

Stephen Dobbs
Senior Planning Officer
Social and Affordable Housing
Department of Planning, Housing and Infrastructure
Locked Bag 5022
Parramatta NSW 2124

GRC Hydro
Level 20, 66 Goulburn Street
Sydney NSW 2000

Tel: +61 413 631 447
www.grchydro.com.au

The Timberyards by RTL Co. FIRA Peer Review (SSD-76927247)

A Flood Risk and Impact Assessment (the report) has been prepared by Mott McDonald on behalf of Varsity Assets Management Pty Ltd (Developer) on behalf of RTL Investments 2 Pty Ltd as trustee for RTL Marrickville Property Trust ('RTL Co.') (the Applicant) to support a State Significant Development Application (SSDA) for the proposed Timberyards development.

RTL Co. has engaged GRC Hydro to undertake an independent peer review of the Mott McDonald FIRA prior to lodgement of the SSDA. The reviewer, Steve Gray from GRC Hydro has extensive experience with flooding in the Marrickville Valley. Mr Gray worked on the Council flood study in 2014 as well as GRC being the main modellers for the Sydney Metro project at Sydenham. Additionally, GRC worked for Inner West Council (IWC) on the DCP for Precinct 47, which the site is located within. GRC have also supported numerous local government development applications and complying development certificates in the region. Mr Gray's CV is attached in Appendix A.

The proposal seeks consent for a diverse rental housing precinct comprising build-to-rent (BTR), co-living and affordable housing. The precinct development comprises seven (7) buildings ranging from eight (8) to thirteen (13) storeys, a single level basement and open space that includes a pocket park, through site link and communal open spaces.

Key flood context as described by the Mott McDonald FIRA is that the Marrickville Valley has two specific flooding characteristics. Land can be part of the Marrickville Industrial Area (MIA) where ground levels are low (as low as 1 mAHD in places) and in times of flood deep ponding can occur. Alternatively, a Lot can be in the upper catchment areas which drain to the MIA where only overland flow flooding occurs. The subject site in the 1% AEP event is within the upper catchment areas. Victoria Street and Sydenham Road drain flows past the site toward the MIA, but no backwater impacts the site in the 1% AEP and in fact the site is flood free in the 1% AEP (see Figure 4.4 in FIRA) such that Council did not select it for inclusion in the FPA as part of their 2017 FRMSP nor do they describe the site as being flood liable in their 1% AEP flood liability map (see mapping provided in FIRA in Appendix A and B).

Although the subject site is not in the FPA nor identified by Council as being flood liable, the FIRA provided by Mott McDonald comprehensively addresses SEARS and DCP Controls. In only one instance is a control contradicted, and this is regarding the use of 1% AEP levels with no freeboard in part for some retail spaces. In this case the Objective of the Control is met via use of appropriately flood compatible materials and the raising to the FPL of kitchen and storage areas. But given the lack of flood liability on the subject site the lack of 500 mm freeboard seems reasonable.

In reviewing the FIRA/FERP document compiled on behalf of RTL Co. I have considered:

1. Technical analysis undertaken:
 - a. Modelling – The Council flood model has been used to assess impact. Impact analysis shows no coherent impact as per Section 4.2.2.3 of the FIRA. Note that the stability of the 2017 model is not conducive to detailed modelling of impact assessment and instead lack of impact is assessed via point inspection of metrics on Sydenham Road and Victoria Street. Inspection of peak flow values indicates the lack of impact;
 - b. Range of events considered – the FIRA has utilised the existing 2017 model and as such is somewhat constrained to the 10% AEP, 1% AEP and PMF events in the report. Given the lack of flood liability until very rare flood events at the site this seems reasonable.
2. Flood Risk Mitigation:
 - a. Lifting residential areas – arguably the development improves net flood risk outcomes despite bringing more residents to the site by:
 - elevation of residential dwellings. Retail is proposed for lower floors. Above the ground floor residential areas are flood free in the PMF.
 - Increasing availability of elevated shelter – that is shelter above the PMF; and
 - Reducing the number of site users that may want to egress area in time of flood (residents versus employees for example);
 - Reducing traffic flow onto Victoria Street and Sydenham Road via provision of entrances for vehicles on Farr Street.
 - Supply of flood protected carparking.
 - b. Basement protection – The basements are suitably protected from flooding. The unique flood behaviour of the area makes protecting basements from the PMF challenging. Council considered this when they put together specific Precinct 47 DCP controls that required basement protection to the 1% plus 500 mm level only (for those areas where low hazard 1% AEP flooding occurs). The development meets this requirement by having basement entrances for vehicles coming off Farr Street where 1% AEP inundation is minimal. Appropriate egress routes are provided from the basement up (in compliance with the DCP) and the single basement level helps contribute to mitigation of risk.
3. Response to a flood event
 - a. Evacuation: - The design facilitates defacto a vertical evacuation procedure. The nature of flooding in the upper areas of the catchment is quick. Waters are quick to rise and quick to dissipate. The site is conducive to Shelter In Place (SIP) and as per the draft SIP guidelines, SIP is a fit given the:
 - i. Short time to rise (no effective warning time for overland flow from north and north-east);
 - ii. Short time to fall (see plots in FIRA – durations above H2 are quite low (two to three hours at most on Sydenham Road)
 - iii. Safety of vertical evacuation versus horizontal given possibility of road flooding. As per EMA Manual 20, SIP is preferred if evacuation is more dangerous than sheltering. This is clearly the case here.
 - iv. Overall, a resident could conceivably go through numerous 1% AEP events and not be inconvenienced at all or even notice their occurrence. Whilst secondary risks associated with the limited period of isolation could be mitigated by conditioning on-site resources be available.
 - v. Access during a flood event – Access to the site by emergency vehicles has been suitably considered. Section 5.3.1.2 shows the issue at Surry Street which was highlighted by the SES in their contribution to the SEARS. The duration of this

impediment is relatively short being a maximum of four hours (time above H2 is far less). Arguably secondary risks for the site are a minor issue given that time of isolation is limited and the potential for self-reliance measures to be conditioned for the whole site due to the nature of the BTR development;

In conclusion, the FIRA report has been reviewed and the findings are supported by the author. All relevant aspects of flooding have been considered, as summarised above, and the design suitably incorporates and manages flood risk. The report's findings in regard to compliance with state and local policy are supported.

Yours Sincerely

A handwritten signature in blue ink, appearing to read 'Steve Gray', with a long horizontal line extending to the right.

Steve Gray

Director

NER 2435438

0413 631 447

Appendix A

Stephen Gray Director



Date of Birth:
13 July 1974

Nationality:
Australian

Profession:
Water Resources
Engineer (hydrologist)

Qualifications:
Bachelor of
Engineering (Res.
Eng) University of New
England, 1997

Masters of
Engineering
(Research) University
of Technology Sydney,
2009



PROFILE

Steve has twenty five years' experience working in the field of hydrology and hydraulics with a principle focus on flooding. Steve's has worked in the Supreme Court of NSW and the NSW Land and Environment Court as a modelling expert. Steve would reasonably be considered an expert in the fields of: flood hydrology; flood modelling (1D and 2D models); stormwater, riverine and urban modelling; floodplain management works design; GIS integration into flooding work and floodplain management as it integrates with council planning. Steve also has a variety of experience in other water resource related fields including yield analysis, water balance and water quality related studies.

PROFESSIONAL EXPERIENCE

GRC Hydro (Director) - 2017 and ongoing

- Various Planning Proposal Reports - NSW
- L&E Expert for Nelligen Residential
- L&E Expert for Lindfield Residential
- Design Competition – 110 George St Parramatta
- Work for Valuer General NSW - Review of Flood Reports
- Rutherglen Insurance Review
- Exile Bay FRMSP (ongoing)
- Cooks Creek Overland Flow Flood Study - ongoing
- A'Becketts Creek Flood and Floodplain Risk Management Study and Plan (ongoing)
- Brisbane Insurance Review
- Dozens of Sydney Metropolitan Development Application Flood Reports
- L&E Expert for Rosehill Development
- L&E Expert for MLC Development in North Sydney
- L&E Expert for Proposed Development at Chifley St Smithfield
- Insurer Reports for Lismore March 2022 Event
- Wollongong Brooks Creek FRMSP (ongoing)
- L&E Court Expert for 10 Raceway Place Eastern Creek v 50 Peter Brock Drive
- Inner West Council Developer Contributions Plan Assessment
- Insurer Reports for March 2021 Event – Port Macquarie, North Haven and North Shore
- Wollongong CBD FRMSP Review (ongoing)
- Yarralumla Creek flood study review and mitigation works development
- ACT Light Rail Flood Impact Design and Assessment
- Rich Street Marrickville – Flood Management Report
- Barangaroo Reference Design and flooding Technical Advisor for INSW
- Snowy 2.0 Main Works SEARs Assessment - flooding
- Sydney Metro City and Southwest, Marrickville – Flood analysis for Detailed Design
- Yarralumla Creek flood study review and mitigation works development
- Canberra Light Rail Project – Flood analysis for Detailed Design
- Hickson Road Flood Modelling and Drainage Design
- Lismore/Murwillumbah 2017 Flood Event, Event Analysis for Overland Flow Damages
- Delhi Road Upgrade REF
- Private Hospital Site Flood Risk Assessment – Johnstons Creek
- Austral Flood Risk Management Report
- Erskine Park Sub-surface Flow Report
- Yallah Road OSD Review – Expert Opinion

GRC Hydro

Stephen Gray Director



- Chatswood Freemans Road Stormwater Impact Assessment
- Wallacia Golf Course Flood Study
- North Bexley Stormwater Assessment
- Austral Flood Risk Management Report
- Appian Way L&E Court Report
- Appian Way Supreme Court Expert Report
- Gladesville – Hillcrest Avenue Supreme Court Expert Court
- Kingsgrove – L&E Court – Flood Expert
- Snowy Mountains Flood and FRMS&P Studies
- University of Sydney – Health Precinct Project – Reviewer
- University of Sydney – Engineering Precinct Project – Reviewer
- North Sydney - LGA FRMS&P
- Hunters Hill - LGA Flood Study
- Burwood Council – Expert Advice re: 149(2) and FPA for Overland Flow Catchments

WMAwater (Director) - 2009 to 2017

- Hawthorne and Dobroyd Canal FRMS&P
- Alexandria and Johnstons Creek Flood Studies
- Tuggerah Lake Overland Flow Studies
- Ourimbah Creek FRMS&P
- Wagga FRMS&P Revision
- Exile Bay and Powell's Creek Flood Studies
- Culcairn, Holbrook and Henty Flood and FRMS&P Studies
- Rushcutters Bay, Centennial Park and Woolloomooloo Flood and FRMS&P Studies
- Gundagai Flood Study
- Currumbene and Moona Moona Creeks FRMS&P
- Milperra Riverside Development Modelling
- CBD and Darling Harbour FRMS&P
- L&E Court – Ashfield Council
- North Sydney Overland Flow Flood Study
- Detailed Model Review – Wagga Wagga
- Lockhart and The Rock – Flood and FRMS&P Studies
- Blackwattle Bay and Johnstons Creek FRMS&P
- Medowie FRMS&P
- Harold Park Flooding, Stormwater and WSUD Review
- Commission into Brisbane River Floods of January 2011
- SES – Griffith 2012 Flood Review
- Griffith CBD FRMS&P
- Griffith CBD Flood Study
- Dobroyd Canal Flood Study
- Hawthorne Canal Flood Study
- Astrolabe Park Flood Impact Study and Design Project
- Middle Bays Floodplain Risk Management Study and Plan
- Woolaware Bay Flood Study
- Eastern Creek Hydrological Assessment – RAFTS Model Build
- Parken Pregar Road Improvement Impact Assessment
- SES - Murrumbidgee River December 2010 Flood Data Collection
- Wagga LGA Murrumbidgee River 2D Modelling
- Griffith Aerodrome Floodplain Risk Management Study and Plan
- RTA Narara to Lisarow Flood Impact Analysis and Review of Modelling
- Wagga Wagga Caravan Park Flood Impact Assessment
- Marrickville Valley Flood Study
- Jugiong Floodplain Risk Management Study and Plan
- Oura to Braehour Flood Mapping, WWCC

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- Holbrook Road Development Impact Assessment – Wagga
- ANU Flood Study – ACT
- Flower Power Flood Impact Study and Floodplain Management Advice
- Medowie Drainage Study
- Upper South Creek Flood Study
- Wagga Wagga Major Overland Flow Study
- Box Hill Impact Assessment, LPMA – Sydney
- L&E Court - Timbumburi Creek Flood Study
- Boral Moorebank Impact Assessment and Floodplain Management Advice
- Murray Area 2D Modelling Review
- Hay Overland Flow Study
- Cotter MIKE She Post Bushfire Yield Review
- Young Street Residential Development – Surface Water Study
- Wagga Wagga 1D to 2D Model Conversion Project
- Griffith Airport Overland Flow Study
- Sandy Beach Development Proposal Environmental Assessment – Review of Findings

DHI Malaysia SDN. BHD, KL (Water Resources Manager)

Flooding and Floodplain Management

- Thurgoona Dam Break Study
- Tanouli NZ MIKE Flood Modelling
- Chowilla Velocity Impact Analysis
- Chowilla Water Use Analysis
- Wyong Economic Zone Hydrologic and Hydraulic Study
- Haslams Ck Tooheys Site MIKE Flood Investigation
- Thurgoona and Airport Flood Study
- Bungambrawatha Dam Break Study
- MIKE Flood Model Review – Greater Wellington Regional Council
- Bankstown Airport MIKE Flood Impact Study
- Chowilla Wetlands 2D Modelling Project
- MIKE Flood Development – Denmark
- Phulbari Open Cut Coal Mines Levee Design – Bangladesh
- East Lavington Drainage Study
- Benalla Model Conversion – MIKE21/MIKE11
- ACT Yield Modelling – MIKESHE/MIKE11
- Poulton Park 2D Drainage Study
- Huon valley Dam Break
- Iberia Street 2D Drainage Study
- Elanora 2D Drainage Study
- SMEC Laos 2D/1D Flood Diversion Project
- Bulimba Creek 2D Preliminary Flood Study
- Buttenderry Creek Development Impact Study
- Hume Dam Catchment Hydrology
- Tenterfield Flood Study
- Orange Flood Study
- RTA Tamworth Road Works
- Brisbane City Council Sewer Study
- Townsville Flood Study

Training Carried Out

- Software Support
- MIKE Product Training – Gui and Partners Sdn Bhd Training
- Papakura Council SHE/MIKE STORM Training
- MIKE Flood Advanced Training – Auckland NZ
- MIKE21 Training – Auckland NZ
- Greater Wellington Regional Council – MIKE21/Mike11 Training

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- University of Canberra CRC for Freshwater Ecology – MIKE21/MIKE11 Training
- HydroTasmania MIKE21/MIKE11
- MIKE FLOOD (2D/1D) Training Course

ERM Australia PTY LTD (Senior Engineer)

- Canungra Army Base Re-development Water Strategy Study
- Parramatta Rail Link Soil and Water Sub-plans
- Hoxton Park Flood Impact Assessment
- Rolleston Coal Mine Environmental Impact Assessment
- Rhodes Peninsula Soil Rehabilitation Project EIS
- AUSTEEL Steel Mill and Harbour Facilities EIS

WBM Oceanics Australia (Water Resources Engineer)

- Hexham Swamp Tide Gate Re-Opening Impact Analysis (inclusive of TUFLOW beta testing)
- East Hills Flood Mitigation Work Analysis
- Singleton Stormwater Management Plan and Infrastructure Design Report
- Cudgera Creek, Yelgun NSW
- Riverlink Canal Estate Development Impact Study
- Steel St, Newcastle NSW
- Cottage Creek Flood Study
- Ulmarra Floodplain Management Study, Ulmarra NSW
- Newcastle Flood Data Collection Study

Ecowise Environmental LTD (Water Resources Engineer)

- Flood Inundation Mapping, Benalla VIC
- ACT Flood Plan
- Flood Forecasting Operations
- Flood Study for the Ginninderra Catchment, ACT

Water Resource Related Civil Works

- Installation of Discharge Monitoring Sites, Dampier WA
- Design of Sedimentation Ponds and Pipe Network, Dampier WA

Water Yield Analysis

- Proposed Lake Jerrambomberra Aquatic Facility
- Cotter Dam – SHE Modelling Assessment
- Gold Creek Golf Club – Water Balance Assessment
- Department of Social Services – Basin Leak Assessment
- Preliminary Water Balance Investigation, Tuggeranong
- Water Supply Study for ACTEW

Water Quality Modelling

- Proposed Lake Jerrambomberra Aquatic Facility
- GIS Land Capability Mapping and CMSS Modelling

Dam Break Modelling

- Kenyir Dam Break Assessment
- Thurgoona Dam Break Study
- Bungambrawatha Dam Break Study
- Huon Valley Dam Break Modelling
- Hume Dam Hydrology and Failures Scenarios

PUBLICATIONS

GRC Hydro

Stephen Gray
Director



- Gray, S.D, Ball, J.E. and M.K. Babister (2011). The Direct Rainfall Method – A Critical Discussion of Current Practice. Proceedings 51st Floodplain Management Association Floodplain Managers Conference Tamworth , February 2011
- Gray, S.D and Ball, J.E. (2010). Coupled One and Two Dimensional Modelling in Urban Catchments – Reducing Uncertainty in Flood Estimation. Proceedings 32nd Hydrology and Water Resources Symposium, December 2009
- Beavis, S. G., A. J. Jakeman, L. Zhang and S. D. Gray (1997). Erosional History of Selected Upland Subcatchments in the Liverpool Plains, New South Wales. Proceedings International Congress on Modelling and Simulation, MODSIM97, University of Tasmania, 8-11 December 1997. A. D. McDonald. (Eds). Vol. 1 pp. 277

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