

# **APPENDIX 5**

## **Flood and Stormwater Study**



# 87 Bay Street Glebe

Flood Investigation Letter

September 2011

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# Issue and revision record

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# 1. Introduction

Mott MacDonald Hughes Trueman have been commissioned by MT Management to undertake a preliminary flooding and drainage assessment to support the Stage 1 redevelopment of 87 Bay Street, Glebe.

The aim of this report is to discuss stormwater and flooding issues related to the subject site and demonstrate how the proposed design is to meet the relevant statutory requirements. In particular, the following items are discussed:

- Understand the existing flooding conditions for the local area and determine flooding issues affecting the subject site;
- Identify flooding requirements from regulatory authorities;
- Discuss the implementation of flooding and drainage requirements into design and make an assessment on whether impacts are positive, negative or negligible.

## 1.1 Site Description & Proposed Works

The subject site is situated at 87 Bay Street, Glebe, and falls within the municipality of City of Sydney Council. The development area is bound by Bay Street to the east, Wentworth Street to the south, Cowper Street to the west, and Wentworth Park to the north. The existing site is occupied by small to medium sized industrial buildings “from boundary to boundary” and has no landscaping or pervious areas.

The site falls generally from south to north in the direction of Wentworth Park. Due to its low lying and relatively flat nature, the site is affected by flooding; this has been confirmed in the *Bay Street Redevelopment Blackwattle Bay, Ultimo – 2d Flood Modelling Stage 1* flood report.

Figure 1.1 – Site Layout



The proposed site works consists of the demolition of the existing buildings and structures on site and the construction of a new multi storey mixed-use development. The proposed development is to include a mix of residential (approximately 183 dwellings), commercial (approximately 10,000m<sup>2</sup> GFA) and open space uses. The proposed buildings are to rise approximately 10 storeys with 2 levels of underground car parking capacity.

A major regional stormwater upgrade has been proposed in the nearby area, involving the construction of a large stormwater culvert which will run from nearby Macarthur Street and extend along Wentworth Park to discharge into Blackwattle Bay. These works may lower localised flood levels adjacent to the site in the future.

## 2. Flooding & Drainage Assessment

### 2.1 Existing Site Flooding Conditions

The *Bay Street Redevelopment Blackwattle Bay, Ultimo – 2d Flood Modelling Stage 1* (dated 5 December 2008) prepared by Bewsher Consulting for the City of Sydney Council indicates that the subject site is located in a flood affected area. Based on the results of this study, it is our understanding that flooding issues both (a) on site; and (b) in the local area, are not dictated by on site drainage issues but instead from mainstream flooding (i.e. on a catchment wide level).

The development site forms part of the larger “Blackwattle Bay” catchment area. Based on the Flood Study prepared by Bewsher Consulting, overland flows are conveyed south-north across the catchment to Sydney Harbour (Blackwattle Bay), approximately 600m north of the subject site. The local topography of this area forms a natural depression which acts to trap and attenuate overland flows during large storm events. Once the banks of Blackwattle Bay are breached, floodwaters are conveyed overland through the development area and across the floodplain.

Based on the results of the Flood Study, we note the following peak flood levels for the 1 in 100 year ARI storm event (assuming 50% blockage on all inlet structures):

- 3.50m AHD – Overland flowpaths in Bay Street, Cowper Street, and Wentworth Park; and
- 3.70m AHD – Flood level at intersection of Wentworth Street and Bay Street.

Figure 2.1 illustrates the extent of flood inundation across the existing site. Here the flood depth for the 100yr ARI storm event ranges from 0.2 to 1m AHD. Due to the nature of mainstream flooding, there is little to no velocity.



Figure 2.1 – Peak Flood Levels 100yr ARI event



Source: Bewsher Consulting Bay Street Redevelopment Blackwattle Bay, Ultimo – 2d Flood Modelling Stage 1

It should be noted that, because major upgrades of the existing trunk drainage network are proposed, the **existing flood levels are considered a worst case scenario** and as such have been adopted as the design constraint for this application.

## 2.2 Council Requirements

All flood planning controls for the proposed development are to be designed in accordance with the following:

- City of Sydney Council's *Draft Sydney Development Control Plan (DCP) 2010*;
- City of Sydney *Sydney Development Control Plan 2011 – Glebe Affordable Housing Project*; and
- NSW Floodplain Development Manual (2005).

### 2.3 Proposed Site and Flood Planning Levels

As discussed in Section 2.1, it is understood that flooding issues both (a) on site; and (b) in the local area, are not dictated by on site drainage issues but instead from mainstream flooding items (i.e. on a catchment wide level). **That is, the proposed re-development works on the subject site will have a negligible effect on the overall flooding of the area.** Subsequently, the design requirements for the proposed development works are instead aimed at minimising risks associated with both property and life.

Preliminary assessment of the proposed re-development indicates that the subject site will typically be improved from the existing scenario, with flooding issues to be managed by on-site measures. In particular, the following benefits are noted:

- **Improved floor levels** – Council's *Sydney Development Control Plan 2011 – Glebe Affordable Housing Project* specifies a minimum flood planning level for habitable areas of the 1 in 100yr ARI top water level plus 0.5m freeboard. As such, the proposed re-development is to incorporate a **minimum habitable floor level of 4.0m AHD** ( $3.5 + 0.5 = 4.0\text{m AHD}$ ) which will reduce risks associated with both property damage and life. Habitable floor levels at the Wentworth Street/Bay Street intersection are to be a minimum 4.2m AHD ( $3.7 + 0.5 = 4.2\text{m AHD}$ ) to protect the site from overland flows in Bay Street. The flood planning level for all **commercial areas is to be above the 1 in 100 year flood top water level** (3.7m AHD at Wentworth Street/Bay Street intersection and 3.5m AHD for the rest of the development area) in accordance with Council's DCP. Currently, the majority of existing buildings on the subject site have floor levels below the minimum level required by council. Access to the basement carpark areas from Wentworth Street is to have a crest at the building boundary of minimum 4.2m AHD to minimize the risk of flooding to the basement carpark in larger storm events;
- **Improved Overland Flowpaths** - Civil works along the boundary of the site will better define overland flows in these area and help to keep surface flows in the roadways away from the proposed buildings;
- **Improved Safety** - In addition to the raised floor levels, proposed site levels are generally higher than the existing site. As such, the resulting design minimizes the ponded depth and extent of flooding on-site, increasing public safety.

Proposed site Flood Management controls are shown below in Figure 2.2



## 2.4 Potential Effects of Climate Change

Global warming and climate change refer to an increase in average global temperatures. Here natural events and human activities are believed to be contributing to an increase in average global temperatures. This is caused primarily by increases in “greenhouse” gases such as Carbon Dioxide (CO<sub>2</sub>). *The earth has warmed, on average, by about 0.7 °C since 1910 with nine of the ten warmest years on record occurring in the past decade. There has been an increase in heatwaves, fewer frosts, and a warming of the lower atmosphere and raises in ocean levels. Australian temperatures have increased by almost 0.9 °C over the last hundred years, which is slightly more than the global average. (CSIRO website, 2009).*

The subject site is located approximately 600m to the south of Blackwattle Bay (Sydney Harbour). In accordance with the NSW Floodplain Development Manual (2005), due to the close proximity to the eastern coastline, the site is also assessed against the potential effects of climate change, sea level rise and an increase in rainfall intensity.

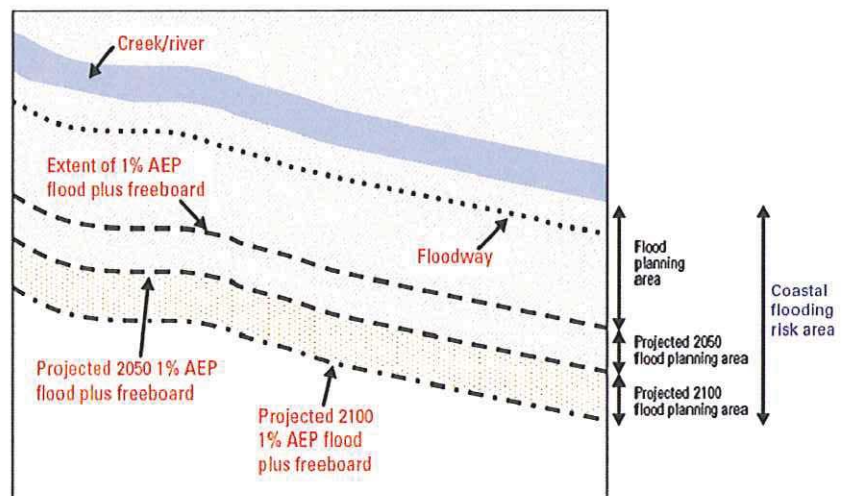
In 2009, the NSW Government provided a guideline entitled “Sea Level Rise Policy Statement” which details the Government’s plan of approach to climate change (in particular sea level rise), identifies risks to property owners as a result of sea level rise and provides a framework for Councils to help develop local strategies and risk assessment. In addition the policy also outlines the sea level rise benchmarks that have been adopted by the NSW Government. As a result a number of other planning tools and guidelines have been developed with the NSW Government’s strategy in mind, for example this is supported by the “NSW Coastal Planning Guideline: Adapting to Sea Level Rise” released by the Department of Planning (DoP) which provides guidance on how sea level rise should be considered in land use planning and development assessment

The NSW Government guidelines suggest that the following be considered for rises in ocean level up to the year 2100:

- 2050: 1990 Mean sea level plus 0.40m.
- 2100: 1990 Mean sea level plus 0.90m.

Figure 2.3 demonstrates how these benchmarks would be applied to traditional flood planning in creeks and rivers, where the above mentioned benchmarks are added to the 1% AEP flood event (1 in 100 yr Flood event) plus freeboard.

Figure 2.2: Coastal Flood Risk Areas and Sea Level Rise



Source: NSW Coastal Planning Guideline: Adapting to Sea Level Rise, DoP, 2010

Recent king tide levels in Sydney (12th January 2009) reached a peak RL of 1.96m. By applying the recommended values for potential ocean level rises, results indicate that the minimum floor level of 4.00m AHD remains above these levels (2.36m and 2.86m AHD). Subsequently, the **potential future effects of climate change on the proposed development can be considered to be negligible** based on the specifications outlined in the NSW Government’s publication “NSW Coastal Planning Guideline: Adapting to Sea Level Rise”.

Yours faithfully,



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