ATTACHEMENT D

INTERNAL HYDRAULIC REPORT

BALLINA HOMEMAKER CENTRE

PRELIMINARY INTERNAL HYDRAULIC ASSESSMENT

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BALLINA HOMEMAKER CENTRE

PRELIMINARY HYDRAULIC ASSESSMENT

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1. INTRODUCTION

1.1 Purpose

This internal Hydraulic Assessment has been prepared on behalf of The Condon Group Pty Ltd for the proposed Ballina Highway Service Centre development to be located on Part of Lot 11 on DP1011575. The aim of this preliminary investigation is to assess the requirements for the development site to drain and the impacts the proposed development will have on the peak flows discharging from the subject site.

1.2 Implementation

This preliminary hydraulic assessment responds to the Ballina Shire Combined Development Control Plan and is in accord with the *Queensland Urban Drainage Manual* (QUDM) and good local engineering practice. This assessment does not address any regional flooding issues, as this is being undertaken by others.

2. DESCRIPTION OF PROJECT

The proposed Ballina Homemaker Centre development is to be located on the western portion of Lot 11 on DP1011575 and will comprise of a fast food centre, a service centre, commercial buildings and the associated roadways and infrastructure, totalling approximately 4.2 hectares.

The proposed site is a 'greenfield site' located in west Ballina, to the north of the Pacific Highway. The existing site and the surrounding area is very flat, with grades less than 1%. The current discharge location is the existing farmers' drains running past the site and through the surrounding land (Refer Fig 1). This is considered to be the legal point of discharge for the site. These drains were constructed to help with the drainage of the site and surrounding area and discharge south, under the Pacific Highway into Emigrant Creek. The layout of the western drain may have been altered recently due to the construction of the Ballina Bypass to the west of the site.

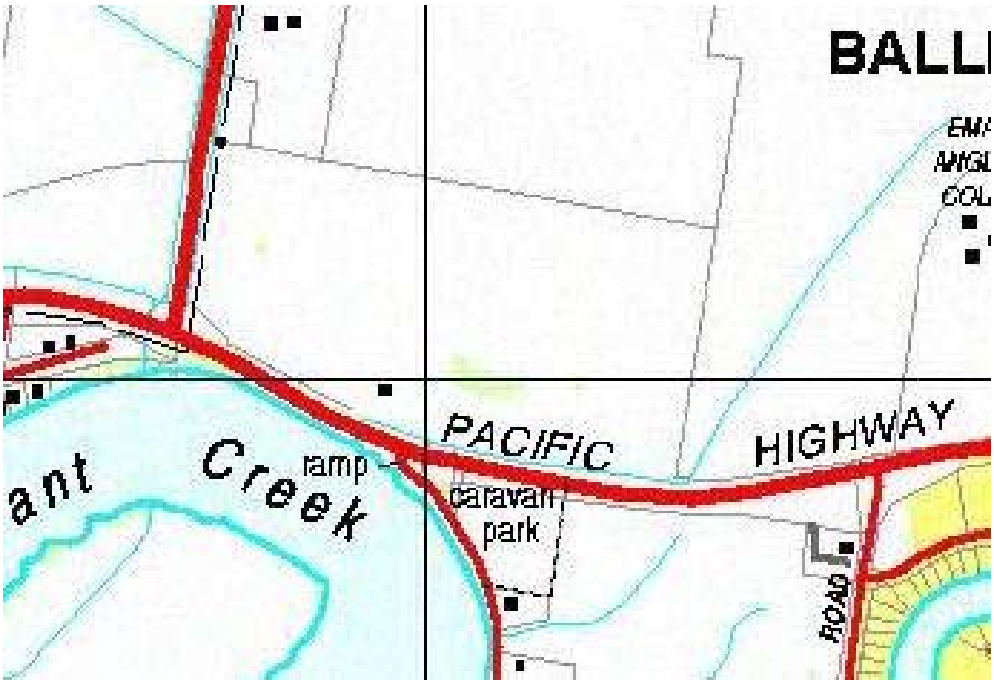

Figure 1 – Existing Drains Running Through Site

The existing surface levels on the site range from RL 0.4 up to RL 1.8. The Q_{100} flood level for the area is approximately RL 2.00 (obtained from BMT-WBM, Flooding for Ballina Bypass – Improved Concept Design Report, May 2007) and it is proposed to fill the site to above this level to ensure all floor levels are above this flood level. An allowance has been made for a floodway to run through the centre of the lot, to the east of the proposed development. This floodway will be revised once the motorway adjacent to the site has been completed, as it is expected the earthworks involved will affect the catchment that discharges through the site.

As the development will include substantial roadway/parking areas, it is anticipated the amount of stormwater runoff generated during rainfall events will increase due to the increase in impervious areas on the site.

3. WATER QUANTITY ASSESSMENT

3.1 Pre-Development Conditions

The Rational Method was used to estimate the peak flow rates discharging from the subject site.

Coefficient of Runoff values for the pre-developed site conditions were determined from QUDM Tables 4.05.1 – 4.05.3(b). Rainfall intensities for the subject site were derived from Australian Rainfall and Runoff.

The Time of Concentration values for the existing site conditions were determined for the contributing catchment in accordance with Section 4.06.4 of the Queensland Urban Drainage Manual (QUDM). Based on an average site slope of approximately 0.5% a flow travel time of 30 minutes was adopted for the existing site conditions of the subject site. This flow travel time was derived from Figure 4.07 (Overland Sheet Flow Times) of QUDM.

A summary of the parameters determined to calculate the 1, 5, 10, 20, 50 and 100 year ARI existing pre-development peak flow rates from the contributing catchment area of the subject site is provided in Table 1 below.

TABLE 1 PRE-DEVELOPMENT DISCHARGE PARAMETERS

ARI	Parameter	Value
1 year	C_1 I_1 (mm/hr) A (ha) Q_1 (m^3/s)	0.44 55 4.24 0.29
5 year	C_5 I_5 (mm/hr) A (ha) Q_5 (m^3/s)	0.61 86 4.24 0.58
10 year	C_{10} I_{10} (mm/hr) A (ha) Q_{10} (m^3/s)	0.66 96 4.24 0.75
20 year	C_{20} I_{20} (mm/hr) A (ha) Q_{20} (m^3/s)	0.71 108 4.24 0.90
50 year	C_{50} I_{50} (mm/hr) A (ha) Q_{50} (m^3/s)	0.77 124 4.24 1.13
100 year	C_{100} I_{100} (mm/hr) A (ha) Q_{100} (m^3/s)	0.84 136 4.24 1.35

3.2 Developed Conditions

Similar to the pre-development condition flows, the Rational Method was used to estimate the peak flow rates discharging from the developed condition catchment area.

As discussed above, Coefficient of Runoff values for the developed site conditions were determined from QUDM Tables 4.05.1 – 4.05.3(b). Rainfall intensities for the subject site were derived from Australian Rainfall and Runoff.

The Time of Concentration values for the developed site conditions were determined for the contributing catchment in accordance with Section 4.06.4 of the Queensland Urban Drainage Manual (QUDM). Overland flow time was estimated from Figure 4.07 (Overland Sheet Flow Times) of QUDM. Swale travel time was based on a grade of 0.5% using QUDM Figure 4.09 (Flow Travel Time in Pipes and Channels).

A developed condition Time of Concentration value of 16 minutes was adopted for the developed catchment.

A summary of the parameters determined to calculate the 1, 5, 10, 20, 50 and 100 year ARI developed peak flow ratess from the contributing catchment area of the subject site is provided in Table 2 below.

TABLE 2 DEVELOPED DISCHARGE PARAMETERS (Total Development Site Catchment - No Detention)

ARI	Parameter	Value
1 year	C_1 I_1 (mm/hr) A (ha) Q_1 (m^3/s)	0.59 76 4.24 0.53
5 year	C_5 I_5 (mm/hr) A (ha) Q_5 (m^3/s)	0.81 117 4.24 1.12
10 year	C_{10} I_{10} (mm/hr) A (ha) Q_{10} (m^3/s)	0.88 129 4.24 1.34
20 year	C_{20} I_{20} (mm/hr) A (ha) Q_{20} (m^3/s)	0.94 146 4.24 1.62
50 year	C_{50} I_{50} (mm/hr) A (ha) Q_{50} (m^3/s)	1.00 167 4.24 1.97
100 year	C_{100} I_{100} (mm/hr) A (ha) Q_{100} (m^3/s)	1.00 183 4.24 2.16

Comparing the pre-development condition peak flows in Table 1 with the developed condition peak flows in Table 2 there is an increase of 0.84m^3/s in the peak 50 year ARI flow discharging off site.

To avoid impacts on the downstream properties and infrastructure and to maintain the existing peak flow rate of runoff discharging from the developed site for all rainfall events up to and including the local catchment 100 year ARI event, on-site detention is proposed to be incorporated into the development works to control the rate of discharge entering the downstream drainage network off site.

3.3 On-site Detention

The on-site detention storage proposed for this site will be sized to maintain the equivalent pre-developed condition peak flows discharging from the subject site for local catchment rainfall events up to and including the 100 year ARI rainfall event. To control the peak rate of discharge from the storage area it will be necessary for the outlet arrangement to be designed to maintain the existing peak flow.

A preliminary assessment of the on-site detention storage requirements for the proposed development area, using the initial sizing manual techniques in Section 5.05.1 of QUDM, indicates that the 50 year ARI storm causes the greatest increase in peak discharge. An estimated total storage volume of approximately 2150m^3 will be required to detain the increase in the Q50 discharge and maintain the equivalent pre-developed Q50 peak flow discharging off site.

It is proposed to provide the required storage capacity of 2150m^3 by the use of rainwater tanks, which will detain runoff from the roofed areas on the site, and detention basins incorporated with in the stormwater drainage network. Overflow from the rainwater tanks will flow into the detention basins. The basins will double as water quality treatment devices and will be suitably designed so as to perform effectively for both tasks. Cardno Drawing GCE1022-Sketch No.2 in **Appendix A** shows the preliminary location of the rainwater tanks and detention basins. These locations may change during the detailed design of the development.

The stormwater inlet pits located within the development site will only be designed with sufficient capacity to capture the developed condition 10 year ARI runoff, as any excess runoff will flow overland into the detention basin area.