AUSTRALIAN TRADE COAST SOUTH
HEMMANT WATERWAY STUDY
March 2001

1.0 INTRODUCTION

The purpose of this investigation was to determine the drainage works that will be required within the Flood Regulation Lines in the Hemmant / Lytton area for ultimate development of the catchment. The study area is delineated as Areas 1, 2 and 3 on Figures 1 and 2. Figure 1 outlines the Hemmant Drain Catchment (Main Drain), the Lindum Creek Catchment (Mayne Nickless Drain) and what is referred to in this report as the Iona Drain catchment. Figure 2 illustrates the three drainage lines that flow through the study area, ie:

1) The Main Drain or Hemmant Drain (T-U-V-W on Figure 2)
2) The Mayne-Nickless Drain or Lindum Creek (P-Q-R-S on Figure 2)
3) The Iona Drain (J-K-L on Figure 2)

The scope of works for this study has included a review of:

- the Sinclair Knight April 1992 "Preliminary Drainage and Filling Assessment Report",
- the Lawson & Treloar 15 August 1997 "Hemmant Wynnum West Area – Master Drainage Investigation and flood Study" and
- the Connell Wagner 17 November 1999 report titled "Hydraulic Report – Port Road Planning and Preliminary Design".

The three available reports are of limited value to this particular investigation for the following reasons:

1) The Sinclair Knight report (1992), was a pre-feasibility report and was therefore very approximate. The results presented in that report were only intended to provide a guide to possible future drainage requirements.

2) The scope of the Lawson and Treloar report did not include the impacts of Bulimba Creek flooding on flood flows through the study area. Flood flows in their report are therefore significantly lower than presented in the other two reports. The advantage of this report is that it provides a comparison of flood flows from the existing and ultimate catchment condition.

3) The Connell Wagner report provides a good estimation of flows through the study area for a short duration flood event (90 minutes) and a longer duration flood event with Bulimba Creek in flood. This report does not assess the impacts of catchment development.

2.0 THE MAIN DRAIN (T-U-V-W) and THE MAYNE-NICKLESS DRAIN (P-Q-R-S)

2.1 Impacts of Catchment Development

The Lawson and Treloar MIKE11 model has been modified to include flood flows from Bulimba Creek combined with a 20-year surge tide cycle at the mouth of Aquarium Passage. The flood flows from Bulimba Creek were extracted from the 1992 Connell Wagner Bulimba Creek Rubicon model and the tide cycle was generated using the following parameters:

Tide period = 12 hours
Tide amplitude = 1.4 metres
Maximum tide height = 1.75m = 20 year storm surge level.

This tailwater condition compares to a constant tailwater level of RL1.75m AHD adopted in the Connell Wagner report.

The MIKE11 model was run for a range of storm duration from 90 minutes to 9 hours. The 4.5 hour and 6 hour storms were found to generate the maximum flood levels and flows over the majority of the study area.

A summary of the MIKE11 model results for the catchment in its existing condition is presented in Table 2.1.

Table 2.1 – Q100 Flood Levels and Flows – Existing Catchment Condition

Location	MIKE11 Chainage	Water Level m AHD	Flow m^3/s
Mayne-Nickless Drain	LindumCk		
Railway Line u/s	10.696	2.08	9.0
d/s	10.737	2.01	
Lytton Road u/s	11.564	2.01	9.6
d/s	11.598	1.95	
Gosport Street u/s	11.705	1.94	9.7
d/s	11.739	1.91	
Main Drain	MainDr		
Railway Line u/s	10.000	2.08	3.7
d/s	10.039	2.01	
Lytton Road u/s	10.522	1.83	4.7
d/s	10.579	1.82	
Gosport Street u/s	10.989	1.82	9.4
d/s	11.039	1.82	

The MIKE11 model was then run using the Lawson and Treloar design flows for the ultimate catchment condition to determine the impacts upon flood levels and flows in the study area. A summary of these results is presented in Table 2.2.

Table 2.2 – Q100 Flood Levels and Flows – Developed Catchment Condition

Location	MIKE11 Chainage	Water Level m AHD	increase	Flow m^3/s	increase
Mayne-Nickless Drain	LindumCk				
Railway Line u/s	10.696	2.11	+0.03	9.3	+0.3
d/s	10.737	2.04	+0.03		
Lytton Road u/s	11.564	2.03	+0.02	9.9	+0.3
d/s	11.598	1.99	+0.04		
Gosport Street u/s	11.705	1.99	+0.05	10.0	+0.3
d/s	11.739	1.97	+0.06		
Main Drain	MainDr				
Railway Line u/s	10.000	2.10	+0.02	3.8	+0.1
d/s	10.039	2.04	+0.03		
Lytton Road u/s	10.522	1.83	+0.00	4.8	+0.1
d/s	10.579	1.82	+0.00		
Gosport Street u/s	10.989	1.82	+0.00	10.9	+1.5
d/s	11.039	1.82	+0.00		

These results indicate that development of the Hemmant Wynnum West catchment (upstream and downstream of the railway line) will potentially increase the Q100 flood levels upstream of the railway line by 30 mm. Since these properties are already flood prone, this increase is not considered to be acceptable.

2.2 Proposed Drainage Works

The following drainage upgrade works are proposed to offset the increase in flood level that will result from catchment development.

Table 2.3 – Proposed Upgrading Works

Location	Existing Drainage	Proposed Drainage
Mayne-Nickless Drain		
Railway Line Culverts	2 / 3000 x 900 box culverts	Additional 2 / 3000 x 900 box culverts
Lytton Road Culverts	5 x 1500 pipe culverts	Replace with 2 / 2700 x 1500 box culverts
Gosport Street Culverts	4 / 3000 x 900 box culverts	no upgrade
Open Channel – Gosport Street to Aquarium Passage	narrow mangrove lined open channel	widen channel by an average of 18 m^2 for a length of 680 m
Main Drain		
Railway Line Culverts	1 / 2600 x 1450 box culvert	Additional 1 / 3000 x 1450 box culvert
Lytton Road Culverts	3 x 1500 pipe culverts	Replace with 3 / 3000 x 1800 box culverts
Gosport Street Culverts	2 / 3000 x 1800 box culverts	no upgrade
Open Channel – Gosport Street to Aquarium Passage	narrow mangrove lined open channel	widen channel by an average of 18 m^2 for a length of 260 m

The MIKE11 model has been modified to include these works, producing the following flood levels and flows.

Table 2.4 – Q100 Flood Levels and Flows
Developed Catchment Condition + Drainage Works

Location	MIKE11 Chainage	Water Level m AHD	increase	Flow m^3/s	increase
Mayne-Nickless Drain	LindumCk				
Railway Line u/s	10.696	2.09	+0.01	12.7	+3.7
d/s	10.737	2.06	+0.05		
Lytton Road u/s	11.564	2.05	+0.04	13.6	+4.0
d/s	11.598	1.97	+0.02		
Gosport Street u/s	11.705	1.96	+0.02	13.7	+4.0
d/s	11.739	1.91	+0.00		
Main Drain	MainDr				
Railway Line u/s	10.000	2.09	+0.01	4.4	+0.7
d/s	10.039	2.07	+0.06		
Lytton Road u/s	10.522	1.83	+0.00	5.1	+0.4
d/s	10.579	1.82	+0.00		
Gosport Street u/s	10.989	1.82	+0.00	12.8	+3.4
d/s	11.039	1.82	+0.00		

Note that these proposed works allow more water to flow under the railway line into the study area to help reduce flood levels upstream of the railway line. Thus the maximum increase in flood level upstream of the railway line has been reduced to 10mm. It is anticipated that the

proposed detention works further up in the Hemmant Wynnum West catchment (as documented in the Lawson and Treloar report) will offset this 10mm increase.

3.0 IONA DRAIN (J-K-L)

This channel flows from the residential area east of North Road (J) to the DBIRD channel (L).

Rational method calculations indicate that the Q100 flow at North Road is 14 m^3/s, increasing to 19 m^3/s at the State Government land (L). Development of the area between J and L increases the Q100 flow to 20 m^3/s due to the additional impervious area.

Current site conditions indicate that the majority of the area downstream of North Road will flood during a Q100 flood event. Filling of this area to facilitate development will therefore reduce flood storage and increase flows onto the State Government land downstream of the study area. No consideration has been given herein to any additional costs that the property owners downstream of the study area may incur as a result of these additional flood flows. It is assumed that the downstream owners will upgrade their open channel system to accommodate flood flows from the fully developed catchment condition.

The open channel downstream of North Road needs to be sized to carry the Q100 flow from the fully developed catchment, whilst causing no increase in flood level on North Road. To date no modelling has been completed to determine what the existing Q100 flood level is on North Road. Council drawings indicate that the road is at RL 2.21 m AHD. If the road is to be trafficable during a Q100 flood event, then the maximum flood level will be RL 2.5 m AHD.

To achieve a level of RL 2.5m AHD, an average flood slope of 1 in 2900 is required to convey the Q100 flood flow with a Q20 storm surge tailwater of RL1.75m AHD. An open channel with a the following properties is required to achieve this flood slope:

Base width	27 metres
Channel side slope	1 in 4
Invert level	RL0.8m AHD at North Road
Top of channel	RL2.5m AHD
Manning's roughness	n=0.08*
Cross-sectional area	58 m^3
Channel length	650 m
Channel volume	37 400 m^3

* The adopted Manning's roughness coefficient of n=0.08 is a composite roughness for the open channel, which will allow for a moderate level of vegetation.

The cost of the open channel will be the excavation below the existing ground level of 1.6m AHD minus the area of the existing waterway, ie approximately 15 m^2 for a length of 650 metres, giving an excavation volume of 9 750 m^3.

The channel will have a top width of approximately 41 metres. Allowing for 6 metres access strip either side, a total width of 53 metres will be required. This compares to a width of 40 metres between the flood regulation lines.

4.0 COSTINGS

A preliminary cost estimate of each section of the works is provided on the attached spreadsheet tabulation. A number of assumptions have been made including the land acquisition costs, cost of permits and cost of conforming to EMP requirements.

The drainage infrastructure charges have been calculated by using the following process:

a) Determining ultimate catchment development land uses using the City Plan 2000 Area Classification plans,

b) Dividing the catchments into areas of interest,
   - Hemmant Drain catchment,
   - Mayne-Nickless Drain (Lindum Creek) catchment north railway line, railway line to Lytton Road and Lytton Road to Aquarium Passage

c) Multiplying these areas by their expected ultimate fraction impervious to provide a weighted allocation for attributing drainage costs to each of the areas of interest (Tables A.1, A.4, A.5, A.6, A.7, A.9 and A.10),

d) In the case of the Hemmant Drain catchment, areas have been factored down to account for some of the flow discharging to Bulimba Creek and some of the flow discharging to the Lindum Creek floodplain (Table A.2 and A.3),

e) Calculate the percentage of costs that can be attributed to each area by dividing the weighted size of the area of interest by the weighted size of the upstream catchment (Tables A.8 and A.11),

f) Calculation of total costs of proposed drainage works (Tables B.1 to B.5),

g) Calculation of drainage costs attributable to each of the areas of interest based upon the percentages determined in e) above (Table B.6),

h) Calculation of weighted land use percentages for each land use type in each area of interest (Table B.7),

i) Calculation of drainage infrastructure charge for each land use in each of the areas of interest by multiplying the allocated cost for each area of interest by the percentage determined in e) above, divided by the actual area for each land use.

The resulting drainage infrastructure charges are tabulated separately.