Project No: S10076

9 December 2015

Holdmark
Suit 2/2-4 Giffnock Avenue
MACQUARIE PARK NSW 2113

Attention: Christina Boumelhem

Dear Christina

SHEPHERDS BAY URBAN RENEWAL PROJECT – STAGE A
FLOOD RISK ASSESSMENT

1 BACKGROUND

BG&E has been engaged by Holdmark to prepare a flood risk assessment for the proposed commercial/residential development located on the corner of Church Street and Well Street in Ryde, as shown in Figure 1. The development forms part of the Shepherds Bay Urban Renewal Project and is referred to as 'Stage A'.

Figure 1 - Locality Plan (source: SIX Maps)

Sydney *Office*—

Level 2, 8 Windmill Street, Sydney NSW 2000
P / +61 2 9770 3300 *E* / info@bgeeng.com
bgeeng.com—

BG&E Pty Limited
ABN / 67 150 804 603

The proposed development consists of:

- Six (6) levels of basement for retail, retail storage, and car parking with vehicle entry/exit from Parsonage Street;
- Retail area, cafe, loading dock, apartment foyer, and public space on the ground floor;
- 23 storeys of residential properties above.

A ground floor plan of the development prepared by Cox Architecture is attached.

The flood risk assessment has been prepared by BG&E support the development application (DA) and to:

- Describe flood behaviour in the vicinity of the site;
- Outline Council's requirements for flood risk management;
- Describe how the proposed development satisfies these conditions; and
- Recommend any flood risk management measures required.

2 FLOOD BEHAVIOUR

2.1 Overland flow

Council has recently completed the *Parramatta River – Ryde Sub-catchments Flood Study and Floodplain Risk Management Plan* to define flooding in the vicinity of the project site. Council has also provided flood information for the site itself (attached). Flood behaviour from these reports is summarised as follows:

2.1.1 Flood depths

Flood depth mapping for 100 year ARI and probable maximum flood (PMF) events is attached, showing:

- The site is not affected by flood events up to and including the 100 year ARI flood. 100 year ARI flood depths in the streets adjacent to the site are expected to be less than 100 mm and contained within the kerb and gutter system;
- Flood depths of between 250 mm and 500 mm are shown to occur in Well Street during the PMF. Flood depths for the PMF in the other streets are expected to be contained within the road reserve.

2.1.2 Flood risk

A Flood Risk Precinct map is attached which shows Well Street classified as a Low Risk Precinct. A Low Risk Precinct is defined as 'all other land within the floodplain (i.e. within the extent of the PMF) but not identified within either the High Risk or Medium Risk Precincts'. The site itself is not classified as being a Flood Risk Precinct.

2.1.3 Flood planning area

A Flood Planning Area map is attached which shows the site is located outside of Councils flood planning area. Telephone discussions with Council have confirmed that the site is not classified as being flood affected.

2.2 Parramatta River

The *Lower Parramatta River Floodplain Risk Management Study – Flood Study Review* (Parramatta City Council, 2005) estimated flood levels within the river for a range of design events, as shown in Table 1:

Design Flood Event	Water level (mAHD)
20 year ARI	1.34
100 year ARI	1.42
PMF	1.92

Table 2 – Parramatta River Design Flood Levels (source: Parramatta City Council, 2005)

Proposed finished levels across the site are typically above 9 mAHD. The site is located outside of the Parramatta River flood extent for events up to and including the PMF.

3 FLOOD RISK MANAGEMENT

Requirements for Flood Risk Management within the City of Ryde are outlined in Councils *Development and Control Plan (DCP) Part: 8.2 Stormwater and Floodplain Management (2014).*

3.1 Overland flow

100 year ARI flood depths in the streets adjacent to the site are expected to be less than 100 mm and contained within the kerb and gutter system. Flood risk to the site can be managed by ensuring finished levels along the site boundary are at least 100mm above top of kerb levels as shown in Figure 2.

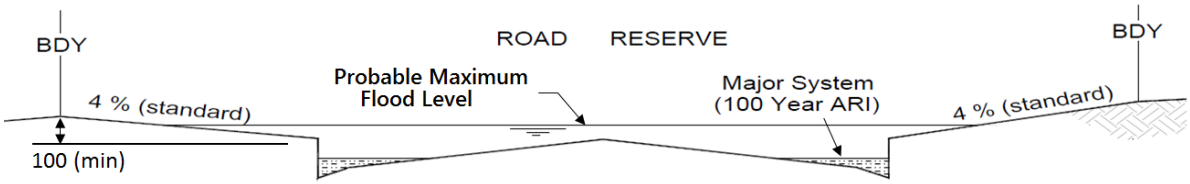


Figure 2 – Local drainage flood management

The vehicle entry to the basement incorporates a crest (threshold) prior to descent which is at or above the level of the PMF, as shown in Figure 3. All stairwell entries and ventilation openings to the basement should also be above the PMF level. The basement entry is located on Parsonage Street where the PMF is expected to be contained within the road reserve. Levels at the site boundary should be at least 100 mm above the top of kerb levels to provide suitable protection from the PMF to basement areas.

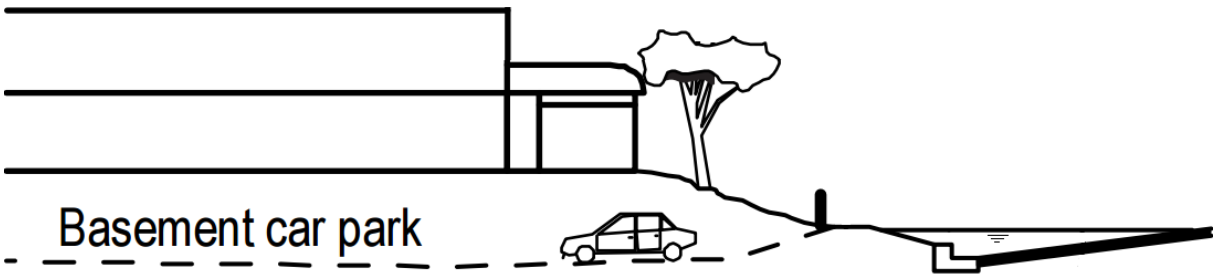


Figure 3 – Basement flood protection

3.2 Local site drainage

Localised flows due to stormwater runoff on the site itself may typically be around 50 mm to 100 mm in depth. Floor levels for all building areas should be minimum 150 mm above adjoining ground levels to ensure adequate protection from stormwater inundation within the site itself.

3.3 Evacuation

The site itself is not classified as being flood affected for events up to and including the PMF. No evacuation plan or flood warning system is required for the development.

3.4 Flood affectation

All flood events up to and including the PMF are contained within the surrounding road reserves. Development of the site will not impact existing flood behaviour.

4 CONCLUSIONS

This report identifies existing flood behaviour in the vicinity of the site to ensure flood risk is suitably managed during the development. The site itself is not classified as being flood affected for events up to and including the PMF. The following flood risk management measures have been incorporated into the development:

- Finished levels along the site boundary are at least 100 mm above top of kerb levels to prevent overland flows within the adjacent streets from entering the site;
- Basement entry threshold levels (vehicle entry, stairwells, ventilation etc.) are also above PMF flood levels;
- Floor levels for all building areas should be minimum 150 mm above adjoining ground levels to ensure adequate protection from localised stormwater inundation;
- The proposed development will not adversely impact existing flood behaviour.

It is our belief that the proposed development meets Councils requirements for flood risk management.

Yours sincerely,
For BG&E Pty Limited

BRETT STINTON
Principal Water Engineer

enc.

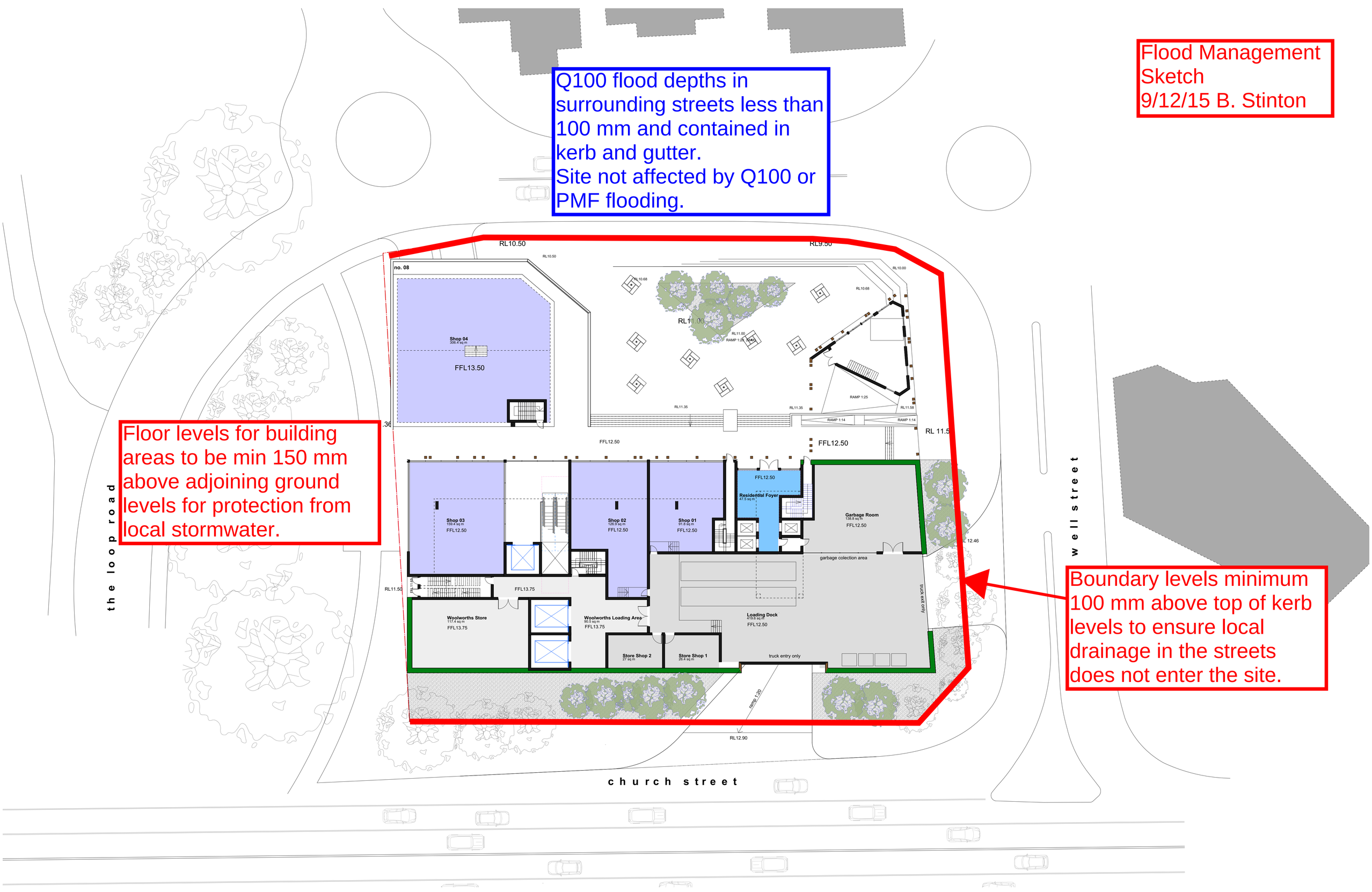
Flood risk management sketch
Flood mapping
Site flood information

Flood Management Sketch
9/12/15 B. Stinton

Q100 flood depths in surrounding streets less than 100 mm and contained in kerb and gutter.
Site not affected by Q100 or PMF flooding.

Floor levels for building areas to be min 150 mm above adjoining ground levels for protection from local stormwater.

Boundary levels minimum 100 mm above top of kerb levels to ensure local drainage in the streets does not enter the site.



ground level

mixed use development @

8 parsonage street RYDE

0 2 4 10m
1.200 @ A1 1.400 @ A3

– DA 13

COX richardson architects level 6 / 155 clarence street sydney 2038 p + 61 2 9267 9599 f + 61 2 9264 5844 kennedy associates architects level 3 / 1 booth street annandale 2038 p + 61 2 9557 6466 f + 61 2 9557 6477

SINCLAIR KNIGHT MERZ SKM

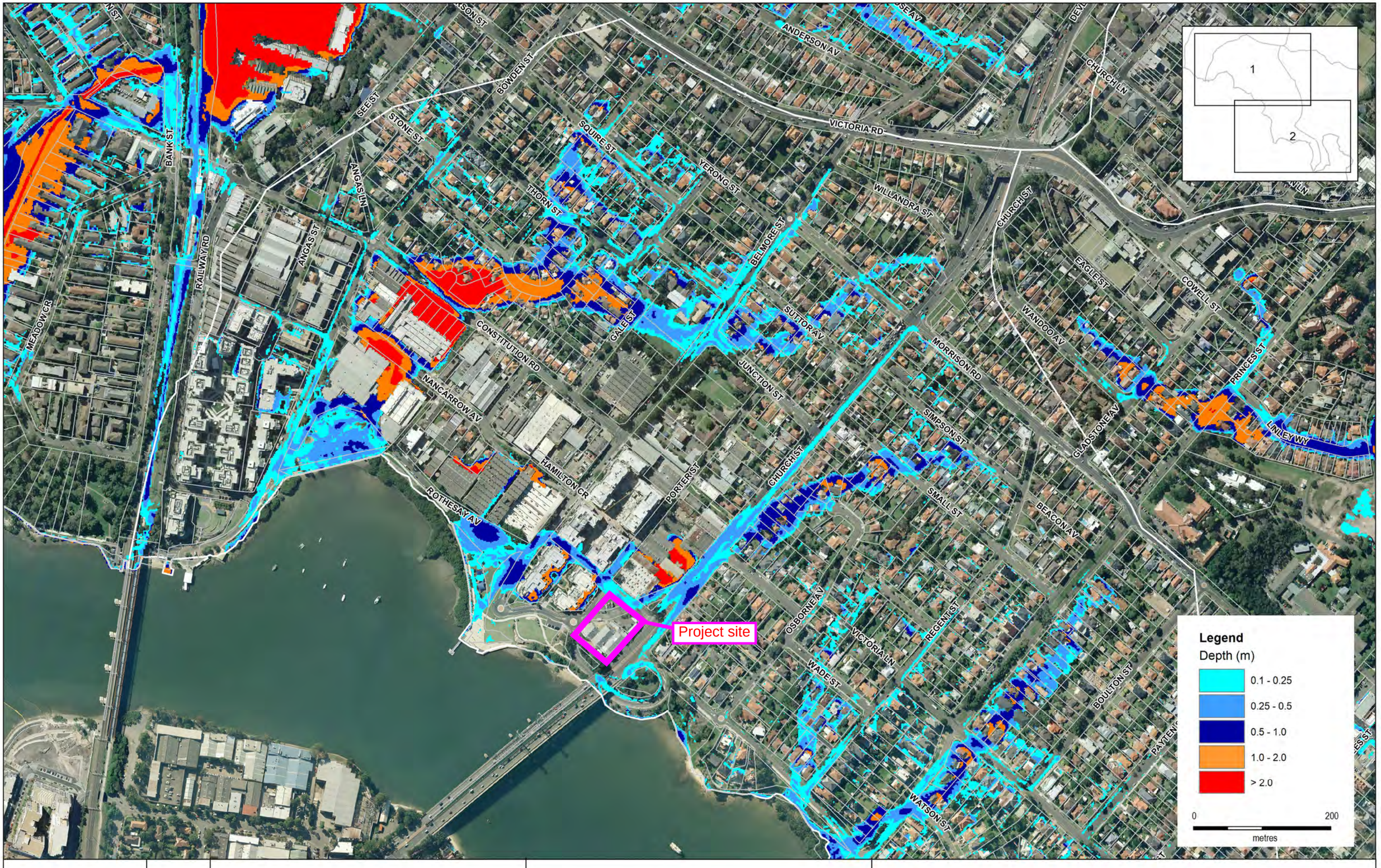
N

Datum: GDA 1994
Coordinate System: MGA Zone 56

Parramatta River - Ryde Sub-Catchments
Flood Study and Floodplain Risk Management Plan

1% AEP Peak Flood Depth

River Catchment Sheet 1 of 2



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Parramatta River - Ryde Sub-Catchments
Flood Study and Floodplain Risk Management Plan

PMF Peak Flood Depth

River Catchment Sheet 1 of 2

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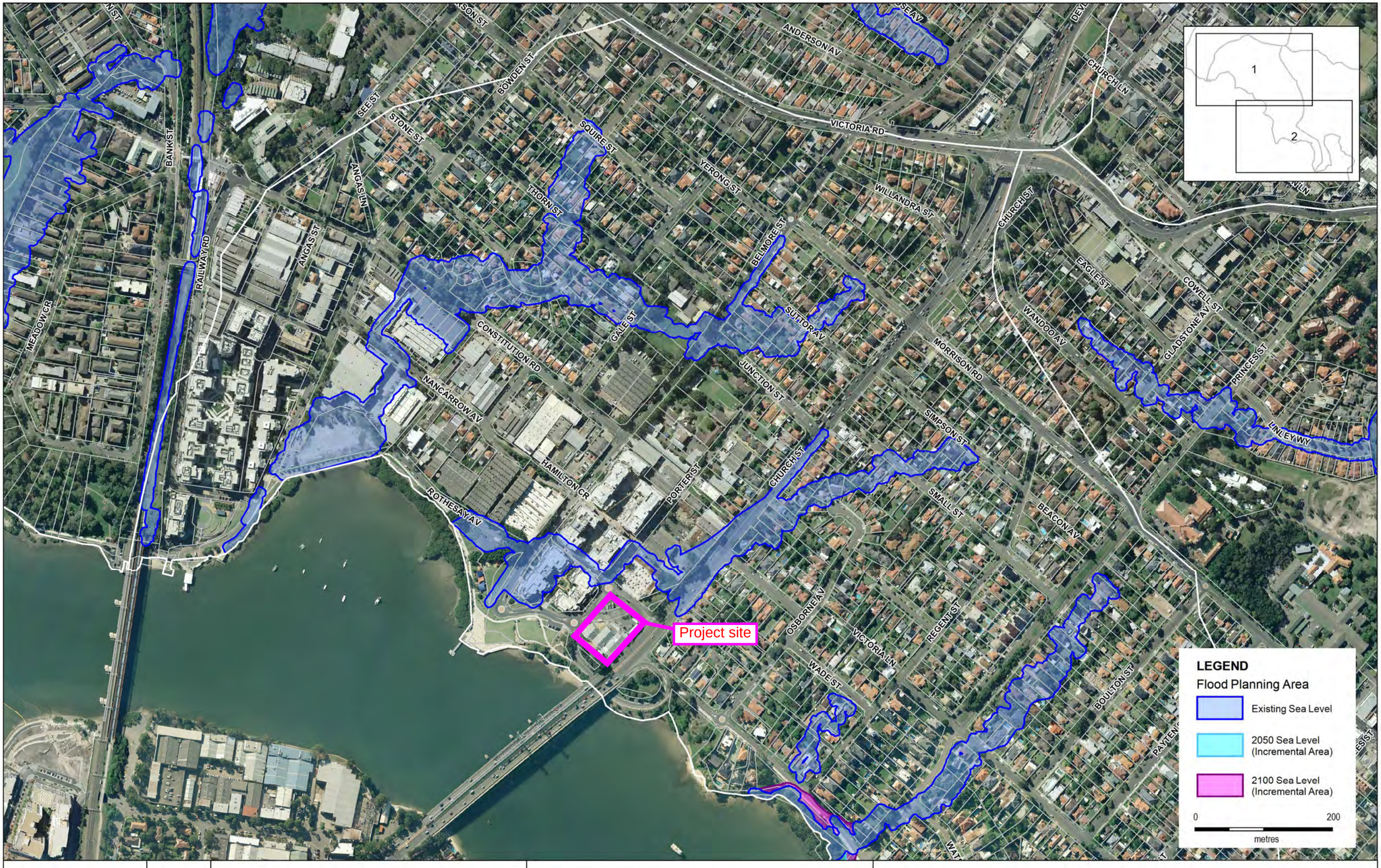
Parramatta River - Ryde Sub-Catchments
Flood Study and Floodplain Risk Management Plan

Flood Risk Precincts
River Catchment Sheet 1 of 2



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Parramatta River - Ryde Sub-Catchments
Flood Study and Floodplain Risk Management Plan

Flood Planning Area

River Catchment Sheet 1 of 2

City of Ryde

Lifestyle and opportunity @ your doorstep

Mr Brett Stinton
Level 2, 8 Windmill Street
SYDNEY NSW 2000

4 December 2015 Our ref: D15/158551

Dear Mr Brett Stinton,

RE: Request for Flood Information – No. 155 Well Street, Ryde

Reference is made to your application received on 3 December 2015 seeking flood level information pertaining to the above-mentioned address.

Please find attached flood level data sheet providing flood levels for the 100 year ARI (Average Recurrence Interval) flood event and the PMF (Probable Maximum Flood) event.

This information has been provided to Council by Jacobs Group (Australia) Pty Ltd, and is derived from models established as part of the Parramatta River – Ryde Sub Catchments Flood Study and Floodplain Risk Management Study and Plan.

Please be advised that flood models are approximate. Care and expertise is required in the interpretation of these flood levels. In addition, this flood information does not take into account any local overland flow issues.

Any person or organisation who acts on the information provided does so at his / her / its own risk. To the extent permitted by law, the City of Ryde accepts no responsibility and excludes all liability whatsoever in respect of any use of or reliance upon this information.

Should you require any further information, please feel free to contact me on (02) 9952 8222.

Yours sincerely,

Guna Veerasingham
Stormwater Coordinator, Stormwater and Catchments
Asset Systems

City of Ryde

FLOOD INFORMATION REQUEST

Property Address: No. 155 Well Street, Ryde
Issue Date: 4 December 2015
Flood Study Reference: Parramatta River Ryde Sub Catchments Flood Study Report (Jan 2015)
Flood Model Reference: TUFLOW Model (March 2014)

Flood Level Location Map

Flood Level Data Table

Location	100 Year ARI Flood Event (m AHD)	Probable Maximum Flood (m AHD)
A	**Nil**	11.74
B	**Nil**	11.57
C	**Nil**	10.21
D	**Nil**	9.67
E	**Nil**	12.00
F	Nil	9.87

City of Ryde

Notes:

- All levels are based on Australian Height Datum (AHD).
- Flood levels are indicative only.
- The flood levels were derived using Areal Laser Survey (ALS) data which is considered as approximate.
- This flood level information is for existing site conditions only.
- For any new development proposal with different footprint, concept plans are required.
- The floor levels of the proposed habitable floor area should be set with a free board of 300 mm (Low Risk) and 500 mm (Medium Risk and High Risk) to the 100 year ARI flood level. A free board of 150 mm is applicable for non habitable floor areas. Refer City of Ryde Development Control Plan 2014.
- A site specific flood study / risk assessment may be required for any future development. Engage a suitably qualified engineer to assist you in this matter. Any study or assessment shall be in accordance with the NSW Government's Floodplain Development Manual 2005 and the City of Ryde Development Control Plan 2014.
- Site specific ground and building survey levels should be used to relate flood levels and to assess the impact of flooding.

Flood Risk Map: Low