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Department of Planning

Report for Riverstone and Alex Avenue Precincts

Post Exhibition Flooding and Water Cycle Management (incl. Climate Change impact on Flooding)

May 2010

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1. Background

1.1 Precinct Planning Process

Precinct planning for the Growth Centres Alex Avenue and Riverstone precincts has been underway for some time. The precinct planning involves the preparation of:

- An Indicative Layout Plan (ILP) to guide planning and assessment of the precincts;
- A precinct planning report summarising the proposed approach to developments;
- A Development Control Plan (DCP);
- A Section 94 Contributions Plan; and
- An amendment to State Environmental Planning Policy – Sydney Growth Centres to facilitate the formal rezoning.

Infrastructure delivery and funding of the works is co-ordinated by the Strategies and Land Release office of the Department of Planning, which is working with Blacktown City Council to facilitate the planning process.

1.2 The Key Issue

Following public exhibition of the draft Riverstone and Alex Avenue Precinct Plans, it has been determined that the Section 94 contribution rates determined on the planning stage output of the original work, are excessively high. A review of the draft ILP would potentially:

- Deliver efficiencies in the provision of open space and drainage land;
- Maximise the area of developable land;
- Rationalise the current drainage strategy; and
- Provide better supporting data to allow costing of facilities with a higher level of confidence.

1.3 Previous Study

In September 2008 GHD prepared a Water Sensitive Urban Design and Flooding report for the Alex Avenue and Riverstone Precincts (Document #142339, September 2008).

This report formed the basis for the calculation of the exhibited draft Section 94 contribution rates for stormwater facilities at the precincts.

The report identified a number of opportunities for management of stormwater quality, quantity and flooding at the Riverstone and Alex Avenue precinct sites. This management would benefit from the implementation of Water Sensitive Urban Design

(WSUD) practices. WSUD encompasses all aspects of urban water cycle management including water supply, wastewater and stormwater management, that promotes opportunities for linking water infrastructure, landscape design and the urban built form to minimize the impacts of development upon the water cycle and achieve sustainable outcomes.

A WSUD strategy for management of stormwater quality and quantity was developed for the site that nominated:

- Vegetated swales along the identified main flow routes;
- Precinct scale co-located detention/ bio-retention basins at key locations to treat the quantity and quality of stormwater flows.
- Five public wetlands are proposed near the town centre and other locations throughout the proposed development.
- Further water quality treatment as required by Council on lots and roads;
- Gross pollutant traps and other structural measures;
- Provision of rainwater tanks in all areas;
- Habitable floor levels of new residences, commercial and industrial developments located 500 mm above the flood level;

To test the effectiveness of the WSUD strategy, numerical modelling was used, which showed that the proposed WSUD strategy together with the flood plain management adequately satisfies the requirements of the Growth Centres Development Code (GCC, 2006), Blacktown City Council Engineering Guideline for Development (BCC, 2005), Blacktown Development Control Plan 2006 (BCC, 2006), Blacktown City Council WSUD DCP (BCC, 2008) and the NSW Floodplain Development Manual for management of stormwater quantity, quality and flooding at the precincts.

1.4 Objectives of this Study

The objectives of this study are to:

- Advise on opportunities to revise the drainage strategy;
- Provide input and contribute to the integrated planning team on matters related to flooding and water cycle management; and
- Ensure efficient use of land for water cycle management facilities through co-location with other land-use elements.

1.5 Indicative Layout Plans

This report corresponds to the Riverstone Precinct Indicative Layout Plan dated 16/04/2010 and the Alex Avenue Indicative Layout Plan dated 12/04/2010. These indicative layout plans are shown in Appendix F.

The indicative layout plans were a critical consideration at all stages of the development of the water cycle management strategy.

2. Introduction

2.1 The Site

The Alex Avenue Precinct is located within the Schofield local area, while the Riverstone Precinct is located to the north of Alex Avenue Precinct with shared boundary being Schofield Road. The precincts fall within Blacktown City Council Local Government Area. The total site area is approximately 1600 ha. Currently the lands are owned by numerous land owners and the average size of land holdings is in the order of two hectares, indicating a high degree of land fragmentation.

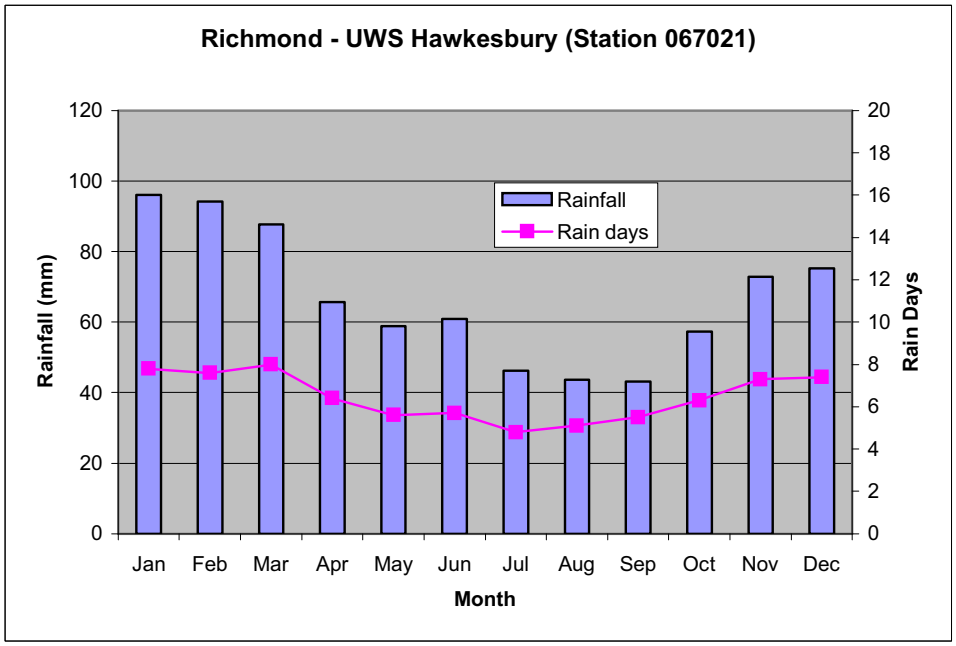
Present land use is predominantly partially developed and includes predominantly rural small holdings and rural residential uses, areas of remnant and regenerating native bushland, and the existing Schofields village.

2.2 Climate and Rainfall

Alex Avenue and Riverstone Precincts experience Sydney's sub-tropical climate with rainfall predominantly occurring in late summer and autumn. Figure 1 below shows the mean monthly rainfall and number of rain days recorded at the Richmond –UWS Hawkesbury daily rainfall station, which is considered representative of conditions at Alex Avenue and Riverstone Precincts. The figure shows elevated monthly rainfalls in the months of January to March, with the least rainfall being recorded in July to September. The mean number of rain days varies between approximately 4 and 8 days of rain days per month.

The high likelihood of rainfall occurring in any month throughout the year would support utilisation of WSUD vegetated systems such as swales, bioretention and wetlands to manage stormwater. Furthermore, the mild seasonal variability would indicate that rainwater collection via rainwater tanks might be viable, however this would depend on roof areas and demands for the captured water.

Figure 1 Monthly Rainfall



2.3 Topography and Slopes

The site is undulating in relief, varying between flat grades along Eastern Creek and First Ponds Creek tributaries. The majority of the site has slopes less than 5%.

The topography is an important consideration when planning stormwater management facilities. This is on account of the significant amount of earthworks required in constructing facilities and in routing overland flows to basins, resulting in more expensive facilities and higher Section 94 costs.

Steeper slopes (greater than 4 to 10%) are generally not suitable for the construction of WSUD facilities such as bioretention and wetland systems. Flow attenuation via vegetated swales and bio-retention systems are less desirable due to excessive flow velocities, reduced detention times and potential scouring. In addition, detention basins are difficult to configure, particularly when located off-channel.

2.4 Water Courses and Receiving Water

The study area lies within Hawkesbury Nepean catchment. A ridge along the length of the precincts separates the catchments draining to the west and Eastern Creek from the catchments draining to the east and First Ponds Creek.

Onsite tributaries collect and convey stormwater runoff from the precincts areas. Many of the tributaries have farm dams before discharging to the aforementioned creeks. Eastern Creek discharges to Hawkesbury River via South Creek, located north of the Riverstone Precinct. First Ponds Creek discharges to Hawkesbury River via Killarney Chain of Ponds, located to the east and north of the precinct.

Sections of First Ponds Creek and Eastern Creek are potentially affected by backwater flooding from the Hawkesbury River, particularly by PMF flood event in the Hawkesbury River.

2.5 Flooding Considerations

Flood levels were simulated as part of GHD's previous WSUD study (September 2008) for existing conditions. For the hydrological analysis, it was assumed that any future development upstream of the precinct would be required to provide management strategies, which ensure that flood peaks discharging from the precincts are maintained at existing conditions, by provision of detention storage within the precinct areas.

The downstream flood levels from previous studies were obtained from Blacktown Council, with backwater flood levels from Nepean River being adopted for the 100-year ARI and PMF events. Where backwater was not applicable, downstream boundary conditions were agreed with Council. The results of the existing conditions flood modelling showed:

- In the upper reaches of the catchment, the PMF flood extents are only marginally larger in flood extent compared with the 100-year ARI flood extents due to the steeper terrain;
- A significant flood plain exists along First Ponds Creek that extends and inundates within the Riverstone Precinct boundary during larger events;
- Flood extents associated with the tributaries draining to Eastern Creek are dominated by culverts under the railway line, which result in backwater upstream of the culverts in a 100-year ARI event; and
- Both creeks are affected by Nepean River PMF flood levels.

2.6 Riparian Considerations

The GHD Riparian Areas Assessment for Riverstone and Alex Avenue Precincts (September 2008) categorised streams in accordance with the Water Management

Act. Broadly, the management objectives of each category were:

- Category 1 stream – Core Riparian Zone (CRZ) of 40 m, consisting of local provenance native vegetation, with an additional riparian zone of 10 m;
- Category 2 stream – CRZ of 20 m, consisting of local provenance native vegetation, with an additional riparian zone of 10 m; and
- Category 3 stream – Riparian Zone minimum width of 10m from top of each bank and generally no vegetated buffer is required. All vegetation being restored will be of local provenance.

Integration of the findings of the assessment with other site assessments helped determine the preferred riparian corridor network for the site, as shown in Appendix A.

2.7 Council Considerations

Council, over the course of the study, has expressed a range of preferences in terms of formulating the Water Sensitive Urban Design strategy for the precincts. In particular, Council has:

- Preferred parameters for use in hydrological and other models;
- Preferred design parameters for water management facilities, such as depths, side slopes and configuration of filter media in bio-retention systems; and
- Preferences for co-located precinct scale basins over on-lot treatment.