SYDNEY CHILDREN'S HOSPITAL STAGE 1/CHILDREN'S COMPREHENSIVE CANCER CENTRE

SCH1/ CCCC

Flood Modeling Assessment

Civil

SSD No. 10831778

SCH-CIV-RPT-00001

Revision: 02

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Report Amendment Register

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Table of Contents

Contents

1. Introduction

The purpose of this Report is to support the State Significant Development Application (SSDA) for the Sydney Children's Hospital Stage 1 (SCH1)/ Children's Comprehensive Cancer Centre (CCCC) (the project) at Randwick Campus Redevelopment area. This report responds to *item 17 Flooding* outlined in the Secretary's Environmental Assessment Requirements (SEARs) issued 2 December 2020 for State Significant Development Application (SSDA) 10831778:

- Identify any flood risk on-site in consultation with Council and having regard to the most recent flood studies for the project area and the potential effects of climate change, sea level rise and an increase in rainfall intensity;
- Assess the impacts of the development, including any changes to flood risk on- site or off-site, and detail design solutions to mitigate flood risk where required. This report is to be read conjunction with the flood maps in Appendix A.

The flood assessment results demonstrate that the proposed development complies with relevant requirements outlined in NSW Floodplain Development Manual (DIPNR, 2005) and Randwick Council DCP. Flooding related items in SEARs have been considered and addressed throughout this report.

2. Site Description

2.1. Location

The existing Randwick Hospital Campus is bound by High St to the north, Barker St to the south, Avoca St to the east and Hospital Rd to the west. The Sydney Children's Hospital Stage 1/Children's Comprehensive Cancer Centre (SCH1/CCCC) proposed development site was identified by the precinct master planning for future expansion of the Hospital Campus. The proposed development is located to the west of the existing campus and is bound by High St to the north, Magill to the south, Hospital Rd to the east and the University of New South Wales (UNSW) Kensington campus/Botany St to the west.

The SCH1/CCCC occupies the north east portion of the Randwick Campus Redevelopment (RCR) whilst the western portion is occupied by the UNSW Health Transition Hub (HTH) development. The site lies immediately to the west of the existing SCH. Both of these developments lie to the north of the Integrated Acute Services Building (IASB) currently under construction. Refer to Figure 1 and 2 below. The site is located within the Randwick Local Government Area.

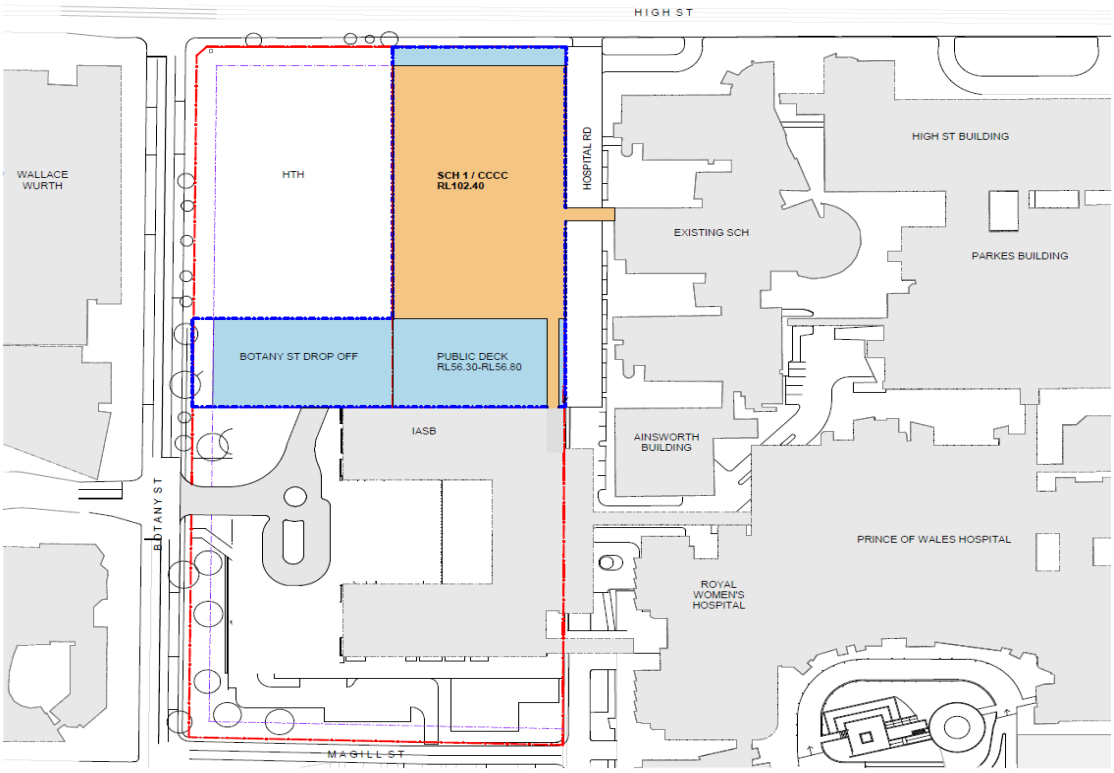

Figure 1 Architectural masterplan layout SITE PLAN -SCH1-CCCC SCOPE -PwC RO 2

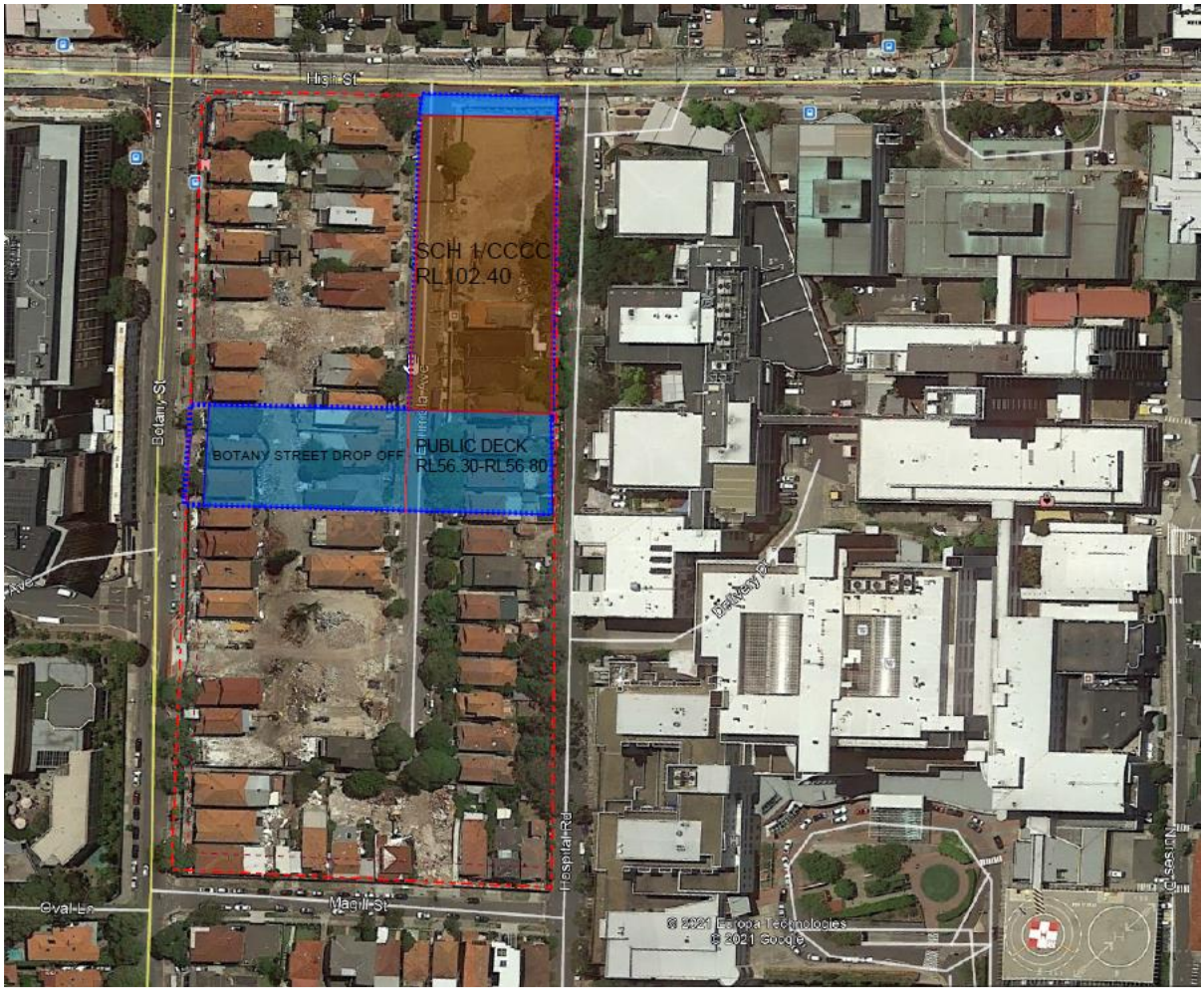

Figure 2 Aerial image of the site

2.2. **Existing Flood Conditions**

The RCR site bounded by High St, Botany Street, Hospital Rd and Magill St is affected by 1% Annual Exceedance Probability (AEP) and Probable Maximum Flood (PMF) flooding. A major overland flow path runs in a north-south direction through the centre of the site from the sag point on High St taking large upstream catchment from the north of the site.

Existing flooding conditions have been modelled and determined by BMT through Tuflow modelling. The results indicate that Hospital Road is not flood affected during the 1% AEP with the exception of localised ponding at existing trapped low point. Flooding occurs along High Street, Botany Street and the existing Eurimbla Avenue. Refer to Figure 3 and Figure 4 for the existing flood depth map for 1% AEP flooding and PMF event respectively by BMT.

Figure 3 1% AEP Flood depth - Existing Case (BMT 2018)

Figure 4 PMF Depth - Existing Case (BMT 2018)

3. Flooding

3.1. Design Criteria

Prior to the RCR, overland flooding ran southward from the sag point in High St, generally along Eurimbla St, towards Magill St. To protect the new IASB site from flooding in the PMF event a strategy for the was developed by Lendlease. This has been documented in the "*State Significant Development Application (SSDA) Civil Engineering Report for Randwick Campus Development Integrated Acute Services Building (IASB) Addition*" prepared by Acor Consultants on 05/08/2019 and Flood report prepared by BMT "*Randwick Campus Redevelopment IASB Project Summary Flood Report*" dated December 2018. Broadly this involves diverting stormwater from the sag point in High St to the west of the precinct and discharging into Botany St through large culverts. In line flood storage is also provided within these structures to ensure that the changed flood condition does not adversely affect any other properties.

This strategy dictates how the proposed sites are to be developed, as protection to the IASB relies on both developments blocking the flood waters across the full frontage of High St to a level which provides the required freeboard to the PMF (nominally 500mm). This imposes a significant constraint to both developments, specific requirements for each site is outlined below:

- SCH1/CCCC: as hospitals are critical infrastructure, Finished Floor Level (FFL) needs to achieve immunity to the PMF with adequate freeboard;
- Randwick City Council DCP outlines that the development is to ensure no increase in flood effects elsewhere for flood events up to and including the 1% AEP flooding;
- HTH site: as the protection to IASB site also relies on the development on HTH blocking flood waters from going south, flood protection is required north of the HTH site across the frontage of High Street;
- The staging of the works, including any delays in the construction of the HTH, will need to address the issue of the provision of flood protection to the IASB. This may include features such as temporary walls or bunds.

3.2. Available Data

The BMT TUFLOW model for the development of IASB has been provided to Bonacci by the IASB project team. The key features of the design include:

- Flood storage adjacent to High Street and a portion of Botany Street to collect and divert upstream flood water from the Eurimbla Avenue to Botany Street;
- Stormtrap for water detention system;
- Site filling to provide flood immunity.

3.2.1. Ground Surface Assumptions

Interrogation of the model has been carried out and an extraction of the ground surface design/assumptions included in the model is shown in Figure 5. The Hospital site has been modelled as a podium at RL60.00 which is well above the PMF level plus freeboard (approximated at RL 56.23), which functions as a blockage to ensure no flood water will travel further south to the SCH1/CCCC and HTH site and also provide flood protection to the IASB site.

As discussed above, this modelling strategy dictates that any future development within the SCH1/CCCC site and HTH site will need to protect the building entrances and openings as well as providing flood immunity to IASB site.

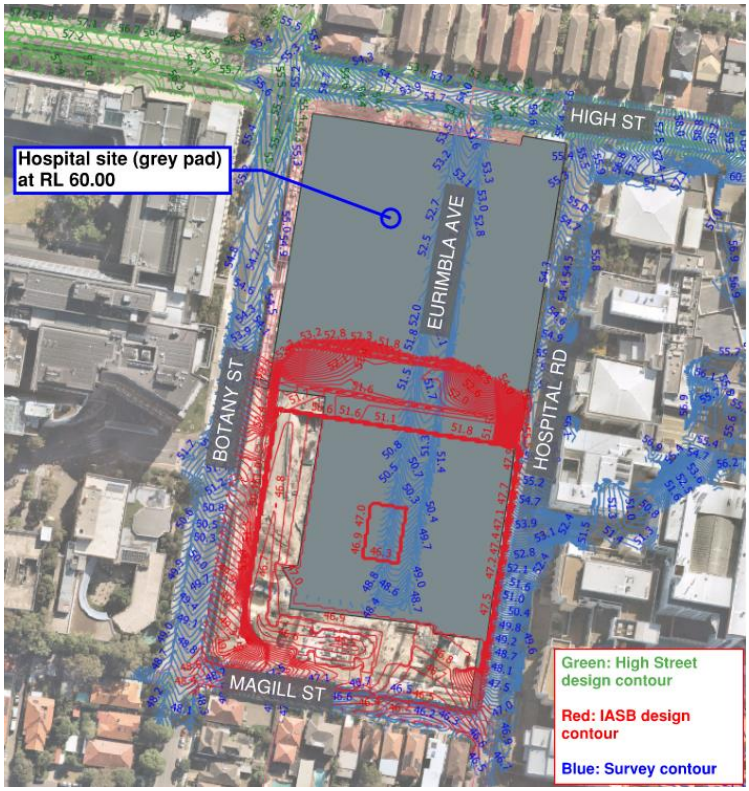

Figure 5 TUFLOW Model Ground Surface Design Extracted from BMT TUFLOW Model

3.2.2. Flood Modelling Results

Bonacci has been supplied with the TUFLOW model for the IASB development (model developed by BMT). A modelling run for the PMF flood event with the proposed flood strategy for IASB development has been carried out and the results are shown below.

Flood Levels and Depths

In a PMF event, a proportion of the stormwater is conveyed to Botany St via the buried culvert with the remainder overflowing into Botany St at the North West Corner of the site. In this scenario the water in High St ponds to a level of 55.75.

Randwick Council DCP require that a free board of 500mm be provided to the PMF for critical facilities. As a result, the minimum level to which the HTH and SCH1/CCCC sites need to be filled to provide protection for the precinct is RL 56.25

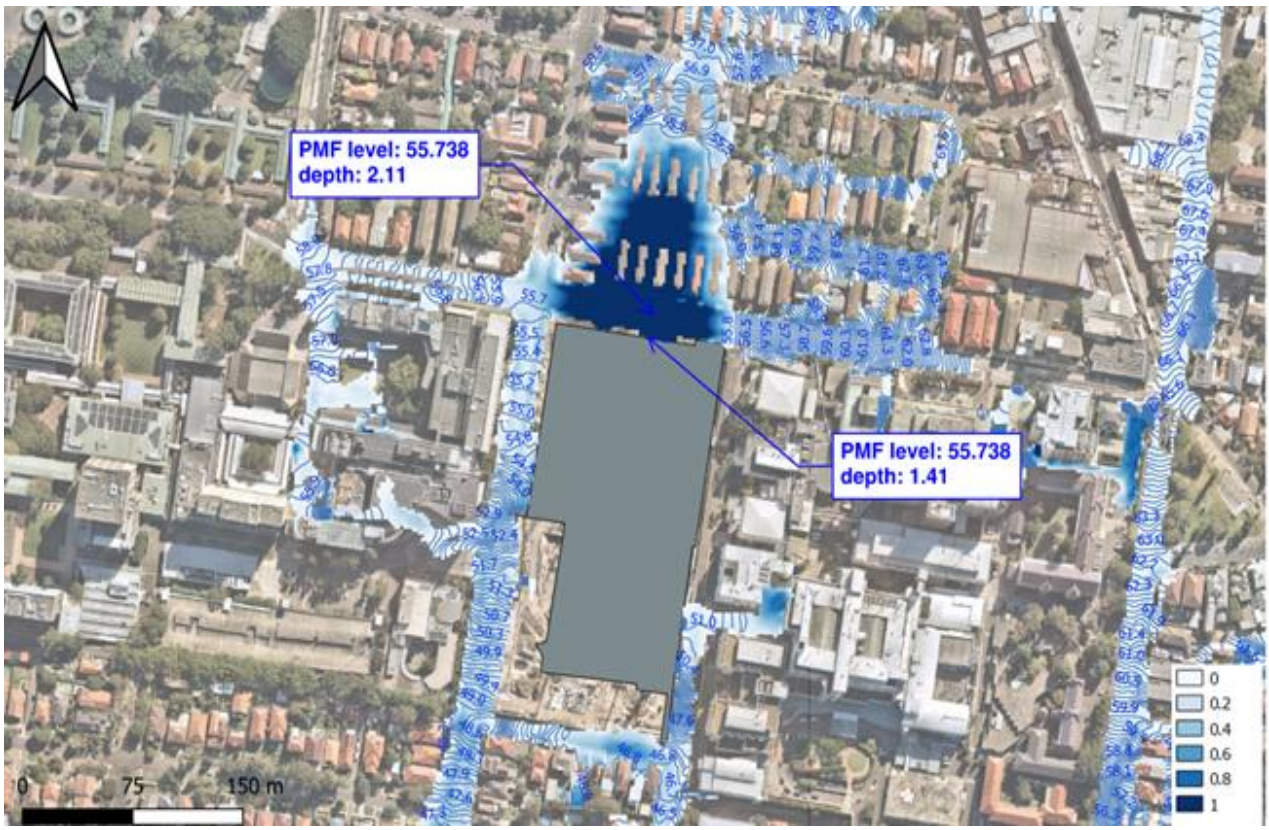

Figure 6 PMF Levels and Depth from BMT TUFLOW Model

Flood Hazard

Flood hazard is high on the frontage of the site on High Street as expected given that the original overland flow path is blocked by the artificial podium on the SCH1/CCCC site and the HTH site.

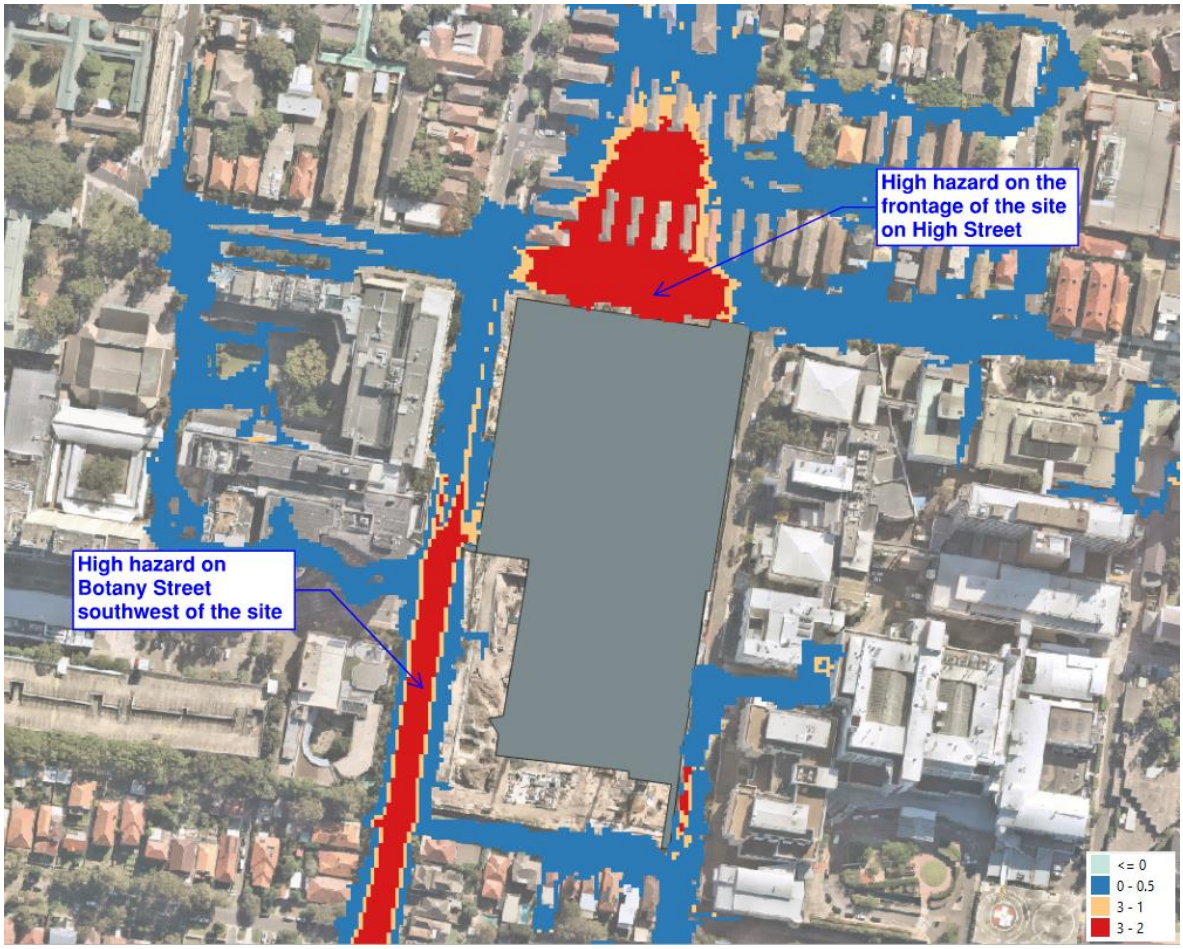

Figure 7 PMF Hazard from BMT TUFLOW Model

Flood Afflux

BMT's 1% AEP flood impact map further demonstrates that the key design features including the filling of the hospital site, installation of stormtraps and the diversion of flood water need to be put in place to ensure no adverse impact on external properties during the 1% AEP storm event.

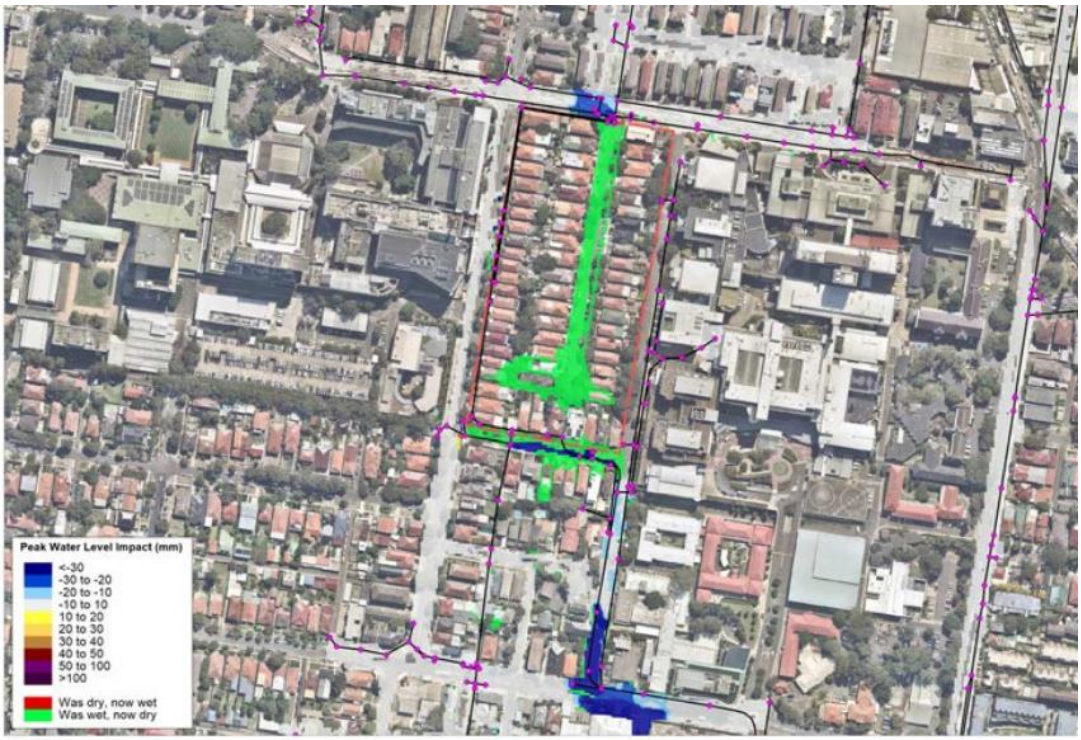

Figure 8 1% AEP Flood Afflux Map (BMT Flood Report for IASB Development, 2018)

The results above demonstrate that the development complies with all design criteria with appropriate mitigation strategies around the whole development area. The following section outlines the specific mitigation measures that SCH1/CCCC proposed to ensure compliance with relevant guidelines.

4. Mitigation Measures

4.1. Final Condition of the Precinct

The current planning for the SCH1/CCCC site requires the construction of floors and basements below RL56.25 and is not to be filled as assumed in the original model. In order to provide flood protection to the precinct, both developments will need to construct an impermeable barrier to RL56.25 along the full length of High St. This need not necessarily be a vertical wall. It would be sufficient for the buildings to act as a weir at the required level of 56.25. There would need to be no points where water could ingress such as doors, windows or vents. For example, steps or ramps which rise to a podium at RL56.25 would have the desired effect in place of filling the site.

4.2. Temporary & Permanent Flood Mitigation Requirements

To provide protection required we propose the following:

1. Prior to occupation of the IASB building, a sufficient barrier should be in place along the full frontage of High Street. This barrier needs to be watertight and able to resist the hydrostatic pressures imposed by the flood water. Options could include a wall of suitable construction or a soil berm engineered to prevent piping. A flood barrier will also need to be constructed along the Botany St boundary to provide the required freeboard to the floodwaters flowing down the road reserve.

2. During construction of the SCH1/CCCC building a sufficient flood barrier needs to be maintained along the High St frontage of both the HTH and SCH1/CCCC sites.

3. On completion of the SCH1/CCCC development, the building structure can form the flood barrier for the eastern portion of the High St frontage. Interim flood protection will still need to be provided along the High St and Botany St boundaries of the HTH site until that building is completed.