



FLOOD IMPACT ASSESSMENT

FOR

**1 VILLAWOOD PLACE,
VILLAWOOD**

MIXED USE DEVELOPMENT

**REPORT NO. R01282-FIA
REVISION D**

JANUARY 2016

PROJECT DETAILS

Property Address: 1 Villawood Place, Villawood

Development Proposal: Mixed use development

REPORT CERTIFICATION

Report prepared by:



WILLIAM WEBB
Civil Engineer
B.E.(Civil)Hons., DipEngPrac

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NPER(Civil), NPER (Building Services)

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REVISION	ISSUE DATE	ISSUED TO	ISSUED FOR
A	JULY 2015	CLIENT	INFORMATION
		FAIRFIELD COUNCIL	APPROVAL
B	NOVEMBER 2015	CLIENT	INFORMATION
		FAIRFIELD COUNCIL	APPROVAL
C	DECEMBER 2015	CLIENT	INFORMATION
		FAIRFIELD COUNCIL	APPROVAL
D	JANUARY 2016	CLIENT	INFORMATION
		FAIRFIELD COUNCIL	APPROVAL

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1. INTRODUCTION

1.1 Background

This Flood Impact Assessment has been prepared in accordance with Fairfield Council's Development Control Plan (DCP) to support the Development Application (DA) for the proposed mixed use development at 1 Villawood Place, Villawood.

The scope of this report includes a comprehensive assessment of the flood effects on the proposed development. Accordingly, this report includes findings of the assessment and proposes a best practice flood management strategy.

The following information and documents were utilised in this investigation:

- Concept Civil Engineering Drawings for the Development Application submission prepared by C&M Consulting Engineers;
- Architectural Drawings by Tony Owen Partners;
- Fairfield City Wide Development Control Plan – Chapter 11 – Flood Risk Management Amendment No.7A (2013);
- Flood Modelling Results by Cardno
- “Australian Rainfall and Runoff – A Guide to Flood Estimation”, Institute of Engineers, Australia (1987)
- “Floodplain Development Manual – The Management of Flood Liable Land”, Department of Infrastructure, Planning and Natural Resources, New South Wales Government (2005)

The increase in building footprints and alteration to the natural topography due to land development has the potential to affect upstream and/or downstream flow conditions. This has the potential to impact on flood regimes and cause erosion of the downstream drainage network and associated waterways.

To avoid any adverse impact on the downstream drainage systems, the development must be designed to ensure the safe conveyance of flows throughout the site and within the capacity of the downstream trunk drainage systems in a healthy environmental state for Ecological Sustainable Development.

1.2 The Site

The site is located within a commercial/industrial district at the corner of Villawood Road and Villawood Place. The land generally falls to the North-East of the site towards Villawood Road. It is proposed to construct a mixed used development with basement car parking (Refer to **Figure 1**).

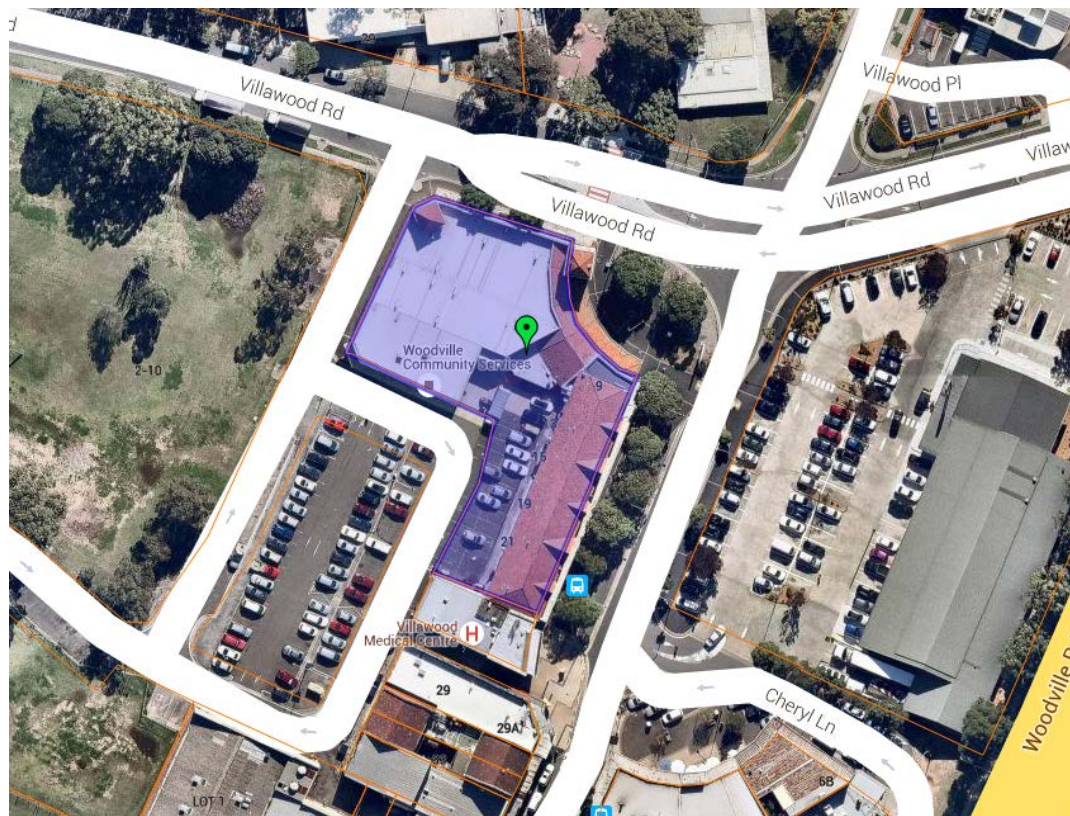


Figure 1 - Aerial Photo of Existing Site
(Source: Nearmap.com)

1.3 Key Issues

The key issues to be addressed in this report include:

Flooding – New structures have the potential to alter existing flow paths and result in changes to flood extent, depth and velocity both upstream and downstream of the subject site. This can have the potential to cause damage and erosion to neighbouring properties. Any proposed development must ensure that upstream and downstream flow conditions are maintained with no increase in flood level.

2. FLOOD MODELLING

C&M was engaged by the Applicant to conduct the flood impact assessment for the development site. The proposed ground floor layout of the subject site was sent to Council's consultant (Cardno) to assess the potential flood effects of the development on the surrounding area. This flood report is to be read in conjunction with the previously issued Flood Impact Assessments by C&M Consulting Engineers.

2.1 Pre vs. Post Development

Following a meeting with Council's development and flooding engineers, additional modelling was requested to reflect the design widths and level changes within the public site thru link. Cardno provided updated flood results based on revised architectural plans incorporating a public site thru link connecting Kamira Court and Villawood Road (Appendix A – Figure 2).

Results received from Cardno indicated a reduction in flood depths downstream of the public site thru link of approximately 40mm. Reductions to the depths of inundations up to 290mm are also expected to occur within the low point of the Kamira Court car park. However, the results also indicated some minor localised depth increases within the upper reaches of Kamira Court of up to 70mm (Appendix A – Figure 3).

The results were interrogated and it was determined that these localised flood depth increases were a consequence of the following factors:

- The public site thru link (actual width 2.3m) was under represented as a 1.6m wide passageway in the future conditions model, thus creating a choking effect.
- The existing low point within Kamira Court is misaligned with the entrance to the public site thru link.

Following additional testing and discussion with Council's consultant (attached as Appendix B) it was agreed that the following measures would reduce the small localised depth increases to predevelopment conditions:

1. That the public site thru link entrance width under the future development conditions be no less than 2.0m wide.
2. Minor regrading of the car park shall be completed to ensure that the low point at the rear of the site aligns with the public site thru link opening, thus drawing overland flow into the access way.

Point No.1 has been satisfied as the proposed public site thru link has an internal width of 2.3m and a minimum opening width of 2.0m. Point No.2 can be implemented during construction works if deemed necessary.

As such, the development will have a negligible impact on the flood behaviour on the surrounding areas. As the flood levels are generally consistent between the existing site conditions and the proposed site conditions the development will not increase flood risk.

2.2 Finished Floor Levels

The finished floor levels for the development are based on the 1% AEP Peak Flood Levels with 150mm depth filter provided by Cardno as depths less than 150mm would normally be contained to within the roadway by the nominal kerb height.

These levels are summarised in Table 1:

Table 1 – Finished Floor Levels & Freeboard Provided

Location	Finished Floor Level (RL)	1% AEP Peak Flood Levels by Cardno (RL)	Freeboard Provided (mm)
Lower Lobby	20.50	20.20 (nearest contour)	300
Lifts 2 & 3	21.10		500
Upper Lobby	20.80	20.30	500
Retail 01	21.50 to 20.80	21.00 20.30	500 500
Retail 02 / Café	20.50	20.20 (nearest contour)	300
Retail 03	20.65	-	-
Retail 04	20.80	-	-
Retail 05	21.10	-	-
Retail 06	21.30	-	-
Retail 07	22.20	21.70 (nearest contour)	500
Retail 08	22.20	21.70	500
Driveway Crest	21.90	-	-
Transformer Room	21.90	21.50 (nearest contour)	400
Fire Sprinkler Pump Room	22.10	21.60	500

Note:

The above table lists the finished floor levels and freeboard requirements as per the 26/10/2015 meeting with Council's development and flooding engineers.

Locations listed as 'XX.XX (nearest contour)' in the 1% AEP peak flood level column experience depths of inundation less than 150mm in the 1:100 year storm event. As per Council's email dated 13th July 2015 (Appendix C), the current adopted 'Old Guildford Overland Flood Study' does not consider depths less than 150mm as this corresponds to the nominal kerb height and flows would typically be contained within the carriageway. Whilst not required under Council's flood regimes, a freeboard height of 300mm has been provided in these areas based on the nearest flood contour (Appendix A – Figure 4).

3. ASSESSMENT OF COUNCIL REQUIREMENTS

3.1 Flood Planning and Compliance

Fairfield Council splits the floodplains within the local government area into three precincts based on varying levels of potential flood risk. The three precincts are described below in Table 2:

Table 2 - Fairfield City Council Flood Risk Precincts

Risk Precinct	Description
High	- Defined as the area of land below the 100 year flood that is either subject to a high hydraulic hazard or where there are significant evacuation difficulties. - The high flood risk precinct is where high flood damages, potential risk to life or evacuation problems would be anticipated, or development would significantly and adversely affect flood behaviour.
Medium	- Defined as land below the 100 year flood that is not in a High Flood Risk Precinct. This is land that is not subject to a high hydraulic hazard or where there are no significant evacuation difficulties. - The medium flood risk precinct is where there would still be a significant risk of flood damage, but these damages can be minimised by the application of appropriate development controls.
Low	- Defined as all other land within the floodplain (i.e. within the extent of the probable maximum flood but not identified within either the High Flood Risk or the Medium Flood Risk precincts). - The low flood risk precinct is where risk of damages are lower for most land uses.

(Source: Fairfield DCP 2013)

3.2 Flood Risk Category & Planning Consideration

The additions and alterations proposed on the development site are restricted to within low and medium flood risk precincts as per the Old Guildford – Flood Planning Map 14th July 2010 by Sinclair Knight Merz & Fairfield Consulting Services 2010 (attached as Appendix D). The land use category for the proposed development falls under commercial or industrial. As a conservative measure, the proposed development has been classified as being within a Medium Risk Precinct for the purposes of this flood impact assessment. The planning considerations applying to the site have been discussed on the following pages under Table 3.

Table 3 - Planning Considerations

Planning Consideration	Compliance	Comments
Floor Level		
The level of <i>habitable floor areas</i> to be equal or greater than the 100 year <i>flood level</i> plus <i>freeboard</i> . If this level is impractical for a development in a Business zone, the floor level should be as high as possible.	Yes	As per Table 1, a 500mm freeboard above the 1% AEP flood level has been provided for habitable floor areas where the depth of inundation has been in excess of 150mm. Flood proof walls will also be incorporated within the public thru site link to prevent the ingress of floodwaters to the lift areas 2 & 3. The locations of these walls are marked in red on the ground floor plan attached to this report as Appendix E.
Non-habitable floor levels to be equal to or greater than the 100 year flood level plus freeboard where possible, or otherwise no lower than the 20 year flood level unless justified by site specific assessment.	Yes	Non-habitable floor areas such as the fire sprinkler pump room, bulky goods storage, garbage holding areas and the fire control centre provide a minimum of 500mm freeboard above the 1% AEP flood level. This has been achieved by raising floor levels or providing ramps and platforms.
A restriction is to be placed on the title of the land, pursuant to S.88B of the Conveyancing Act, where the lowest <i>habitable floor area</i> is elevated more than 1.5m above finished ground level, confirming that the under croft area is not to be enclosed.	Yes	There is no under croft area proposed as part of the development.
Building Components & Method		
All structures to have <i>flood compatible building components</i> below the 100 year flood level plus <i>freeboard</i> .	Yes	The construction method will utilise flood compatible materials such as concrete, block or brick work.
Structural Soundness		
Applicant to demonstrate that the structure can withstand the forces of floodwater, debris and buoyancy up to and including a 100 year flood plus <i>freeboard</i> , or a <i>PMF</i> if required to satisfy evacuation criteria (below). An engineer's report may be required.	Yes	Certification will be provided by the Structural Engineer engaged for the development during the Construction Certificate Application phase of the project.

Flood Effects		
The flood impact of the development to be considered to ensure that the development will not increase flood effects elsewhere, having regard to: (i) loss of flood storage; (ii) changes in flood levels and velocities caused by alterations to the flood conveyance; and (iii) the cumulative impact of multiple potential developments in the floodplain. An engineer's report may be required.	Yes	By inspection of the indicative depths of inundation between the pre and post development results, the affectation to flood behaviour is observed to be minimal within Villawood Road. The public site thru link will have an internal width of 2.3m (300mm wider than the minimum requirement of 2.0m). In addition to this, minor regrading of low points are expected to reduce the localised ponding within Kamira Court to pre development conditions. These results indicate that the development will have a negligible impact on flood behaviour on the surrounding areas.
Car Parking and Driveway Access		
The minimum surface level of open car parking spaces or carports shall be as high as practical, and not below: (i) the 20 year flood level; or (ii) the level of the crest of the road at the location where the site has access; (whichever is lower). In the case of garages, the minimum surface level shall be as high as practical, but no lower than the 20 year flood level.	Yes	There are no surface or open car parking spaces/carports proposed as part of the development.
Garages capable of accommodating more than 3 motor vehicles on land zoned for urban purposes, or <i>enclosed car parking</i> , must be protected from inundation by floods equal to or greater than the 100 year flood level.	Yes	Basement car parking is being provided for the development. The 1% AEP peak flood depth results from Cardno do not indicate any depths greater than 150mm at the driveway/basement ramp location. Regardless, the crest of the proposed basement driveway ramp has been set 400mm higher than the existing natural surface level at the boundary as a conservative measure.
Where the level of the driveway providing access between the road and parking space is lower than 0.3m below the 100 year flood, the following condition must be satisfied. The depth of inundation on the driveway during a 100 year flood shall not be greater than the larger of; (i) the	Yes	As there are no depths of inundation greater than 150mm shown on the 1% AEP peak flood depth results, it can be assumed that the level of the driveway providing access between the road and parking space is not

depth at the road; and (ii) the depth at the car parking space. A lesser standard may be accepted for single detached dwelling houses where it can be demonstrated that risk to human life would not be compromised.		lower than 0.3m below the 100 year flood level.
<i>Enclosed car parking</i> and car parking areas accommodating more than 3 vehicles (other than on Rural zoned land), with a flood level below the 20 year flood level or more than 0.8m below the 100 year flood level, shall have <i>adequate warning systems, signage and exits</i> .	Yes	As there are no depths of inundation greater than 150mm shown on the 1% AEP peak flood depth results and the driveway crest is 400mm higher than the existing ground levels at the boundary, the parking spaces within the basement should not require an alarm warning system.
Restraints or vehicle barriers to be provided to prevent floating vehicles leaving a site during a 100 year flood.	Yes	The car parking provided on site is basement. As such, vehicles cannot physically leave the site during the 100 year flood event.
Evacuation		
Reliable access for pedestrians or vehicles required during a 100 year flood.	Yes	Appendix A – Figure 2 indicates that a large majority of the areas around the development have less than a 150mm depth of inundation. As a result, there are multiple avenues for pedestrians to exit the site via Kamira Court or Villawood Place. As per Council's request, consideration was given to the flow velocity, depth and hydraulic hazard for pedestrian safety and stability within the public site thru link. Cardno relayed results back to C&M confirming that velocity depth products were less than $0.4\text{m}^2/\text{s}$ which is typically the limit of stability for pedestrians. A plot showing this has been attached as Appendix F. A maximum Q_{100} flow rate of $0.36\text{m}^3/\text{s}$ is expected to occur within the public site thru link as per the post development model calculations. ARR chapter 6 discusses the safety in design criteria for the stability of persons in flood waters. The hazard is considered low if the depth is less than 0.5m deep and the velocity is less than 3ms^{-1}. As the flow within the

		public site thru link meets both of these criteria the hazard can be considered low.
The development is to be consistent with any relevant <i>flood evacuation strategy</i> or similar plan.	Yes	There is no relevant flood evacuation strategy for this area.
Management and Design		
<i>Site Emergency Response Flood Plan</i> required where floor levels are below the <i>design floor level</i> , (except for single dwelling-houses).	Yes	All floor levels within the development are above the design floor level based on the flood extents provided by Cardno. A <i>Site Emergency Response Flood Plan</i> should be prepared for implementation as per Section 3.3 below.
Applicant to demonstrate that an area is available to store goods above the 100 year flood level plus <i>freeboard</i> .	Yes	The bulky good storage room is set at RL 22.10 which is 500mm higher than the interpolated adjacent flood contour of 21.60. As such this requirement is satisfied.
No storage of materials below the <i>design floor level</i> which may cause pollution or be potentially hazardous during any flood.	Yes	Storage within the basement is unaffected as there are no depths of inundation greater than 150mm at the driveway ramp.

3.3 Site Emergency Response Flood Plan

A Site Emergency Response Flood Plan (SERFP) details the flood inundation mitigation measures and proposed relocation of people to safe locations in the event of an emergency. Staff working within the retail areas should be trained in typical emergency situations. In addition to the general emergency training the management of a flood event can be incorporated into the responsibility of staff members.

It is recommended that the SERFP includes:

- The training and action required for the management of a flood event including the deployment of flood mitigation measures and relocation/evacuation of persons if deemed necessary;
- Similarly to fire wardens, the appointment of flood wardens responsible for managing the flood event.
- Locations of appropriate flood warning signage. It is recommended that signage be erected within the public site thru link to ensure pedestrians are aware it is an overland flow path.

4. RECOMMENDATIONS

The key strategies to be adopted for this development include the following:

1. A freeboard height of 500mm shall be provided above the 1:100 year flood level in areas experience depths of inundation in excess of 150mm.

The finished floor levels for the development shall be set as per Table 1.

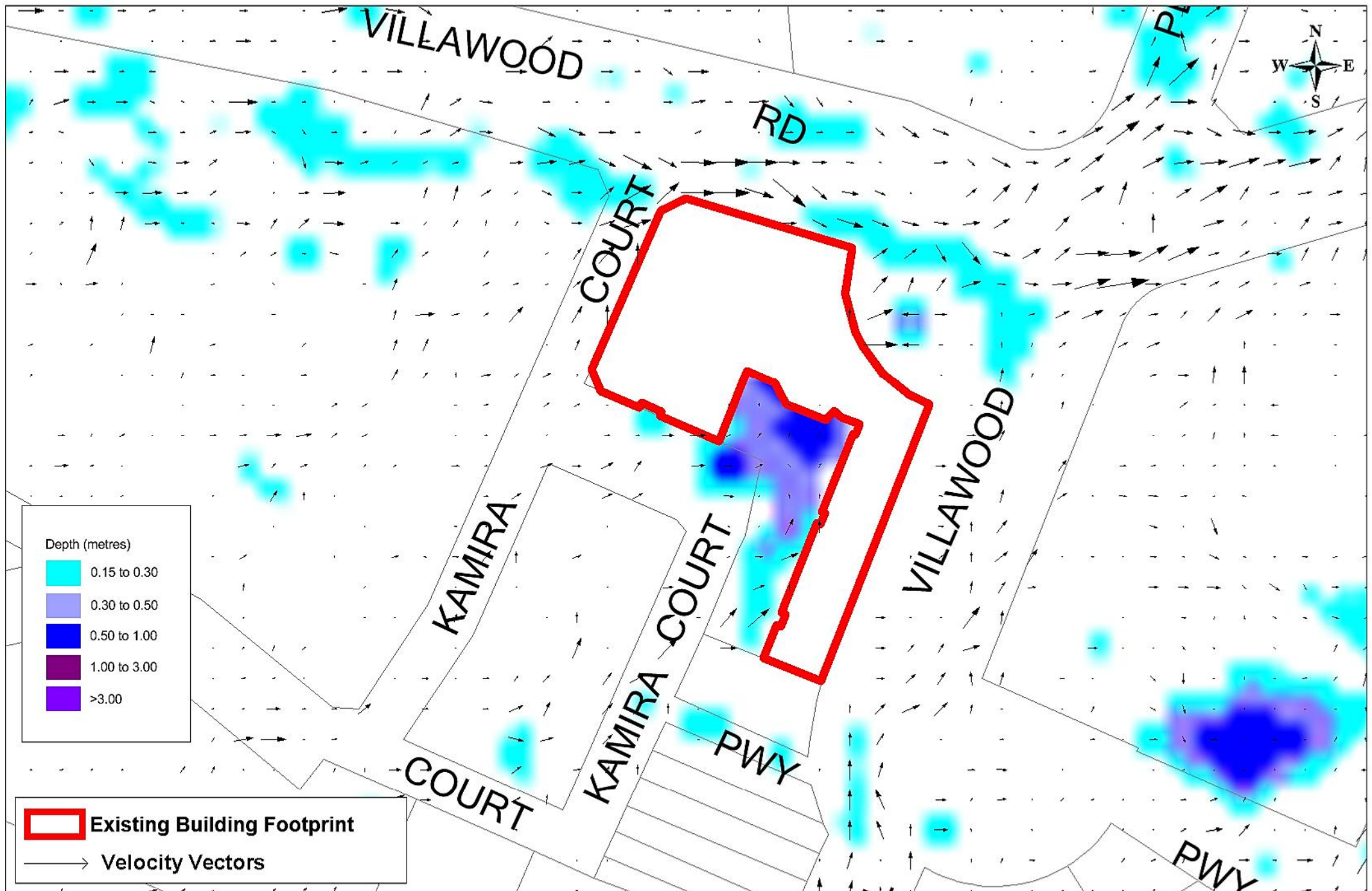
2. In addition to the provisions of freeboards, flood proof walls shall also be provided within the public thru site link to prevent the ingress of flood waters into the adjacent areas.
3. The internal width of the public site thru link is to be maintained at 2.3m in width as per the architectural plans with a minimum unobstructed entrance width at Kamira Court of 2.0m.
4. If required, minor grading shall be carried out to ensure that the low point within Kamira Court is the entrance to the public site thru link.
5. The building shall be constructed from flood compatible materials and designed to withstand flood pressure and impacts from debris carried in flood waters. The design shall be certified by a structural engineer during the Construction Certificate phase of the project.

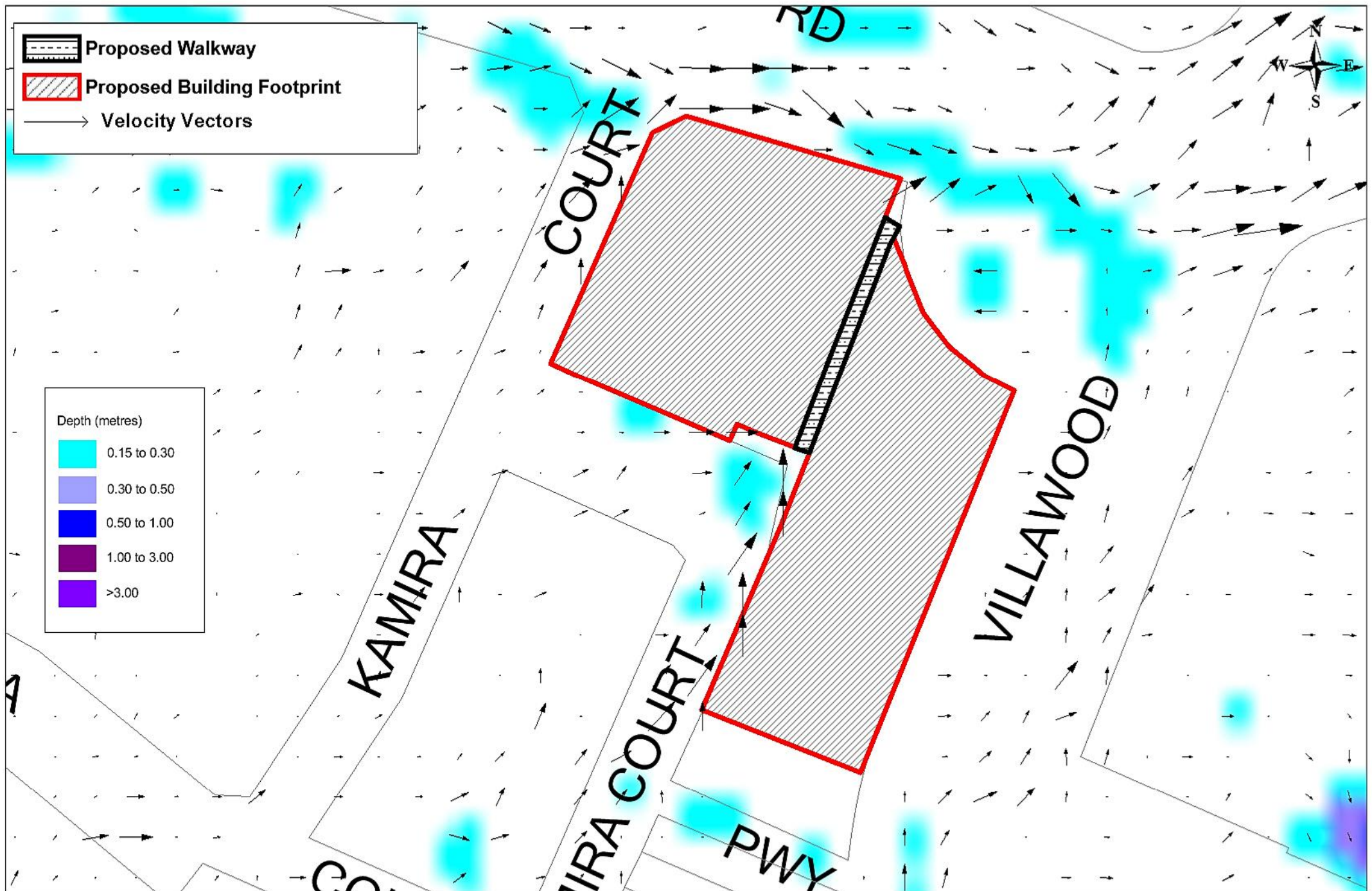
5. REFERENCES

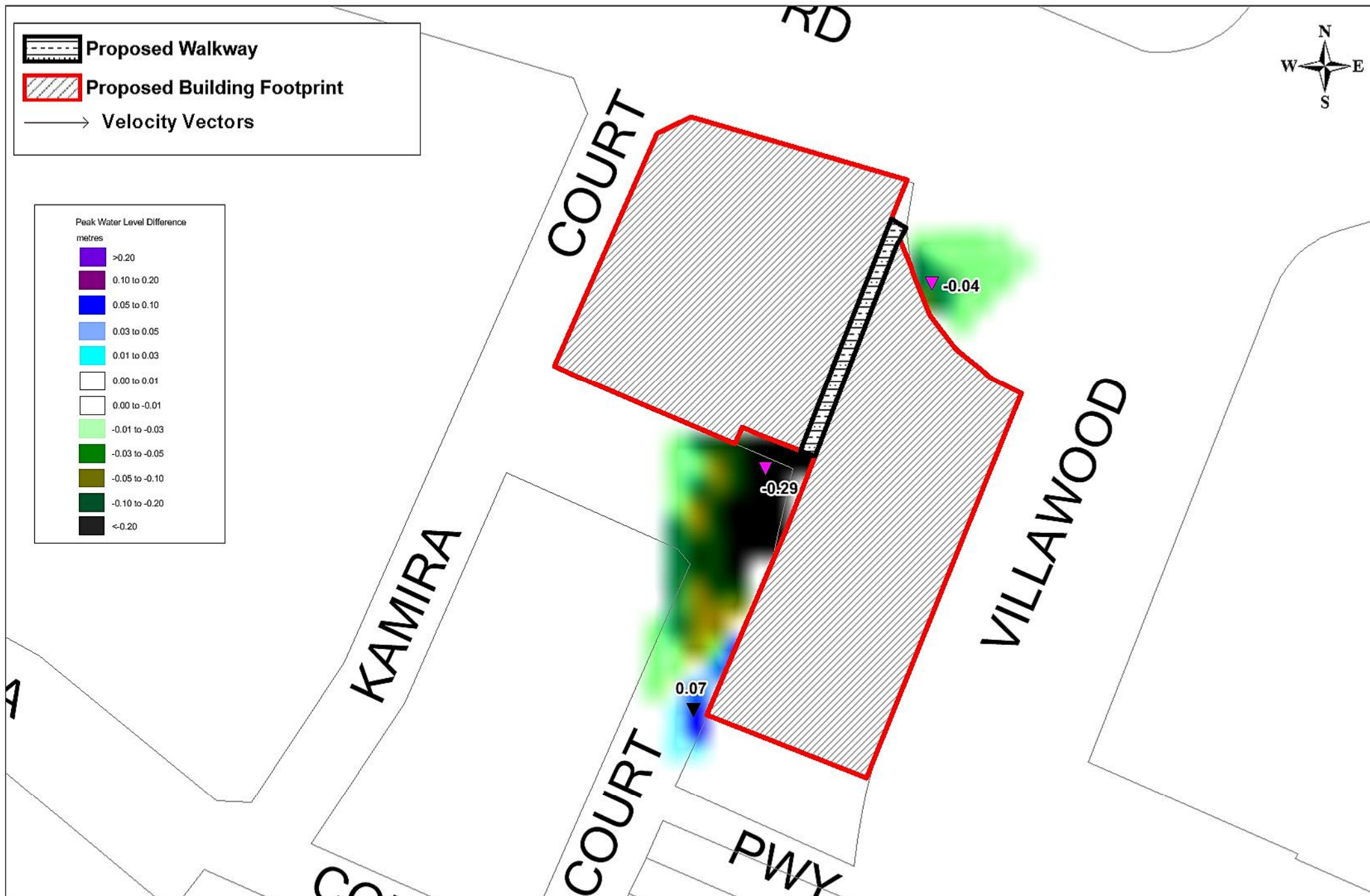
- Concept Civil Engineering Drawings for the Development Application submission prepared by C&M Consulting Engineers;
- Architectural Drawings by Tony Owen Partners
- Fairfield City Wide Development Control Plan – Chapter 11 – Flood Risk Management Amendment No.7A (2013);
- “Australian Rainfall and Runoff – A Guide to Flood Estimation”, Institute of Engineers, Australia (1987)
- “Floodplain Development Manual – The Management of Flood Liable Land”, Department of Infrastructure, Planning and Natural Resources, New South Wales Government (2005)
- Pre and Post Development Flood Modelling by Cardno

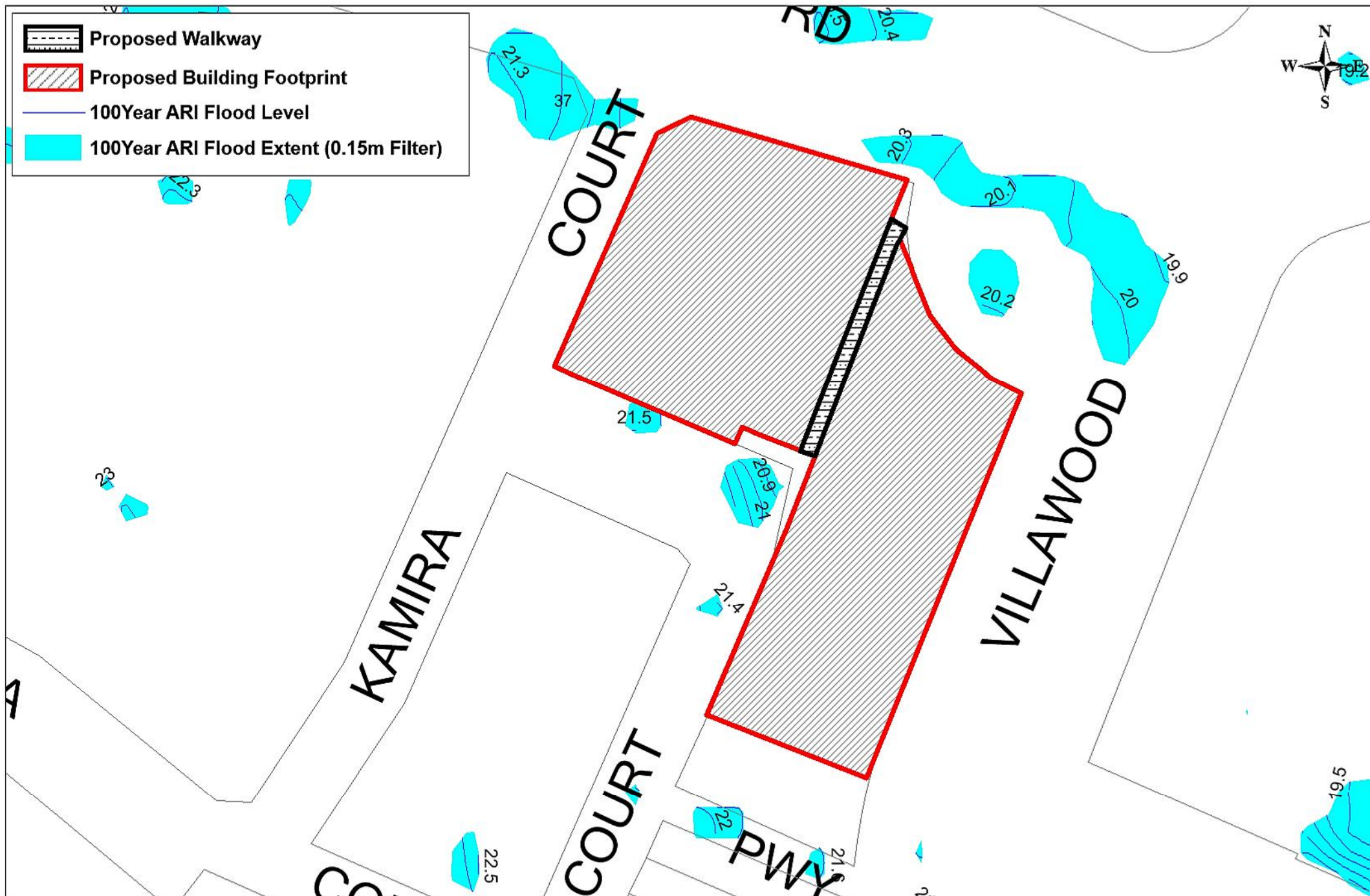
APPENDIX A

CARDNO PRE/POST DEVELOPMENT MODELLING RESULTS









APPENDIX B

CARDNO ADDITIONAL TESTING RESULTS

From: [Stephen Yu](#)
To: [William Webb](#)
Subject: RE: 1 Villawood Place, Villawood - Council request for additional information
Date: Monday, 23 November 2015 12:20:41 PM
Attachments: [image002.png](#)
[image003.png](#)
[image005.png](#)
[image006.png](#)
[image008.png](#)
[image014.png](#)

Hi Willam,

The test carried out in the model shows that the entrance width under future development would need to be not less than 2m. Also it is necessary to carry out local ground grading work in the southern side of the entrance on Karima Court Road in order draw overland flow into the access way. The RL of the access way entrance is 20.4mAHD in the model.

Hope this helps.

Regards,
Stephen Yu
SENIOR ENGINEER
CARDNO



Phone +61 2 9496 7700 Fax +61 2 9439 5170 Direct +61 2 9496 7778
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From: William Webb [<mailto:William@cmce.com.au>]
Sent: Friday, 20 November 2015 1:51 PM
To: Stephen Yu
Subject: RE: 1 Villawood Place, Villawood - Council request for additional information

Thanks Stephen.

Appreciate the help.

Kind regards,

William Webb
Civil Engineer
C & M Consulting Engineers Pty Ltd

APPENDIX C

COUNCIL FLOOD ASSESSMENT EMAIL

William Webb

From: Johnny Su <JSu@fairfieldcity.nsw.gov.au>
Sent: Monday, 13 July 2015 9:01 PM
To: William Webb
Cc: Liam Hawke; Joseph Bazergy
Subject: RE: Flood Freeboard Advice - Villawood

Follow Up Flag: FollowUp
Flag Status: Flagged

Hi William,

Sorry for the delay.

In response to your email, I'm assuming that the results are coming from Cardno's revised model that they are preparing for Council (the same revised model as the Bunnings Villawood project).

The results seem to be showing areas where depths are less than 100mm (light blue) which is not normally shown in Council's adopted models. Council's current adopted flood study for that particular catchment (Old Guildford Overland) does not consider depths less than 150mm as this corresponds with the kerb height and will typically be contained within the roadway. I will have to confirm with the Council staff who are currently working with Cardno whether or not they want these new results to be treated in the same way as the current adopted flood study.

If this is the case, a revised plan with results filtered for depths above 150mm would be more useful and this should then resolve the freeboard issue for areas between 0-50mm as these areas would no longer be showing up.

For areas where the depth is greater than 150mm, Council's current FRM policy does offer any variances on freeboard based on the depth of floodwater. The control states that the level of habitable floor areas to be equal to or greater than the 100 year flood level plus freeboard and that freeboard equals an additional height of 500mm.

I hope this clarifies your query.

Regards,

Johnny Su
Development Engineer | City and Community Development Group
Fairfield City Council

PO Box 21, Fairfield NSW 1860
P (02) 9725 0251 | F (02) 9757 4708



From: William Webb <William@cmce.com.au>
Sent: Monday, 6 July 2015 9:04 AM

APPENDIX D

OLD GUILDFORD – FLOOD PLANNING MAP



High Flood Risk Precinct

Land below 100 year flood that is either subject to a high hydraulic hazard or where there are significant evacuation difficulties.



Medium Flood Risk Precinct

Land below the 100 year flood that is not subject to a high hydraulic hazard and where there are no significant evacuation difficulties.



Low Flood Risk Precinct

All other land within the floodplain i.e. within the Probable Maximum Flood (PMF) extent, but not identified as within the high or medium flood risk precinct.

Important Notes

Mapping does not include local stormwater flooding.

Sheet 2 of 2

APPENDIX E

FLOOD PROOF WALL LOCATIONS

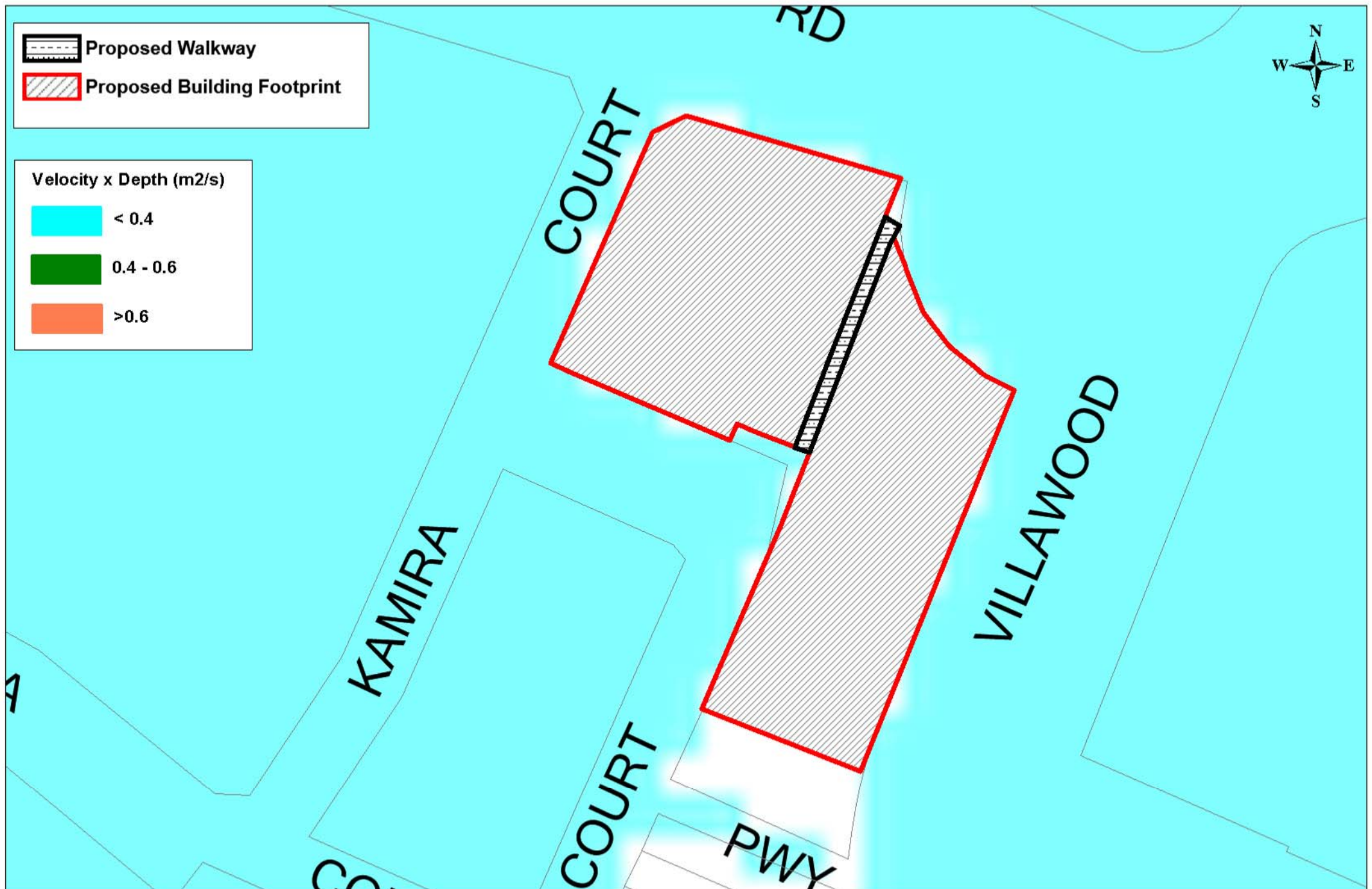
11



	Description	Date
A	DA SUBMISSION	03.10.14
B	DA RE-SUBMISSION	27.04.15
C	DA ADDITIONAL INFO	25.08.15
D	DA ADDITIONAL INFO	09.10.15
E	DA INFO VIA EMAIL	29.10.15
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NOTES: DRAWINGS MADE TO A LARGER SCALE AND THOSE SHOWING PARTICULAR DETAIL OF WORKS SHALL TAKE PRECEDENCE OVER DRAWINGS MADE TO A SMALLER SCALE AND FOR MORE GENERAL PURPOSES WHERE AN DISCREPANCY EXISTS BETWEEN FIGURED AND SCALED DIMENSIONS, THE FIGURED DIMENSIONS SHALL PREVAIL BUILDER TO CHECK ALL SITE DIMENSIONS PRIOR TO CONSTRUCTION OF FETMENTS THESE DOCUMENTS AND ANY WORKS EXECUTED AS A RESULT OF THESE DOCUMENTS SHALL BE SUBJECT TO THE COPYRIGHT/RIGHTS CONDITIONS SET OUT IN THE CONDITIONS OF ENGAGEMENT.		
TONY OWEN PARTNERS FOR DA SUBMISSION OCTOBER 2014		
Consultants		
Client		
Architects		
Project: VILLAWOOD		
Project address: Villawood Place, Villawood		
Key plan		
Scale: 1:125 @ A1		
Date: OCT 2015		
Drawing title: GROUND FLOOR PLAN		
Project no. 923 Dwg #. A103		
Drawn: WT REV. E		
Drawing status: DA - ADDITIONAL INFORMATION		

APPENDIX F

VELOCITY X DEPTH PRODUCT PLOT & Q_{100} FLOW RATE



William Webb

From: Stephen Yu <Stephen.Yu@cardno.com.au>
Sent: Wednesday, 25 November 2015 3:45 PM
To: William Webb
Cc: James Chryssafis; Mazen
Subject: RE: 1 Villawood Place, Villawood - Council request for additional information
Attachments: 1A Villawood Place_November2015_Results_v1.pdf

Hi William,

Attached are the 100yr flood results for your information.

In the access way, Q100 is 0.28 m3/s under existing conditions, and would be 0.36 m3/s under developed conditions provided local regrading is to be carried out to draw overland flow into the access way.

Regards,

Regards,

Stephen Yu
SENIOR ENGINEER
CARDNO



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From: William Webb [<mailto:William@cmce.com.au>]
Sent: Wednesday, 25 November 2015 12:57 PM
To: Stephen Yu
Cc: James Chryssafis; Mazen
Subject: RE: 1 Villawood Place, Villawood - Council request for additional information

Hi Stephen,

Is there any chance I will be receiving the Q₁₀₀ results for depth and velocity along the public site thru link this afternoon?

I'm intending to have by report for the Council JRPP out by COB today.

Kind regards,