth maps with level contours for the design events are shown on Figure 2 (20% AEP), Figure 3 (5% AEP), Figure 4 (1% AEP), Figure 5 (0.2% AEP) and Figure 6 (PMF). Table 2 summarises design flood levels for a number of locations in the study area, while Table 3 shows the equivalent depths. The locations in Table 2 are a range of reporting locations along each of the flowpaths, and the locations are shown on Figure A02 and also Image 3 below.

Table 2: Design Flood Levels

ID	Location	Ground Level (mAHD)	Peak Flood Level (mAHD) per design event				
			20% AEP	5% AEP	1% AEP	0.2% AEP	PMF
A	Sparkes St - Sag Point	12.67	12.99	13.08	13.14	13.19	18.04
B	Parramatta Rd - Sag Point	19.36	19.86	19.96	20.04	20.12	21.37
C	Corner of Arundel St and Ross St (West)	23.37	23.39	23.40	23.41	23.42	23.47
D	Corner of Parramatta Rd and Ross St (West)	24.13	24.19	24.19	24.21	24.22	24.27
E	Arundel St - Officeworks Carpark Entrance	29.66	29.68	29.68	29.69	29.69	29.72
F	Parramatta Rd - Officeworks Front Entrance	26.04	26.10	26.11	26.12	26.13	26.18

Table 3: Design Flood Depth

ID	Location	Ground Level (mAHD)	Peak Flood Depth (m) per design event				
			20% AEP	5% AEP	1% AEP	0.2% AEP	PMF
A	Sparkes St - Sag Point	12.67	0.32	0.41	0.47	0.52	5.37
B	Parramatta Rd - Sag Point	19.36	0.5	0.6	0.68	0.76	2.01
C	Corner of Arundel St and Ross St (West)	23.37	0.02	0.03	0.04	0.05	0.1
D	Corner of Parramatta Rd and Ross St (West)	24.13	0.06	0.06	0.08	0.09	0.14
E	Arundel St - Officeworks Carpark Entrance	29.66	0.02	0.02	0.03	0.03	0.06
F	Parramatta Rd - Officeworks Front Entrance	26.04	0.06	0.07	0.08	0.09	0.14



Image 3: Reporting locations A to F

The flood depth in Table 3 is calculated from the flood levels in Table 2, for example, the flood depth at location A is 0.32 m (12.99 flood level – 12.67 ground level = 0.32 m). Thus, Table 3 shows,

- In a relatively common flood such as the 5% AEP, the greatest depths of flooding are at locations A and B (the two sag points) where runoff accumulates and ponds. Other locations have negligible depth of less than 0.1 m.
- In a 1% AEP event, commonly used as the design event, the two sag points have slightly more depth, at about 0.5 m (Sparkes Street) and 0.7 m (Parramatta Road) while other locations still have negligible depth. The 0.2% AEP event (1 in 500 year average recurrence interval) is generally equivalent.
- In the PMF, depths remain generally shallow or negligible to the east. However, the Parramatta Road sag reaches 2.0 m depth and the Sparkes St sag forms a very large, deep pool behind Bridge Road, with around 5.4 m depth near the site.

4.3.2 Flood Behaviour – Flow Rates

All locations have generally low to moderate flow in events up to the 1% AEP, with less than 2 m^3/s. There is significant scaling at locations C and D, which have much larger upstream catchments than A and B, with flow of >30 m^3/s in the PMF. Flow is still moderate in the 0.2% AEP with 3-4 m^3/s at locations B to D.

Table 4: Peak Flow Rates by key locations

ID	Location	Overland Peak Flow(m^3/s) per design event				
		20% AEP	5% AEP	1% AEP	0.2% AEP	PMF
A	Arundel St - from East	0.6	0.8	1.3	1.7	4.3
B	Parramatta Rd - from East	1.1	1.5	2.3	3.0	7.3
C	Parramatta Rd - from South (USYD)	0.7	1.4	2.0	2.6	36.6
D	Larkin St - from Parramatta Rd	0.9	1.8	2.8	4.0	31.0

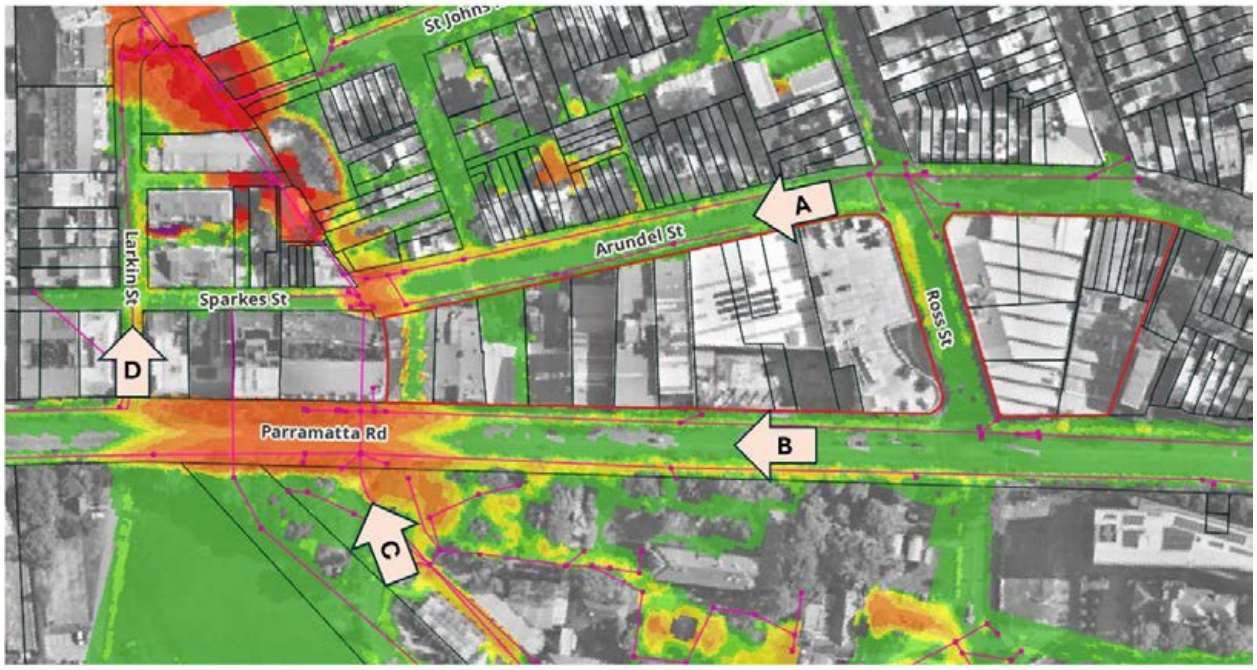


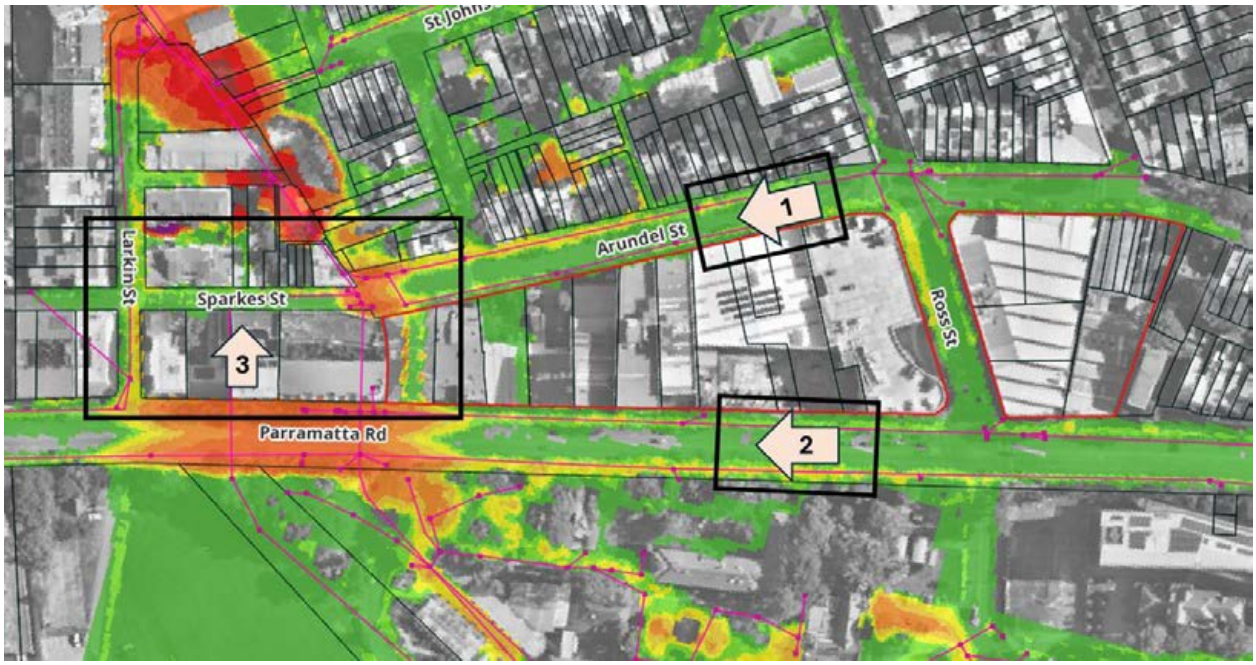
Image 4: Locations of overland flow measurement

Peak flow rate considering pipe flow is shown in Table 5, with a breakdown of the above ground and piped flow in each design event, at the locations shown in Image 5.

Table 5: Peak flow rates considering piped flow

	5% AEP (m^3/s)			1% AEP (m^3/s)			PMF (m^3/s)		
Location See Image 5	Pipes Peak flow	Overland Peak flow	Total	Pipes Peak flow	Overland Peak flow	Total	Pipes Peak flow	Overland Peak flow	Total
1	0.02	1.0	1.0	0.03	1.6	1.6	0.1	5.1	5.2
2	0.1	1.5	1.6	0.1	2.3	2.5	0.2	7.3	7.6
3	5.1	2.7	7.8	5.7	4.0	9.7	6.4	42.5	48.9

Image 5 Locations of overland flow and pipe flow measurement



The table shows that the main trunk pipe takes significant flow in most flood events, e.g. 5.1 m^3/s in the 5% AEP and 5.7 m^3/s in the 1% AEP, more than 50% of total flow in both. However, piped drainage is generally negligible at locations 1 and 2. Likewise, pipe flow is generally low to negligible at all locations in the PMF.

4.3.3 Flood Behaviour – Hazard

Flood hazard mapping has been developed through application of ARR2019 and Australian Emergency Management Institute (AEMI) flood hazard guidelines. The guidelines consider the threat to people, vehicles and buildings based on flood depth and velocity at a specific location. The AEMI flood hazard mapping can be used to assess the flood hazard for site occupants and proposed site usage, as well as for the community surrounding the site.

Chart 1 and Table 6 present the relationship between the velocity and depth of floodwaters and the corresponding classification.

Chart 1: Flood Hazard Curves (Australian Emergency Management Handbook 7)

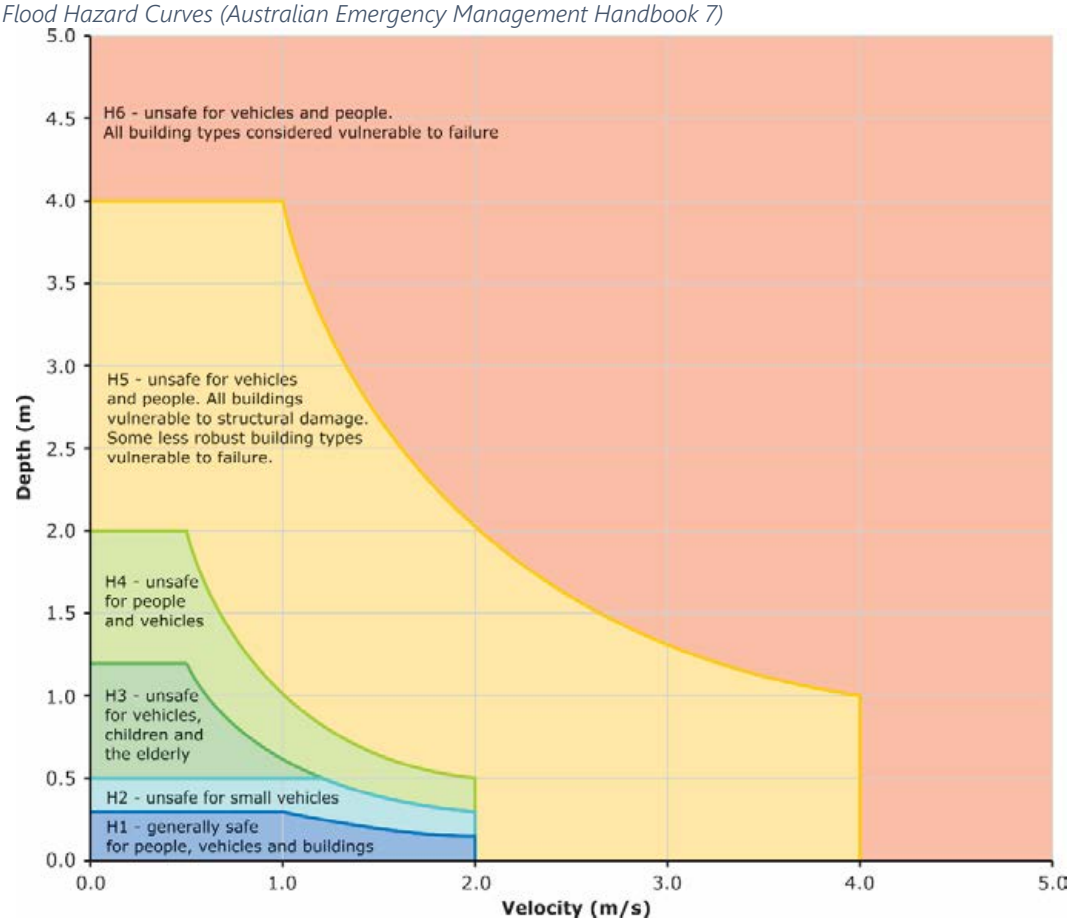


Table 6: Flood Hazard – Vulnerability Thresholds

Hazard Classification	Description
H1	Generally safe for vehicles, people and buildings.
H2	Unsafe for small vehicles.
H3	Unsafe for vehicles, children and the elderly.
H4	Unsafe for vehicles and people.
H5	Unsafe for vehicles and people. All buildings vulnerable to structural damage. Some less robust buildings subject to failure.
H6	Unsafe for vehicles and people. All building types considered vulnerable to failure.

The hazard is shown on Figures 7 to 11 for the 20% AEP up to the PMF. The figures show:

- Almost all of the site has H1 hazard on roads in the 20% AEP, with some H2 and H3 hazard at the western corners. There is some H3-H4 hazard on part of the gutter on Arundel Street, due to shallow runoff flowing quickly (>2 m/s).
- In a 5% AEP and 1% AEP, there is still largely H1 hazard but the H2-H3 hazard at the two sags reaches the westernmost lot. There is slightly more hazardous flow on the steep portion of Arundel Street. In a 1% AEP it is considered that all lots would be accessible by foot or vehicle, based on the hazard.
- In the 0.2% AEP event, H5 hazard on Arundel Street is prominent and covers more than half the roadway. It is noted that depths are still <0.1 m, apart from model cells in the gutter which

have <0.2 m, and that in other catchments (including in the LGA) such depths are not mapped as flooding. On Parramatta the H3 covers most of the westernmost lot frontage, making the lot inaccessible. The remaining lots are considered accessible in a 0.2% AEP (500 year) flood.

- In a PMF, hazard is significantly higher. The sag on Parramatta Road creates H3-H5 hazard on the five westernmost lots, while other lots have H5 in the gutter. The Arundel Street footpath is H1 but the entire roadway is H5. Ross Street is H1-H2.
- See Section 4.3.8 for hazard assessment under climate change

4.3.4 Flood Behaviour – Flood Function/Hydraulic Categories

Flood Function (also referred to as 'Hydraulic Category') refers to the classification of floodwaters into three categories: floodway/flow conveyance, flood storage and flood fringe. These categories help to describe the nature of flooding across the floodplain and aid planning when assessing developable areas. According to the Australian Emergency Management Handbook 7, these three categories can be defined as:

- Floodway – the areas where a significant proportion of the floodwaters flow and typically align with defined channels. If these areas are blocked or developed, there will be significant redistribution of flow and increased flood levels across the floodplain. Generally, floodways have deep and/or fast moving floodwaters.
- Flood storage – areas where, during a flood, a significant proportion of floodwaters extend into, water is stored and then recedes after a flood. Significant filing or development in these areas may increase flood levels nearby; and
- Flood fringe – areas that make up the remainder of the flood extent. Development in these areas are unlikely to alter flood behaviour in the surrounding area.

All flood-affected land in the study area is overland flow, for which the guideline states:

- Defining flood function is complex
- It is important to define a continuous flowpath or floodway once it has formed
- Conveyance and encroachment techniques are difficult to use, and the indicator technique is likely more appropriate (this means using depth and velocity, or similar outputs, to estimate areas of flood function)
- Large flood storage areas are not common and may not be present

On this basis, and in reviewing the previous definition of floodway in the catchment, the flood function criteria were updated to use a higher set of depth, velocity and depth-velocity thresholds than used in the 2015 study. The rationale was that the many steep parts of the catchment see 'floodway' form in gutters, even when the upstream catchment is low. For example gutter flow of 0.13 m depth moving at 2 m/s was previously mapped as floodway, which creates an overly conservative estimate of floodway extent. The updated thresholds are as follows:

1. Floodway = Velocity x Depth > 0.50 m^2/s (up from 0.25 m^2/s) AND Velocity > 0.25 m/s OR Velocity > 1 m/s AND depth > 0.3 m
2. Flood Storage = Areas that are not floodway, with depth of >0.5 m
3. Flood Fringe = All remaining areas

The flood function is shown on Figure 12, 13 and 14 for the 5% AEP, 1% AEP and PMF. The figures show that in the 1% AEP virtually all of the site perimeter is flood fringe, with the SW and NW site corners adjacent to a flood storage area. In the PMF, the western third of the site is floodway on Arundel Street, as are the five western lots on Parramatta Road.

4.3.5 Flood Behaviour – Duration and Rate of Rise

Flooding in the area is predominantly overland flow flooding with rapid rate of rise and short duration. Catchment areas are small and the critical duration for overland flowpaths will often be one hour or less. This means that flooding can occur immediately (e.g. minutes) after heavy rainfall beginning, and the rate of rise is close to instantaneous. The duration of flooding is therefore an important consideration when assessing flood risk. The main consideration with regards to flood risk is not property inundation, as it is assumed any new buildings would provide significant protection against flooding, but rather access to the site, and the duration of any isolation. Once flooding reaches H3 hazard, most vehicles and pedestrians cannot cross it. The duration of H3 and H4 hazard was therefore measured at three locations, shown in Table 7 and Image 6. The location 100 m east of the SW corner is on the edge of the Parramatta Road sag, in the PMF, where there is H5 hazard but in the gutter due to overland flow from the east.

Table 7: Duration of hazardous flooding

	Duration of H3/H4 across in minutes						
ID	1% AEP 30 min storm	1% AEP 60min storm	1% AEP 120min storm	1% AEP 180min storm	PMF 30min storm	PMF 60min storm	PMF 120min storm
SW Site Corner	45/-	65/-	110/-	130/-	85/30	115/75	205/125
NW Site Corner	30/-	45/-	35/-	30/-	85/80	115/105	205/190
Parramatta Road 100m east of SW corner	-/-	-/-	-/-	-/-	30/30	40/40	60/60

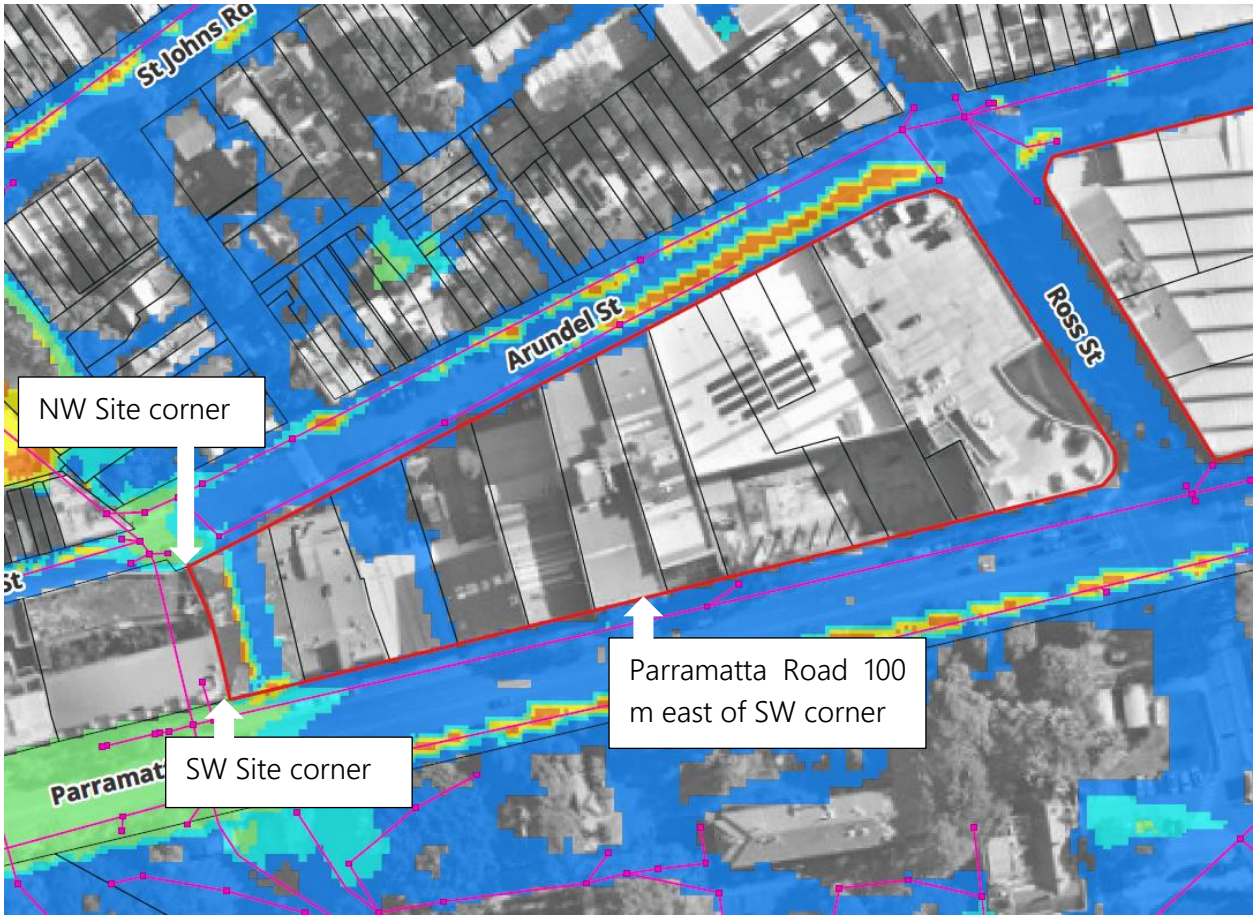


Image 6: Three reporting locations for flood duration

The table shows that:

- In a 1% AEP, H3 hazard is very short-lived on the Arundel Street side, lasting only 30-45 minute across a range of storm durations. On Parramatta Road in the sag, the duration is slightly longer at about 1-2 hours. This is considered as short-lived flooding.
- Similar durations would be expected in the 0.2% AEP event, given it has very similar depths, flows and hazard compared to the 1% AEP.
- In a PMF, the duration of H3 hazard is around 1.5-3.5 hours on Parramatta Road at the sag. However, there is expected to be 1 hour or less at the third location (100 m east of SW corner). On Arundel Street at the NW site corner, durations are similar at around 1.5-3.5 hours.

The access to the west portion of the site under the existing and proposed scenarios is presented below, as set out in Image 7.

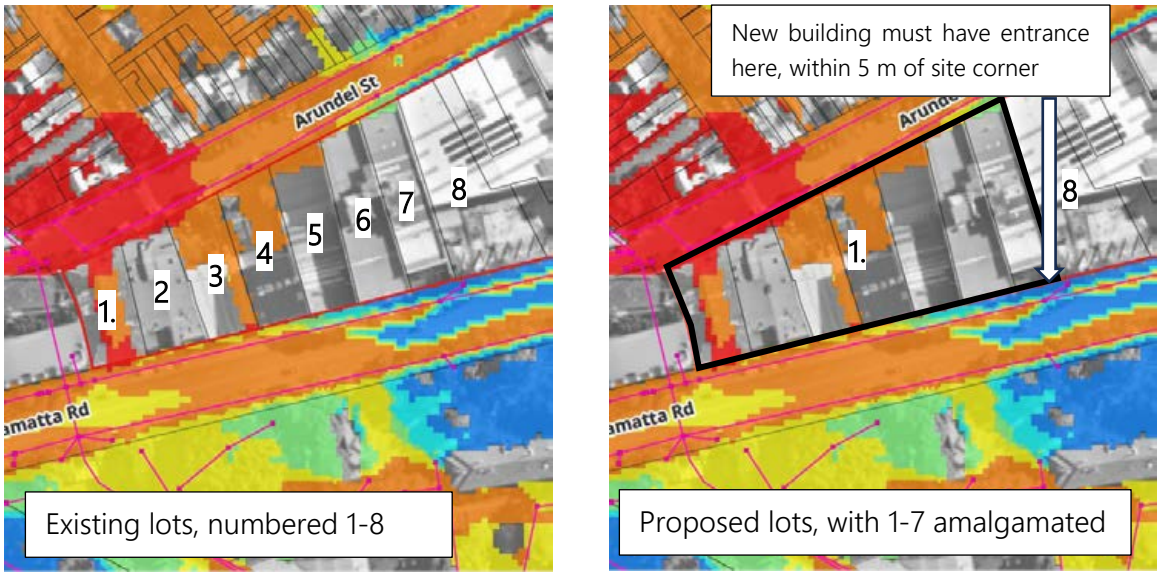


Image 7: Existing and proposed lots access with PMF hazard shown

All lots in existing and proposed cases have entrances on to Parramatta Road, while the amalgamated lot would have an entrance at the SE lot corner where hazard is lowest, refer to Image 7. For the existing case:

- Lots 1-3 entrances egress into H5 hazard, with hazard of H3 or greater lasting around 1.5-3 hours
- Lots 4 and 5 have around H3 on the footpath and H5 on the road, with similar durations
- Lots 6 and 7 have H1 on the footpath, and H2-H5 in the gutter, with H3 or greater lasting at around 0.5-1 hour in the PMF at the SW corner of lot 6 (there is actually only H2 hazard in front of lot 7 in the PMF)

This contrasts with the proposed case where:

- The amalgamated lot at the SE entrance would have H1 on the footpath, with only H2 in the gutter for one section, and hazardous gutter flow in that area only lasting 0.5-1 hour in the PMF. There is only H1 hazard in this area in the 0.2% AEP event.

With regards to Arundel Street, as described in Section 4.3.3, there is high hazard (H5) on the roadway but still some portion of H1 hazard on the footpath, away from the sag point. The road would not be used for access for the amalgamated lot due to the roadway hazard, however, lots between Ross Street and the amalgamated lot could potentially use Arundel Street as an access route in a PMF, if required (noting that all but one lot has Parramatta Road frontage).

While significant flood risk exists on Parramatta Road and Arundel Street in both scenarios, the proposed amalgamation significantly diminishes the existing flood access issues in very rare to extreme floods.

4.3.6 Emergency Access and Secondary Risk

Flood risk with regards to evacuation, emergency access and secondary risk is an important consideration with regards to the rezoning policy requirements, and the 2025 Shelter In Place

guideline. Compliance with these requirements is described in Section 5. The relevant features of access and evacuation at the site are:

- There is no effective warning time of flooding at the site as flooding is often caused by short duration (e.g. 0.5-2 hour), high intensity storms that can occur with little to no warning. Flooding specifically in this catchment will not be forecast by the BOM or SES.
- As a result, offsite evacuation in advance of flooding occurring would not be possible and a shelter in place approach would be the only possible strategy, at this site. This is also the case across the LGA and neighbouring LGAs, none of which have warning that would allow for evacuation. SES warnings of potential flooding advise residents to stay indoors and avoid hazardous conditions outside.
- New buildings built after the rezoning has occurred would have a high level of protection, facilitating a shelter in place approach. City of Sydney require all basements to have passive protection to the PMF, all residential uses to be above the 1% AEP + 0.5 m (which would be above the 0.1% AEP event flood level at this site), and for commercial uses to have 1% AEP protection. City of Sydney also require planning for shelter in place such as alarms, signage and access to higher levels.

With new buildings protected against PMF flooding and the site designed to shelter in place, there would remain some secondary risk relating to other emergencies occurring a flood, requiring a building occupant to evacuate. To address this risk, which is assessed as having exceptionally low probability (see below) but significant consequence, the planning proposal includes the amalgamation of the seven western lots with a building entrance at the SE corner, ensuring access during a PMF event for all future building occupants. Along with the raised building floor levels relative to existing, this will result in a large reduction in flood risk at the site, parts of which are cut-off during a rare or extreme flood.

It is worth describing the probability of isolation at the site, without amalgamation, as the duration of flooding means the probability is exceptionally low. As an estimate we consider:

- NSW residents make approximately 1.18 million 000 calls a year, or 0.14 calls per person per year. (Source: NSW Ambulance, Year in Review 2022-2023)
- In a large apartment building of 100 units, 200 people, this equates to 28 calls per year from the building, or 0.08 calls per day.
- Assuming the emergency incident lasts 1 hour, there is an extremely low probability of the two events (an emergency call lasting one hour, and a flood of say 0.1% AEP isolating the site for up to 3 hours) occurring simultaneously. As an estimate of the order of magnitude, it would be approximately once every 180,000 years, on average.

As noted however, despite the very low probability of the secondary risk, the planning proposal is to amalgamate the seven western lots in order to provide a protected flood access route to outside the sag point, in the PMF.

4.3.7 Flood Planning Area

The Flood Planning Area is traditionally the area to which flood planning controls apply. Following recent changes to the Section 9.1 NSW Ministerial Directions (July 2026), flood planning controls

more specifically now apply up to the PMF. The Flood Planning Area (FPA) is still referred to in the policy and guidelines so has been included in this assessment.

The City of Sydney has a wide definition of what lots are considered to be in the FPA. After previously defining all lots in the LGA as being in the FPA, the most recent definition is to include any lots with a flood depth of around 0.2 m in their vicinity. There are a number of other criteria used but in general, many lots are included that have H1 hazard in the adjacent roadway, even in an extreme flood. This is done to carefully manage future development with regard to flooding.

It is important to note that the FPA does not designate properties with a certain level of flood risk, as lots can have minor affection (e.g. ~0.2 m depth over part of the backyard) and be included in the FPA, or alternatively have very significant affectation (e.g. high hazard flow through the dwelling in frequent floods). Rather than a designation of flood risk, the FPA is simply a determination of where flooding needs to be considered in future development on a particular lot.

The FPA is shown on Figure 17 (attached at the end of this report). The figure shows the five westernmost lots are in the FPA while the remaining lots west of Ross Street are included in the 'buffer' area. Four lots to the east are in the PMF buffer.

4.3.8 Model Results - Sensitivity Analysis

Sensitivity analysis describes the sensitivity of model results to changes in the modelling parameters. These parameters include structure blockage, hydraulic roughness and climate change (rainfall increase, and sea level rise). Each parameter is estimated based on the available data, but, due to the complexity of the catchment and flood-producing rainfall, the estimate will involve a series of assumptions and therefore has a degree of uncertainty. The sensitivity analysis therefore qualifies the assumptions by measuring their effect on the modelled flood behaviour. Large changes in the flood behaviour indicates a higher degree of uncertainty in the model results.

The sensitivity is tested by varying each parameter within a reasonable estimate range, and then re-running the hydraulic models to determine the peak flood level results for each scenario, for the 1% AEP event. The sensitivity is then quantified by measuring the impact on the peak flood level at a series of reporting locations.

The parameters tested and the results of the sensitivity analysis are presented below in Table 8 for roughness and blockage, and Table 9 for climate change.

Table 8: Sensitivity Analysis - Roughness and Blockage

Change in 1% AEP flood level				
ID	Location	Roughness Decreased by 20%	Roughness Increased by 20%	Blockage (pipes) by 100%
A	Sparkes St - Sag Point	-0.01	0.01	0.28
B	Parramatta Rd - Sag Point	0.00	0.00	0.09
C	Corner of Arundel St and Ross St (West)	-0.01	0.01	0.01
D	Corner of Parramatta Rd and Ross St (West)	0.00	0.00	0.01
E	Arundel St - Officeworks Carpark Entrance	0.00	0.01	0.00

F	Parramatta Rd - Officeworks Front Entrance	0.00	0.01	0.00

Table 8 shows that there is very minimal sensitivity to hydraulic roughness, with all locations having +-0.01 m change. The pipe blockage also shows low sensitivity except for Sparks Street where there is an increase of 0.28 m under a pipe blockage scenario. This is because the sag relies on the pits and pipes to drain it.

Table 9: Sensitivity Analysis – Climate Change

		Change in flood level			
		1% AEP		PMF	
ID	Location	SSP5-8.5 2080	SSP5-8.5 2130	SSP5-8.5 2080	SSP5-8.5 2130
A	Sparkes St - Sag Point	0.08	0.74	0.78	1.35
B	Parramatta Rd - Sag Point	0.11	0.22	0.50	1.30
C	Corner of Arundel St and Ross St (West)	0.01	0.02	0.03	0.05
D	Corner of Parramatta Rd and Ross St (West)	0.01	0.02	0.02	0.05
E	Arundel St - Officeworks Carpark Entrance	0.00	0.01	0.01	0.02
F	Parramatta Rd - Officeworks Front Entrance	0.02	0.03	0.02	0.05

Present day climate change (i.e. rainfall increase expected in the year 2030) is incorporated into the baseline flood levels. Future climate change under a low-probability scenario that sees emissions increase every year (SSP5-8.5) has been modelled for the years 2080 and 2130. The four locations (C to F) show almost no sensitivity to climate change, with less than 0.06 m increase in all events including the PMF. At the Parramatta Road sag (location B) there is minor sensitivity in the 1% AEP (0.1-0.2 m increase) but significant increase in the PMF of 0.5 and 1.3 m. Downstream at the second sag point (location A), there is significant increase in the 1% AEP by the year 2130 (0.74 m higher) and the PMF increases by 0.8 m and 1.4 m by the year 2080 and 2130, respectively. With regards to hazard under these climate change scenarios:

- In a 1% AEP, flood hazard is similar on Parramatta Road with a larger area of H2 and H3. The area of shallow but high velocity H5 hazard on Arundel Street covers more of the roadway.
- In a PMF, the sag on Parramatta Road has much more H5 hazard than without climate change, with H5 extending to within ~50 m of Ross Street. Arundel Street hazard is similar but with more areas of H6 on the roadway.

With regards to rate of rise and duration, the rate of rise is considered as close to instantaneous in both existing and future climate scenarios, as either would be a matter of minutes for floodwaters to rise, potentially. Regarding duration, climate change is projected to lead to increased frequency and severity of flooding but available data does not suggest the duration would not be markedly different from the 1.5-3.5 hours in a PMF previously described. The same duration of storm event will cause flooding at the site, under climate change, and so the duration would be similar.

4.3.9 Implications of Climate Change for Future Development

The modelling indicates that climate change has a negligible effect across most of the site, particularly at the eastern lots fronting Parramatta Road and the Officeworks site, where increases in flood level are generally less than 0.05 m in the PMF. However, significant increases are predicted at the Parramatta Road and Sparkes Street sag points, where PMF flood levels increase by up to 1.3–1.4 m under the SSP5-8.5 2130 scenario. As a result, climate change risk is concentrated within the western portion of the site and should be reflected in future flood planning controls, flood planning levels and emergency management measures applicable to those lots.

5.FLOOD RISK ASSESSMENT OF PROPOSED REZONING

The proposed rezoning for the site is described in Section 3.5 and proposes a significant intensification of the land compared to the current usage. Building footprints would not change as all lots are currently built out to the lot boundary. The planning proposal has been assessed with regard to flooding, specifically to determine:

- The compatibility of the proposed land-uses with the flood hazard of the area. Local and state policies require tailoring a site's land use to fit the flood hazard.
- The impact of the indicative building envelopes on flood risk in the area, and whether any flood impacts require specific mitigation measures.
- The suitability of Council's LGA flood planning controls in mitigating flood risk associated with future development at the site, and whether additional planning controls are required.
- The compliance of the proposal with each of the specific requirements of Council policy, specifically the Local Environmental Plan (LEP) and Development Control Plan, and each of the requirements of state government policy, specifically:
    - Section 9.1 Ministerial Direction - P5.7 Flooding (July 2026)
    - Considering flooding in land use planning (guideline) (July 2021)
    - Planning circular PS 26-001: Flooding and Land Use Planning (February 2026)
    - NSW Flood Risk Management Manual (2023), which replaces the earlier Floodplain Development Manual

Consideration has also been given to the draft Climate Change and Natural Hazards SEPP released in 2026.

5.1 Flood Hazard Compatibility

A primary consideration in assessing development of flood-affected land is the flood hazard. Flood hazard refers to the threat posed to people, vehicles and buildings in an area of flooding, and is based on the depth and velocity of floodwaters across the range of flood events. Deeper and faster flow has the potential to carry away people or vehicles, causing potential injury, death or financial loss, and similarly, deep and/or fast flow can damage and in some cases destroy buildings. Section

4.3.3 presents the thresholds of depth and velocity that separate the hazard categories from H1 (lowest level) to H6 (highest level).

As set out in Section 4.3.3, flood hazard has been mapped for the site, for the 20% AEP, 5% AEP, 1% AEP, 0.2% AEP and PMF event. The area has predominantly low hazard in most events including the 1% AEP, however, the western edge is adjacent to two sag points which contain H2-H3 hazard near the site. In the PMF event, there is high hazard of up to H4-H5 along most of Arundel Street, as well as the five westernmost lots, on Parramatta Road, and also in the gutters on Parramatta Road. The lots themselves do not have hazardous flow except for the two that convey flow. It is assumed these areas would be designed as culverts or similar as part of future building design, i.e. they would not be an occupied space in the building that has hazardous flow.

The flood hazard mapping shows that while the proposed intensification would be in an area subject to high hazard road flooding, it has limited associated risk and is considered suitable. More specifically:

- The proposed rezoning would include amalgamation of the seven westernmost lots. This means that the new large lot would have an access point on Parramatta Road that has much less flooding than the SW site corner. Flooding at the SW and NW corners could be largely immaterial to risk at the site, via building design that protects against flooding and provides safe access to Parramatta Road.
- In the large majority of potential floods there is low hazard (H1 or higher hazard limited to fast moving gutter flow). This is the case in a 0.2% AEP event and a 1% AEP under climate change SSP5-8.5 in 2130.
- With a design that significantly mitigates risk at the two sag points, via the amalgamated lots and new building design, the remaining flood risk, while not insignificant, is typical of the wider Sydney area. The presence of H5 flow in the gutter is common to many areas, as it occurs on many streets with minimal upstream catchment but some grade. This hazard remains similar under climate change scenarios.
- Further, the hazard is short-lived (see Section 4.3.5) and would often pass without any particular consequence to building occupants. Again, this would not change under climate change scenarios.

Further consideration of flood hazard and flood risk is given in Section 5.3 and 5.4

5.2 Hydraulic Modelling Assessment

Hydraulic modelling of the concept-level proposed building footprints was undertaken to quantify the impact of future works on existing flood behaviour. Development in an area affected by flooding is required to assess the magnitude and location of flood impacts, which are changes to the existing flood behaviour that increase flood risk for neighbouring properties.

The assessment is primarily based on the change in flood level under a 1% AEP flood event, and is assessed using the hydraulic models. Changes in ground levels and building extents have the potential to change how overland flowpaths occur and increase the flow and/or flood level at a location either upstream or downstream of the subject site. For example, obstructing a flowpath through the site will tend to increase flood levels upstream, while re-directing or diverting flow can

lead to slightly more flow being directed to one area and likewise increasing the flood level. Advice in National Guidelines (Project 15 of ARR 20219) indicates an increase of more than 0.01 m in the 1% AEP flood level is considered a reportable flood impact (i.e. lesser increases are considered negligible).

The hydraulic modelling assessment was based on the 'existing case' 1% AEP results from the hydraulic model, and then compared to the 1% AEP results of a 'proposed case' model. The 5% AEP and PMF were also modelled to ensure results are similar across different flood events. Initially, a proposed case was modelled that maintained all buildings but blocked out the two flowpaths near the Parramatta Road sag point, that pass through existing buildings. This found significant impacts would occur as a result, extending across Parramatta Road and affecting numerous private properties. This is not mapped as it is not proposed by the planning proposal. Based on the initial runs, the planning proposal must ensure new buildings have a flowpath of equivalent effect to the openings shown in Image 8 below. This would be required in any case via DA or SSDA, when building designs are assessed for impact.

Following this initial result, the 'proposed case' was treated as maintaining all existing building footprints. As this would have no impact on flood behaviour, impact maps were not included in this report (as they would only show no impact in all locations, across the range of events).

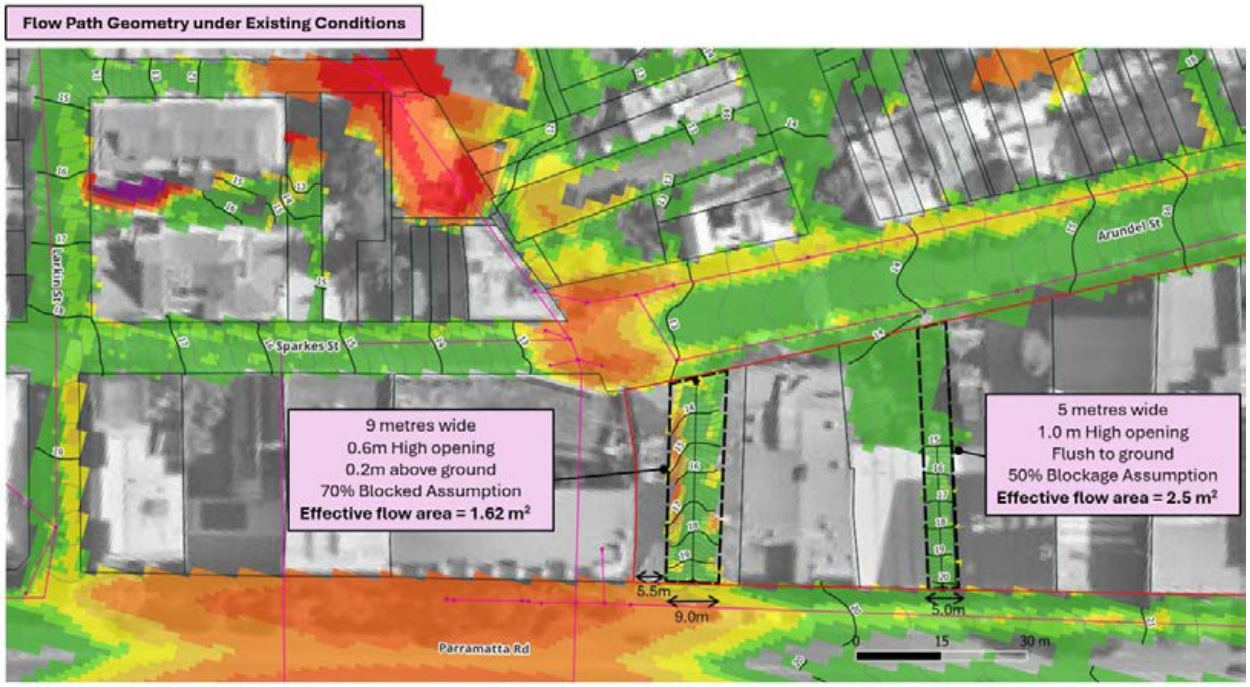


Image 8: Example of overland flowpath where future building footprint will need to incorporate flowpath

5.3 Compliance with City of Sydney Policy

Development on flood-prone land within the City of Sydney is guided by Clause 5.21 of Sydney Local Environmental Plan 2012 and the flood management provisions contained in Section 3.7 Water and Flood Management Policy of the Draft Sydney Development Control Plan 2012 – Policy and Housekeeping Amendments 2023, endorsed for finalisation by Council on 23 June 2025 (Draft DCP). Council also resolved that, upon commencement of the amended DCP, Section 3.7 will become the

City's flood policy and the Interim Floodplain Management Policy will be rescinded. Accordingly, the planning proposal has been assessed against the objectives and provisions of the Draft DCP.

The LEP has a standard clause related to flooding, clause 5.21. Clause 5.22 was not adopted. Clause 5.21 applies to all development on flood-prone land. The objectives of the LEP clauses are to:

- Minimise flood risk to life and to property
- Allow development on flood-affected land that is compatible with the area's flood function and behaviour, including climate change
- To avoid adverse or cumulative impacts on flood behaviour and the environment
- to enable the safe occupation and efficient evacuation of people in the event of a flood

The compliance of the planning proposal with the LEP is set out in Table 10.

Table 10: LEP Compliance

LEP Planning Control	Compliance Comment
(1) The objectives of this clause are as follows— (a) to minimise the flood risk to life and property associated with the use of land, (b) to allow development on land that is compatible with the flood function and behaviour on the land, taking into account projected changes as a result of climate change, (c) to avoid adverse or cumulative impacts on flood behaviour and the environment, (d) to enable the safe occupation and efficient evacuation of people in the event of a flood.	Rezoning to higher density residential/commercial would meet the LEP objectives, provided that new development follows the applicable flood planning controls. The majority of the site east of 52 Parramatta Road does not have high flood risk and the flood risk to life and property is readily managed. The flood behaviour largely consists of shallow overland flow with small to negligible upstream catchment. For the western end of the site, there are significant depths occurring but the flooding remains limited in most events. New buildings can be designed to be safely occupied during a flood with evacuation consisting of a shelter in place strategy.
(2) Development consent must not be granted to development on land the consent authority considers to be within the flood planning area unless the consent authority is satisfied the development— (a) is compatible with the flood function and behaviour on the land, and (b) will not adversely affect flood behaviour in a way that results in detrimental increases in the potential	a) The flood function consists of flood fringe in the 1% AEP with some floodway and flood storage near the western site edge. The site is currently fully-developed and new development would not alter any flood function. Flood behaviour has been considered with regards to depth, level, hazard, duration and other factors, with the rezoning found to be compatible with the flood hazard.

flood affectation of other development or properties, and (c) will not adversely affect the safe occupation and efficient evacuation of people or exceed the capacity of existing evacuation routes for the surrounding area in the event of a flood, and (d) incorporates appropriate measures to manage risk to life in the event of a flood, and (e) will not adversely affect the environment or cause avoidable erosion, siltation, destruction of riparian vegetation or a reduction in the stability of river banks or watercourses.	b) The site is currently fully developed so no significant change to the built environment is proposed, at street level. Flood impact assessment has been carried out and confirmed that floodwater conveyance from Parramatta Road to Sparkes/Arundel Street(s) would have to be maintained by the new development to ensure no adverse effect on flood behaviour. c) Evacuation is not a significant risk factor as the areas have low hazard overland flow in the large majority of potential flood events. New buildings can be designed to be safely occupied during a flood event, with a Shelter In Place evacuation strategy. Emergency access during a PMF event will be possible via proposed amalgamation of seven lots located at the two sag points. d) At the rezoning stage, risk to life measures consist of appropriate zoning based on the flood risk, and ensuring suitable flood planning controls are to be applied. Rezoning is suitable for the area and buildings can be designed to ensure risk to life is managed, see Section 5.77 Recommended Measures. e) There are no waterways in the vicinity of the proposed changes.
(3) In deciding whether to grant development consent on land to which this clause applies, the consent authority must consider the following matters— (a) the impact of the development on projected changes to flood behaviour as a result of climate change, (b) the intended design and scale of buildings resulting from the development, (c) whether the development incorporates measures to minimise the risk to life and ensure the safe evacuation of people in the event of a flood, (d) the potential to modify, relocate or remove buildings resulting from development if the surrounding area is impacted by flooding or coastal erosion.	a) Projected changes to flood behaviour as a result of climate change have been assessed, with regards to rainfall increase (it is well above sea level). There is a significant effect of worst-case scenario climate change under SSP5-8.5, however, the risk across the majority of the site (all but the westernmost 3-4 lots) remains low as in the 1% AEP under worst case climate change (2130, SSP5-8.5) hazard at all lots remains H1 to H3, similar to existing case. b) The intended design and scale of buildings is, across the site, likely a significant increase from what currently exists, with a series of new multistorey buildings. The increase is suitable, from a flood risk perspective. c) There are measures to minimise risk to life and ensure the safe evacuation of people in the event of a flood. d) Building relocation would not be required at the location, given the flood risk under current and future climate scenarios, and the elevated location.

The table overview shows the proposed rezoning is compliant with the objectives and requirements of the LEP.

Table 11 summarises the Interim Floodplain Management Policy and the project's compliance with it. The policy contains objectives, design principles and then various specific planning controls. Many of the DCP controls pertain to building design and so would apply again for the design of any individual building. The assessment of the planning proposal is a broader review of compliance and to identify the relevant controls to be applied in the future.

Table 11: DCP Compliance

DCP Provision	Compliance	Comment
3.7.1.1 Flood Risk Assessment	Complies	This Flood Impact and Risk Assessment has been prepared in accordance with Section 3.7.1.1. The assessment considers existing flood behaviour, flood hazard, flood function, climate change, emergency management implications and residual risk to life, including SSP5-8.5 2080 and 2130 climate change scenarios. Future development applications will be required to undertake detailed site-specific flood assessments using Council-approved flood models.
3.7.1.2 Flood Planning Levels	Complies, subject to future development controls	This assessment recommends adoption of climate-change-informed flood planning levels based on the SSP5-8.5 2130 scenario. For residential and non-residential development, the recommended flood planning levels supersede the corresponding flood planning levels contained in the Draft DCP and are intended to provide a site-specific response to the significant climate change impacts identified at the west end of the site. All other development types will be required to comply with the applicable flood planning levels in the Draft DCP.
3.7.1.3 Design to Reduce Risk and Hazard	Complies	Future development will be capable of incorporating flood-compatible materials, protection of building services and shelter-in-place measures consistent with the Draft DCP.
3.7.1.4 Ancillary Development	Complies	No filling or fencing is proposed as part of the planning proposal. Future development applications will be required to demonstrate that ancillary works do not obstruct flood flows or increase flood risk elsewhere.
3.7.1.5 Minor Additions	Not applicable	This provision applies to additions to existing development rather than rezoning proposals.
3.7.1.6 Temporary Development	Not applicable	No temporary development is proposed.
3.7.1.7 Heritage Management	Not applicable	The planning proposal does not rely on any heritage-related flood planning exemption provisions.
3.7.2 Drainage and Stormwater Management	Complies	The assessment demonstrates no flood impacts are possible, so long as flow conveyance is included in the development of two locations (64 and 60 Parramatta Road). Assessment of flood impacts will be carried out for each site as it is developed.

3.7.3 Stormwater Quality	Complies	Future development applications will be required to demonstrate compliance with stormwater quality and water-sensitive urban design requirements where applicable.
Shelter in Place	Complies in principle	The site is affected by flash flooding with limited warning time. Consistent with the Draft DCP and the NSW Shelter in Place Guideline, future development can provide refuge above the PMF and incorporate shelter-in-place measures for residents, workers and visitors.

The planning proposal is assessed to be in accordance with the design principles in the DCP, with regards to flooding. The relevant planning controls relating to building design are discussed in more detail in Section 5.5.

5.4 Compliance with NSW Policy

Management of flood risk is overseen by the state government in conjunction with local governments, with the state government providing technical guidelines for understanding and managing flood risk. These guidelines are collected in the NSW Flood Risk Management Manual (2023) which has superseded the earlier Floodplain Development Manual (2005). The overarching legislation is the NSW Environmental Planning and Assessment Act 1979 (EP&A Act), which tasks Councils with implementing the NSW government's flood prone land policy, with the objectives:

(a) to ensure that development of flood prone land is consistent with the NSW Government's Flood Prone Land Policy and the principles of the Floodplain Development Manual 2005, and

(b) to ensure that the provisions of an LEP on flood prone land is commensurate with flood hazard and includes consideration of the potential flood impacts both on and off the subject land.

The policy has requirements prohibiting development in areas of floodway and high hazard, ensuring development does not adversely impact others, and requirements for development of the FPA. These requirements are then set out in the LEP clauses (see previous report section).

In addition to the two guidelines and overarching policy, three recent policies have been released with specific direction on flooding and land use planning including rezoning. These are:

- Planning circular PS 26-001: Flooding and Land Use Planning (February 2026)
- Considering flooding in land use planning (guideline) (July 2021)
- Section 9.1 Ministerial Direction - P5.7 – Flooding (July 2026)

Planning circular PS 26-001: Flooding and Land Use Planning (February 2026) sets out the various statutory requirements including the new LEP clauses (assessed above), and the two other guidelines above.

Considering flooding in land use planning (July 2021) is a 9 page guideline for Councils on how to consider flooding in land use planning, which instructs Councils to:

- Consider flood function, flood hazard, extent and flooding behaviour for the full range of flood events, and risk to life
- Recommends Councils produce a Flood Planning Area for their LGA

- Use a freeboard of 0.5 m when setting Flood Planning Levels, or a lower freeboard in some cases where the consequences of flooding are lower
- Consider including within their LEP the optional Special Flood Considerations - Clause 5.22, contained in the Standard Instrument LEP
- Map areas of flooding as part of the assessment

These considerations have all been included in the current assessment.

Lastly, Section 9.1 Ministerial Direction - P5.7 – Flooding (July 2026) requirements are set out below in Table 12.

Table 12: Section 9.1 Ministerial Direction - P5.7 – Flooding (July 2026)

Planning Directions	Compliance Comment
A planning proposal must include provisions that give effect to and are consistent with: a) The NSW Flood Prone Land Policy, as published by the NSW Department of Planning and Environment on June 2023. b) The principles of the Flood Risk Management Manual, as published by the NSW Department of Planning and Environment on June 2023. c) The Considering Flooding in Land Use Planning Guideline as published by the NSW Department of Planning, Industry and Environment on July 2021 (or its subsequent update). d) Any adopted flood study and/or floodplain risk management plan prepared in accordance with the relevant flood manual and adopted by the relevant council.	Consideration of a range of flood events up to the PMF, including flood hazard and flood function classification, has been undertaken. Further, site access and the potential for isolation and emergency vehicle access issues are considered. The analysis and findings are consistent with the objectives of the 2023 Flood Risk Management Manual.
A planning proposal must not rezone land within the flood planning area from Recreation, Rural, Special Purpose or Conservation Zones to a Residential, Employment, MU1 Mixed Use, W4 Working Waterfront or Special Purpose Zones.	The rezoning proposed partially applies to an area of Flood Planning Area. However, the current zoning is not any of those listed. The rezoning proposes to rezone land currently zoned E3 - Productivity Support to MU1 - Mixed Use.
A planning proposal must not contain provisions that apply to the flood planning areas which: • permit development in floodway areas, • permit development that will result in significant flood impacts to other properties, • permit development for the purposes of residential accommodation in high hazard areas, • permit a significant increase in the development and/or dwelling density of that land, • Permit development for the purpose of centre-based childcare facilities, hostels,	The planning proposal applies to a FPA, specifically the five westernmost lots. The rezoning: • Has no significant areas of floodway in the design event. • Would not result in significant flood impacts to other properties • Would not result in residential areas in high hazard areas. However, in the PMF there is high hazard at the road of these five lots, which can be mitigated as part of the design. • Would permit a significant increase in the development of that land. See further discussion below this table as to the suitability.

boarding houses, group homes, hospitals, residential care facilities, respite day care centres, and seniors housing in areas where the occupants of the development cannot effectively evacuate, • Are likely to result in a significantly increased requirement for government resources on emergency management services, combat agencies, flood mitigation, and emergency response measures, which can include but are not limited to the provision of road infrastructure, flood mitigation infrastructure and utilities, o, or • permit development to be carried out without development consent except for the purposes of agriculture (not including dams, drainage canals, levees, buildings or structures in floodways or high hazard areas), roads or exempt development. • Permit hazardous industries or hazardous storage establishments where hazardous materials cannot be effectively contained during the occurrence of a flood event.	• Would permit such uses but evacuation risk is low to negligible across the area. As a precaution, certain lots will have restrictions on usage (see Section 5.7) • Would not likely result in increased government spending flood mitigation • Would not permit development to be carried out without development consent • Would not permit hazardous industries or hazardous storage establishments
A planning proposal must not contain provisions that apply to flood prone land, which: a) Permit sensitive and hazardous development in floodway areas, b) Permit the development of centre-based childcare facilities, hostels, boarding houses, group homes, hospitals, residential care facilities, respite day care centres and seniors housing in areas where the occupants of the development cannot effectively evacuate, c) Are likely to affect the safe occupation of and efficient evacuation of the development; or d) Are likely to result in a significantly increased requirement for government resources on emergency management services, combat agencies, and flood mitigation and emergency response measures, which can include but not limited to road infrastructure, flood mitigation infrastructure and utilities	The planning proposal applies to flood prone land. The planning proposal: • has no significant areas of floodway in the design event. • Would permit such uses but evacuation risk is low to negligible across the area. As a precaution, certain lots will have restrictions on usage (see Section 5.7) • Would have no bearing on the safe occupation of and efficient evacuation of the development (apart from reducing flood risk to building occupants due to raised floor levels relative to existing) • Would not likely result in increased government spending flood mitigation
A planning proposal must be: a) Consistent with the flood study adopted by the council prepared in accordance with the relevant manual, or b) Supported by a flood and risk impact assessment (FIRA) which is: i) Accepted by the planning proposal authority.	The planning proposal is consistent with the Johnstons Creek flood study This document constitutes the FIRA and has been prepared in accordance with those guidelines and authorities' requirements.

ii) Prepared in accordance with the Flood risk management guideline LU01 2023, as published by the NSW Department of Planning and Environment on June 2023. iii) Consistent with the planning proposal authorities' requirements.	
The planning proposal authority must be satisfied that proposed provisions of an LEP that apply to flood prone land are commensurate with flood behaviour and includes consideration of the potential flood impacts both on and off the subject land.	The LEP provisions are commensurate with flood behaviour and consider flood impacts

The assessment finds that the re-zoning is not fully compliant with the planning directions, due to the presence of 'Flood Planning Area' in the intensification area. The directions prohibit changes to a Flood Planning Area that result in "*significant increase in the development of that land*". However, based on GRC Hydro's assessment of flooding and flood risk, the FPA in this area does not necessarily mean the particular lots have high flood risk and based on experience in other areas, future development could be readily designed such that it ensures protection against flooding and for each of the lots, reduces the flood risk from what currently exists.

The planning directions do make some allowance for inconsistency with the above requirements, stating that a proposal can be inconsistent if the planning authority is satisfied that the proposal is "*justified by a study or strategy prepared in support of the planning proposal which provides for the aim of the priority,*". The current assessment clearly sets out the low risk at the site with regards to design flood depths, velocities, hazard, flood function, evacuation and also scaling between the 1% AEP and extreme events, and sensitivity to blockage and climate change. At the area in question, the lots in the FPA, while having some flood affectation, have manageable flood risk in many regards, to specifically:

- In the 1% AEP and 0.2% AEP, nearly all hazard is H1, except for at the westernmost lot
- Largely flood fringe in most events
- Evacuation constraints are present but can be managed through a shelter-in-place response. No major evacuation or access issues given the short duration of flooding, and the proposed amalgamation of seven lots to give the combined lot access to outside the PMF extent at the sag point.

On this basis we would seek the consent of the planning authority that intensification of this particular Flood Planning Area be permitted.

5.5 NSW Shelter In Place Guideline

The SES shelter in place guideline was released in 2025 and provides guidance to Councils when assessing works that propose a shelter in place approach. The guideline defines shelter in place as "the internal movement of a building's occupants to an area within the building above the probable maximum flood (PMF) level before the property becomes inundated by floodwaters". The guideline is applicable to the site as it has flash flooding and there no effective warning time, so any new development (and the current buildings) would use such a response.

The advice and requirements of the guideline have been separated out in Table 13, which then provides comment on compliance, with respect to the planning proposal and potential future buildings at the site.

Table 13: Shelter in place guidelines

Shelter in Place Guideline	Assessment at the Site
When considering shelter in place, secondary risks such as the impact of a flood on people's access to water and electricity, the availability of food, management of medical emergencies, building fire and their health and well-being should also be addressed	Complies Secondary risks at the site are minimal due to the short duration of flooding and the site being accessible in the 0.2% AEP and also the PMF. Analysis has shown the probability of an emergency coinciding with a rare flood is exceptionally low.
There may be minimal time between the start of rainfall that causes flood and the flooding of roads, property and potentially buildings. Warnings to the community are often limited to severe weather warnings or flood watches for the general area, often with no specific forecasts or advice available on the local impacts of flash flooding.	Complies The lack of flood warning is well understood and no warnings directing residents to evacuate, from either the BOM or SES, would be relied on in the event of a flood. Severe weather warnings or flood watches would be used.
Evacuation off-site is the primary emergency management strategy for flooding in NSW. Flooding may displace individuals, require people to relocate or disrupt essential services to communities for hours, days or weeks. Before a flood, getting people to evacuate off-site to an area not affected by flooding is considered.	Complies The primary strategy is recognised and analysis has found that evacuation off-site is not suitable for the site. The site would follow the same response used across virtually all of inner Sydney which is to stay indoors during a flood. SES warnings recognise that travelling by foot or in a car is hazardous and to stay indoors.
Understanding the full range of flood behaviour at a site can help identify evacuation constraints.	Complies The full range of flood events has been assessed. The recommended response recognises a large range of floods can occur at the site but that the severity/probability of a flood will not be known until after the event, and so a single response should be followed (shelter in place).
When considering shelter in place, consent authorities should take a risk based approach that is informed by the proposal's scale and establishes controls and mitigation measures that reflect the duration and depth of modelled flooding up to the PMF.	Complies The duration and depth of flooding in a range of events up to the PMF has been assessed. The site has low hazard (H1) in the large majority of floods including the 1% AEP, with higher hazard limited to lot boundaries that would not be relied on for access to the building. Mitigation measures are primarily to ensure minimal

Shelter in Place Guideline	Assessment at the Site
	above-floor flooding, and no basement flooding, via adoption of the Council Flood Planning Controls, and secondly, to plan for the residual risk presented by very rare to extreme floods, by developing a straightforward emergency response plan that does not rely on BOM or SES warnings, and places the site's occupants in an area that is fully protected against PMF flooding.
[Consider] does shelter in place align with existing emergency management strategies for the area, as determined through the flood risk management process and by the NSW SES	Considered The SES does not carry out evacuations in the City of Sydney area in advance of flooding occurring. Warnings in the event of severe weather and potential flooding are generally to stay indoors and avoid non-essential travel.
[Consider] has evacuation off-site (the primary emergency management strategy) been investigated and determined to be unachievable	Considered Evacuation off-site may be possible at the site, given the prevalence of H1 flooding in most flood events, but would not be recommended given the relative safety of staying on the site, compared to travelling on surrounding roads during a flood.
[Consider] does the development include medical centres, emergency service and community facilities, and sensitive and hazardous land uses, some of which may not be suitable for shelter in place	Considered The planning proposal does not specifically plan for these uses, but has included provisions in Section 5.7 for if they are used (see also Image 9).
shelter in place for greenfield development is not supported	Complies The site is not a greenfield site. There are no greenfield sites in the area.
[Consider] whether there is existing government developed flood warning systems that give advanced detailed forecasts of flash flooding to allow sufficient time to evacuate to the proposed refuge locations	Considered There are no detailed forecasts of flash flooding in the area.
[Consider] can the community effectively be informed of the risks associated with the emergency	The community would be a mix of businesses and residents, who could be informed of the risks.
A FIRA for the site should include: 7. detailed assessment of evacuation off-site (the primary emergency management strategy) to determine that evacuation off-site is not achievable. 8. the flood behaviour at the site, with consideration of climate change and	Complies 7. Evacuation off-site would not be recommended. For 8 a. and 8 b. the current report sets out this information and shows most flooding would pass within 1-2 hours, with longer durations of 3 hours possible in very rare to extreme floods.

Shelter in Place Guideline	Assessment at the Site
assessment of the potential maximum duration of isolation up to and including the PMF to identify that: a. flash flooding is the only flood risk present at the site, whether it be from overland flooding, local creek or riverine flooding, and b. the flooding occurs within less than 6 hours from the commencement of causative rain and the duration of shelter in place due to isolation by floodwaters is less than 12 hours from the commencement of rainfall, and c. the development is not subject to high hazard flooding (e.g. floodways, high hazard H5 or H6 areas) or surrounding roadways are not subject to high hazard flooding.	This remains the case under climate change including a worst-case scenario under SSP5-8.5 in the year 2130. For 8 c, due to the amalgamated lot at the main flood-affected portion of the site, there would be low hazard access on to Parramatta Road from the site. Arundel Street has low hazard (H1 and H2) on the footpath in the PMF but does have H5 on the roadway.
If 7 and 8 are complied with, a FIRA should include: 9. how shelter in place will be: a. used as part of the site's emergency management response, including actions before, during and after sheltering in place, and b. communicated to occupants and visitors of the building and how this communication will be maintained for the life of the development. 10. managed is outlined in the FIRA. Secondary risks include medical emergencies, building fire, health and wellbeing.	Future development can comply with the SIP requirement. Guidance on SIP arrangements for the building design and management across three possible building types are given below this table. At this rezoning stage no specific buildings are proposed. However, this FIRA shows how emergency response could function across the site.
[The design must have]: I. the floor level of the shelter in place part of the development be above the PMF, and II. structural soundness for conditions in a PMF event, considering flood and debris forces, be verified by a suitably qualified structural engineer, and III. area and access to the area does not rely on access to electricity, is self-directing, and have clearly marked internal access for all people on site, including consideration of access for potential occupants and/or visitors.	Future development can comply with, see further information below this table. As above, no specific buildings or floor levels are set at this stage, but these requirements are all able to be met by future design.
The consent authority may also consider: V. protection from weather and appropriate heating and cooling	Future development can comply with As above, no specific buildings or floor levels are set at this stage, but these requirements are all able to be met by future design.

Shelter in Place Guideline	Assessment at the Site
V. access to personal hygiene facilities such as a toilet VI. a minimum floor space of 2 m^2 per person VII. items for self-sufficiency that are stored, maintained and are regularly updated in an accessible location above the PMF, including sufficient drinking water and food for occupants, fire extinguishers, radios and torches with spare batteries, and a first aid kit with an automated external defibrillator (AED) VIII. centralised communal shelters may be considered but must be freely accessible internally at all times and externally accessible during events IX. access is provided to onsite systems that generate power of the shelter in place location during and after the event for a full range of flood events up to the PMF	

In regards to requirement 9 which asks how emergency response would be managed at particular sites, the proposed building types have been considered and how shelter in place would be managed at each. The flooding will vary significantly lot to lot with some having negligible flooding. For the sake of this exercise, it is assumed each building has no above-floor flooding in a 1% AEP, but some (e.g. 0.3 m depth) flooding in the PMF, while upper levels remain dry. To demonstrate that shelter in place is a reasonable evacuation response for these sites, three example building types and possible shelter in place strategies are as follows. Shop top housing (an apartment building with retail on the ground floor)

- On receipt of a BOM/SES flood warning describing potential flash flooding in inner Sydney, ground-floor shop employees will be alerted but will continue trading and monitoring conditions, as such warnings are frequently not followed by significant flooding;
- employees will close the premises, secure stock above the PMF level and vacate to upper levels only once flooding is observed on the adjoining roadway.
- Residential occupants above will remain in their units throughout, as upper levels stay dry in the PMF.
- Re-entry to the ground floor will occur once floodwaters recede and the area is visually confirmed safe (or inspected by a contractor if damage is suspected).
- This procedure can be set out in tenancy lease conditions and reinforced by permanent signage near the ground-floor entry, with periodic review on lease renewal to maintain currency over the life of the development.

- Co-living (such as student housing) or build to rent, where there would likely be a manager on site
  - The on-site manager will treat a BOM/SES warning for potential flash flooding in inner Sydney as an alert to monitor conditions, given the low reliability of such

warnings, and will direct residents to vacate ground-floor common areas only once flooding is observed on the roadway, sheltering instead in rooms or upper common areas above the PMF level.
    - During the event, the manager will maintain contact with residents via intercom or building app. Liaison with the SES would not be required.
    - After floodwaters recede, the manager will inspect the ground floor before permitting re-occupation. This procedure will be covered at resident induction and via permanent common-area signage, with the FERP reviewed periodically by management to remain current for the life of the development.
- Mixed use, comprising several levels of commercial in the podium, with either apartments, co-living or build to rent above
    - The building/precinct manager will treat BOM/SES warnings for potential flash flooding in inner Sydney as an alert only, directing ground-floor commercial tenants to prepare (securing stock/equipment above PMF level) but to vacate only once flooding is observed on the roadway, while upper-level residential/co-living occupants remain in place.
    - During the event, ground-floor access will be restricted and the manager will communicate with occupants via the building management system and liaise with the SES. Following recession of floodwaters, re-entry to ground-floor areas will require inspection and clearance by the manager or a contractor.
    - The procedure will be documented in a site-wide FERP issued at tenancy/occupation commencement, reinforced by permanent signage, and reviewed periodically by the manager and handed over to incoming managing agents to remain current for the life of the development.
- For the three building types, specific design features required to facilitate shelter in place arrangements would include:
    - Lifts and stairs to flood-free levels, with lifts to be designed to shutdown if flooding in the lift well is detected. Doorways to stairs/corridors at ground/flooded levels should open outwards away from floodwater, in the event that they are opened after flooding has begun.
    - Building power to function throughout any flood event, which may include battery or generator if normal functioning would be impacted.
    - Other utilities (e.g. fire pumps, mechanical equipment) to be above PMF level or should be designed to function uninterrupted through a PMF flood event
    - Access-controlled doorways that allow retail occupants to access a level above the PMF in the event of a flood
    - No significant parking (i.e. more than 10 spaces) to be below ground level
- These are based on the potential MU1 zoning which includes residential/habitable areas (shop-top housing, co-living, build-to-rent, hotel accommodation, serviced apartments), and commercial uses of retail, food and drink, health services (if permissible), and educational establishments. All are possible across the site with the exception of health services and educational establishment (for minors, not tertiary education) having higher flood risk so have been excluded from the amalgamated lot.

5.6 Assessment against EM01 Emergency Management Principles

The planning proposal has been assessed against the principals for emergency management set out in EM01, part of the 2023 Flood Risk Management Manual. As set out in Section 4.3.6 and Section 5.5, off-site evacuation in advance of flooding is not achievable, which is the threshold test set out in the NSW Shelter in Place Guideline for Flash Flooding (2025) and Flood Risk Management Guideline EM01 (Support for Emergency Management Planning) for determining whether shelter in place may be considered as an appropriate emergency management strategy in place of evacuation.

The nature of the flood risk at this site is consistent with the "flash flooding" definition applied under the guideline — inundation occurring within six hours of the causative rainfall — and the existing road network, which conveys overland flow to the north, supports the conclusion that flood behaviour readily managed as development proceeds. NSW SES guidance in these circumstances is for residents to remain indoors and avoid hazardous conditions outside, reinforcing that shelter in place, rather than attempted evacuation, is the safer response for short-duration, flood events of this kind, when BOM or SES do not always issue warnings in advance of the flood occurring.

The building standards proposed to be applied through the rezoning are consistent with the residual risk management measures and design criteria set out in EM01 (Table 12) and the shelter-in-place guideline. These include passive protection of all basements to the Probable Maximum Flood (PMF), residential floor levels set above the 1% AEP flood level plus 0.5 m freeboard (which exceeds the 0.1% AEP flood level at this site), commercial floor levels protected to the 1% AEP standard, and provision for shelter-in-place infrastructure such as alarms, signage and access to higher floor levels. The guideline recommends refuge areas be located above the PMF, that structural adequacy be demonstrated for flood and debris loading, and that occupants have clear, self-directing access to shelter areas and are informed of the emergency management strategy applying to their building.

On this basis, the proposal's approach to flood risk and emergency management reflects the framework and intent of EM01 and the associated shelter-in-place guideline. The guideline's seven principles are set out below with comment on each.

1. *Any proposed EM strategy for an area should be compatible with the evacuation strategies identified in the relevant local or state flood plan or by the NSW SES.* The proposed emergency response is consistent with existing emergency management arrangements for the area;
2. *Decisions relating to future development should be risk-based and ensure emergency management risks to the community of the full range of floods are effectively understood and managed.* The full range of flood behaviour and associated emergency management risks up to the PMF has been assessed and planned for*;*
3. *Development of the floodplain does not impact on the ability of the existing community to safely and effectively respond to a flood The ability of the existing community to effectively respond (including self-evacuating) within the available timeframe on available infrastructure is to be maintained. It is not to be impacted on by the cumulative impact of new development.* The proposal would not adversely affect the ability of the existing community to respond to

flooding. There is not an evacuation path through or past the site and the site's development would not add to any evacuation that uses roads in the area.

4. *Decisions on redevelopment within the floodplain are supported by an EM strategy that does not increase risk to life from flooding.* A shelter in place strategy is supported by site-specific assessment showing evacuation off-site is not the preferred response and refuge can be provided above the PMF. As is the case across inner Sydney, evacuation offsite would not be possible or recommended.
5. *Risks faced by the itinerant population need to be managed.* These risks can be managed as set out in the preceding section, with the itinerant population consisting of staff and visitors to retail/commercial uses at ground floor, or visitors to residential levels.
6. *Recognise the need for effective flood warning and associated limitations An effective flood warning strategy with clear and concise messaging understood by the community is key to providing the community an opportunity to respond to a flood threat in an appropriate and timely manner.* The assessment recognises the limitations of flood warning in a flash-flooding environment and does not rely on warning lead times. Site occupants can effectively take shelter without any warning from BOM/SES.
7. *Ongoing community awareness of flooding is critical to assist effective emergency response Councils and government play an important role in ensuring communities have and retain an awareness of flooding and the strategies that will help them respond appropriately to a flood threat.* City of Sydney and the SES regularly promote awareness of flooding in the LGA. Specifically at the site, emergency response procedures and flood awareness measures would be communicated to occupants and maintained through ongoing site management.

5.7 Recommended Measures including Flood Planning Controls

The current assessment has found that rezoning across the area is suitable in relation to the area's flood behaviour, but has identified various requirements that must be met in subsequent stages in the design of new buildings and associated development. These requirements are captured by the LEP and DCP flood planning controls, which are assessed to comprehensively manage flood risk, primarily through Flood Planning Levels (including PMF protection for basements, 1% AEP + 0.5 m for habitable spaces, and minimum of 1% AEP for commercial use). However, given the significant flood risk at the west end of the site (around 60-64 Parramatta Road), and the increasing risk posed by climate change, CoS must require additional controls, as part of the rezoning and subsequent development. This will also formalise the findings of this assessment, for example in regards to flood impact.

The following measures are to be implemented for future development at the site:

- Flood Planning Levels are set by CoS Interim Floodplain Management Policy. In addition, CoS are to:
    - Include the SSP5-8.5 2130 scenario in the 1% AEP and PMF levels used to set FPLs. The reason would be that CoS currently manage climate change risk via the 0.5 m freeboard, however, at the western end of the site at the two sags, 1% AEP and PMF climate change sensitivity is larger than 0.5 m. At other locations to the east, a

higher FPL is less warranted but given the difference is marginal, with the current or higher FPL, the higher FPL using SSP5-8.5 2130 is recommended across the site for consistency.

- While some level of flood liability is acceptable for residential and commercial development, to manage the risk at this site where very high depths (metres) of water can occur, CoS must require residential habitable spaces have PMF protection, and commercial levels are to have 24/7 access via stairs/elevators to a level above the PMF. 'Habitable' spaces are to include any part of a building where residents would spend a reasonable portion of time (e.g. hours) so would include communal living spaces, recreation areas such as pool or gym, but would not include uses such as lobby or bike storage. This would mean no resident would have to evacuate externally during a PMF, and could stay in their apartment. The site is somewhat unique in the catchment as a depth of >5 m occurs at the NW corner, many metres above the 1% AEP + 0.5 m level. The higher residential FPL would mean there is no risk of an apartment being flooded 4 m above floor (which would otherwise be possible). The use of SSP5-8.5 and the year 2130 is a precautionary approach that ensures future flood risk is managed, including uncertainties relating to climate change, with a consistent approach across the site.

- To formalise the findings of this report, the planning proposal or subsequent development controls must ensure:
  - New development includes first the amalgamation of the seven western-most lots, adjacent to the two sag points. Any development of the amalgamated lot would then require a pedestrian entry point, accessible from anywhere in the building, near the SE lot corner, on Parramatta Road.
  - New development maintains a flowpath (similar to a culvert) through the new building in the amalgamated lot, to ensure no change to existing flood behaviour.
- CoS are to monitor the delivery of flood risk management measures upstream and downstream of the site as listed in the Johnstons Creek Flood Risk Management Plan 2015, to ensure that any changes are reflected in the flood modelling prior to any development on the site.
- CoS must exclude sensitive uses (childcare, education facility for minors including preschool, primary schools, secondary schools, aged care of any sort, and health services) from the amalgamated lot where flood risk is concentrated. Refer to Image 9 below. The addresses of the seven lots to be amalgamated are 52, 54, 56, 58, 60, 62 and 64 Parramatta Road, Forest Lodge.
- Further, in relation to the seven lots, none of the seven lots (52 to 64 Parramatta Road) can be safely developed if not included in an amalgamated lot with building entrance shown in Image 9. This report's findings that flood risk can be managed but will no longer apply if the lot is not amalgamated. If, however, less than seven lots amalgamate including the eastern lot, those that amalgamate can be developed but the excluded lot or lots cannot. If less than seven lots choose to amalgamate (e.g. 56, 58 and 60 Parramatta Road) but not 52 Parramatta Road, the eastern lot, then the amalgamated lot cannot be safely developed.

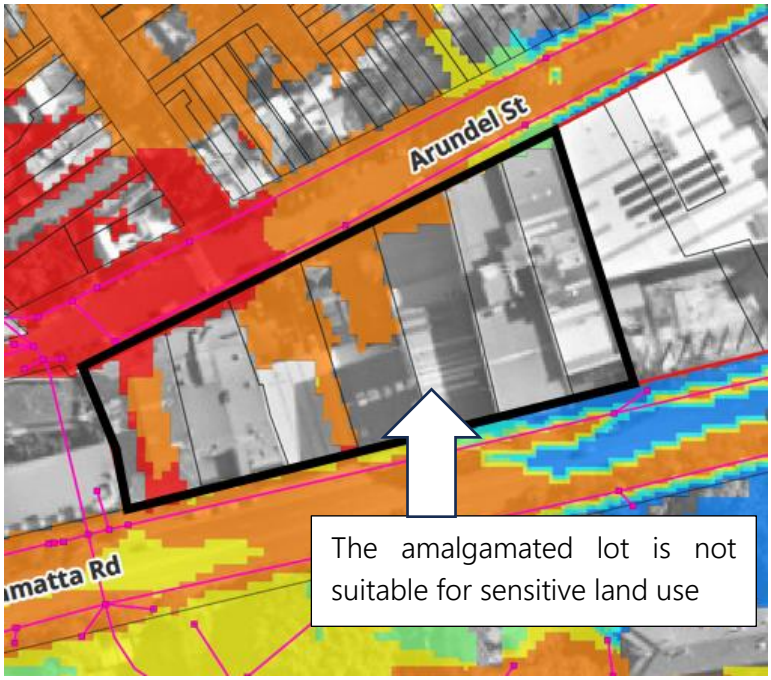


Image 9: Location where sensitive uses must be excluded

For future reference, the design flood levels under climate change, which are required for use in FPLs, are provided below in Table 14, with locations shown on Image 10. Note the levels do not include any freeboard.

Table 14: Climate Change Flood Levels at 26 Locations

Point ID	1% AEP SSP5-8.5 2130	PMF SSP5-8.5 2130
A01	13.89	19.39
A02	13.89	19.40
A03	13.89	19.40
A04	14.19	19.40
A05	14.75	19.40
A06	15.75	19.40
A07	16.68	19.40
A08	17.61	19.40
A09	20.94	21.01
A10	24.07	24.21
A11	25.33	25.37
A12	29.95	30.00
A13	32.55	32.56
B01	20.24	22.69
B02	20.24	22.69
B03	20.24	22.70
B04	20.46	22.71
B05	20.82	22.72
B06	21.13	22.72
B07	21.57	22.72

B08	21.83	22.72
B09	23.31	23.36
B10	24.52	24.60
B11	25.17	25.20
B12	25.95	26.05
B13	26.61	26.66

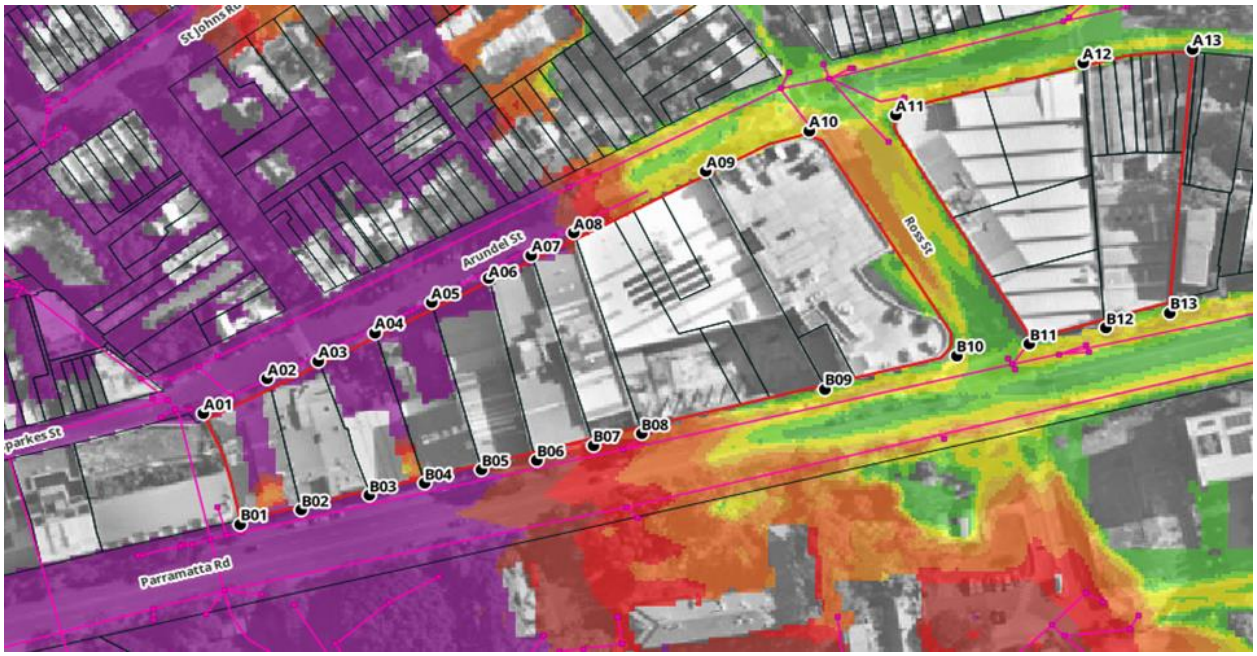


Image 10: Location of 26 reporting points

6. CONCLUSION

The assessment of a planning proposal for intensification of a section of Parramatta Road at Forest Lodge, has found that proposed higher density in the area is suitable from a flood risk perspective, so long as certain measures are put in place. Council's DCP and LEP, and relevant state government policies have been considered with respect to development of flood-prone areas. The report sets out relevant planning controls that are currently in the DCP that will manage flood risk, but notes that additional measures are required, specifically in regards to lot amalgamation at the western end of the site. These controls will ensure flood risk is incorporated into the design of new buildings and associated development, and that flooding outside of the site is not impacted as a result of the development. These are set out in Section 5.7 and include 1) higher FPLs incorporating climate change and PMF protection for residential habitable areas 2) amalgamation of the seven lots with a building entry at the SE lot corner and flow conveyance through the building 3) maintain an area of overland flow, similar to a culvert, through any new building at the amalgamated lot and 4) CoS must exclude sensitive uses from the amalgamated lot such as child care centres, primary schools, secondary schools, health service facilities and aged care.

7.APPENDIX A

Glossary of Key Terminology

annual exceedance probability (AEP)	the chance of a flood of a given or larger size occurring in any one year, usually expressed as a percentage. Eg, if a peak flood discharge of 500 m3/s has an AEP of 5%, it means that there is a 5% chance (that is one-in-20 chance) of a 500 m3/s or larger events occurring in any one year (see ARI). (see Table 15, Appendix A)
Australian Height Datum (AHD)	a common national surface level datum approximately corresponding to mean sea level.
average annual damage (AAD)	depending on its size (or severity), each flood will cause a different amount of flood damage to a flood prone area. AAD is the average damage per year that would occur in a nominated development situation from flooding over a very long period of time.
average recurrence interval (ARI)	the long-term average number of years between the occurrence of a flood as big as or larger than the selected event. For example, floods with a discharge as great as or greater than the 20 year ARI flood event will occur on average once every 20 years. ARI is another way of expressing the likelihood of occurrence of a flood event.
catchment	the land area draining through the main stream, as well as tributary streams, to a particular site. It always relates to an area above a specific location.
consent authority	the council, government agency or person having the function to determine a development application for land use under the EP&A Act. The consent authority is most often the council, however legislation or an EPI may specify a Minister or public authority (other than a council), or the Director General of DIPNR, as having the function to determine an application.
development	is defined in Part 4 of the EP&A Act infill development: refers to the development of vacant blocks of land that are generally surrounded by developed properties and is permissible under the current zoning of the land. Conditions such as minimum floor levels may be imposed on infill development new development: refers to development of a completely different nature to that associated with the former land use. Eg, the urban subdivision of an area previously used for rural purposes. New developments involve re-zoning and typically require major extensions of existing urban services, such as roads, water supply, sewerage and electric power.

	redevelopment: refers to rebuilding in an area. Eg, as urban areas age, it may become necessary to demolish and reconstruct buildings on a relatively large scale. Redevelopment generally does not require either re-zoning or major extensions to urban services.
disaster plan (DISPLAN)	a step by step sequence of previously agreed roles, responsibilities, functions, actions and management arrangements for the conduct of a single or series of connected emergency operations, with the object of ensuring the coordinated response by all agencies having responsibilities and functions in emergencies.
discharge	the rate of flow of water measured in terms of volume per unit time, for example, cubic metres per second (m3/s). Discharge is different from the speed or velocity of flow, which is a measure of how fast the water is moving for example, metres per second (m/s).
effective warning time	the time available after receiving advice of an impending flood and before the floodwaters prevent appropriate flood response actions being undertaken. The effective warning time is typically used to move farm equipment, move stock, raise furniture, evacuate people and transport their possessions.
emergency management	a range of measures to manage risks to communities and the environment. In the flood context it may include measures to prevent, prepare for, respond to and recover from flooding.
flash flooding	flooding which is sudden and unexpected. It is often caused by sudden local or nearby heavy rainfall. Often defined as flooding which peaks within six hours of the causative rain.
flood	relatively high stream flow which overtops the natural or artificial banks in any part of a stream, river, estuary, lake or dam, and/or local overland flooding associated with major drainage (refer Section C6) before entering a watercourse, and/or coastal inundation resulting from super-elevated sea levels and/or waves overtopping coastline defences excluding tsunami.
flood awareness	Awareness is an appreciation of the likely effects of flooding and a knowledge of the relevant flood warning, response and evacuation procedures.
flood education	flood education seeks to provide information to raise awareness of the flood problem so as to enable individuals to understand how to manage themselves and their property in response to flood warnings and in a flood event. It invokes a state of flood readiness.
flood fringe areas	the remaining area of flood prone land after floodway and flood storage areas have been defined.
flood liable land	is synonymous with flood prone land (i.e.) land susceptible to flooding by the PMF event. Note that the term flood liable land covers the whole floodplain, not just that part below the FPL (see flood planning area).

flood mitigation standard	the average recurrence interval of the flood, selected as part of the floodplain risk management process that forms the basis for physical works to modify the impacts of flooding.
floodplain	area of land which is subject to inundation by floods up to and including the probable maximum flood event, that is, flood prone land.
floodplain risk management options	the measures that might be feasible for the management of a particular area of the floodplain. Preparation of a floodplain risk management plan requires a detailed evaluation of floodplain risk management options.
floodplain risk management plan	a management plan developed in accordance with the principles and guidelines in this manual. Usually includes both written and diagrammatic information describing how particular areas of flood prone land are to be used and managed to achieve defined objectives.
flood plan (local)	A sub-plan of a disaster plan that deals specifically with flooding. They can exist at state, division and local levels. Local flood plans are prepared under the leadership of the SES.
flood planning area	the area of land below the FPL and thus subject to flood related development controls. The concept of flood planning area generally supersedes the "flood liable land" concept in the 1986 Manual.
flood planning levels (FPLs)	are the combinations of flood levels (derived from significant historical flood events or floods of specific AEPs) and freeboards selected for floodplain risk management purposes, as determined in management studies and incorporated in management plans. FPLs supersede the "standard flood event" in the 1986 manual.
flood proofing	a combination of measures incorporated in the design, construction and alteration of individual buildings or structures subject to flooding, to reduce or eliminate flood damages.
flood prone land	land susceptible to flooding by the PMF event. Flood prone land is synonymous with flood liable land.
flood readiness	Readiness is an ability to react within the effective warning time.
flood risk	potential danger to personal safety and potential damage to property resulting from flooding. The degree of risk varies with circumstances across the full range of floods. Flood risk in this manual is divided into 3 types, existing, future and continuing risks. They are described below: existing flood risk: the risk a community is exposed to as a result of its location on the floodplain. future flood risk: the risk a community may be exposed to as a result of new development on the floodplain.

	continuing flood risk: the risk a community is exposed to after floodplain risk management measures have been implemented. For a town protected by levees, the continuing flood risk is the consequences of the levees being overtopped. For an area without any floodplain risk management measures, the continuing flood risk is simply the existence of its flood exposure.
flood storage areas	those parts of the floodplain that are important for the temporary storage of floodwaters during the passage of a flood. The extent and behaviour of flood storage areas may change with flood severity, and loss of flood storage can increase the severity of flood impacts by reducing natural flood attenuation. Hence, it is necessary to investigate a range of flood sizes before defining flood storage areas.
floodway areas	those areas of the floodplain where a significant discharge of water occurs during floods. They are often aligned with naturally defined channels. Floodways are areas that, even if only partially blocked, would cause a significant redistribution of flood flow, or a significant increase in flood levels.
freeboard	provides reasonable certainty that the risk exposure selected in deciding on a particular flood chosen as the basis for the FPL is actually provided. It is a factor of safety typically used in relation to the setting of floor levels, levee crest levels, etc. (See Section K5). Freeboard is included in the flood planning level.
habitable room	in a residential situation: a living or working area, such as a lounge room, dining room, rumpus room, kitchen, bedroom or workroom. in an industrial or commercial situation: an area used for offices or to store valuable possessions susceptible to flood damage in the event of a flood.
hazard	a source of potential harm or a situation with a potential to cause loss. In relation to this manual the hazard is flooding which has the potential to cause damage to the community.
hydraulics	term given to the study of water flow in waterways; in particular, the evaluation of flow parameters such as water level and velocity.
hydrograph	a graph which shows how the discharge or stage/flood level at any particular location varies with time during a flood.
hydrology	term given to the study of the rainfall and runoff process; in particular, the evaluation of peak flows, flow volumes and the derivation of hydrographs for a range of floods.
local overland flooding	inundation by local runoff rather than overbank discharge from a stream, river, estuary, lake or dam.
local drainage	smaller scale problems in urban areas. They are outside the definition of major drainage in this glossary.

mainstream flooding	inundation of normally dry land occurring when water overflows the natural or artificial banks of a stream, river, estuary, lake or dam.
major drainage	councils have discretion in determining whether urban drainage problems are associated with major or local drainage. For the purposes of this manual major drainage involves: • the floodplains of original watercourses (which may now be piped, channelised or diverted), or sloping areas where overland flows develop along alternative paths once system capacity is exceeded; and/or • water depths generally in excess of 0.3m (in the major system design storm as defined in the current version of Australian Rainfall and Runoff). These conditions may result in danger to personal safety and property damage to both premises and vehicles; and/or • major overland flowpaths through developed areas outside of defined drainage reserves; and/or • the potential to affect a number of buildings along the major flow path.
mathematical/computer models	the mathematical representation of the physical processes involved in runoff generation and stream flow. These models are often run on computers due to the complexity of the mathematical relationships between runoff, stream flow and the distribution of flows across the floodplain.
merit approach	the merit approach weighs social, economic, ecological and cultural impacts of land use options for different flood prone areas together with flood damage, hazard and behaviour implications, and environmental protection and well being of the State's rivers and floodplains. The merit approach operates at two levels. At the strategic level it allows for the consideration of social, economic, ecological, cultural and flooding issues to determine strategies for the management of future flood risk which are formulated into council plans, policy, and EPIs. At a site specific level, it involves consideration of the best way of conditioning development allowable under the floodplain risk management plan, local flood risk management policy and EPIs.
minor, moderate and major flooding	both the SES and the BoM use the following definitions in flood warnings to give a general indication of the types of problems expected with a flood: minor flooding: causes inconvenience such as closing of minor roads and the submergence of low level bridges. The lower limit of this class of flooding on the reference gauge is the initial flood level at which landholders and townspeople begin to be flooded. moderate flooding: low-lying areas are inundated requiring removal of stock and/or evacuation of some houses. Main traffic routes may be covered.

	major flooding: appreciable urban areas are flooded and/or extensive rural areas are flooded. Properties, villages and towns can be isolated.
modification measures	measures that modify either the flood, the property or the response to flooding.
peak discharge	the maximum discharge occurring during a flood event.
probable maximum flood	the PMF is the largest flood that could conceivably occur at a particular location, usually estimated from probable maximum precipitation, and where applicable, snow melt, coupled with the worst flood producing catchment conditions. Generally, it is not physically or economically possible to provide complete protection against this event. The PMF defines the extent of flood prone land, that is, the floodplain. The extent, nature and potential consequences of flooding associated with a range of events rarer than the flood used for designing mitigation works and controlling development, up to and including the PMF event should be addressed in a floodplain risk management study.
probable maximum precipitation	the PMP is the greatest depth of precipitation for a given duration meteorologically possible over a given size storm area at a particular location at a particular time of the year, with no allowance made for long-term climatic trends (World Meteorological Organisation, 1986). It is the primary input to PMF estimation.
probability	a statistical measure of the expected chance of flooding (see AEP).
risk	chance of something happening that will have an impact. It is measured in terms of consequences and likelihood. In the context of the manual it is the likelihood of consequences arising from the interaction of floods, communities and the environment.
runoff	the amount of rainfall which actually ends up as streamflow, also known as rainfall excess.
stage	equivalent to water level (both measured with reference to a specified datum).
stage hydrograph	a graph that shows how the water level at a particular location changes with time during a flood. It must be referenced to a particular datum.
survey plan	a plan prepared by a registered surveyor.
water surface profile	a graph showing the flood stage at any given location along a watercourse at a particular time.

Table 15: ARR 2016 Preferred Terminology

Frequency Descriptor	EY	AEP (%)	AEP (1 in x)	ARI
Very Frequent	12			
	6	99.75	1.002	0.17
	4	98.17	1.02	0.25
	3	95.02	1.05	0.33
	2	86.47	1.16	0.5
	1	63.21	1.58	1
Frequent	0.69	50	2	1.44
	0.5	39.35	2.54	2
	0.22	20	5	4.48
	0.2	18.13	5.52	5
	0.11	10	10	9.49
Rare	0.05	5	20	20
	0.02	2	50	50
	0.01	1	100	100
Very Rare	0.005	0.5	200	200
	0.002	0.2	500	500
	0.001	0.1	1000	1000
	0.0005	0.05	2000	2000
Extreme	0.0002	0.02	5000	5000
			↓	
			PMP/ PMPDF	

8.APPENDIX B – MODEL UPDATE

8.1Overview

Two new flood models were built to capture flood modelling at a precinct scale for the Johnsons Creek catchment:

- The DRAINS software package was used as the hydrologic model
- The TUFLOW software package for the hydraulic model.

The DRAINS hydrology model generates the rainfall hydrographs that are used as inputs to the TUFLOW hydraulic model. Both software packages are widely used in Australia due to the robustness and quality of their flood modelling.

An overview of key model parameters is provided in Table 16.

Table 16: Key parameters in the flood models

Parameter	Description
Hydrology Model – DRAINS software	
Sub catchments	The Johnsons Creek Catchment has been divided into 1045 subcatchments
Rainfall	Australian Rainfall and Runoff 2019 (ARR2019) Includes present day (2030) scaling factors as recommended in ARR2019 v4.2
Climate Change	Rainfall scaling for the SSP5-8.5 scenario for two future timescales: • 50-year (2080) • 100-year (2130)
Hydraulic Model – TUFLOW software	
Version	TUFLOW version 2025.2.0-iSP Features: • Sub-grid sampling • HPC solution scheme
Resolution	2.0m with details to 0.4m captured with sub-grid sampling
Elevations	LiDAR capture from May 2020
Buildings	Building extents based on 2026 aerial imagery. Key updates from the previous flood study are: • Developments within the University of Sydney (USYD) Camperdown campus (see below) • Ross Street apartments near Harold Park

Extra detail at key hydraulic controls	• Formalisation of University Oval 1 and Oval 2 as detention basins within USYD (see below) • Pyrmont Bridge Road at the end of Larkin Street • Overland flow paths between buildings along Parramatta Road • Reinforced road centrelines with breaklines • Solid wall along overland flowpath in Carillon Ave
Stormwater Network	Pits, pipes and culverts from the most recent Council data. Design blockage based on Council blockage policy.

Further description of the University of Sydney updates is given below in Image 11. This shows the status of various developments, which have been included in the model, and the data source. The overall effect is that additional runoff is captured at the university and there is reduced runoff, particularly peak flow, downstream at Parramatta Road. Specific changes include modelling of the masonry wall along Carillon Avenue that detains runoff on the road and the two detention basins of Oval 1 and Oval 2.

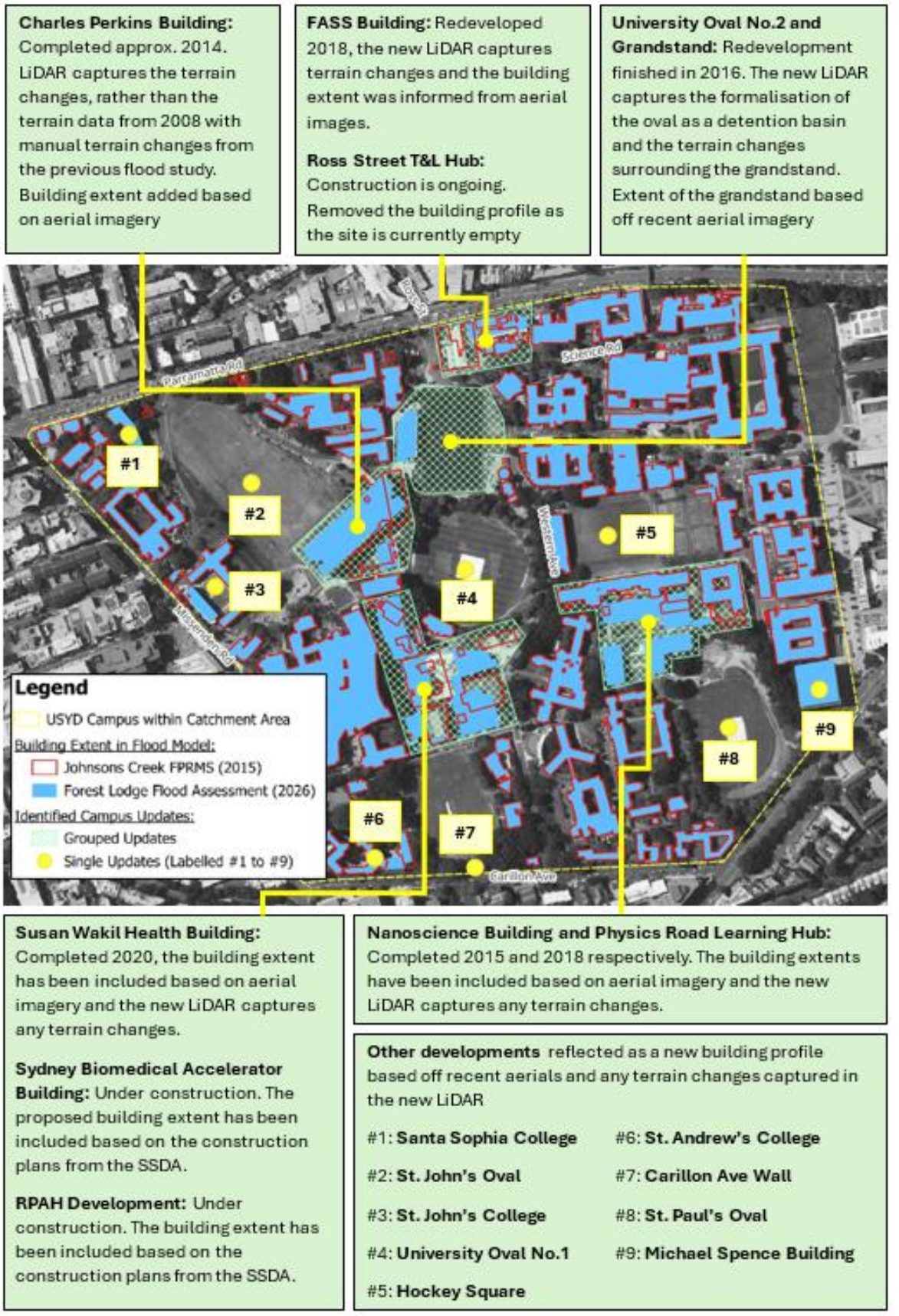


Image 11: University of Sydney Model Updates

8.2 Model Builds

The Johnsons Creek catchment extends over both the Inner West Council LGA and City of Sydney Council LGA, with the Inner West LGA portion flowing into the City of Sydney portion. The TUFLOW model extent focuses on the City of Sydney LGA and utilises hydrographs from the DRAINS model as inflows from the Inner West LGA portion of the catchment.

Image 12 shows the setup of inflows from the DRAINS model into the TUFLOW model.

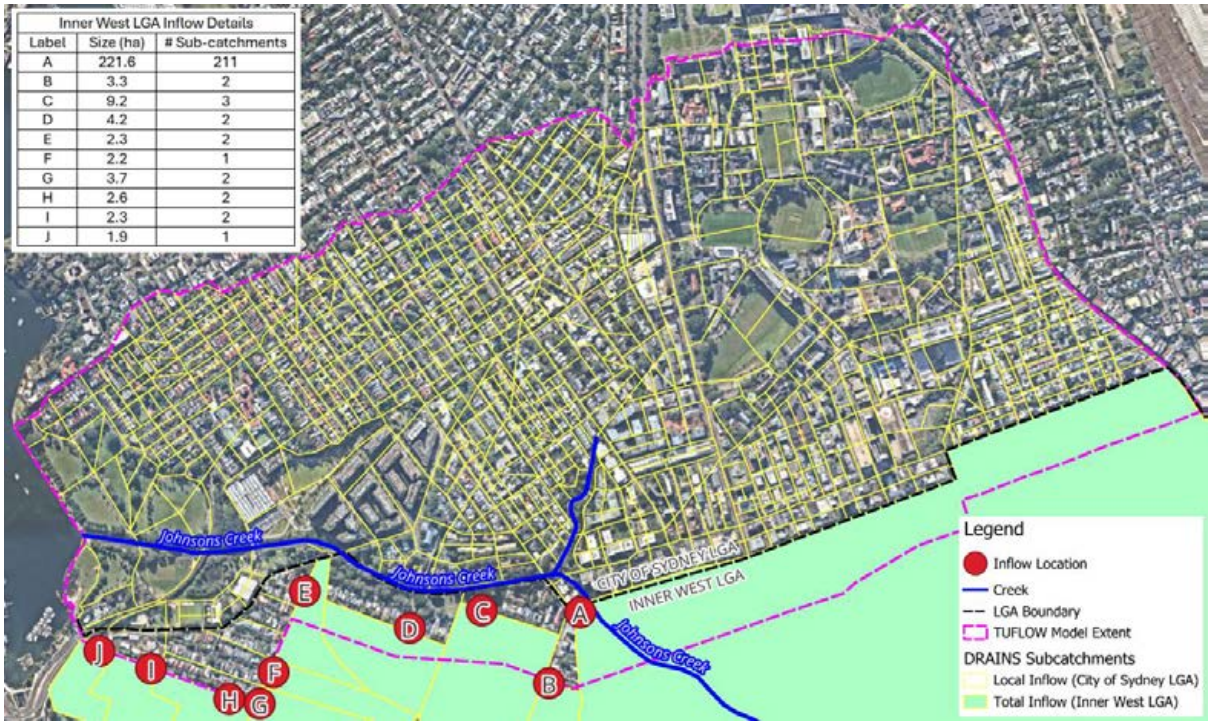


Image 12: Setup of the TUFLOW model with local DRAINS inflows within the City of Sydney LGA and routed total DRAINS inflows from the Inner West LGA

The TUFLOW model is a 1D-2D coupled model which represents buildings, surface elevation and roughness in the 2-D domain, while stormwater pits and pipes and the Johnsons Creek channel area in the 1-D domain. The layout of the TUFLOW model is shown in Image 13 and Image 14.

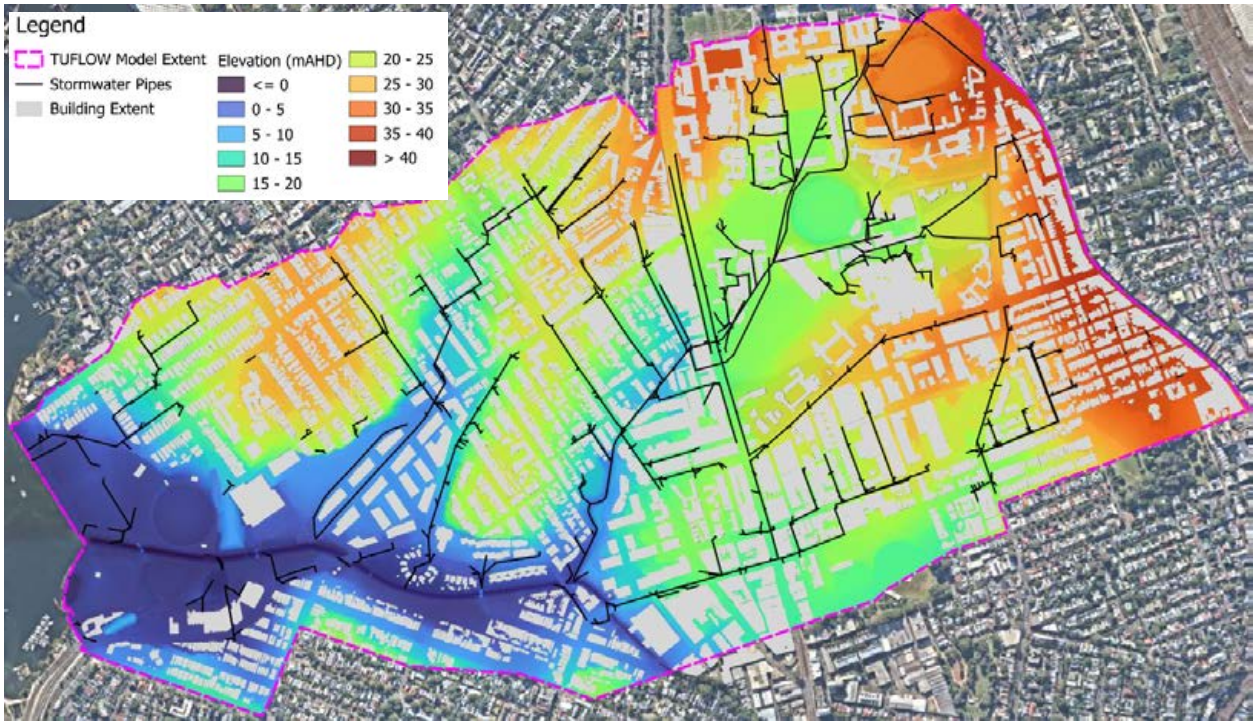


Image 13: TUFLOW model elevations

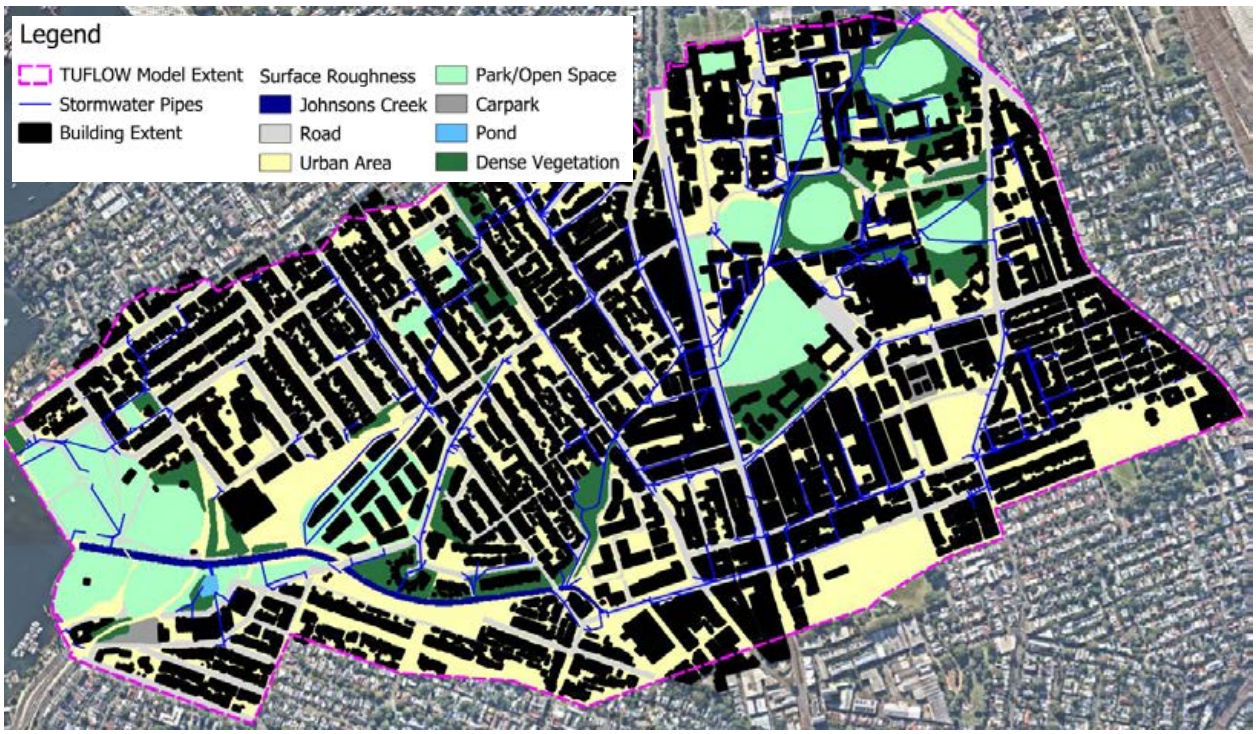


Image 14: TUFLOW model surface roughness, buildings and stormwater network layout

8.3 Design Events

The 20% AEP, 5% AEP, 1% AEP, 1 in 500 year event (i.e. 0.2% AEP), and the Probable Maximum Flood (PMF) design events were modelled to capture a range of flood behaviour. The critical durations for each design event were:

- 20% AEP – 45 mins storm (storm 8 temporal pattern)
- 5% AEP – 30 mins storm (storm 6 temporal pattern)
- 1% AEP – 25 mins storm (storm 1 temporal pattern) and 45 mins storm (storm 3 temporal pattern)
- 1 in 500 year – 20 mins storm (storm 7 temporal pattern) and 45 mins storm (storm 3 temporal pattern)
- PMF – 60 mins storm (GDSM temporal pattern) and 120 mins storm (GDSM temporal pattern)

The critical durations were chosen based on the recommended procedure in ARR2019:

- The full ensemble of ARR2019 storms with durations between 20min and 180min were run in the TUFLOW model. Each duration has 10 temporal patterns, for a total of 80 storms in the ensemble for each design event. A slightly lower resolution (4m) was used to decrease the runtime while minimising the impact on flood behaviour.
- The results were compared to find the temporal pattern that produces the median water level for each duration
- The highest water levels from the subset of temporal patterns was spatially compared across the model extent to produce a single 'critical water level' grid for the entire catchment
- The critical duration is chosen as the storm duration and storm temporal pattern that is most representative of the critical water level grid with minimal differences along the overland flow paths.

All critical durations were rerun at the original resolution (2m with sub-grid sampling to 0.4m) when producing the design flood results used in this study.

8.4 Climate Change

The hydrologic and hydraulic models were adjusted to assess the effect of climate change on design flood behaviour. Climate change is expected to worsen flood risk over time as higher greenhouse gas concentrations lead to increases in high intensity rainfall and sea levels. The assessment used the IPCC (Intergovernmental Panel on Climate Change) shared socio-economic pathway scenario 'SSP5-8.5', which is the least optimistic of the scenarios and representative of rapid economic development using fossil fuels with little mitigation of emissions. For the SSP5-8.5 scenario the projected increase in precipitation intensity was calculated from the ARR Data Hub values for the years 2076 and 2126 for a 50-year and 100-year timescales respectively. The increase in precipitation for both timescales is shown in Table 17. These were then modelled for the 1% AEP and PMF events.

Table 17: Climate Change Factors – Percentage Increase in Rainfall Intensity for the 50-year and 100-year timescales

Event	Duration	2076	2126
1% AEP	25min	+61 %	+109%
	45min	+61 %	+109%
PMF	60min	+61 %	+109%
	120min	+50 %	+90 %

For each scenario the peak flood levels were then tabulated and compared to the base case (i.e., no climate change), as presented in 4.2.1.

8.5 Comparison to Previous Study

Comparison was made to the 2015 study to understand the effect of the changes on design flood levels. The new model involved both site-specific and catchment-wide updates that both increased and decreased flood levels. The comparison was therefore only made of the net or combined effect of the changes. The comparison is shown in Table 18 and Table 19, followed by discussion of the likely effect of the individual changes.

Table 18: Comparison of Design Results - 1% AEP

Location	2015 1% AEP	Revised 1% AEP
Parramatta Road sag point	20.31 mAHD flood level	20.03 mAHD flood level
	3.7 m3/s peak flow	2.0 m3/s peak flow
Sparkes/Larkin St sag point	13.85 mAHD flood level	13.14 mAHD flood level
	10.4 m3/s peak flow (inc. pipe)	9.7 m3/s peak flow (inc. pipe)
Orphan School Creek and Johnstons Creek confluence	3.85 mAHD flood level	3.93 mAHD flood level
	57.5 m3/s peak flow (channel only)	63.4 m3/s peak flow (channel only)
Hereford Street sag near Hegarty Street, Glebe	13.26 mAHD flood level	13.02 mAHD flood level
	8.01 m3/s peak flow (exc. Pipe) 9.20 m3/s peak flow (inc. pipe)	3.26 m3/s peak flow (exc. Pipe) 5.83 m3/s peak flow (inc. pipe)

Table 19: Comparison of Design Results - PMF

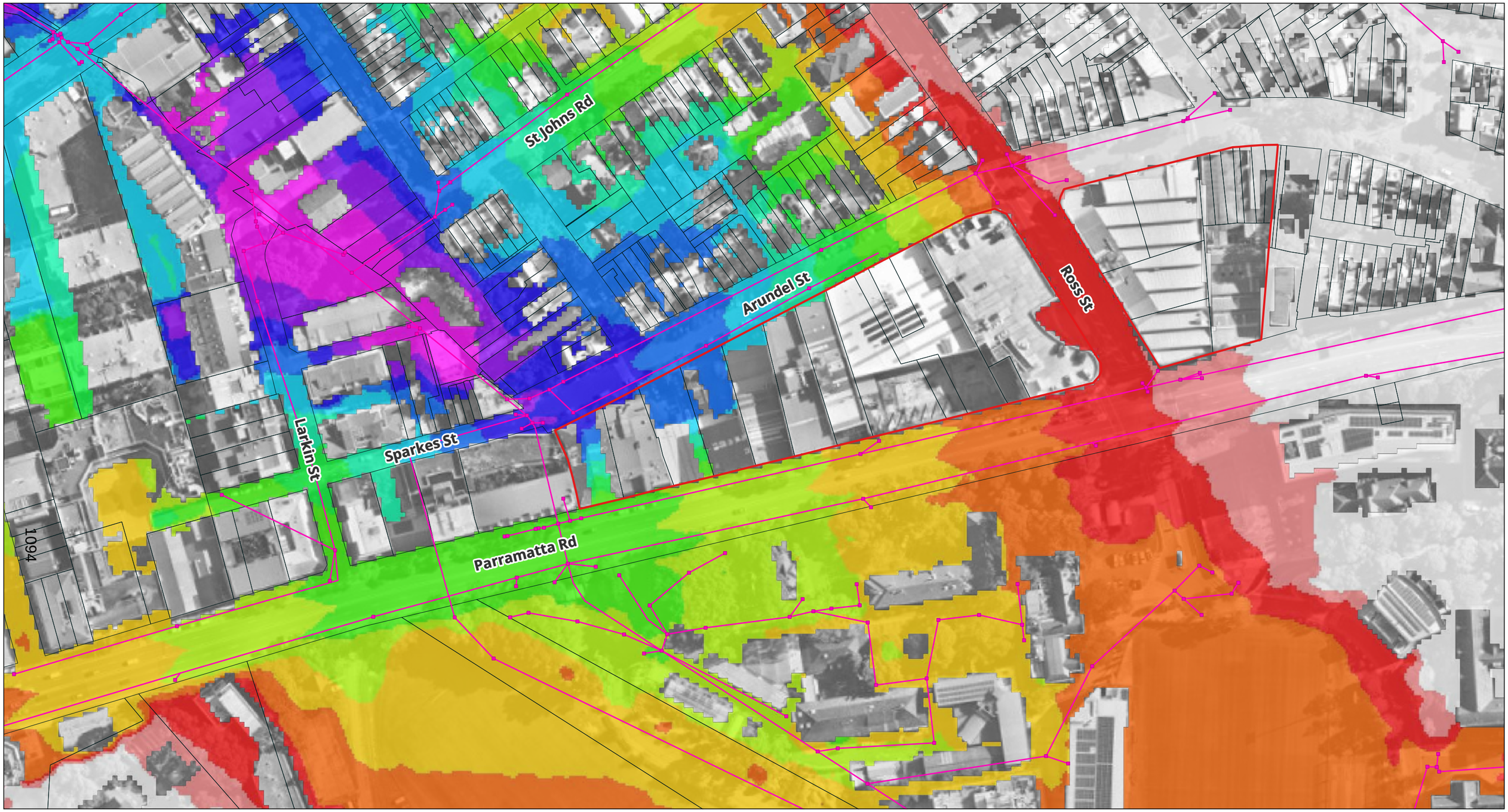
Location	2015 PMF	Revised PMF
Parramatta Road sag point	21.57 mAHD flood level	21.37 mAHD flood level
Sparkes/Larkin St sag point	18.47 mAHD flood level	18.03 mAHD flood level
Orphan School Creek and Johnstons Creek confluence	5.27 mAHD flood level	5.29 mAHD flood level
Hereford Street sag near Hegarty Street, Glebe	13.54 mAHD flood level	13.79 mAHD flood level

The main catchment-wide changes consisted of new hydrologic inputs from the updated ARR, the new DRAINS model and the new blockage approach. Other catchment-wide changes such as LiDAR are unlikely to have significantly changed flood levels. The new DRAINS model with ARR2019 IFD data likely had the effect of reducing flows, as the revised IFDs were significantly lower than those estimated by ARR87. The temporal pattern changes may have also reduced flood levels. The reduction due to updated IFDs was then partially offset by the use of 'present day climate change', which increased design rainfall by around 20%. The blockage approach had a significant effect, particularly at Larkin Street where the pipe takes significantly more flow.

The Hereford Street comparison point is included as that area is completely independent/unaffected from the University of Sydney model updates. There, the flood level is lower and the total flow is significantly reduced from 2015, i.e. the reduced level there and across the catchment in the 1% AEP is not just a result of increased pipe flows due to the revised blockage.

The main site-specific change was the inclusion of University of Sydney updates. These appear to detain significantly more runoff in the campus and mean less flow reaches Parramatta Road, and Larkin Street.

FIGURES



Subject Site
Cadastral Boundaries
Existing Stormwater

Ground Levels (mAHD)

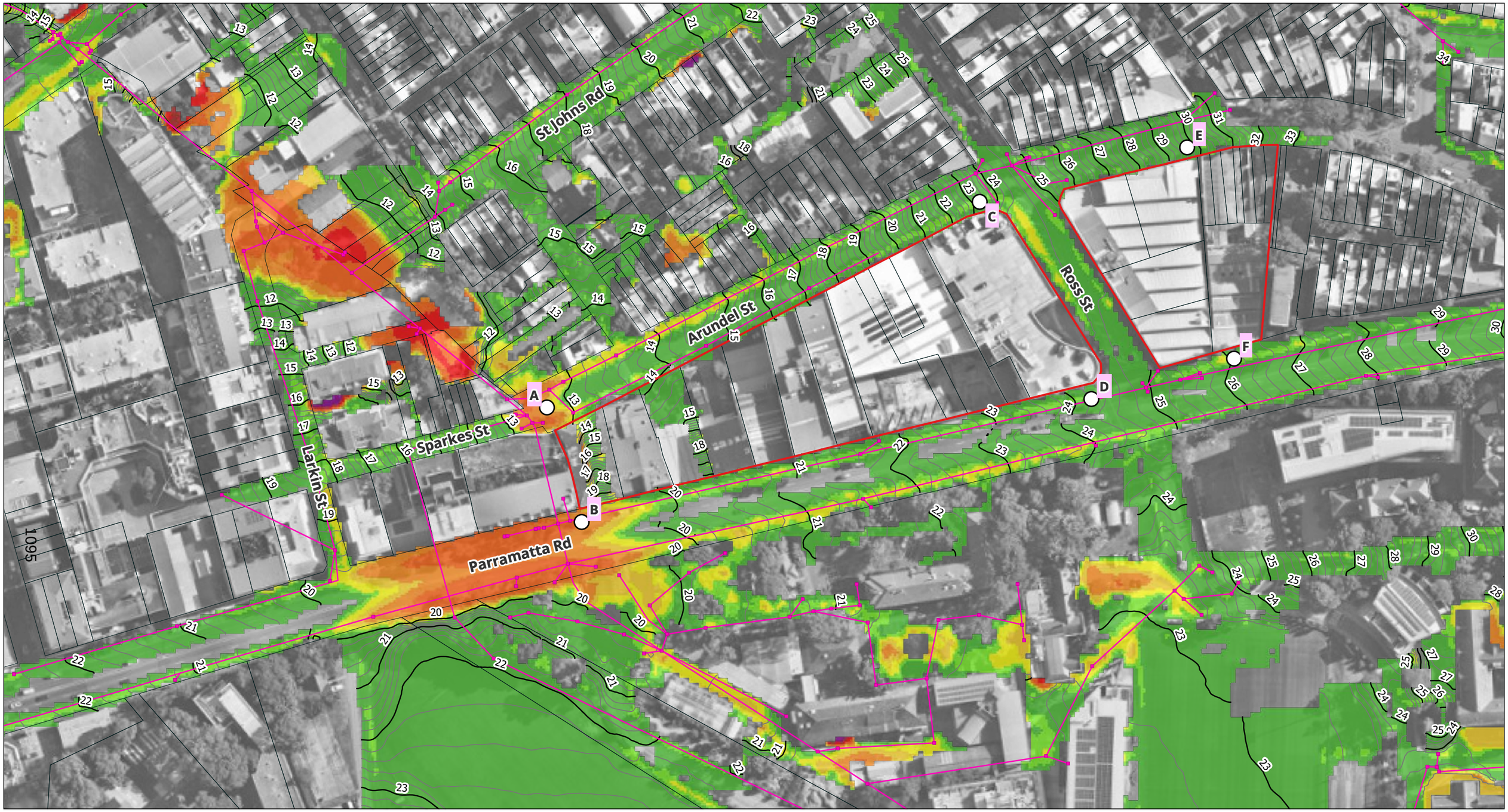
- <= 11.25
- 11.25 - 12.50
- 12.50 - 13.75
- 13.75 - 15.00
- 15.00 - 16.25
- 16.25 - 17.50
- 17.50 - 18.75
- 18.75 - 20.00
- 20.00 - 21.25
- 21.25 - 22.50
- 22.50 - 23.75
- 23.75 - 25.00
- 25.00 - 26.25
- > 26.25

N
W E
S

0 20 40 60 80 100

grc HYDRO

TITLE: **Study Area and Digital Elevation Model**	PROJECT: **Flood Impact and Risk Assessment - Parramatta Road, Forest Lodge**	PROJECT No. **260030**	DATE: **06-2026**	SCALE: **1:1500**	FIGURE No. **A01**



Subject Site
Cadastral Boundaries
Existing Stormwater

Peak Flood Depths (m)

- 0 - 0.05
- 0.05 - 0.1
- 0.1 - 0.2
- 0.2 - 0.3
- 0.3 - 0.5
- 0.5 - 1.0
- 1.0 - 1.5
- 1.5 - 2.0
- > 2.0

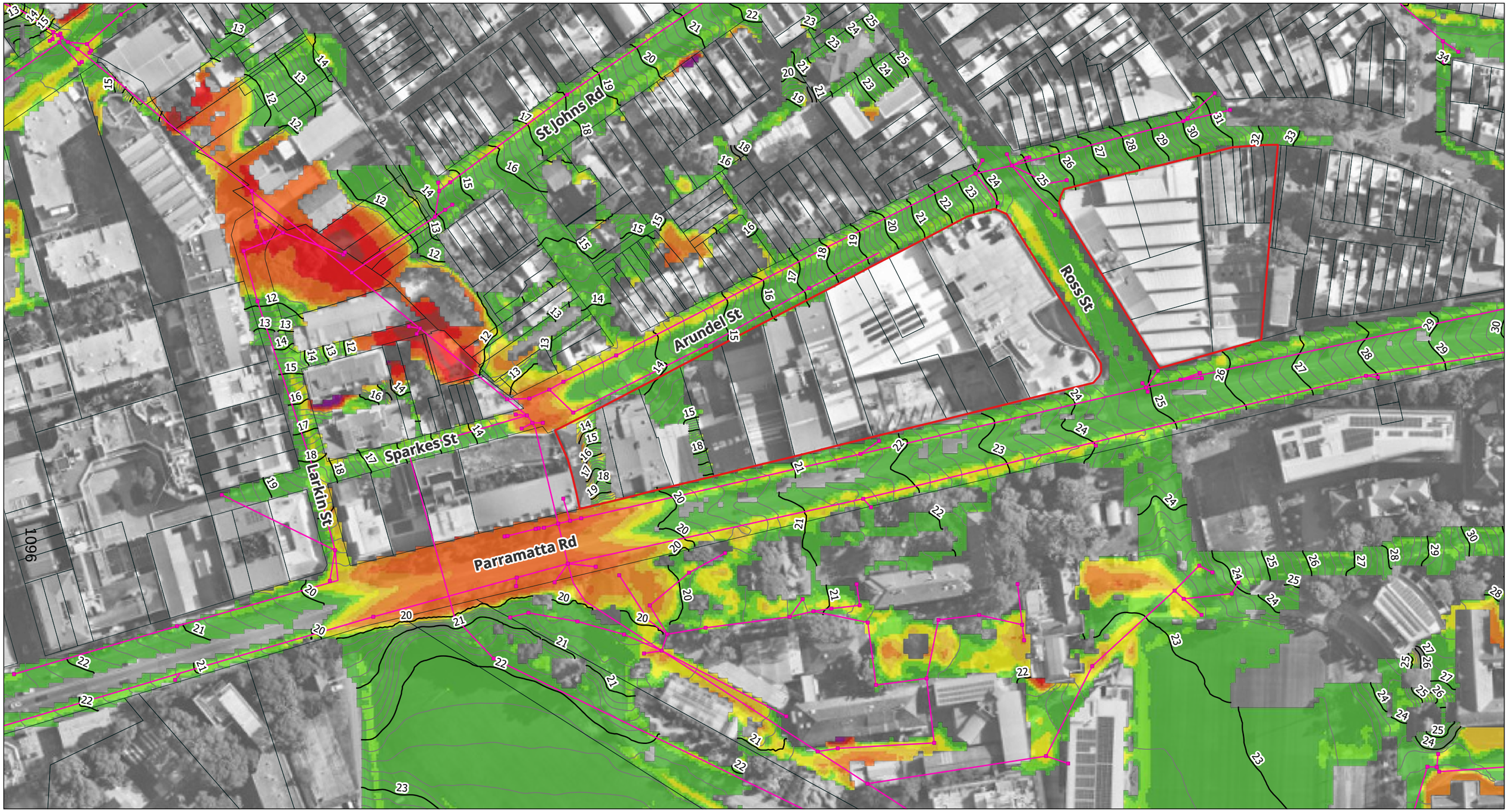
Major Flood Level Contours (Spacing = 1.0 m)
Minor Flood Level Contours (Spacing = 0.2 m)

N W E S

0 20 40 60 80 100

grc HYDRO

TITLE: **20% AEP Flood Depth and Level**	PROJECT: **Flood Impact and Risk Assessment - Parramatta Road, Forest Lodge**	PROJECT No. **260030**	DATE: **06-2026**	SCALE: **1:1500**	FIGURE No. **A02**



Subject Site
Cadastral Boundaries
Existing Stormwater

Peak Flood Depths (m)

0 - 0.05
0.05 - 0.1
0.1 - 0.2
0.2 - 0.3
0.3 - 0.5
0.5 - 1.0
1.0 - 1.5
1.5 - 2.0
> 2.0

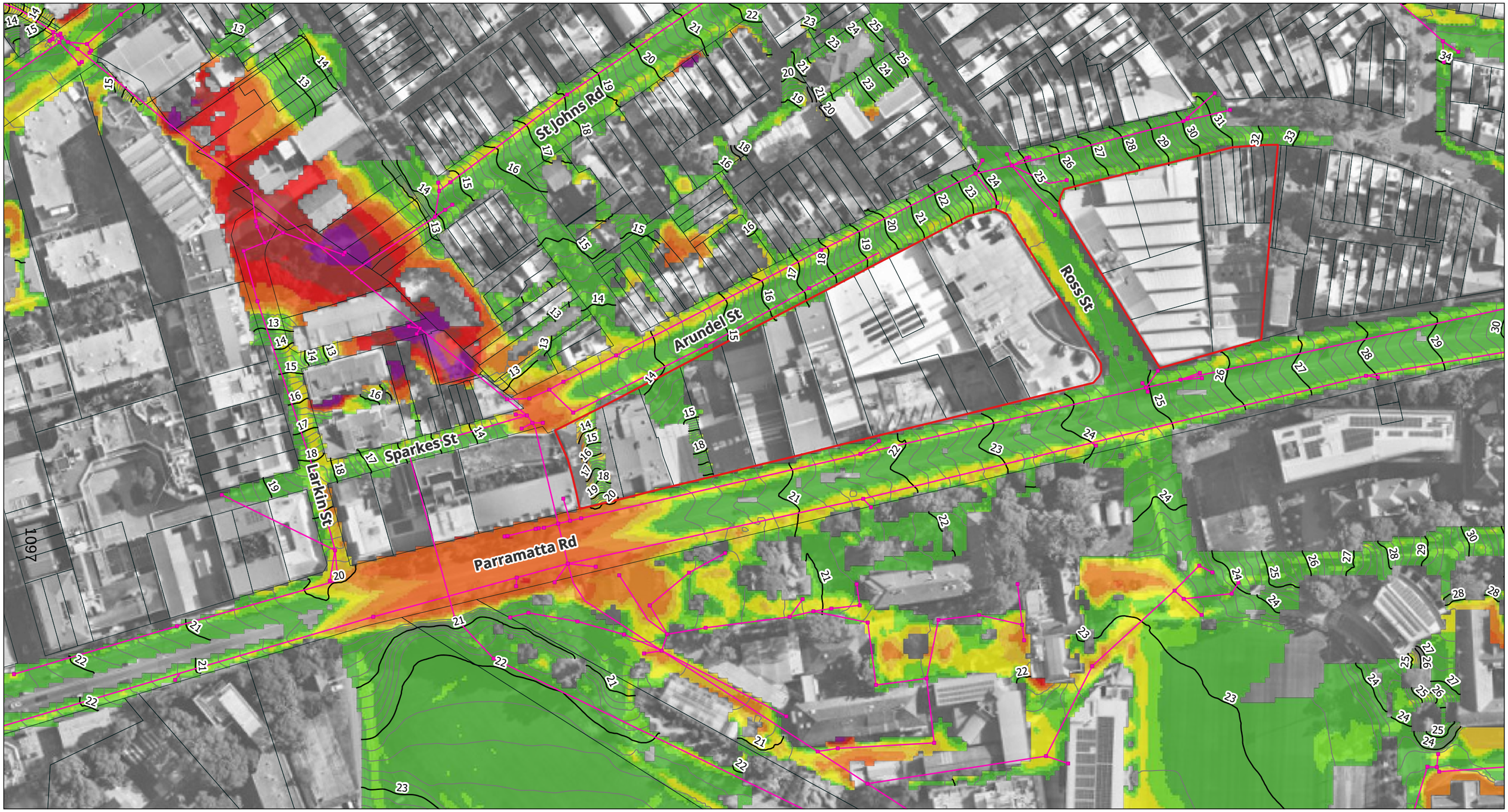
Major Flood Level Contours (Spacing = 1.0 m)
Minor Flood Level Contours (Spacing = 0.2 m)

N
W E
S

0 20 40 60 80 100

grc HYDRO

TITLE: **5% AEP Flood Depth and Level**	PROJECT: **Flood Impact and Risk Assessment - Parramatta Road, Forest Lodge**	PROJECT No. **260030**	DATE: **06-2026**	SCALE: **1:1500**	FIGURE No. **A03**



Subject Site
Cadastral Boundaries
Existing Stormwater

Peak Flood Depths (m)

0 - 0.05
0.05 - 0.1
0.1 - 0.2
0.2 - 0.3
0.3 - 0.5
0.5 - 1.0
1.0 - 1.5
1.5 - 2.0
> 2.0

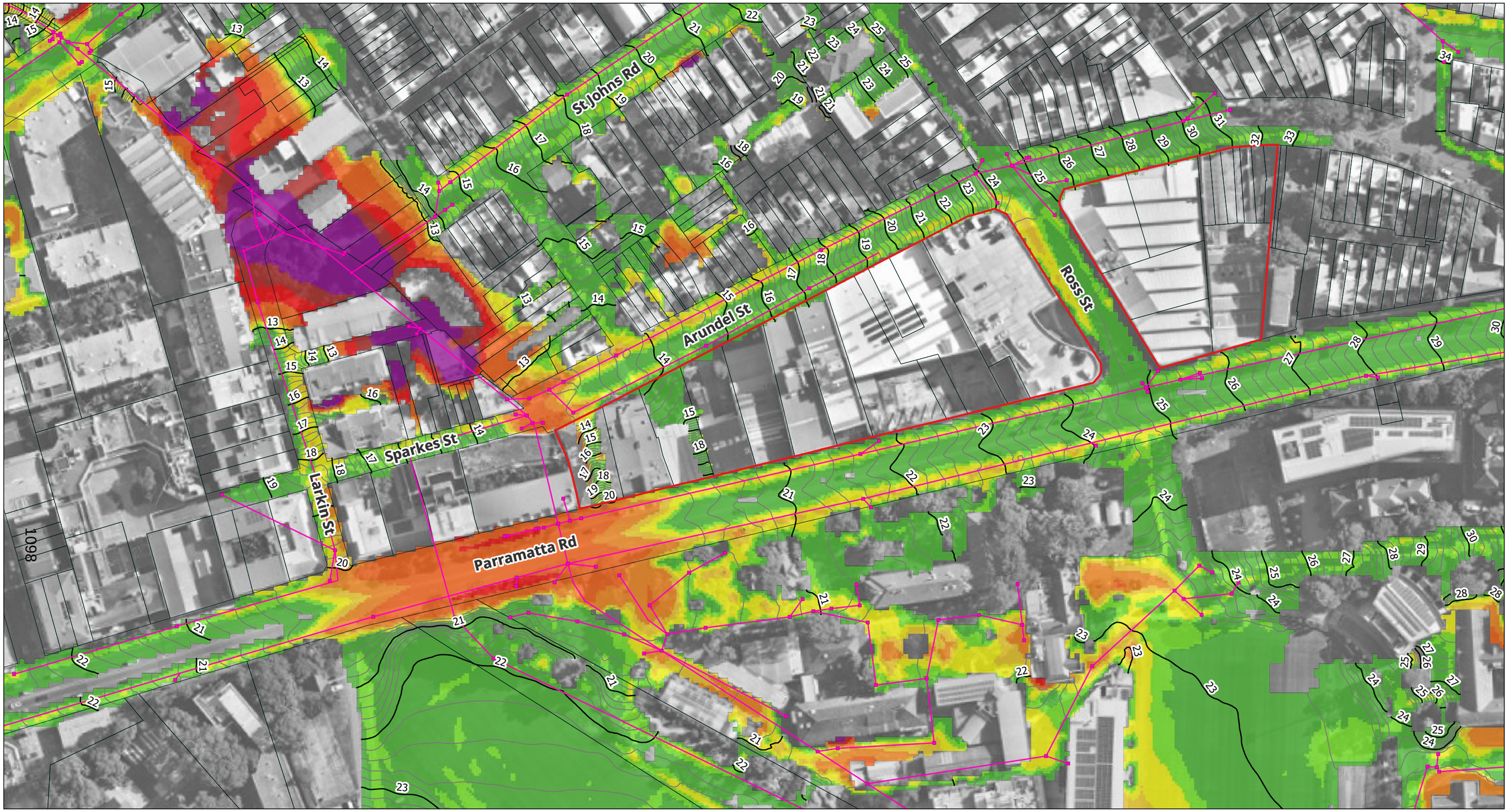
Major Flood Level Contours (Spacing = 1.0 m)
Minor Flood Level Contours (Spacing = 0.2 m)

N
W E
S

0 20 40 60 80 100

grc HYDRO

TITLE: **1% AEP Flood Depth and Level**	PROJECT: **Flood Impact and Risk Assessment - Parramatta Road, Forest Lodge**	PROJECT No. **260030**	DATE: **06-2026**	SCALE: **1:1500**	FIGURE No. **A04**



Subject Site
Cadastral Boundaries
Existing Stormwater

Peak Flood Depths (m)

0 - 0.05
0.05 - 0.1
0.1 - 0.2
0.2 - 0.3
0.3 - 0.5
0.5 - 1.0
1.0 - 1.5
1.5 - 2.0
> 2.0

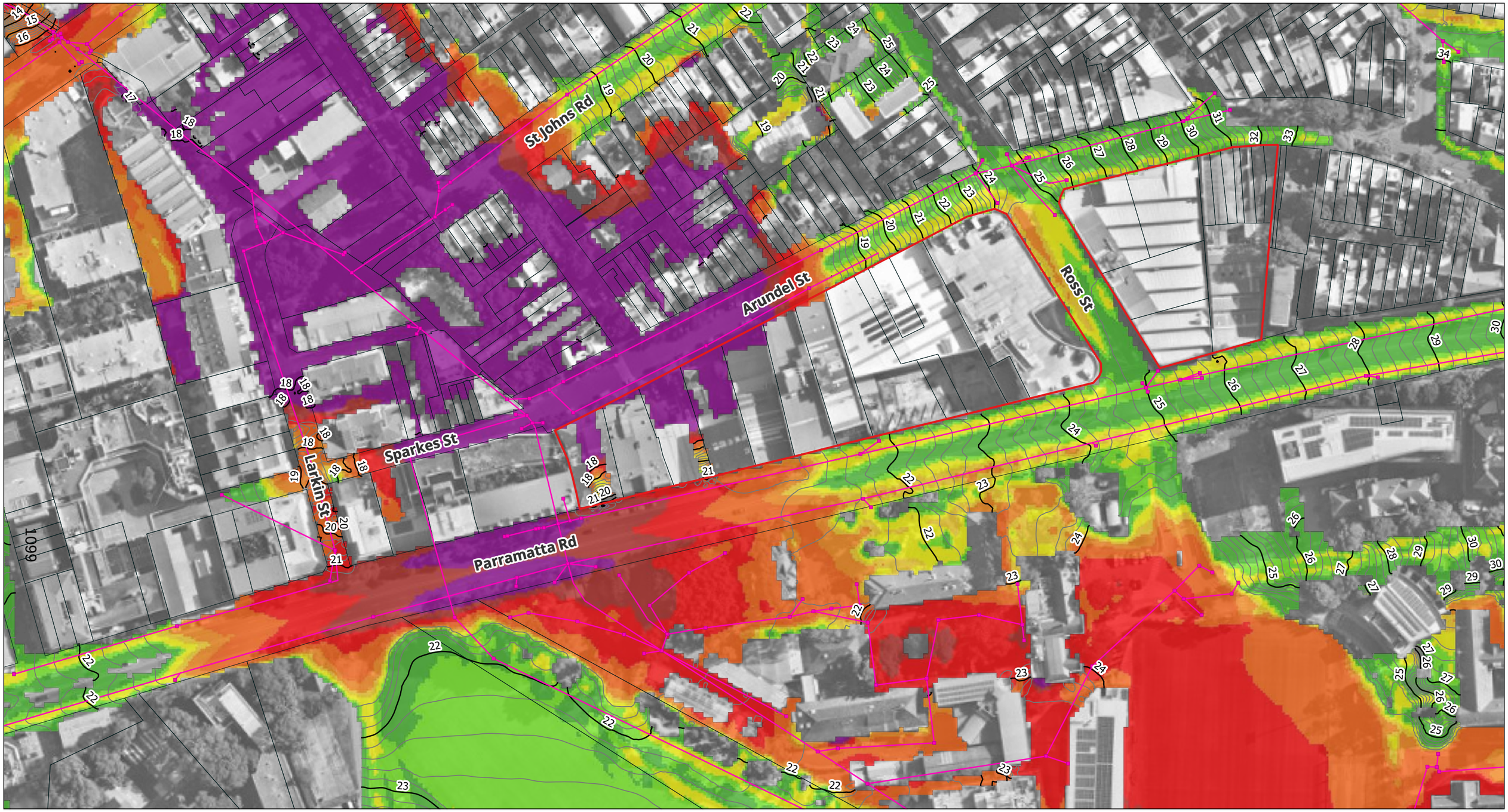
Major Flood Level Contours (Spacing = 1.0 m)
Minor Flood Level Contours (Spacing = 0.2 m)

N
W
E
S

0 20 40 60 80 100

grc HYDRO

TITLE: **0.2% AEP Flood Depth and Level**	PROJECT: **Flood Impact and Risk Assessment - Parramatta Road, Forest Lodge**	PROJECT No. **260030**	DATE: **06-2026**	SCALE: **1:1500**	FIGURE No. **A05**



Subject Site
Cadastral Boundaries
Existing Stormwater

Peak Flood Depths (m)

0 - 0.05
0.05 - 0.1
0.1 - 0.2
0.2 - 0.3
0.3 - 0.5
0.5 - 1.0
1.0 - 1.5
1.5 - 2.0
> 2.0

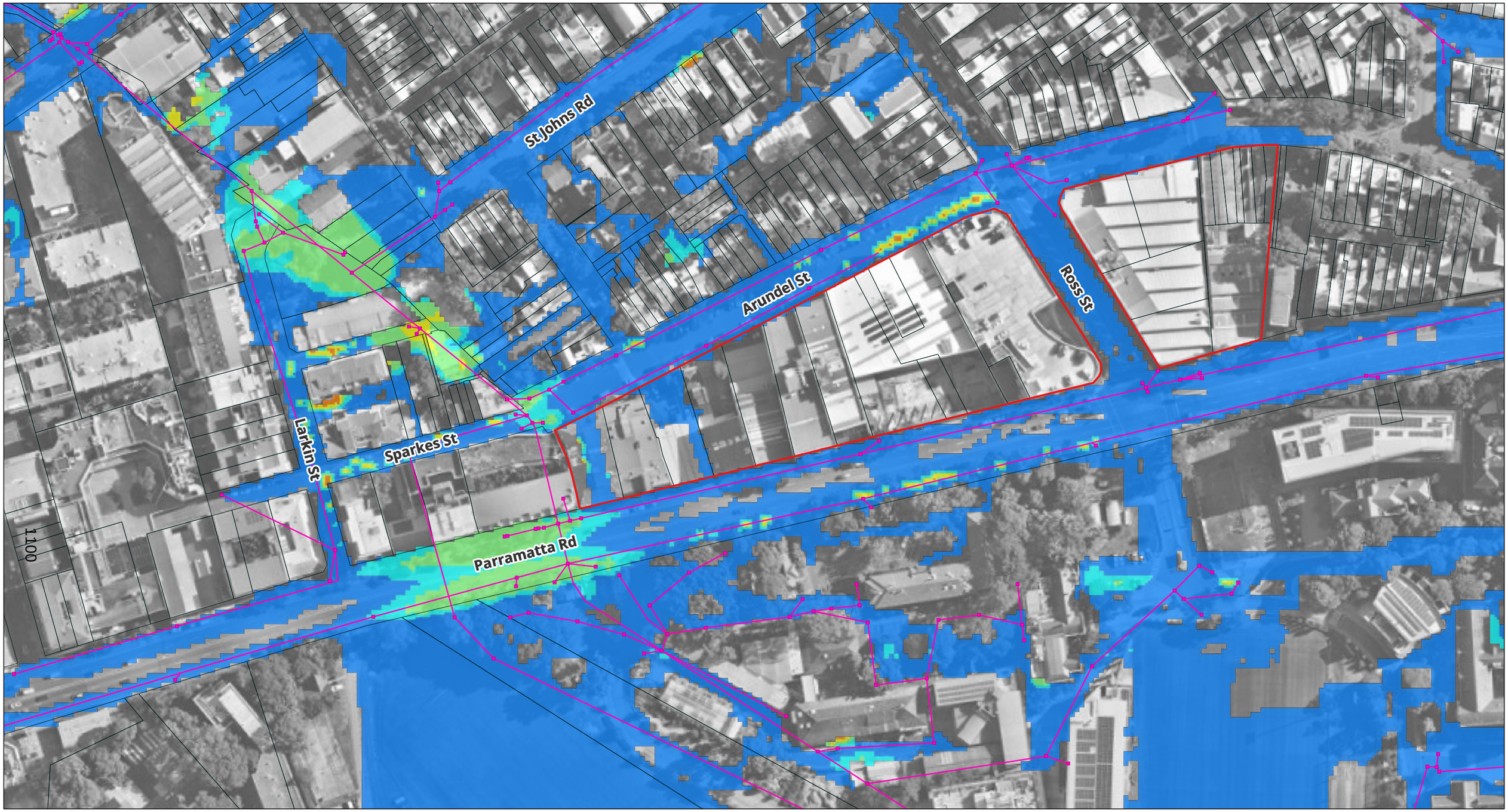
Major Flood Level Contours (Spacing = 1.0 m)
Minor Flood Level Contours (Spacing = 0.2 m)

N W E S

0 20 40 60 80 100

grc HYDRO

TITLE: **PMF Flood Depth and Level**	PROJECT: **Flood Impact and Risk Assessment - Parramatta Road, Forest Lodge**	PROJECT No. **260030**	DATE: **06-2026**	SCALE: **1:1500**	FIGURE No. **A06**



Subject Site
Cadastral Boundaries
Existing Stormwater

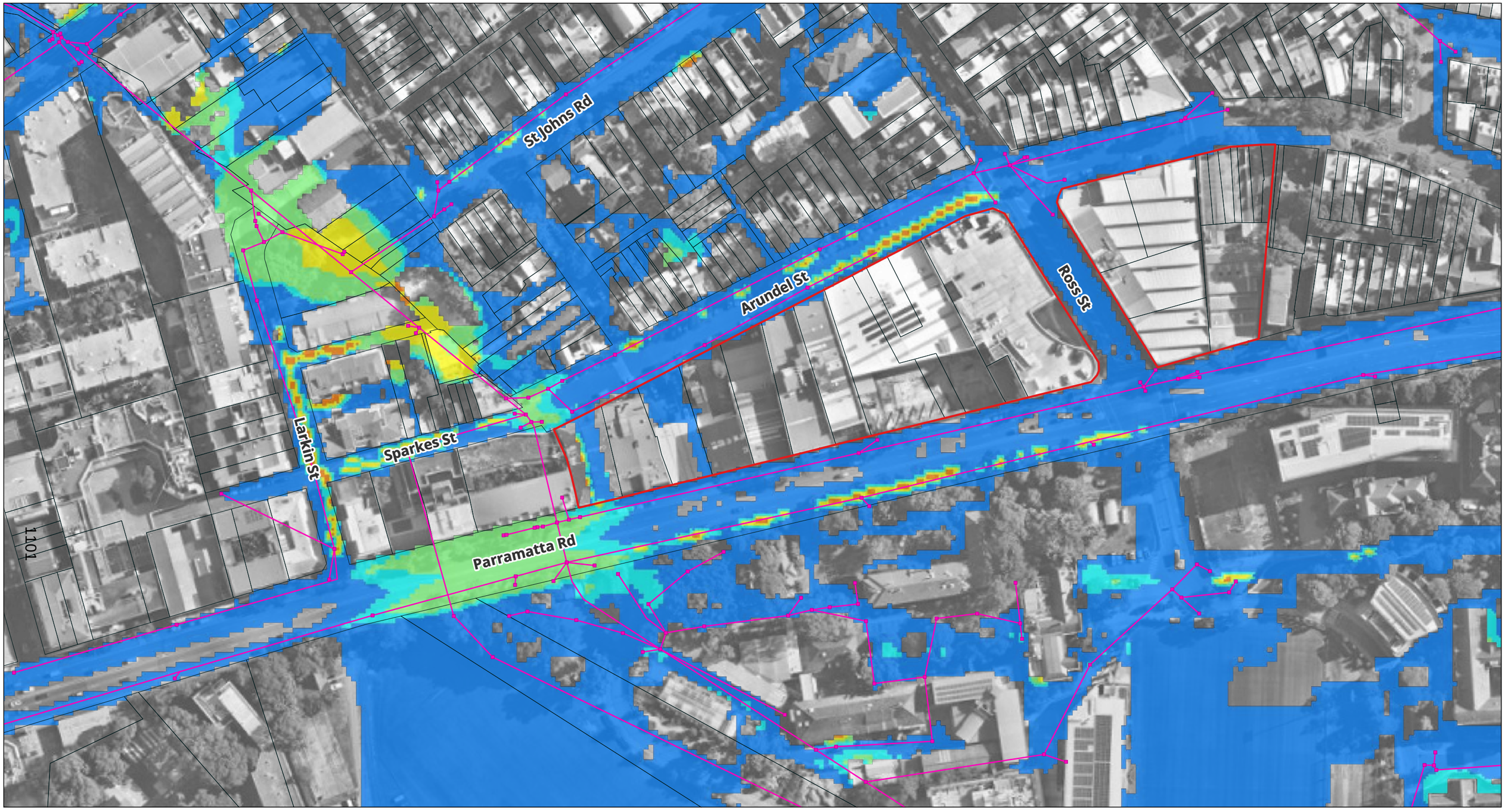
Peak Flood Hazard
- H1
- H2
- H3
- H4
- H5
- H6

N
W E
S

0 20 40 60 80 100

grc HYDRO

TITLE: **20% AEP Flood Hazard**	PROJECT: **Flood Impact and Risk Assessment - Parramatta Road, Forest Lodge**	PROJECT No. **260030**	DATE: **06-2026**	SCALE: **1:1500**	FIGURE No. **A07**



Subject Site
Cadastral Boundaries
Existing Stormwater

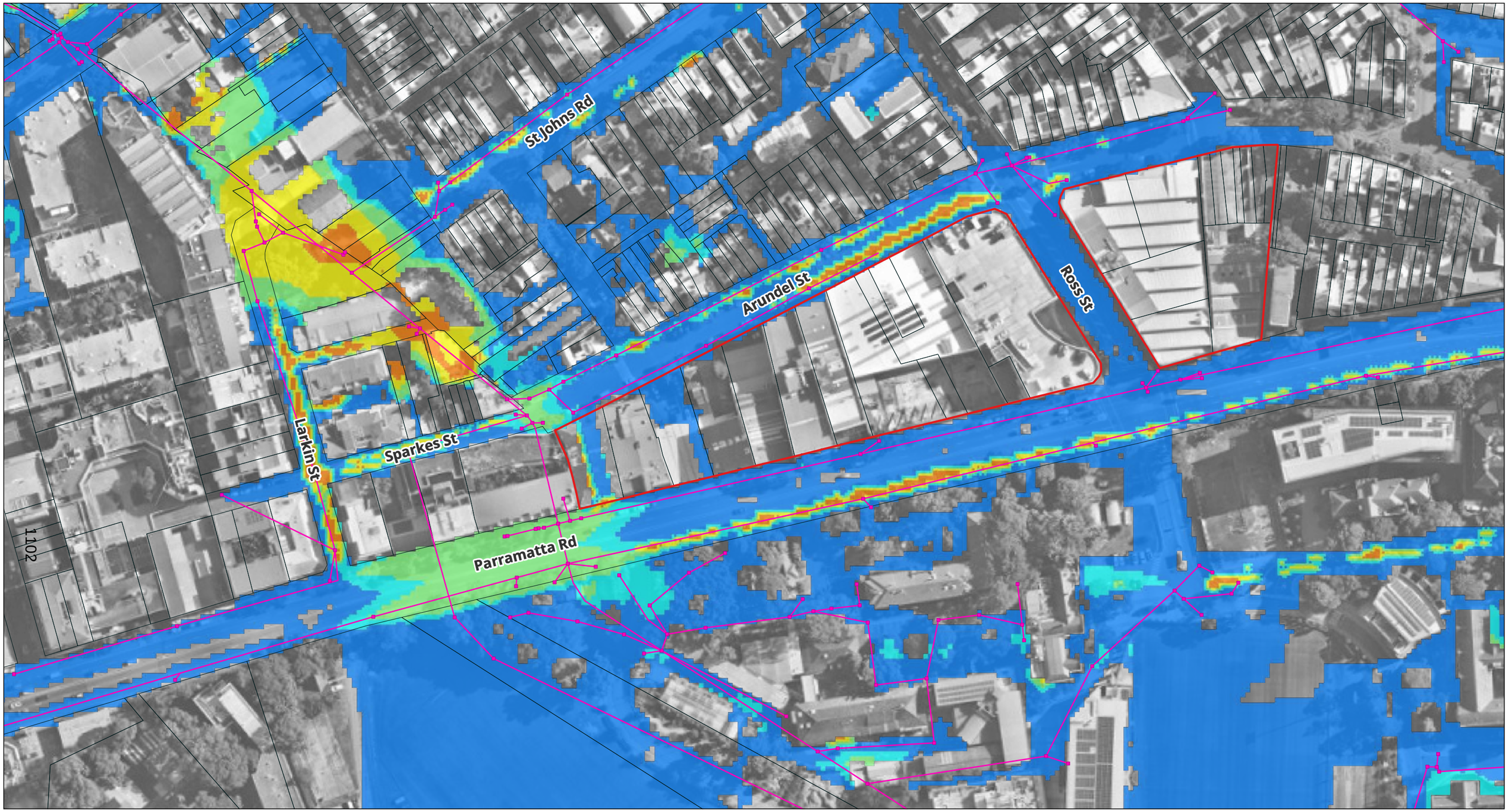
Peak Flood Hazard
- H1
- H2
- H3
- H4
- H5
- H6

N
W E
S

0 20 40 60 80 100

grc HYDRO

TITLE: **5% AEP Flood Hazard**	PROJECT: **Flood Impact and Risk Assessment - Parramatta Road, Forest Lodge**	PROJECT No. **260030**	DATE: **06-2026**	SCALE: **1:1500**	FIGURE No. **A08**



Subject Site
Cadastral Boundaries
Existing Stormwater

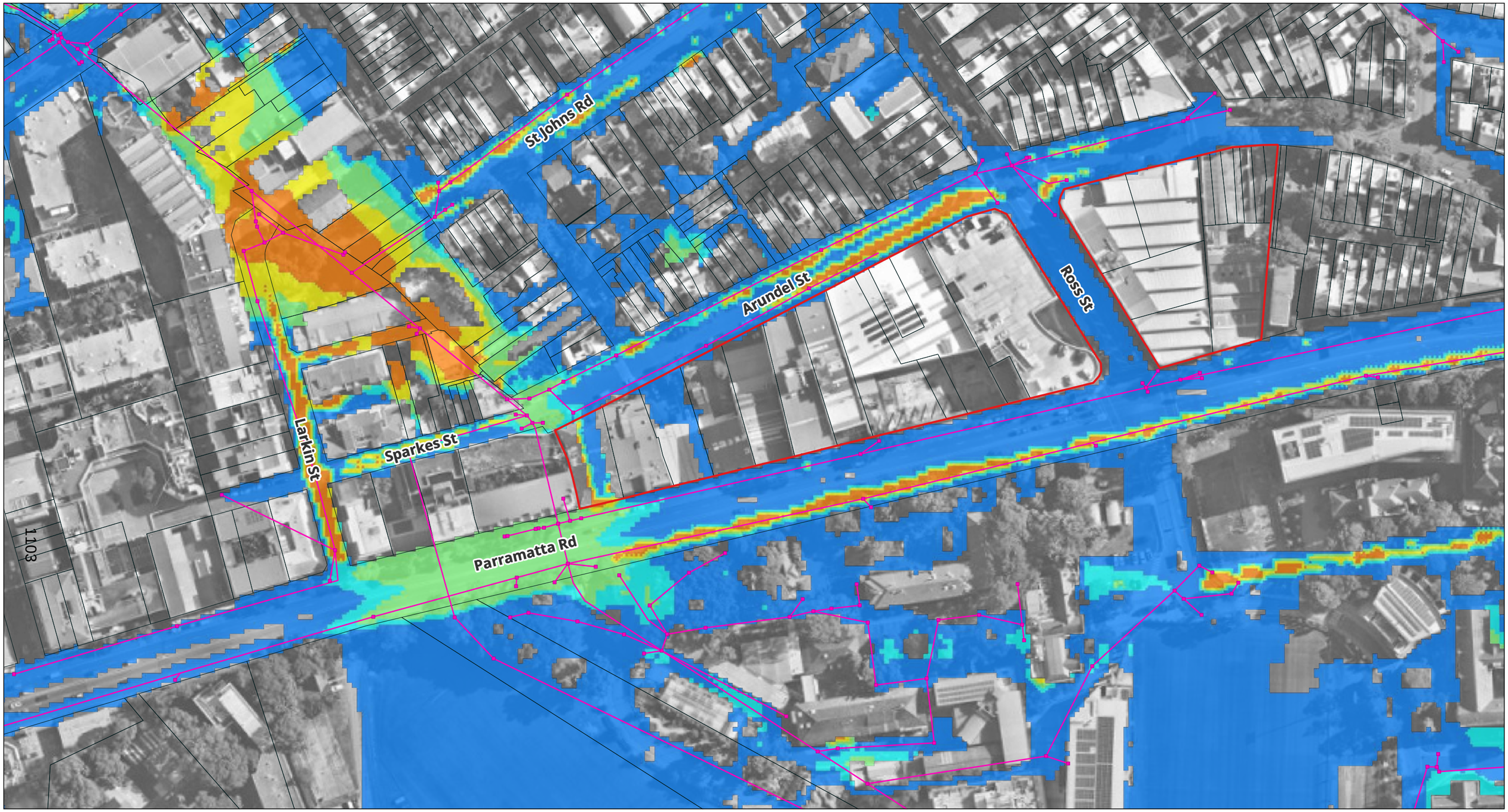
Peak Flood Hazard
- H1
- H2
- H3
- H4
- H5
- H6

N
W E
S

0 20 40 60 80 100

grc HYDRO

TITLE: **1% AEP Flood Hazard**	PROJECT: **Flood Impact and Risk Assessment - Parramatta Road, Forest Lodge**	PROJECT No. **260030**	DATE: **06-2026**	SCALE: **1:1500**	FIGURE No. **A09**



Subject Site
Cadastral Boundaries
Existing Stormwater

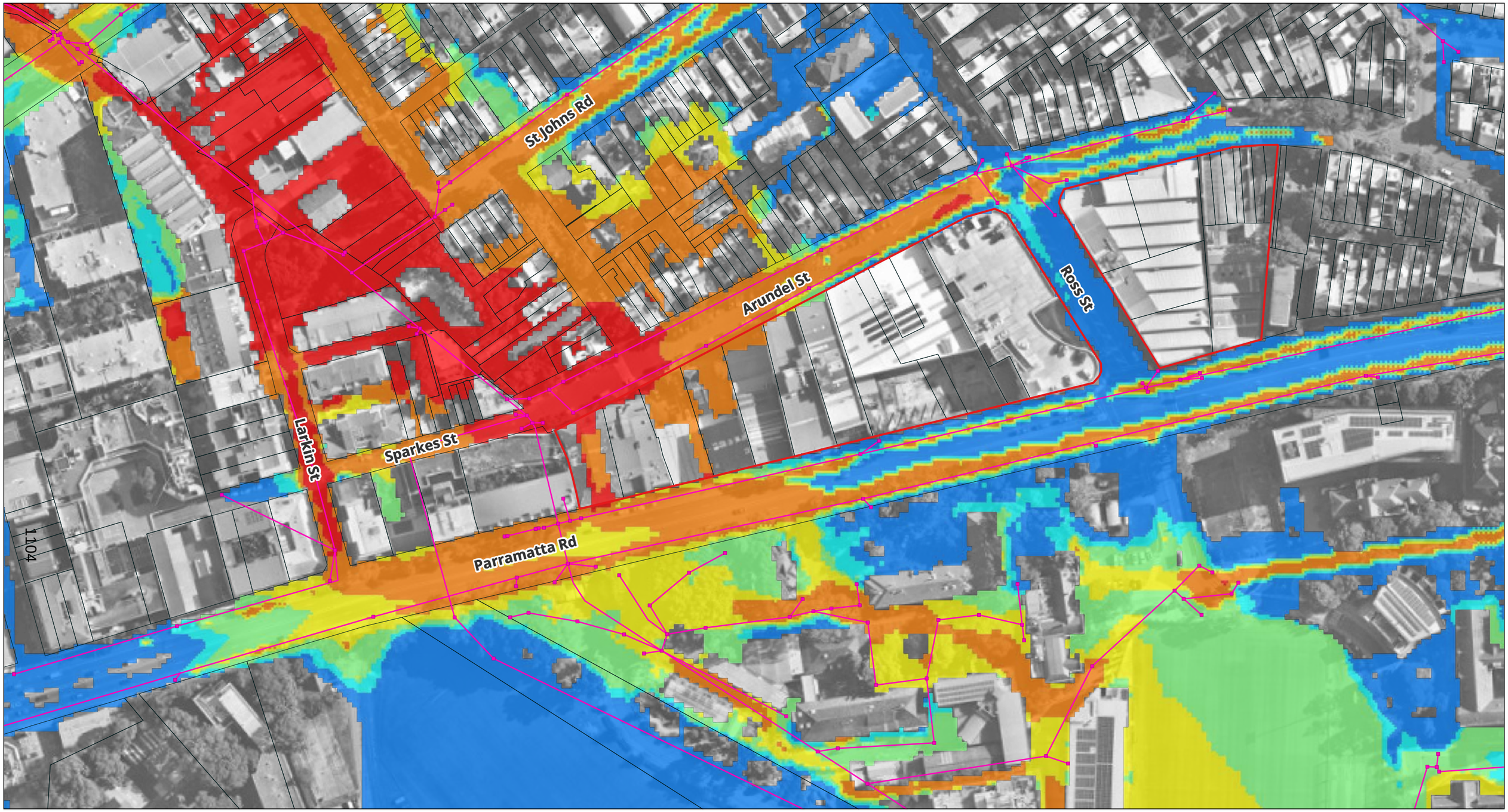
Peak Flood Hazard
- H1
- H2
- H3
- H4
- H5
- H6

N
W E
S

0 20 40 60 80 100

grc HYDRO

TITLE: **0.2% AEP Flood Hazard**	PROJECT: **Flood Impact and Risk Assessment - Parramatta Road, Forest Lodge**	PROJECT No. **260030**	DATE: **06-2026**	SCALE: **1:1500**	FIGURE No. **A10**



Subject Site
Cadastral Boundaries
Existing Stormwater

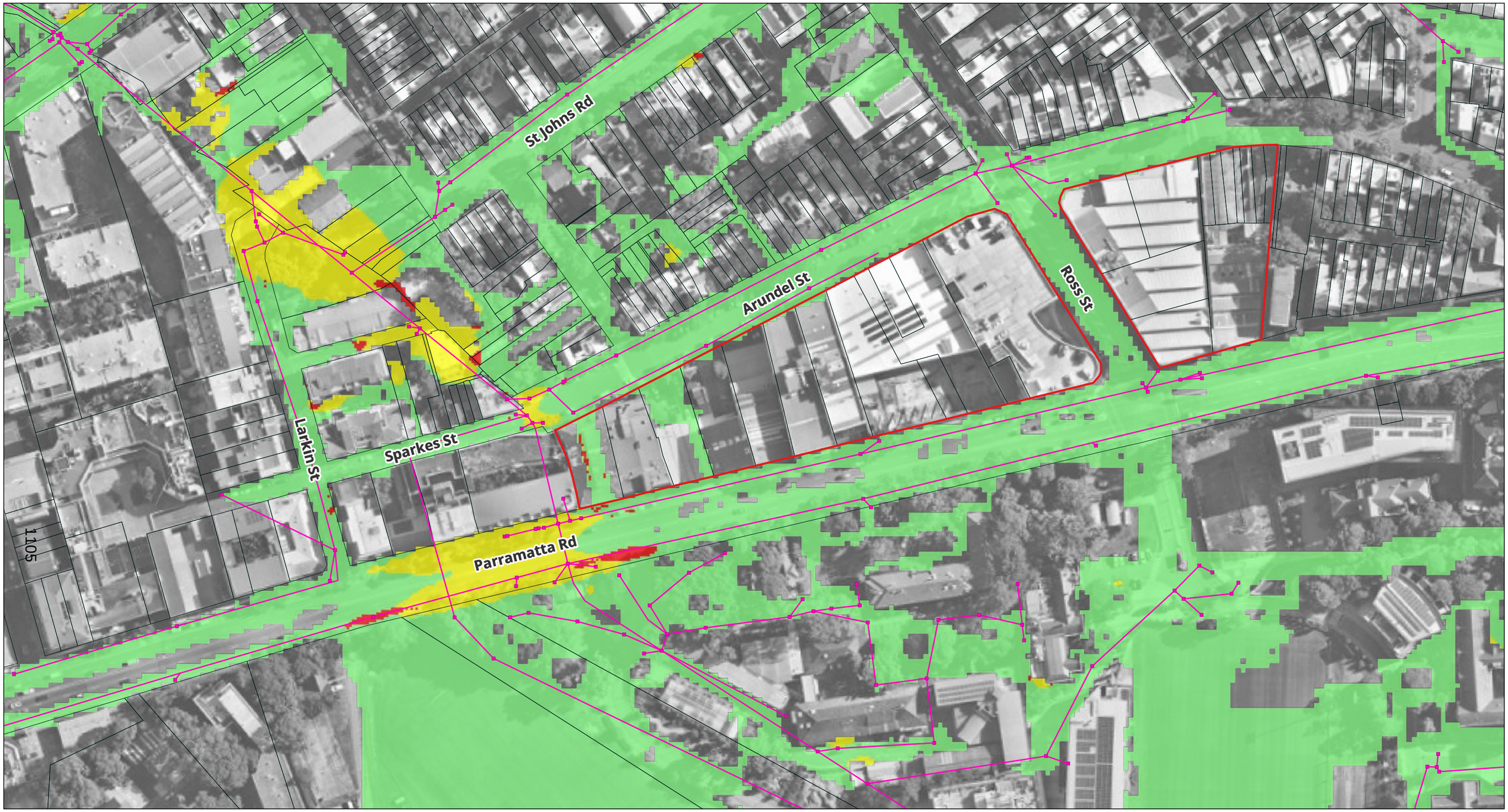
Peak Flood Hazard
- H1
- H2
- H3
- H4
- H5
- H6

N
W E
S

0 20 40 60 80 100

grc HYDRO

TITLE: **PMF Flood Hazard**	PROJECT: **Flood Impact and Risk Assessment - Parramatta Road, Forest Lodge**	PROJECT No. **260030**	DATE: **06-2026**	SCALE: **1:1500**	FIGURE No. **A11**



Subject Site
Cadastral Boundaries
Existing Stormwater

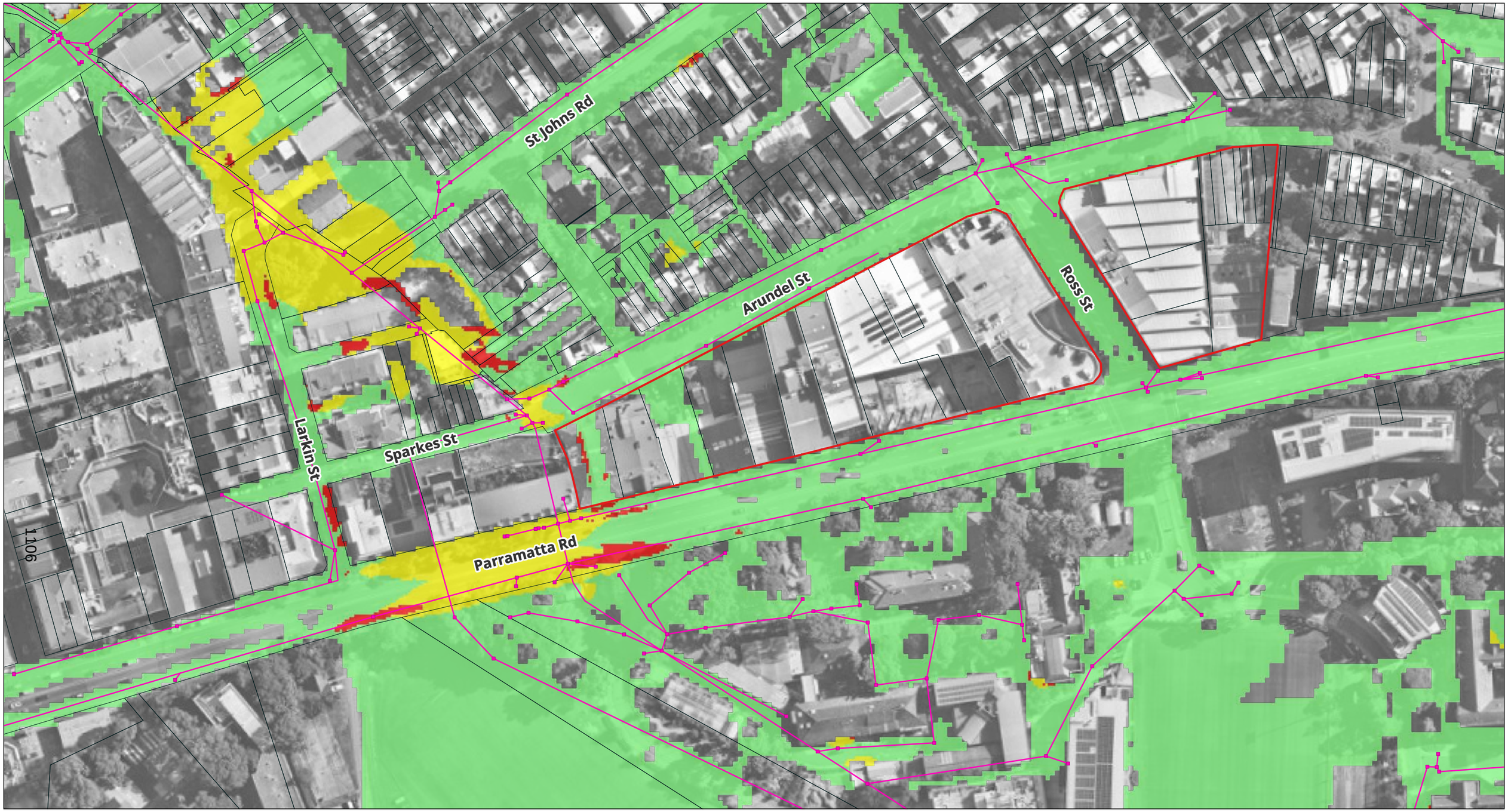
Hydraulic Categories
Flow Conveyance
Flood Storage
Flood Fringe

N
W E
S

0 20 40 60 80 100

grc HYDRO

TITLE: **5% AEP Hydraulic Categorisation**	PROJECT: **Flood Impact and Risk Assessment - Parramatta Road, Forest Lodge**	PROJECT No. **260030**	DATE: **06-2026**	SCALE: **1:1500**	FIGURE No. **A12**



Subject Site
Cadastral Boundaries
Existing Stormwater

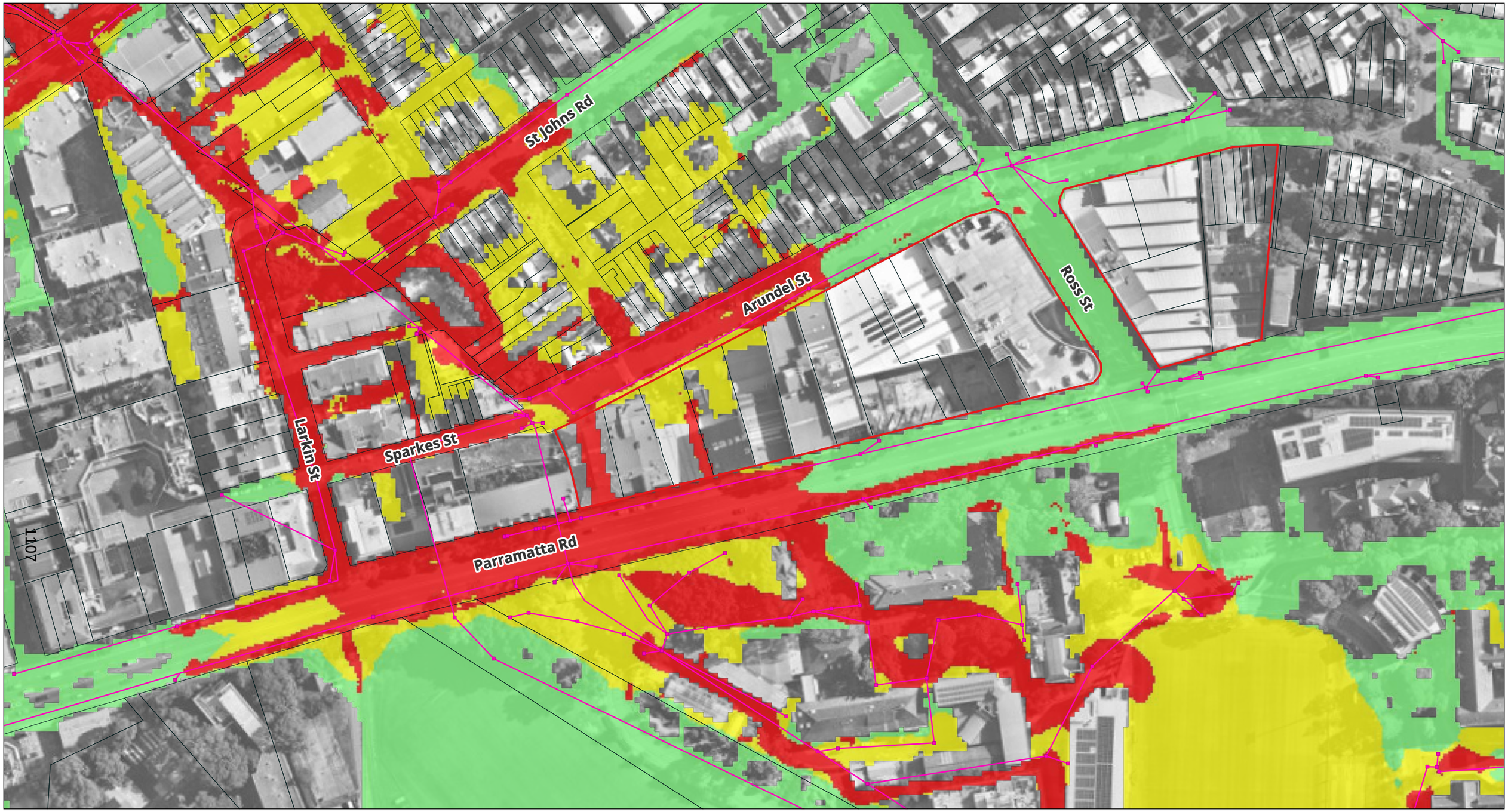
Hydraulic Categories
Flow Conveyance
Flood Storage
Flood Fringe

N
W E
S

0 20 40 60 80 100

grc HYDRO

TITLE: **1% AEP Hydraulic Categorisation**	PROJECT: **Flood Impact and Risk Assessment - Parramatta Road, Forest Lodge**	PROJECT No. **260030**	DATE: **06-2026**	SCALE: **1:1500**	FIGURE No. **A13**



Subject Site
Cadastral Boundaries
Existing Stormwater

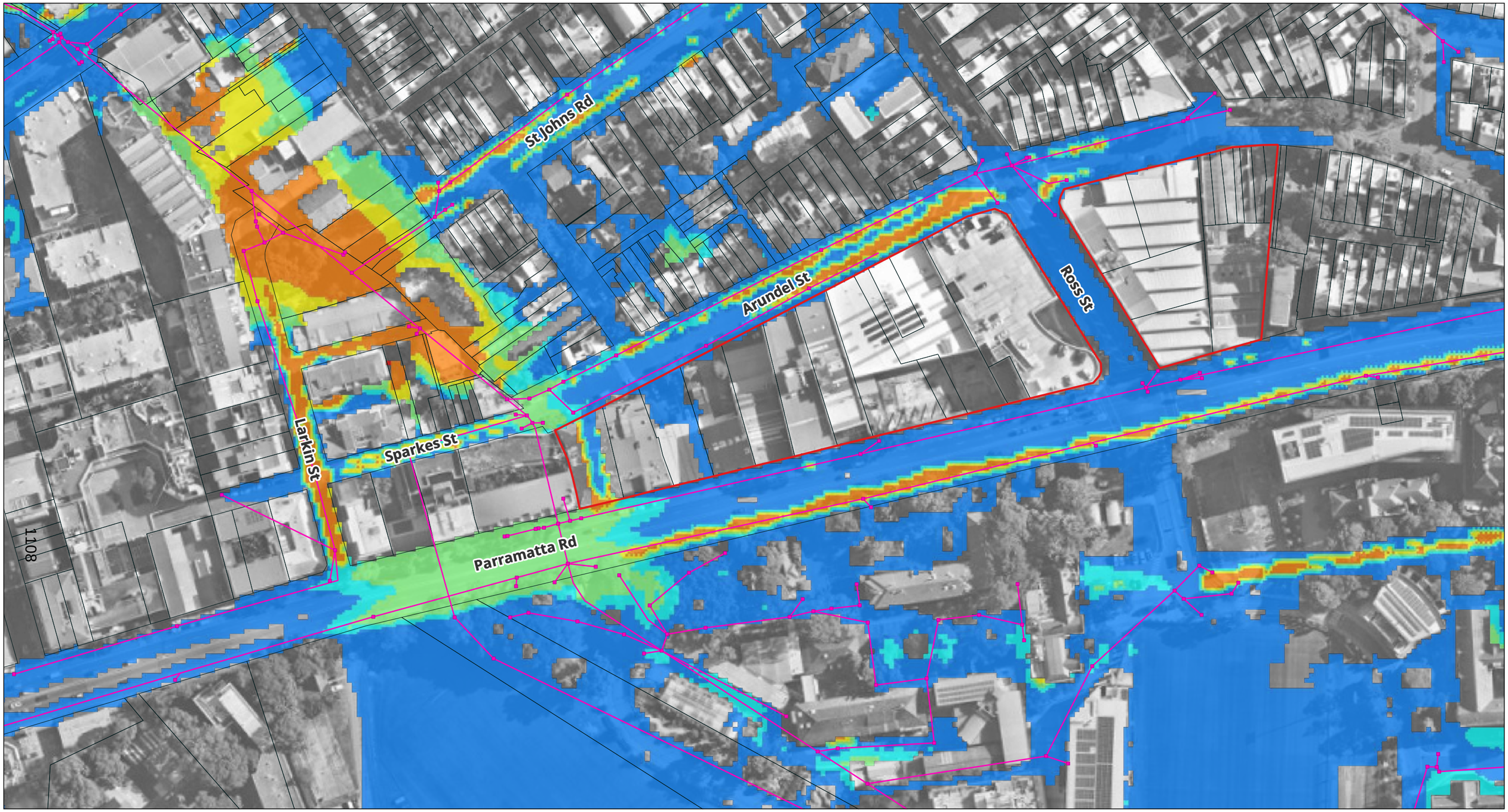
Hydraulic Categories
Flow Conveyance
Flood Storage
Flood Fringe

N
W E
S

0 20 40 60 80 100

grc HYDRO

TITLE: **PMF Hydraulic Categorisation**	PROJECT: **Flood Impact and Risk Assessment - Parramatta Road, Forest Lodge**	PROJECT No. **260030**	DATE: **06-2026**	SCALE: **1:1500**	FIGURE No. **A14**



Subject Site
Cadastral Boundaries
Existing Stormwater

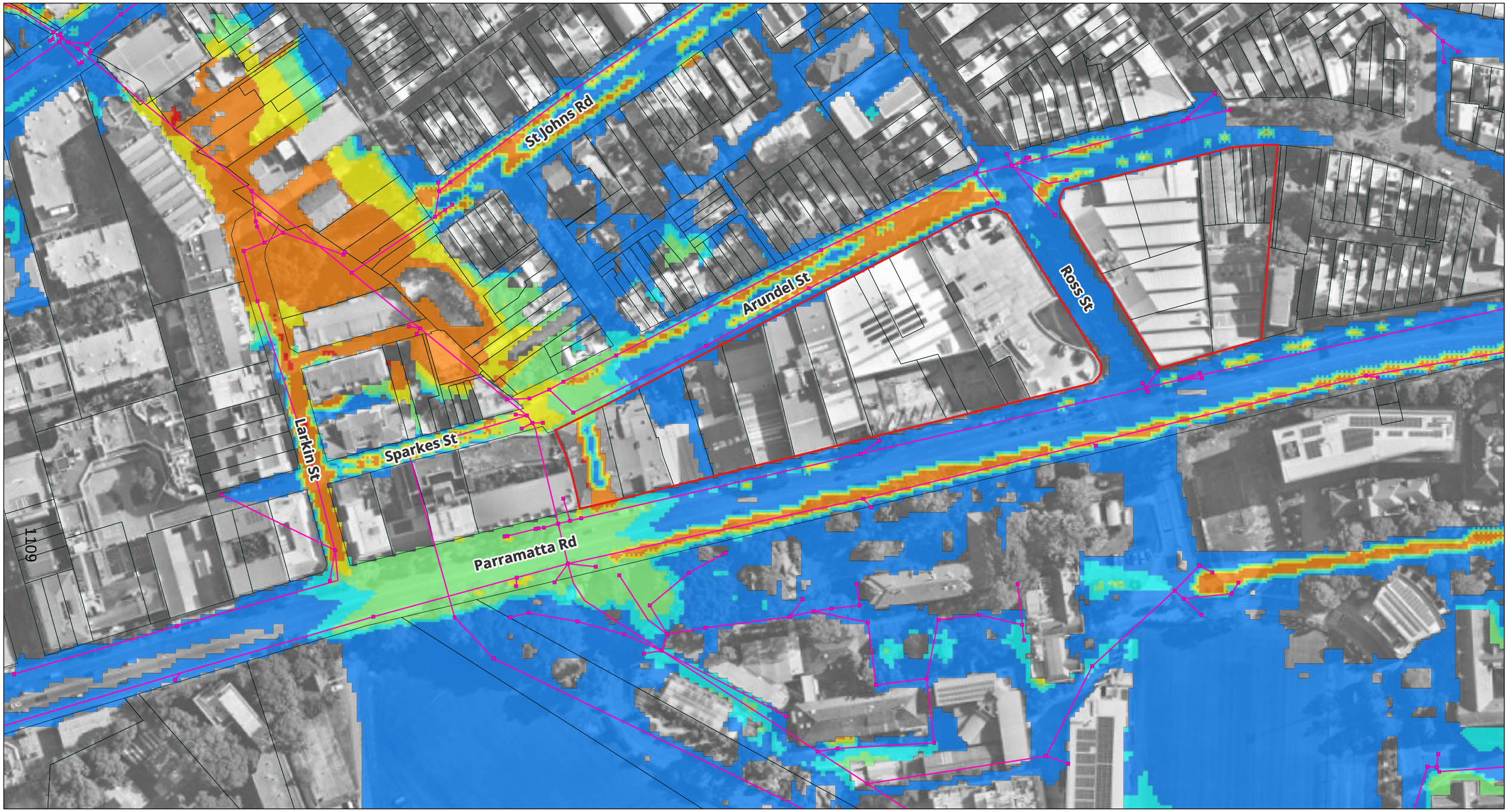
Peak Flood Hazard
- H1
- H2
- H3
- H4
- H5
- H6

N
W E
S

0 20 40 60 80 100

grc HYDRO

TITLE: **1% AEP with Climate Change (50-year SSP5-8.5), Flood Hazard**	PROJECT: **Flood Impact and Risk Assessment - Parramatta Road, Forest Lodge**	PROJECT No. **260030**	DATE: **06-2026**	SCALE: **1:1500**	FIGURE No. **A15.1**



Subject Site
Cadastral Boundaries
Existing Stormwater

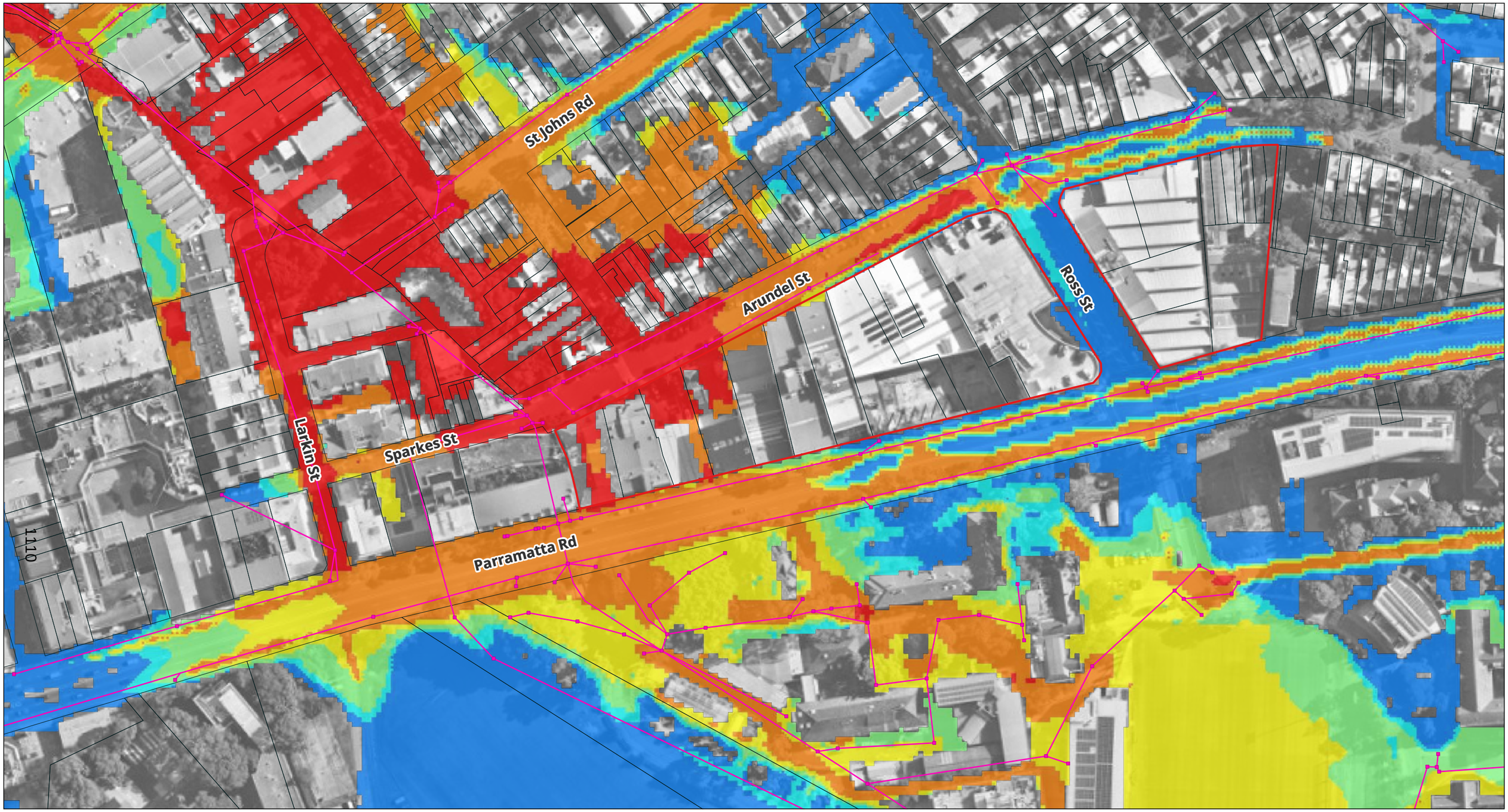
Peak Flood Hazard
- H1
- H2
- H3
- H4
- H5
- H6

N
W E
S

0 20 40 60 80 100

grc HYDRO

TITLE: **1% AEP with Climate Change (100-year SSP5-8.5), Flood Hazard**	PROJECT: **Flood Impact and Risk Assessment - Parramatta Road, Forest Lodge**	PROJECT No. **260030**	DATE: **06-2026**	SCALE: **1:1500**	FIGURE No. **A15.2**



Subject Site
Cadastral Boundaries
Existing Stormwater

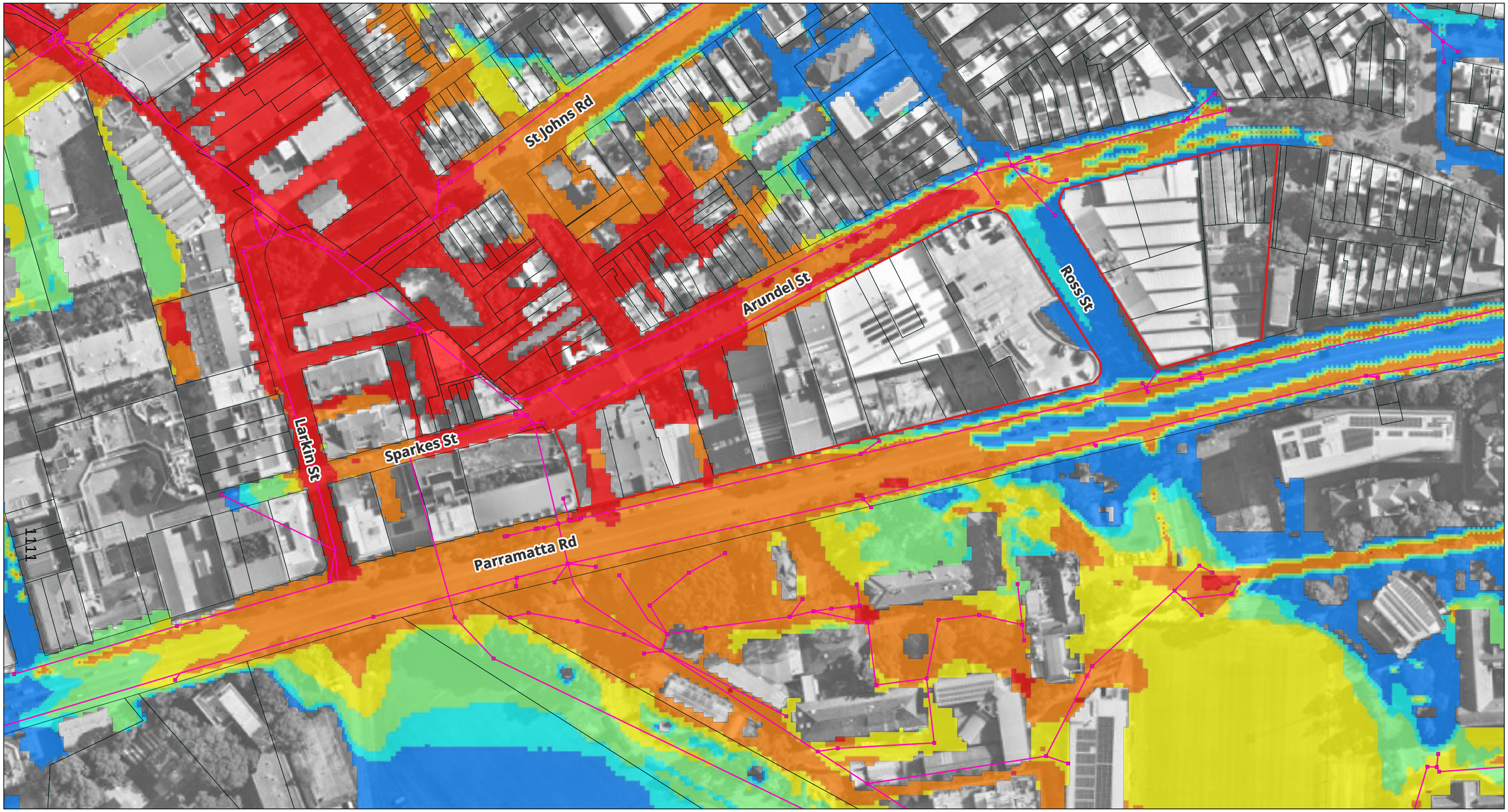
Peak Flood Hazard
- H1
- H2
- H3
- H4
- H5
- H6

N
W E
S

0 20 40 60 80 100

grc HYDRO

TITLE: **PMF with Climate Change (50-year SSP5-8.5), Flood Hazard**	PROJECT: **Flood Impact and Risk Assessment - Parramatta Road, Forest Lodge**	PROJECT No. **260030**	DATE: **06-2026**	SCALE: **1:1500**	FIGURE No. **A16.1**



Subject Site
Cadastral Boundaries
Existing Stormwater

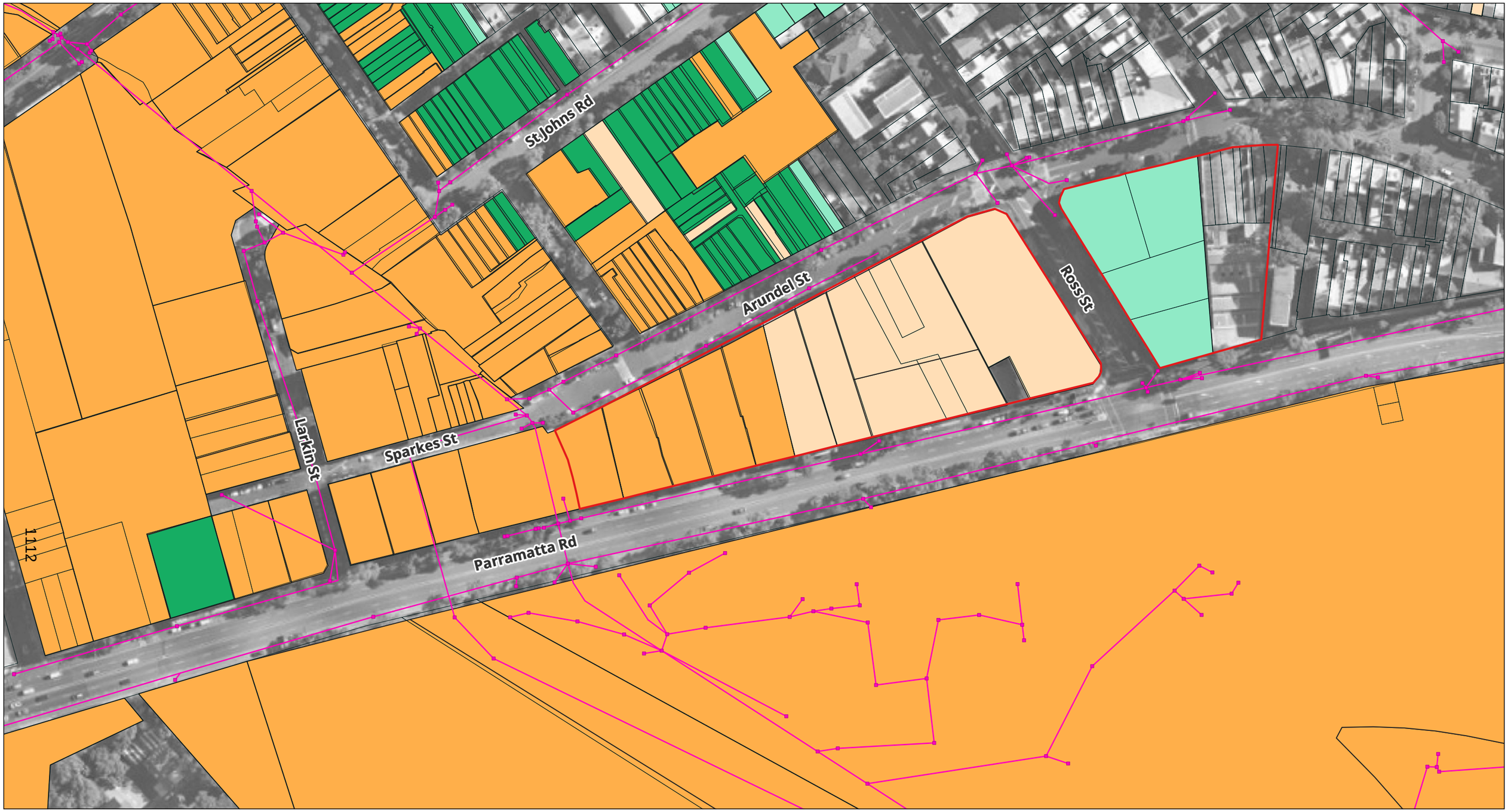
Peak Flood Hazard
H1
H2
H3
H4
H5
H6

N
W
E
S

0 20 40 60 80 100

grc HYDRO

TITLE: **PMF with Climate Change (100-year SSP5-8.5), Flood Hazard**	PROJECT: **Flood Impact and Risk Assessment - Parramatta Road, Forest Lodge**	PROJECT No. **260030**	DATE: **06-2026**	SCALE: **1:1500**	FIGURE No. **A16.2**



Subject Site
Cadastral Boundaries
Existing Stormwater

Flood Planning Area
FPA
FPA Buffer
PMF FPA
PMF FPA Buffer

N
W
E
S
0 20 40 60 80 100

grc HYDRO

TITLE: **Flood Planning Area**	PROJECT: **Flood Impact and Risk Assessment - Parramatta Road, Forest Lodge**	PROJECT No. **260030**	DATE: **06-2026**	SCALE: **1:1500**	FIGURE No. **17**

Job Number: *220126*
Date: *28 October 2026*

GRC Hydro
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Sydney NSW 2000

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www.grchydro.com.au

Re: Parramatta Road Forest Lodge Addendum Letter #1

This letter is in relation to the Flood Impact and Risk Assessment for the proposed rezoning site in Forest Lodge, "Parramatta Road, Forest Lodge – Flood Impact and Risk Assessment (FIRA)" by GRC Hydro, dated August 2026. The proposed changes have been updated since the FIRA was completed. This letter provides assessment of the recent change and confirms the findings of the FIRA remain unchanged. The proposed raised pedestrian evacuation route achieves the same outcomes regarding flood risk management, as amalgamation.

As background, the FIRA noted significant flood-affectation in rare to extreme flood events for the west end of the site, and found:

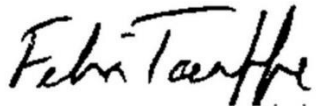
- The seven western-most lots in the rezoning area should be amalgamated in order to allow a building access point at the south-eastern corner, at the eastern end of 52 Parramatta Road
- The findings of the report, which concluded the rezoning was suitable with respect to flood risk, would no longer apply if the lots were not amalgamated. I.e. rezoning without amalgamation was not considered suitable with respect to flood risk, due to the lack of access to the building in a large flood.

The revised planning proposal no longer includes mandatory amalgamation of the lots. Instead it now requires that a publicly-accessible raised pedestrian evacuation route is built, at the front of the seven lots, parallel to the Parramatta Road footpath. The pedestrian evacuation route would be to the same point at the eastern end of 52 Parramatta Road. The planning proposal includes requirement that any one site not be developed unless it can include access to this point, by building its own section of the pedestrian access, and waiting for all lots to the east to have also built their section. This means that apart from 52 Parramatta Road, lots must either be developed simultaneously, or one by one from east (first) to west (last), or some other arrangement that progresses east to west. The planning proposal contains incentives to encourage lot amalgamation in the area.

The raised pedestrian access route to the corner of 52 Parramatta Road is functionally equivalent to the previously assessed amalgamation, that included access within the building to the same corner. In either case the building occupants would be able to access the evacuation point. The findings of the FIRA regarding

flood risk still apply, including that the proposal would be compliant with council policy and the state government ministerial directions of July 2026. The outcomes regarding shelter-in-place and evacuation remain unchanged. The route is an improvement over the amalgamation option as the route would form a public area that would be flood-free in all flood events, rather than an internal building corridor that would likely have access restrictions for someone trying to enter the building.

Yours Sincerely



Felix Taaffe

Senior Engineer