

HAWKESBURY CITY COUNCIL

Bligh Park Evacuation Route Options Study

March 2011



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EXECUTIVE SUMMARY

Within the Hawkesbury-Nepean Floodplain Management Strategy, Bligh Park was one of a number of population centres which were identified as needing improved local evacuation routes to ensure effectiveness of the regional evacuation routes.

In 2007, hydrologic and hydraulic modelling of design events ranging between 20 year average recurrence interval (ARI) and the probable maximum flood (PMF) found that many of the low points along the Bligh Park local flood evacuation routes were problematic in major storm events. This study expands on those earlier report findings by undertaking more sophisticated flood modelling of the low points.

The model results confirm that there many problematic inundation issues. As well as better quantifying the depths and extent of local evacuation route flooding, the results will also provide the SES and Council with the best available information to help with the planning of evacuations.

Since both the low point inundation issues and associated impacts on flood-time evacuation are very substantial, the report recommends further consideration of a range of potential options such as utilisation (& modification) of existing laneways (in order to serve as alternative evacuation routes), laneway-based improvements to overland flowpaths and drainage infrastructure modifications/upgrades.

As well as providing more precise information on low point flooding, the modelling also provides improved levels of detail in terms of water levels and associated inundation mapping especially in the vicinity of the Colonial Reserve and Bounty Reserve detention basins.

1. INTRODUCTION

Bewsher Consulting undertook the 2007 Bligh Park Evacuation Route Study (**Reference 1**) which focussed on low point flooding along the various local evacuation routes which then connect to the Hawkesbury-Nepean regional evacuation route. Details regarding public consultation and documentation of historical flood observations as well as low point flood modelling can be found in that report.

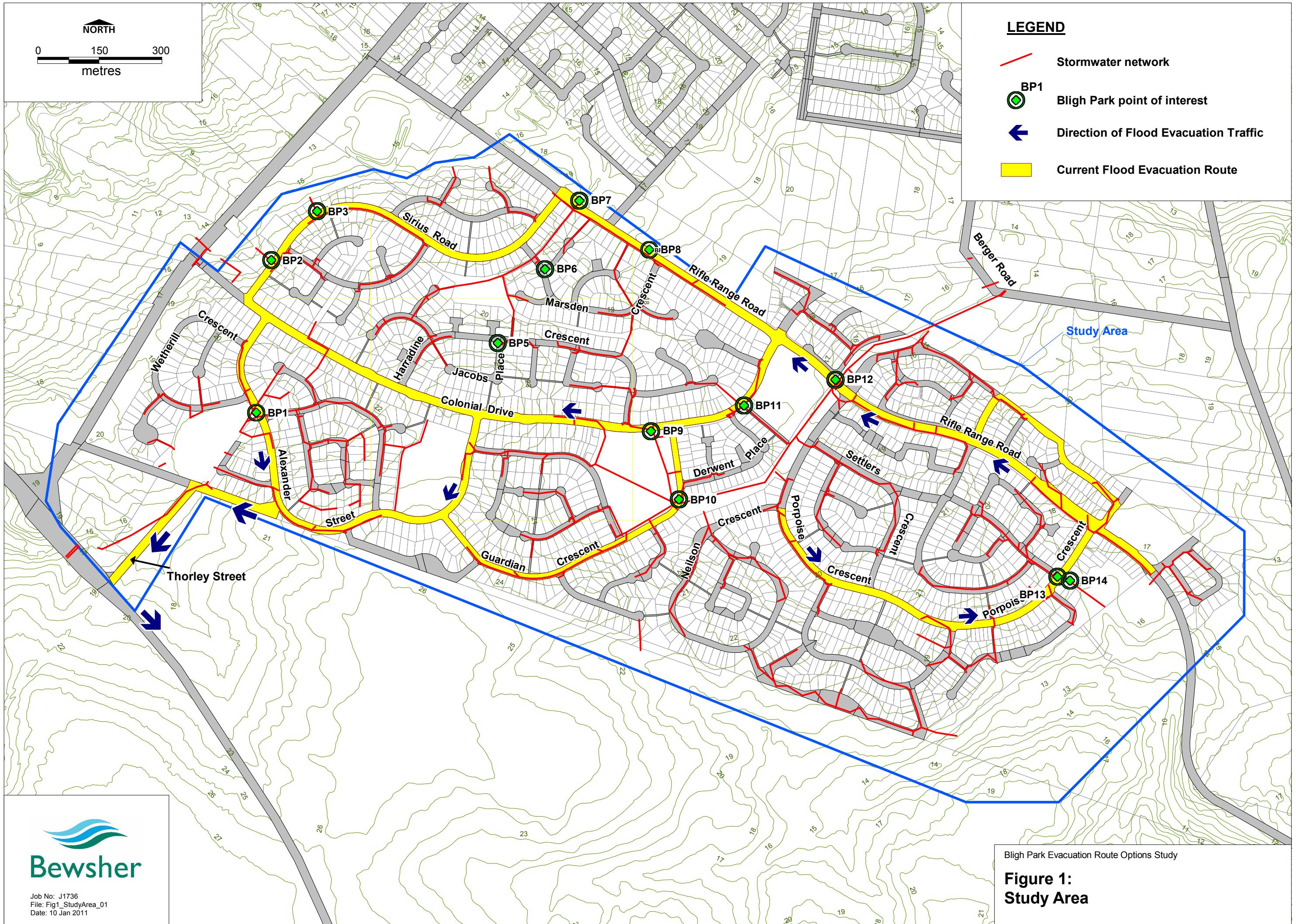
Figure 1 defines those SES-identified local area evacuation routes and their accompanying low point locations.

This study expands on the 2007 report findings by undertaking more sophisticated flood modelling of the low points in order to both better quantify the extent of local evacuation route flooding and to provide the SES and Council with the best available information to help with the planning of evacuations. As such the study looks at not only the evacuation constraints but also the evacuation improvement opportunities such as potential utilisation of laneways and local culvert/road upgrades.

As commissioned, the assessment involves a range of design events ranging between 20 year average recurrence interval (ARI) and the probable maximum flood (PMF) for the area shown in **Figure 1**.

Both studies are being undertaken by Hawkesbury City Council as part of it's preparation of a Local Floodplain Risk Management Study and Plan for Bligh Park.

Both were undertaken under the guidance of a Technical Working Group (TWG) which comprised representatives from the Department of Environment, Climate Change & Water (DECCW), the State Emergency Service (SES) and Hawkesbury City Council (HCC).





Photograph No. 1: View of Rifle Range Road twin box culvert structure, looking upstream.

2. MODELLING APPROACH

The 2007 study (**Reference 1**) utilised a combination of RAFTS (hydrologic) modelling to assess potential depths of ponding at most of the points of interest; and HEC-RAS (hydraulic) modelling to assess flood levels at the Rifle Range Road culvert crossing of the open channel. Since the emphasis of this study is on the assessment of potentially broader scale overland flow regimes there is the need to use a superior modelling approach especially for the calculation of water levels and the associated inundation mapping.

Consequently, the commission called for the following tasks to be undertaken:

- ▶ Utilisation of earlier RAFTS models for assessment of 20 year ARI, 50 year ARI, 100 year ARI, 200 year ARI, 500 year ARI and PMF event flows; and
- ▶ Development of a TUFLOW (2D hydraulic) model to assess flood levels and related hazard along urban neighbourhood flow paths, in detention basins and in open channels. The modelling was also to consider several blockage scenarios at the Rifle Range Road culvert (see **Photograph No. 1**).

As the focus of the study is on overland flow issues, the analysis has not included an assessment of the capacity of local stormwater pipe systems. While the bulk of the modelling has not included the pipe systems, the sensitivity of making an allowance for their capacities has been tested.

2.1 HYDROLOGIC MODELLING

For the calculation of flows, the 2007 RAFTS model (Version 2000) was used. Several modifications were made to that model which consisted of deletion of all de-facto basins (since they would now be explicitly included in the comprehensive hydraulic model) and adjustments to several subcatchment boundaries (following a review of airborne laser scanning (ALS) generated contours provided by Council).

Figure 2 defines the revised network of sub-catchments which are very similar to the 2007 definition. As also reported in 2007 it can be seen that some of the catchment boundaries are actually crossing the alignment of pipe systems. This anomaly arises where there were found to be differences between the catchment watershed boundaries and the areas draining to underground pipe systems. For example, while Harradine Crescent can act as a de facto flowpath carrying flows from west to east, its runoff in frequent storm events would be collected by pipe systems which convey those flows in a northerly direction towards Rifle Range Road. Since as explained earlier the analysis is based on ignoring pipe system capacities, in instances such as Harradine Crescent the catchment watershed boundaries take precedence over the pipe system catchment boundaries.

Table 1 lists the ‘existing conditions’ sub-catchment details. The design rainfall IDF data, losses, RAFTS B_x value and RAFTS PERN values are all consistent with that used in 2007.

After inclusion of all of the above information concerning current day catchment conditions, the RAFTS models were run over a series of storm durations for each of the design flood events. The resultant 20 year ARI flows through to PMF flows were, as expected, very similar to those reported in the 2007 Evacuation Route Study report (**Reference 1**). **Table 2** lists all the peak flows and summary 100 year and 500 year ARI outputs from the model are reproduced in **Appendix A**. **Table 2** shows that the critical storm duration is typically 90 minutes for the 20 year ARI to 500 year ARI events and 15 minutes for the PMF event.

2.2 HYDRAULIC MODELLING

Using a combination of the ALS data and detailed field survey information (undertaken for the 2007 study and which is reproduced in **Appendix B**), a digital elevation model (DEM) was developed for Bligh Park.

Based on the DEM, a 2D hydraulic model (operating on a two metre grid) was developed to assess the overland flow regimes. The TUFLOW software package (**Reference 3**) was used and the build number is 2008-08-AG-ISP.

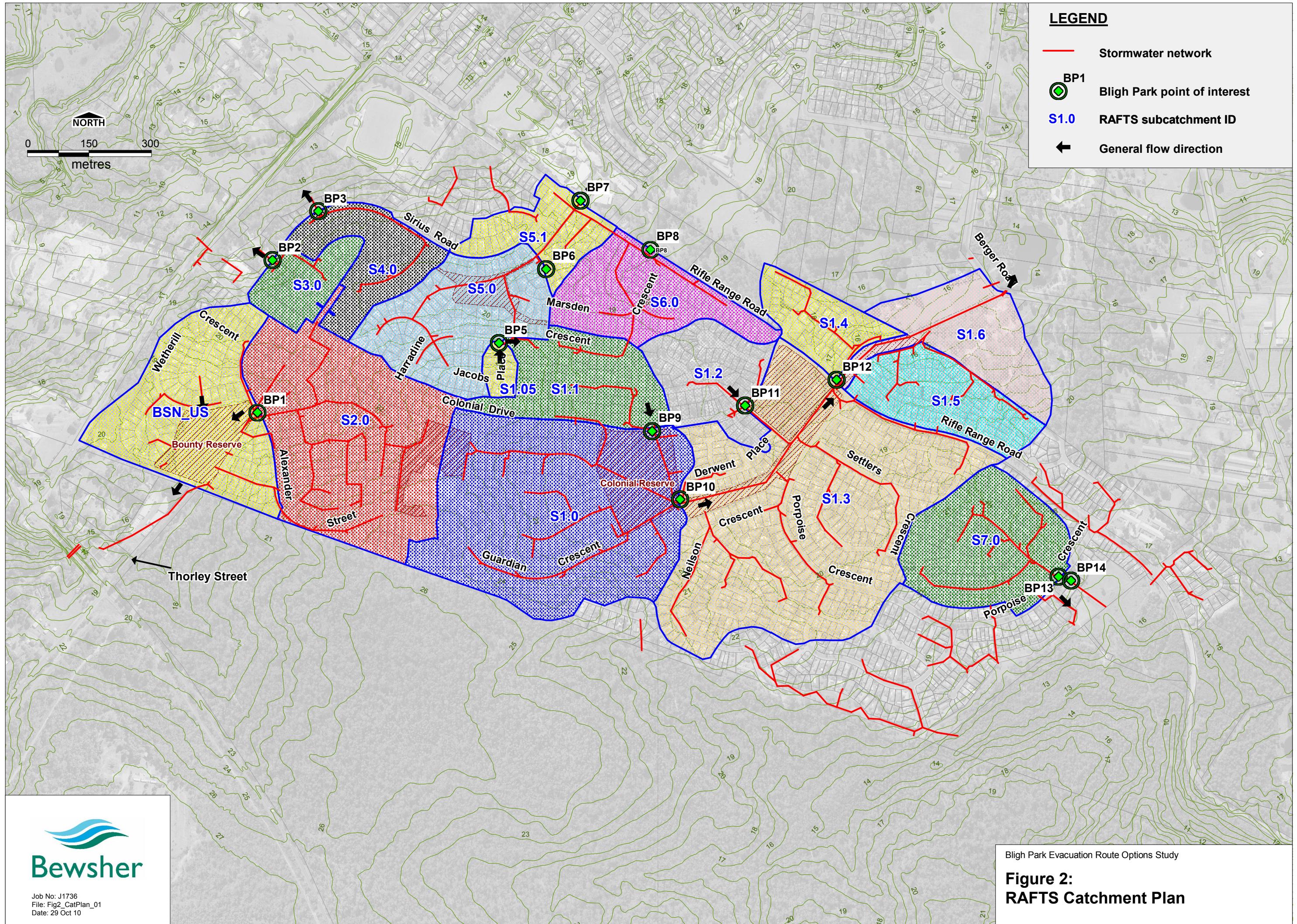


TABLE 1: SUBCATCHMENT DETAILS

BLIGH PARK: SUB-CATCHMENT AREAS & RAFTS HYDROLOGICAL MODEL DEFINITIONS						
Sub-Catchment Id	Subcatchment	Average Slope	Urban	Urban (undeveloped) i.e. parks, vegetation, etc	RAFTS Catchment Definition	
					Split Catchment 100% Impervious	Split Catchment Pervious (with 5% Impervious defn)
		(hectares)	(%)	(hectares)	(hectares)	(hectares)
S1.0	25.98	0.73	21.42	4.56	11.78	14.20
S1.05	0.95	1.10	0.95		0.52	0.43
S1.1	7.88	0.63	7.88		4.33	3.55
S1.2	6.32	0.53	6.32		3.48	2.84
S1.3	34.52	0.66	30.16	4.36	16.59	17.93
S1.4	4.35	0.40	4.35		2.39	1.96
S1.5	6.86	0.60	6.86		3.77	3.09
S1.6	7.75	0.66	0.00	7.75	0.00	7.75
S2.0	20.48	1.20	19.28	1.20	10.60	9.88
S3.0	3.46	1.00	3.46		1.90	1.56
S4.0	5.91	1.00	5.91		3.25	2.66
S5.0	10.65	1.00	10.65		5.86	4.79
S5.1	4.64	1.00	4.64		2.55	2.09
S6.0	8	1.00	8.00		4.40	3.60
S7.0	10.39	1.00	10.39		5.71	4.68
BSN_US	13.84	1.20	13.84		7.61	6.23
Total Area (ha)	171.98			Sub-Total	84.76	87.22
				Total		171.98

NOTE:

1: Typical of such urban areas, the impervious percentage is 55%

TABLE 2: SUMMARY OF RAFTS FLOWS (EXISTING CONDITIONS)

5 Year ARI Flows

RAFTS Node	Storm Duration (minutes)								Max
	25	60	90	120	180	360	540	720	
S6.0_BP8	1.7	1.6	1.7	1.6	1.1	0.8	0.7	0.7	1.7
S5.0_BP6	1.7	1.7	1.8	1.8	1.4	1.1	1.0	1.0	1.8
S5.1_BP7	2.0	2.3	2.3	2.4	1.9	1.6	1.4	1.4	2.4
S4.0_BP3	1.2	1.2	1.3	1.2	0.8	0.6	0.5	0.5	1.3
S3.0_BP2	0.8	0.7	0.8	0.7	0.5	0.4	0.3	0.3	0.8
S2.0_BP1	4.0	3.8	4.1	3.8	2.6	2.1	1.8	1.9	4.1
BSN_US	6.8	6.5	7.1	6.4	4.4	3.5	3.1	3.2	7.1
BSN_DS	0.5	1.4	1.5	1.7	1.7	2.0	2.3	2.1	2.3
BP2_Out	0.8	1.5	1.7	1.8	1.8	2.2	2.5	2.3	2.5
BP3_Out	2.0	2.0	2.2	2.2	2.1	2.6	2.9	2.8	2.9
Out	3.8	4.0	4.4	4.3	3.5	3.6	4.0	4.2	4.4
BP8_Out	5.0	5.3	5.8	5.5	4.4	4.1	4.5	4.8	5.8
S7.0_BP13	2.1	2.0	2.2	2.0	1.4	1.1	0.9	1.0	2.2
BP13_Out	2.1	2.0	2.2	2.0	1.4	1.1	0.9	1.0	2.2
S1.4	0.9	0.8	0.9	0.8	0.5	0.4	0.4	0.4	0.9
S1.5	1.4	1.3	1.4	1.3	0.8	0.7	0.6	0.6	1.4
S1.0	4.3	4.1	4.5	4.1	2.7	2.4	2.1	2.2	4.5
S1.05_BP5	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.2
S1.1_BP9	1.7	1.6	1.8	1.6	1.1	0.9	0.8	0.8	1.8
Col_Bsn	6.0	5.7	6.2	5.7	3.8	3.3	2.9	3.0	6.2
S1.2_BP11	1.3	1.2	1.3	1.2	0.8	0.6	0.5	0.6	1.3
S1.3	6.5	6.3	6.7	6.1	4.3	3.7	4.4	3.6	6.7
Dummy	7.8	7.6	8.0	7.7	5.4	4.7	5.0	4.5	8.0
S1.6	7.9	7.8	8.3	8.0	5.6	5.1	5.5	4.9	8.3
ArtOutlet	13.3	13.8	14.2	15.1	11.1	10.1	10.5	10.6	15.1

10 Year ARI Flows

RAFTS Node	Storm Duration (minutes)								Max
	25	60	90	120	180	360	540	720	
S6.0_BP8	1.9	1.8	2.1	1.8	1.3	0.9	0.8	0.9	2.1
S5.0_BP6	2.1	2.0	2.2	2.2	1.7	1.3	1.1	1.1	2.2
S5.1_BP7	2.4	2.6	2.7	2.9	2.3	1.8	1.6	1.6	2.9
S4.0_BP3	1.4	1.3	1.5	1.4	1.0	0.7	0.6	0.6	1.5
S3.0_BP2	0.9	0.8	0.9	0.8	0.6	0.4	0.4	0.4	0.9
S2.0_BP1	4.6	4.3	4.9	4.4	3.1	2.4	2.1	2.2	4.9
BSN_US	7.8	7.4	8.4	7.6	5.3	4.0	3.5	3.6	8.4
BSN_DS	0.7	1.8	2.1	2.3	2.2	2.5	2.7	2.8	2.8
BP2_Out	1.0	2.0	2.3	2.6	2.4	2.8	3.0	3.1	3.1
BP3_Out	2.2	2.4	2.7	3.0	2.8	3.2	3.5	3.6	3.6
Out	4.4	4.6	5.2	5.3	4.2	4.4	4.8	5.2	5.3
BP8_Out	5.9	6.1	6.8	6.7	5.3	5.0	5.5	6.0	6.8
S7.0_BP13	2.5	2.3	2.6	2.4	1.6	1.2	1.1	1.1	2.6
BP13_Out	2.4	2.3	2.6	2.3	1.6	1.2	1.1	1.1	2.6
S1.4	1.0	0.9	1.0	0.9	0.6	0.5	0.4	0.4	1.0
S1.5	1.6	1.5	1.6	1.5	1.0	0.8	0.7	0.7	1.6
S1.0	5.0	4.7	5.2	4.8	3.2	2.8	2.4	2.6	5.2
S1.05_BP5	0.3	0.2	0.3	0.3	0.2	0.1	0.1	0.1	0.3
S1.1_BP9	2.0	1.9	2.1	1.9	1.3	1.0	0.9	0.9	2.1
Col_Bsn	6.9	6.4	7.2	6.6	4.5	3.8	3.3	3.5	7.2
S1.2_BP11	1.5	1.3	1.5	1.4	0.9	0.7	0.6	0.7	1.5
S1.3	7.6	7.0	7.8	7.0	5.0	4.3	5.8	5.3	7.8
Dummy	9.0	8.6	9.4	8.9	6.3	5.4	6.6	6.0	9.4
S1.6	9.2	8.9	9.7	9.3	6.7	5.9	7.2	6.6	9.7
ArtOutlet	15.4	15.7	16.9	17.8	13.3	12.0	13.3	13.3	17.8

TABLE 2: SUMMARY OF RAFTS FLOWS (EXISTING CONDITIONS)

20 Year ARI Flows

RAFTS Node	Storm Duration (minutes)								Max
	25	60	90	120	180	360	540	720	
S6.0_BP8	2.3	2.2	2.5	2.2	1.6	1.1	1.0	1.0	2.5
S5.0_BP6	2.6	2.4	2.7	2.7	2.0	1.5	1.3	1.3	2.7
S5.1_BP7	3.0	3.2	3.3	3.5	2.8	2.1	1.8	1.9	3.5
S4.0_BP3	1.7	1.6	1.9	1.7	1.2	0.8	0.7	0.7	1.9
S3.0_BP2	1.0	1.0	1.1	1.0	0.7	0.5	0.4	0.4	1.1
S2.0_BP1	5.5	5.2	5.9	5.3	3.7	2.8	2.4	2.5	5.9
BSN_US	9.4	8.8	10.0	9.0	6.4	4.7	4.1	4.2	10.0
BSN_DS	1.1	2.7	3.0	3.2	3.0	3.2	3.3	3.6	3.6
BP2_Out	1.3	3.0	3.2	3.5	3.3	3.5	3.7	4.0	4.0
BP3_Out	2.8	3.5	3.7	4.1	3.8	4.0	4.3	4.6	4.6
Out	5.6	5.8	6.6	6.6	5.3	5.6	6.0	6.5	6.6
BP8_Out	7.2	7.3	8.4	8.2	6.6	6.4	6.8	7.4	8.4
S7.0_BP13	3.0	2.8	3.1	2.8	2.0	1.4	1.3	1.3	3.1
BP13_Out	2.9	2.7	3.1	2.8	2.0	1.4	1.3	1.3	3.1
S1.4	1.2	1.1	1.2	1.1	0.7	0.6	0.5	0.5	1.2
S1.5	1.9	1.7	2.0	1.8	1.2	0.9	0.8	0.8	2.0
S1.0	5.9	5.6	6.3	5.7	3.9	3.3	2.9	3.0	6.3
S1.05_BP5	0.3	0.3	0.3	0.3	0.2	0.1	0.1	0.1	0.3
S1.1_BP9	2.4	2.2	2.5	2.2	1.6	1.2	1.0	1.1	2.5
Col_Bsn	8.3	7.7	8.7	7.8	5.5	4.5	3.9	4.1	8.7
S1.2_BP11	1.7	1.6	1.8	1.6	1.1	0.8	0.7	0.8	1.8
S1.3	9.0	8.3	9.3	8.3	6.0	5.2	7.1	7.6	9.3
Dummy	10.8	10.2	11.2	10.7	7.6	6.5	8.2	8.6	11.2
S1.6	11.1	10.6	11.7	11.1	8.0	7.1	8.9	9.3	11.7
ArtOutlet	18.9	19.2	20.7	21.6	16.2	14.7	16.2	17.6	21.6

50 Year ARI Flows

RAFTS Node	Storm Duration (minutes)								Max
	25	60	90	120	180	360	540	720	
S6.0_BP8	2.5	2.5	2.8	2.6	1.9	1.2	1.2	1.1	2.8
S5.0_BP6	2.9	2.8	3.1	3.1	2.5	1.6	1.5	1.5	3.1
S5.1_BP7	3.5	3.8	3.9	4.1	3.4	2.3	2.2	2.1	4.1
S4.0_BP3	1.9	1.9	2.1	1.9	1.4	0.9	0.9	0.8	2.1
S3.0_BP2	1.1	1.1	1.3	1.2	0.9	0.5	0.5	0.5	1.3
S2.0_BP1	6.0	5.9	6.7	6.0	4.6	3.1	2.9	2.8	6.7
BSN_US	10.3	10.2	11.4	10.3	7.8	5.2	4.9	4.7	11.4
BSN_DS	1.8	4.0	4.0	4.1	3.9	3.8	4.2	4.2	4.2
BP2_Out	2.1	4.4	4.4	4.6	4.3	4.2	4.7	4.7	4.7
BP3_Out	3.2	5.1	5.1	5.2	5.0	4.9	5.4	5.4	5.4
Out	6.4	7.5	7.8	8.1	6.8	6.9	7.5	7.4	8.1
BP8_Out	8.3	8.9	9.9	9.9	8.4	7.9	8.5	8.5	9.9
S7.0_BP13	3.2	3.2	3.6	3.2	2.4	1.6	1.5	1.4	3.6
BP13_Out	3.2	3.1	3.5	3.2	2.4	1.6	1.5	1.4	3.5
S1.4	1.3	1.2	1.4	1.2	0.9	0.6	0.6	0.6	1.4
S1.5	2.0	2.0	2.3	2.0	1.5	1.0	1.0	0.9	2.3
S1.0	6.5	6.3	7.1	6.4	4.9	3.7	3.5	3.4	7.1
S1.05_BP5	0.4	0.4	0.4	0.4	0.2	0.1	0.1	0.1	0.4
S1.1_BP9	2.6	2.5	2.9	2.6	2.0	1.3	1.3	1.2	2.9
Col_Bsn	9.0	8.8	9.9	8.9	6.8	5.0	4.7	4.6	9.9
S1.2_BP11	1.9	1.8	2.0	1.8	1.4	0.9	0.9	0.8	2.0
S1.3	9.8	9.5	10.5	9.4	7.5	6.8	9.0	9.2	10.5
Dummy	11.8	11.7	12.8	12.1	9.4	7.7	10.3	10.5	12.8
S1.6	12.2	12.2	13.4	12.8	10.0	8.5	11.1	11.3	13.4
ArtOutlet	21.5	22.7	24.3	25.3	20.2	17.2	20.7	20.8	25.3

TABLE 2: SUMMARY OF RAFTS FLOWS (EXISTING CONDITIONS)

100 Year ARI Flows

RAFTS Node	Storm Duration (minutes)								Max
	25	60	90	120	180	360	540	720	
S6.0_BP8	2.9	2.9	3.2	2.9	2.0	1.4	1.2	1.2	3.2
S5.0_BP6	3.3	3.3	3.6	3.5	2.6	1.8	1.6	1.6	3.6
S5.1_BP7	4.1	4.4	4.4	4.7	3.6	2.6	2.3	2.3	4.7
S4.0_BP3	2.2	2.2	2.4	2.2	1.5	1.0	0.9	0.9	2.4
S3.0_BP2	1.3	1.3	1.5	1.3	0.9	0.6	0.5	0.5	1.5
S2.0_BP1	6.8	6.8	7.7	6.9	4.9	3.5	3.1	3.1	7.7
BSN_US	11.7	11.6	13.1	11.8	8.3	5.8	5.1	5.2	13.1
BSN_DS	2.5	5.0	5.0	5.1	4.4	4.6	4.5	4.8	5.1
BP2_Out	2.9	5.6	5.6	5.7	4.8	5.1	5.0	5.3	5.7
BP3_Out	3.7	6.4	6.4	6.5	5.5	5.9	5.8	6.1	6.5
Out	7.5	9.3	9.4	10.2	7.6	8.3	8.0	8.4	10.2
BP8_Out	9.6	10.8	11.5	11.8	9.2	9.5	9.1	9.6	11.8
S7.0_BP13	3.7	3.7	4.1	3.7	2.6	1.8	1.6	1.6	4.1
BP13_Out	3.6	3.6	4.0	3.6	2.6	1.8	1.6	1.6	4.0
S1.4	1.4	1.4	1.6	1.4	1.0	0.7	0.6	0.6	1.6
S1.5	2.3	2.3	2.6	2.3	1.6	1.2	1.0	1.0	2.6
S1.0	7.4	7.2	8.1	7.3	5.3	4.2	3.6	3.8	8.1
S1.05_BP5	0.4	0.4	0.4	0.4	0.3	0.2	0.1	0.1	0.4
S1.1_BP9	3.0	2.9	3.2	2.9	2.1	1.5	1.3	1.3	3.2
Col_Bsn	10.3	10.1	11.3	10.2	7.3	5.6	4.9	5.1	11.3
S1.2_BP11	2.1	2.1	2.3	2.1	1.5	1.1	0.9	0.9	2.3
S1.3	11.2	10.8	12.0	10.7	8.0	8.5	9.7	10.4	12.0
Dummy	13.4	13.5	14.7	13.8	10.1	9.6	11.1	11.8	14.7
S1.6	13.9	14.1	15.4	14.6	10.8	10.5	11.9	12.7	15.4
ArtOutlet	24.8	26.4	28.3	29.3	21.9	20.1	22.1	23.6	29.3

200 Year ARI Flows

RAFTS Node	Storm Duration (minutes)								Max
	25	60	90	120	180	360	540	720	
S6.0_BP8	3.2	3.1	3.5	3.2	2.2	1.5	1.3	1.3	3.5
S5.0_BP6	3.7	3.6	3.9	3.9	2.9	2.0	1.7	1.7	3.9
S5.1_BP7	4.6	4.8	4.8	5.1	4.0	2.8	2.5	2.5	5.1
S4.0_BP3	2.4	2.4	2.6	2.4	1.6	1.1	1.0	1.0	2.6
S3.0_BP2	1.4	1.5	1.6	1.4	1.0	0.6	0.6	0.6	1.6
S2.0_BP1	7.5	7.4	8.3	7.6	5.4	3.8	3.3	3.3	8.3
BSN_US	12.9	12.7	14.2	12.9	9.1	6.3	5.6	5.6	14.2
BSN_DS	3.2	5.9	5.8	6.1	4.8	5.3	5.0	5.2	6.1
BP2_Out	3.7	6.5	6.4	6.7	5.3	5.9	5.5	5.8	6.7
BP3_Out	4.3	7.4	7.4	7.6	6.1	6.8	6.4	6.7	7.6
Out	8.3	10.7	10.8	11.9	8.7	9.5	8.8	9.1	11.9
BP8_Out	10.6	12.3	12.7	13.6	10.4	10.8	10.0	10.4	13.6
S7.0_BP13	4.0	4.0	4.4	4.0	2.8	1.9	1.7	1.7	4.4
BP13_Out	4.0	3.9	4.4	4.0	2.8	1.9	1.7	1.7	4.4
S1.4	1.6	1.5	1.7	1.5	1.1	0.8	0.7	0.7	1.7
S1.5	2.6	2.5	2.8	2.5	1.8	1.3	1.1	1.1	2.8
S1.0	8.0	7.9	8.9	8.0	5.7	4.5	4.0	4.1	8.9
S1.05_BP5	0.5	0.4	0.5	0.4	0.3	0.2	0.2	0.2	0.5
S1.1_BP9	3.3	3.2	3.6	3.2	2.3	1.6	1.4	1.4	3.6
Col_Bsn	11.2	11.0	12.3	11.1	8.0	6.1	5.4	5.5	12.3
S1.2_BP11	2.3	2.3	2.5	2.3	1.6	1.2	1.0	1.0	2.5
S1.3	12.3	11.8	13.0	11.7	8.8	9.6	10.6	11.3	13.0
Dummy	14.8	14.6	16.0	15.1	11.1	11.0	12.1	12.8	16.0
S1.6	15.3	15.3	16.8	16.0	11.9	12.0	13.0	13.8	16.8
ArtOutlet	27.3	28.9	31.2	32.4	24.3	22.4	24.2	25.5	32.4

TABLE 2: SUMMARY OF RAFTS FLOWS (EXISTING CONDITIONS)

500 Year ARI Flows

RAFTS Node	Storm Duration (minutes)								Max
	25	60	90	120	180	360	540	720	
S6.0_BP8	3.6	3.6	4.0	3.6	2.5	1.7	1.5	1.5	4.0
S5.0_BP6	4.3	4.1	4.4	4.4	3.2	2.2	1.9	2.0	4.4
S5.1_BP7	5.3	5.4	5.5	5.8	4.5	3.1	2.8	2.8	5.8
S4.0_BP3	2.7	2.7	3.0	2.7	1.8	1.2	1.1	1.1	3.0
S3.0_BP2	1.7	1.7	1.8	1.7	1.1	0.7	0.6	0.6	1.8
S2.0_BP1	8.5	8.5	9.5	8.6	6.0	4.2	3.7	3.7	9.5
BSN_US	14.6	14.5	16.1	14.6	10.2	7.0	6.2	6.3	16.1
BSN_DS	4.4	7.2	7.2	7.7	5.7	6.3	5.7	5.9	7.7
BP2_Out	4.9	7.9	7.9	8.5	6.2	6.9	6.3	6.6	8.5
BP3_Out	5.7	9.1	9.1	9.8	7.2	8.0	7.2	7.6	9.8
Out	9.7	13.2	13.5	14.8	10.8	11.0	9.9	10.3	14.8
BP8_Out	12.2	15.1	15.4	16.8	12.5	12.5	11.3	11.7	16.8
S7.0_BP13	4.6	4.5	5.0	4.6	3.1	2.1	1.9	1.9	5.0
BP13_Out	4.5	4.5	5.0	4.5	3.1	2.1	1.9	1.9	5.0
S1.4	1.8	1.7	1.9	1.7	1.2	0.9	0.8	0.8	1.9
S1.5	2.9	2.8	3.2	2.9	2.0	1.4	1.2	1.2	3.2
S1.0	9.1	9.0	10.0	9.1	6.6	5.1	4.4	4.6	10.0
S1.05_BP5	0.5	0.5	0.5	0.5	0.3	0.2	0.2	0.2	0.5
S1.1_BP9	3.7	3.6	4.1	3.6	2.6	1.8	1.6	1.6	4.1
Col_Bsn	12.7	12.5	14.0	12.7	9.1	6.9	6.0	6.2	14.0
S1.2_BP11	2.6	2.6	2.9	2.6	1.8	1.3	1.1	1.1	2.9
S1.3	13.9	13.3	14.7	13.2	10.5	11.1	11.9	12.6	14.7
Dummy	16.7	16.6	18.1	17.1	12.6	12.7	13.6	14.4	18.1
S1.6	17.3	17.4	19.2	18.1	13.6	13.9	14.6	15.5	19.2
ArtOutlet	31.2	33.6	36.5	37.5	28.3	25.6	27.3	28.7	37.5

PMF Flows

RAFTS Node	Storm Duration (minutes)										Max
	15	30	45	60	90	120	150	180	240	360	
S6.0_BP8	14.5	13.4	12.3	11.3	10.1	9.1	8.1	7.4	6.3	4.9	14.5
S5.0_BP6	20.2	17.6	15.8	15.1	13.3	12.1	10.8	9.8	8.4	6.5	20.2
S5.1_BP7	26.5	24.6	22.8	21.1	18.9	17.3	15.4	14.1	12.0	9.4	26.5
S4.0_BP3	11.0	10.1	9.1	8.4	7.5	6.7	6.0	5.5	4.7	3.6	11.0
S3.0_BP2	6.9	6.1	5.4	5.1	4.4	3.9	3.5	3.2	2.7	2.1	6.9
S2.0_BP1	34.6	32.3	30.7	28.3	25.5	23.2	20.7	18.9	16.1	12.6	34.6
BSN_US	59.2	54.8	51.5	47.5	42.9	38.9	34.7	31.7	27.0	21.0	59.2
BSN_DS	55.7	52.6	49.8	46.7	42.6	38.7	34.6	31.7	27.0	21.0	55.7
BP2_Out	61.9	58.1	54.7	51.6	46.8	42.7	38.1	34.9	29.8	23.2	61.9
BP3_Out	70.6	67.4	62.5	59.4	54.0	49.2	43.9	40.3	34.4	26.8	70.6
Out	96.6	91.9	84.4	80.4	72.9	66.4	59.3	54.4	46.4	36.2	96.6
BP8_Out	107.2	103.7	95.2	90.6	82.5	75.2	67.3	61.7	52.7	41.1	107.2
S7.0_BP13	18.6	17.0	15.8	14.5	13.0	11.8	10.5	9.6	8.2	6.4	18.6
BP13_Out	18.3	16.9	15.7	14.5	13.0	11.8	10.5	9.6	8.2	6.4	18.3
S1.4	7.3	6.4	6.2	6.0	5.3	4.9	4.4	4.0	3.4	2.7	7.3
S1.5	11.7	10.4	10.1	9.5	8.5	7.7	6.9	6.3	5.4	4.2	11.7
S1.0	36.4	35.0	34.2	34.6	30.6	28.7	25.9	23.8	20.4	15.9	36.4
S1.05_BP5	2.1	1.7	1.5	1.4	1.2	1.1	1.0	0.9	0.7	0.6	2.1
S1.1_BP9	15.0	13.7	13.1	12.1	10.9	10.0	8.9	8.2	7.0	5.4	15.0
Col_Bsn	51.2	47.8	47.0	46.7	41.1	38.7	34.8	32.0	27.3	21.3	51.2
S1.2_BP11	10.7	9.5	9.2	8.7	7.8	7.1	6.4	5.8	5.0	3.9	10.7
S1.3	55.5	84.7	91.6	91.9	86.9	80.6	73.5	68.2	59.0	46.3	91.9
Dummy	71.2	93.7	102.9	104.0	99.0	91.6	83.9	78.1	67.5	53.1	104.0
S1.6	76.2	101.3	111.2	112.7	107.3	99.3	91.1	84.8	73.4	57.7	112.7
ArtOutlet	196.6	191.7	200.5	202.5	192.5	180.6	166.6	154.8	134.0	105.1	202.5

2.2.1 TUFLOW Features

The TUFLOW model includes the following inputs and features:

- ▶ Inflows: These consist of the RAFTS-generated hydrographs (including as-required proportioning of some hydrographs to reflect separate subcatchment flowpath regimes);
- ▶ Downstream boundary conditions: The same approach used for design tailwater conditions in the 2007 study was adopted, as follows.

Table 3 itemises the coincident Hawkesbury-Nepean flood events used for the various local catchment model runs.

TABLE 3: DESIGN DOWNSTREAM BOUNDARY CONDITIONS

Bligh Park local catchment ARI storm	Coincident Hawkesbury-Nepean ARI flood peak
20 year	5 year
50 year	10 year
100 year	20 year
200 & 500 year	50 year
PMF	100 year

Table 4 lists the corresponding Hawkesbury-Nepean River flood levels which were adopted at the downstream boundary.

TABLE 4: WINDSOR FLOOD LEVELS

ARI (years)	RL (m AHD)
5	11.1
10	12.3
20	13.7
50	15.7
100	17.3
200	18.7
500	20.2
PMF	26.4

Where it was found that the Hawkesbury-Nepean backwater levels were not dominant, boundary conditions were assessed using ‘uniform flow’ calculations. (To take account of potential downstream impacts below the Bounty Reserve basin outlet, the Thorley Street and Richmond Road culverts were also included with data obtained from the ‘existing conditions’ HEC-RAS model documented in the **Reference 2** report);

- ▶ Allotment modelling: Dwellings are modelled by ‘raising’ the ALS ground level by 200mm (to reflect typical slab-on-ground floor levels) and assigning a very high hydraulic roughness to the footprint. Allotment curtilage areas have been assigned a composite

- hydraulic roughness to allow for minor flow obstructions such as sheds, landscape features and boundary fences, etc as well as lawn areas;
- ▶ Culverts: The culverts under Berger Road and Rifle Range Road are included in the model.
 - ▶ Basin outlets: Since both the Colonial Reserve and Bounty Reserve detention basins have low flow pipe outlets, nominal capacity short pipe outlet systems were included in the model;
 - ▶ Hydraulic roughness parameters: The general roughness parameters used in the model are as listed in **Table 5** with open channels being modelled with the same roughness parameters as used in the 2007 hydraulic modelling.

TABLE 5: TUFLOW Model Manning's n Roughnesses

Surface Type (Material)	Manning's n
Urban property curtilage area	0.10
Roads and paved/concrete areas	0.02
Short grass / bare earth	0.03
Thick vegetation	0.06
Building footprints	20

A range of different storm duration events were tested in TUFLOW and based on those results the 25 minute and two hour storm duration flood surfaces were combined to map the 20 year to 500 year ARI events. Similarly a combination of 15 minute and one hour storm duration flood surfaces were used to map the PMF event.

2.2.2 Blockage Scenarios

The Rifle Range Road culvert crossing is the only open channel crossing within the Bligh Park study area. The TUFLOW model was run with both 0% and 50% blockage applied to the culvert waterway opening.

2.2.3 Sensitivity Trials

The flood modelling also included the following sensitivity trials associated with the 100 year ARI base case (unblocked) model:

- ▶ Firstly, recognising that full blockage of stormwater pipes is conservative, the analysis has been adjusted to make an allowance for the stormwater pipe systems. Based on the broad assumption that the pipes have a 2 year ARI flow capacity, the surface flow hydrographs for all the urban neighbourhood catchments were modified by subtracting all flows which are smaller than the 2 year ARI storm peak flow. The modified hydrographs (which then approximate the remnant surface flows) were then utilised in the TUFLOW model. However in addition where these catchment flows are conveyed to either of the Colonial Reserve or Bounty Reserve detention basins or the swale system downstream of the Colonial Reserve basin, the truncated 'pipe flow' portions of the hydrographs have

- been separately imported at the respective basin (or swale) locations in order to preserve the total flow volume at those locations;
- ▶ Secondly, the potential impacts of climate change were examined. The TWG considered that an appropriate upper limit for design rainfall intensity increases would be 20% and therefore the 100 year storm intensities were increased by that amount. The resultant hydrographs were then utilised in the TUFLOW model.

3 FLOOD MODEL RESULTS

Electronic TUFLOW output for all six design events (for both 0% and 50% Rifle Range culvert blockage scenarios) have been provided to HCC.

The following maps are presented in this report:

- ▶ 100 year ARI extent of inundation maps (for both 0% and 50% blockage conditions at the Rifle Range Road culvert), see **Figures 3 and 4** respectively;
- ▶ PMF extent of inundation maps (for both 0% and 50% blockage conditions at the Rifle Range Road culvert), see **Figures 5 and 6** respectively;
- ▶ 100 year ARI Provisional Hazard Map (based on unblocked conditions at the Rifle Range Road culvert) where the hazard categories are consistent with Figure L.2 of Appendix L of the Floodplain Development Manual (**Reference 4**), see **Figure 7**; and
- ▶ The two 100 year ‘sensitivity’ impact maps (based on unblocked conditions at the Rifle Range Road culvert): These are **Figure 8** which defines the changes in water level after conceptual allowance for pipe system capacities, and **Figure 9** which reflects the increases in water levels which would be associated with a 20% increase in rainfall intensities.

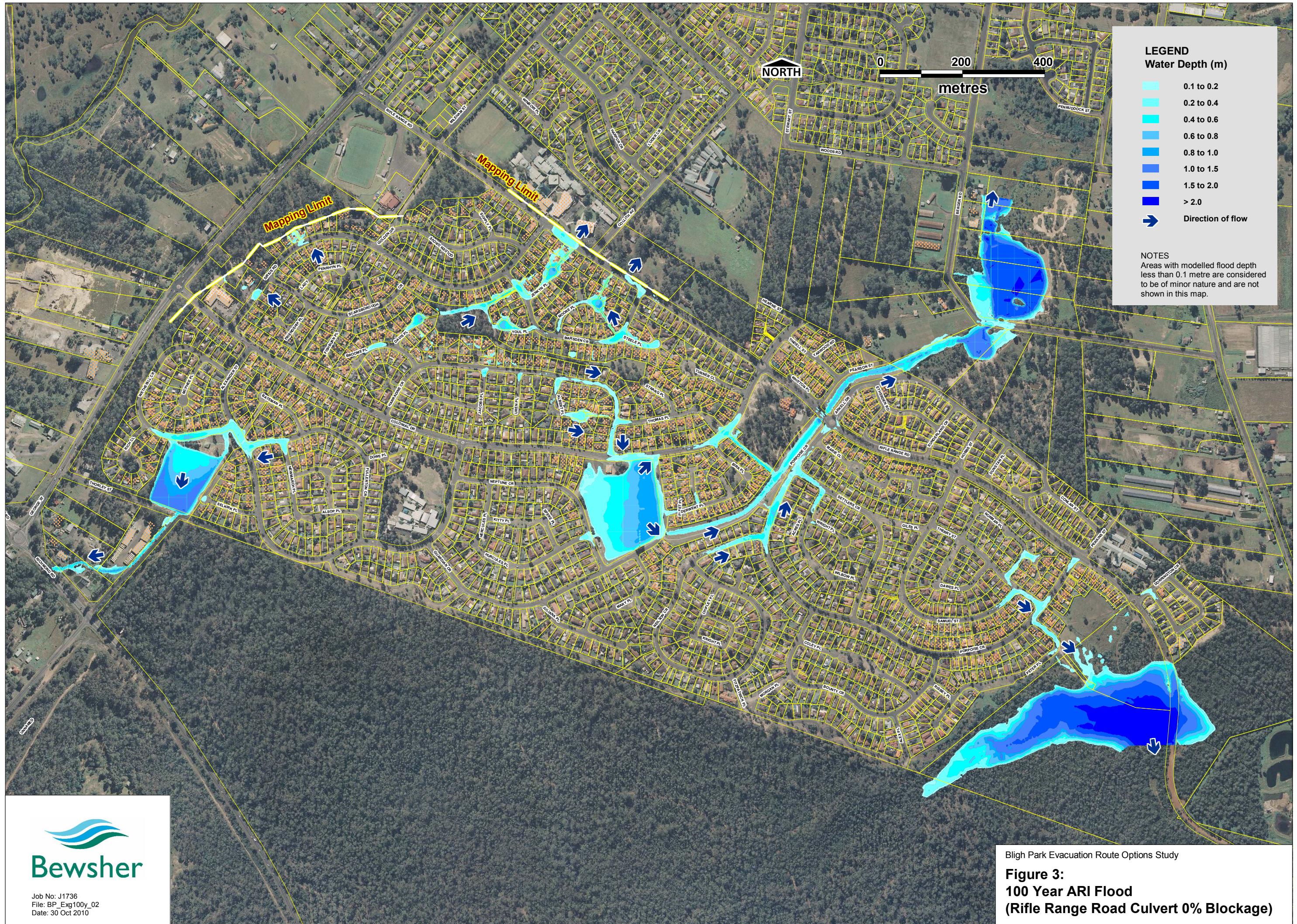
The maps are supplemented by a series of graphs which define the water level and flow hydrographs at each of the low points shown in **Figure 10**. The graphs, see **Figures 11 to 23**, plot either the 25 minute or two hour storm duration results since typically either one produces the ‘worst’ water levels at the low points. (It is important to note that the ground level shown in the water level graphs is consistent with the DEM level at the ‘marker’ location shown in **Figure 10**. Since the DEM does not explicitly replicate the definitive low point at sag point locations, the maximum sag point depths listed in the text below are relative to the detailed field surveyed level and not to the DEM level. Hence the listed depths often differ from the values which would be read from the corresponding graph.)

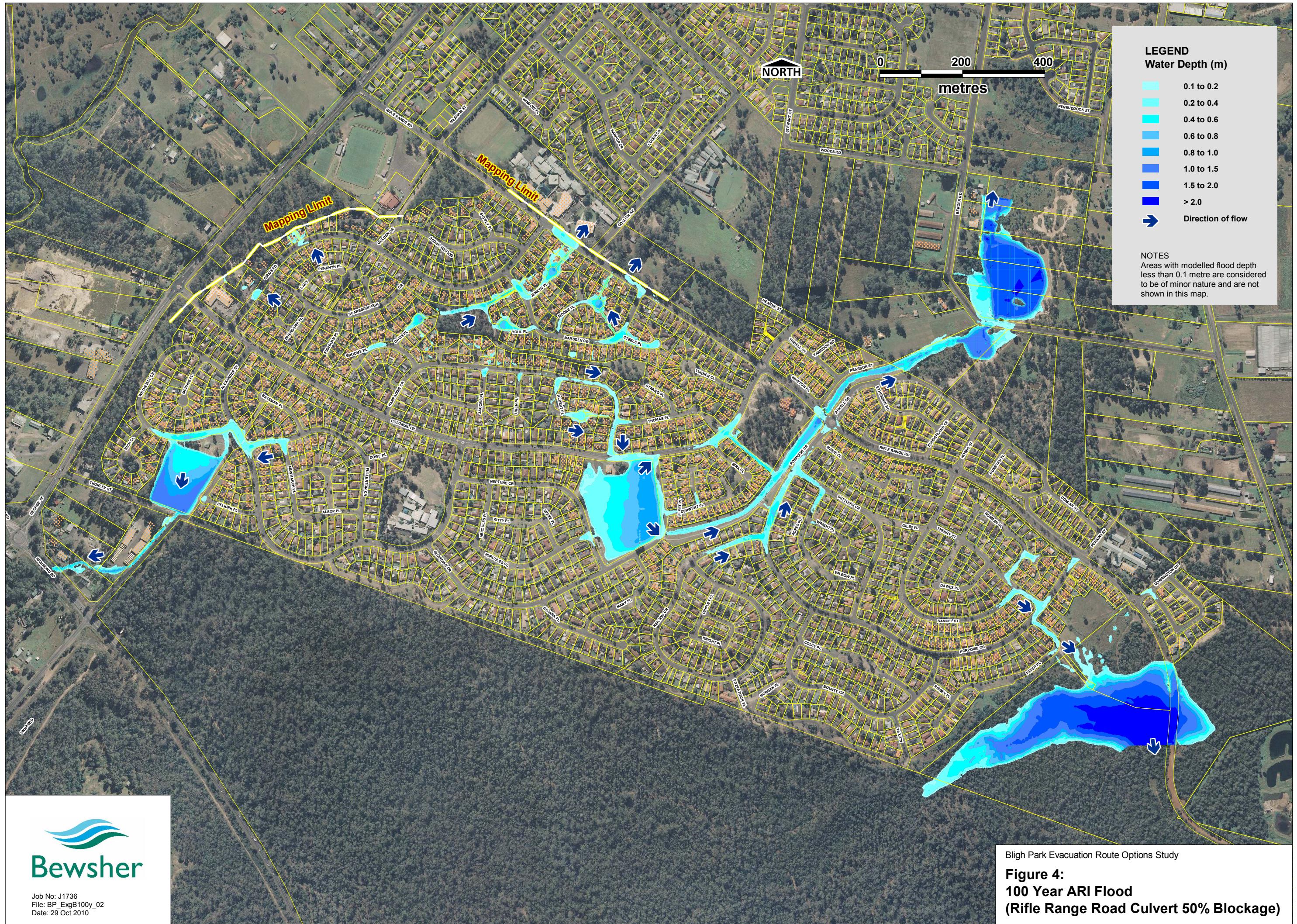
3.1 100 YEAR ARI AND PMF EXTENTS OF INUNDATION

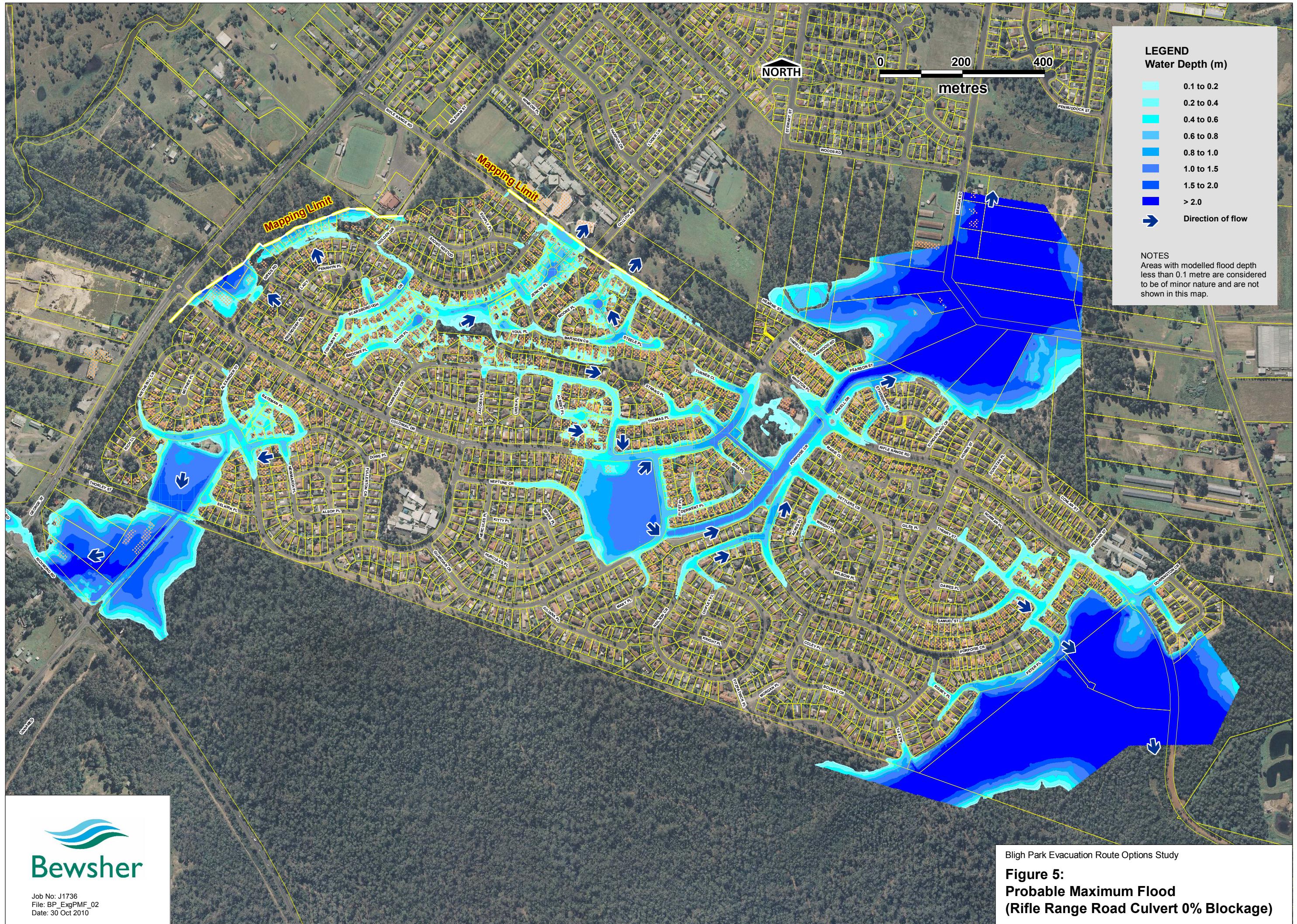
Figures 3 and 4 provide near identical pictures of 100 year ARI inundation since the only difference between the two models is consideration of blockage at the Rifle Range Road culvert. Since depths of inundation of less than 0.1 metres represent only very minor flow regimes, areas experiencing such inundation have not been mapped. One consequence of this is that it can be seen from the figures that the elimination of areas experiencing such shallow inundation results in non-continuous flow patterns in some areas.

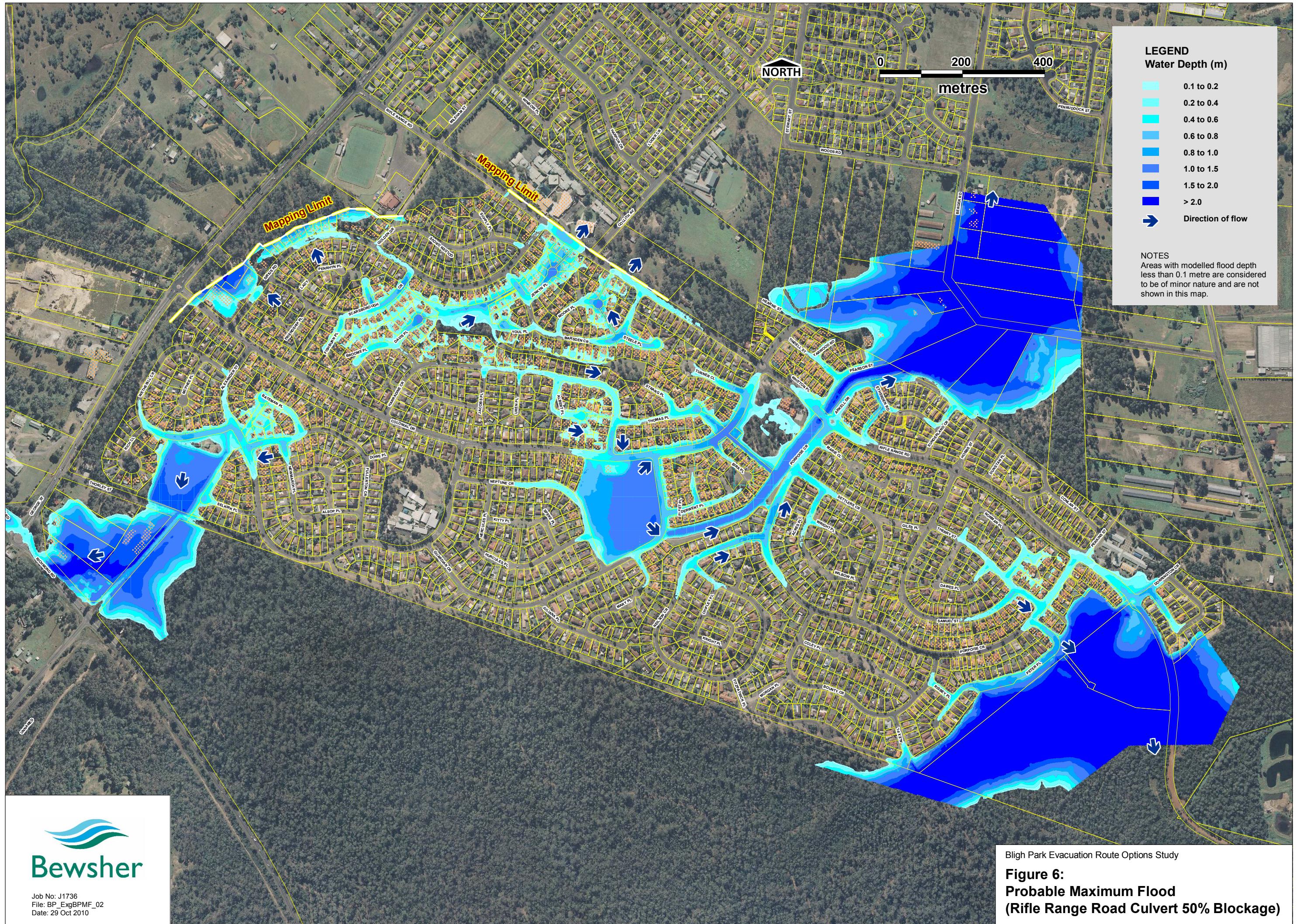
The two figures show that in most urban neighbourhood locations, the flowpaths are predominantly in roadways.

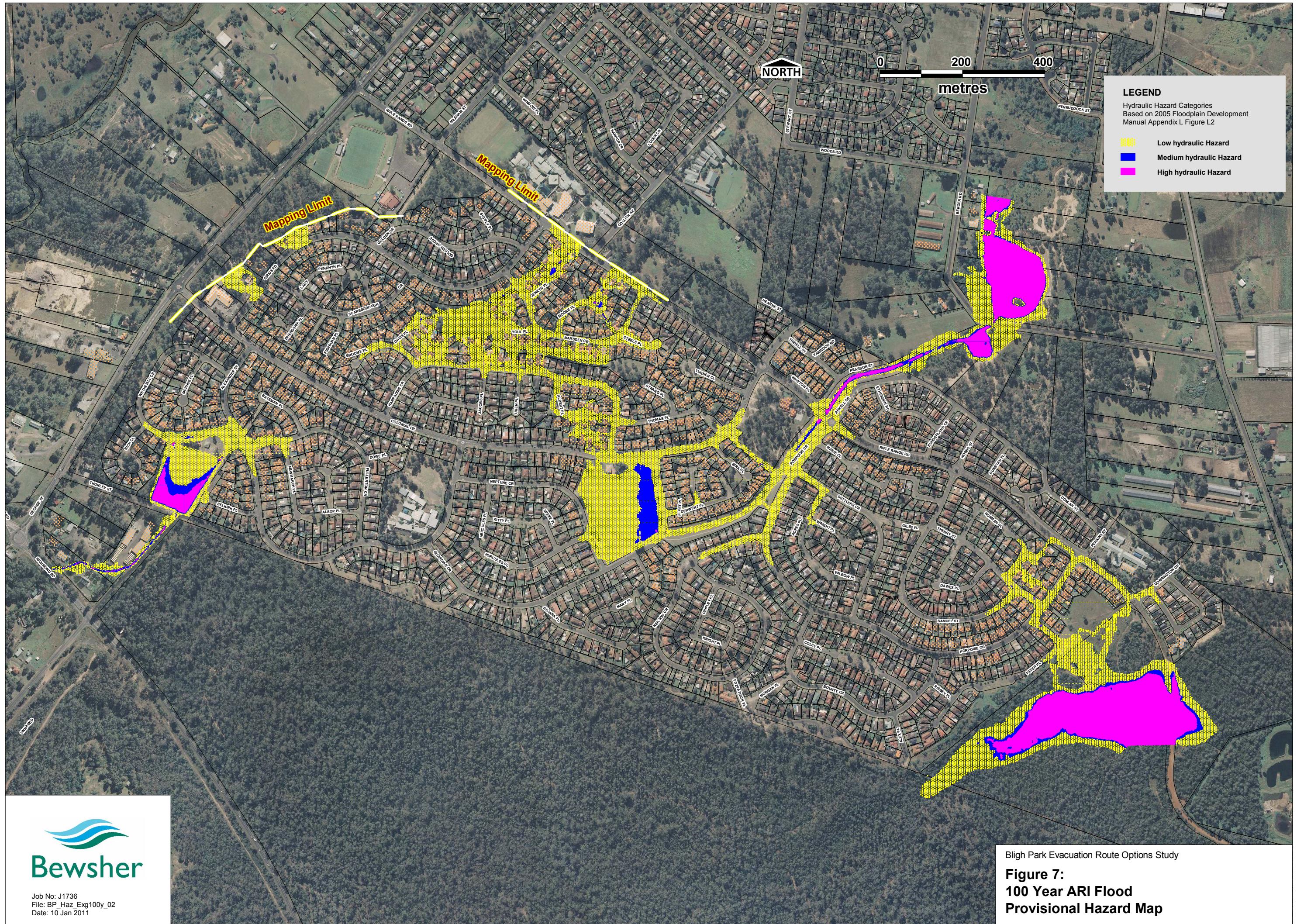
Figure 7 shows that all of the urban neighbourhood and roadway overland flow areas only experience low hazard conditions in the 100 year ARI event. Medium and high hazard conditions are confined to the deeper portions of the Colonial Reserve and Bounty Reserve detention basins, the swale system downstream of Rifle Range Road and several areas beyond the formal study area boundaries (that is, in the vicinity of Berger Road and downslope of Peter Place).

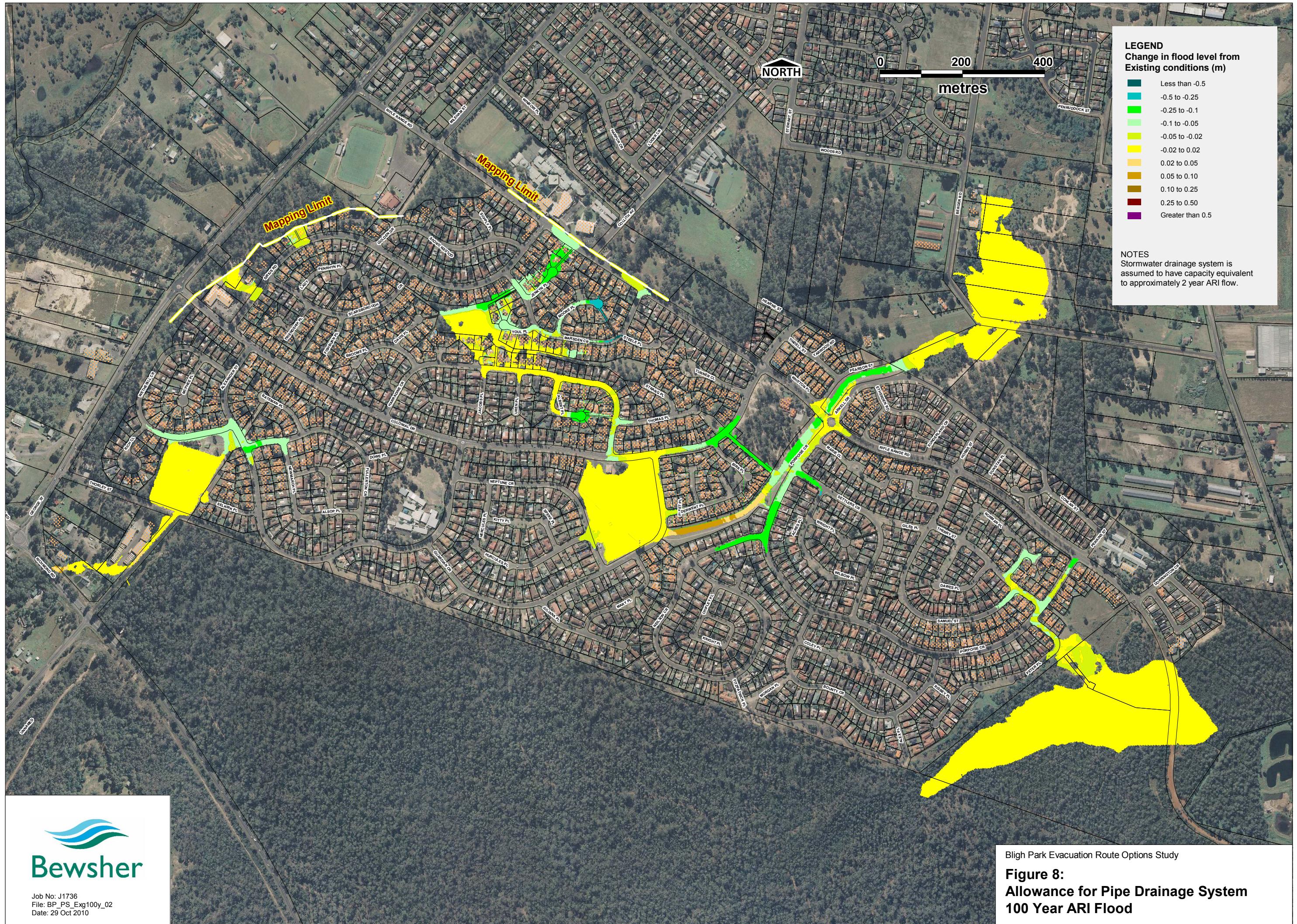


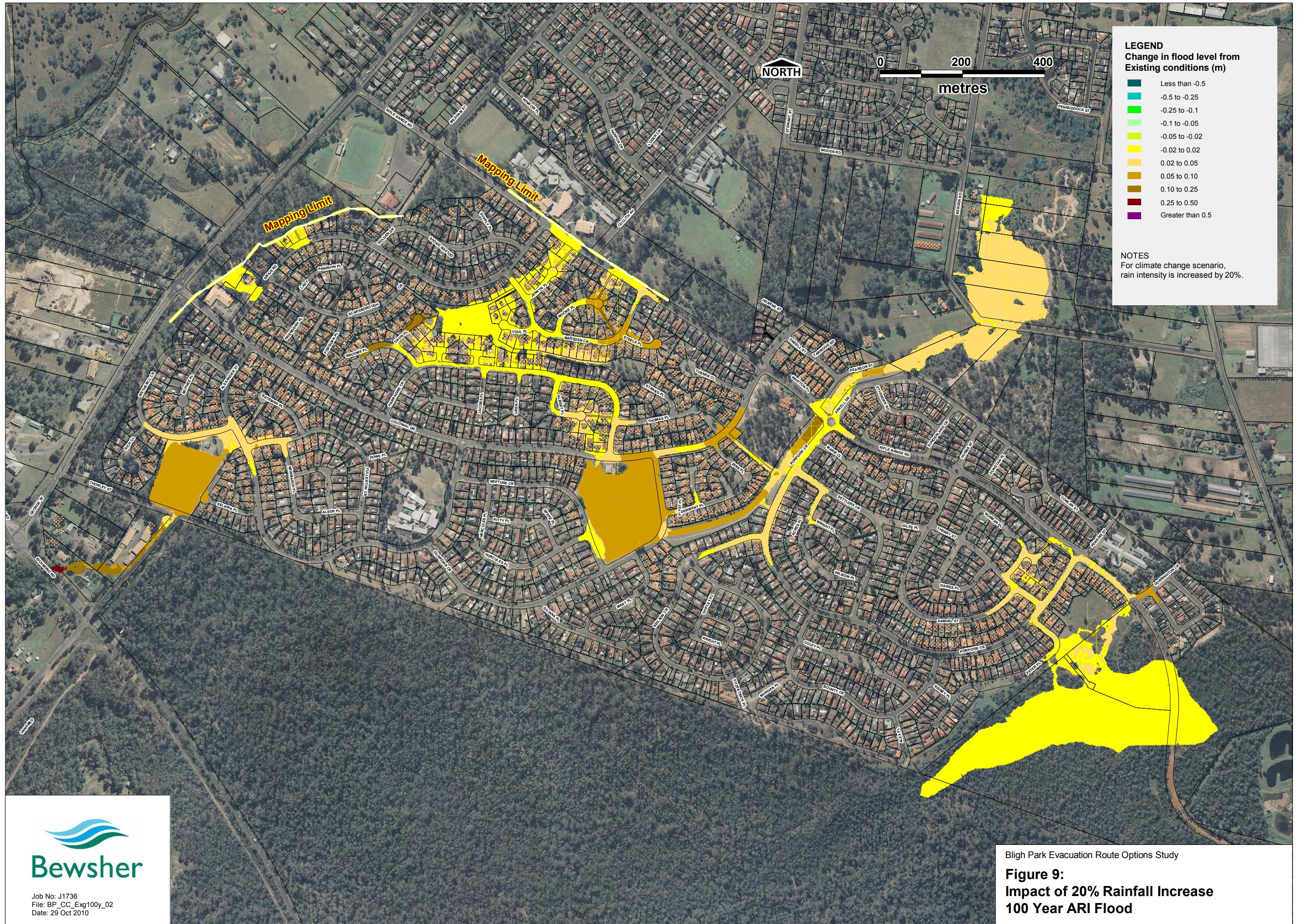


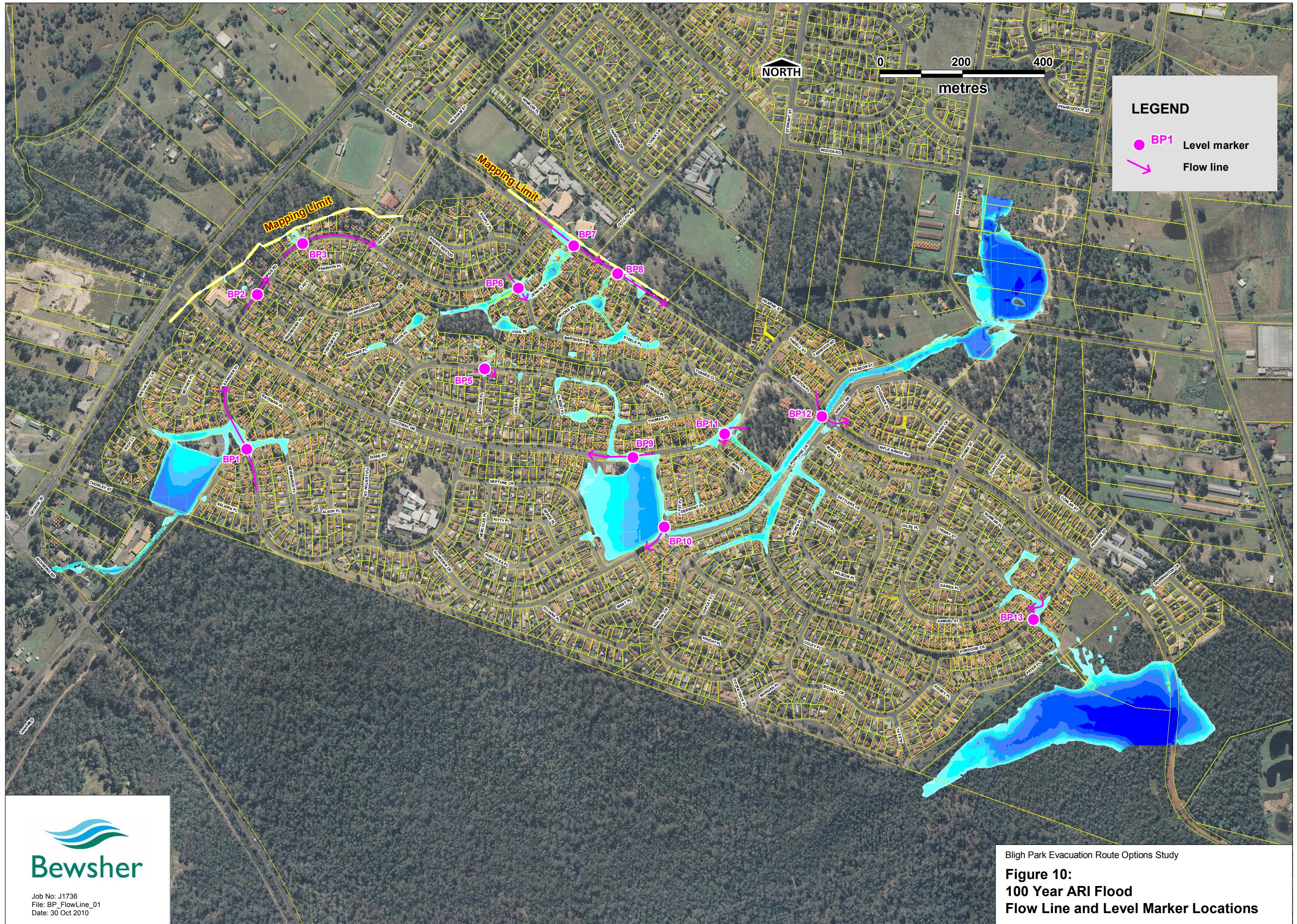


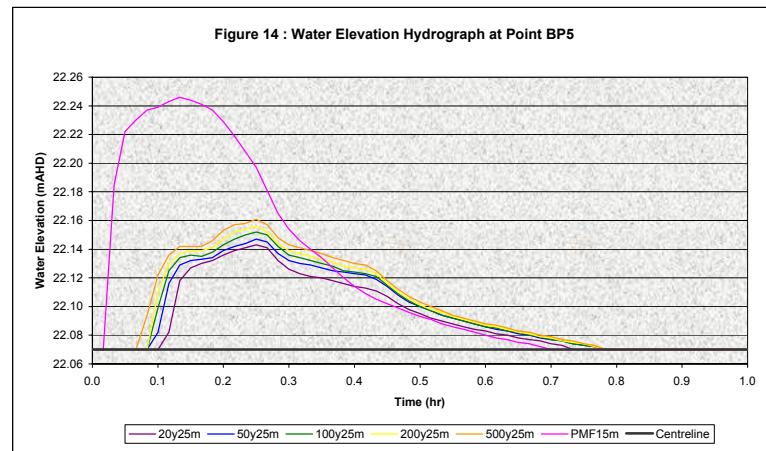
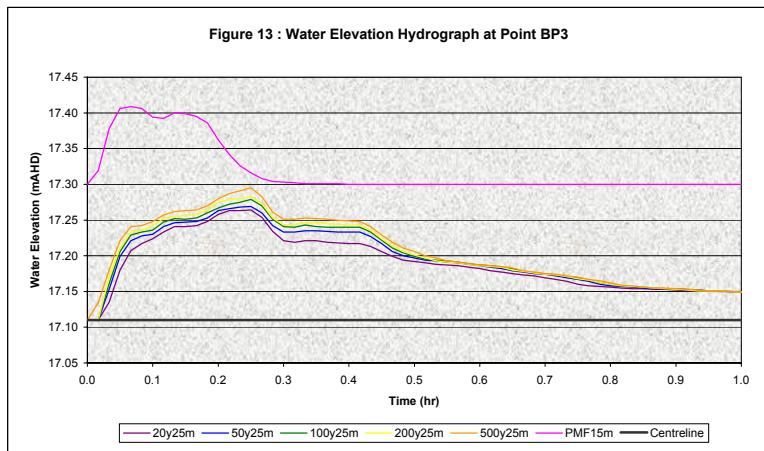
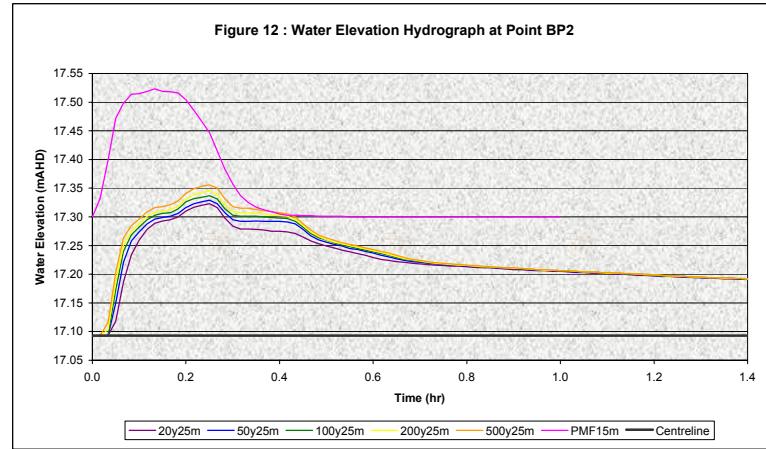
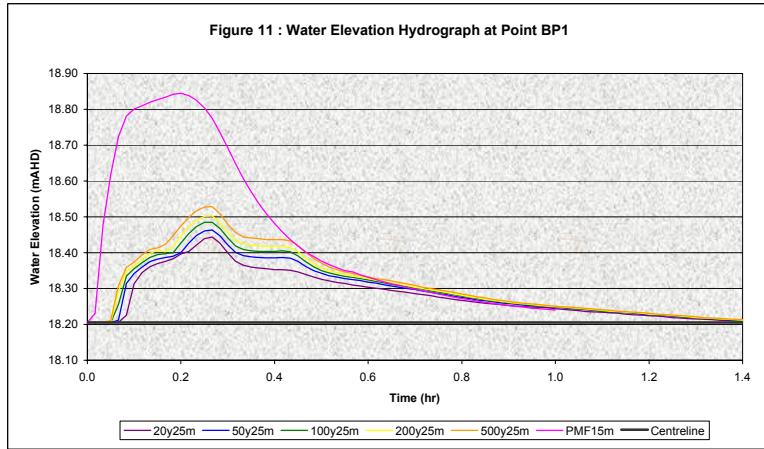


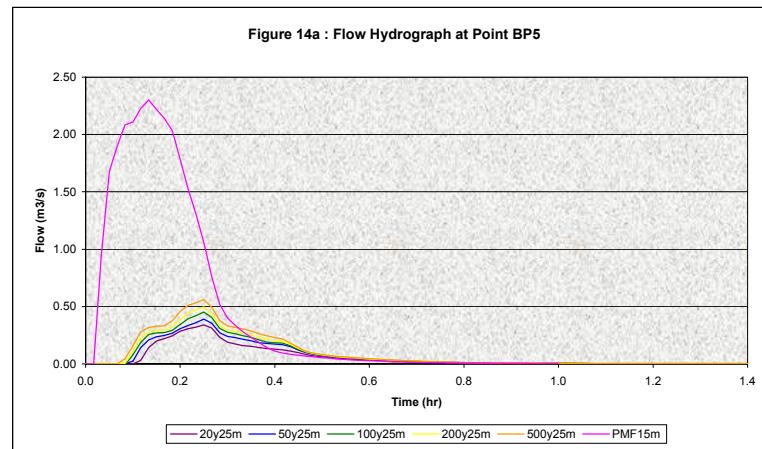
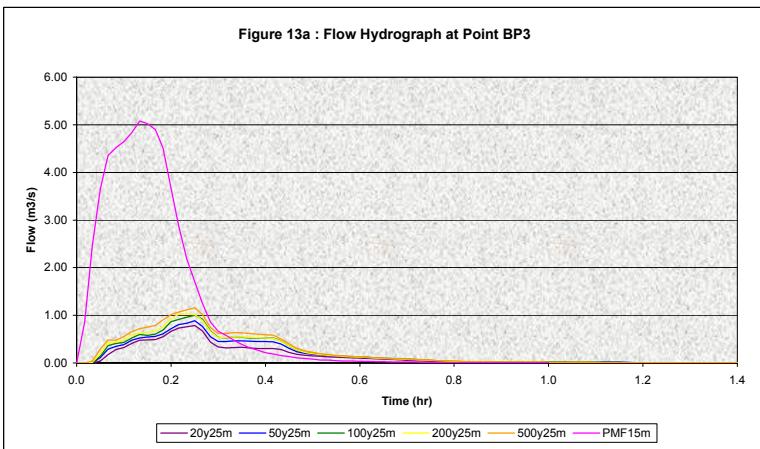
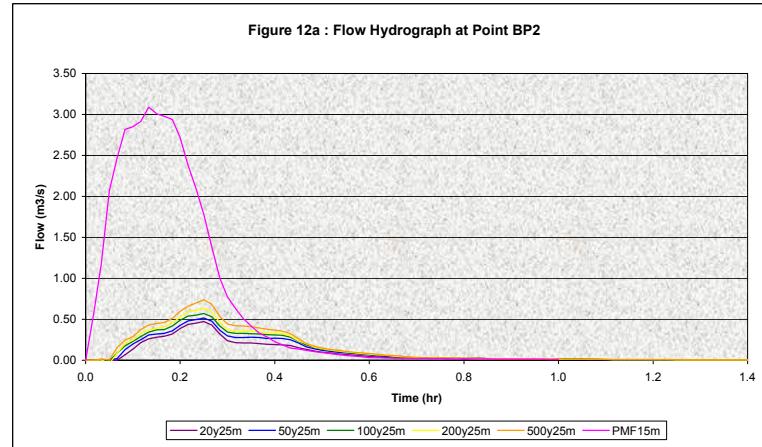
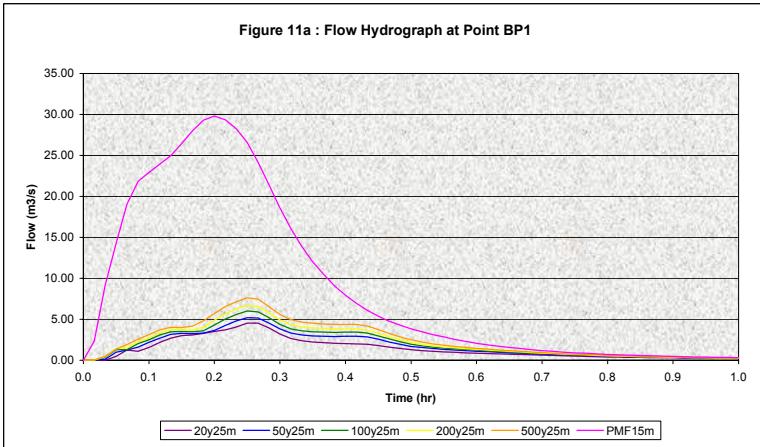


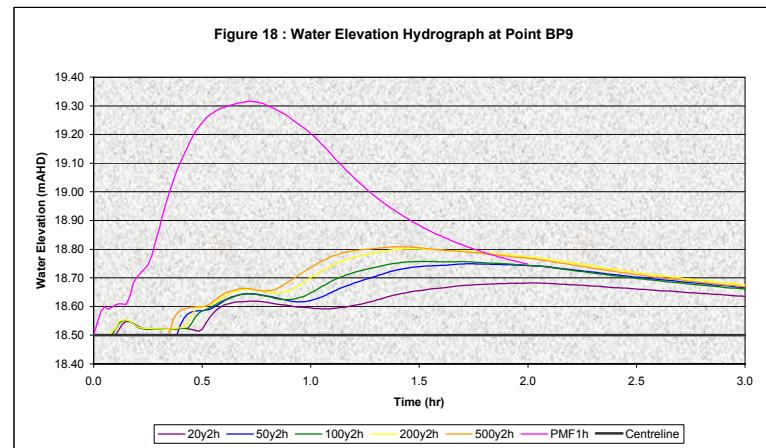
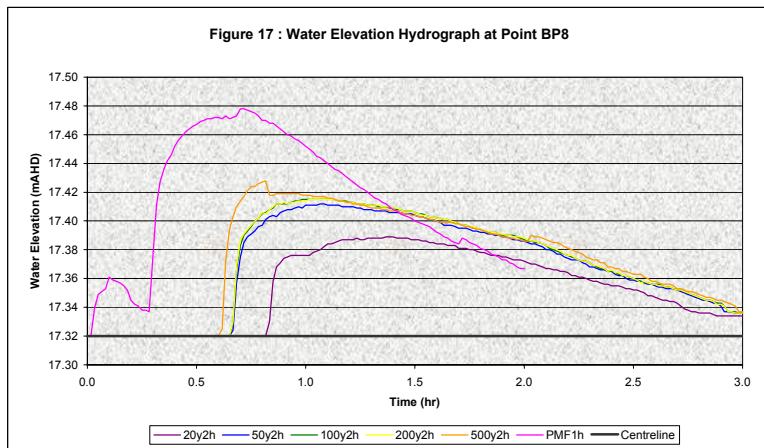
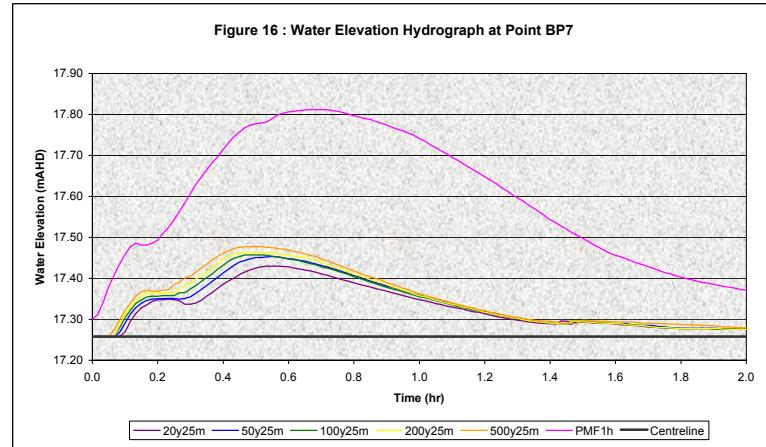
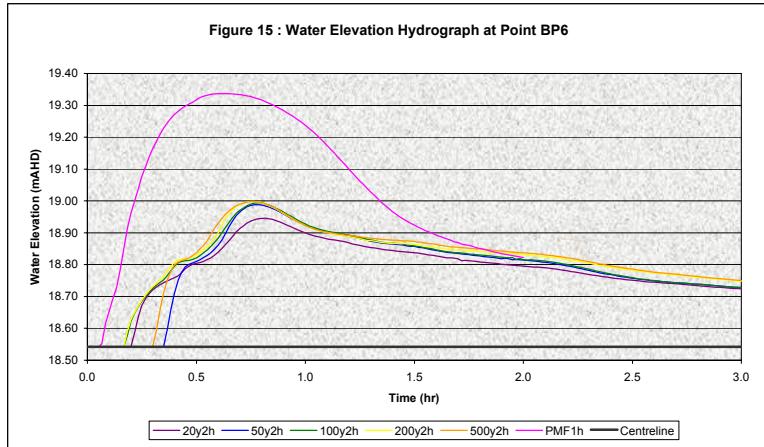


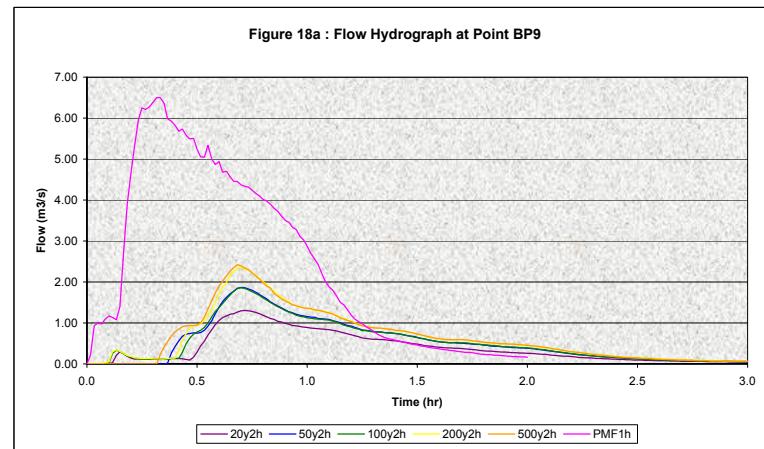
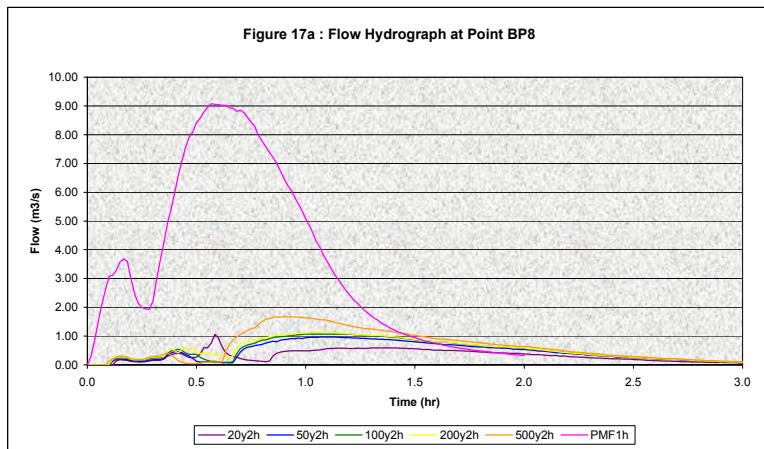
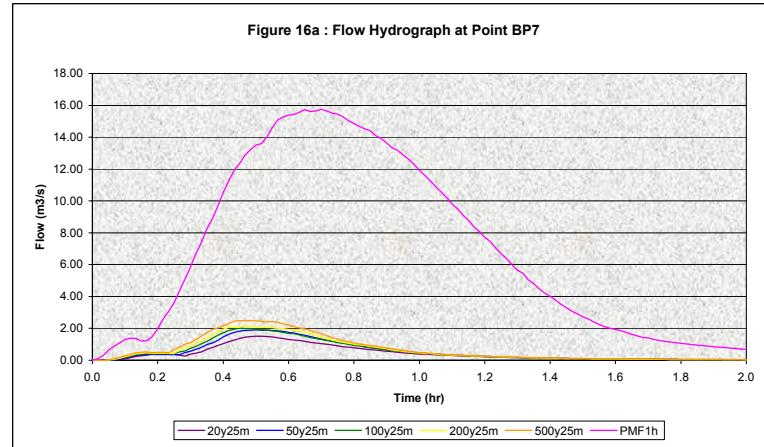
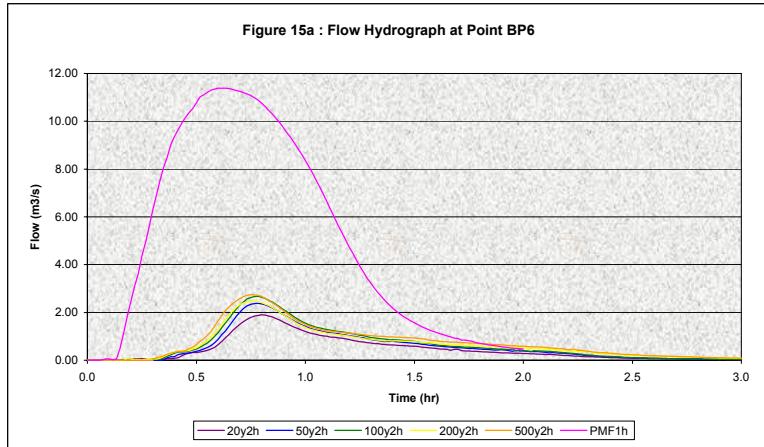


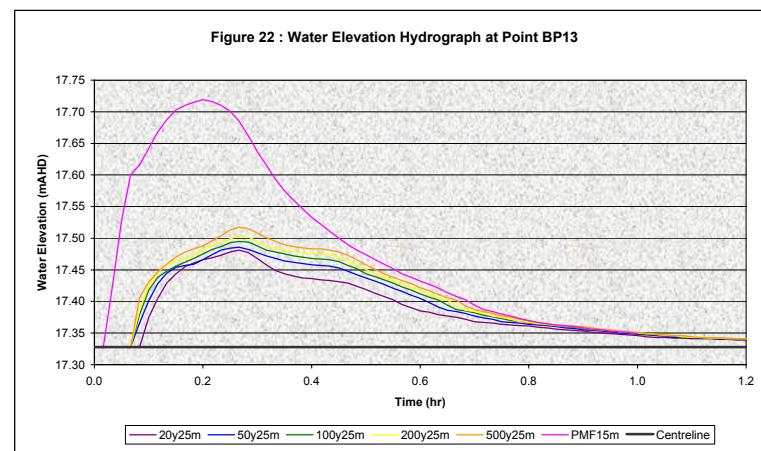
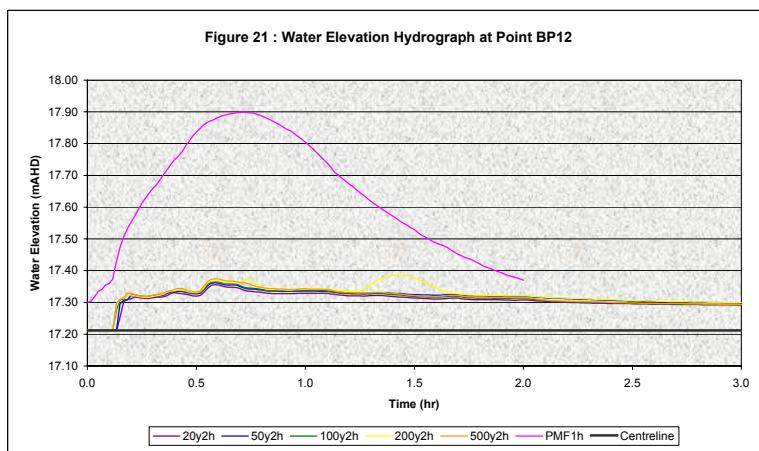
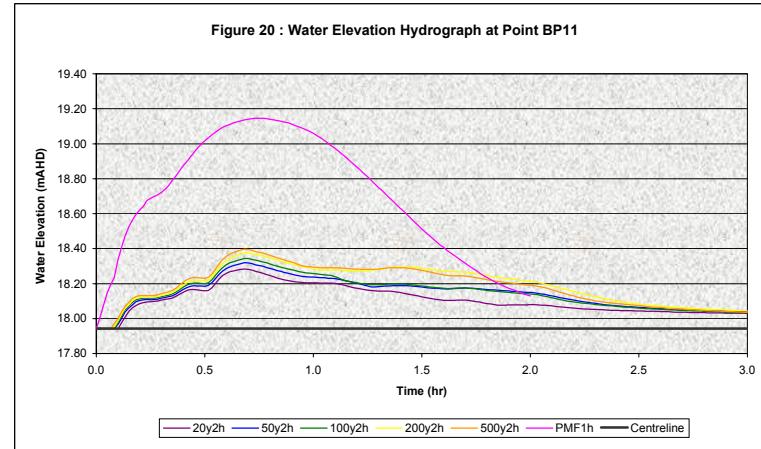
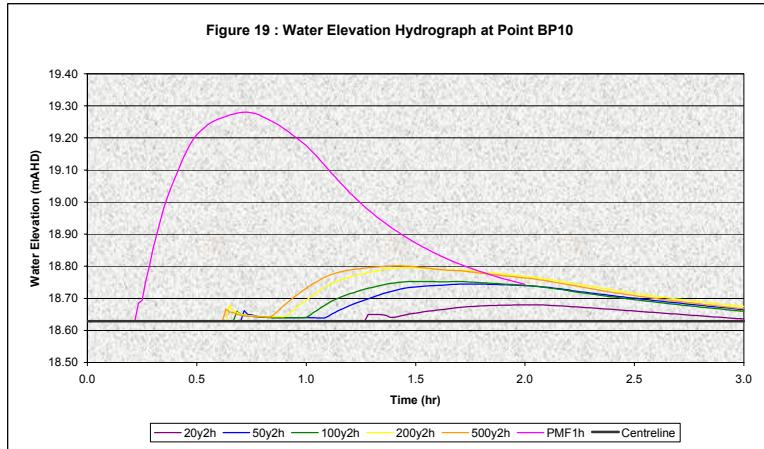


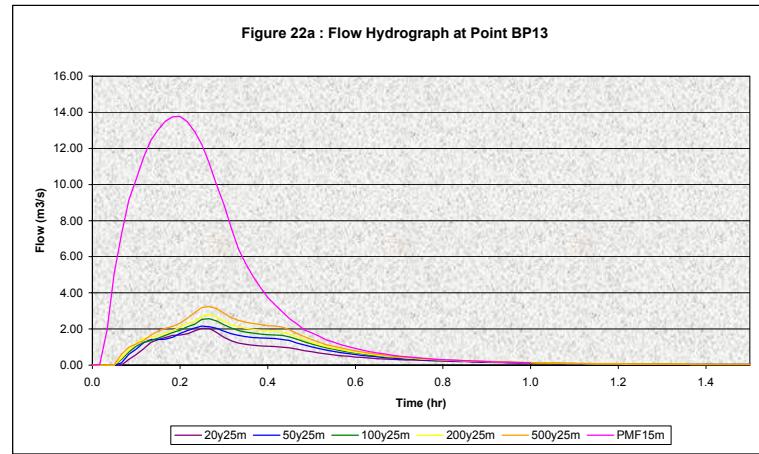
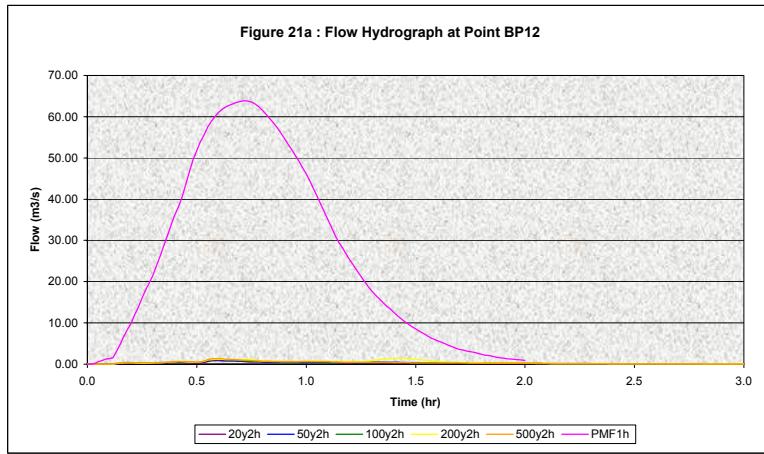
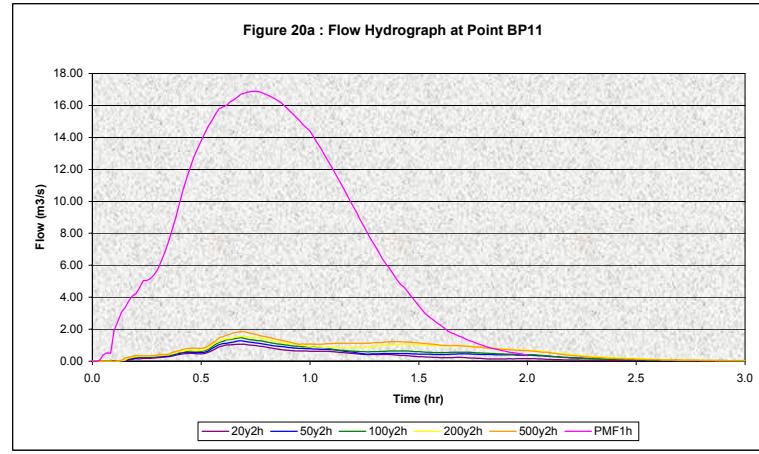
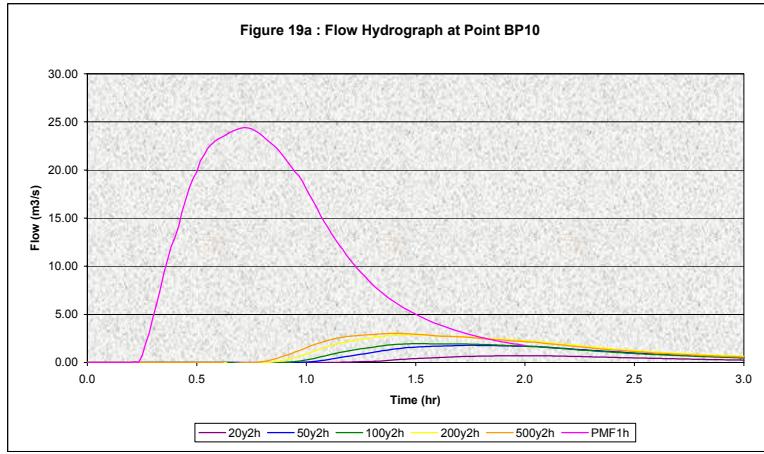












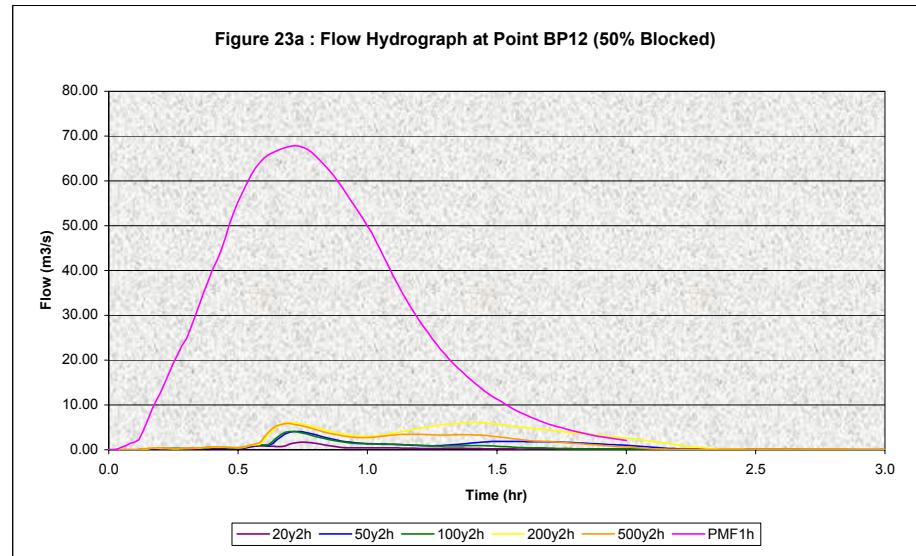
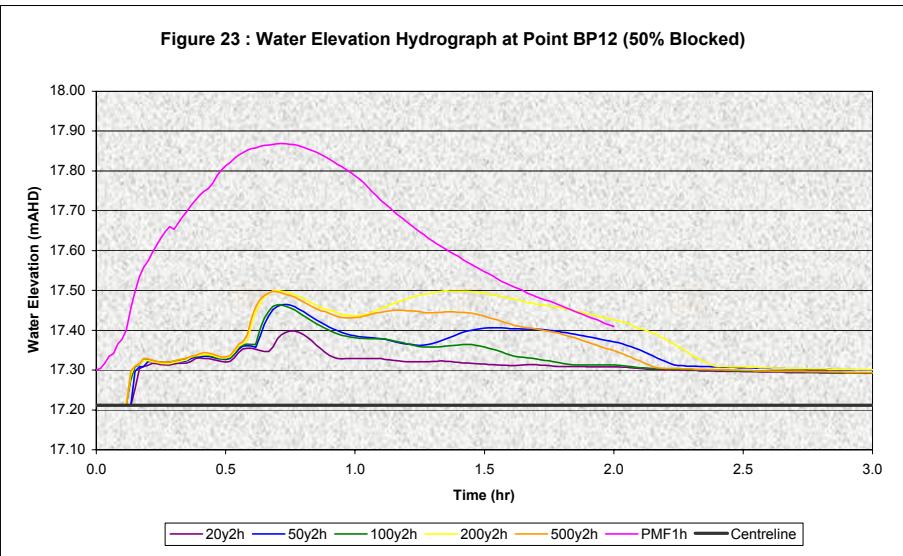


Figure 8 shows how 100 year ARI water depths would change after making (hydrologic) allowances in the TUFLOW model to conceptually replicate stormwater pipe systems having 2 year ARI event capacities. Since the ‘base case’ flow depths throughout the urban neighbourhoods area are typically relatively shallow, it is not surprising that the reductions in flow depths are limited. The largest depth reductions are typically found at cul-de-sacs which effectively operate as trapped low points in the base case model.

Figure 9 shows how 100 year ARI water depths would change if the 100 year ARI rainfall intensities were to increase by twenty percent. It can be seen that there is very little impact on those private properties which lie within overland flowpaths while the relatively biggest impact on roads which form part of the current network of Hawkesbury Nepean flood evacuation routes is in Colonial Drive and Guardian Crescent (in the vicinity of the Colonial Reserve basin).

In the PMF event, **Figures 5** and **6** also provide near identical pictures of inundation. Similarly also, the major flowpaths are associated with roadways. It is noted that the inundation shown at the rear of a number of low lying properties in Sirius Road is not associated with the spill of local flows generated at and upslope of the road but rather reflect the adoption of a coincident 100 year flood level peak in the Hawkesbury Nepean River.

3.2 LOW POINT INUNDATION REGIMES

The following sections document the ranges of road centreline depths. The depths listed in the text are based on the difference between the modelled water level and the ground-truthed road level. Since the accompanying reference figures include the ‘approximate’ roadway level (as per the TUFLOW grid) the scaling of water depths from the figures will often generate a slightly different water depth. Due the referencing against ground truthed levels, it follows that the depths listed within the text are the more accurate values.

3.2.1 Alexander Street (BP1)

Figures 11 and **11a** define the water levels and flows at BP1. The road centreline depth at the intersection varies between 150 and 240mm over the range of 20 year to 500 year ARI.

As shown in **Figure 10**, the 100 year ARI spill associated with BP1 sees flows following the Alexander Street gutter to the intersection with Wetherill Crescent. This spill pattern is exacerbating the volume of water in Wetherill Crescent and therefore contributing to low point flooding in the Crescent (and which is discussed further in Sub Section 3.2.14).

3.2.2 Sirius Road (BP2)

Figures 12 and **12a** define the water levels and flows at BP2. The sag point road centreline depth at BP2 varies between 310 and 350mm over the range of 20 year to 500 year ARI. That these depths are relatively significant is reflective of the fact that spill is only initiated when the ponding exceeds a depth of 180mm relative to the road centreline level at the sag point.

3.2.3 Sirius Road (BP3)

Figures 13 and 13a define the water levels and flows at BP3. The sag point road centreline depth at BP3 varies between 170 and 210mm over the range of 20 year to 500 year ARI. These depths reflect the fact that spill is only initiated when the ponding exceeds a depth of 120mm relative to the road centreline level at the sag point.

3.2.4 Harradine Crescent/Jacobs Place (BP5)

Figures 14 and 14a define the water levels and flows at BP5. The sag point centreline depth at BP5 varies between 450 and 470mm over the range of 20 year to 500 year ARI. While these depths are significant, it is noted that the sag point is actually in the Jacobs Place cul-de-sac. The corresponding centreline depth in Harradine Crescent is shallow (being of the order of 100mm).

3.2.5 Marsden Crescent (BP6)

Figures 15 and 15a define the water levels and flows at BP6. The sag point centreline depth at BP6 varies between 650 and 700mm over the range of 20 year to 500 year ARI. That these depths are significant is reflective of two factors; (a) spill into Jenkyn Place is only initiated when the ponding exceeds the gutter level at the intersection of Marsden Crescent and Jenkyn Place which is 170mm above the road centreline level at the sag point, and (b) the catchment is relatively large and therefore the flows are also relatively large.

3.2.6 Rifle Range Road (BP7)

Figures 16 and 16a define the water levels and flows at BP7. The sag point centreline depth at BP7 varies between 430 and 480mm over the range of 20 year to 500 year ARI. These depths partly reflect the fact that spill is only initiated when the ponding exceeds a depth of 200mm relative to the road centreline level at the sag point.

3.2.7 Rifle Range Road (BP8)

Figures 17 and 17a define the water levels and flows at BP8. The sag point centreline depth at BP8 varies between 360 and 400mm over the range of 20 year to 500 year ARI. These depths partly reflect the fact that spill is only initiated when the ponding exceeds a depth of 170mm relative to the road centreline level at the sag point.

3.2.8 Colonial Drive (BP9)

Figures 18 and 18a define the water levels and flows at BP9. The sag point centreline depth at BP9 varies between 150 and 280mm over the range of 20 year to 500 year ARI. The depth is relatively shallow since spill is initiated into neighbouring Guardian Crescent at an early stage and also spills eastwards along Colonial Drive near the flood peak of major storms.

3.2.9 Guardian Crescent (BP10)

Figures 19 and 19a define the water levels and flows at BP10. The sag point centreline at BP10 is adjacent to the start of the swale location and the depth at that location varies between 180 and 300mm over the range of 20 year to 500 year ARI. Similar depths are experienced at the next Guardian Crescent sag point located north of Derwent Place while slightly worse depths are experienced in the adjacent sag point in Derwent Place.

3.2.10 Colonial Drive (BP11)

Figures 20 and 20a define the water levels and flows at BP11. The sag point centreline depth at BP11 varies between 300 and 450mm over the range of 20 year to 500 year ARI.

3.2.11 Colonial Reserve Basin (BP9, BP10 & BP11)

The modelling confirms that the flow/ponding regimes at BP9, BP10 and BP11 are not isolated situations since they are related to the performance of the adjacent Colonial Reserve detention basin. That is, the modelling shows that spill from the basin occurs at both BP9 and BP10 and the spill at the intersection of Colonial Drive and Guardian Crescent (i.e. adjacent to BP9) is conveyed in an easterly direction along Colonial Drive, towards BP11.

3.2.12 Rifle Range Road (BP12)

The culvert arrangement at BP12 is twin 2100mm x 900mm box culverts.

Figures 21 and 21a define the water levels and flows at BP12 for the 0% blockage case. There is shallow inundation of the road in all events between the 20 year and 500 year ARI events and the maximum road centreline depth varies between 130mm and 150mm.

Figures 23 and 23a define the water levels and flows for the 50% culvert blockage case and the range of maximum road centreline depths varies between 170mm and 270mm respectively.

3.2.13 Porpoise Crescent (BP13)

Figures 22 and 22a define the water levels and flows at BP13. The maximum road centreline depth in Porpoise Crescent varies between 130 and 170mm over the range of 20 year to 500 year ARI. That these depths are relatively shallow is due to a combination of the small flow values and the fact that spill can commence into neighbouring Peter Place at an early stage of any event. (Since the adjacent sag point in Therry Street is lower, it is noted that the depths at that centreline location are about 100mm deeper.)

3.2.14 Wetherill Crescent Sag Point

The 2007 report documented a resident's observations of significant ponding at this location with the worst observed ponding occurring during a storm in December 2004. While the report found that it was unclear whether the ponding was a function of excess street water not being able to readily spill into the adjacent Bounty Reserve detention basin or whether the ponding was reflecting the peak water level in the basin, it favoured the former explanation.

The modelling undertaken for this study has found that at the peak of the 100 year ARI flood the maximum water level in the basin was RL17.7m compared with a peak level of RL18.0m in the roadway. Hence the modelling has confirmed that the ponding was a function of excess street water not being able to readily spill into the adjacent basin.

3.2.15 Review of Sag Point 500 year ARI Regimes

While this study has a local area flood perspective, it is noted that the regional Hawkesbury-Nepean flood evacuation routes are assessed relative to their flood proneness in the 500 year ARI event.

The Bligh Park 500 year ARI depths presented in **Sections 3.2.1-3.2.13** vary across a wide range (as summarised in **Table 6**). From an SES perspective, any centreline depth which exceeds 100mm is of critical importance and from **Table 6** it can be seen that all exceed 100mm.

However it is also the combination of potential duration of problematic inundation as well as maximum depth that may impact on the overall hazard scenario and to that end **Table 6** also includes comments about likely duration.

The relative ranking of each sag point location (where 1 represents the worst ranking) is then assessed in **Table 6** after taking account of the current Bligh Park evacuation route network. While the relative rankings are essentially qualitative they are seen to represent priorities for either works to be undertaken to address their seriousness or consideration of alternative routes (which would serve to bypass the problem location).

TABLE 6: SUMMARY OF 500 YEAR ARI SAG POINT DEPTHS

Sag Point Location	Road Centreline Depth (mm)	Does Depth Exceed 100mm?	Inundation Duration Comment	Overall Problem Ranking Relative to Current Evacuation Route Strategy
Alexander Street (BP1)	240	Yes	Likely short duration problem	2
Sirius Road (BP2)	350	Yes	Likely short duration problem	3
Sirius Road (BP3)	210	Yes	Likely short duration problem	3
Harradine Crescent (BP5)	110	Yes	Likely short duration problem	3
Marsden Crescent (BP6)	700	Yes	Likely short duration problem	2
Rifle Range Road (BP7)	480	Yes	Likely short duration problem	1
Rifle Range Road (BP8)	400	Yes	Likely short duration problem	1
Colonial Drive (BP9)	280	Yes	Likely long duration problem (due to adjacent Colonial Reserve detention basin ponding and spill)	1
Guardian Crescent (BP10)	300	Yes	Likely long duration problem (due to adjacent Colonial Reserve detention basin ponding)	1
Colonial Drive (BP11)	450	Yes	Likely long duration problem (due to spill from upslope Colonial Reserve detention basin)	1
Rifle Range Road (BP12) – culvert 0% blocked	150	Yes	Likely long duration problem (due to upslope Colonial Reserve detention basin impacts)	1
Rifle Range Road (BP12) – culvert 50% blocked	270	Yes	Likely long duration problem (due to upslope Colonial Reserve detention basin impacts)	1
Porpoise Crescent (BP13)	170	Yes	Likely short duration problem	3

4.0 POTENTIAL WORKS OPTIONS

This chapter provides some initial guidance on works which might be considered to address the problems associated with the low point inundations. They include an assessment of the current network of pedestrian laneways (which might serve to provide alternative evacuation routes) and site-specific drainage infrastructure options (which would serve to reduce the roadway inundation depths).

4.1 LANEWAY ASSESSMENT

There are a number of laneways within Bligh Park which provide pedestrian access between residential streets as shown in **Figure 24** (and **Appendix D**). As can be seen in the figure, some of them also have stormwater pipe systems laid beneath them and hence in many such cases they serve as formal or informal overland flowpaths.

This section of the report looks at whether some of the laneways might potentially be modified to provide an alternate local traffic route in times of Hawkesbury-Nepean related flood evacuation if or when the formally designated Bligh Park streets were impassable or otherwise unable to be used.

One factor which would impact on their potential use for such evacuation purposes would be the likely depths of inundation in the laneways themselves.

Now the RAFTS and TUFLOW analyses are based on lumped catchment analysis – that is, the analysis does not assess surface inundation flows and depths along every stormwater pipe system – and the lumped catchment analysis itself does not cover the whole of Bligh Park. Hence it follows that there are only some laneways for which there are modelled inundation depths. In order to provide input to their possible evacuation usage, the TUFLOW results were interrogated in order to extract the 100 year ARI event flow depths and the corresponding ‘bold font’ maximum and mean flood depths are presented in **Table 7**.

In order to complete the picture of laneway inundation depths, a broad comparison was made between catchment sizes for those laneways which were located within the TUFLOW model footprint and those which were not, and on that basis the TUFLOW results were extrapolated to provide indicative depth information for the ‘non-modelled’ laneways. Those indicative depths are also presented in **Table 7**.

It is important to note that the **Table 7** modelled depths – and hence also the estimated depths – are only approximate values. This is because:

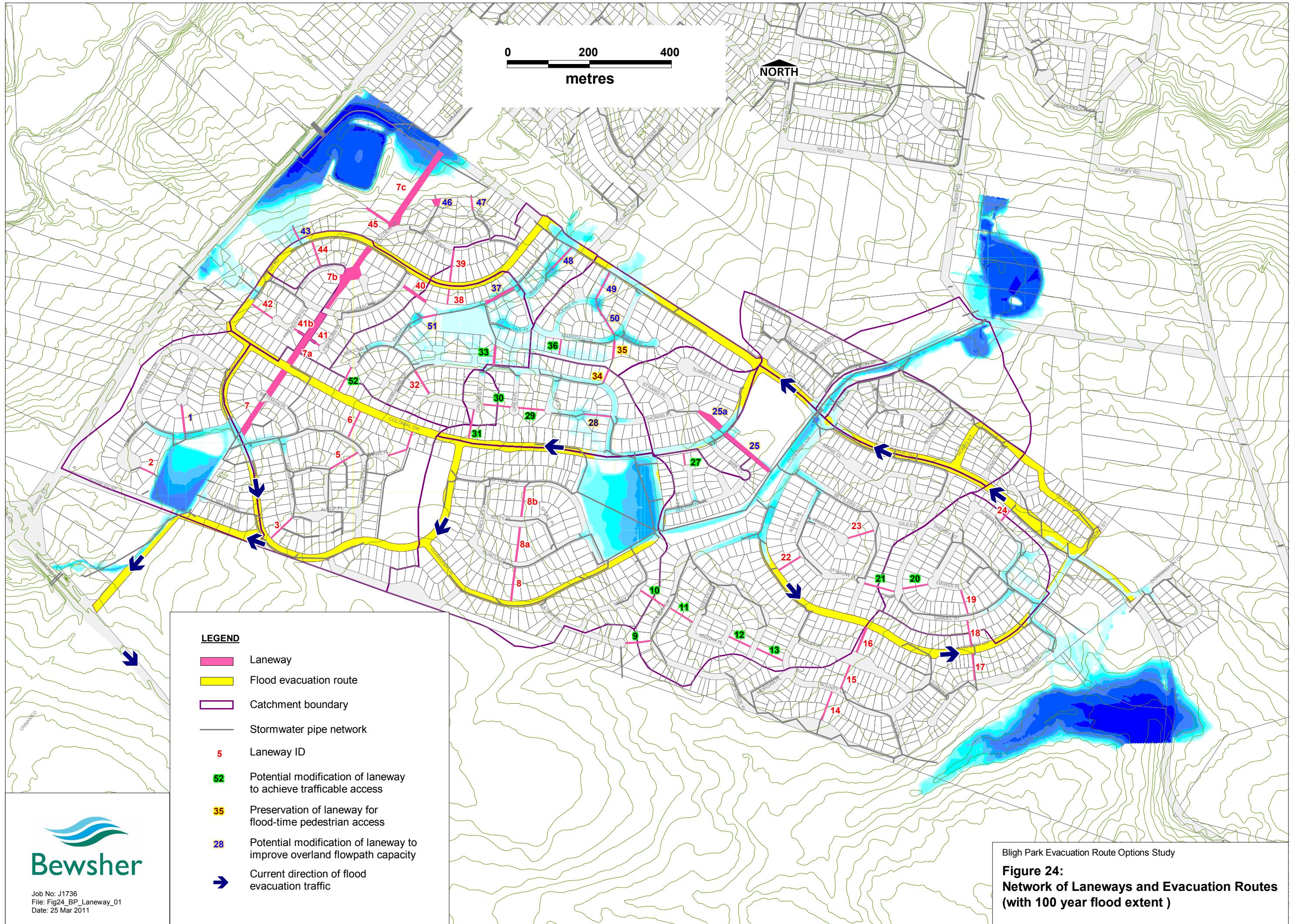
- ▶ the TULFLOW 2D analysis is based on a 2 metre grid and therefore relatively small variations in ground levels both in the typically narrow laneways and between the laneways and adjoining properties cannot be accurately reflected in the model; and
- ▶ The model also does not explicitly take account of flow obstructions such as ‘solid’ fences and property furniture (e.g. BBQs) in adjoining properties, etc and these features too would potentially impact on laneway flow depths.

Since the above factors may impact on the modelling of shallow local overland flow regimes it follows that the tabulated depths should not be regarded as precise. Hence it follows that if

Table 7: Bligh Park Laneway Assessment

Laneway ID (see Figure 24)	Is Stormwater Pipe laid in Laneway?	100y Maximum Depth (metres)	100y Mean Depth (metres)	Cadastre lane width (metres)	Available lane width at narrowest point (metres)	Preserve laneway, for access to stormwater pipe?	Preserve laneway, for overland flow?	Potential Works to improve overland flow path role	Preserve laneway, for flood evacuation purposes?	Potential Works to improve flood evacuation role
1	Yes	0.3	0.2	4	3.5	Yes	Yes	Civil works at upslope end of laneway to reduce McPhee Place sag point water depth		
2	Yes	0.1	<0.1	3	2.9	Yes				
3	Yes	0.1	<0.1	3	2.6	Yes				
4		0.1	<0.1	3	2.9					
5	Yes	0.1	<0.1	3	2.8	Yes				
6		0.1	<0.1	3	2.8					
7	Yes	0.3	0.1	15.3	11.0, section (2)-15.0	Yes				
7a	Yes	0.1	<0.1	15.3	15	Yes				
7b		0.1	<0.1	15.3	11.5					
7c		1.4*	0.7*	15.3	15.5					
8	Yes	0.1	<0.1	4	3.8	Yes				
8a	Yes	0.1	<0.1	4	3.8	Yes				
8b	Yes	0.1	<0.1	4	3.8	Yes				
9		0.1	<0.1	3	2.9			Yes, works in series of seven laneways (L9, L10, L11, L12, L13, L20 & L21) to provide alternative trafficable route to Thorley Street via Guardian Crescent for east Bligh Park residents	High priority civil works (including full width concrete & collapsible bollards) to create trafficable route	
10	Yes	0.1	<0.1	3	2.6	Yes		Yes, works in series of seven laneways (L9, L10, L11, L12, L13, L20 & L21) to provide alternative trafficable route to Thorley Street via Guardian Crescent for east Bligh Park residents	High priority civil works (including full width concrete & collapsible bollards) to create trafficable route	
11		0.1	<0.1	3	2.8			Yes, works in series of seven laneways (L9, L10, L11, L12, L13, L20 & L21) to provide alternative trafficable route to Thorley Street via Guardian Crescent for east Bligh Park residents	Civil works (including full width concrete & collapsible bollards) to create trafficable route. These are medium priority works since there is an optional route via Morgan Place, Finnian Place and Fitzpatrick Place.	
12		0.1	<0.1	3	2.8			Yes, works in series of seven laneways (L9, L10, L11, L12, L13, L20 & L21) to provide alternative trafficable route to Thorley Street via Guardian Crescent for east Bligh Park residents	Civil works (including full width concrete & collapsible bollards) to create trafficable route. These are medium priority works since there is an optional route via Morgan Place, Finnian Place and Fitzpatrick Place.	
13		0.1	<0.1	3	2.8			Yes, works in series of seven laneways (L9, L10, L11, L12, L13, L20 & L21) to provide alternative trafficable route to Thorley Street via Guardian Crescent for east Bligh Park residents	Civil works (including full width concrete & collapsible bollards) to create trafficable route. These are medium priority works since there is an optional route via Morgan Place, Finnian Place and Fitzpatrick Place.	
14	Yes	0.1	<0.1	3	2.5	Yes				
15	Yes	0.1	<0.1	3	2.8	Yes				
16		0.1	<0.1	3	2.8					
17	Yes	0.1	<0.1	3	2.5	Yes				
18	Yes	0.1	<0.1	3	2.7	Yes				
19		0.1	<0.1	3	2.8					
20		0.1	<0.1	3	2.7			Yes, works in series of seven laneways (L9, L10, L11, L12, L13, L20 & L21) to provide alternative trafficable route to Thorley Street via Guardian Crescent for east Bligh Park residents	Civil works (including full width concrete & collapsible bollards) to create trafficable route. These are medium priority works since there is an optional route via Therry Street.	
21		0.1	<0.1	3	2			Yes, works in series of seven laneways (L9, L10, L11, L12, L13, L20 & L21) to provide alternative trafficable route to Thorley Street via Guardian Crescent for east Bligh Park residents	Civil works (including full width concrete & collapsible bollards) to create trafficable route. These are medium priority works since there is an optional route via Giles Place and Webb Place.	
22		0.1	<0.1	3	1.1					
23		0.1	<0.1	3	2.8					
24		0.1	<0.1	3	2.7					
25	Yes	0.6	0.3	10	6	Yes	Yes	Civil works at upslope end of laneway to reduce Colonial Drive sag point water depth		
25a	Yes	0.4	<0.1	10.7 / 28.3	18	Yes	Yes	Civil works at upslope end of laneway to reduce Thomas Place sag point water depth		
27		0.1	<0.1	3	2.7			Yes, to provide alternative route for Fleet Place & Denwent Place residents	Civil works (including full width concrete & collapsible bollards) required if route needs to be trafficable. They have a low priority.	
28	Yes	0.5	0.1	3	2.7	Yes	Yes	Civil works at upslope end of laneway to reduce Albert Place sag point water depth		
29		0.1	<0.1	3	2.7			Yes, works in series of three laneways (L29, L30 & L31) to provide alternative route to Colonial Drive for local traffic (if Harradine Crescent has road inundation issues)	Civil works (including full width concrete & collapsible bollards) required if route needs to be trafficable. They have a low priority.	
30		0.1	<0.1	3	2.8			Yes, works in series of three laneways (L29, L30 & L31) to provide alternative route to Colonial Drive for local traffic (if Harradine Crescent has road inundation issues)	Civil works (including full width concrete & collapsible bollards) required if route needs to be trafficable. They have a low priority.	
31		0.1	<0.1	3	2.7			Yes, works in series of three laneways (L29, L30 & L31) to provide alternative route to Colonial Drive for local traffic (if Harradine Crescent has road inundation issues)	Civil works (including full width concrete & collapsible bollards) required if route needs to be trafficable. They have a low priority.	
32	Yes	0.1	<0.1	4	3.7	Yes				
33	Yes	0.1	<0.1	5	5.1	Yes		Yes, works in two laneways (L33 & L36) and connecting Council reserve to provide trafficable route for Marsden Crescent neighbourhood residents	Civil works (including full width concrete & collapsible bollards) required if route needs to be trafficable. They have a low priority.	
34	Yes	0.1	<0.1	3	2.9	Yes		Yes, alternative pedestrian route (together with L35) away from Marsden Crescent/Steele Place inundation		
35	Yes	0.3	0.1	3	2.4	Yes		Yes, alternative pedestrian route (together with L34) away from Marsden Crescent/Steele Place inundation		
36		0.1	<0.1	3	2			Yes, works in two laneways (L33 & L36) and connecting Council reserve to provide trafficable route for Marsden Crescent neighbourhood residents	Civil works (including full width concrete & collapsible bollards) required if route needs to be trafficable. They have a low priority.	
37	Yes	0.7	0.4	6	3.8	Yes	Yes	Nil		
38		0.1	<0.1	3	3					
39		0.1	<0.1	3	2.7					
40		0.1	<0.1	6.5	4.4					
41		0.1	<0.1	3	2.9					
41b				3	2.6					
42		0.1	<0.1	3	2.3					
43	Yes	0.2	0.2	3	3	Yes	Yes	Civil works at upslope end of laneway to reduce Sirius Road sag point water depth		
44		0.1	<0.1	3	2.9					
45		0.1	<0.1	5	3.6					
46	Yes	0.2	0.1	8.8	5	Yes	Yes	Civil works at upslope end of laneway to reduce Charlotte Place sag point water depth		
47	Yes	0.2	0.1	3	2.4	Yes	Yes	Civil works at upslope end of laneway to reduce Supply Place sag point water depth		
48	Yes	0.7	0.4	3.5	3.1	Yes	Yes	Civil works at upslope end of laneway to reduce Jenkyn Place sag point water depth		
49	Yes	0.6	0.3	3.5	3.1	Yes	Yes	Civil works at upslope end of laneway to reduce Moore Place sag point water depth		
50	Yes	0.8	0.5	3.5	3.2	Yes	Yes	Civil works at upslope end of laneway to reduce Marsden Crescent sag point water depth		
51	Yes	0.6	0.1	3	2.8	Yes	Yes	Civil works at upslope end of laneway to reduce Davis Place sag point water depth		
52		0.1	<0.1	3	2.8			Yes, works to provide trafficable route for Broome Place residents	Civil works (including full width concrete & collapsible bollards) required if route needs to be trafficable. They have a low priority.	

Notes: * depths listed reflect assumed coincident tailwater conditions in TUFLOW model
Bold font depth values reflect TUFLOW output



consideration is to be given to modifying laneways to form alternative trafficable routes and potential maximum depths of inundation were an important factor in the decision making, more detailed depth assessments may need to be undertaken.

However whilst keeping in mind the above comments about the absolute accuracy of the **Table 7** depths, it is noted that the vast majority of laneways have been assessed to have 100 year ARI maximum water depths of less than 0.2m.

Table 7 also lists the laneway cadastre widths and available (minimum) widths as assessed by HCC staff.

The potential to utilise some of the laneways as flood evacuation routes has been assessed by examining which ones might serve to provide bypasses of flood evacuation route problem locations (reference **Table 6**) and/or provide exit routes from potential neighbourhood flood inundation problems. The results of the assessment are presented in **Table 7**. Based on the '1' rankings in **Table 6**, the highest priority potential laneway works is seen to be the use and modification of Laneways 9, 10, 11, 12, 13, 20 and 21 so as to provide an alternative (and trafficable) option to the Rifle Range Road and Colonial Drive evacuation routes. Of all these, Laneways 9 and 10 have the highest priority since alternate road access is available to complement Laneways 11-13, 20 and 21.

There is also the potential to undertake minor scale construction works at some locations which act as relieving overland flowpaths for neighbourhood sag points. As presented in **Table 7**, the works are envisaged to involve the lowering of ground levels, etc at the upslope ends of Laneways 1, 25, 25A, 28, 37, 43, 46, 47, 48, 49, 50 and 51.

Table 7 also recommends the preservation of those laneways which contain Council stormwater pipes.

Combining all the above differing criteria for preserving various laneways it follows that a total of 41 laneways should be preserved. They are Laneways 1-3, 5, 7, 7a, 8-15, 17, 18, 20, 21, 25, 25a, 27-37, 43 & 46-52.

4.2 DRAINAGE WORKS OPTIONS

As presented in **Table 6** the '1' ranked locations are associated with Rifle Range Road (i.e. at BP7, BP8 and BP12) and Colonial Drive/Guardian Crescent (being BP9, BP10 & BP11 in the vicinity of the Colonial Reserve detention basin). In those locations, the following works options are recommended for further consideration:

- ▶ At BP7, overland flowpath works at and downslope of the adjacent school boundary to reduce the ponding depths in Rifle Range Road. Another option that might be explored would be the construction of a detention basin in the Council reserve located upslope of Marsden Crescent since such a basin would reduce private property inundation between the reserve and Rifle Range Road as well reducing ponding in Rifle Range Road itself;
- ▶ At BP8, lowering of ground levels at the common boundary of Rifle Range Road and the downslope property to reduce ponding depths in Rifle Range Road;
- ▶ At BP12, installing 'soldier posts' to limit the potential for major debris to block the multiple box culvert under Rifle Range Road and also increasing the total size of the box culvert waterway opening. With regard to the latter, interpolation of the 0% and 50% flood modelling results presented in **Section 3.2.12** shows that the installation of an identical

third box culvert at BP12 would reduce the 50% blockage upgraded culvert flood depths to those calculated for 0% blockage of the current culvert;

- ▶ At BP9 & BP10, constructing new conduits under Guardian Crescent at BP10 which would direct additional flows to the downslope swale system. This would result in reduced roadway inundation in both Guardian Crescent and Colonial Drive (which is a function of spill from the Colonial Reserve detention basin). In order to limit the potential adverse impact on the basin performance it is envisaged that the entry of water into the new conduits would be governed by spill via a vertical-walled inlet structure. It is noted that if such works produced a measureable adverse impact at downstream BP12, then compensating measures would be required at the BP12 box culvert; and
- ▶ At BP11, lowering of ground levels at the common boundary of Colonial Drive and Laneway 25 to reduce ponding depths in Colonial Drive.

At BP9 & 11, the roadway flow regimes are made worse by spill occurring from the Colonial Reserve detention basin. While this indicates that reducing the capacity of the basin would serve to reduce that spill component, the Technical Working Group considered that the adverse impacts on downstream flows between the basin and the water feature located north of Berger Road resulting from this option would be unacceptable. Hence this option is not recommended for further consideration.

5. CONCLUSIONS

The hydrologic and hydraulic modelling undertaken for this evacuation route options study has confirmed that many of the low points along the currently identified flood evacuation routes are problematic in major storm events.

Relative to the regional Hawkesbury-Nepean flood evacuation design standard of roads being 300mm higher than the 500 year local flood event water level, the study has identified that all the modelled low points would have very significant inundation problems in that same design event.

Since both the inundation issues and associated impacts on flood-time evacuation are very substantial, it is recommended that the implications be very carefully addressed. As part of this, it is recommended that the potential works options outlined in **Chapter 4** be considered further. A significant number of the options relate to Bligh Park laneways and hence pending the results of the review it is concluded that many of the laneways should be preserved, as follows:

- ▶ Laneways 2, 3, 5, 7, 7a, 8, 8a, 8b, 10, 14, 15, 17, 18, 25, 25a, 28, 32-35, 37, 43 & 46-51 (since they all contain Council stormwater pipes);
- ▶ Laneways 9-13, 20, 21, 27, 29-31, 33, 36 & 52 (subject to feasibility as alternative flood-time trafficable routes);
- ▶ Laneways 34 & 35 (to serve as flood-time pedestrian routes); and
- ▶ Laneways 1, 25, 25a, 28, 37, 43, 46-51 (together with works to reduce upslope road sag point water depths).

Combining all the above differing criteria for preserving various laneways it follows that a total of 41 laneways should be preserved. They are Laneways 1-3, 5, 7, 7a, 8-15, 17, 18, 20, 21, 25, 25a, 27-37, 43 & 46-52.

Not only has the overall picture of low point flooding assessed in the 2007 study been confirmed, but the more sophisticated 2D hydraulic modelling approach used in this study has resulted in improved levels of detail in terms of water levels and associated inundation mapping. In particular, the assessment of flood levels at Rifle Range Road and at, and in the vicinity of, the Colonial Reserve and Bounty Reserve detention basins has been substantially improved.

The flood model results also show that some of the local roads serve as de-facto flowpaths and indeed most significant pockets of overland flow inundation occur within the road reserves. Furthermore, in locations where there is no road reserve flowpath, there is shallow inundation of private properties. However since the focus of the study has been on the low points, it is important to note that the model results (including associated inundation mapping) in areas away from the flood evacuation routes represent only approximations of local flow regimes.

6. REFERENCES

1. Bewsher Consulting (2007). “*Bligh Park Evacuation Route Study*”. December. Commissioned by Hawkesbury City Council. Bewsher Consulting Job Number J1434.
2. Bewsher Consulting (2004). “*Thorley Street (Bligh Park) Flood Evacuation Route LHSS*”. Commissioned by the Department of Infrastructure, Planning and Natural Resources. September. Bewsher Consulting Job Number J1327.
3. BMT WBM Pty Ltd (2006). “*TUFLOW and Estry Reference Manual. GIS Based 2D/1D Hydrodynamic Modelling*”.
4. NSW Government (2005). “*Floodplain Development Manual*”. ISBN 0 7347 5476 0.

7. GLOSSARY

Note that terms shown in bold are described elsewhere in this Glossary.

100 year flood	A flood that occurs on average once every 100 years. Also known as a 1% flood. See annual exceedence probability (AEP) and average recurrence interval (ARI) .
50 year flood	A flood that occurs on average once every 50 years. Also known as a 2% flood. See annual exceedence probability (AEP) and average recurrence interval (ARI) .
20 year flood	A flood that occurs on average once every 20 years. Also known as a 5% flood. See annual exceedence probability (AEP) and average recurrence interval (ARI) .
afflux	The increase in flood level upstream of a constriction of flood flows. A road culvert, a pipe or a narrowing of the stream channel could cause the constriction.
annual exceedence probability (AEP)	AEP (measured as a percentage) is a term used to describe flood size. It is a means of describing how likely a flood is to occur in a given year. For example, a 1% AEP flood is a flood that has a 1% chance of occurring, or being exceeded, in any one year. It is also referred to as the '100 year flood' or 1 in 100 year flood'. The terms 100 year flood , 50 year flood , 20 year flood etc, have been used in this study. See also average recurrence interval (ARI) .
Australian Height Datum (AHD)	A common national plane of level approximately equivalent to the height above sea level. All flood levels , floor levels and ground levels in this study have been provided in metres AHD.
average recurrence interval (ARI)	ARI (measured in years) is a term used to describe flood size. It is the long-term average number of years between floods of a certain magnitude. For example, a 100 year ARI flood is a flood that occurs or is exceeded on average once every 100 years. The terms 100 year flood , 50 year flood , 20 year flood etc, have been used in this study. See also annual exceedence probability (AEP) .
catchment	The land draining through the main stream, as well as tributary streams.
Development Control Plan (DCP)	A DCP is a plan prepared in accordance with Section 72 of the <i>Environmental Planning and Assessment Act, 1979</i> that provides detailed guidelines for the assessment of development applications.
DECCW	Department of Environment, Climate Change & Water, formerly the Department of Natural Resources.
discharge	The rate of flow of water measured in terms of volume per unit time, for example, cubic metres per second (m³/s) . Discharge is different from the speed or velocity of flow, which is a measure of how fast the water is moving.
extreme flood	An estimate of the probable maximum flood (PMF) , which is the largest flood likely to occur.

flood	A relatively high stream flow that overtops the natural or artificial banks in any part of a stream, river, estuary, lake or dam, and/or local overland flooding associated with major drainage before entering a watercourse, and/or coastal inundation resulting from super-elevated sea levels and/or waves overtopping coastline defences excluding tsunami.
flood level	The height of the flood measured with reference to a specified datum such as Australian Height Datum (eg the flood level was 7.8m AHD). Terms also used include stage and water level .
flood liable land	Land susceptible to flooding up to the probable maximum flood (PMF) . Also called flood prone land . Note that the term 'flood liable land' now covers the whole of the floodplain , not just that part below the flood planning level (FPL) .
flood study	A study that investigates flood behaviour, including identification of flood extents, flood levels and flood velocities for a range of flood sizes.
floodplain	The area of land that is subject to inundation by floods up to and including the probable maximum flood event, that is, flood prone land or flood liable land .
Floodplain Risk Management Plan	A management plan developed in accordance with the principles and guidelines in the <i>Floodplain Development Manual</i> (NSW Government, 2005). (Note that the term 'risk' is often dropped in common usage and 'Floodplain Risk Management Plans' are referred to as 'Floodplain Management Plans').
Floodplain Risk Management Study	A study carried out in accordance with the principles and guidelines in the <i>Floodplain Development Manual</i> (NSW Government, 2005) that assess options for minimising the danger to life and property during floods . These measures, referred to as 'floodplain management measures/options' aim to achieve an equitable balance between environmental, social, economic, financial and engineering considerations. (Note that the term 'risk' is often dropped in common usage and 'Floodplain Risk Management Studies' are referred to as 'Floodplain Management Studies').
floodway	Those areas of the floodplain where a significant discharge of water occurs during floods . Floodways are often aligned with naturally defined channels. Floodways are areas that, even if only partially blocked, would cause a significant redistribution of flood flow, or a significant increase in flood levels .
flow	See discharge
hazard	A source of potential harm or a situation with a potential to cause loss. In relation to this study the hazard is flooding which has the potential to cause damage to the community. See high hazard and low hazard .
high hazard	Possible danger to personal safety; evacuation by trucks difficult; able-bodied adults would have difficulty in wading to safety; potential for significant structural damage to buildings.
hydraulics	Term given to the study of water flow in waterways; in particular, the evaluation of flow parameters such as water level and velocity .
hydrograph	A graph which shows how the discharge or stage/flood level at any particular location varies with time during a flood.

hydrology	Term given to the study of the rainfall and runoff process; in particular, the evaluation of peak discharges , flow volumes and the derivation of hydrographs for a range of floods.
low hazard	Should it be necessary, truck could evacuate people and their possessions; able-bodied adults would have little difficulty in wading to safety.
m AHD	Metres Australian Height Datum (AHD) .
m/s	Metres per second. Unit used to describe the velocity of floodwaters.
m³/s	Cubic metres per second or 'cumecs'. A unit of measurement for creek or river flows or discharges . It the rate of flow of water measured in terms of volume per unit time.
overland flow	The component of flow which is not carried by the underground pipe system.
overland flowpath	The path that floodwaters can follow as they are conveyed towards the main flow channel or if they leave the confines of the main flow channel. Overland flow paths can occur through private property or along roads.
peak discharge	The maximum flow or discharge during a flood.
probable maximum flood (PMF)	The largest flood that could conceivably occur at a particular location, usually estimated from probable maximum precipitation coupled with the worst flood producing catchment conditions. Generally, it is not physically or economically possible to provide complete protection against this event. The PMF defines the extent of flood prone land , that is, the floodplain .
risk	Chance of something happening that will have an impact. It is measured in terms of consequences and likelihood. In the context of this study, it is the likelihood of consequences arising from the interaction of floods, communities and the environment.
runoff	The amount of rainfall that ends up as flow in a stream, also known as rainfall excess.
SES	State Emergency Service of New South Wales.
stage	Equivalent to water level (both measured with reference to a specified datum). See flood level .
velocity	The term used to describe the speed of floodwaters, usually in m/s .
water level	Equivalent to stage (both measured with reference to a specified datum). See flood level .
water surface profile	A graph showing the height of the flood (stage, water level or flood level) at any given location along a watercourse at a particular time.

APPENDIX A

RAFTS MODEL OUTPUTS

100 YEAR ARI OUTPUT

#####
Bligh Park- Existing Conditions 100y

Results for period from 0: 0.0 1/ 1/1990
to 5: 0.0 1/ 1/1990

#####

ROUTING INCREMENT (MINS) =	1.00
STORM DURATION (MINS) =	25.
RETURN PERIOD (YRS) =	100.
BX =	0.8200
TOTAL OF FIRST SUB-AREAS (ha) =	87.24
TOTAL OF SECOND SUB-AREAS (ha) =	84.74
TOTAL OF ALL SUB-AREAS (ha) =	171.98

SUMMARY OF CATCHMENT AND RAINFALL DATA

Link	Catch. Area	Slope	% Impervious	Pern	B	Link			
Label	#1 (ha)	#2 (%)	#1 (%)	#2 (%)	#1	#2	#1	#2	No.
S6.0_BP8	3.600	4.400	1.000	1.000	5.000	100.0	.025	.015	.0334 .0026 1.000
S5.0_BP6	4.790	5.860	1.000	1.000	5.000	5.000	.025	.015	.0387 .0215 2.000
S5.1_BP7	2.090	2.550	1.000	1.000	5.000	100.0	.025	.015	.0252 .0020 2.001
S4.0_BP3	2.660	3.250	1.000	1.000	5.000	100.0	.025	.015	.0285 .0023 3.000
S3.0_BP2	1.560	1.900	1.000	1.000	5.000	100.0	.025	.015	.0216 .0017 4.000
S2.0_BP1	9.880	10.600	1.200	1.200	5.000	100.0	.025	.015	.0515 .0038 5.000
BSN_US	6.228	7.612	1.200	1.200	5.000	100.0	.025	.015	.0405 .0032 5.001
BSN_DS	.00001	0.000	.0010	0.000	0.000	0.000	.025	0.00	.0017 0.000 5.002
BP2_Out	.00001	0.000	.0010	0.000	0.000	0.000	.025	0.00	.0017 0.000 4.001
BP3_Out	.00001	0.000	1.000	0.000	0.000	0.000	.025	0.00	0.000 0.000 3.001
Out	.00001	0.000	.0010	0.000	0.000	0.000	.025	0.00	.0017 0.000 2.002
BP8_Out	.00001	0.000	1.000	0.000	0.000	0.000	.025	0.00	0.000 0.000 1.001
S7.0_BP13	4.680	5.710	1.000	1.000	5.000	100.0	.025	.015	.0383 .0030 6.000
BP13_Out	.00001	0.000	1.000	0.000	0.000	0.000	.025	0.00	0.000 0.000 6.001
S1.4	1.960	2.390	.4000	.4000	5.000	100.0	.025	.015	.0384 .0030 7.000
S1.5	3.090	3.770	.6000	.6000	5.000	100.0	.025	.015	.0398 .0031 8.000
S1.0	14.200	11.780	.7300	.7300	5.000	100.0	.025	.015	.0797 .0052 9.000
S1.05_BP5	0.4300	0.5200	1.100	1.100	5.000	100.0	.025	.015	.0105 .0008 10.00
S1.1_BP9	3.550	4.330	.6300	.6300	5.000	100.0	.025	.015	.0417 .0033 10.00
Col_Bsn	.00001	0.000	1.000	0.000	0.000	0.000	.050	0.00	0.000 0.000 9.001
S1.2_BP11	2.840	3.480	.5300	.5300	5.000	100.0	.025	.015	.0405 .0032 11.00
S1.3	17.930	16.590	.6600	.6600	5.000	100.0	.025	.015	.0946 .0065 9.002
Dummy	.00001	0.000	1.000	0.000	0.000	0.000	.050	0.00	0.000 0.000 7.001
S1.6	7.750	0.000	.6600	0.000	5.000	0.000	.050	0.00	.1020 0.000 7.002
ArtOutlet	.00001	0.000	.0010	0.000	0.000	0.000	.025	0.00	.0017 0.000 1.002

Link	Average Intensity	Init. Loss #1	Cont. Loss #2	Excess Rain #1	Peak Inflow #2	Time to Peak	Link Lag mins
Label	(mm/h)	(mm)	(mm/h)	(mm)	(m^3/s)		
S6.0_BP8	108.30	10.00	1.500	2.500 0.000	34.292 43.625	2.895	15.00 0.000
S5.0_BP6	108.30	10.00	1.500	2.500 0.000	34.292 43.625	3.345	16.00 2.000
S5.1_BP7	108.30	10.00	1.500	2.500 0.000	34.292 43.625	4.117	19.00 0.000
S4.0_BP3	108.30	10.00	1.500	2.500 0.000	34.292 43.625	2.183	15.00 0.000
S3.0_BP2	108.30	10.00	1.500	2.500 0.000	34.292 43.625	1.316	15.00 0.000
S2.0_BP1	108.30	10.00	1.500	2.500 0.000	34.292 43.625	6.849	15.00 0.000
BSN_US	108.30	10.00	1.500	2.500 0.000	34.292 43.625	11.731	15.00 0.000
BSN_DS	108.30	10.00	0.000	2.500 0.000	34.292 0.000	2.486	31.00 1.000
BP2_Out	108.30	1.500	0.000	0.000 0.000	43.625 0.000	2.900	29.00 1.000
BP3_Out	108.30	1.500	0.000	0.000 0.000	43.625 0.000	3.717	16.00 1.000
Out	108.30	10.00	0.000	2.500 0.000	34.292 0.000	7.485	17.00 1.000
BP8_Out	108.30	1.500	0.000	0.000 0.000	43.625 0.000	9.568	17.00 1.000
S7.0_BP13	108.30	10.00	1.500	2.500 0.000	34.292 43.625	3.676	15.00 0.000
BP13_Out	108.30	1.500	0.000	0.000 0.000	43.625 0.000	3.627	15.00 1.000
S1.4	108.30	10.00	1.500	2.500 0.000	34.292 43.625	1.442	15.00 0.000
S1.5	108.30	10.00	1.500	2.500 0.000	34.292 43.625	2.325	15.00 0.000
S1.0	108.30	10.00	1.500	2.500 0.000	34.292 43.625	7.365	15.00 0.000
S1.05_BP5	108.30	10.00	1.500	2.500 0.000	34.292 43.625	0.4175	15.00 2.500
S1.1_BP9	108.30	10.00	1.500	2.500 0.000	34.292 43.625	2.952	15.00 0.000

Col_Bsn	108.30	10.00	0.000	2.500	0.000	34.292	0.000	10.258	15.00	6.000
S1.2_BP11	108.30	10.00	1.500	2.500	0.000	34.292	43.625	2.128	15.00	4.000
S1.3	108.30	10.00	1.500	2.500	0.000	34.292	43.625	11.193	15.00	2.500
Dummy	108.30	10.00	0.000	2.500	0.000	34.292	0.000	13.433	16.00	3.000
S1.6	108.30	10.00	0.000	2.500	0.000	34.292	0.000	13.893	19.00	1.000
ArtOutlet	108.30	100.0	0.000	100.0	0.000	0.000	0.000	24.758	19.00	0.000

SUMMARY OF BASIN RESULTS

Link Label	Time to Peak	Inflow Peak (m^3/s)	Time to Outflow Peak (m^3/s)	Total Inflow (m^3)	-----	Basin Vol.	Vol.	Stage
BSN_US	15.00	11.73	31.00	2.485	13433.6	0.0000	9322.9	17.481
Col_Bsn	15.00	10.26	188.0	.0261	13427.7	0.0000	13066.0	18.505

#####
Bligh Park- Existing Conditions 100y

Results for period from 0: 0.0 1/ 1/1990
to 5: 0.0 1/ 1/1990

ROUTING INCREMENT (MINS) =	1.00
STORM DURATION (MINS) =	60.
RETURN PERIOD (YRS) =	100.
BX =	0.8200
TOTAL OF FIRST SUB-AREAS (ha) =	87.24
TOTAL OF SECOND SUB-AREAS (ha) =	84.74
TOTAL OF ALL SUB-AREAS (ha) =	171.98

SUMMARY OF CATCHMENT AND RAINFALL DATA

Link Label	Catch. Area #1 (ha)	Slope #1 (%)	% Impervious #1 (%)	Pern #1	B #1	Link No.	
	#2	#2	#2	#2	#2		
S6.0_BP8	3.600	4.400	1.000	1.000	5.000	100.0	.025 .015 .0334 .0026 1.000
S5.0_BP6	4.790	5.860	1.000	1.000	5.000	5.000	.025 .015 .0387 .0215 2.000
S5.1_BP7	2.090	2.550	1.000	1.000	5.000	100.0	.025 .015 .0252 .0020 2.001
S4.0_BP3	2.660	3.250	1.000	1.000	5.000	100.0	.025 .015 .0285 .0023 3.000
S3.0_BP2	1.560	1.900	1.000	1.000	5.000	100.0	.025 .015 .0216 .0017 4.000
S2.0_BP1	9.880	10.600	1.200	1.200	5.000	100.0	.025 .015 .0515 .0038 5.000
BSN_US	6.228	7.612	1.200	1.200	5.000	100.0	.025 .015 .0405 .0032 5.001
BSN_DS	.00001	0.000	.0010	0.000	0.000	0.000	.025 0.00 .0017 0.000 5.002
BP2_Out	.00001	0.000	.0010	0.000	0.000	0.000	.025 0.00 .0017 0.000 4.001
BP3_Out	.00001	0.000	1.000	0.000	0.000	0.000	.025 0.00 0.000 0.000 3.001
Out	.00001	0.000	.0010	0.000	0.000	0.000	.025 0.00 .0017 0.000 2.002
BP8_Out	.00001	0.000	1.000	0.000	0.000	0.000	.025 0.00 0.000 0.000 1.001
S7.0_BP13	4.680	5.710	1.000	1.000	5.000	100.0	.025 .015 .0383 .0030 6.000
BP13_Out	.00001	0.000	1.000	0.000	0.000	0.000	.025 0.00 0.000 0.000 6.001
S1.4	1.960	2.390	.4000	.4000	5.000	100.0	.025 .015 .0384 .0030 7.000
S1.5	3.090	3.770	.6000	.6000	5.000	100.0	.025 .015 .0398 .0031 8.000
S1.0	14.200	11.780	.7300	.7300	5.000	100.0	.025 .015 .0797 .0052 9.000
S1.05_BP5	0.4300	0.5200	1.100	1.100	5.000	100.0	.025 .015 .0105 .0008 10.00
S1.1_BP9	3.550	4.330	.6300	.6300	5.000	100.0	.025 .015 .0417 .0033 10.00
Col_Bsn	.00001	0.000	1.000	0.000	0.000	0.000	.050 0.00 0.000 0.000 9.001
S1.2_BP11	2.840	3.480	.5300	.5300	5.000	100.0	.025 .015 .0405 .0032 11.00
S1.3	17.930	16.590	.6600	.6600	5.000	100.0	.025 .015 .0946 .0065 9.002
Dummy	.00001	0.000	1.000	0.000	0.000	0.000	.050 0.00 0.000 0.000 7.001
S1.6	7.750	0.000	.6600	0.000	5.000	0.000	.050 0.00 .1020 0.000 7.002
ArtOutlet	.00001	0.000	.0010	0.000	0.000	0.000	.025 0.00 .0017 0.000 1.002

Link Label	Average Intensity (mm/h)	Init. Loss #1 (mm)	Cont. Loss #1 (mm/h)	Excess Rain #1 (mm)	Peak Inflow (m^3/s)	Time to Peak	Lag mins	Link	
S6.0_BP8	66.800	10.00	1.500	2.500	0.000	54.758	65.300	2.869	25.00 0.000
S5.0_BP6	66.800	10.00	1.500	2.500	0.000	54.758	65.300	3.300	26.00 2.000
S5.1_BP7	66.800	10.00	1.500	2.500	0.000	54.758	65.300	4.373	30.00 0.000

S4.0_BP3	66.800	10.00	1.500	2.500	0.000	54.758	65.300	2.185	25.00	0.000
S3.0_BP2	66.800	10.00	1.500	2.500	0.000	54.758	65.300	1.320	25.00	0.000
S2.0_BP1	66.800	10.00	1.500	2.500	0.000	54.758	65.300	6.808	25.00	0.000
BSN_US	66.800	10.00	1.500	2.500	0.000	54.758	65.300	11.601	25.00	0.000
BSN_DS	66.800	10.00	0.000	2.500	0.000	54.758	0.000	5.046	45.00	1.000
BP2_Out	66.800	1.500	0.000	0.000	0.000	65.300	0.000	5.586	45.00	1.000
BP3_Out	66.800	1.500	0.000	0.000	0.000	65.300	0.000	6.400	45.00	1.000
Out	66.800	10.00	0.000	2.500	0.000	54.758	0.000	9.297	41.00	1.000
BP8_Out	66.800	1.500	0.000	0.000	0.000	65.300	0.000	10.769	37.00	1.000
S7.0_BP13	66.800	10.00	1.500	2.500	0.000	54.758	65.300	3.664	25.00	0.000
BP13_Out	66.800	1.500	0.000	0.000	0.000	65.300	0.000	3.600	25.00	1.000
S1.4	66.800	10.00	1.500	2.500	0.000	54.758	65.300	1.395	25.00	0.000
S1.5	66.800	10.00	1.500	2.500	0.000	54.758	65.300	2.287	25.00	0.000
S1.0	66.800	10.00	1.500	2.500	0.000	54.758	65.300	7.202	25.00	0.000
S1.05_BP5	66.800	10.00	1.500	2.500	0.000	54.758	65.300	0.4081	25.00	2.500
S1.1_BP9	66.800	10.00	1.500	2.500	0.000	54.758	65.300	2.928	25.00	0.000
Col_Bsn	66.800	10.00	0.000	2.500	0.000	54.758	0.000	10.065	25.00	6.000
S1.2_BP11	66.800	10.00	1.500	2.500	0.000	54.758	65.300	2.071	25.00	4.000
S1.3	66.800	10.00	1.500	2.500	0.000	54.758	65.300	10.826	25.00	2.500
Dummy	66.800	10.00	0.000	2.500	0.000	54.758	0.000	13.452	26.00	3.000
S1.6	66.800	10.00	0.000	2.500	0.000	54.758	0.000	14.060	29.00	1.000
ArtOutlet	66.800	100.0	0.000	100.0	0.000	0.000	0.000	26.406	30.00	0.000

SUMMARY OF BASIN RESULTS

Link Label	Time to Peak	Peak (m^3/s)	Time to Peak	Peak (m^3/s)	Total Inflow (m^3)	-----	Basin Vol.	Vol. Used	Stage Used
BSN_US	25.00	11.60	45.00	5.045	20681.3	0.0000	11215.9		17.629
Col_Bsn	25.00	10.07	63.00	2.147	20754.5	0.0000	16599.8		18.612

#####
Bligh Park- Existing Conditions 100y

Results for period from 0: 0.0 1/ 1/1990
to 5: 0.0 1/ 1/1990

ROUTING INCREMENT (MINS) =	1.00
STORM DURATION (MINS) =	90.
RETURN PERIOD (YRS) =	100.
BX =	0.8200
TOTAL OF FIRST SUB-AREAS (ha) =	87.24
TOTAL OF SECOND SUB-AREAS (ha) =	84.74
TOTAL OF ALL SUB-AREAS (ha) =	171.98

SUMMARY OF CATCHMENT AND RAINFALL DATA

Link Label	Catch. Area #1 (ha)	Slope #1 (%)	% Impervious #1 (%)	Pern #1	B #1	Link No.
	#2	#2	#2	#2	#2	
S6.0_BP8	3.600	4.400	1.000	.025	.015	.0334 .0026 1.000
S5.0_BP6	4.790	5.860	1.000	.025	.015	.0387 .0215 2.000
S5.1_BP7	2.090	2.550	1.000	.025	.015	.0252 .0020 2.001
S4.0_BP3	2.660	3.250	1.000	.025	.015	.0285 .0023 3.000
S3.0_BP2	1.560	1.900	1.000	.025	.015	.0216 .0017 4.000
S2.0_BP1	9.880	10.600	1.200	.025	.015	.0515 .0038 5.000
BSN_US	6.228	7.612	1.200	.025	.015	.0405 .0032 5.001
BSN_DS	.00001	0.000	.0010	.025	0.00	.0017 0.000 5.002
BP2_Out	.00001	0.000	.0010	.025	0.00	.0017 0.000 4.001
BP3_Out	.00001	0.000	1.000	.025	0.00	0.000 0.000 3.001
Out	.00001	0.000	.0010	.025	0.00	.0017 0.000 2.002
BP8_Out	.00001	0.000	1.000	.025	0.00	0.000 0.000 1.001
S7.0_BP13	4.680	5.710	1.000	.025	.015	.0383 .0030 6.000
BP13_Out	.00001	0.000	1.000	.025	0.00	0.000 0.000 6.001
S1.4	1.960	2.390	.4000	.025	.015	.0384 .0030 7.000
S1.5	3.090	3.770	.6000	.025	.015	.0398 .0031 8.000

S1.0	14.200	11.780	.7300	.7300	5.000	100.0	.025	.015	.0797	.0052	9.000
S1.05_BP5	0.4300	0.5200	1.100	1.100	5.000	100.0	.025	.015	.0105	.0008	10.00
S1.1_BP9	3.550	4.330	.6300	.6300	5.000	100.0	.025	.015	.0417	.0033	10.00
Col_Bsn	.00001	0.000	1.000	0.000	0.000	0.000	.050	0.00	0.000	0.000	9.001
S1.2_BP11	2.840	3.480	.5300	.5300	5.000	100.0	.025	.015	.0405	.0032	11.00
S1.3	17.930	16.590	.6600	.6600	5.000	100.0	.025	.015	.0946	.0065	9.002
Dummy	.00001	0.000	1.000	0.000	0.000	0.000	.050	0.00	0.000	0.000	7.001
S1.6	7.750	0.000	.6600	0.000	5.000	0.000	.050	0.00	.1020	0.000	7.002
ArtOutlet	.00001	0.000	.0010	0.000	0.000	0.000	.025	0.00	.0017	0.000	1.002

Link	Average	Init.	Loss	Cont.	Loss	Excess	Rain	Peak	Time	Link
Label	Intensity	#1	#2	#1	#2	#1	#2	Inflow	to	Lag
	(mm/h)	(mm)		(mm/h)		(mm)		(m^3/s)	Peak	mins
S6.0_BP8	52.600	10.00	1.500	2.500	0.000	65.608	77.400	3.207	30.00	0.000
S5.0_BP6	52.600	10.00	1.500	2.500	0.000	65.608	77.400	3.557	31.00	2.000
S5.1_BP7	52.600	10.00	1.500	2.500	0.000	65.608	77.400	4.431	30.00	0.000
S4.0_BP3	52.600	10.00	1.500	2.500	0.000	65.608	77.400	2.423	30.00	0.000
S3.0_BP2	52.600	10.00	1.500	2.500	0.000	65.608	77.400	1.469	30.00	0.000
S2.0_BP1	52.600	10.00	1.500	2.500	0.000	65.608	77.400	7.663	30.00	0.000
BSN_US	52.600	10.00	1.500	2.500	0.000	65.608	77.400	13.055	30.00	0.000
BSN_DS	52.600	10.00	0.000	2.500	0.000	65.608	0.000	5.040	46.00	1.000
BP2_Out	52.600	1.500	0.000	0.000	0.000	77.400	0.000	5.578	46.00	1.000
BP3_Out	52.600	1.500	0.000	0.000	0.000	77.400	0.000	6.385	46.00	1.000
Out	52.600	10.00	0.000	2.500	0.000	65.608	0.000	9.354	41.00	1.000
BP8_Out	52.600	1.500	0.000	0.000	0.000	77.400	0.000	11.508	31.00	1.000
S7.0_BP13	52.600	10.00	1.500	2.500	0.000	65.608	77.400	4.094	30.00	0.000
BP13_Out	52.600	1.500	0.000	0.000	0.000	77.400	0.000	4.034	30.00	1.000
S1.4	52.600	10.00	1.500	2.500	0.000	65.608	77.400	1.552	30.00	0.000
S1.5	52.600	10.00	1.500	2.500	0.000	65.608	77.400	2.558	30.00	0.000
S1.0	52.600	10.00	1.500	2.500	0.000	65.608	77.400	8.141	30.00	0.000
S1.05_BP5	52.600	10.00	1.500	2.500	0.000	65.608	77.400	0.4302	30.00	2.500
S1.1_BP9	52.600	10.00	1.500	2.500	0.000	65.608	77.400	3.247	30.00	0.000
Col_Bsn	52.600	10.00	0.000	2.500	0.000	65.608	0.000	11.331	30.00	6.000
S1.2_BP11	52.600	10.00	1.500	2.500	0.000	65.608	77.400	2.330	30.00	4.000
S1.3	52.600	10.00	1.500	2.500	0.000	65.608	77.400	11.981	30.00	2.500
Dummy	52.600	10.00	0.000	2.500	0.000	65.608	0.000	14.665	31.00	3.000
S1.6	52.600	10.00	0.000	2.500	0.000	65.608	0.000	15.401	34.00	1.000
ArtOutlet	52.600	100.0	0.000	100.0	0.000	0.000	0.000	28.272	35.00	0.000

SUMMARY OF BASIN RESULTS

Link	Time	Peak	Time	Peak	Total	-----	Basin	-----
Label	to	Inflow	to	Outflow	Inflow	Vol.	Vol.	Stage
		Peak		Peak	(m^3/s)	(m^3)	Avail	Used
BSN_US	30.00	13.06	46.00	5.040	24623.1	0.0000	11212.6	17.628
Col_Bsn	30.00	11.33	74.00	2.873	24706.5	0.0000	17187.1	18.628

#####
Bligh Park- Existing Conditions 100y

Results for period from 0: 0.0 1/ 1/1990
to 10: 0.0 1/ 1/1990

#####

ROUTING INCREMENT (MINS) =	1.00
STORM DURATION (MINS) =	120.
RETURN PERIOD (YRS) =	100.
BX =	0.8200
TOTAL OF FIRST SUB-AREAS (ha) =	87.24
TOTAL OF SECOND SUB-AREAS (ha) =	84.74
TOTAL OF ALL SUB-AREAS (ha) =	171.98

SUMMARY OF CATCHMENT AND RAINFALL DATA

Link	Catch.	Area	Slope	% Impervious	Pern	B	Link
Label	#1	#2	#1	#2	#1	#2	No.

	(ha)	(%)				(%)				
S6.0_BP8	3.600	4.400	1.000	1.000	5.000	100.0	.025	.015	.0334	.0026 1.000
S5.0_BP6	4.790	5.860	1.000	1.000	5.000	5.000	.025	.015	.0387	.0215 2.000
S5.1_BP7	2.090	2.550	1.000	1.000	5.000	100.0	.025	.015	.0252	.0020 2.001
S4.0_BP3	2.660	3.250	1.000	1.000	5.000	100.0	.025	.015	.0285	.0023 3.000
S3.0_BP2	1.560	1.900	1.000	1.000	5.000	100.0	.025	.015	.0216	.0017 4.000
S2.0_BP1	9.880	10.600	1.200	1.200	5.000	100.0	.025	.015	.0515	.0038 5.000
BSN_US	6.228	7.612	1.200	1.200	5.000	100.0	.025	.015	.0405	.0032 5.001
BSN_DS	.00001	0.000	.0010	0.000	0.000	0.000	.025	0.00	.0017	0.000 5.002
BP2_Out	.00001	0.000	.0010	0.000	0.000	0.000	.025	0.00	.0017	0.000 4.001
BP3_Out	.00001	0.000	1.000	0.000	0.000	0.000	.025	0.00	0.000	0.000 3.001
Out	.00001	0.000	.0010	0.000	0.000	0.000	.025	0.00	.0017	0.000 2.002
BP8_Out	.00001	0.000	1.000	0.000	0.000	0.000	.025	0.00	0.000	0.000 1.001
S7.0_BP13	4.680	5.710	1.000	1.000	5.000	100.0	.025	.015	.0383	.0030 6.000
BP13_Out	.00001	0.000	1.000	0.000	0.000	0.000	.025	0.00	0.000	0.000 6.001
S1.4	1.960	2.390	.4000	.4000	5.000	100.0	.025	.015	.0384	.0030 7.000
S1.5	3.090	3.770	.6000	.6000	5.000	100.0	.025	.015	.0398	.0031 8.000
S1.0	14.200	11.780	.7300	.7300	5.000	100.0	.025	.015	.0797	.0052 9.000
S1.05_BP5	0.4300	0.5200	1.100	1.100	5.000	100.0	.025	.015	.0105	.0008 10.00
S1.1_BP9	3.550	4.330	.6300	.6300	5.000	100.0	.025	.015	.0417	.0033 10.00
Col_Bsn	.00001	0.000	1.000	0.000	0.000	0.000	.050	0.00	0.000	0.000 9.001
S1.2_BP11	2.840	3.480	.5300	.5300	5.000	100.0	.025	.015	.0405	.0032 11.00
S1.3	17.930	16.590	.6600	.6600	5.000	100.0	.025	.015	.0946	.0065 9.002
Dummy	.00001	0.000	1.000	0.000	0.000	0.000	.050	0.00	0.000	0.000 7.001
S1.6	7.750	0.000	.6600	0.000	5.000	0.000	.050	0.00	.1020	0.000 7.002
ArtOutlet	.00001	0.000	.0010	0.000	0.000	0.000	.025	0.00	.0017	0.000 1.002

Link	Average	Init.	Loss	Cont.	Loss	Excess	Rain	Peak	Time	Link
Label	Intensity	#1	#2	#1	#2	#1	#2	Inflow	to	Lag
	(mm/h)	(mm)		(mm/h)		(mm)		(m^3/s)	Peak	mins
S6.0_BP8	44.200	10.00	1.500	2.500	0.000	74.025	86.900	2.897	35.00	0.000
S5.0_BP6	44.200	10.00	1.500	2.500	0.000	74.025	86.900	3.539	40.00	2.000
S5.1_BP7	44.200	10.00	1.500	2.500	0.000	74.025	86.900	4.721	40.00	0.000
S4.0_BP3	44.200	10.00	1.500	2.500	0.000	74.025	86.900	2.195	35.00	0.000
S3.0_BP2	44.200	10.00	1.500	2.500	0.000	74.025	86.900	1.326	35.00	0.000
S2.0_BP1	44.200	10.00	1.500	2.500	0.000	74.025	86.900	6.883	35.00	0.000
BSN_US	44.200	10.00	1.500	2.500	0.000	74.025	86.900	11.771	35.00	0.000
BSN_DS	44.200	10.00	0.000	2.500	0.000	74.025	0.000	5.133	52.00	1.000
BP2_Out	44.200	1.500	0.000	0.000	0.000	86.900	0.000	5.680	52.00	1.000
BP3_Out	44.200	1.500	0.000	0.000	0.000	86.900	0.000	6.521	51.00	1.000
Out	44.200	10.00	0.000	2.500	0.000	74.025	0.000	10.180	46.00	1.000
BP8_Out	44.200	1.500	0.000	0.000	0.000	86.900	0.000	11.803	42.00	1.000
S7.0_BP13	44.200	10.00	1.500	2.500	0.000	74.025	86.900	3.691	35.00	0.000
BP13_Out	44.200	1.500	0.000	0.000	0.000	86.900	0.000	3.639	35.00	1.000
S1.4	44.200	10.00	1.500	2.500	0.000	74.025	86.900	1.420	34.00	0.000
S1.5	44.200	10.00	1.500	2.500	0.000	74.025	86.900	2.324	35.00	0.000
S1.0	44.200	10.00	1.500	2.500	0.000	74.025	86.900	7.310	35.00	0.000
S1.05_BP5	44.200	10.00	1.500	2.500	0.000	74.025	86.900	0.3996	35.00	2.500
S1.1_BP9	44.200	10.00	1.500	2.500	0.000	74.025	86.900	2.932	35.00	0.000
Col_Bsn	44.200	10.00	0.000	2.500	0.000	74.025	0.000	10.173	35.00	6.000
S1.2_BP11	44.200	10.00	1.500	2.500	0.000	74.025	86.900	2.109	35.00	4.000
S1.3	44.200	10.00	1.500	2.500	0.000	74.025	86.900	10.730	35.00	2.500
Dummy	44.200	10.00	0.000	2.500	0.000	74.025	0.000	13.829	38.00	3.000
S1.6	44.200	10.00	0.000	2.500	0.000	74.025	0.000	14.595	41.00	1.000
ArtOutlet	44.200	100.0	0.000	100.0	0.000	0.000	0.000	29.302	42.00	0.000

SUMMARY OF BASIN RESULTS

Link	Time to Peak	Peak Inflow	Time to Outflow	Peak Outflow	Total Inflow	-----	Basin Vol.	Vol.	Stage Used	-----
Label		(m^3/s)		(m^3/s)	(m^3)					
BSN_US	35.00	11.77	52.00	5.132	27745.0		0.0000	11266.1	17.633	
Col_Bsn	35.00	10.17	82.00	3.314	27872.1		0.0000	17444.6	18.635	

#####
Bligh Park- Existing Conditions 100y

Results for period from 0: 0.0 1/ 1/1990
 to 8:20.0 1/ 1/1990

#####

ROUTING INCREMENT (MINS) =	1.00
STORM DURATION (MINS) =	180.
RETURN PERIOD (YRS) =	100.
BX =	0.8200
TOTAL OF FIRST SUB-AREAS (ha) =	87.24
TOTAL OF SECOND SUB-AREAS (ha) =	84.74
TOTAL OF ALL SUB-AREAS (ha) =	171.98

SUMMARY OF CATCHMENT AND RAINFALL DATA

Link Label	Catch. Area (ha)	Slope (%)	% Impervious (%)	Pern #1 #2	B #1 #2	Link No.
	#1	#2	#1	#2	#1	
S6.0_BP8	3.600	4.400	1.000	1.000	5.000 100.0	.025 .015 .0334 .0026 1.000
S5.0_BP6	4.790	5.860	1.000	1.000	5.000 5.000	.025 .015 .0387 .0215 2.000
S5.1_BP7	2.090	2.550	1.000	1.000	5.000 100.0	.025 .015 .0252 .0020 2.001
S4.0_BP3	2.660	3.250	1.000	1.000	5.000 100.0	.025 .015 .0285 .0023 3.000
S3.0_BP2	1.560	1.900	1.000	1.000	5.000 100.0	.025 .015 .0216 .0017 4.000
S2.0_BP1	9.880	10.600	1.200	1.200	5.000 100.0	.025 .015 .0515 .0038 5.000
BSN_US	6.228	7.612	1.200	1.200	5.000 100.0	.025 .015 .0405 .0032 5.001
BSN_DS	.00001	0.000	.0010	0.000	0.000 0.000	.025 0.00 .0017 0.000 5.002
BP2_Out	.00001	0.000	.0010	0.000	0.000 0.000	.025 0.00 .0017 0.000 4.001
BP3_Out	.00001	0.000	1.000	0.000	0.000 0.000	.025 0.00 0.000 0.000 3.001
Out	.00001	0.000	.0010	0.000	0.000 0.000	.025 0.00 .0017 0.000 2.002
BP8_Out	.00001	0.000	1.000	0.000	0.000 0.000	.025 0.00 0.000 0.000 1.001
S7.0_BP13	4.680	5.710	1.000	1.000	5.000 100.0	.025 .015 .0383 .0030 6.000
BP13_Out	.00001	0.000	1.000	0.000	0.000 0.000	.025 0.00 0.000 0.000 6.001
S1.4	1.960	2.390	.4000	.4000	5.000 100.0	.025 .015 .0384 .0030 7.000
S1.5	3.090	3.770	.6000	.6000	5.000 100.0	.025 .015 .0398 .0031 8.000
S1.0	14.200	11.780	.7300	.7300	5.000 100.0	.025 .015 .0797 .0052 9.000
S1.05_BP5	0.4300	0.5200	1.100	1.100	5.000 100.0	.025 .015 .0105 .0008 10.00
S1.1_BP9	3.550	4.330	.6300	.6300	5.000 100.0	.025 .015 .0417 .0033 10.00
Col_Bsn	.00001	0.000	1.000	0.000	0.000 0.000	.050 0.00 0.000 0.000 9.001
S1.2_BP11	2.840	3.480	.5300	.5300	5.000 100.0	.025 .015 .0405 .0032 11.00
S1.3	17.930	16.590	.6600	.6600	5.000 100.0	.025 .015 .0946 .0065 9.002
Dummy	.00001	0.000	1.000	0.000	0.000 0.000	.050 0.00 0.000 0.000 7.001
S1.6	7.750	0.000	.6600	0.000	5.000 0.000	.050 0.00 .1020 0.000 7.002
ArtOutlet	.00001	0.000	.0010	0.000	0.000 0.000	.025 0.00 .0017 0.000 1.002

Link Label	Average Intensity (mm/h)	Init. Loss (mm)	Cont. Loss (mm/h)	Excess Rain (mm)	Peak Inflow (m^3/s)	Time to Peak mins	Link Lag
	#1	#2	#1	#2	#1		
S6.0_BP8	34.500	10.00	1.500	2.500 0.000	86.750 102.00	2.003	45.00 0.000
S5.0_BP6	34.500	10.00	1.500	2.500 0.000	86.750 102.00	2.618	45.00 2.000
S5.1_BP7	34.500	10.00	1.500	2.500 0.000	86.750 102.00	3.627	45.00 0.000
S4.0_BP3	34.500	10.00	1.500	2.500 0.000	86.750 102.00	1.501	45.00 0.000
S3.0_BP2	34.500	10.00	1.500	2.500 0.000	86.750 102.00	0.8920	45.00 0.000
S2.0_BP1	34.500	10.00	1.500	2.500 0.000	86.750 102.00	4.926	45.00 0.000
BSN_US	34.500	10.00	1.500	2.500 0.000	86.750 102.00	8.334	45.00 0.000
BSN_DS	34.500	10.00	0.000	2.500 0.000	86.750 0.000	4.351	76.00 1.000
BP2_Out	34.500	1.500	0.000	0.000 0.000	102.00 0.000	4.791	76.00 1.000
BP3_Out	34.500	1.500	0.000	0.000 0.000	102.00 0.000	5.535	75.00 1.000
Out	34.500	10.00	0.000	2.500 0.000	86.750 0.000	7.563	47.00 1.000
BP8_Out	34.500	1.500	0.000	0.000 0.000	102.00 0.000	9.189	47.00 1.000
S7.0_BP13	34.500	10.00	1.500	2.500 0.000	86.750 102.00	2.570	45.00 0.000
BP13_Out	34.500	1.500	0.000	0.000 0.000	102.00 0.000	2.555	45.00 1.000
S1.4	34.500	10.00	1.500	2.500 0.000	86.750 102.00	0.9677	45.00 0.000
S1.5	34.500	10.00	1.500	2.500 0.000	86.750 102.00	1.612	45.00 0.000
S1.0	34.500	10.00	1.500	2.500 0.000	86.750 102.00	5.264	45.00 0.000
S1.05_BP5	34.500	10.00	1.500	2.500 0.000	86.750 102.00	0.2516	45.00 2.500
S1.1_BP9	34.500	10.00	1.500	2.500 0.000	86.750 102.00	2.092	45.00 0.000
Col_Bsn	34.500	10.00	0.000	2.500 0.000	86.750 0.000	7.326	45.00 6.000
S1.2_BP11	34.500	10.00	1.500	2.500 0.000	86.750 102.00	1.466	45.00 4.000
S1.3	34.500	10.00	1.500	2.500 0.000	86.750 102.00	8.026	45.00 2.500
Dummy	34.500	10.00	0.000	2.500 0.000	86.750 0.000	10.115	45.00 3.000

S1.6	34.500	10.00	0.000	2.500	0.000	86.750	0.000	10.795	48.00	1.000
ArtOutlet	34.500	100.0	0.000	100.0	0.000	0.000	0.000	21.878	47.00	0.000

SUMMARY OF BASIN RESULTS

Link Label	Time to Peak	Inflow Peak (m^3/s)	Time to Peak	Outflow Peak (m^3/s)	Total Inflow (m^3)	Vol. Avail	Vol. Used	Stage Used
BSN_US	45.00	8.333	76.00	4.351	32538.7	0.0000	10809.1	17.597
Col_Bsn	45.00	7.326	92.00	3.246	32697.7	0.0000	17409.2	18.634

#####
Bligh Park- Existing Conditions 100y

Results for period from 0: 0.0 1/ 1/1990
to 20: 0.0 1/ 1/1990

ROUTING INCREMENT (MINS) =	1.00
STORM DURATION (MINS) =	360.
RETURN PERIOD (YRS) =	100.
BX =	0.8200
TOTAL OF FIRST SUB-AREAS (ha) =	87.24
TOTAL OF SECOND SUB-AREAS (ha) =	84.74
TOTAL OF ALL SUB-AREAS (ha) =	171.98

SUMMARY OF CATCHMENT AND RAINFALL DATA

Link Label	Catch. #1 (ha)	Area #2	Slope #1 (%)	% Impervious #1 (%)	Pern #1	B #1	Link No.
			#2	#2	#2	#2	
S6.0_BP8	3.600	4.400	1.000	1.000	5.000	100.0	.025 .015 .0334 .0026 1.000
S5.0_BP6	4.790	5.860	1.000	1.000	5.000	5.000	.025 .015 .0387 .0215 2.000
S5.1_BP7	2.090	2.550	1.000	1.000	5.000	100.0	.025 .015 .0252 .0020 2.001
S4.0_BP3	2.660	3.250	1.000	1.000	5.000	100.0	.025 .015 .0285 .0023 3.000
S3.0_BP2	1.560	1.900	1.000	1.000	5.000	100.0	.025 .015 .0216 .0017 4.000
S2.0_BP1	9.880	10.600	1.200	1.200	5.000	100.0	.025 .015 .0515 .0038 5.000
BSN_US	6.228	7.612	1.200	1.200	5.000	100.0	.025 .015 .0405 .0032 5.001
BSN_DS	.00001	0.000	.0010	0.000	0.000	0.000	.025 0.00 .0017 0.000 5.002
BP2_Out	.00001	0.000	.0010	0.000	0.000	0.000	.025 0.00 .0017 0.000 4.001
BP3_Out	.00001	0.000	1.000	0.000	0.000	0.000	.025 0.00 0.000 0.000 3.001
Out	.00001	0.000	.0010	0.000	0.000	0.000	.025 0.00 .0017 0.000 2.002
BP8_Out	.00001	0.000	1.000	0.000	0.000	0.000	.025 0.00 0.000 0.000 1.001
S7.0_BP13	4.680	5.710	1.000	1.000	5.000	100.0	.025 .015 .0383 .0030 6.000
BP13_Out	.00001	0.000	1.000	0.000	0.000	0.000	.025 0.00 0.000 0.000 6.001
S1.4	1.960	2.390	.4000	.4000	5.000	100.0	.025 .015 .0384 .0030 7.000
S1.5	3.090	3.770	.6000	.6000	5.000	100.0	.025 .015 .0398 .0031 8.000
S1.0	14.200	11.780	.7300	.7300	5.000	100.0	.025 .015 .0797 .0052 9.000
S1.05_BP5	0.4300	0.5200	1.100	1.100	5.000	100.0	.025 .015 .0105 .0008 10.00
S1.1_BP9	3.550	4.330	.6300	.6300	5.000	100.0	.025 .015 .0417 .0033 10.00
Col_Bsn	.00001	0.000	1.000	0.000	0.000	0.000	.050 0.00 0.000 0.000 9.001
S1.2_BP11	2.840	3.480	.5300	.5300	5.000	100.0	.025 .015 .0405 .0032 11.00
S1.3	17.930	16.590	.6600	.6600	5.000	100.0	.025 .015 .0946 .0065 9.002
Dummy	.00001	0.000	1.000	0.000	0.000	0.000	.050 0.00 0.000 0.000 7.001
S1.6	7.750	0.000	.6600	0.000	5.000	0.000	.050 0.00 .1020 0.000 7.002
ArtOutlet	.00001	0.000	.0010	0.000	0.000	0.000	.025 0.00 .0017 0.000 1.002

Link Label	Average Intensity (mm/h)	Init. Loss #1 (mm)	Cont. Loss #1 (mm/h)	Excess Rain #1 (mm)	Peak Inflow (m^3/s)	Time to Peak mins	Link Lag
S6.0_BP8	22.500	10.00	1.500	2.500 0.000	111.75 133.50	1.363	120.0 0.000
S5.0_BP6	22.500	10.00	1.500	2.500 0.000	111.75 133.50	1.807	120.0 2.000
S5.1_BP7	22.500	10.00	1.500	2.500 0.000	111.75 133.50	2.583	120.0 0.000
S4.0_BP3	22.500	10.00	1.500	2.500 0.000	111.75 133.50	1.009	120.0 0.000
S3.0_BP2	22.500	10.00	1.500	2.500 0.000	111.75 133.50	0.5918	120.0 0.000
S2.0_BP1	22.500	10.00	1.500	2.500 0.000	111.75 133.50	3.453	120.0 0.000
BSN_US	22.500	10.00	1.500	2.500 0.000	111.75 133.50	5.804	120.0 0.000

BSN_DS	22.500	10.00	0.000	2.500	0.000	111.75	0.000	4.588	124.0	1.000
BP2_Out	22.500	1.500	0.000	0.000	0.000	133.50	0.000	5.115	124.0	1.000
BP3_Out	22.500	1.500	0.000	0.000	0.000	133.50	0.000	5.891	124.0	1.000
Out	22.500	10.00	0.000	2.500	0.000	111.75	0.000	8.285	122.0	1.000
BP8_Out	22.500	1.500	0.000	0.000	0.000	133.50	0.000	9.479	122.0	1.000
S7.0_BP13	22.500	10.00	1.500	2.500	0.000	111.75	133.50	1.764	120.0	0.000
BP13_Out	22.500	1.500	0.000	0.000	0.000	133.50	0.000	1.762	120.0	1.000
S1.4	22.500	10.00	1.500	2.500	0.000	111.75	133.50	0.7170	120.0	0.000
S1.5	22.500	10.00	1.500	2.500	0.000	111.75	133.50	1.155	120.0	0.000
S1.0	22.500	10.00	1.500	2.500	0.000	111.75	133.50	4.156	120.0	0.000
S1.05_BP5	22.500	10.00	1.500	2.500	0.000	111.75	133.50	0.1632	118.0	2.500
S1.1_BP9	22.500	10.00	1.500	2.500	0.000	111.75	133.50	1.485	120.0	0.000
Col_Bsn	22.500	10.00	0.000	2.500	0.000	111.75	0.000	5.636	120.0	6.000
S1.2_BP11	22.500	10.00	1.500	2.500	0.000	111.75	133.50	1.056	120.0	4.000
S1.3	22.500	10.00	1.500	2.500	0.000	111.75	133.50	8.477	150.0	2.500
Dummy	22.500	10.00	0.000	2.500	0.000	111.75	0.000	9.612	150.0	3.000
S1.6	22.500	10.00	0.000	2.500	0.000	111.75	0.000	10.533	153.0	1.000
ArtOutlet	22.500	100.0	0.000	100.0	0.000	0.000	0.000	20.078	122.0	0.000

SUMMARY OF BASIN RESULTS

Link Label	Time to Peak	Peak (m^3/s)	Time to Peak	Peak (m^3/s)	Total Inflow (m^3)	-----	Basin Vol. Avail	Vol. Used	Stage Used
BSN_US	120.0	5.804	124.0	4.587	42263.9	0.0000	10951.8		17.608
Col_Bsn	120.0	5.636	151.0	3.877	42466.5	0.0000	17739.5		18.643

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Bligh Park- Existing Conditions 100y

Results for period from 0: 0.0 1/ 1/1990
to 9:20.0 2/ 1/1990

ROUTING INCREMENT (MINS) =	1.00
STORM DURATION (MINS) =	540.
RETURN PERIOD (YRS) =	100.
BX =	0.8200
TOTAL OF FIRST SUB-AREAS (ha) =	87.24
TOTAL OF SECOND SUB-AREAS (ha) =	84.74
TOTAL OF ALL SUB-AREAS (ha) =	171.98

SUMMARY OF CATCHMENT AND RAINFALL DATA

Link Label	Catch. Area #1 (ha)	Slope #2	% Impervious #1 (%)	% Impervious #2 (%)	Pern #1	Pern #2	B #1	B #2	Link No.
S6.0_BP8	3.600	4.400	1.000	1.000	5.000	100.0	.025	.015	.0334 .0026 1.000
S5.0_BP6	4.790	5.860	1.000	1.000	5.000	5.000	.025	.015	.0387 .0215 2.000
S5.1_BP7	2.090	2.550	1.000	1.000	5.000	100.0	.025	.015	.0252 .0020 2.001
S4.0_BP3	2.660	3.250	1.000	1.000	5.000	100.0	.025	.015	.0285 .0023 3.000
S3.0_BP2	1.560	1.900	1.000	1.000	5.000	100.0	.025	.015	.0216 .0017 4.000
S2.0_BP1	9.880	10.600	1.200	1.200	5.000	100.0	.025	.015	.0515 .0038 5.000
BSN_US	6.228	7.612	1.200	1.200	5.000	100.0	.025	.015	.0405 .0032 5.001
BSN_DS	.00001	0.000	.0010	0.000	0.000	0.000	.025	0.00	.0017 0.000 5.002
BP2_Out	.00001	0.000	.0010	0.000	0.000	0.000	.025	0.00	.0017 0.000 4.001
BP3_Out	.00001	0.000	1.000	0.000	0.000	0.000	.025	0.00	0.000 0.000 3.001
Out	.00001	0.000	.0010	0.000	0.000	0.000	.025	0.00	.0017 0.000 2.002
BP8_Out	.00001	0.000	1.000	0.000	0.000	0.000	.025	0.00	0.000 0.000 1.001
S7.0_BP13	4.680	5.710	1.000	1.000	5.000	100.0	.025	.015	.0383 .0030 6.000
BP13_Out	.00001	0.000	1.000	0.000	0.000	0.000	.025	0.00	0.000 0.000 6.001
S1.4	1.960	2.390	.4000	.4000	5.000	100.0	.025	.015	.0384 .0030 7.000
S1.5	3.090	3.770	.6000	.6000	5.000	100.0	.025	.015	.0398 .0031 8.000
S1.0	14.200	11.780	.7300	.7300	5.000	100.0	.025	.015	.0797 .0052 9.000
S1.05_BP5	0.4300	0.5200	1.100	1.100	5.000	100.0	.025	.015	.0105 .0008 10.00
S1.1_BP9	3.550	4.330	.6300	.6300	5.000	100.0	.025	.015	.0417 .0033 10.00
Col_Bsn	.00001	0.000	1.000	0.000	0.000	0.000	.050	0.00	0.000 0.000 9.001

S1.2_BP11	2.840	3.480	.5300	.5300	5.000	100.0	.025	.015	.0405	.0032	11.00
S1.3	17.930	16.590	.6600	.6600	5.000	100.0	.025	.015	.0946	.0065	9.002
Dummy	.00001	0.000	1.000	0.000	0.000	0.000	.050	0.00	0.000	0.000	7.001
S1.6	7.750	0.000	.6600	0.000	5.000	0.000	.050	0.00	.1020	0.000	7.002
ArtOutlet	.00001	0.000	.0010	0.000	0.000	0.000	.025	0.00	.0017	0.000	1.002

Link Label	Average Intensity	Init. #1	Loss #2	Cont. #1	Loss #2	Excess #1	Rain #2	Peak Inflow	Time to Peak	Link Lag mins
	(mm/h)	(mm)		(mm/h)		(mm)		(m^3/s)		
S6_0_BP8	17.700	10.00	1.500	2.500	0.000	128.80	157.80	1.209	300.0	0.000
S5_0_BP6	17.700	10.00	1.500	2.500	0.000	128.80	157.80	1.601	300.0	2.000
S5.1_BP7	17.700	10.00	1.500	2.500	0.000	128.80	157.80	2.285	300.0	0.000
S4_0_BP3	17.700	10.00	1.500	2.500	0.000	128.80	157.80	0.8944	300.0	0.000
S3_0_BP2	17.700	10.00	1.500	2.500	0.000	128.80	157.80	0.5257	300.0	0.000
S2_0_BP1	17.700	10.00	1.500	2.500	0.000	128.80	157.80	3.050	300.0	0.000
BSN_US	17.700	10.00	1.500	2.500	0.000	128.80	157.80	5.133	300.0	0.000
BSN_DS	17.700	10.00	0.000	2.500	0.000	128.80	0.000	4.510	303.0	1.000
BP2_Out	17.700	1.500	0.000	0.000	0.000	157.80	0.000	5.006	303.0	1.000
BP3_Out	17.700	1.500	0.000	0.000	0.000	157.80	0.000	5.758	303.0	1.000
Out	17.700	10.00	0.000	2.500	0.000	128.80	0.000	7.977	302.0	1.000
BP8_Out	17.700	1.500	0.000	0.000	0.000	157.80	0.000	9.096	302.0	1.000
S7_0_BP13	17.700	10.00	1.500	2.500	0.000	128.80	157.80	1.562	300.0	0.000
BP13_Out	17.700	1.500	0.000	0.000	0.000	157.80	0.000	1.560	300.0	1.000
S1.4	17.700	10.00	1.500	2.500	0.000	128.80	157.80	0.6310	300.0	0.000
S1.5	17.700	10.00	1.500	2.500	0.000	128.80	157.80	1.015	300.0	0.000
S1.0	17.700	10.00	1.500	2.500	0.000	128.80	157.80	3.638	300.0	0.000
S1.05_BP5	17.700	10.00	1.500	2.500	0.000	128.80	157.80	0.1449	300.0	2.500
S1.1_BP9	17.700	10.00	1.500	2.500	0.000	128.80	157.80	1.315	300.0	0.000
Col_Bsn	17.700	10.00	0.000	2.500	0.000	128.80	0.000	4.948	300.0	6.000
S1.2_BP11	17.700	10.00	1.500	2.500	0.000	128.80	157.80	0.9272	300.0	4.000
S1.3	17.700	10.00	1.500	2.500	0.000	128.80	157.80	9.674	300.0	2.500
Dummy	17.700	10.00	0.000	2.500	0.000	128.80	0.000	11.089	303.0	3.000
S1.6	17.700	10.00	0.000	2.500	0.000	128.80	0.000	11.908	306.0	1.000
ArtOutlet	17.700	100.0	0.000	100.0	0.000	0.000	0.000	22.116	304.0	0.000

SUMMARY OF BASIN RESULTS

Link Label	Time to Peak	Peak Inflow (m^3/s)	Time to Peak	Peak Outflow (m^3/s)	Total Inflow (m^3)	----- Vol.	Basin Vol.	----- Stage
						Avail	Used	Used
BSN_US	300.0	5.132	303.0	4.510	49441.9	0.0000	10907.0	17.605
Col Bsn	300.0	4.947	303.0	4.519	49585.6	0.0000	18075.4	18.652

Bligh Park- Existing Conditions 100y

Results for period from 0: 0.0 1/ 1/1990
to 2: 0.0 3/ 1/1990

ROUTING INCREMENT (MINS)	=	1.00
STORM DURATION (MINS)	=	720.
RETURN PERIOD (YRS)	=	100.
BX	=	0.8200
TOTAL OF FIRST SUB-AREAS (ha)	=	87.24
TOTAL OF SECOND SUB-AREAS (ha)	=	84.74
TOTAL OF ALL SUB-AREAS (ha)	=	171.98

SUMMARY OF CATCHMENT AND RAINFALL DATA

SUMMARY OF CATCHMENT AND RAINFALL DATA											
Link Label	Catch. Area		Slope		% ImperVIOUS		Pern		B #1	Link No.	
	#1 (ha)	#2	#1 (%)	#2	#1 (%)	#2	#1	#2			
S6_0_BP8	3.600	4.400	1.000	1.000	5.000	100.0	.025	.015	.0334	.0026	1.000
S5_0_BP6	4.790	5.860	1.000	1.000	5.000	5.000	.025	.015	.0387	.0215	2.000

S5.1_BP7	2.090	2.550	1.000	1.000	5.000	100.0	.025	.015	.0252	.0020	2.001
S4.0_BP3	2.660	3.250	1.000	1.000	5.000	100.0	.025	.015	.0285	.0023	3.000
S3.0_BP2	1.560	1.900	1.000	1.000	5.000	100.0	.025	.015	.0216	.0017	4.000
S2.0_BP1	9.880	10.600	1.200	1.200	5.000	100.0	.025	.015	.0515	.0038	5.000
BSN_US	6.228	7.612	1.200	1.200	5.000	100.0	.025	.015	.0405	.0032	5.001
BSN_DS	.00001	0.000	.0010	0.000	0.000	0.000	.025	0.00	.0017	0.000	5.002
BP2_Out	.00001	0.000	.0010	0.000	0.000	0.000	.025	0.00	.0017	0.000	4.001
BP3_Out	.00001	0.000	1.000	0.000	0.000	0.000	.025	0.00	0.000	0.000	3.001
Out	.00001	0.000	.0010	0.000	0.000	0.000	.025	0.00	.0017	0.000	2.002
BP8_Out	.00001	0.000	1.000	0.000	0.000	0.000	.025	0.00	0.000	0.000	1.001
S7.0_BP13	4.680	5.710	1.000	1.000	5.000	100.0	.025	.015	.0383	.0030	6.000
BP13_Out	.00001	0.000	1.000	0.000	0.000	0.000	.025	0.00	0.000	0.000	6.001
S1.4	1.960	2.390	.4000	.4000	5.000	100.0	.025	.015	.0384	.0030	7.000
S1.5	3.090	3.770	.6000	.6000	5.000	100.0	.025	.015	.0398	.0031	8.000
S1.0	14.200	11.780	.7300	.7300	5.000	100.0	.025	.015	.0797	.0052	9.000
S1.05_BP5	0.4300	0.5200	1.100	1.100	5.000	100.0	.025	.015	.0105	.0008	10.00
S1.1_BP9	3.550	4.330	.6300	.6300	5.000	100.0	.025	.015	.0417	.0033	10.00
Col_Bsn	.00001	0.000	1.000	0.000	0.000	0.000	.050	0.00	0.000	0.000	9.001
S1.2_BP11	2.840	3.480	.5300	.5300	5.000	100.0	.025	.015	.0405	.0032	11.00
S1.3	17.930	16.590	.6600	.6600	5.000	100.0	.025	.015	.0946	.0065	9.002
Dummy	.00001	0.000	1.000	0.000	0.000	0.000	.050	0.00	0.000	0.000	7.001
S1.6	7.750	0.000	.6600	0.000	5.000	0.000	.050	0.00	.1020	0.000	7.002
ArtOutlet	.00001	0.000	.0010	0.000	0.000	0.000	.025	0.00	.0017	0.000	1.002

Link	Average	Init.	Loss	Cont.	Loss	Excess	Rain	Peak	Time	Link
Label	Intensity	#1	#2	#1	#2	#1	#2	Inflow	to	Lag
	(mm/h)	(mm)		(mm/h)		(mm)		(m^3/s)	Peak	mins
S6.0_BP8	14.900	10.00	1.500	2.500	0.000	142.02	177.30	1.223	420.0	0.000
S5.0_BP6	14.900	10.00	1.500	2.500	0.000	142.02	177.30	1.623	420.0	2.000
S5.1_BP7	14.900	10.00	1.500	2.500	0.000	142.02	177.30	2.321	420.0	0.000
S4.0_BP3	14.900	10.00	1.500	2.500	0.000	142.02	177.30	0.9041	420.0	0.000
S3.0_BP2	14.900	10.00	1.500	2.500	0.000	142.02	177.30	0.5306	420.0	0.000
S2.0_BP1	14.900	10.00	1.500	2.500	0.000	142.02	177.30	3.099	420.0	0.000
BSN_US	14.900	10.00	1.500	2.500	0.000	142.02	177.30	5.209	420.0	0.000
BSN_DS	14.900	10.00	0.000	2.500	0.000	142.02	0.000	4.822	421.0	1.000
BP2_Out	14.900	1.500	0.000	0.000	0.000	177.30	0.000	5.327	421.0	1.000
BP3_Out	14.900	1.500	0.000	0.000	0.000	177.30	0.000	6.146	420.0	1.000
Out	14.900	10.00	0.000	2.500	0.000	142.02	0.000	8.422	421.0	1.000
BP8_Out	14.900	1.500	0.000	0.000	0.000	177.30	0.000	9.574	421.0	1.000
S7.0_BP13	14.900	10.00	1.500	2.500	0.000	142.02	177.30	1.583	420.0	0.000
BP13_Out	14.900	1.500	0.000	0.000	0.000	177.30	0.000	1.581	420.0	1.000
S1.4	14.900	10.00	1.500	2.500	0.000	142.02	177.30	0.6472	420.0	0.000
S1.5	14.900	10.00	1.500	2.500	0.000	142.02	177.30	1.035	420.0	0.000
S1.0	14.900	10.00	1.500	2.500	0.000	142.02	177.30	3.781	420.0	0.000
S1.05_BP5	14.900	10.00	1.500	2.500	0.000	142.02	177.30	0.1460	420.0	2.500
S1.1_BP9	14.900	10.00	1.500	2.500	0.000	142.02	177.30	1.335	420.0	0.000
Col_Bsn	14.900	10.00	0.000	2.500	0.000	142.02	0.000	5.114	420.0	6.000
S1.2_BP11	14.900	10.00	1.500	2.500	0.000	142.02	177.30	0.9479	420.0	4.000
S1.3	14.900	10.00	1.500	2.500	0.000	142.02	177.30	10.385	420.0	2.500
Dummy	14.900	10.00	0.000	2.500	0.000	142.02	0.000	11.819	420.0	3.000
S1.6	14.900	10.00	0.000	2.500	0.000	142.02	0.000	12.698	423.0	1.000
ArtOutlet	14.900	100.0	0.000	100.0	0.000	0.000	0.000	23.571	421.0	0.000

SUMMARY OF BASIN RESULTS

Link	Time to Peak	Peak Inflow	Time to Peak	Peak Outflow	Total Inflow	Vol. Avail	Vol. Used	Stage Used	Basin Stage
BSN_US	420.0	5.208	421.0	4.822	55112.6	0.0000	11086.8	17.619	-----
Col_Bsn	420.0	5.113	421.0	4.807	55199.0	0.0000	18219.3	18.656	-----

#####
Bligh Park- Existing Conditions 100y

Results for period from 0: 0.0 1/ 1/1990
to 18:40.0 3/ 1/1990

#####

ROUTING INCREMENT (MINS) = 1.00
 STORM DURATION (MINS) = 1080.
 RETURN PERIOD (YRS) = 100.
 BX = 0.8200
 TOTAL OF FIRST SUB-AREAS (ha) = 87.24
 TOTAL OF SECOND SUB-AREAS (ha) = 84.74
 TOTAL OF ALL SUB-AREAS (ha) = 171.98

SUMMARY OF CATCHMENT AND RAINFALL DATA

Link Label	Catch. #1 (ha)	Area #2 (ha)	Slope #1 (%)	% Impervious #1 (%)	Pern #1	B #1	Link No.
S6.0_BP8	3.600	4.400	1.000	1.000	5.000	100.0	.025 .015 .0334 .0026 1.000
S5.0_BP6	4.790	5.860	1.000	1.000	5.000	5.000	.025 .015 .0387 .0215 2.000
S5.1_BP7	2.090	2.550	1.000	1.000	5.000	100.0	.025 .015 .0252 .0020 2.001
S4.0_BP3	2.660	3.250	1.000	1.000	5.000	100.0	.025 .015 .0285 .0023 3.000
S3.0_BP2	1.560	1.900	1.000	1.000	5.000	100.0	.025 .015 .0216 .0017 4.000
S2.0_BP1	9.880	10.600	1.200	1.200	5.000	100.0	.025 .015 .0515 .0038 5.000
BSN_US	6.228	7.612	1.200	1.200	5.000	100.0	.025 .015 .0405 .0032 5.001
BSN_DS	.00001	0.000	.0010	0.000	0.000	0.000	.025 0.00 .0017 0.000 5.002
BP2_Out	.00001	0.000	.0010	0.000	0.000	0.000	.025 0.00 .0017 0.000 4.001
BP3_Out	.00001	0.000	1.000	0.000	0.000	0.000	.025 0.00 0.000 0.000 3.001
Out	.00001	0.000	.0010	0.000	0.000	0.000	.025 0.00 .0017 0.000 2.002
BP8_Out	.00001	0.000	1.000	0.000	0.000	0.000	.025 0.00 0.000 0.000 1.001
S7.0_BP13	4.680	5.710	1.000	1.000	5.000	100.0	.025 .015 .0383 .0030 6.000
BP13_Out	.00001	0.000	1.000	0.000	0.000	0.000	.025 0.00 0.000 0.000 6.001
S1.4	1.960	2.390	.4000	.4000	5.000	100.0	.025 .015 .0384 .0030 7.000
S1.5	3.090	3.770	.6000	.6000	5.000	100.0	.025 .015 .0398 .0031 8.000
S1.0	14.200	11.780	.7300	.7300	5.000	100.0	.025 .015 .0797 .0052 9.000
S1.05_BP5	0.4300	0.5200	1.100	1.100	5.000	100.0	.025 .015 .0105 .0008 10.00
S1.1_BP9	3.550	4.330	.6300	.6300	5.000	100.0	.025 .015 .0417 .0033 10.00
Col_Bsn	.00001	0.000	1.000	0.000	0.000	0.000	.050 0.00 0.000 0.000 9.001
S1.2_BP11	2.840	3.480	.5300	.5300	5.000	100.0	.025 .015 .0405 .0032 11.00
S1.3	17.930	16.590	.6600	.6600	5.000	100.0	.025 .015 .0946 .0065 9.002
Dummy	.00001	0.000	1.000	0.000	0.000	0.000	.050 0.00 0.000 0.000 7.001
S1.6	7.750	0.000	.6600	0.000	5.000	0.000	.050 0.00 .1020 0.000 7.002
ArtOutlet	.00001	0.000	.0010	0.000	0.000	0.000	.025 0.00 .0017 0.000 1.002

Link Label	Average Intensity (mm/h)	Init. Loss #1 (mm)	Cont. Loss #1 (mm/h)	Excess Rain #1 (mm)	Inflow #1 (mm^3/s)	Peak Inflow	Time to Peak mins	Link Lag
S6.0_BP8	11.900	10.00	1.500	2.500 0.000	164.02 212.70	0.8505	420.0	0.000
S5.0_BP6	11.900	10.00	1.500	2.500 0.000	164.02 212.70	1.132	420.0	2.000
S5.1_BP7	11.900	10.00	1.500	2.500 0.000	164.02 212.70	1.625	420.0	0.000
S4.0_BP3	11.900	10.00	1.500	2.500 0.000	164.02 212.70	0.6283	420.0	0.000
S3.0_BP2	11.900	10.00	1.500	2.500 0.000	164.02 212.70	0.3679	420.0	0.000
S2.0_BP1	11.900	10.00	1.500	2.500 0.000	164.02 212.70	2.172	420.0	0.000
BSN_US	11.900	10.00	1.500	2.500 0.000	164.02 212.70	3.644	420.0	0.000
BSN_DS	11.900	10.00	0.000	2.500 0.000	164.02 0.000	3.480	421.0	1.000
BP2_Out	11.900	1.500	0.000	0.000 0.000	212.70 0.000	3.840	421.0	1.000
BP3_Out	11.900	1.500	0.000	0.000 0.000	212.70 0.000	4.448	420.0	1.000
Out	11.900	10.00	0.000	2.500 0.000	164.02 0.000	6.059	420.0	1.000
BP8_Out	11.900	1.500	0.000	0.000 0.000	212.70 0.000	6.894	420.0	1.000
S7.0_BP13	11.900	10.00	1.500	2.500 0.000	164.02 212.70	1.105	420.0	0.000
BP13_Out	11.900	1.500	0.000	0.000 0.000	212.70 0.000	1.105	419.0	1.000
S1.4	11.900	10.00	1.500	2.500 0.000	164.02 212.70	0.4613	420.0	0.000
S1.5	11.900	10.00	1.500	2.500 0.000	164.02 212.70	0.7285	420.0	0.000
S1.0	11.900	10.00	1.500	2.500 0.000	164.02 212.70	2.725	420.0	0.000
S1.05_BP5	11.900	10.00	1.500	2.500 0.000	164.02 212.70	0.1010	419.0	2.500
S1.1_BP9	11.900	10.00	1.500	2.500 0.000	164.02 212.70	0.9376	420.0	0.000
Col_Bsn	11.900	10.00	0.000	2.500 0.000	164.02 0.000	3.662	420.0	6.000
S1.2_BP11	11.900	10.00	1.500	2.500 0.000	164.02 212.70	0.6707	420.0	4.000
S1.3	11.900	10.00	1.500	2.500 0.000	164.02 212.70	7.635	420.0	2.500
Dummy	11.900	10.00	0.000	2.500 0.000	164.02 0.000	8.694	420.0	3.000
S1.6	11.900	10.00	0.000	2.500 0.000	164.02 0.000	9.386	423.0	1.000
ArtOutlet	11.900	100.0	0.000	100.0 0.000	0.000 0.000	17.222	421.0	0.000

SUMMARY OF BASIN RESULTS

Link Label	Time to Peak	Peak (m^3/s)	Time to Peak	Peak (m^3/s)	Total Inflow (m^3)	Vol. Avail	Vol. Used	Stage Used
BSN_US	420.0	3.643	421.0	3.480	65112.1	0.0000	10209.6	17.550
Col_Bsn	420.0	3.662	421.0	3.510	65128.6	0.0000	17547.2	18.638

#####
Bligh Park- Existing Conditions 100y

Results for period from 0: 0.0 1/ 1/1990
to 11:20.0 4/ 1/1990

ROUTING INCREMENT (MINS) =	1.00
STORM DURATION (MINS) =	1440.
RETURN PERIOD (YRS) =	100.
BX =	0.8200
TOTAL OF FIRST SUB-AREAS (ha) =	87.24
TOTAL OF SECOND SUB-AREAS (ha) =	84.74
TOTAL OF ALL SUB-AREAS (ha) =	171.98

SUMMARY OF CATCHMENT AND RAINFALL DATA

Link Label	Catch. Area #1 (ha)	Area #2	Slope #1 (%)	% Impervious #1 (%)	Pern #1	B #1	Link No.
	#1	#2	#1	#2	#1	#2	
S6.0_BP8	3.600	4.400	1.000	1.000	5.000	100.0	.025 .015 .0334 .0026 1.000
S5.0_BP6	4.790	5.860	1.000	1.000	5.000	5.000	.025 .015 .0387 .0215 2.000
S5.1_BP7	2.090	2.550	1.000	1.000	5.000	100.0	.025 .015 .0252 .0020 2.001
S4.0_BP3	2.660	3.250	1.000	1.000	5.000	100.0	.025 .015 .0285 .0023 3.000
S3.0_BP2	1.560	1.900	1.000	1.000	5.000	100.0	.025 .015 .0216 .0017 4.000
S2.0_BP1	9.880	10.600	1.200	1.200	5.000	100.0	.025 .015 .0515 .0038 5.000
BSN_US	6.228	7.612	1.200	1.200	5.000	100.0	.025 .015 .0405 .0032 5.001
BSN_DS	.00001	0.000	.0010	0.000	0.000	0.000	.025 0.00 .0017 0.000 5.002
BP2_Out	.00001	0.000	.0010	0.000	0.000	0.000	.025 0.00 .0017 0.000 4.001
BP3_Out	.00001	0.000	1.000	0.000	0.000	0.000	.025 0.00 0.000 0.000 3.001
Out	.00001	0.000	.0010	0.000	0.000	0.000	.025 0.00 .0017 0.000 2.002
BP8_Out	.00001	0.000	1.000	0.000	0.000	0.000	.025 0.00 0.000 0.000 1.001
S7.0_BP13	4.680	5.710	1.000	1.000	5.000	100.0	.025 .015 .0383 .0030 6.000
BP13_Out	.00001	0.000	1.000	0.000	0.000	0.000	.025 0.00 0.000 0.000 6.001
S1.4	1.960	2.390	.4000	.4000	5.000	100.0	.025 .015 .0384 .0030 7.000
S1.5	3.090	3.770	.6000	.6000	5.000	100.0	.025 .015 .0398 .0031 8.000
S1.0	14.200	11.780	.7300	.7300	5.000	100.0	.025 .015 .0797 .0052 9.000
S1.05_BP5	0.4300	0.5200	1.100	1.100	5.000	100.0	.025 .015 .0105 .0008 10.00
S1.1_BP9	3.550	4.330	.6300	.6300	5.000	100.0	.025 .015 .0417 .0033 10.00
Col_Bsn	.00001	0.000	1.000	0.000	0.000	0.000	.050 0.00 0.000 0.000 9.001
S1.2_BP11	2.840	3.480	.5300	.5300	5.000	100.0	.025 .015 .0405 .0032 11.00
S1.3	17.930	16.590	.6600	.6600	5.000	100.0	.025 .015 .0946 .0065 9.002
Dummy	.00001	0.000	1.000	0.000	0.000	0.000	.050 0.00 0.000 0.000 7.001
S1.6	7.750	0.000	.6600	0.000	5.000	0.000	.050 0.00 .1020 0.000 7.002
ArtOutlet	.00001	0.000	.0010	0.000	0.000	0.000	.025 0.00 .0017 0.000 1.002

Link Label	Average Intensity (mm/h)	Init. Loss #1 (mm)	Cont. Loss #1 (mm/h)	Excess Rain #1 (mm)	Inflow (m^3/s)	Peak	Time to Lag	Link
	#1	#2	#1	#2	#1	Peak mins		
S6.0_BP8	10.200	10.00	1.500	2.500	0.000	184.04	243.30	0.8342 720.0 0.000
S5.0_BP6	10.200	10.00	1.500	2.500	0.000	184.04	243.30	1.111 720.0 2.000
S5.1_BP7	10.200	10.00	1.500	2.500	0.000	184.04	243.30	1.594 720.0 0.000
S4.0_BP3	10.200	10.00	1.500	2.500	0.000	184.04	243.30	0.6163 720.0 0.000
S3.0_BP2	10.200	10.00	1.500	2.500	0.000	184.04	243.30	0.3608 720.0 0.000
S2.0_BP1	10.200	10.00	1.500	2.500	0.000	184.04	243.30	2.131 720.0 0.000
BSN_US	10.200	10.00	1.500	2.500	0.000	184.04	243.30	3.574 720.0 0.000

BSN_DS	10.200	10.00	0.000	2.500	0.000	184.04	0.000	3.507	721.0	1.000
BP2_Out	10.200	1.500	0.000	0.000	0.000	243.30	0.000	3.864	721.0	1.000
BP3_Out	10.200	1.500	0.000	0.000	0.000	243.30	0.000	4.470	720.0	1.000
Out	10.200	10.00	0.000	2.500	0.000	184.04	0.000	6.057	720.0	1.000
BP8_Out	10.200	1.500	0.000	0.000	0.000	243.30	0.000	6.883	720.0	1.000
S7.0_BP13	10.200	10.00	1.500	2.500	0.000	184.04	243.30	1.083	720.0	0.000
BP13_Out	10.200	1.500	0.000	0.000	0.000	243.30	0.000	1.083	720.0	1.000
S1.4	10.200	10.00	1.500	2.500	0.000	184.04	243.30	0.4529	720.0	0.000
S1.5	10.200	10.00	1.500	2.500	0.000	184.04	243.30	0.7149	720.0	0.000
S1.0	10.200	10.00	1.500	2.500	0.000	184.04	243.30	2.680	720.0	0.000
S1.05_BP5	10.200	10.00	1.500	2.500	0.000	184.04	243.30	0.0991	717.0	2.500
S1.1_BP9	10.200	10.00	1.500	2.500	0.000	184.04	243.30	0.9200	720.0	0.000
Col_Bsn	10.200	10.00	0.000	2.500	0.000	184.04	0.000	3.600	720.0	6.000
S1.2_BP11	10.200	10.00	1.500	2.500	0.000	184.04	243.30	0.6583	720.0	4.000
S1.3	10.200	10.00	1.500	2.500	0.000	184.04	243.30	7.730	720.0	2.500
Dummy	10.200	10.00	0.000	2.500	0.000	184.04	0.000	8.861	720.0	3.000
S1.6	10.200	10.00	0.000	2.500	0.000	184.04	0.000	9.581	723.0	1.000
ArtOutlet	10.200	100.0	0.000	100.0	0.000	0.000	0.000	17.505	721.0	0.000

SUMMARY OF BASIN RESULTS

Link Label	Time to Peak	Peak Inflow (m^3/s)	Time to Peak	Peak Outflow (m^3/s)	Total Inflow (m^3)	-----	Basin Vol.	Vol.	Stage
							Avail	Used	Used
BSN_US	720.0	3.574	721.0	3.506	73906.0	-----	0.0000	10227.9	17.552
Col_Bsn	720.0	3.600	720.0	3.556	73833.0	-----	0.0000	17571.4	18.638

500 YEAR ARI OUTPUT

#####
Bligh Park- Existing Conditions 500Yr

Results for period from 0: 0.0 1/ 1/1990
to 5: 0.0 1/ 1/1990

#####

ROUTING INCREMENT (MINS) =	1.00
STORM DURATION (MINS) =	25.
RETURN PERIOD (YRS) =	500.
BX =	0.8200
TOTAL OF FIRST SUB-AREAS (ha) =	87.24
TOTAL OF SECOND SUB-AREAS (ha) =	84.74
TOTAL OF ALL SUB-AREAS (ha) =	171.98

SUMMARY OF CATCHMENT AND RAINFALL DATA

Link Label	Catch. Area (ha)	Slope (%)	% Impervious (%)	Pern #1	Pern #2	B #1	B #2	Link No.
S6.0_BP8	3.600	4.400	1.000 1.000	5.000 100.0	.025 .015	.0334 .0026	.0026 1.000	
S5.0_BP6	4.790	5.860	1.000 1.000	5.000 5.000	.025 .015	.0387 .0215	.0215 2.000	
S5.1_BP7	2.090	2.550	1.000 1.000	5.000 100.0	.025 .015	.0252 .0020	.0020 2.001	
S4.0_BP3	2.660	3.250	1.000 1.000	5.000 100.0	.025 .015	.0285 .0023	.0023 3.000	
S3.0_BP2	1.560	1.900	1.000 1.000	5.000 100.0	.025 .015	.0216 .0017	.0017 4.000	
S2.0_BP1	9.880	10.600	1.200 1.200	5.000 100.0	.025 .015	.0515 .0038	.0038 5.000	
BSN_US	6.228	7.612	1.200 1.200	5.000 100.0	.025 .015	.0405 .0032	.0032 5.001	
BSN_DS	.00001	0.000	.0010 0.000	0.000 0.000	.025 0.00	.0017 0.000	.0000 5.002	
BP2_Out	.00001	0.000	.0010 0.000	0.000 0.000	.025 0.00	.0017 0.000	.0000 4.001	
BP3_Out	.00001	0.000	1.000 0.000	0.000 0.000	.025 0.00	0.000 0.000	0.000 3.001	
Out	.00001	0.000	.0010 0.000	0.000 0.000	.025 0.00	.0017 0.000	.0000 2.002	
BP8_Out	.00001	0.000	1.000 0.000	0.000 0.000	.025 0.00	0.000 0.000	0.000 1.001	
S7.0_BP13	4.680	5.710	1.000 1.000	5.000 100.0	.025 .015	.0383 .0030	.0030 6.000	
BP13_Out	.00001	0.000	1.000 0.000	0.000 0.000	.025 0.00	0.000 0.000	0.000 6.001	
S1.4	1.960	2.390	.4000 .4000	5.000 100.0	.025 .015	.0384 .0030	.0030 7.000	
S1.5	3.090	3.770	.6000 .6000	5.000 100.0	.025 .015	.0398 .0031	.0031 8.000	
S1.0	14.200	11.780	.7300 .7300	5.000 100.0	.025 .015	.0797 .0052	.0052 9.000	
S1.05_BP5	0.4300	0.5200	1.100 1.100	5.000 100.0	.025 .015	.0105 .0008	.0008 10.00	
S1.1_BP9	3.550	4.330	.6300 .6300	5.000 100.0	.025 .015	.0417 .0033	.0033 10.00	
Col_Bsn	.00001	0.000	1.000 0.000	0.000 0.000	.050 0.00	0.000 0.000	0.000 9.001	
S1.2_BP11	2.840	3.480	.5300 .5300	5.000 100.0	.025 .015	.0405 .0032	.0032 11.00	
S1.3	17.930	16.590	.6600 .6600	5.000 100.0	.025 .015	.0946 .0065	.0065 9.002	
Dummy	.00001	0.000	1.000 0.000	0.000 0.000	.050 0.00	0.000 0.000	0.000 7.001	
S1.6	7.750	0.000	.6600 0.000	5.000 0.000	.050 0.00	.1020 0.000	0.000 7.002	
ArtOutlet	.00001	0.000	.0010 0.000	0.000 0.000	.025 0.00	.0017 0.000	0.000 1.002	

Link Label	Average Intensity (mm/h)	Init. Loss #1 (mm)	Cont. Loss #1 (mm/h)	Excess Rain #1 (mm)	Peak Inflow (m^3/s)	Time to Peak mins	Link Lag
S6.0_BP8	130.10	10.00	1.500	2.500 0.000	43.375 52.708	3.598	15.00 0.000
S5.0_BP6	130.10	10.00	1.500	2.500 0.000	43.375 52.708	4.252	16.00 2.000
S5.1_BP7	130.10	10.00	1.500	2.500 0.000	43.375 52.708	5.250	19.00 0.000
S4.0_BP3	130.10	10.00	1.500	2.500 0.000	43.375 52.708	2.733	15.00 0.000
S3.0_BP2	130.10	10.00	1.500	2.500 0.000	43.375 52.708	1.673	15.00 0.000
S2.0_BP1	130.10	10.00	1.500	2.500 0.000	43.375 52.708	8.533	15.00 0.000
BSN_US	130.10	10.00	1.500	2.500 0.000	43.375 52.708	14.573	15.00 0.000
BSN_DS	130.10	10.00	0.000	2.500 0.000	43.375 0.000	4.392	28.00 1.000
BP2_Out	130.10	1.500	0.000	0.000 0.000	52.708 0.000	4.939	28.00 1.000
BP3_Out	130.10	1.500	0.000	0.000 0.000	52.708 0.000	5.658	27.00 1.000
Out	130.10	10.00	0.000	2.500 0.000	43.375 0.000	9.658	17.00 1.000
BP8_Out	130.10	1.500	0.000	0.000 0.000	52.708 0.000	12.229	16.00 1.000
S7.0_BP13	130.10	10.00	1.500	2.500 0.000	43.375 52.708	4.606	15.00 0.000
BP13_Out	130.10	1.500	0.000	0.000 0.000	52.708 0.000	4.523	15.00 1.000
S1.4	130.10	10.00	1.500	2.500 0.000	43.375 52.708	1.782	15.00 0.000
S1.5	130.10	10.00	1.500	2.500 0.000	43.375 52.708	2.902	15.00 0.000
S1.0	130.10	10.00	1.500	2.500 0.000	43.375 52.708	9.101	15.00 0.000
S1.05_BP5	130.10	10.00	1.500	2.500 0.000	43.375 52.708	0.5223	15.00 2.500

S1.1_BP9	130.10	10.00	1.500	2.500	0.000	43.375	52.708	3.726	15.00	0.000
Col_Bsn	130.10	10.00	0.000	2.500	0.000	43.375	0.000	12.737	15.00	6.000
S1.2_BP11	130.10	10.00	1.500	2.500	0.000	43.375	52.708	2.641	15.00	4.000
S1.3	130.10	10.00	1.500	2.500	0.000	43.375	52.708	13.851	15.00	2.500
Dummy	130.10	10.00	0.000	2.500	0.000	43.375	0.000	16.705	16.00	3.000
S1.6	130.10	10.00	0.000	2.500	0.000	43.375	0.000	17.343	19.00	1.000
ArtOutlet	130.10	100.0	0.000	100.0	0.000	0.000	0.000	31.160	19.00	0.000

SUMMARY OF BASIN RESULTS

Link Label	Time to Peak	Peak Inflow (m^3/s)	Time to Peak	Peak Outflow (m^3/s)	Total Inflow (m^3)	----- Vol. Avail	Vol. Used	Basin Stage	-----
BSN_US	15.00	14.57	28.00	4.392	16531.7	0.0000	10837.5	17.599	
Col_Bsn	15.00	12.74	66.00	.5267	16585.0	0.0000	14982.8	18.564	

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Bligh Park- Existing Conditions 500Yr

Results for period from 0: 0.0 1/ 1/1990
to 5: 0.0 1/ 1/1990

ROUTING INCREMENT (MINS) =	1.00
STORM DURATION (MINS) =	60.
RETURN PERIOD (YRS) =	500.
BX =	0.8200
TOTAL OF FIRST SUB-AREAS (ha) =	87.24
TOTAL OF SECOND SUB-AREAS (ha) =	84.74
TOTAL OF ALL SUB-AREAS (ha) =	171.98

SUMMARY OF CATCHMENT AND RAINFALL DATA

Link Label	Catch. Area #1 (ha)	Slope #2	% Impervious #1 (%)	% Impervious #2 (%)	Pern #1	Pern #2	B #1	B #2	Link No.
S6.0_BP8	3.600	4.400	1.000	1.000	5.000	100.0	.025	.015	.0334 .0026 1.000
S5.0_BP6	4.790	5.860	1.000	1.000	5.000	5.000	.025	.015	.0387 .0215 2.000
S5.1_BP7	2.090	2.550	1.000	1.000	5.000	100.0	.025	.015	.0252 .0020 2.001
S4.0_BP3	2.660	3.250	1.000	1.000	5.000	100.0	.025	.015	.0285 .0023 3.000
S3.0_BP2	1.560	1.900	1.000	1.000	5.000	100.0	.025	.015	.0216 .0017 4.000
S2.0_BP1	9.880	10.600	1.200	1.200	5.000	100.0	.025	.015	.0515 .0038 5.000
BSN_US	6.228	7.612	1.200	1.200	5.000	100.0	.025	.015	.0405 .0032 5.001
BSN_DS	.00001	0.000	.0010	0.000	0.000	0.000	.025	0.00	.0017 0.000 5.002
BP2_Out	.00001	0.000	.0010	0.000	0.000	0.000	.025	0.00	.0017 0.000 4.001
BP3_Out	.00001	0.000	1.000	0.000	0.000	0.000	.025	0.00	0.000 0.000 3.001
Out	.00001	0.000	.0010	0.000	0.000	0.000	.025	0.00	.0017 0.000 2.002
BP8_Out	.00001	0.000	1.000	0.000	0.000	0.000	.025	0.00	0.000 0.000 1.001
S7.0_BP13	4.680	5.710	1.000	1.000	5.000	100.0	.025	.015	.0383 .0030 6.000
BP13_Out	.00001	0.000	1.000	0.000	0.000	0.000	.025	0.00	0.000 0.000 6.001
S1.4	1.960	2.390	.4000	.4000	5.000	100.0	.025	.015	.0384 .0030 7.000
S1.5	3.090	3.770	.6000	.6000	5.000	100.0	.025	.015	.0398 .0031 8.000
S1.0	14.200	11.780	.7300	.7300	5.000	100.0	.025	.015	.0797 .0052 9.000
S1.05_BP5	0.4300	0.5200	1.100	1.100	5.000	100.0	.025	.015	.0105 .0008 10.00
S1.1_BP9	3.550	4.330	.6300	.6300	5.000	100.0	.025	.015	.0417 .0033 10.00
Col_Bsn	.00001	0.000	1.000	0.000	0.000	0.000	.050	0.00	0.000 0.000 9.001
S1.2_BP11	2.840	3.480	.5300	.5300	5.000	100.0	.025	.015	.0405 .0032 11.00
S1.3	17.930	16.590	.6600	.6600	5.000	100.0	.025	.015	.0946 .0065 9.002
Dummy	.00001	0.000	1.000	0.000	0.000	0.000	.050	0.00	0.000 0.000 7.001
S1.6	7.750	0.000	.6600	0.000	5.000	0.000	.050	0.00	.1020 0.000 7.002
ArtOutlet	.00001	0.000	.0010	0.000	0.000	0.000	.025	0.00	.0017 0.000 1.002

Link Label	Average Intensity (mm/h)	Init. Loss #1 (mm)	Cont. Loss #1 (mm/h)	Excess Rain #1 (mm)	Peak Inflow (mm^3/s)	Peak to Peak (s)	Time Lag (mins)	Link No.
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S6.0_BP8	80.000	10.00	1.500	2.500	0.000	67.917	78.500	3.596	25.00	0.000
S5.0_BP6	80.000	10.00	1.500	2.500	0.000	67.917	78.500	4.105	26.00	2.000
S5.1_BP7	80.000	10.00	1.500	2.500	0.000	67.917	78.500	5.432	30.00	0.000
S4.0_BP3	80.000	10.00	1.500	2.500	0.000	67.917	78.500	2.706	25.00	0.000
S3.0_BP2	80.000	10.00	1.500	2.500	0.000	67.917	78.500	1.662	25.00	0.000
S2.0_BP1	80.000	10.00	1.500	2.500	0.000	67.917	78.500	8.502	25.00	0.000
BSN_US	80.000	10.00	1.500	2.500	0.000	67.917	78.500	14.497	25.00	0.000
BSN_DS	80.000	10.00	0.000	2.500	0.000	67.917	0.000	7.243	40.00	1.000
BP2_Out	80.000	1.500	0.000	0.000	0.000	78.500	0.000	7.924	40.00	1.000
BP3_Out	80.000	1.500	0.000	0.000	0.000	78.500	0.000	9.122	40.00	1.000
Out	80.000	10.00	0.000	2.500	0.000	67.917	0.000	13.168	37.00	1.000
BP8_Out	80.000	1.500	0.000	0.000	0.000	78.500	0.000	15.084	37.00	1.000
S7.0_BP13	80.000	10.00	1.500	2.500	0.000	67.917	78.500	4.529	25.00	0.000
BP13_Out	80.000	1.500	0.000	0.000	0.000	78.500	0.000	4.460	25.00	1.000
S1.4	80.000	10.00	1.500	2.500	0.000	67.917	78.500	1.717	25.00	0.000
S1.5	80.000	10.00	1.500	2.500	0.000	67.917	78.500	2.840	25.00	0.000
S1.0	80.000	10.00	1.500	2.500	0.000	67.917	78.500	8.977	25.00	0.000
S1.05_BP5	80.000	10.00	1.500	2.500	0.000	67.917	78.500	0.4934	25.00	2.500
S1.1_BP9	80.000	10.00	1.500	2.500	0.000	67.917	78.500	3.637	25.00	0.000
Col_Bsn	80.000	10.00	0.000	2.500	0.000	67.917	0.000	12.525	25.00	6.000
S1.2_BP11	80.000	10.00	1.500	2.500	0.000	67.917	78.500	2.579	25.00	4.000
S1.3	80.000	10.00	1.500	2.500	0.000	67.917	78.500	13.317	25.00	2.500
Dummy	80.000	10.00	0.000	2.500	0.000	67.917	0.000	16.570	26.00	3.000
S1.6	80.000	10.00	0.000	2.500	0.000	67.917	0.000	17.404	29.00	1.000
ArtOutlet	80.000	100.0	0.000	100.0	0.000	0.000	0.000	33.638	32.00	0.000

SUMMARY OF BASIN RESULTS

Link Label	Time to Peak	Peak Inflow	Time to Peak	Peak Outflow	Total Inflow	-----	Basin Vol.	Vol.	Stage
		(m^3/s)		(m^3/s)	(m^3)		Avail	Used	Used
BSN_US	25.00	14.50	40.00	7.242	25214.0	0.0000	12283.9	17.712	
Col_Bsn	25.00	12.52	56.00	4.167	25314.2	0.0000	17891.4	18.647	

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Bligh Park- Existing Conditions 500Yr

Results for period from 0: 0.0 1/ 1/1990
to 5: 0.0 1/ 1/1990

ROUTING INCREMENT (MINS) =	1.00
STORM DURATION (MINS) =	90.
RETURN PERIOD (YRS) =	500.
BX =	0.8200
TOTAL OF FIRST SUB-AREAS (ha) =	87.24
TOTAL OF SECOND SUB-AREAS (ha) =	84.74
TOTAL OF ALL SUB-AREAS (ha) =	171.98

SUMMARY OF CATCHMENT AND RAINFALL DATA

Link Label	Catch. Area #1 (ha)	Slope #1	% Impervious #1 (%)	Pern #1	B #1	Link No.
	#2	#1	#2	#1	#2	
S6.0_BP8	3.600	4.400	1.000 1.000	5.000 100.0	.025 .015	.0334 .0026 1.000
S5.0_BP6	4.790	5.860	1.000 1.000	5.000 5.000	.025 .015	.0387 .0215 2.000
S5.1_BP7	2.090	2.550	1.000 1.000	5.000 100.0	.025 .015	.0252 .0020 2.001
S4.0_BP3	2.660	3.250	1.000 1.000	5.000 100.0	.025 .015	.0285 .0023 3.000
S3.0_BP2	1.560	1.900	1.000 1.000	5.000 100.0	.025 .015	.0216 .0017 4.000
S2.0_BP1	9.880	10.600	1.200 1.200	5.000 100.0	.025 .015	.0515 .0038 5.000
BSN_US	6.228	7.612	1.200 1.200	5.000 100.0	.025 .015	.0405 .0032 5.001
BSN_DS	.00001	0.000	.0010 0.000	0.000 0.000	.025 0.00	.0017 0.000 5.002
BP2_Out	.00001	0.000	.0010 0.000	0.000 0.000	.025 0.00	.0017 0.000 4.001
BP3_Out	.00001	0.000	.0010 0.000	0.000 0.000	.025 0.00	0.000 0.000 3.001
Out	.00001	0.000	.0010 0.000	0.000 0.000	.025 0.00	.0017 0.000 2.002
BP8_Out	.00001	0.000	.0010 0.000	0.000 0.000	.025 0.00	0.000 0.000 1.001
S7.0_BP13	4.680	5.710	1.000 1.000	5.000 100.0	.025 .015	.0383 .0030 6.000
BP13_Out	.00001	0.000	.0010 0.000	0.000 0.000	.025 0.00	0.000 0.000 6.001

S1.4	1.960	2.390	.4000	.4000	5.000	100.0	.025	.015	.0384	.0030	7.000
S1.5	3.090	3.770	.6000	.6000	5.000	100.0	.025	.015	.0398	.0031	8.000
S1.0	14.200	11.780	.7300	.7300	5.000	100.0	.025	.015	.0797	.0052	9.000
S1.05_BP5	0.4300	0.5200	1.100	1.100	5.000	100.0	.025	.015	.0105	.0008	10.00
S1.1_BP9	3.550	4.330	.6300	.6300	5.000	100.0	.025	.015	.0417	.0033	10.00
Col_Bsn	.00001	0.000	1.000	0.000	0.000	0.000	.050	0.00	0.000	0.000	9.001
S1.2_BP11	2.840	3.480	.5300	.5300	5.000	100.0	.025	.015	.0405	.0032	11.00
S1.3	17.930	16.590	.6600	.6600	5.000	100.0	.025	.015	.0946	.0065	9.002
Dummy	.00001	0.000	1.000	0.000	0.000	0.000	.050	0.00	0.000	0.000	7.001
S1.6	7.750	0.000	.6600	0.000	5.000	0.000	.050	0.00	.1020	0.000	7.002
ArtOutlet	.00001	0.000	.0010	0.000	0.000	0.000	.025	0.00	.0017	0.000	1.002

Link Label	Average Intensity (mm/h)	Init. #1 (mm)	Loss #1 (mm/h)	Cont. #1 (mm/h)	Loss #2 (mm/h)	Excess #1 (mm)	Rain #2 (m^3/s)	Peak Inflow	Peak Peak	Time to mins	Link Lag
S6.0_BP8	63.000	10.00	1.500	2.500	0.000	81.167	93.000	3.959	30.00	0.000	
S5.0_BP6	63.000	10.00	1.500	2.500	0.000	81.167	93.000	4.421	31.00	2.000	
S5.1_BP7	63.000	10.00	1.500	2.500	0.000	81.167	93.000	5.543	30.00	0.000	
S4.0_BP3	63.000	10.00	1.500	2.500	0.000	81.167	93.000	2.973	30.00	0.000	
S3.0_BP2	63.000	10.00	1.500	2.500	0.000	81.167	93.000	1.794	30.00	0.000	
S2.0_BP1	63.000	10.00	1.500	2.500	0.000	81.167	93.000	9.468	30.00	0.000	
BSN_US	63.000	10.00	1.500	2.500	0.000	81.167	93.000	16.136	30.00	0.000	
BSN_DS	63.000	10.00	0.000	2.500	0.000	81.167	0.000	7.217	42.00	1.000	
BP2_Out	63.000	1.500	0.000	0.000	0.000	93.000	0.000	7.892	42.00	1.000	
BP3_Out	63.000	1.500	0.000	0.000	0.000	93.000	0.000	9.066	42.00	1.000	
Out	63.000	10.00	0.000	2.500	0.000	81.167	0.000	13.532	37.00	1.000	
BP8_Out	63.000	1.500	0.000	0.000	0.000	93.000	0.000	15.438	38.00	1.000	
S7.0_BP13	63.000	10.00	1.500	2.500	0.000	81.167	93.000	5.028	30.00	0.000	
BP13_Out	63.000	1.500	0.000	0.000	0.000	93.000	0.000	4.963	30.00	1.000	
S1.4	63.000	10.00	1.500	2.500	0.000	81.167	93.000	1.948	30.00	0.000	
S1.5	63.000	10.00	1.500	2.500	0.000	81.167	93.000	3.169	30.00	0.000	
S1.0	63.000	10.00	1.500	2.500	0.000	81.167	93.000	10.036	30.00	0.000	
S1.05_BP5	63.000	10.00	1.500	2.500	0.000	81.167	93.000	0.5187	30.00	2.500	
S1.1_BP9	63.000	10.00	1.500	2.500	0.000	81.167	93.000	4.063	30.00	0.000	
Col_Bsn	63.000	10.00	0.000	2.500	0.000	81.167	0.000	13.992	30.00	6.000	
S1.2_BP11	63.000	10.00	1.500	2.500	0.000	81.167	93.000	2.863	30.00	4.000	
S1.3	63.000	10.00	1.500	2.500	0.000	81.167	93.000	14.723	30.00	2.500	
Dummy	63.000	10.00	0.000	2.500	0.000	81.167	0.000	18.133	31.00	3.000	
S1.6	63.000	10.00	0.000	2.500	0.000	81.167	0.000	19.166	34.00	1.000	
ArtOutlet	63.000	100.0	0.000	100.0	0.000	0.000	0.000	36.458	35.00	0.000	

SUMMARY OF BASIN RESULTS

Link Label	Time to Peak	Peak (m^3/s)	Time to Peak	Peak (m^3/s)	Total Inflow	-----	Basin Vol.	Vol. Avail	Stage Used	-----	Stage Used
BSN_US	30.00	16.14	42.00	7.217	30005.6	0.0000	12273.8	17.711			
Col_Bsn	30.00	13.99	60.00	4.817	30129.7	0.0000	18223.8	18.656			

#####
Bligh Park- Existing Conditions 500Yr

Results for period from 0: 0.0 1/ 1/1990
to 10: 0.0 1/ 1/1990

#####

ROUTING INCREMENT (MINS) =	1.00
STORM DURATION (MINS) =	120.
RETURN PERIOD (YRS) =	500.
BX =	0.8200
TOTAL OF FIRST SUB-AREAS (ha) =	87.24
TOTAL OF SECOND SUB-AREAS (ha) =	84.74
TOTAL OF ALL SUB-AREAS (ha) =	171.98

SUMMARY OF CATCHMENT AND RAINFALL DATA

Link Label	Catch. #1 (ha)	Area #2	Slope #1 (%)	% Impervious #1 (%)	Pern #1	B #1	Link No.
S6.0_BP8	3.600	4.400	1.000	1.000	5.000	100.0	.025 .015 .0334 .0026 1.000
S5.0_BP6	4.790	5.860	1.000	1.000	5.000	5.000	.025 .015 .0387 .0215 2.000
S5.1_BP7	2.090	2.550	1.000	1.000	5.000	100.0	.025 .015 .0252 .0020 2.001
S4.0_BP3	2.660	3.250	1.000	1.000	5.000	100.0	.025 .015 .0285 .0023 3.000
S3.0_BP2	1.560	1.900	1.000	1.000	5.000	100.0	.025 .015 .0216 .0017 4.000
S2.0_BP1	9.880	10.600	1.200	1.200	5.000	100.0	.025 .015 .0515 .0038 5.000
BSN_US	6.228	7.612	1.200	1.200	5.000	100.0	.025 .015 .0405 .0032 5.001
BSN_DS	.00001	0.000	.0010	0.000	0.000	0.000	.025 0.00 .0017 0.000 5.002
BP2_Out	.00001	0.000	.0010	0.000	0.000	0.000	.025 0.00 .0017 0.000 4.001
BP3_Out	.00001	0.000	1.000	0.000	0.000	0.000	.025 0.00 0.000 0.000 3.001
Out	.00001	0.000	.0010	0.000	0.000	0.000	.025 0.00 .0017 0.000 2.002
BP8_Out	.00001	0.000	1.000	0.000	0.000	0.000	.025 0.00 0.000 0.000 1.001
S7.0_BP13	4.680	5.710	1.000	1.000	5.000	100.0	.025 .015 .0383 .0030 6.000
BP13_Out	.00001	0.000	1.000	0.000	0.000	0.000	.025 0.00 0.000 0.000 6.001
S1.4	1.960	2.390	.4000	.4000	5.000	100.0	.025 .015 .0384 .0030 7.000
S1.5	3.090	3.770	.6000	.6000	5.000	100.0	.025 .015 .0398 .0031 8.000
S1.0	14.200	11.780	.7300	.7300	5.000	100.0	.025 .015 .0797 .0052 9.000
S1.05_BP5	0.4300	0.5200	1.100	1.100	5.000	100.0	.025 .015 .0105 .0008 10.00
S1.1_BP9	3.550	4.330	.6300	.6300	5.000	100.0	.025 .015 .0417 .0033 10.00
Col_Bsn	.00001	0.000	1.000	0.000	0.000	0.000	.050 0.00 0.000 0.000 9.001
S1.2_BP11	2.840	3.480	.5300	.5300	5.000	100.0	.025 .015 .0405 .0032 11.00
S1.3	17.930	16.590	.6600	.6600	5.000	100.0	.025 .015 .0946 .0065 9.002
Dummy	.00001	0.000	1.000	0.000	0.000	0.000	.050 0.00 0.000 0.000 7.001
S1.6	7.750	0.000	.6600	0.000	5.000	0.000	.050 0.00 .1020 0.000 7.002
ArtOutlet	.00001	0.000	.0010	0.000	0.000	0.000	.025 0.00 .0017 0.000 1.002

Link Label	Average Intensity (mm/h)	Init. #1 (mm)	Loss #2	Cont. #1 (mm/h)	Loss #2	Excess #1 (mm)	Rain #2	Inflow (m^3/s)	Peak Inflow	Time to Peak	Link Lag mins
S6.0_BP8	53.000	10.00	1.500	2.500	0.000	91.500	104.50	3.604	35.00	0.000	
S5.0_BP6	53.000	10.00	1.500	2.500	0.000	91.500	104.50	4.382	40.00	2.000	
S5.1_BP7	53.000	10.00	1.500	2.500	0.000	91.500	104.50	5.827	40.00	0.000	
S4.0_BP3	53.000	10.00	1.500	2.500	0.000	91.500	104.50	2.715	35.00	0.000	
S3.0_BP2	53.000	10.00	1.500	2.500	0.000	91.500	104.50	1.651	35.00	0.000	
S2.0_BP1	53.000	10.00	1.500	2.500	0.000	91.500	104.50	8.555	35.00	0.000	
BSN_US	53.000	10.00	1.500	2.500	0.000	91.500	104.50	14.616	35.00	0.000	
BSN_DS	53.000	10.00	0.000	2.500	0.000	91.500	0.000	7.729	47.00	1.000	
BP2_Out	53.000	1.500	0.000	0.000	0.000	104.50	0.000	8.471	47.00	1.000	
BP3_Out	53.000	1.500	0.000	0.000	0.000	104.50	0.000	9.752	46.00	1.000	
Out	53.000	10.00	0.000	2.500	0.000	91.500	0.000	14.770	46.00	1.000	
BP8_Out	53.000	1.500	0.000	0.000	0.000	104.50	0.000	16.779	46.00	1.000	
S7.0_BP13	53.000	10.00	1.500	2.500	0.000	91.500	104.50	4.568	35.00	0.000	
BP13_Out	53.000	1.500	0.000	0.000	0.000	104.50	0.000	4.494	35.00	1.000	
S1.4	53.000	10.00	1.500	2.500	0.000	91.500	104.50	1.745	35.00	0.000	
S1.5	53.000	10.00	1.500	2.500	0.000	91.500	104.50	2.856	35.00	0.000	
S1.0	53.000	10.00	1.500	2.500	0.000	91.500	104.50	9.120	35.00	0.000	
S1.05_BP5	53.000	10.00	1.500	2.500	0.000	91.500	104.50	0.4813	35.00	2.500	
S1.1_BP9	53.000	10.00	1.500	2.500	0.000	91.500	104.50	3.625	35.00	0.000	
Col_Bsn	53.000	10.00	0.000	2.500	0.000	91.500	0.000	12.665	35.00	6.000	
S1.2_BP11	53.000	10.00	1.500	2.500	0.000	91.500	104.50	2.627	35.00	4.000	
S1.3	53.000	10.00	1.500	2.500	0.000	91.500	104.50	13.169	35.00	2.500	
Dummy	53.000	10.00	0.000	2.500	0.000	91.500	0.000	17.057	38.00	3.000	
S1.6	53.000	10.00	0.000	2.500	0.000	91.500	0.000	18.113	41.00	1.000	
ArtOutlet	53.000	100.0	0.000	100.0	0.000	0.000	0.000	37.480	42.00	0.000	

SUMMARY OF BASIN RESULTS

Link Label	Time to Peak (s)	Peak Inflow (m^3/s)	Time to Peak (s)	Peak Outflow (m^3/s)	Total Inflow (m^3)	-----	Basin	-----
						Vol.	Vol.	Stage
						Avail	Used	Used
BSN_US	35.00	14.62	47.00	7.729	33743.1	0.0000	12476.8	17.727
Col_Bsn	35.00	12.66	67.00	5.257	33960.8	0.0000	18439.9	18.662

#####
Bligh Park- Existing Conditions 500Yr

Results for period from 0: 0.0 1/ 1/1990
to 8:20.0 1/ 1/1990

#####
ROUTING INCREMENT (MINS) = 1.00
STORM DURATION (MINS) = 180.
RETURN PERIOD (YRS) = 500.
BX = 0.8200
TOTAL OF FIRST SUB-AREAS (ha) = 87.24
TOTAL OF SECOND SUB-AREAS (ha) = 84.74
TOTAL OF ALL SUB-AREAS (ha) = 171.98

SUMMARY OF CATCHMENT AND RAINFALL DATA

Link Label	Catch. #1 (ha)	Area #2	Slope #1 (%)	% Impervious #1 (%)	Pern #1	B #1	Link No.
					#2	#2	
S6.0_BP8	3.600	4.400	1.000	1.000	5.000	100.0	.025 .015 .0334 .0026 1.000
S5.0_BP6	4.790	5.860	1.000	1.000	5.000	5.000	.025 .015 .0387 .0215 2.000
S5.1_BP7	2.090	2.550	1.000	1.000	5.000	100.0	.025 .015 .0252 .0020 2.001
S4.0_BP3	2.660	3.250	1.000	1.000	5.000	100.0	.025 .015 .0285 .0023 3.000
S3.0_BP2	1.560	1.900	1.000	1.000	5.000	100.0	.025 .015 .0216 .0017 4.000
S2.0_BP1	9.880	10.600	1.200	1.200	5.000	100.0	.025 .015 .0515 .0038 5.000
BSN_US	6.228	7.612	1.200	1.200	5.000	100.0	.025 .015 .0405 .0032 5.001
BSN_DS	.00001	0.000	.0010	0.000	0.000	0.000	.025 0.00 .0017 0.000 5.002
BP2_Out	.00001	0.000	.0010	0.000	0.000	0.000	.025 0.00 .0017 0.000 4.001
BP3_Out	.00001	0.000	1.000	0.000	0.000	0.000	.025 0.00 0.000 0.000 3.001
Out	.00001	0.000	.0010	0.000	0.000	0.000	.025 0.00 .0017 0.000 2.002
BP8_Out	.00001	0.000	1.000	0.000	0.000	0.000	.025 0.00 0.000 0.000 1.001
S7.0_BP13	4.680	5.710	1.000	1.000	5.000	100.0	.025 .015 .0383 .0030 6.000
BP13_Out	.00001	0.000	1.000	0.000	0.000	0.000	.025 0.00 0.000 0.000 6.001
S1.4	1.960	2.390	.4000	.4000	5.000	100.0	.025 .015 .0384 .0030 7.000
S1.5	3.090	3.770	.6000	.6000	5.000	100.0	.025 .015 .0398 .0031 8.000
S1.0	14.200	11.780	.7300	.7300	5.000	100.0	.025 .015 .0797 .0052 9.000
S1.05_BP5	0.4300	0.5200	1.100	1.100	5.000	100.0	.025 .015 .0105 .0008 10.00
S1.1_BP9	3.550	4.330	.6300	.6300	5.000	100.0	.025 .015 .0417 .0033 10.00
Col_Bsn	.00001	0.000	1.000	0.000	0.000	0.000	.050 0.00 0.000 0.000 9.001
S1.2_BP11	2.840	3.480	.5300	.5300	5.000	100.0	.025 .015 .0405 .0032 11.00
S1.3	17.930	16.590	.6600	.6600	5.000	100.0	.025 .015 .0946 .0065 9.002
Dummy	.00001	0.000	1.000	0.000	0.000	0.000	.050 0.00 0.000 0.000 7.001
S1.6	7.750	0.000	.6600	0.000	5.000	0.000	.050 0.00 .1020 0.000 7.002
ArtOutlet	.00001	0.000	.0010	0.000	0.000	0.000	.025 0.00 .0017 0.000 1.002

Link Label	Average Intensity (mm/h)	Init. Loss #1 (mm)	Cont. Loss #1 (mm/h)	Excess Rain #1 (mm)	Peak Inflow (mm ³ /s)	Time to Peak mins	Link Lag
S6.0_BP8	41.400	10.00	1.500	2.500 0.000	107.41 122.70	2.456	45.00 0.000
S5.0_BP6	41.400	10.00	1.500	2.500 0.000	107.41 122.70	3.214	45.00 2.000
S5.1_BP7	41.400	10.00	1.500	2.500 0.000	107.41 122.70	4.488	45.00 0.000
S4.0_BP3	41.400	10.00	1.500	2.500 0.000	107.41 122.70	1.829	45.00 0.000
S3.0_BP2	41.400	10.00	1.500	2.500 0.000	107.41 122.70	1.087	45.00 0.000
S2.0_BP1	41.400	10.00	1.500	2.500 0.000	107.41 122.70	6.046	45.00 0.000
BSN_US	41.400	10.00	1.500	2.500 0.000	107.41 122.70	10.236	45.00 0.000
BSN_DS	41.400	10.00	0.000	2.500 0.000	107.41 0.000	5.661	54.00 1.000
BP2_Out	41.400	1.500	0.000	0.000 0.000	122.70 0.000	6.244	54.00 1.000
BP3_Out	41.400	1.500	0.000	0.000 0.000	122.70 0.000	7.173	54.00 1.000
Out	41.400	10.00	0.000	2.500 0.000	107.41 0.000	10.837	50.00 1.000
BP8_Out	41.400	1.500	0.000	0.000 0.000	122.70 0.000	12.547	47.00 1.000
S7.0_BP13	41.400	10.00	1.500	2.500 0.000	107.41 122.70	3.147	45.00 0.000
BP13_Out	41.400	1.500	0.000	0.000 0.000	122.70 0.000	3.132	45.00 1.000
S1.4	41.400	10.00	1.500	2.500 0.000	107.41 122.70	1.221	45.00 0.000
S1.5	41.400	10.00	1.500	2.500 0.000	107.41 122.70	1.993	45.00 0.000
S1.0	41.400	10.00	1.500	2.500 0.000	107.41 122.70	6.564	45.00 0.000
S1.05_BP5	41.400	10.00	1.500	2.500 0.000	107.41 122.70	0.3029	45.00 2.500
S1.1_BP9	41.400	10.00	1.500	2.500 0.000	107.41 122.70	2.584	45.00 0.000
Col_Bsn	41.400	10.00	0.000	2.500 0.000	107.41 0.000	9.127	45.00 6.000

S1.2_BP11	41.400	10.00	1.500	2.500	0.000	107.41	122.70	1.814	45.00	4.000
S1.3	41.400	10.00	1.500	2.500	0.000	107.41	122.70	10.532	75.00	2.500
Dummy	41.400	10.00	0.000	2.500	0.000	107.41	0.000	12.635	45.00	3.000
S1.6	41.400	10.00	0.000	2.500	0.000	107.41	0.000	13.571	48.00	1.000
ArtOutlet	41.400	100.0	0.000	100.0	0.000	0.000	0.000	28.286	47.00	0.000

SUMMARY OF BASIN RESULTS

Link Label	Time to Peak	Peak (m^3/s)	Time to Peak	Peak (m^3/s)	Total Inflow (m^3)	Vol. Avail	Vol. Used	Stage Used	Basin
S6.0_BP8	45.00	2.456	45.00	2.430	9273.0	0.0000	347.60	17.348	
S5.0_BP6	45.00	3.214	46.00	3.163	12330.3	0.0000	312.91	18.896	
S5.1_BP7	45.00	4.488	45.00	4.443	17688.0	0.0000	418.44	17.358	
S4.0_BP3	45.00	1.828	45.00	1.813	6848.4	0.0000	155.80	17.302	
S3.0_BP2	45.00	1.086	45.00	1.079	4005.2	0.0000	296.72	17.362	
S2.0_BP1	45.00	6.045	45.00	6.012	23624.5	0.0000	200.53	18.143	
BSN_US	45.00	10.24	54.00	5.661	39627.1	0.0000	11557.1	17.655	
S7.0_BP13	45.00	3.147	45.00	3.132	12027.6	0.0000	183.23	17.504	
S1.05_BP5	45.00	.3029	45.00	.3018	1099.6	0.0000	45.568	21.996	
S1.1_BP9	45.00	2.583	45.00	2.563	10202.0	0.0000	247.77	18.656	
Col_Bsn	45.00	9.127	78.00	4.877	39866.3	0.0000	18253.6	18.657	

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Bligh Park- Existing Conditions 500Yr

Results for period from 0: 0.0 1/ 1/1990
to 20: 0.0 1/ 1/1990

ROUTING INCREMENT (MINS) =	1.00
STORM DURATION (MINS) =	360.
RETURN PERIOD (YRS) =	500.
BX =	0.8200
TOTAL OF FIRST SUB-AREAS (ha) =	87.24
TOTAL OF SECOND SUB-AREAS (ha) =	84.74
TOTAL OF ALL SUB-AREAS (ha) =	171.98

SUMMARY OF CATCHMENT AND RAINFALL DATA

Link Label	Catch. Area #1 (ha)	Catch. Area #2	Slope #1 (%)	% Impervious #1 (%)	Pern #1	Pern #2	B #1	B #2	Link No.
S6.0_BP8	3.600	4.400	1.000	1.000	5.000	100.0	.025	.015	.0334 .0026 1.000
S5.0_BP6	4.790	5.860	1.000	1.000	5.000	5.000	.025	.015	.0387 .0215 2.000
S5.1_BP7	2.090	2.550	1.000	1.000	5.000	100.0	.025	.015	.0252 .0020 2.001
S4.0_BP3	2.660	3.250	1.000	1.000	5.000	100.0	.025	.015	.0285 .0023 3.000
S3.0_BP2	1.560	1.900	1.000	1.000	5.000	100.0	.025	.015	.0216 .0017 4.000
S2.0_BP1	9.880	10.600	1.200	1.200	5.000	100.0	.025	.015	.0515 .0038 5.000
BSN_US	6.228	7.612	1.200	1.200	5.000	100.0	.025	.015	.0405 .0032 5.001
BSN_DS	.00001	0.000	.0010	0.000	0.000	0.000	.025	0.00	.0017 0.000 5.002
BP2_Out	.00001	0.000	.0010	0.000	0.000	0.000	.025	0.00	.0017 0.000 4.001
BP3_Out	.00001	0.000	1.000	0.000	0.000	0.000	.025	0.00	0.000 0.000 3.001
Out	.00001	0.000	.0010	0.000	0.000	0.000	.025	0.00	.0017 0.000 2.002
BP8_Out	.00001	0.000	1.000	0.000	0.000	0.000	.025	0.00	0.000 0.000 1.001
S7.0_BP13	4.680	5.710	1.000	1.000	5.000	100.0	.025	.015	.0383 .0030 6.000
BP13_Out	.00001	0.000	1.000	0.000	0.000	0.000	.025	0.00	0.000 0.000 6.001
S1.4	1.960	2.390	.4000	.4000	5.000	100.0	.025	.015	.0384 .0030 7.000
S1.5	3.090	3.770	.6000	.6000	5.000	100.0	.025	.015	.0398 .0031 8.000
S1.0	14.200	11.780	.7300	.7300	5.000	100.0	.025	.015	.0797 .0052 9.000
S1.05_BP5	0.4300	0.5200	1.100	1.100	5.000	100.0	.025	.015	.0105 .0008 10.00
S1.1_BP9	3.550	4.330	.6300	.6300	5.000	100.0	.025	.015	.0417 .0033 10.00
Col_Bsn	.00001	0.000	1.000	0.000	0.000	0.000	.050	0.00	0.000 0.000 9.001
S1.2_BP11	2.840	3.480	.5300	.5300	5.000	100.0	.025	.015	.0405 .0032 11.00
S1.3	17.930	16.590	.6600	.6600	5.000	100.0	.025	.015	.0946 .0065 9.002
Dummy	.00001	0.000	1.000	0.000	0.000	0.000	.050	0.00	0.000 0.000 7.001
S1.6	7.750	0.000	.6600	0.000	5.000	0.000	.050	0.00	.1020 0.000 7.002

ArtOutlet .00001 0.000 .0010 0.000 0.000 0.000 .025 0.00 .0017 0.000 1.002

Link Label	Average Intensity (mm/h)	Init. #1 (mm)	Loss #1 (mm/h)	Cont. #1 (mm/h)	Loss #2 (mm/h)	Excess #1 (mm)	Rain #2 (mm)	Peak Inflow (m^3/s)	Time to Peak	Link Lag mins
S6.0_BP8	27.100	10.00	1.500	2.500	0.000	139.14	161.10	1.650	120.0	0.000
S5.0_BP6	27.100	10.00	1.500	2.500	0.000	139.14	161.10	2.194	120.0	2.000
S5.1_BP7	27.100	10.00	1.500	2.500	0.000	139.14	161.10	3.136	120.0	0.000
S4.0_BP3	27.100	10.00	1.500	2.500	0.000	139.14	161.10	1.222	120.0	0.000
S3.0_BP2	27.100	10.00	1.500	2.500	0.000	139.14	161.10	0.7160	120.0	0.000
S2.0_BP1	27.100	10.00	1.500	2.500	0.000	139.14	161.10	4.195	120.0	0.000
BSN_US	27.100	10.00	1.500	2.500	0.000	139.14	161.10	7.044	120.0	0.000
BSN_DS	27.100	10.00	0.000	2.500	0.000	139.14	0.000	6.297	122.0	1.000
BP2_Out	27.100	1.500	0.000	0.000	0.000	161.10	0.000	6.930	122.0	1.000
BP3_Out	27.100	1.500	0.000	0.000	0.000	161.10	0.000	7.994	121.0	1.000
Out	27.100	10.00	0.000	2.500	0.000	139.14	0.000	11.024	122.0	1.000
BP8_Out	27.100	1.500	0.000	0.000	0.000	161.10	0.000	12.523	122.0	1.000
S7.0_BP13	27.100	10.00	1.500	2.500	0.000	139.14	161.10	2.140	120.0	0.000
BP13_Out	27.100	1.500	0.000	0.000	0.000	161.10	0.000	2.138	120.0	1.000
S1.4	27.100	10.00	1.500	2.500	0.000	139.14	161.10	0.8748	120.0	0.000
S1.5	27.100	10.00	1.500	2.500	0.000	139.14	161.10	1.398	120.0	0.000
S1.0	27.100	10.00	1.500	2.500	0.000	139.14	161.10	5.061	120.0	0.000
S1.05_BP5	27.100	10.00	1.500	2.500	0.000	139.14	161.10	0.1969	120.0	2.500
S1.1_BP9	27.100	10.00	1.500	2.500	0.000	139.14	161.10	1.800	120.0	0.000
Col_Bsn	27.100	10.00	0.000	2.500	0.000	139.14	0.000	6.856	120.0	6.000
S1.2_BP11	27.100	10.00	1.500	2.500	0.000	139.14	161.10	1.284	120.0	4.000
S1.3	27.100	10.00	1.500	2.500	0.000	139.14	161.10	11.104	141.0	2.500
Dummy	27.100	10.00	0.000	2.500	0.000	139.14	0.000	12.690	143.0	3.000
S1.6	27.100	10.00	0.000	2.500	0.000	139.14	0.000	13.876	146.0	1.000
ArtOutlet	27.100	100.0	0.000	100.0	0.000	0.000	0.000	25.594	122.0	0.000

SUMMARY OF BASIN RESULTS

Link Label	Time to Peak	Peak (m^3/s)	Time to Peak	Peak (m^3/s)	Total Inflow (m^3)	-----	Basin	-----
					Inflow	Vol. Avail	Vol. Used	Stage Used
BSN_US	120.0	7.043	122.0	6.297	51716.3	0.0000	11862.5	17.679
Col_Bsn	120.0	6.856	140.0	5.107	52031.0	0.0000	18366.5	18.660

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Bligh Park- Existing Conditions 500Yr

Results for period from 0: 0.0 1/ 1/1990
to 9:20.0 2/ 1/1990

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ROUTING INCREMENT (MINS) = 1.00
STORM DURATION (MINS) = 540.
RETURN PERIOD (YRS) = 500.
BX = 0.8200
TOTAL OF FIRST SUB-AREAS (ha) = 87.24
TOTAL OF SECOND SUB-AREAS (ha) = 84.74
TOTAL OF ALL SUB-AREAS (ha) = 171.98

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SUMMARY OF CATCHMENT AND RAINFALL DATA

Link Label	Catch. Area (ha)	Slope #1 (%)	% Impervious #1 (%)	Pern #1 (%)	B #1 (%)	Link No.	
S6.0_BP8	3.600	4.400	1.000	1.000	5.000	100.0	.025 .015 .0334 .0026 1.000
S5.0_BP6	4.790	5.860	1.000	1.000	5.000	5.000	.025 .015 .0387 .0215 2.000
S5.1_BP7	2.090	2.550	1.000	1.000	5.000	100.0	.025 .015 .0252 .0020 2.001
S4.0_BP3	2.660	3.250	1.000	1.000	5.000	100.0	.025 .015 .0285 .0023 3.000
S3.0_BP2	1.560	1.900	1.000	1.000	5.000	100.0	.025 .015 .0216 .0017 4.000
S2.0_BP1	9.880	10.600	1.200	1.200	5.000	100.0	.025 .015 .0515 .0038 5.000

BSN_US	6.228	7.612	1.200	1.200	5.000	100.0	.025	.015	.0405	.0032	5.001
BSN_DS	.00001	0.000	.0010	0.000	0.000	0.000	.025	0.00	.0017	0.000	5.002
BP2_Out	.00001	0.000	.0010	0.000	0.000	0.000	.025	0.00	.0017	0.000	4.001
BP3_Out	.00001	0.000	1.000	0.000	0.000	0.000	.025	0.00	0.000	0.000	3.001
Out	.00001	0.000	.0010	0.000	0.000	0.000	.025	0.00	.0017	0.000	2.002
BP8_Out	.00001	0.000	1.000	0.000	0.000	0.000	.025	0.00	0.000	0.000	1.001
S7.0_BP13	4.680	5.710	1.000	1.000	5.000	100.0	.025	.015	.0383	.0030	6.000
BP13_Out	.00001	0.000	1.000	0.000	0.000	0.000	.025	0.00	0.000	0.000	6.001
S1.4	1.960	2.390	.4000	.4000	5.000	100.0	.025	.015	.0384	.0030	7.000
S1.5	3.090	3.770	.6000	.6000	5.000	100.0	.025	.015	.0398	.0031	8.000
S1.0	14.200	11.780	.7300	.7300	5.000	100.0	.025	.015	.0797	.0052	9.000
S1.05_BP5	0.4300	0.5200	1.100	1.100	5.000	100.0	.025	.015	.0105	.0008	10.00
S1.1_BP9	3.550	4.330	.6300	.6300	5.000	100.0	.025	.015	.0417	.0033	10.00
Col_Bsn	.00001	0.000	1.000	0.000	0.000	0.000	.050	0.00	0.000	0.000	9.001
S1.2_BP11	2.840	3.480	.5300	.5300	5.000	100.0	.025	.015	.0405	.0032	11.00
S1.3	17.930	16.590	.6600	.6600	5.000	100.0	.025	.015	.0946	.0065	9.002
Dummy	.00001	0.000	1.000	0.000	0.000	0.000	.050	0.00	0.000	0.000	7.001
S1.6	7.750	0.000	.6600	0.000	5.000	0.000	.050	0.00	.1020	0.000	7.002
ArtOutlet	.00001	0.000	.0010	0.000	0.000	0.000	.025	0.00	.0017	0.000	1.002

Link	Average Label	Intensity (mm/h)	Init. #1 (mm)	Loss #2 (mm/h)	Cont. #1 (mm/h)	Loss #2 (mm/h)	Excess #1 (mm)	Rain #2 (mm)	Peak Inflow (m^3/s)	Time to Peak	Link Lag mins
S6.0_BP8	S6.0_BP8	21.200	10.00	1.500	2.500	0.000	160.09	189.30	1.456	300.0	0.000
S5.0_BP6	S5.0_BP6	21.200	10.00	1.500	2.500	0.000	160.09	189.30	1.933	300.0	2.000
S5.1_BP7	S5.1_BP7	21.200	10.00	1.500	2.500	0.000	160.09	189.30	2.760	300.0	0.000
S4.0_BP3	S4.0_BP3	21.200	10.00	1.500	2.500	0.000	160.09	189.30	1.080	300.0	0.000
S3.0_BP2	S3.0_BP2	21.200	10.00	1.500	2.500	0.000	160.09	189.30	0.6325	300.0	0.000
S2.0_BP1	S2.0_BP1	21.200	10.00	1.500	2.500	0.000	160.09	189.30	3.691	300.0	0.000
BSN_US	BSN_US	21.200	10.00	1.500	2.500	0.000	160.09	189.30	6.204	300.0	0.000
BSN_DS	BSN_DS	21.200	10.00	0.000	2.500	0.000	160.09	0.000	5.676	302.0	1.000
BP2_Out	BP2_Out	21.200	1.500	0.000	0.000	0.000	189.30	0.000	6.273	303.0	1.000
BP3_Out	BP3_Out	21.200	1.500	0.000	0.000	0.000	189.30	0.000	7.210	302.0	1.000
Out	Out	21.200	10.00	0.000	2.500	0.000	160.09	0.000	9.899	302.0	1.000
BP8_Out	BP8_Out	21.200	1.500	0.000	0.000	0.000	189.30	0.000	11.260	302.0	1.000
S7.0_BP13	S7.0_BP13	21.200	10.00	1.500	2.500	0.000	160.09	189.30	1.886	300.0	0.000
BP13_Out	BP13_Out	21.200	1.500	0.000	0.000	0.000	189.30	0.000	1.884	300.0	1.000
S1.4	S1.4	21.200	10.00	1.500	2.500	0.000	160.09	189.30	0.7654	300.0	0.000
S1.5	S1.5	21.200	10.00	1.500	2.500	0.000	160.09	189.30	1.230	300.0	0.000
S1.0	S1.0	21.200	10.00	1.500	2.500	0.000	160.09	189.30	4.423	300.0	0.000
S1.05_BP5	S1.05_BP5	21.200	10.00	1.500	2.500	0.000	160.09	189.30	0.1753	300.0	2.500
S1.1_BP9	S1.1_BP9	21.200	10.00	1.500	2.500	0.000	160.09	189.30	1.585	300.0	0.000
Col_Bsn	Col_Bsn	21.200	10.00	0.000	2.500	0.000	160.09	0.000	6.003	300.0	6.000
S1.2_BP11	S1.2_BP11	21.200	10.00	1.500	2.500	0.000	160.09	189.30	1.130	300.0	4.000
S1.3	S1.3	21.200	10.00	1.500	2.500	0.000	160.09	189.30	11.901	300.0	2.500
Dummy	Dummy	21.200	10.00	0.000	2.500	0.000	160.09	0.000	13.609	303.0	3.000
S1.6	S1.6	21.200	10.00	0.000	2.500	0.000	160.09	0.000	14.638	306.0	1.000
ArtOutlet	ArtOutlet	21.200	100.0	0.000	100.0	0.000	0.000	0.000	27.284	304.0	0.000

SUMMARY OF BASIN RESULTS

Link	Time Label	Peak to Peak (m^3/s)	Time Inflow to Peak (m^3/s)	Peak Outflow (m^3/s)	Total Inflow (m^3)	-----	Basin Vol. Avail	Basin Vol. Used	Stage Used
BSN_US	BSN_US	300.0	6.203	302.0	5.675	60224.5	0.0000	11564.1	17.656
Col_Bsn	Col_Bsn	300.0	6.002	302.0	5.568	60511.1	0.0000	18592.5	18.666

#####
Bligh Park- Existing Conditions 500Yr

Results for period from 0: 0.0 1/ 1/1990
to 2: 0.0 3/ 1/1990

#####

ROUTING INCREMENT (MINS) = 1.00

STORM DURATION (MINS)	=	720.
RETURN PERIOD (YRS)	=	500.
BX	=	0.8200
TOTAL OF FIRST SUB-AREAS (ha)	=	87.24
TOTAL OF SECOND SUB-AREAS (ha)	=	84.74
TOTAL OF ALL SUB-AREAS (ha)	=	171.98

SUMMARY OF CATCHMENT AND RAINFALL DATA

Link Label	Catch. Area		Slope		% Impervious		Pern		B		Link No.
	#1 (ha)	#2 (ha)	#1 (%)	#2 (%)	#1 (%)	#2 (%)	#1	#2	#1	#2	
S6.0_BP8	3.600	4.400	1.000	1.000	5.000	100.0	.025	.015	.0334	.0026	1.000
S5.0_BP6	4.790	5.860	1.000	1.000	5.000	5.000	.025	.015	.0387	.0215	2.000
S5.1_BP7	2.090	2.550	1.000	1.000	5.000	100.0	.025	.015	.0252	.0020	2.001
S4.0_BP3	2.660	3.250	1.000	1.000	5.000	100.0	.025	.015	.0285	.0023	3.000
S3.0_BP2	1.560	1.900	1.000	1.000	5.000	100.0	.025	.015	.0216	.0017	4.000
S2.0_BP1	9.880	10.600	1.200	1.200	5.000	100.0	.025	.015	.0515	.0038	5.000
BSN_US	6.228	7.612	1.200	1.200	5.000	100.0	.025	.015	.0405	.0032	5.001
BSN_DS	.00001	0.000	.0010	0.000	0.000	0.000	.025	0.00	.0017	0.000	5.002
BP2_Out	.00001	0.000	.0010	0.000	0.000	0.000	.025	0.00	.0017	0.000	4.001
BP3_Out	.00001	0.000	1.000	0.000	0.000	0.000	.025	0.00	0.000	0.000	3.001
Out	.00001	0.000	.0010	0.000	0.000	0.000	.025	0.00	.0017	0.000	2.002
BP8_Out	.00001	0.000	1.000	0.000	0.000	0.000	.025	0.00	0.000	0.000	1.001
S7.0_BP13	4.680	5.710	1.000	1.000	5.000	100.0	.025	.015	.0383	.0030	6.000
BP13_Out	.00001	0.000	1.000	0.000	0.000	0.000	.025	0.00	0.000	0.000	6.001
S1.4	1.960	2.390	.4000	.4000	5.000	100.0	.025	.015	.0384	.0030	7.000
S1.5	3.090	3.770	.6000	.6000	5.000	100.0	.025	.015	.0398	.0031	8.000
S1.0	14.200	11.780	.7300	.7300	5.000	100.0	.025	.015	.0797	.0052	9.000
S1.05_BP5	0.4300	0.5200	1.100	1.100	5.000	100.0	.025	.015	.0105	.0008	10.00
S1.1_BP9	3.550	4.330	.6300	.6300	5.000	100.0	.025	.015	.0417	.0033	10.00
Col_Bsn	.00001	0.000	1.000	0.000	0.000	0.000	.050	0.00	0.000	0.000	9.001
S1.2_BP11	2.840	3.480	.5300	.5300	5.000	100.0	.025	.015	.0405	.0032	11.00
S1.3	17.930	16.590	.6600	.6600	5.000	100.0	.025	.015	.0946	.0065	9.002
Dummy	.00001	0.000	1.000	0.000	0.000	0.000	.050	0.00	0.000	0.000	7.001
S1.6	7.750	0.000	.6600	0.000	5.000	0.000	.050	0.00	.1020	0.000	7.002
ArtOutlet	.00001	0.000	.0010	0.000	0.000	0.000	.025	0.00	.0017	0.000	1.002

Link Label	Average		Init. Loss		Cont. Loss		Excess Rain		Peak	Time	Link No.
	Intensity	#1 (mm/h)	#2 (mm)	#1 (mm/h)	#2 (mm/h)	#1 (mm)	#2 (mm)	Inflow	(m^3/s)	to Peak	Lag mins
S6.0_BP8	17.800	10.00	1.500	2.500	0.000	175.87	212.10	1.467	420.0	0.000	
S5.0_BP6	17.800	10.00	1.500	2.500	0.000	175.87	212.10	1.950	420.0	2.000	
S5.1_BP7	17.800	10.00	1.500	2.500	0.000	175.87	212.10	2.790	420.0	0.000	
S4.0_BP3	17.800	10.00	1.500	2.500	0.000	175.87	212.10	1.087	420.0	0.000	
S3.0_BP2	17.800	10.00	1.500	2.500	0.000	175.87	212.10	0.6364	420.0	0.000	
S2.0_BP1	17.800	10.00	1.500	2.500	0.000	175.87	212.10	3.729	420.0	0.000	
BSN_US	17.800	10.00	1.500	2.500	0.000	175.87	212.10	6.264	420.0	0.000	
BSN_DS	17.800	10.00	0.000	2.500	0.000	175.87	0.000	5.934	421.0	1.000	
BP2_Out	17.800	1.500	0.000	0.000	0.000	212.10	0.000	6.556	421.0	1.000	
BP3_Out	17.800	1.500	0.000	0.000	0.000	212.10	0.000	7.560	420.0	1.000	
Out	17.800	10.00	0.000	2.500	0.000	175.87	0.000	10.291	420.0	1.000	
BP8_Out	17.800	1.500	0.000	0.000	0.000	212.10	0.000	11.691	420.0	1.000	
S7.0_BP13	17.800	10.00	1.500	2.500	0.000	175.87	212.10	1.903	420.0	0.000	
BP13_Out	17.800	1.500	0.000	0.000	0.000	212.10	0.000	1.902	420.0	1.000	
S1.4	17.800	10.00	1.500	2.500	0.000	175.87	212.10	0.7807	420.0	0.000	
S1.5	17.800	10.00	1.500	2.500	0.000	175.87	212.10	1.247	420.0	0.000	
S1.0	17.800	10.00	1.500	2.500	0.000	175.87	212.10	4.553	420.0	0.000	
S1.05_BP5	17.800	10.00	1.500	2.500	0.000	175.87	212.10	0.1762	420.0	2.500	
S1.1_BP9	17.800	10.00	1.500	2.500	0.000	175.87	212.10	1.605	420.0	0.000	
Col_Bsn	17.800	10.00	0.000	2.500	0.000	175.87	0.000	6.154	420.0	6.000	
S1.2_BP11	17.800	10.00	1.500	2.500	0.000	175.87	212.10	1.147	420.0	4.000	
S1.3	17.800	10.00	1.500	2.500	0.000	175.87	212.10	12.628	420.0	2.500	
Dummy	17.800	10.00	0.000	2.500	0.000	175.87	0.000	14.373	420.0	3.000	
S1.6	17.800	10.00	0.000	2.500	0.000	175.87	0.000	15.461	423.0	1.000	
ArtOutlet	17.800	100.0	0.000	100.0	0.000	0.000	0.000	28.735	421.0	0.000	

SUMMARY OF BASIN RESULTS

Link Label	Time to Peak	Peak Inflow (m^3/s)	Time to Peak	Peak Outflow (m^3/s)	Total Inflow (m^3)	-----	Basin Vol. Avail	Vol. Used	Stage Used
BSN_US	420.0	6.263	421.0	5.934	66891.4	0.0000	11688.3		17.666
Col_Bsn	420.0	6.154	421.0	5.832	67137.5	0.0000	18722.5		18.670

#####
Bligh Park- Existing Conditions 500Yr

Results for period from 0: 0.0 1/ 1/1990
to 18:40.0 3/ 1/1990

ROUTING INCREMENT (MINS)	=	1.00
STORM DURATION (MINS)	=	1080.
RETURN PERIOD (YRS)	=	500.
BX	=	0.8200
TOTAL OF FIRST SUB-AREAS (ha)	=	87.24
TOTAL OF SECOND SUB-AREAS (ha)	=	84.74
TOTAL OF ALL SUB-AREAS (ha)	=	171.98

SUMMARY OF CATCHMENT AND RAINFALL DATA

Link Label	Catch. Area #1 (ha)	Area #2	Slope #1 (%)	% Impervious #1 (%)	Pern #1	B #1	Link No.
	#2	#2	#2	#2	#2	#2	
S6.0_BP8	3.600	4.400	1.000	1.000	5.000 100.0	.025 .015	.0334 .0026 1.000
S5.0_BP6	4.790	5.860	1.000	1.000	5.000 5.000	.025 .015	.0387 .0215 2.000
S5.1_BP7	2.090	2.550	1.000	1.000	5.000 100.0	.025 .015	.0252 .0020 2.001
S4.0_BP3	2.660	3.250	1.000	1.000	5.000 100.0	.025 .015	.0285 .0023 3.000
S3.0_BP2	1.560	1.900	1.000	1.000	5.000 100.0	.025 .015	.0216 .0017 4.000
S2.0_BP1	9.880	10.600	1.200	1.200	5.000 100.0	.025 .015	.0515 .0038 5.000
BSN_US	6.228	7.612	1.200	1.200	5.000 100.0	.025 .015	.0405 .0032 5.001
BSN_DS	.00001	0.000	.0010	0.000	0.000 0.000	.025 0.00	.0017 0.000 5.002
BP2_Out	.00001	0.000	.0010	0.000	0.000 0.000	.025 0.00	.0017 0.000 4.001
BP3_Out	.00001	0.000	1.000	0.000	0.000 0.000	.025 0.00	0.000 0.000 3.001
Out	.00001	0.000	.0010	0.000	0.000 0.000	.025 0.00	.0017 0.000 2.002
BP8_Out	.00001	0.000	1.000	0.000	0.000 0.000	.025 0.00	0.000 0.000 1.001
S7.0_BP13	4.680	5.710	1.000	1.000	5.000 100.0	.025 .015	.0383 .0030 6.000
BP13_Out	.00001	0.000	1.000	0.000	0.000 0.000	.025 0.00	0.000 0.000 6.001
S1.4	1.960	2.390	.4000	.4000	5.000 100.0	.025 .015	.0384 .0030 7.000
S1.5	3.090	3.770	.6000	.6000	5.000 100.0	.025 .015	.0398 .0031 8.000
S1.0	14.200	11.780	.7300	.7300	5.000 100.0	.025 .015	.0797 .0052 9.000
S1.05_BP5	0.4300	0.5200	1.100	1.100	5.000 100.0	.025 .015	.0105 .0008 10.00
S1.1_BP9	3.550	4.330	.6300	.6300	5.000 100.0	.025 .015	.0417 .0033 10.00
Col_Bsn	.00001	0.000	1.000	0.000	0.000 0.000	.050 0.00	0.000 0.000 9.001
S1.2_BP11	2.840	3.480	.5300	.5300	5.000 100.0	.025 .015	.0405 .0032 11.00
S1.3	17.930	16.590	.6600	.6600	5.000 100.0	.025 .015	.0946 .0065 9.002
Dummy	.00001	0.000	1.000	0.000	0.000 0.000	.050 0.00	0.000 0.000 7.001
S1.6	7.750	0.000	.6600	0.000	5.000 0.000	.050 0.00	.1020 0.000 7.002
ArtOutlet	.00001	0.000	.0010	0.000	0.000 0.000	.025 0.00	.0017 0.000 1.002

Link Label	Average Intensity #1 (mm/h)	Init. Loss #1 (mm)	Cont. Loss #1 (mm/h)	Excess Rain #1 (mm)	Peak Inflow (m^3/s)	Time to Peak mins	Link Lag
S6.0_BP8	14.400	10.00	1.500	2.500 0.000	208.41 257.70	1.035	420.0 0.000
S5.0_BP6	14.400	10.00	1.500	2.500 0.000	208.41 257.70	1.377	420.0 2.000
S5.1_BP7	14.400	10.00	1.500	2.500 0.000	208.41 257.70	1.977	420.0 0.000
S4.0_BP3	14.400	10.00	1.500	2.500 0.000	208.41 257.70	0.7643	420.0 0.000
S3.0_BP2	14.400	10.00	1.500	2.500 0.000	208.41 257.70	0.4474	420.0 0.000
S2.0_BP1	14.400	10.00	1.500	2.500 0.000	208.41 257.70	2.644	420.0 0.000
BSN_US	14.400	10.00	1.500	2.500 0.000	208.41 257.70	4.433	420.0 0.000
BSN_DS	14.400	10.00	0.000	2.500 0.000	208.41 0.000	4.349	420.0 1.000
BP2_Out	14.400	1.500	0.000	0.000 0.000	257.70 0.000	4.789	421.0 1.000
BP3_Out	14.400	1.500	0.000	0.000 0.000	257.70 0.000	5.544	420.0 1.000
Out	14.400	10.00	0.000	2.500 0.000	208.41 0.000	7.512	420.0 1.000
BP8_Out	14.400	1.500	0.000	0.000 0.000	257.70 0.000	8.535	420.0 1.000

S7.0_BP13	14.400	10.00	1.500	2.500	0.000	208.41	257.70	1.343	420.0	0.000
BP13_Out	14.400	1.500	0.000	0.000	0.000	257.70	0.000	1.343	419.0	1.000
S1.4	14.400	10.00	1.500	2.500	0.000	208.41	257.70	0.5616	420.0	0.000
S1.5	14.400	10.00	1.500	2.500	0.000	208.41	257.70	0.8866	420.0	0.000
S1.0	14.400	10.00	1.500	2.500	0.000	208.41	257.70	3.328	420.0	0.000
S1.05_BP5	14.400	10.00	1.500	2.500	0.000	208.41	257.70	0.1228	415.0	2.500
S1.1_BP9	14.400	10.00	1.500	2.500	0.000	208.41	257.70	1.141	418.0	0.000
Col_Bsn	14.400	10.00	0.000	2.500	0.000	208.41	0.000	4.465	420.0	6.000
S1.2_BP11	14.400	10.00	1.500	2.500	0.000	208.41	257.70	0.8165	420.0	4.000
S1.3	14.400	10.00	1.500	2.500	0.000	208.41	257.70	9.556	420.0	2.500
Dummy	14.400	10.00	0.000	2.500	0.000	208.41	0.000	10.940	420.0	3.000
S1.6	14.400	10.00	0.000	2.500	0.000	208.41	0.000	11.805	423.0	1.000
ArtOutlet	14.400	100.0	0.000	100.0	0.000	0.000	0.000	21.623	421.0	0.000

SUMMARY OF BASIN RESULTS

Link	Time	Peak	Time	Peak	Total	-----	Basin	-----
Label	to	Inflow	to	Outflow	Inflow	Vol.	Vol.	Stage
		(m^3/s)		Peak	(m^3)	Avail	Used	Used
BSN_US	420.0	4.433	420.0	4.348	80465.4	0.0000	10807.5	17.597
Col_Bsn	420.0	4.465	420.0	4.395	80649.5	0.0000	18010.7	18.650

#####
Bligh Park- Existing Conditions 500Yr

Results for period from 0: 0.0 1/ 1/1990
to 11:20.0 4/ 1/1990

ROUTING INCREMENT (MINS) =	1.00
STORM DURATION (MINS) =	1440.
RETURN PERIOD (YRS) =	500.
BX =	0.8200
TOTAL OF FIRST SUB-AREAS (ha) =	87.24
TOTAL OF SECOND SUB-AREAS (ha) =	84.74
TOTAL OF ALL SUB-AREAS (ha) =	171.98

SUMMARY OF CATCHMENT AND RAINFALL DATA

Link	Catch. Area	Slope	% Impervious	Pern	B	Link					
Label	#1 (ha)	#2	#1 (%)	#2	#1 (%)	#2	#1	#2	No.		
S6.0_BP8	3.600	4.400	1.000	1.000	5.000	100.0	.025	.015	.0334	.0026	1.000
S5.0_BP6	4.790	5.860	1.000	1.000	5.000	5.000	.025	.015	.0387	.0215	2.000
S5.1_BP7	2.090	2.550	1.000	1.000	5.000	100.0	.025	.015	.0252	.0020	2.001
S4.0_BP3	2.660	3.250	1.000	1.000	5.000	100.0	.025	.015	.0285	.0023	3.000
S3.0_BP2	1.560	1.900	1.000	1.000	5.000	100.0	.025	.015	.0216	.0017	4.000
S2.0_BP1	9.880	10.600	1.200	1.200	5.000	100.0	.025	.015	.0515	.0038	5.000
BSN_US	6.228	7.612	1.200	1.200	5.000	100.0	.025	.015	.0405	.0032	5.001
BSN_DS	.00001	0.000	.0010	0.000	0.000	0.000	.025	0.00	.0017	0.000	5.002
BP2_Out	.00001	0.000	.0010	0.000	0.000	0.000	.025	0.00	.0017	0.000	4.001
BP3_Out	.00001	0.000	1.000	0.000	0.000	0.000	.025	0.00	0.000	0.000	3.001
Out	.00001	0.000	.0010	0.000	0.000	0.000	.025	0.00	.0017	0.000	2.002
BP8_Out	.00001	0.000	1.000	0.000	0.000	0.000	.025	0.00	0.000	0.000	1.001
S7.0_BP13	4.680	5.710	1.000	1.000	5.000	100.0	.025	.015	.0383	.0030	6.000
BP13_Out	.00001	0.000	1.000	0.000	0.000	0.000	.025	0.00	0.000	0.000	6.001
S1.4	1.960	2.390	.4000	.4000	5.000	100.0	.025	.015	.0384	.0030	7.000
S1.5	3.090	3.770	.6000	.6000	5.000	100.0	.025	.015	.0398	.0031	8.000
S1.0	14.200	11.780	.7300	.7300	5.000	100.0	.025	.015	.0797	.0052	9.000
S1.05_BP5	0.4300	0.5200	1.100	1.100	5.000	100.0	.025	.015	.0105	.0008	10.00
S1.1_BP9	3.550	4.330	.6300	.6300	5.000	100.0	.025	.015	.0417	.0033	10.00
Col_Bsn	.00001	0.000	1.000	0.000	0.000	0.000	.050	0.00	0.000	0.000	9.001
S1.2_BP11	2.840	3.480	.5300	.5300	5.000	100.0	.025	.015	.0405	.0032	11.00
S1.3	17.930	16.590	.6600	.6600	5.000	100.0	.025	.015	.0946	.0065	9.002
Dummy	.00001	0.000	1.000	0.000	0.000	0.000	.050	0.00	0.000	0.000	7.001
S1.6	7.750	0.000	.6600	0.000	5.000	0.000	.050	0.00	.1020	0.000	7.002
ArtOutlet	.00001	0.000	.0010	0.000	0.000	0.000	.025	0.00	.0017	0.000	1.002

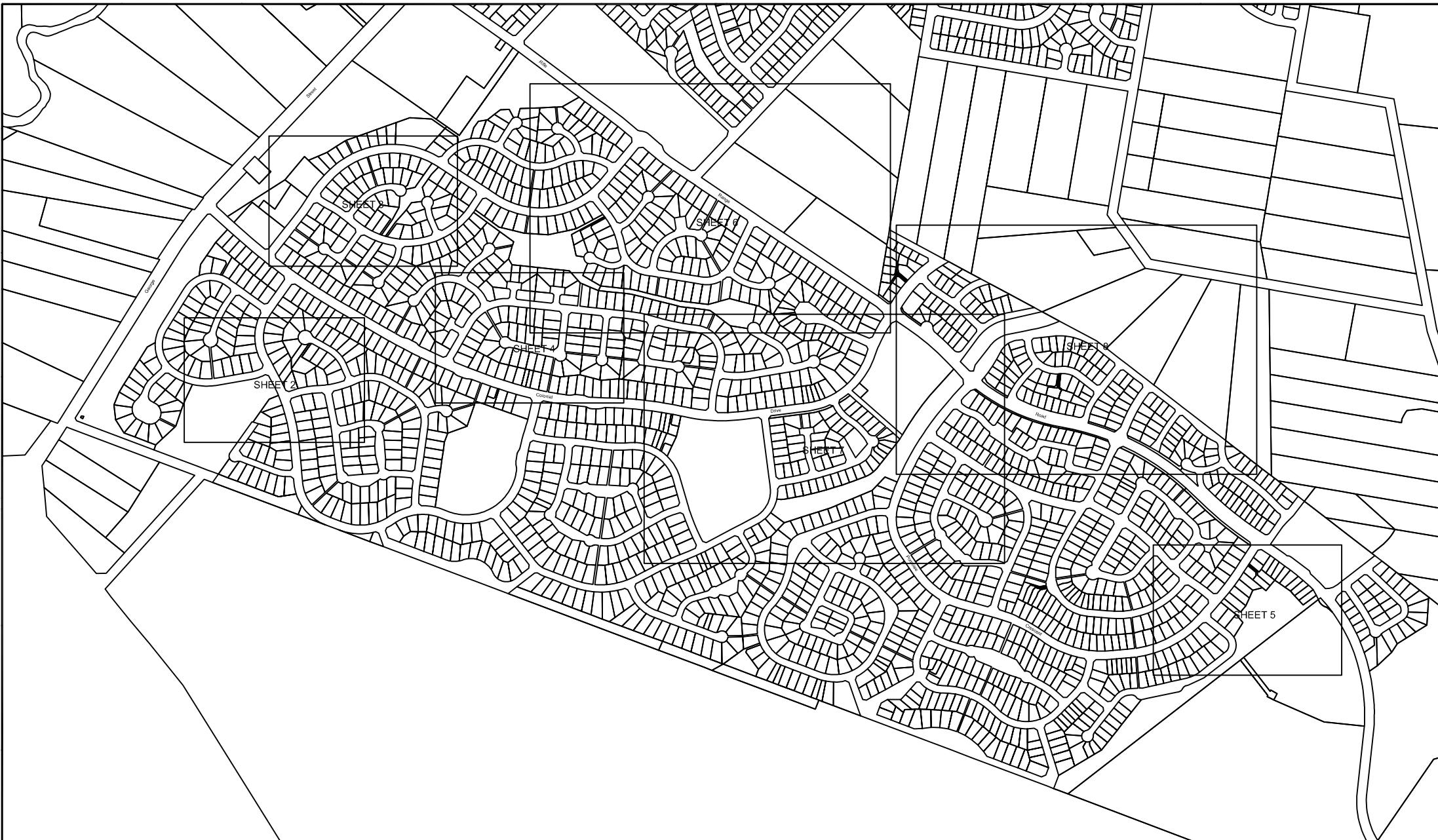
Link Label	Average Intensity (mm/h)	Init. #1 (mm)	Loss #2 (mm/h)	Cont. #1 (mm/h)	Loss #2 (mm/h)	Excess #1 (mm)	Rain #2 (mm)	Peak Inflow (m^3/s)	Time to Peak	Link Lag mins
S6.0_BP8	12.400	10.00	1.500	2.500	0.000	235.70	296.10	1.020	720.0	0.000
S5.0_BP6	12.400	10.00	1.500	2.500	0.000	235.70	296.10	1.357	720.0	2.000
S5.1_BP7	12.400	10.00	1.500	2.500	0.000	235.70	296.10	1.949	720.0	0.000
S4.0_BP3	12.400	10.00	1.500	2.500	0.000	235.70	296.10	0.7532	720.0	0.000
S3.0_BP2	12.400	10.00	1.500	2.500	0.000	235.70	296.10	0.4410	720.0	0.000
S2.0_BP1	12.400	10.00	1.500	2.500	0.000	235.70	296.10	2.605	720.0	0.000
BSN_US	12.400	10.00	1.500	2.500	0.000	235.70	296.10	4.369	720.0	0.000
BSN_DS	12.400	10.00	0.000	2.500	0.000	235.70	0.000	4.328	720.0	1.000
BP2_Out	12.400	1.500	0.000	0.000	0.000	296.10	0.000	4.766	721.0	1.000
BP3_Out	12.400	1.500	0.000	0.000	0.000	296.10	0.000	5.514	720.0	1.000
Out	12.400	10.00	0.000	2.500	0.000	235.70	0.000	7.458	720.0	1.000
BP8_Out	12.400	1.500	0.000	0.000	0.000	296.10	0.000	8.473	720.0	1.000
S7.0_BP13	12.400	10.00	1.500	2.500	0.000	235.70	296.10	1.324	720.0	0.000
BP13_Out	12.400	1.500	0.000	0.000	0.000	296.10	0.000	1.325	719.0	1.000
S1.4	12.400	10.00	1.500	2.500	0.000	235.70	296.10	0.5538	720.0	0.000
S1.5	12.400	10.00	1.500	2.500	0.000	235.70	296.10	0.8740	720.0	0.000
S1.0	12.400	10.00	1.500	2.500	0.000	235.70	296.10	3.285	720.0	0.000
S1.05_BP5	12.400	10.00	1.500	2.500	0.000	235.70	296.10	0.1211	713.0	2.500
S1.1_BP9	12.400	10.00	1.500	2.500	0.000	235.70	296.10	1.125	717.0	0.000
Col_Bsn	12.400	10.00	0.000	2.500	0.000	235.70	0.000	4.407	720.0	6.000
S1.2_BP11	12.400	10.00	1.500	2.500	0.000	235.70	296.10	0.8050	720.0	4.000
S1.3	12.400	10.00	1.500	2.500	0.000	235.70	296.10	9.497	720.0	2.500
Dummy	12.400	10.00	0.000	2.500	0.000	235.70	0.000	10.888	720.0	3.000
S1.6	12.400	10.00	0.000	2.500	0.000	235.70	0.000	11.787	723.0	1.000
ArtOutlet	12.400	100.0	0.000	100.0	0.000	0.000	0.000	21.520	720.0	0.000

SUMMARY OF BASIN RESULTS

Link Label	Time to Peak Peak	Peak Inflow Peak	Time to Outflow Peak	Peak Outflow (m^3/s)	Total Inflow (m^3)	-----	Basin Vol. Avail	Vol. Used	Stage Used
BSN_US	720.0	4.369	720.0	4.328	91838.3	0.0000	10793.1	17.596	
Col_Bsn	720.0	4.407	720.0	4.368	91994.0	0.0000	17996.5	18.650	

APPENDIX B

GROUND SURVEY PLANS



NOTE: Sheet 9 Road Centerline GPS Survey
Sheet 10 Cross Sections 1 to 13
Sheet 11 Cross Sections 14 to 25

ZONE	REF.	REVISION	BY	CKD	DATE
SURVEY SERVICES LEVEL 5 10 VALENTINE AVE PARRAMATTA 2150	HAWKESBURY OVERLAND FLOW STUDY BLIGH PARK				
State Water	SURVEYED: DPG	FIELD BOOK: FB238	DATE: 3/06/05	DRAWING FILE: 12070-Richmond	A3
	DATUM: AHD	RL ORIGIN: SSM61300, SSM61321	COORD. SYSTEM: ISG Zone 56/1		
	DRAWN: MDH	DATE: 22/6/05	EXAMINED: DPG	SCALE: 1:8000	PLAN NO: 2070 SHT 1 of 11

N

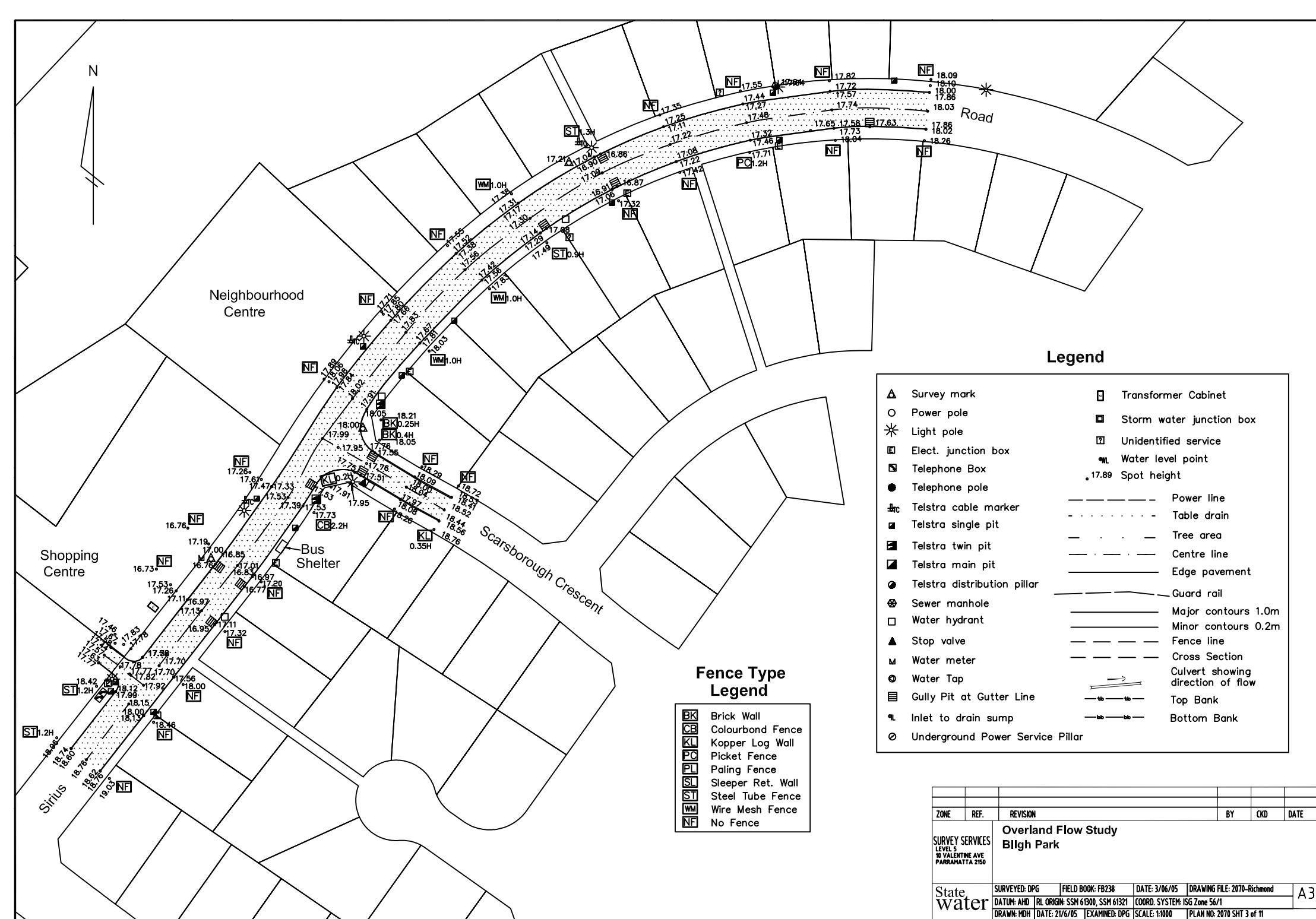
Legend

▲ Survey mark	■ Transformer Cabinet
○ Power pole	□ Storm water junction box
★ Light pole	■ Unidentified service
■ Elect. junction box	■ Water level point
■ Telephone Box	.17.89 Spot height
● Telephone pole	
■ Telstra cable marker	— Power line
■ Telstra single pit	- - - Table drain
■ Telstra twin pit	- - - Tree area
■ Telstra main pit	- - - Centre line
● Telstra distribution pillar	- - - Edge pavement
⊗ Sewer manhole	- - - Guard rail
□ Water hydrant	— Major contours 1.0m
▲ Stop valve	— Minor contours 0.2m
■ Water meter	— Fence line
○ Water Tap	— Cross Section
■ Gully Pit at Gutter Line	— Culvert showing direction of flow
■ Inlet to drain sump	→ Top Bank
○ Underground Power Service Pillar	← Bottom Bank

Fence-Type Legend

BK	Brick Wall
CB	Colourbond Fence
KL	Kopper Log Wall
PC	Picket Fence
PL	Paling Fence
SL	Sleeper Ret. Wall
ST	Steel Tube Fence
WM	Wire Mesh Fence
NF	No Fence

ZONE	REF.	REVISION	BY	CKD	DATE
SURVEY SERVICES LEVEL 5 10 VALENTINE AVE PARRAMATTA 250					
HAWKSLEY - OVERLAND FLOW STUDY BLIGH PARK					
State Water	SURVEYED: DPG	FIELD BOOK: FB238	DATE: 3/06/05	DRAWING: 2070-RICHMOND	A3
	DATUM: AHD	RL ORIGIN: SSM61300 & SSM 61321	COORD. SYSTEM: ISG Zone 56/1		
	DRAWN: CHC	DATE: 20/06/05	EXAMINED: DPG	SCALE: 1:1000	PLAN No: 2070 SHT2 of 11



Broome

Place

N

Studdy Close

Walter Close

Crescent

Haradine

Legend

- △ Survey mark
- Power pole
- ★ Light pole
- Elect. junction box
- Telephone Box
- Telephone pole
- Telstra cable marker
- Telstra single pit
- Telstra twin pit
- Telstra main pit
- Telstra distribution pillar
- ⊗ Sewer manhole
- Water hydrant
- ▲ Stop valve
- Water meter
- ◎ Water Tap
- Gully Pit at Gutter Line
- Inlet to drain sump
- Underground Power Service Pillar

- Transformer Cabinet
- Storm water junction box
- Unidentified service
- Water level point
- 17.89 Spot height
- Power line
- - - Table drain
- - - Tree area
- - - Centre line
- - - Edge pavement
- - - Guard rail
- Major contours 1.0m
- Minor contours 0.2m
- Fence line
- Cross Section
- Culvert showing direction of flow
- Top Bank
- Bottom Bank

Fence Type Legend

BK	Brick Wall
CB	Colourbond Fence
KL	Kopper Log Wall
PC	Picket Fence
PL	Paling Fence
SL	Sleeper Ret. Wall
ST	Steel Tube Fence
WM	Wire Mesh Fence
NF	No Fence

ZONE	REF.	REVISION	BY	CKD	DATE
SURVEY SERVICES LEVEL 5 10 VALENTINE AVE PARRAMATTA 2150					Overland Flow Study Bligh Park
State Water	SURVEYED: DPG	FIELD BOOK: FB238	DATE: 3/06/05	DRAWING FILE: 2070-Richmond	A3
	DATUM: AHD	RL ORIGIN: SSM 61300, SSM 61321	COORD. SYSTEM: ISG Zone 56/1		
	DRAWN: MDH	DATE: 22/6/05	EXAMINED: DPG	SCALE: 1:1000	PLAN NO: 2070 SHT 4 of 11

N

Thery Street

Samuel Street

Porpoise

Crescent

Peter Place

Legend

▲ Survey mark	■ Transformer Cabinet
○ Power pole	□ Storm water junction box
★ Light pole	□ Unidentified service
■ Elect. junction box	● Water level point
■ Telephone Box	.17.89 Spot height
● Telephone pole	
■ Telstra cable marker	— Power line
■ Telstra single pit	- - - Table drain
■ Telstra twin pit	- - - Tree area
■ Telstra main pit	- - - Centre line
● Telstra distribution pillar	- - - Edge pavement
⊗ Sewer manhole	- - - Guard rail
□ Water hydrant	— Major contours 1.0m
▲ Stop valve	— Minor contours 0.2m
■ Water meter	— Fence line
● Water Tap	— Cross Section
■ Gully Pit at Gutter Line	→ Culvert showing direction of flow
■ Inlet to drain sump	— Top Bank
○ Underground Power Service Pillar	— Bottom Bank

Fence Type Legend

BK	Brick Wall
CB	Colourbond Fence
KL	Kopper Log Wall
PC	Picket Fence
PL	Paling Fence
SL	Sleeper Ret. Wall
ST	Steel Tube Fence
WM	Wire Mesh Fence
NF	No Fence

ZONE	REF.	REVISION	BY	CKD	DATE
SURVEY SERVICES LEVEL 5 10 VALENTINE AVE PARRAMATTA 2150		Overland Flow Study Bligh Park			
State Water	SURVEYED: DPG	FIELD BOOK: FB238	DATE: 3/06/05	DWG FILE: 2070-Richmond	A3
	DATUM: AHD	RL ORIGIN: SSM 61300, SSM 61321	COORD. SYSTEM: ISG Zone 56/1	EXAMINED: DPG	SCALE: 1:1000
	DRAWN: MDH	DATE: 21/6/05	PLAN NO: 2070 SHT 5 of 11		

N

Legend

▲ Survey mark	■ Transformer Cabinet
○ Power pole	■ Storm water junction box
* Light pole	■ Unidentified service
■ Elect. Junction box	■ Water level point
■ Telephone Box	17.00 Spot height
● Telephone pole	
▲ Teletra cable marker	
■ Teletra single pit	
■ Teletra twin pit	
■ Teletra main pit	
● Sewer manhole	
□ Water hydrant	
△ Stop valve	
■ Water meter	
● Water Tap	
■ Gully Pit at Gutter Line	
● Inlet to drain sump	
● Underground Power Service Pillar	
	Power line
	Tube drain
	Tree area
	Centre line
	Edge pavement
	Guard rail
	Major contours 1.0m
	Minor contours 0.2m
	Fence line
	Cross Section
	Culvert showing direction of flow
	Top Bank
	Bottom Bank

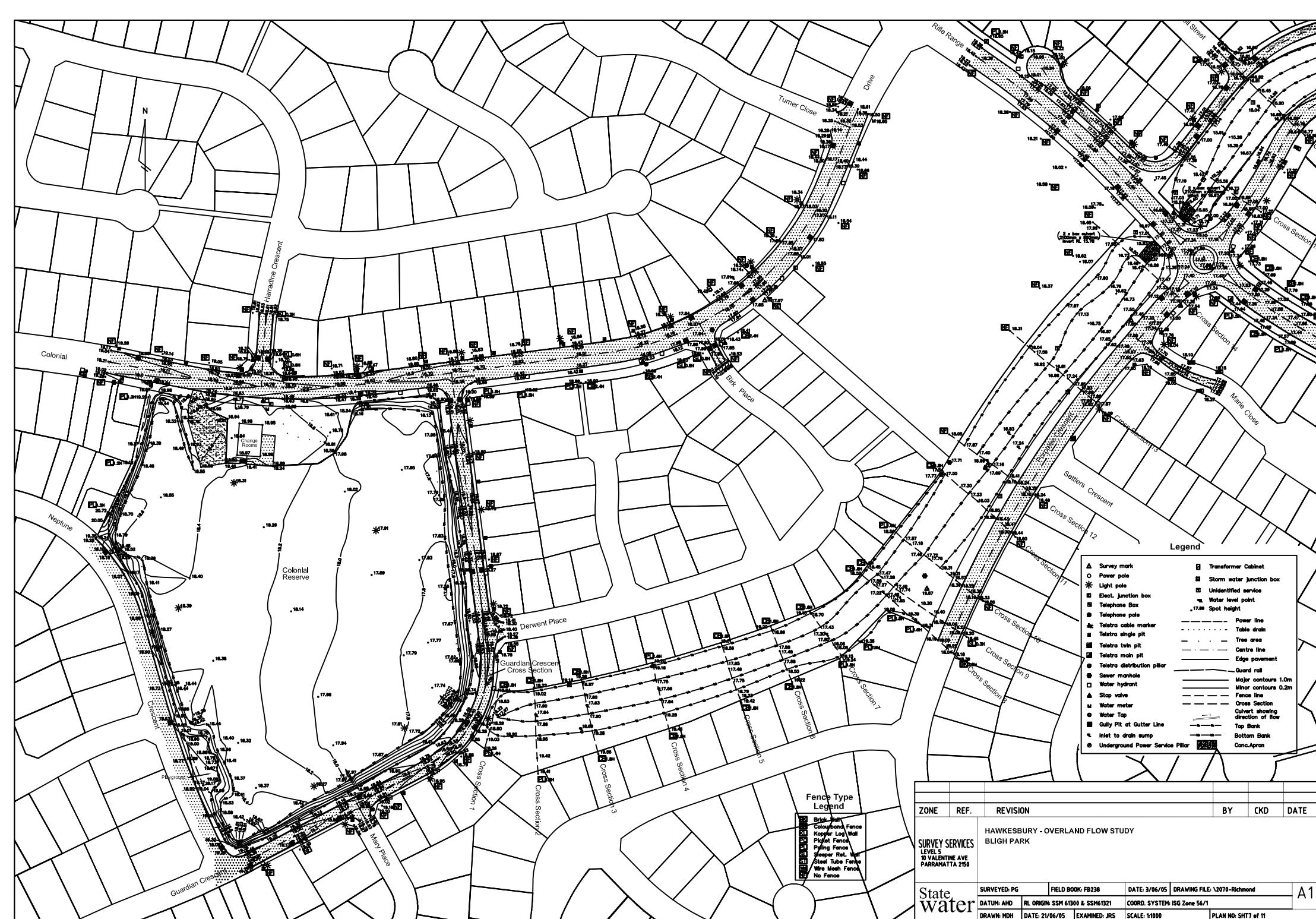
Fence Type Legend

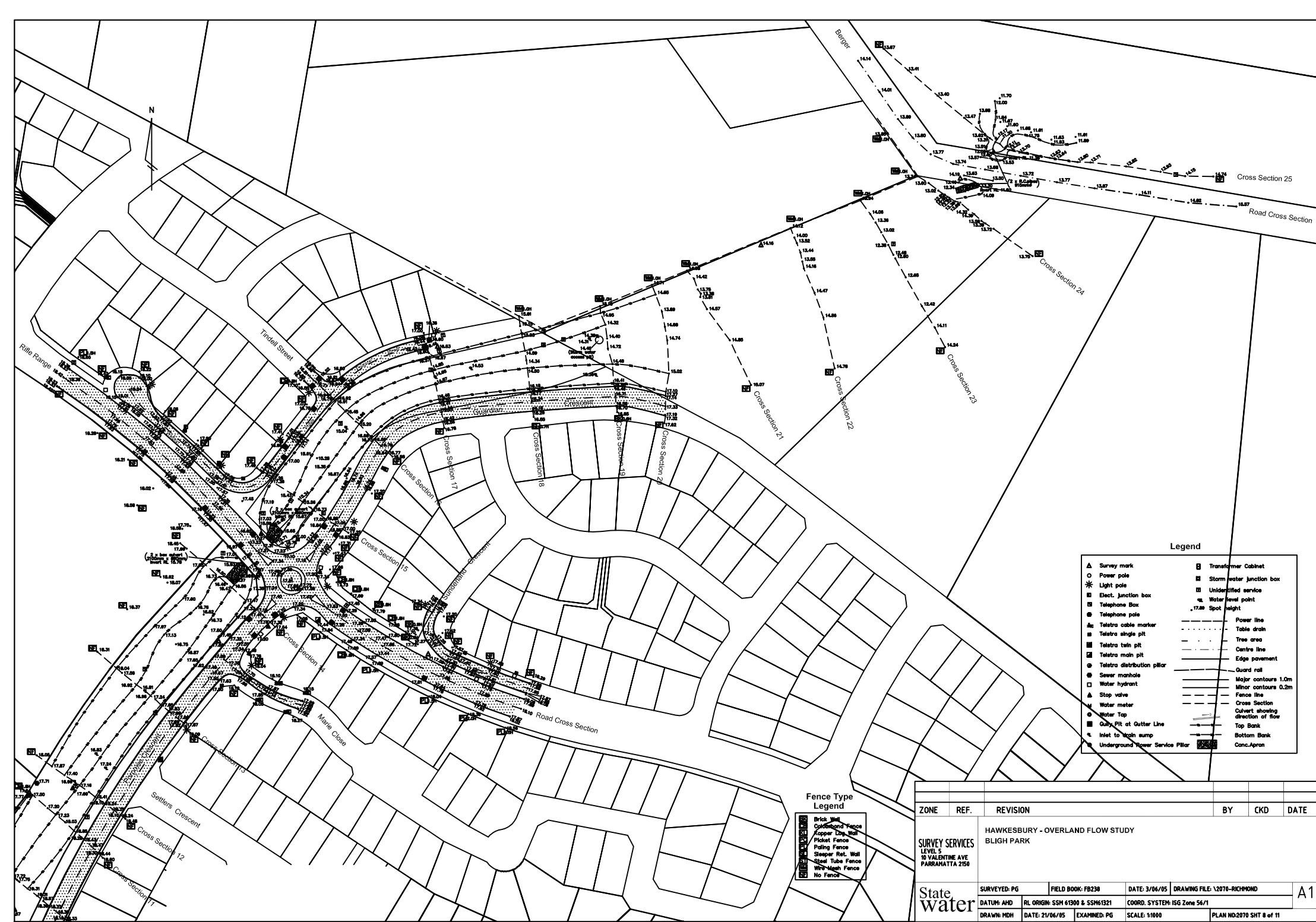
Brick Wall
Colourbond Fence
Kopper Log Wall
Picket Fence
Slat fence
Slater Ret. Wall
Steel Tube Fence
Wire Mesh Fence
No Fence

ZONE	REF.	REVISION	BY	CKD	DATE
SURVEY SERVICES LEVEL 5 10 VALENTINE AVE PARRAMATTA 2500		HAWKESBURY - OVERLAND FLOW STUDY BLIGH PARK			
		SURVEYED: PG	FIELD BOOK: FB238	DATE: 3/06/05	DRAWING: 2070-Richmond
DATUM: AHD	RL ORIGIN: SSM 61300 & SSM61321	COORD. SYSTEM: ISG Zone 56/1			
DRAWN: CHC	DATE: 21/06/05	EXAMINED: DPG	SCALE: 1:1000		
				PLAN NO: 2070 SHT 6 of 11	

State Water

A1



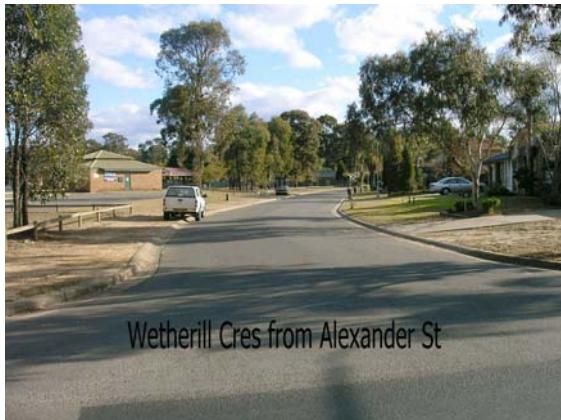




ZONE	REF.	REVISION	BY	CKD	DATE
SURVEY SERVICES LEVEL 3 10 VALENTINE AVE PARRAMATTA 2150		HAWKESBURY - OVERLAND FLOW STUDY BLIGH PARK			
		SURVEYED: PG	FIELD BOOK: FB230	DATE: 3/06/05	DRAWING FILE: 12070-RICHMOND
DATUM: AHD		RL ORIGIN: SSM 61300 & SSM61321	COORD. SYSTEM: ISG Zone 56/1		
DRAWN: MDH		DATE: 17/06/05	EXAMINED: PG	SCALE: 1:4000	PLAN NO: SHT 9 of 11

APPENDIX C

STUDY AREA PHOTOGRAPHS



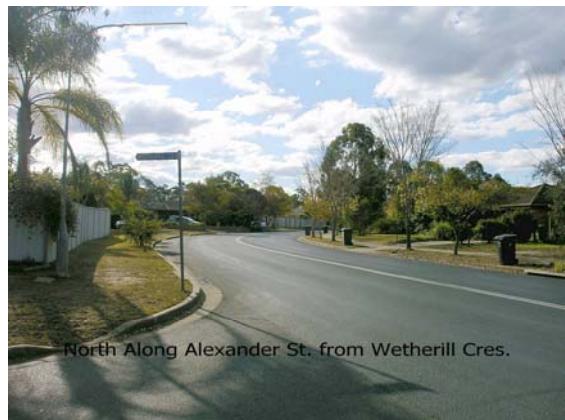
Wetherill Cres from Alexander St



East from Alexander St.



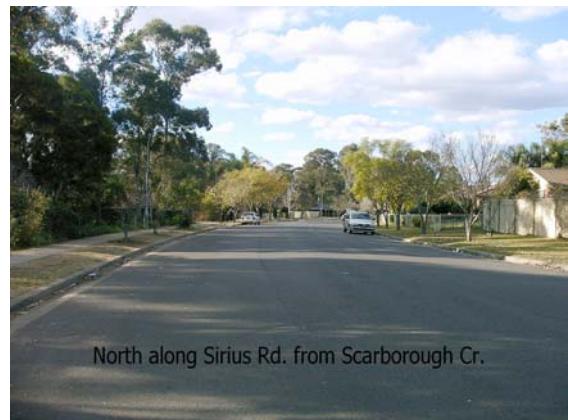
Looking South along Alexander St.



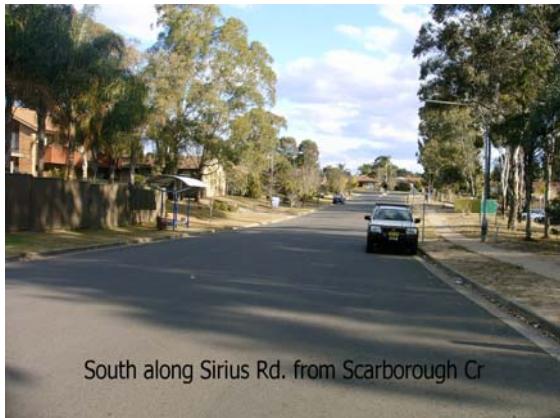
North Along Alexander St. from Wetherill Cres.



Sirius Rd. from Colonial Dr.



North along Sirius Rd. from Scarborough Cr.



South along Sirius Rd. from Scarborough Cr



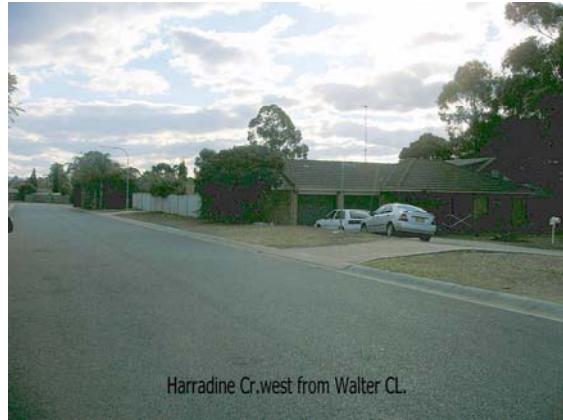
Scarborough Cr. from Sirius Rd.



Shopping Centre at Colonial Dr and Sirius Rd.



East along Harradine Cr. from Jacobs Pl.



Harradine Cr. west from Walter Cl.



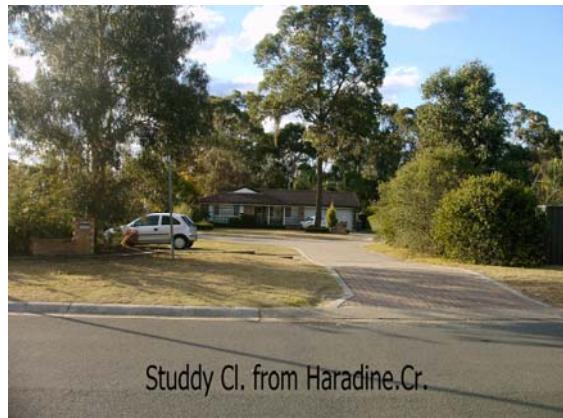
Jacobs Pl. from Harradine Cr.



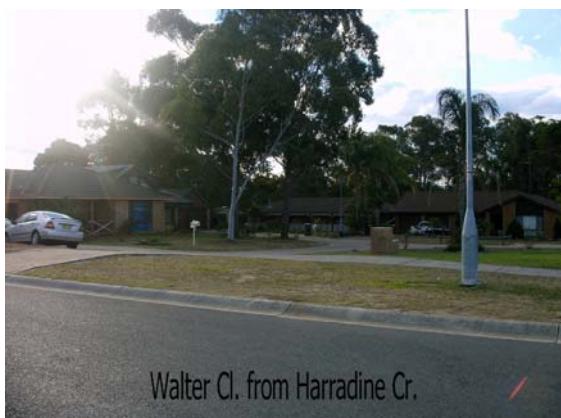
Harradine Cr. west from Walter Cl.



West along Harradine from Jacobs Pl.



Studdy Cl. from Harradine.Cr.



Walter Cl. from Harradine Cr.



Harradine Cr. west towards Broome Pl.



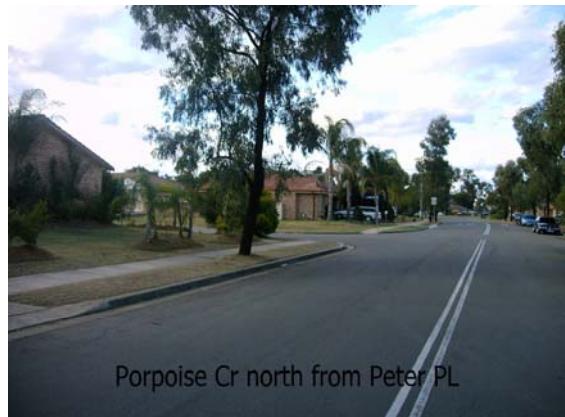
Broome Pl. from Harradine Cr.



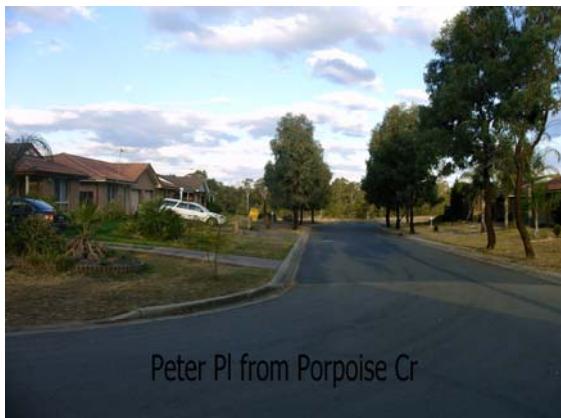
Harradine Cr. west from Broome PL.



Porpoise Cr south from Therry St



Porpoise Cr north from Peter PL



Peter Pl from Porpoise Cr



Porpoise Cr north from Therry St



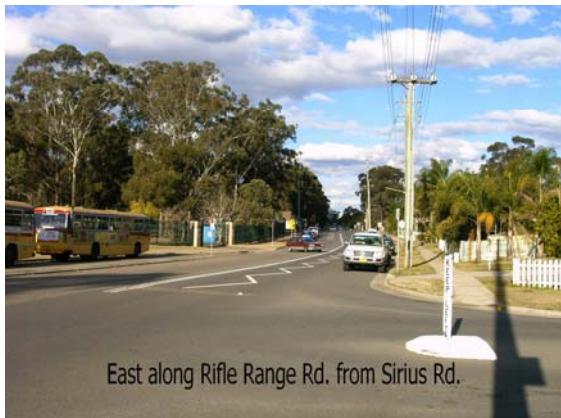
Porpoise Cr south from Peter Pl



South along Sirius Rd. from Rifle Range Rd.



East along Rifle Range Rd. from Collith Av.



East along Rifle Range Rd. from Sirius Rd.



West along Rifle Range Rd. from Collith Av.



West along Rifle Range Road from Sirius Rd.



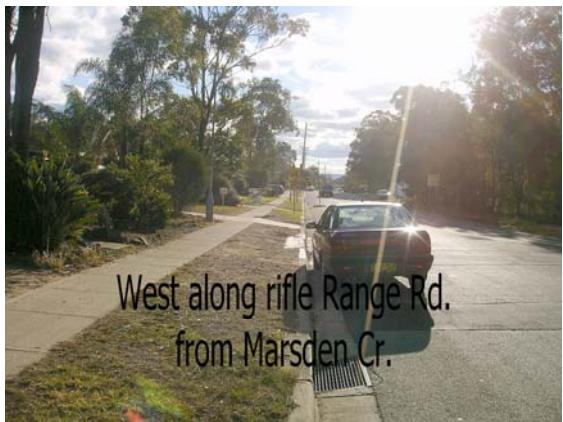
Marsden Cr. from Rifle Range Rd.



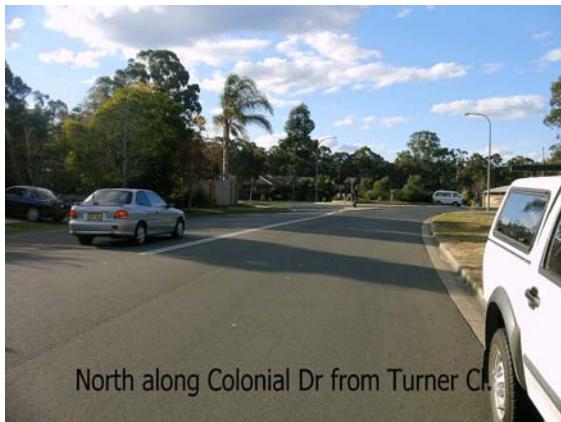
Collith Av. from Rifle Range Rd.



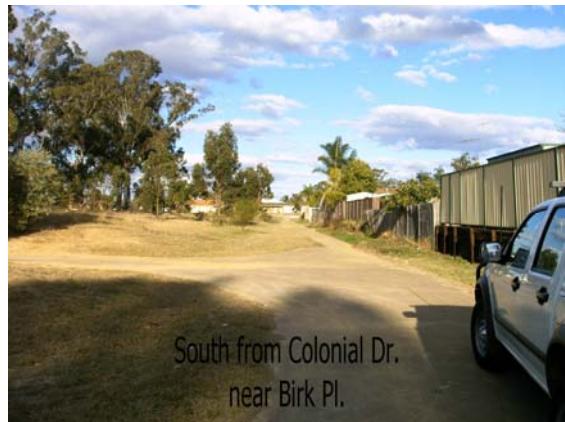
East along Rifle Range Rd. from Marsden Cr.



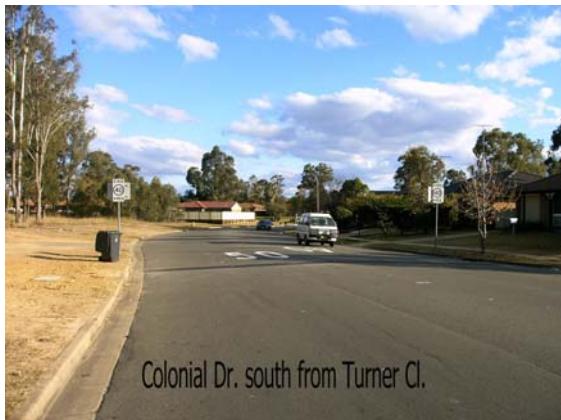
West along rifle Range Rd.
from Marsden Cr.



North along Colonial Dr from Turner Cl.



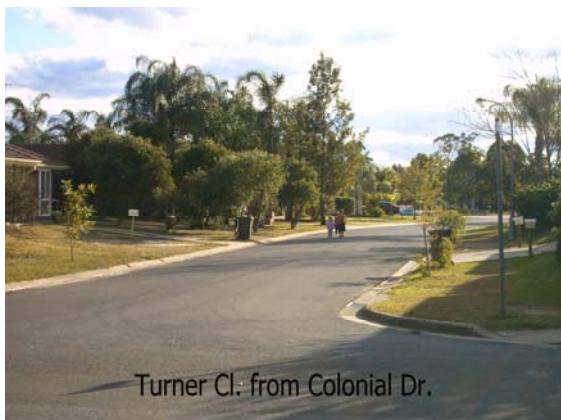
South from Colonial Dr.
near Birk Pl.



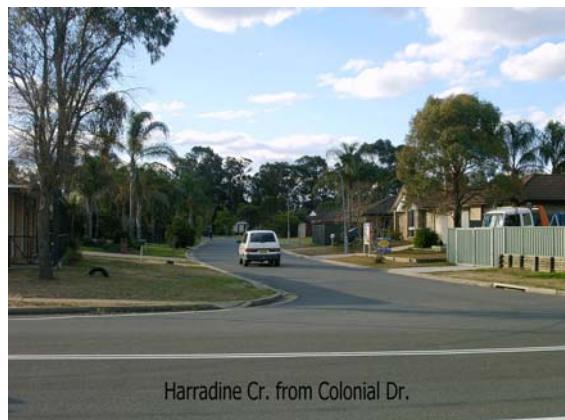
Colonial Dr. south from Turner Cl.



East along ColonialDr. from Harradine Cr.



Turner Cl. from Colonial Dr.



Harradine Cr. from Colonial Dr.



North from Colonial Dr.at low point
near Birk Pl.

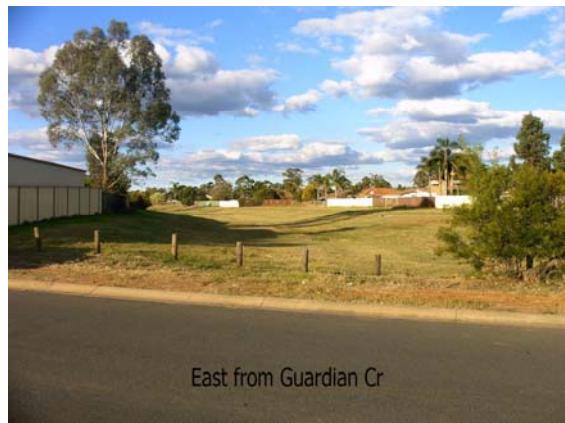


Colonial Dr. west from Colonial Reserve.





North along Guardian Cr



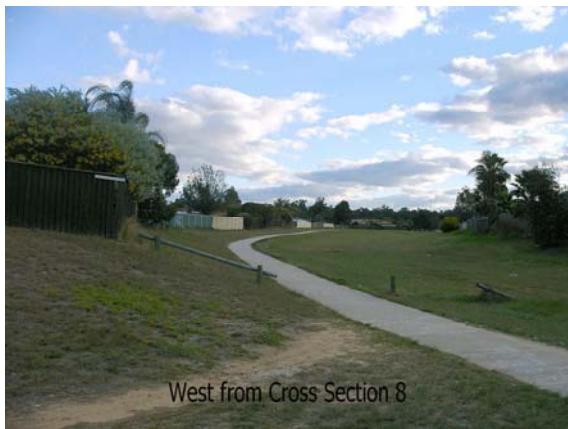
East from Guardian Cr



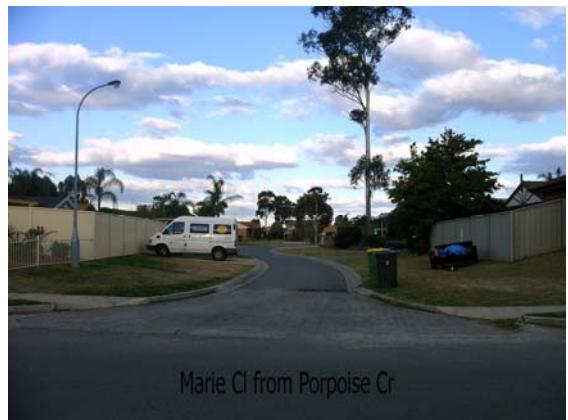
South along Guardian Cr



Inlet east side of Guardian CR



West from Cross Section 8



Marie Ct from Porpoise Cr



South from Cross Section 8



Rifle Range Rd from Porpoise Cr



East from Cross Section 8



West from Rifle Range Rd



East from Cross Section 8



South side of Rifle Range Rd



West along Rifle Range Rd



North side of Rifle Range Rd



Northside of Rifle Range Rd
at round about



Waterway north from Rifle Range Rd



East along Rifle Range Rd from Porpoise Cr



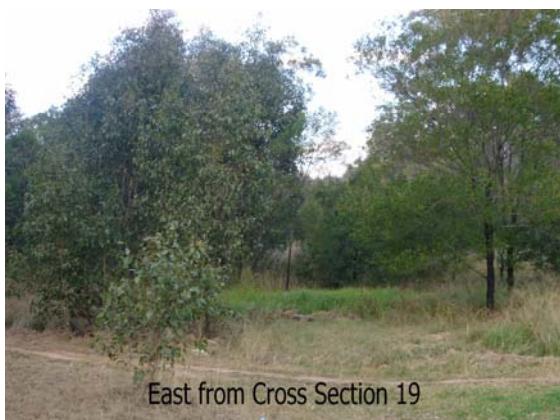
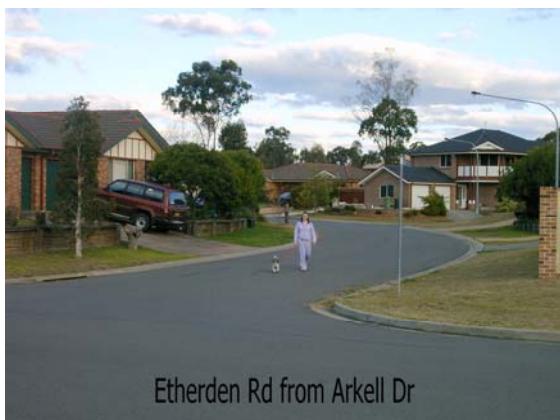
Tindell St from Pearson St



Arkell Dr from Rifle Range Rd

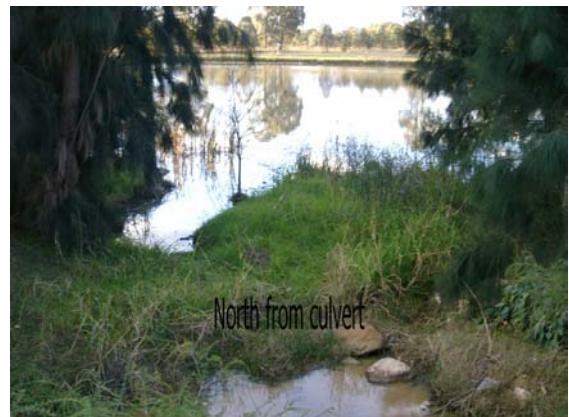


Sunderland Cr from Rifle Range Rd





Culvert north side of Berger Rd



North from culvert

APPENDIX D

LANEWAY PHOTOGRAPHS



Photo L1-1
View of L1 from McPhee Place



Photo L1-2
View of L1 from Wetherill Crescent



Photo L2-1
View of L2 from Rich Close



Photo L2-2
View of L2 from reserve



Photo L3-1
View of L3 from Alexander Street



Photo L3-2
View of L3 from Newmarch Place



Photo L4-1
View of L4 from Dowe Place



Photo L4-2
View of L4 from Colonial Drive



Photo L5-1
View of L5 from Fullerton Crescent



Photo L5-2
View of L5 from Hosier Place



Photo L6-1
View of L6 from Fullerton Crescent



Photo L6-2
View of L6 from Colonial Drive



Photo L7-1
View of L7 from Alexander Drive



Photo L7-2
View of L7 from Bateman Place



Photo L7-3
View of L7 from Bateman Place



Photo L7-4
View of L7 from Colonial Drive



Photo L7a-1
View of L7a from Colonial Drive



Photo L7a-2
View of L7a from Scarsborough Crescent



Photo L7b-1
View of L7b from Scarsborough Crescent



Photo L7b-2
View of L7b from Sirius Road



Photo L7c-1
View of L7c from Golden Grove



Photo L7c-2
View of L7c from Rifle Range Road



Photo L8-1
View of L8 from Guardian Crescent



Photo L8-2
View of L8 from Britannia Place



Photo L8a-1
View of L8a from Brittania Place



Photo L8a-2
View of L8a from Kitty Place



Photo L8b-1
View of L8b from Kitty Place



Photo L8b-2
View of L8-2 from Neptune Crescent



Photo L9-1
View of L9 from Juliana Place



Photo L9-2
View of L9 from Neilson Crescent



Photo L10-1
View of L10 from Neilson Crescent



Photo L10-2
View of L10 from Mary Place



Photo L11-1
View of L11 from Neilson Place



Photo L11-2
View of L11 from Chifley Place



Photo L12-1
View of L12 from Neilson Crescent



Photo L12-2
View of L12 from Knight Place



Photo L13-1
View of L13 from Neilson Crescent



Photo L13-2
View of L13 from Bounty Crescent



Photo L14-1
View of L14 from Bounty Crescent



Photo L14-2
View of L14 from Fitzpatrick Place



Photo L15-1
View of L15 from Bounty Crescent



Photo L15-2
View of L15 from Paine Place



Photo L16-1
View of L16 from Paine Place



Photo L16-2
View of L16 from Porpoise Crescent



Photo L17-1
View of L17 from Porpoise Crescent



Photo L17-2
View of L17 from Risbey Place



Photo L18-1
View of L18 from Porpoise Crescent



Photo L18-2
View of L18 from Samuel Street



Photo L19-1
View of L19 from Samuel Street



Photo L19-2
View of L19 from Dawes Place



Photo L20-1
View of L20 from Samuel Street



Photo L20-2
View of L20 from Chaplain Place



Photo L21-1
View of L21 from Samuel Street



Photo L21-2
View of L21 from Settlers Crescent



Photo L22-1
View of L22 from Porpoise Crescent



Photo L22-2
View of L22 from Acres Place



Photo L23-1
View of L23 from Settlers Street



Photo L23-2
View of L23-2 from Wright Place



Photo L24-1
View of L24 from Rifle Range Road



Photo L24-2
View of L24 from Norman Place



Photo L25-1
View of L25 from Porpoise Crescent



Photo L25-2
View of L25 from Colonial Drive



Photo L25a-1
View of L20 from Colonial Drive



Photo L25a-2
View of L25 from Thomas Place



Photo L27-1
View of L27 from Colonial Drive



Photo L27-2
View of L27 from Fleet Place



Photo L28-1
View of L28 from Harradine Crescent



Photo L28-2
View of L28 from Albert Place



Photo L29-1
View of L29 from Uren Place



Photo L29-2
View of L29-2 from Albert Place



Photo L30-1
View of L30 from Uren Place



Photo L30-2
View of L30 from Jacobs Place



Photo L31-1
View of L31 from Jacobs Place



Photo L31-2
View of L31 from Colonial Drive



Photo L32-1
View of L32 from Jacobs Place



Photo L32-2
View of L32 from Harradine Crescent



Photo L33-1
View of L33 from Harradine Crescent



Photo L33-2
View of L33 from reserve



Photo L34-1
View of L34 from Harradine Crescent



Photo L34-2
View of L34 from reserve



Photo L35-1
View of L35 from reserve



Photo L35-2
View of L35 from Marsden Crescent



Photo L36-1
View of L36 from Marsden Crescent



Photo L36-2
View of L36 from reserve



Photo L37-1
View of L37 from Marsden Crescent



Photo L37-2
View of L37 from reserve



Photo L38-1
View of L38 from reserve



Photo L38-2
View of L38 from Sirius Road



Photo L39-1
View of L39 from Sirius Road



Photo L39-2
View of L39 from Golden Grove



Photo L40-1
View of L40 from reserve



Photo L40-2
View of L40 from Scarsborough Crescent



Photo L41-1
View of L41 from Fishburn Place



Photo L41-2
View of L41 from reserve

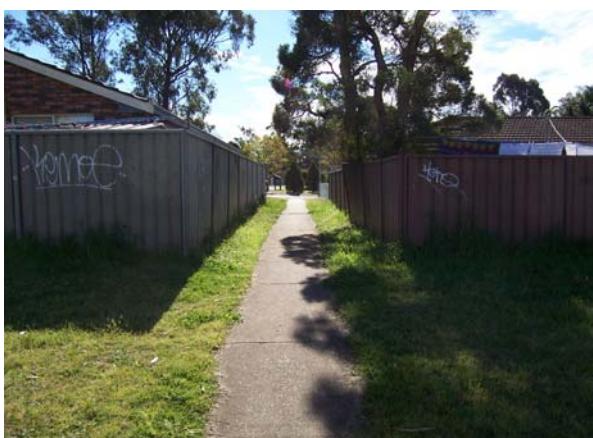


Photo L41b-1
View of L41b from reserve



Photo L41b-2
View of L41 from Friendship Place



Photo L42-1
View of L42 from Friendship Place



Photo L42-2
View of L42 from Sirius Road



Photo L43-1
View of L43 from Sirius Road



Photo L43-2
View of L43 from reserve



Photo L44-1
View of L44 from Sirius Road



Photo L44-2
View of L44 from Lady Penrhyn Close



Photo L45-1
View of L45 from Golden Grove



Photo L45-2
View of L45 from reserve



Photo L46-1
View of L46 from Charlotte Place



Photo L46-2
View of L46 from reserve



Photo L47-1
View of L47 from Supply Place



Photo L47-2
View of L44 from reserve



Photo L48-1
View of L48 from Jenkyn Place



Photo L48-2
View of L48 from Rifle Range Road



Photo L49-1
View of L49 from Moore Place



Photo L49-2
View of L49 from Rifle Range Road



Photo L50-1
View of L50 from Moore Place



Photo L50-2
View of L50 from Marsden Crescent



Photo L51-1
View of L51 from Davis Place



Photo L51-2
View of L51 from reserve



Photo L52-1
View of L52 from Broome Place



Photo L52-2
View of L52 from Colonial Drive