REDLAND CITY COUNCIL

KINROSS ROAD STRUCTURE PLAN

STORMWATER INFRASTRUCTURE CONCEPT PLAN

June 2011

M8000_005

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PROJECT M8000_005 - KINROSS ROAD STRUCTURE PLAN STRUCTURE PLAN

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CONTENTS

1. INTRODUCTION 1

2. SCOPE OF WORKS 3

3. CATCHMENT DESCRIPTION 4

4. TRUNK INFRASTRUCTURE NETWORK COMPONENTS 5

5. STORMWATER QUANTITY ASSESSMENT 6

5.1 Introduction and Approach 6

5.2 Hydrologic Analysis 6

5.2.1 Catchment Characteristics 7
5.2.2 Rainfall Losses and Intensities 10
5.2.3 Hydrologic Model Validation 10
5.2.4 Hydrologic Results 13
5.2.5 Local Hydological Analysis 13

5.3 Hydraulic Analysis 16

5.3.1 Model Parameters 16
5.3.2 Roughness 16
5.3.3 Stormwater Pipe System 16
5.3.4 Model Topography 17
5.3.5 Hydraulic Model Scenarios 17
5.3.6 Hydraulic Results 19

6. STORMWATER QUALITY ANALYSIS 25

6.1 MUSIC Modelling 25

6.1.1 Typical Treatment Train 27

6.2 Stormwater Quality Results 28

7. PROPOSED TRUNK STORMWATER INFRASTRUCTURE 33

7.1 Stormwater Quantity Infrastructure Requirements 33

7.1.1 Stormwater Detention Infrastructure Summary 33

7.2 Stormwater Quality Trunk Infrastructure Requirements 34

7.2.1 Consideration of Treatment Options and Locations 35

8. CONSTRUCTION COST ESTIMATES 38

8.1 Stormwater Quantity 38

8.2 Stormwater Quality 39

9. STORMWATER INFRASTRUCTURE CHARGES 41

10. CONCLUSIONS/RECOMMENDATIONS.....46

11. QUALIFICATIONS.....47

12. REFERENCES.....48

LIST OF TABLES

Table 4-1 Potential Inclusions for Infrastructure Charges 5
Table 5-1 Land Use Percent Impervious values 7
Table 5-2 Rainfall Loss Parameters 10
Table 5-3 Rational and TUFLOW Flow Comparison 10
Table 5-4 Rational Method 100 year ARI Flow Comparison 14
Table 5-5 Initial Detention Sizing 15
Table 5-6 Existing Culvert Details 18
Table 6-1 RCC Water Quality Objectives 26
Table 6-2 Land Uses adopted in MUSIC 27
Table 6-3 MUSIC Modelling Results 28
Table 7-1 Required Detention Basin Volumes (Initial Sizing) 33
Table 7-2 Details of Bio-retention Basins 34
Table 8-1 Stormwater Quantity Infrastructure Cost Estimate 38
Table 8-2 Stormwater Quality Infrastructure Cost Estimate 39
Table 9-1 Catchment Mitigation Summary for Infrastructure Charges Determination 41
Table 9-2 Land Acquisition Costs 42
Table 9-3 Summary of Infrastructure Charges for Kinross Road 44

LIST OF FIGURES

Figure 1.1 Locality Plan 2
Figure 5.1 Existing Landuse 8
Figure 5.2 Ultimate Landuse 9
Figure 5.3 Stormwater Quantity Sub-Catchment Layout 12
Figure 5.4 TUFLOW Hydraulic Model Layout 21
Figure 5.5 Q100 Existing Case Flood Depth & Extent 22
Figure 5.6 Q100 Ultimate Case Flood Depth & Extent 23
Figure 5.7 Q100 Ultimate Case Flood Afflux 24
Figure 6.1 MUSIC Layout 32
Figure 7.1 Stormwater Quantity Infrastructure Concept Plan 36
Figure 7.2 Stormwater Quality Infrastructure Concept Plan 37

APPENDICES

Appendix A Stormwater Quantity Construction Cost Estimates

Appendix B Stormwater Quality Construction Cost Estimates

Appendix C Infrastructure Charges Calculations

1. INTRODUCTION

Redland City Council (RCC) has commissioned Engeny to develop a stormwater infrastructure plan for the proposed Kinross Road development area.

The purpose of this study is to determine the integrated stormwater quantity and quality trunk infrastructure requirements, associated costs, and infrastructure charges for the proposed development area. The stormwater infrastructure plan will assist Council in applying appropriate planning and acquisition principles for servicing forecasted demands. Refer to Figure 1.1 which illustrates the extent of the Kinross Road Structure Plan Area.

The former South East Queensland Regional Plan 2005-2026 included Kinross Road within the Urban Footprint regional land use category. On 16 June 2006, Kinross Road was identified as a Major Development Area (MDA) by the regional planning Minister. In accordance with the South East Queensland Regional Plan 2009-2031 (SEQ Regional Plan), land use and infrastructure planning is required to be prepared and adopted prior to any future development taking place within the Kinross Road Structure Plan Area.

A number of studies previously undertaken to assist in the development of the Kinross Road Structure Plan have been used by Engeny to provide background information to this study. The previous studies include:

- Kinross Road Structure Plan Site Issues and Values Summary Report (Parsons Brinckerhoff, 2006);
- Kinross Road Draft Structure Plan (RCC, 2008) ; and
- Hilliards Creek Catchment Management Plan (JWP, 2007).

The investigation has adopted a design approach consistent with the Queensland Government's Guide to Planning Stormwater Trunk Infrastructure (March, 2010), Statutory Guideline 01/09, Queensland Urban Design Manual (QUDM) and relevant Council policies for stormwater management.



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Kinross Road Structure Plan

Locality Plan

Figure 1.1

2. SCOPE OF WORKS

The scope of works for this study has included stormwater quantity and quality analysis works, including determination of infrastructure requirements, associated construction costs, infrastructure charges as well as reporting. Specifically, the technical scope of works included the following:

- **Stormwater Quantity**
  - Development of an existing case XP-RAFTS hydrologic and TUFLOW hydraulic model representing the existing land use conditions and existing stormwater infrastructure throughout the study area;
  - Simulate the existing case model for the 100 year ARI design event to determine the existing design flows and flood levels and assess the hydraulic capacity of the existing stormwater infrastructure;
  - Development of an existing case XP-RAFTS hydrologic and TUFLOW hydraulic model to represent the proposed development plan which comprises the proposed ultimate land use within the development area;
  - Simulate the ultimate case model for the 100 year ARI design events to determine the ultimate design flows and flood levels and afflux for the range of events and assess the hydraulic capacity of the existing stormwater infrastructure (i.e. culvert crossings);
  - Concept design of proposed stormwater quantity mitigation measures including estimation of construction costs and infrastructure maps for the proposed trunk infrastructure requirements to cater for the proposed development.

- **Stormwater Quality**
  - Development of a MUSIC Version 3.0 model for the catchment to represent the ultimate development unmitigated scenario. This model allows for a quantitative assessment of stormwater runoff quality for the proposed development plan (proposed ultimate land use);
  - Amend the ultimate development unmitigated MUSIC model to include the appropriate treatment measures required to achieve the prescribed water quality objectives from the catchment. This model represents the ultimate mitigated scenario for the proposed development area and enables the appropriate water quality treatment infrastructure to be defined;
  - Concept design of the proposed stormwater quality mitigation measures including estimation of construction costs for the proposed water quality trunk infrastructure requirements for the proposed development.

3. CATCHMENT DESCRIPTION

The Kinross Road development area covers one hundred and ninety one (191) hectares of land which is bounded by Hilliards Creek to the west, Boundary Road to the south, and a mixture of residential and bushland areas to the east and north.

While the majority of the existing land use for the catchment consists of Rural Residential and Open Space with discrete areas of Commercial (typically poultry farms), the ultimate land uses comprises a mixture of Urban and Medium Density Residential, Open Space with pockets of Community Purpose, Environmental Protection and Local Centre areas.

Three main drainage corridors have been identified within the structure plan area which can also be defined as the flood prone area. These three corridors include Hilliards Creek Corridor in west, and minor waterways to the north and east. These drainage corridors are serviced by a number of smaller discrete drainage lines throughout the study area. Figure 1.1 shows the location of the waterway corridors.

4. TRUNK INFRASTRUCTURE NETWORK COMPONENTS

According to the Department of Infrastructure and Planning's (DIP) Statutory Guidelines 01/09 for Priority Infrastructure Plans and Infrastructure Charges Schedules, trunk infrastructure is defined as 'higher order' development infrastructure planned, funded and provided by local governments and shared between developments. The guidelines also state that local governments should apply proper planning and acquisition principles for servicing forecasted demands rather than imposing development conditions requiring stormwater to be retained and treated on-site. In accordance with Statutory Guidelines, Table 4.1 outlines potential inclusions for trunk infrastructure charges for the Kinross Road Structure Plan Area.

Table 4.1 Potential Inclusions for Infrastructure Charges

Network	Inclusions
Stormwater Quantity	Pipes, box culverts, manholes, inlets and outlets
	Detention/retention facilities
	Channels and overland flow paths (natural and constructed)
	Bank stabilisation, erosion protection and revegetation (only as direct result in increase in demand)
Stormwater Quality	Riparian corridors
	Wetlands
	Gross Pollutant Traps (GPT's)
	Stormwater quality improvement devices (SQIDS)
	Bio-retention facilities

This study has identified the stormwater quantity and quality trunk infrastructure requirements for the Kinross Road Structure Plan Area which is outlined in Section 7. It is noted that both the existing (culverts) and proposed trunk stormwater infrastructure meet RCC's desired level of service.

5. STORMWATER QUANTITY ASSESSMENT

5.1 Introduction and Approach

The increase in impervious areas associated with urban development generally leads to increased runoff volumes, reduced infiltration to groundwater and increased rates of runoff and stream flow. Hydrologic and hydraulic modelling has therefore been undertaken to assess the impacts associated with the proposed development of the Kinross Road Development Area. In particular, this includes assessment of mostly natural channels throughout the study area (including a number of farm dam storages) and a limited number of road crossings within and downstream of the Kinross Road Development Area for both the existing and ultimate development conditions.

These works have been undertaken to determine whether stormwater infrastructure upgrades are required as a result of the increase in flow due to the proposed development. A specific assessment has also been undertaken to determine the associated impacts on the receiving waterways located to the north, east and west of the study area.

5.2 Regional Hydrologic Analysis

The regional hydrological impacts from the development were assessed by estimating the peak flows discharging from the various catchments within the Kinross Road study area and the associated impacts on the receiving waterways (i.e. Hilliards Ceek).

The TUFLOW hydraulic modelling software was used to determine the impacts beyond the study area boundary. Given the discrete and detailed nature of many of the catchments within the study area, it was considered appropriate to adopt a 'direct rainfall' modelling approach within the TUFLOW hydraulic modelling software. This approach applies a representative rainfall hyetograph in mm/hr and is converted to a hydrograph to smooth the transition from one rainfall period to another. This approach essentially replaces the need to use a separate hydrological model. Initial and continuing losses are applied via the associated land use.

In order to determine the correct design storm to apply using the direct rainfall approach, an analysis of the time of concentration for each respective sub-catchment was undertaken. Typically for the small catchments within the study area, this range between 5 and 20 minutes. The smaller time of concentrations were typically evident in the smaller, steeper catchments draining to Hilliards Creek, whilst the larger flatter catchments draining to the north and east had the longer times of concentration.

Hydrographs for the Hilliards Creek inflows at Boundary Road and Redland Bay Road were obtained from the report titled 'Hilliards Creek Flood Study' (JWP, 2007). Whilst these inflows were available for the 100 year ARI event, no inflows were available for the 10 year ARI event at the time of this study at these locations. As a result, no regional 10 year ARI inflows have been modelled for the 10 year ARI event simulation.

5.2.1 Catchment Characteristics

Model parameters for each sub-catchment have been selected from recommended design values for various categories of land use types based upon the provisions of the Queensland Urban Drainage Manual (QUDM, 2007). The determination of pervious and impervious areas of each sub-catchment for the Existing Case was undertaken using the Council supplied Aerial photography (MainLand_Mosaic_2008). The existing land use for the Kinross Road catchment is illustrated in Figure 5.1.

The pervious and impervious area of each sub-catchment for the Ultimate Case was determined from the proposed Kinross Road land use plan as provided by Council. The proposed future (ultimate) land use consists of a mixture of Urban and Medium Density Residential, Open Space, and pockets of Community Purpose, Environmental Protection and Local Centre areas. The percentage impervious values have been determined for each land use in accordance with Redland City Council Planning Scheme- Policy 9- Stormwater Management and also the Kinross Road demographic data provided by Redland City Council (i.e. Urban Residential Zone (UR1) is assumed to consist of 15 lots per hectare which equates to 660m^2 lot size and a fraction impervious factor of 0.5 as per Policy 9).

The ultimate land use for the Kinross Road development area is illustrated in Figure 4.2. The land use outside the Kinross Road development area was assumed not to change between the Existing and Ultimate Cases. Table 5.1 below outlines the adopted impervious values for each land use type for the existing and ultimate development land use scenarios.

Table 5.1 Land Use Percent Impervious values

Land Use	Percent Impervious (%)
Urban Residential Zone (UR1)	50
Medium Density Residential	80
Rural Residential	20
Non Urban/Rural	10
Local Centre	100
Community	60
Road	90
Public Open Space	0

Existing and Ultimate catchment plans are presented in Figures 5.1 and 5.2.

N
W
E
S

REDLAND BAY ROAD

KINROSS ROAD

BOUNDARY ROAD

PANORAMA DRIVE

Legend

Kinross Road Structure Plan Area

Existing Landuse

- Water Body
- Road
- Open Space / Grass
- Open Space / Lightly Vegetated
- Open Space / Medium Vegetation
- Open Space / Thick Vegetation
- Open Space / Heavy Vegetation
- Building
- Low Density Residential
- Rural Residential

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Kinross Road Structure Plan

Existing Landuse

Figure 5.1

N
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REDLAND BAY ROAD

KINROSS ROAD

BOUNDARY ROAD

PANORAMA DRIVE

Legend

Kinross Road Structure Plan Area

Ultimate Landuse

- Community Purposes
- Conservation
- Environmental Protection
- Local Centre
- Low Density Residential
- Medium Density Residential
- Open Space
- Urban Residential

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Kinross Road Structure Plan

Ultimate Landuse

Figure 5.2

5.2.2 Rainfall Losses and Intensities

Table 5.2 below outlines the rainfall loss parameters used in the TUFLOW direct rainfall model. These losses are applied via the associated materials delineation of the study area and are factored according to the percentage imperviousness of the associated landuse (e.g Urban Residential [50% impervious] would have an associated initial and continuing rainfall loss of 7.5mm/h and 1.75mm/hr respectively).

Table 5.2 Rainfall Loss Parameters

Surface Condition	Rainfall Losses
Impervious surfaces	Initial Loss 0mm
	Continuing Loss 1mm/hr
Pervious Surfaces	Initial loss 15mm
	Continuing Loss 2.5mm/hr

The design rainfall Intensity-Frequency Duration (IFD) data for various storm events within the development area were derived based upon the procedures outlined in Book 2 of Australian Rainfall and Runoff (AR&R 2001 edition).

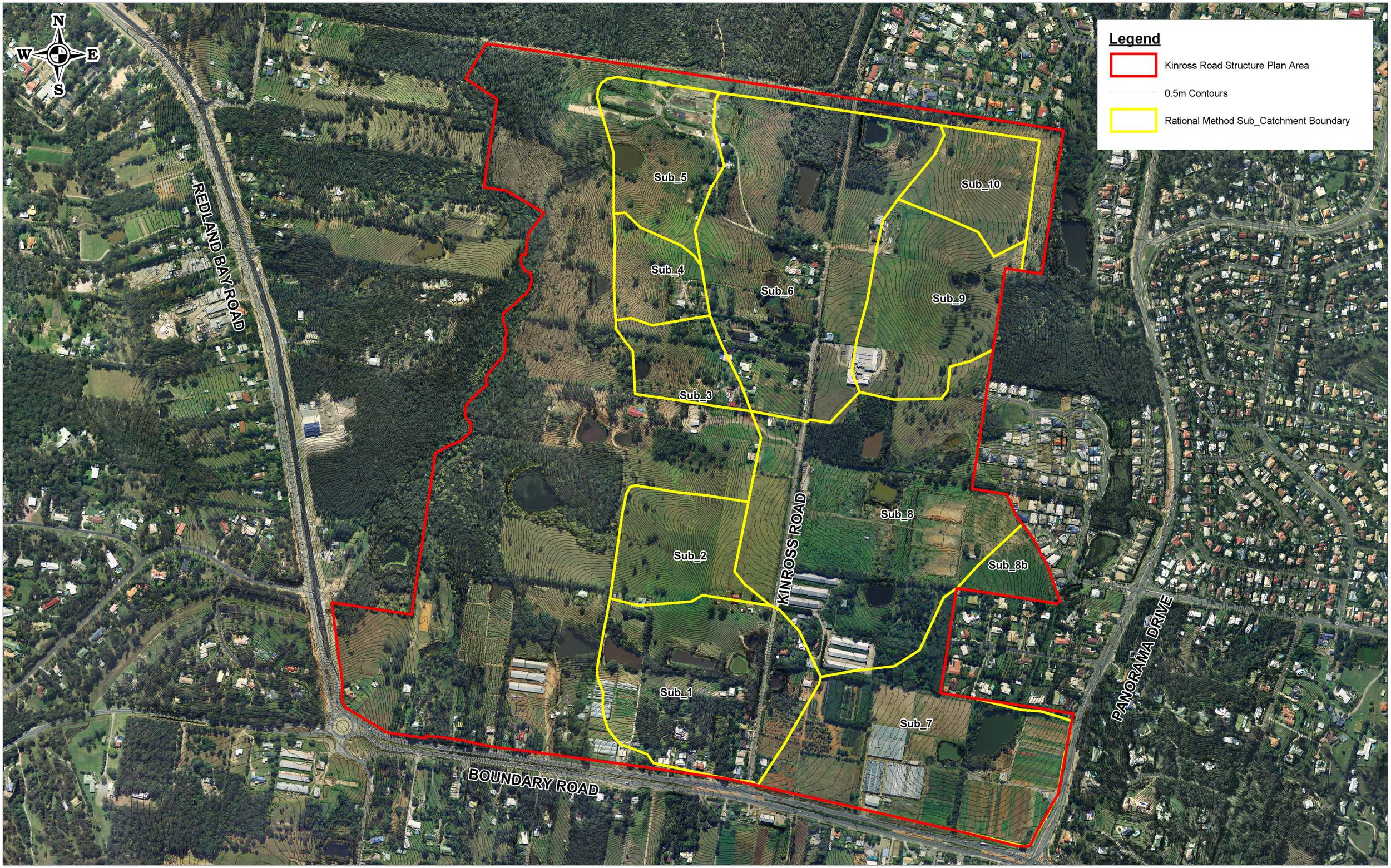
5.2.3 Hydrologic Model Validation

Sub-catchment flows throughout the development area have been independently verified through the use of the Rational Method. A comparison of two (2) sub-catchments was undertaken to compare the TUFLOW 100 year ARI peak flows representing the Existing Case and the Rational Method flows. The results are summarized in Table 5.3.

Table 5.3 Rational and TUFLOW Flow Comparison

Rational Method Locations	Rational Method Flow (m^3/sec)	TUFLOW Peak Flow (m^3/sec)	Difference
Sub_2	2.56	2.47	-3.6%
Sub_6	8.81	9.41	-6.4%

Figure 5.3 illustrates locations of the flow validation points. In general, flow comparisons between the TUFLOW model and the Rational Method correlate well (i.e. within 15%). Typically flow predictions using the TUFLOW direct rainfall approach are lower than those predicted by the Rational Method due to the effects of routing and storages within the model. This is particularly true for the Kinross Road development area, where a significant number of farm dams and existing/natural storages are evident.



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Kinross Road Structure Plan

Figure 5.3

Stormwater Quantity Sub-Catchment Layout

5.2.4 Regional Hydrologic Results

Whilst it has been predicted that local increases in flows may occur as a result of the proposed development, modelling results suggest flood levels in Hilliards Creek adjacent to the site and downstream are dominated by the regional flows from the large contributing catchments upstream of Boundary Road and Redland Bay Road. These regional flows peak some time after the local flows from the Kinross Road study area have already travelled downstream. It is therefore unlikely that unmitigated flows from these western facing catchments would result in adverse impacts on flood levels downstream from the site.

In addition, it is also likely that downstream flows may increase in the event that detention is provided given flow translation and attenuation effects including the likely coincidence of peak flows between the respective flood events. Given the location of the proposed development area in relation to the overall Hilliards Creek catchment and downstream land uses, there would not appear to be any likely significant impacts on downstream residents.

On the basis of the above discussion, it was considered appropriate to exclude detention of stormwater flows from the western facing catchments of the study area which flow into Hilliards Creek.

Detention options for the northern and eastern facing catchments of the study area have been investigated as increases in peak flows may impact on downstream properties. This is summarised in the following sections.

5.2.5 Local Hydrologic Analysis

Given that the proposed development is unlikely to increase peaks flows or flood levels within Hilliard Creek, a comparison of local flows for the existing and ultimate development scenarios has been undertaken for the local sub-catchments discharging to the eastern and northern waterway systems. The pre-development (Existing) and post-development (Ultimate) flows are summarised in Table 5.4. Refer to Figure 5.3 for reporting locations. The peak flows have been obtained from the Rational Method analysis at the proposed legal points of discharge at the bottom of the catchments outlined in Figure 5.3 into either the existing open space areas or existing waterways.

Table 5.4 Rational Method 100 year ARI Flow Comparison

Locations	Existing Peak Flow (m^3/sec)	Ultimate Peak Flow (m^3/sec)	Difference (%)
Sub_1	6.7	6.97	3.9
Sub_2	2.56	3.63	29.4
Sub_3	1.65	2.22	25.7
Sub_4	1.63	2.01	18.8
Sub_5	3.2	4.08	21.4
Sub_6	8.81	12.47	29.3
Sub_7	6.85	9.56	28.4
Sub_8	10.01	14.25	29.7
Sub_8b	0.82	1.10	25.5
Sub_9	4.60	5.69	19.1
Sub_10	2.17	2.91	25.5

The comparison of flows demonstrates the hydrologic impacts associated with urban development are due to the increase in impervious areas.

- Investigation of Detention Basins

Assessment of stormwater detention requirements for the northern and eastern flowing sub catchments has been undertaken to achieve a no net worsening of peak flows at each adopted legal point of discharge (LPD).

Results of the Rational Method analysis show an increase in peak discharge at the LPD of each sub catchment when comparing peak ultimate development flows to the existing case.

In order to achieve the objective of no net worsening, detention basin sizing has been undertaken to reduce ultimate development peak discharges to that of the existing condition. Sizing of detention basins was undertaken using XP-RAFTS hydrologic modelling, with the

results validated against the peak Rational Method results. Table 5.5 summarises the results of the detention basin sizing, while Figure 7.1 presents the proposed locations of detention basins within the Kinross Road Structure Plan study area.

Table 5.5 RAFTS Detention Basin Sizing

Catchment	Pre-Development Flow Rate (m^3s)	Post-Development (Unmitigated) Flow Rate (m^3s)	Post-Development (Mitigated) Flow Rate (m^3s)	Peak Detention Volume (m^3)
Sub_6	8.27	15.04	8.00	8 970
Sub_7	5.33	12.29	5.31	8 325
Sub_8	8.78	14.68	7.88	10 460
Sub_8b	4.25	7.07	4.24	420
Sub_9	2.80	4.03	2.76	3 746
Sub_10	1.19	1.54	1.14	1 708

Given the number of existing farm dams within the open space areas, an investigation was carried out into the possibility of using existing dams to act as detention basins by way of minor modification (i.e. bund raising, etc.). The end area method was used to calculate volumes that would be available above the existing standing water level by way of minor increases in bund wall height. It was shown that minor modifications to the existing dams in Sub-catchments 6, 7 and 8 would be sufficient to achieve the detention requirements, whilst still maintaining the visual amenity of the existing farm dams and surrounding flora. At the time of this study, it is understood that Council intend to maintain the visual amenity of the existing farm dams (where possible). It is recommended that consideration be given to public safety and nuisance.

It is noted that for catchment 'Sub_6', RCC has requested the basin be placed upstream of the proposed road crossing within the watercourse at this location. As this reduces the catchment area flowing to the basin, an over-attenuation of flows in the upper catchment will be required to reduce overall catchment flows to existing levels at the Kinross Road Development Area boundary.

It should be noted that the determination of detention basin requirements was undertaken for the 100 year ARI event and therefore further analysis would be required at the detailed design stage to ensure that the outlet configuration achieves the stormwater quantity objectives for the range of design flood events.

5.3 Hydraulic Analysis

Hydraulic analysis of the Kinross Road study area using the TUFLOW modelling package was undertaken to determine both the existing and ultimate case flood extents, as well as hydraulic structure performance.

The following sections detail the parameters and data used in the creation of the TUFLOW models.

5.3.1 Model Parameters

The TUFLOW hydraulic model parameters adopted for the various modelling scenarios investigated in this study are summarised briefly below.

5.3.2 Roughness

Hydraulic roughness for the model has been adopted based on a Manning's "n" roughness coefficient which was determined from the 2008 aerial photographs in combination with a site inspection. Typical roughness "n" values ranged from 0.014 for concrete pipes through to 0.200 which was used to represent buildings (no flow areas) whilst maintaining flood storage representation.

5.3.3 Stormwater Pipe System

Existing stormwater pipe data was supplied by Council in a MapInfo spatial GIS format. Any missing data was obtained during site visit, which was also used to confirm supplied data from Council.

Typically, the pipe information included pipe sizes, invert levels and spatial locations which assisted in locating stormwater assets throughout the system as well as defining pipe lengths. Where culvert invert level information was not available, analysis of the Digital Elevation Model (DEM) and site photographic record were used to estimate invert levels. This method provided a level of detail which is sufficient for the purposes of this study. Existing stormwater infrastructure locations within the Kinross Road development area are presented in Table 5.5 and Figure 5.3.

5.3.4 Model Topography

Redland City Council has provided 0.5m Contours from which a Digital Elevation Model (DEM) was created using a 1 metre grid size.

All modelling works undertaken for this study have been prepared based on the aforementioned DEM. A grid size within the TUFLOW model of 4m has been adopted, and ground surface elevations for each cell are based on the topographic detail provided by the created DEM.

Discrete drainage features can sometimes be poorly represented in the topographic data (and DEM), and modifications to model topography based on site inspection and photographic record may have been undertaken to more accurately represent flow behaviour.

5.3.5 Hydraulic Model Scenarios

- Existing Case Investigation

This scenario represents the existing catchment flows and existing trunk infrastructure throughout the catchment. The various discrete catchments drain by way of three (3) waterway corridors - to the west (Hilliards Creek) and minor waterways to the north and east. These drainage corridors are serviced by a number of smaller discrete drainage lines throughout the study area.

Some stormwater infrastructure data was provided by Council in GIS format and included stormwater pipes, inlet pits and manholes. From the provided infrastructure data, only two (2) culverts exist within the study area, one crossing of Kinross Road and one additional culvert located as part of an existing detention basin in the eastern facing catchment (adjacent to Lyndhurst Place). A site visit was conducted to obtain measurements of the remaining existing culvert data not provided by Council (including culverts outside the study area). This scenario allows for the determination of existing design flows for the range of events as well as assessment of the hydraulic capacity of the existing culverts. This scenario identified the target flows and flood levels from which the assessment of infrastructure upgrades (if required) could be compared.

The TUFLOW model has been utilised to comprehensively assess the hydraulic capacity of existing stormwater infrastructure within the Kinross Road study area. TUFLOW hydraulic modelling has been undertaken for the 100 year ARI design event.

Culverts details used in the existing investigation of stormwater infrastructure are presented below in Table 5.5. Culvert locations are shown in Figure 5.3.

Table 5.6 Existing Culvert Details

Culvert ID	Type	Size	Upstream Invert Level (m AHD)	Downstream Invert Level (m AHD)
Culvert 1	RCP	450mm	56.00*	55.70*
Culvert 8 (Detention Basin Outlet)	RCP	750mm	44.95	44.92

*Denotes interpolated invert levels.

Engeny has also undertaken an assessment of the potential impacts on flood behaviour downstream of the development area in the minor tributaries of Hilliards Creek to the north and east of the development area. This includes a number of wetland and road crossings.

Inflows for Redland Bay Road and Boundary Road from the upper Hilliards Creek catchment have been interpolated from those specified in the *'Hilliards Creek Flood Study'* (JWP, 2007). The peak 100 year ARI flows at these locations (90 minute peak storm duration) of $35m^3/s$ and $24m^3/s$ respectively occur after approximately 2 hours at both inflow locations and is the dominant source of flooding along the Hilliards Creek boundary of the study area. As mentioned previously, no inflows were available for the 10 year ARI event at the time of this study at these locations. As a result, no regional 10 year ARI inflows have been modelled for the 10 year ARI event simulation.

- Ultimate Case Investigation

This scenario represents the ultimate catchment flows and existing trunk infrastructure throughout the development area. Analysis of this scenario has been undertaken to ensure that adequate flow conveyance exists in the trunk drainage system to cater for the proposed ultimate development of the area and to ensure roads are trafficable in accordance with QUDM maximum requirements of maximum 250mm depth and 0.6 depth velocity product.

Given the number of discrete natural open channels servicing the study area, investigation was also undertaken into whether adequate capacities were evident in these natural channel features for ultimate case flows.

- Investigation of Trunk Drainage Infrastructure

The assessment of sub surface trunk drainage infrastructure requirements to service the proposed development area was not considered necessary due to the natural topography of the study area and associated number of small discrete sub catchments and associated flow lines. Given the significant number of discrete sub catchments and associated local waterways servicing the subject area, it is considered that numerous legal points of discharge (LPD) will be available, and only minor local sub surface drainage features will be required within the subject site.

- Investigation of Mitigation Infrastructure (Stormwater Detention)

Flood modelling results predicted minor increases in flood levels in the northern and eastern draining minor waterways of the study area as a result from the Kinross Road development. As discussed in Section 5.2.4, investigation into stormwater detention has been carried out for these waterways using XP-RAFTS hydrologic modelling for the 100 year ARI flood event.

As the developed (ultimate case) catchment boundaries are typically modified from those evident in the existing case due to constructed features such as roads and bulk earthworks associated with building pad creation, hydraulic modelling assessment of the developed case mitigated scenario has not been undertaken.

It is likely that this detailed assessment would be undertaken by Council during the detailed design phase of the development, where the proposed final topography for the developed case scenario contributing to the basins could be clearly identified.

5.3.6 Hydraulic Results

- Culvert Investigation Results

The culvert capacities have been assessed using TUFLOW in order to ensure that adequate flow conveyance exists in the trunk drainage system to cater for the proposed ultimate development of the area and to ensure roads are trafficable in accordance with QUDM maximum requirements of maximum 250mm depth and 0.6 depth velocity product.

Modelling results predicted that no upgrade of ‘Culvert 1’ (refer Figure 5.4) is required as it has been determined that the existing stormwater infrastructure has sufficient capacity to accommodate flows in both the existing and developed cases. That is, the QUDM maximum requirements of maximum 250mm depth and 0.6 depth velocity product are not predicted to be exceeded in either scenario.

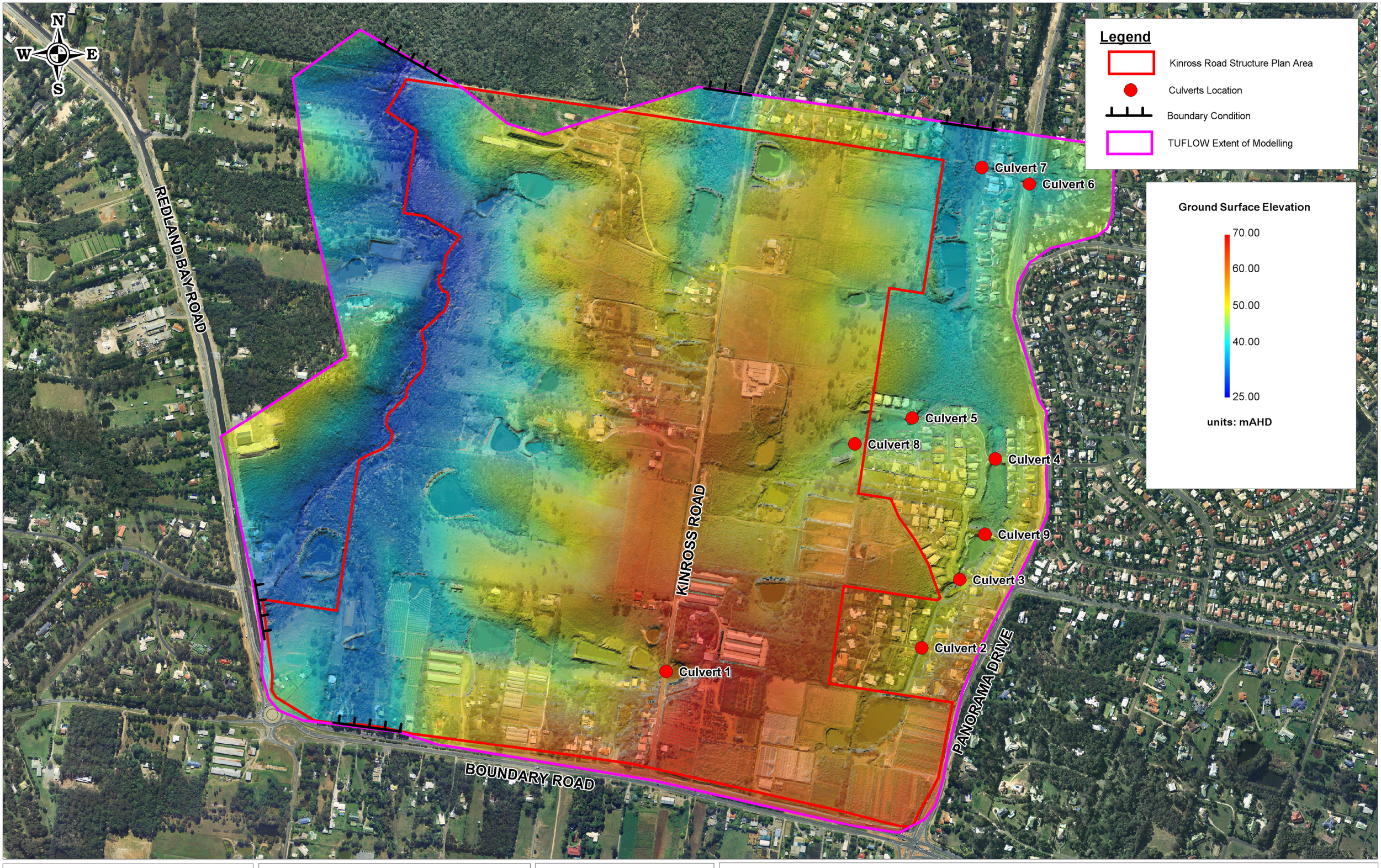
Results similarly suggest that ‘Culvert 8’ (refer Figure 5.4) has sufficient capacity in the existing case. It is noted that this culvert is in fact a low flow feature of a detention basin located upstream of Carlingford Drive. As it is proposed that this detention basin will be augmented to accommodate post development flows from the Kinross Road Structure Plan Area, it has been assumed that this culvert will be either replaced or augmented during the construction of the basin. The cost of this culvert augmentation has been included in the preliminary cost estimates for this feature (Detention Basin 8).

It is noted that any cross road drainage features associated with the proposed new road network have not been included in this analysis. The design and sizing of these features would need to be undertaken by Council during the detailed design phase of the development.

- Natural Channel Capacity Results

The major overland flow paths (Q100) represented by the latest Flood Layer, Version 3 of the Redland City Planning Scheme (RPS) are considered to be trunk infrastructure for the Kinross Road development area due to the fact that the overland flow paths provide flood conveyance for the entire Kinross Road development area.

Review of topography and existing and ultimate case modelling results suggests that the existing natural channels in the open space areas have adequate capacity to handle ultimate case design flows. Typically the increases in peak flows in the upper tributaries of development area results in only very minor increases in flood extents, and are typically representative of V3 of the RPS Flood Layer supplied by RCC.



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Kinross Road Structure Plan

TUFLOW Hydraulic Model Layout

Figure 5.4

N
W
E
S

REDLAND BAY ROAD

KINROSS ROAD

PANORAMA DRIVE

BOUNDARY ROAD

Legend

- Kinross Road Structure Plan Area
- TUFLOW Extent of Modelling
- 1 in 100 Year ARI Flood Layer, V3- RPS

Depth (m)

- 0.05 to 0.25
- 0.25 to 0.50
- 0.50 to 1.00
- 1.00 to 1.50
- 1.50 to 2.00
- 2.00 to 4.00
- > 4.00

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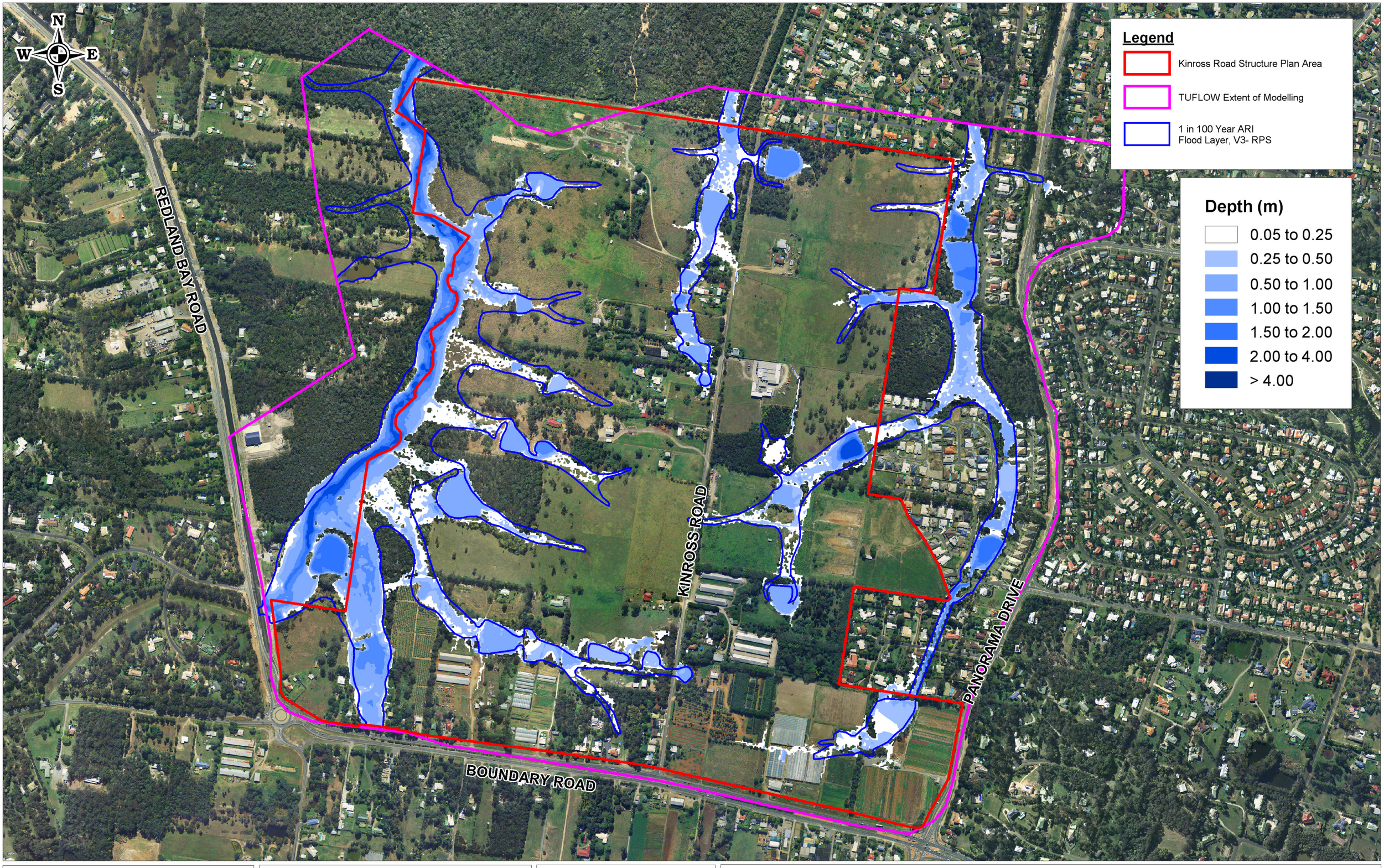
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Kinross Road Structure Plan

Q100 Existing Case Flood Depth and Extent (TUFLOW Modelling)

Figure 5.5



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Kinross Road Structure Plan

Q100 Ultimate Case Flood Depth and Extent (TUFLOW Modelling)

Figure 5.6

N
W
E
S

REDLAND BAY ROAD

KINROSS ROAD

PANORAMA DRIVE

BOUNDARY ROAD

Legend

- Kinross Road Structure Plan Area
- TUFLOW Extent of Modelling
- 1 in 100 Year ARI Flood Layer, V3- RPS

Afflux (m)

- -0.50 to -0.30
- -0.30 to -0.20
- -0.20 to -0.10
- -0.10 to -0.05
- -0.05 to -0.02
- -0.02 to 0.02
- 0.02 to 0.05
- 0.05 to 0.10
- 0.10 to 0.20
- 0.20 to 0.30
- 0.30 to 0.50

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Kinross Road Structure Plan

Q100 Ultimate Case Flood Afflux (TUFLOW Modelling)

Figure 5.7

6. STORMWATER QUALITY ANALYSIS

6.1 MUSIC Modelling

A quantitative assessment of stormwater runoff quality has been undertaken for the ultimate land use scenario for the Kinross Road Structure Plan Area. This assessment was undertaken in order to develop a required footprint for regional water quality treatment devices within the Kinross Road Structure Plan Area.

In completing the water quality modelling for the Kinross Road catchments, the load based objectives identified within the South East Queensland Regional Plan as well as those adopted by the Healthy Waterways Partnership have been used. Load based objectives compare loads produced by an unmitigated developed catchment to the loads coming from the developed catchment where Water Sensitive Urban Design has been implemented. It is recommended that these objectives for urbanised areas within the Kinross Road catchment are adopted to ensure “Best Practice” Stormwater Management Standards are achieved. The percentage removal efficiency or the “treatment train effectiveness” required to be achieved are outlined in Table 6.1.

Load based targets stipulated in the South East Queensland Regional Plan 2005-2026 Implementation Guideline No. 7 were adopted for discharge targets from urban areas as outlined in Table 6.1.

Table 6.1 RCC Water Quality Objectives

Pollutant Type	Objective	South East Queensland Regional Plan Load Based Reduction Targets
Total Suspended Solid	Reduction in average annual load of pollutants leaving the developed unmitigated scenario compared to the developed mitigated scenario	80 %
Total Phosphorous	Reduction in average annual load of pollutants leaving the developed unmitigated scenario compared to the developed mitigated scenario	60%
Total Nitrogen	Reduction in average annual load of pollutants leaving the developed unmitigated scenario compared to the developed mitigated scenario	45%
Gross Pollutant	Reduction in average annual load of pollutants leaving the developed unmitigated scenario compared to the developed mitigated scenario	90%

The MUSIC model was established for the ultimate catchment scenario. Climate data for the catchment was sourced from the Bureau of Meteorology (BOM). Rainfall data is from the Redlands BOM station (40265), and uses the 1996-2001 rainfall events with 6 minute rainfall duration.

A quantitative assessment of stormwater runoff quality has been considered for the ultimate land use scenario of the Kinross Road catchments. The pollutant export loads from the catchment were assessed using the Cooperative Research Centre for Catchment Hydrology's (CRCCH) Model for Urban Stormwater Improvement Conceptualisation (MUSIC). MUSIC is a decision support tool, used to plan and design appropriate urban stormwater management systems at the conceptual level. MUSIC Version 3.0, released in June 2005, was used in this assessment.

As Redland City Council does not have specific guidelines on MUSIC modelling, the Brisbane City Council (BCC) "Pollutant Export Modelling Guidelines" and Gold Coast City Council's (GCCC) "MUSIC Modelling Guidelines 2006" was used, in conjunction with the Healthy Waterways "Water Sensitive Urban Design Technical Design Guidelines for South East Queensland". The stormwater quality treatment devices incorporated into the catchment model have been setup based on the design parameters recommended by the GCCC and Healthy Waterways Guidelines.

The MUSIC model was established for the ultimate unmitigated and ultimate mitigated scenarios. This involved the following steps:

1. Climate data for the catchment was sourced from the Bureau of Meteorology (BOM). Rainfall data is from the Redlands BOM station (40265), and uses the 1996-2001 rainfall events with six (6) minute rainfall duration.
2. Land uses for the ultimate catchment were derived from GIS information supplied by Redland City Council. The representation of each zoning within MUSIC has been defined in Table 6.2.
3. The natural assimilative capacity of any waterway was not able to be represented within the MUSIC model as it presently does not have the capability to perform in-stream treatment effectiveness assessment.
4. A breakdown of the MUSIC land uses within each sub-catchment is detailed in Table 6.2.

Table 6.2 Land Uses adopted in MUSIC

Land Use Type	Description	MUSIC Land Use
1	Urban Residential	Urban Residential
2	Medium Density Residential	Urban Residential
3	Local Centre	Commercial
4	Community	Commercial

It should be noted that rainwater tanks have not been considered for the purpose of identifying trunk stormwater infrastructure and the requirements for rainwater tanks are managed separately under the Queensland Development Code.

6.1.1 Typical Treatment Train

Best management practices in Water Sensitive Urban Design (WSUD) techniques are proposed to be implemented throughout the Kinross Road Structure Plan Area. Stormwater runoff will be treated by a range of treatment devices prior to discharge to the receiving waterways. Certain techniques of WSUD target varying aspects with regard to pollutant reduction and water re-use. Examples of typical WSUD treatment measures include:

Gross Pollutant Traps (GPT's)

GPT's trap coarse sediment, trash and debris carried in stormwater flows. Most GPT's act by passing a design storm flow collected from the pipe networks through a screen. This screen captures gross pollutants down to a certain diameter. The GPT's are generally designed so that flows above the design event by-pass the trash screens so that re-suspension of captured material does not occur. Regardless of the type of gross pollutant trap incorporated into the treatment train, these mechanical separators play an important role in reducing the gross pollutant load on the waterways. GPT's were only recommended

in area identified as being high litter generation areas. These land uses have been identified as being School, Business and Town Centre. The GPT's have been proposed at the pipe outlet immediately upstream of the bio-retention basins.

Bio-Retention Basins

Bio-retention basins use ponding above a bio-retention surface to maximise the volume of runoff through the filtration media. Their operation for treatment is in a similar manner as for a bio-retention swale, but typically they convey flows above the design event through overflow pits.

The treatment system operates by firstly filtering surface flows through surface vegetation and then percolating runoff through prescribed filtration media that provides treatment through fine filtration, extended detention and some biological uptake. They also provide flow retardation for smaller events and are particularly efficient in removing nutrients. The MUSIC modelling undertaken has shown that the surface area of a bio-retention system is required to be approximately 1.7% of the contributing developable area.

6.2 Stormwater Quality Results

A MUSIC model was developed for the Kinross Road Structure Plan Area. The water quality sub-catchments have been illustrated in Figure 7.2 whilst the MUSIC model layout for the Kinross Road Structure Plan Area is provided in Figure 6.1. Outlined in Table 6.3 is the MUSIC modelling results which demonstrate that the load based objectives for the catchment have been achieved using thirteen (13) GPT's and thirteen (13) bio-retention basins. The details of the proposed treatment measures are outlined in Section 7.2.

Table 6.3 MUSIC Modelling Results

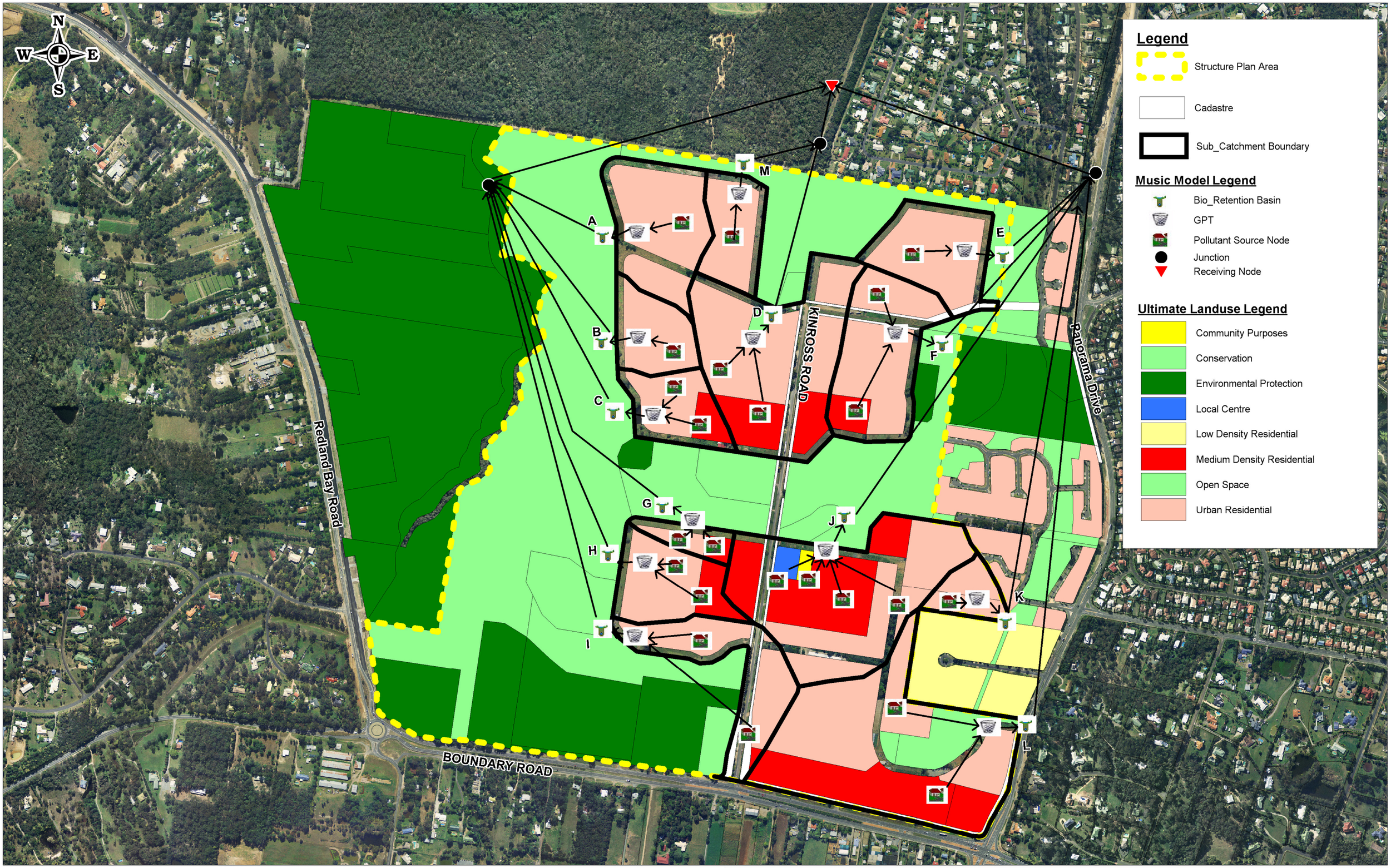
Location	Pollutants	Unmitigated	Mitigated	Reduction (%)	Target	Target Achieved
Receiving Node	**TSS (kg/yr)**	**70900.0**	**3990.0**	**94.4**	**80**	✓
	TP (kg/yr)	**141**	**36.9**	**73.8**	**60**	✓
	TN (kg/yr)	**706**	**385**	**45.4**	**45**	✓
	GP (kg/yr)	**8830.0**	**0**	**100**	**90**	✓
Basin A	TSS (kg/yr)	5110.0	270	94.7	80	✓
	TP (kg/yr)	10.1	2.57	74.7	60	✓
	TN (kg/yr)	51	27.8	45.5	45	✓

Location	Pollutants	Unmitigated	Mitigated	Reduction (%)	Target	Target Achieved
	GP (kg/yr)	629	0	100	90	✓
Basin B	TSS (kg/yr)	2390.0	139	94.2	80	✓
	TP (kg/yr)	4.86	1.29	73.6	60	✓
	TN (kg/yr)	24.7	13.5	45.5	45	✓
	GP (kg/yr)	304	0	100	90	✓
Basin C	TSS (kg/yr)	2860.0	169	94.1	80	✓
	TP (kg/yr)	5.67	1.47	74.2	60	✓
	TN (kg/yr)	28.2	15.3	45.5	45	✓
	GP (kg/yr)	352	0	100	90	✓
Basin D	TSS (kg/yr)	9790.0	528	94.6	80	✓
	TP (kg/yr)	19.9	5.13	74.2	60	✓
	TN (kg/yr)	99.5	53.9	45.8	45	✓
	GP (kg/yr)	1230.0	0	100	90	✓
Basin E	TSS (kg/yr)	4190.0	244	94.2	80	✓
	TP (kg/yr)	8.02	2.07	74.2	60	✓
	TN (kg/yr)	39.8	21.8	45.2	45	✓
	GP (kg/yr)	491	0	100	90	✓
Basin F	TSS (kg/yr)	5820	329	94.3	80	✓
	TP (kg/yr)	11.6	2.96	74.4	60	✓
	TN (kg/yr)	58.8	32.2	45.1	45	✓
	GP (kg/yr)	715	0	100	90	✓

Location	Pollutants	Unmitigated	Mitigated	Reduction (%)	Target	Target Achieved
Basin G	TSS (kg/yr)	1140.0	63.3	94.4	80	✓
	TP (kg/yr)	2.22	0.558	74.9	60	✓
	TN (kg/yr)	11	6.01	45.3	45	✓
	GP (kg/yr)	138	0	100	90	✓
Basin H	TSS (kg/yr)	3750.0	212	94.3	80	✓
	TP (kg/yr)	7.42	1.94	73.8	60	✓
	TN (kg/yr)	36.4	19.9	45.4	45	✓
	GP (kg/yr)	454	0	100	90	✓
Basin I	TSS (kg/yr)	4450.0	264	94.1	80	✓
	TP (kg/yr)	8.64	2.3	73.4	60	✓
	TN (kg/yr)	45.2	24.5	45.7	45	✓
	GP (kg/yr)	534	0	100	90	✓
Basin J	TSS (kg/yr)	12300.0	553	95.5	80	✓
	TP (kg/yr)	24.5	6.33	74.2	60	✓
	TN (kg/yr)	125	68.4	45.3	45	✓
	GP (kg/yr)	1550.0	0	100	90	✓
Basin K	TSS (kg/yr)	1430.0	80.2	94.4	80	✓
	TP (kg/yr)	2.81	0.7	75.1	60	✓
	TN (kg/yr)	13.3	7.31	45	45	✓
	GP (kg/yr)	167	0	100	90	✓
Basin L	TSS	14800.0	906	93.9	80	✓

Location	Pollutants	Unmitigated	Mitigated	Reduction (%)	Target	Target Achieved
	(kg/yr)					
	TP (kg/yr)	28.8	7.78	73	60	✓
	TN (kg/yr)	144	78.7	45.4	45	✓
	GP (kg/yr)	1940.0	0	100	90	✓
Basin M	TSS (kg/yr)	2590.0	148	94.3	80	✓
	TP (kg/yr)	5.39	1.39	74.3	60	✓
	TN (kg/yr)	27.4	15	45.2	45	✓
	GP (kg/yr)	324	0	100	90	✓

In recommending appropriate treatment devices for this catchment, an assessment was undertaken for each sub-catchment and its relative topography. Wetlands require a larger area per hectare of developable land and are therefore generally placed where the topography is flatter and there are limitations in grade for bio-retention systems. Bio-retention basins are generally located where the land is more constrained or where achieving an effective outlet is possible due to an increasing grade over the treatment area. Due to the catchment topography, thirteen (13) bio-retention basins have been proposed to achieve the prescribed water quality objectives. The stormwater quality improvement devices have been designed for sub-catchment scale treatment and are therefore relatively large in size. A major benefit of sub-catchment scale treatment as opposed to development or on-site treatment is the reduction in the number of treatment devices. A stormwater quality infrastructure conceptual plan for the Kinross Road Structure Plan Area has been provided in Figure 7.2.



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Kinross Road Structure Plan

MUSIC Model Layout

Figure 6.1

7. PROPOSED TRUNK STORMWATER INFRASTRUCTURE

7.1 Stormwater Quantity Infrastructure Requirements

All mitigation works have been determined based on the detailed TUFLOW modelling works undertaken as part of this study. Analysis has been undertaken to ensure that adequate flow conveyance exists in the trunk drainage system and that mitigation works proposed for the development are in accordance with current stormwater drainage standards.

It should be noted that rainwater tanks have not been considered for the purpose of identifying trunk stormwater infrastructure and the requirements for rainwater tanks are managed under the Queensland Development Code.

The identification of trunk stormwater infrastructure is consistent with Queensland Government's Guide to Planning Stormwater Trunk Infrastructure (March, 2010) as well as Statutory Guideline 01/09 (2009).

7.1.1 Stormwater Detention Infrastructure Summary

The proposed stormwater detention infrastructure has been determined based on review of existing and ultimate catchment peak flow predictions. Section 5.2.4 outlines the philosophy behind the initial sizing of the detention basins. Details of the proposed detention basin surface areas and locations within the Kinross Road Development Area are shown in Figure 7.1.

As previously noted, developed (ultimate case) catchment boundaries are typically modified from those evident in the existing case due to constructed features such as roads and bulk earthworks associated with building pad creation, and as a result, hydraulic modelling assessment of the developed case mitigated scenario has not been undertaken.

Table 7.1 Required Detention Basin Volumes (XP-RAFTS Modelling)

Basin ID	Approximate Detention Basin Volume Requirements (QUDM 2007) (m^3)
6	8 970
7	8 325
8	10 460
8b	420

Basin ID	Approximate Detention Basin Volume Requirements (QUDM 2007) (m^3)
9	3 746
10	1 708

Whilst definitive details for each basin are to be determined during the detailed design phase of the construction, infrastructure requirements for each detention basin (including scour protection and estimated low flow features) have also been included in the preliminary cost estimates for each detention basin.

It is noted that for detention basin "8", increasing the volume of the existing basin would be undertaken by raising the existing basin embankment at this location. It is not considered necessary to remove either existing vegetation or modify the topography at this location (i.e. along the southern boundary) to achieve the detention volume required. As such, delineation of the proposed detention areas as shown in Figure 7.1 does not necessarily correlate to the removal of native vegetation in these areas.

7.2 Stormwater Quality Trunk Infrastructure Requirements

As seen in Figure 6.1, the stormwater quality treatment train includes thirteen (13) GPT'S and thirteen (13) bio-retention systems. Table 7.2 outlines the details of the bio-retention basins.

Table 7.2 Details of Bio-retention Basins

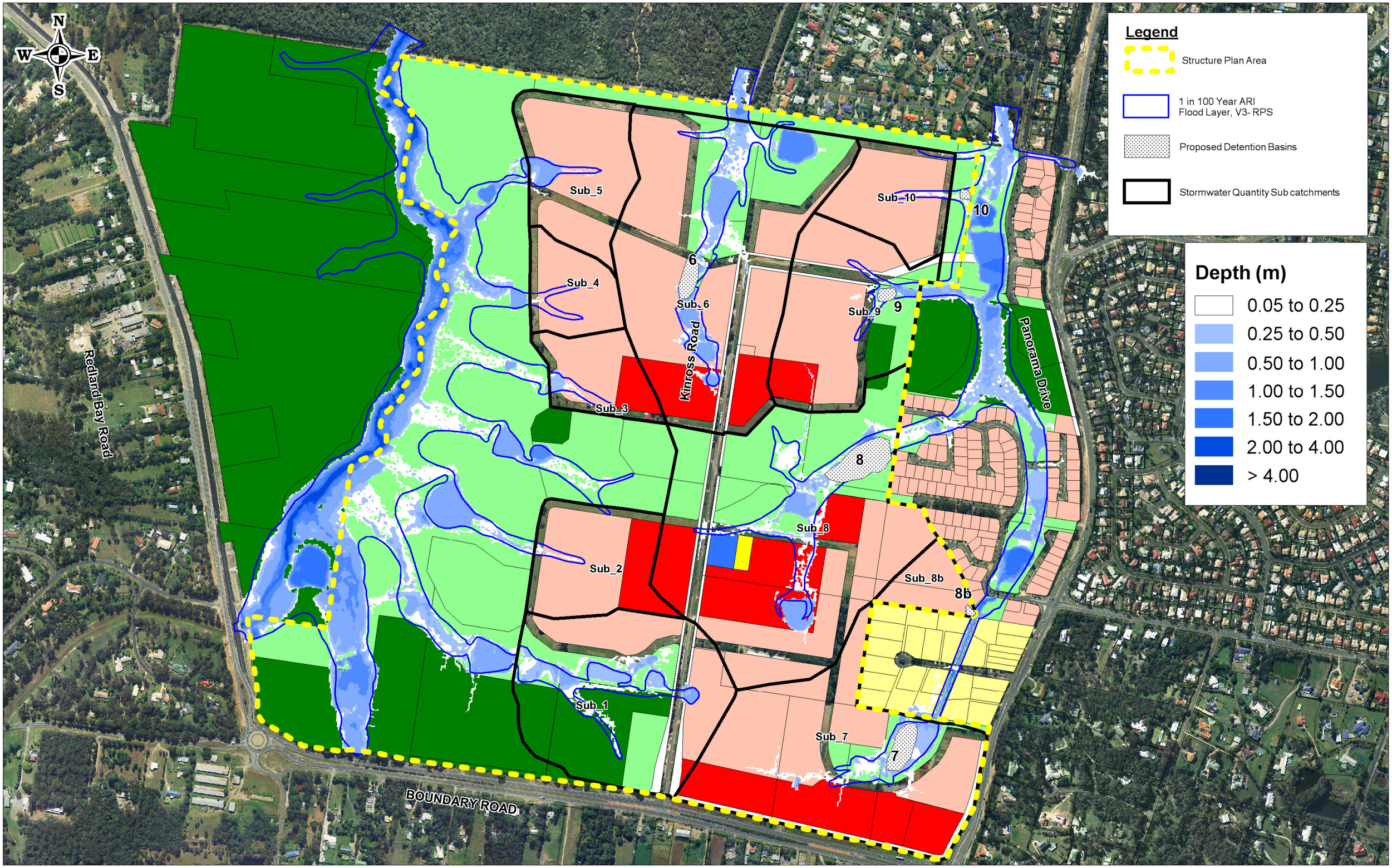
Bio-retention	Filter Area(m^2)	Surface Area(m^2)	Filter Depth(m)	Extended Depth(m)
Bio-retention A	1220	1480	0.7	0.3
Bio-retention B	550	740	0.7	0.3
Bio-retention C	610	800	0.7	0.3
Bio-retention D	2100	2450	0.7	0.3
Bio-retention E	900	1150	0.7	0.3
Bio-retention F	1300	1550	0.7	0.3
Bio-retention G	230	350	0.7	0.3
Bio-retention H	800	1000	0.7	0.3

Bio-retention	Filter Area(m^2)	Surface Area(m^2)	Filter Depth(m)	Extended Depth(m)
Bio-retention I	1000	1240	0.7	0.3
Bio-retention J	3000	3400	0.7	0.3
Bio-retention K	320	460	0.7	0.3
Bio-retention L	2500	2850	0.7	0.3
Bio-retention M	600	800	0.7	0.3

The various treatment measures and locations that have been considered are discussed below.

7.2.1 Consideration of Treatment Options and Locations

The selection of treatment devices and locations was undertaken based on the Redland City Planning Scheme as well as the requirements of various Council stakeholders including Infrastructure Planning, Environmental Management, Development & Community Standards, etc. In all cases, it has been considered to minimize disturbance to the natural environment and avoid tree canopies and therefore the need for tree removal. It is also intended to maximize the amount of available land for development and as such all bio-retention basins have been positioned outside the developable land and within the open space area except for Bio-retention Basin D and K. All the treatment devices have been placed with consideration of site access for construction and maintenance.



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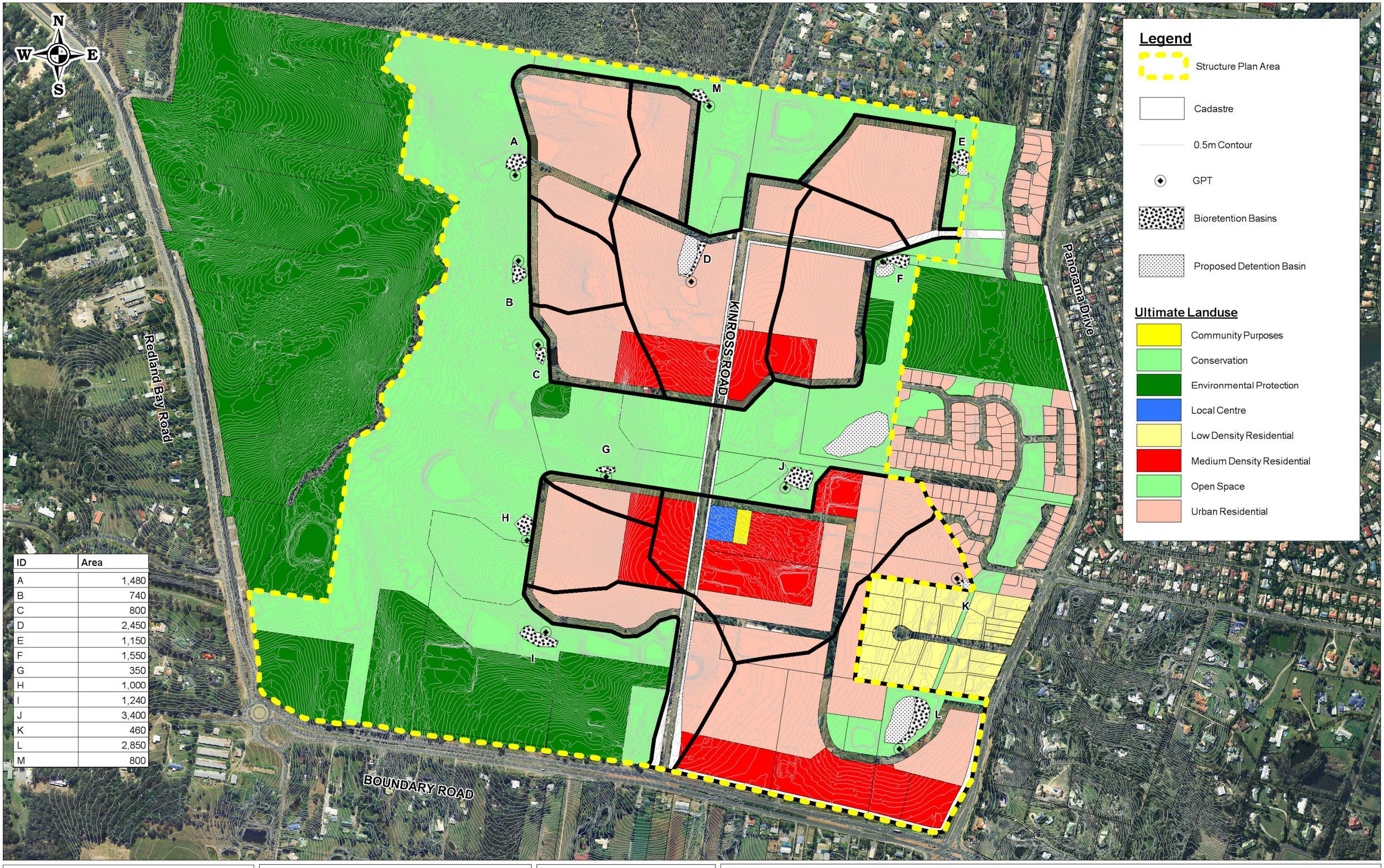
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Kinross Road Structure Plan

Water Quantity Infrastructure Concept Plan
Detention Basin Layout

Figure 7.1



ID	Area
A	1,480
B	740
C	800
D	2,450
E	1,150
F	1,550
G	350
H	1,000
I	1,240
J	3,400
K	460
L	2,850
M	800

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Kinross Road Structure Plan

Water Quality Infrastructure Concept Plan

Figure 7.2

8. CONSTRUCTION COST ESTIMATES

8.1 Stormwater Quantity

Construction cost estimates have been prepared for the various drainage upgrade works identified as part of this study. The cost estimates have been prepared based on a standard cost estimating spreadsheet and incorporates various allowances and assumptions made for the works. A detailed summary of the estimated costs against each work element as based on Council's standard cost estimating spreadsheet are also included in Appendix A. It should be noted that the costs for providing scour protection at the outlet of detention basins into waterways have been included in the trunk drainage infrastructure costs. The resulting construction cost estimates for the drainage upgrade works identified as part of this study are summarised in Table 8.1 below.

Table 8.1 Stormwater Quantity Infrastructure Cost Estimate

Detention Basin Number	Estimated Construction Cost$_{2011}$ ($)	Construction Cost$_{2011}$ Plus Additional Fees** ($)
6	$ 356,177*	$ 552,074
7	$ 322,332	$ 499,614
8	$ 413,892	$ 641,532
8b	$ 117,303	$ 181,819
9	$ 224,191	$ 347,496
10	$ 169,729	$ 263,079
Total Cost	**$ 1,603,624**	**$ 2,485,617**

** Basin wall constructed as part of internal road design (not included in cost estimate)*

*** Total Cost Including Additional Fees of 40% Contingency and 15% Consultants Fees (Exclude 2% Administration and On-costs)*

The construction cost estimates prepared as part of this study are based upon standard construction rates and unit prices as detailed in Council's standard cost estimating spreadsheet. The resulting costs should therefore be considered as approximate budget estimates only based on initial sizing calculations and in the absence of any preliminary or detailed design.

It will be necessary to undertake more detailed design works for the respective measures in order to obtain a more accurate cost estimate for the various work items. As such, construction cost estimates should be revised and updated following further design works where more detailed information including detailed survey and service relocation requirements are accurately known.

8.2 Stormwater Quality

Costing for the bio-retention basins and GPT's was obtained from the life cycle costing module of MUSIC. It should be noted that the connection from the outlet of each catchment to the bio-retention basins has not been included in the cost estimation as this should be undertaken at the detailed design stage. Cost estimates as outlined from MUSIC are found in Appendix B. The summary of the stormwater quality infrastructure life cycle cost (excluding land acquisition) is outlined in Table 8.2.

Table 8.2 Stormwater Quality Infrastructure Cost Estimate

Treatment Device	$Cost_{2011}$ ($)	$Cost_{2011}$ Plus Additional Fees* ($)
Bio-retention A	$ 247,637	$ 383,837
Bio-retention B	$ 135,924	$ 210,682
Bio-retention C	$ 146,256	$ 226,697
Bio-retention D	$ 390,735	$ 605,639
Bio-retention E	$ 195,003	$ 302,255
Bio-retention F	$ 260,704	$ 404,091
Bio-retention G	$ 77,061	$ 119,445
Bio-retention H	$ 178,359	$ 276,456
Bio-retention I	$ 211,534	$ 327,878
Bio-retention J	$ 537,106	$ 832,514
Bio-retention K	$ 94,624	$ 146,667

Bio-retention M	$ 144,542	$ 224,040
GPT A	$ 35,740	$ 55,397
GPT B	$ 25,799	$ 39,988
GPT C	$ 35,740	$ 55,397
GPT D	$ 49,511	$ 76,742
GPT E	$ 35,740	$ 55,397
GPT F	$ 43,247	$ 67,033
GPT G	$ 25,799	$ 39,988
GPT H	$ 35,740	$ 55,397
GPT I	$ 59,910	$ 92,861
GPT J	$ 35,740	$ 55,397
GPT K	$ 25,799	$ 39,988
GPT L	$ 49,511	$ 76,742
GPT M	$ 35,740	$ 55,397
Total Cost (2011)	**$ 3,569,212**	**$ 5,532,279**

***Total Cost Including Additional Fees of 40% Contingency and 15% Consultants Fees (Exclude 2% Administration and On-costs)*

It should be noted that the land acquisition costs has not been included in the above cost estimates. The drainage pipes which convey the Q_{3month} to the bio-retention basins have also been excluded from the proposed trunk infrastructure system.

9. STORMWATER INFRASTRUCTURE CHARGES

As part of this study, stormwater infrastructure charges have been calculated for the Kinross Road Structure Plan Area. This was undertaken to enable the establishment costs of trunk infrastructure to be recovered through the fair apportionment of these costs amongst network users. A summary of infrastructure charge calculations is provided in Appendix C. Appendix C includes a number of tables outlining information used to calculate infrastructure charges for Kinross Road.

It should be noted that the land acquisition costs for stormwater quality treatment devices located in the Open Space has been included in the infrastructure charge calculations. Costs associated with scour protection have also been included in the stormwater infrastructure charge calculations.

It is noted the development area is divided naturally into the western and eastern/northern draining catchments, of which each has specific mitigation requirements. That is, whilst all catchments have proposed water quality treatment devices, the western draining catchments to Hilliards Creek do not require stormwater quantity mitigation for reasons outlined in Section 5.2.4. As a result, and for the purposes of determining Infrastructure Charges, charges have been separated to represent these two catchment areas and mitigation requirements. Table 9.1 summaries the requirements for each sub catchment as defined in Figure 5.3.

Table 9.1 Catchment Mitigation Summary for Infrastructure Charges Determination

Sub Catchment ID (Refer Figure 5.3)	Drainage Direction	Mitigation Requirements
Sub_1	West	Water Quality
Sub_2	West	Water Quality
Sub_3	West	Water Quality
Sub_4	West	Water Quality
Sub_5	West	Water Quality
Sub_6	East	Water Quality & Quantity
Sub_7	East	Water Quality & Quantity
Sub_8	East	Water Quality & Quantity

Sub Catchment ID (Refer Figure 5.3)	Drainage Direction	Mitigation Requirements
Sub_8b	East	Water Quality & Quantity
Sub_9	East	Water Quality & Quantity
Sub_10	East	Water Quality & Quantity

The costs for land acquisition for stormwater infrastructure within Kinross Road Structure Plan Area have been determined and are outlined in Table 9.2.

Table 9.2 Land Acquisition Costs

Item Description	Report Reference	Land Area (m^2)	Ultimate Land Use Type	Rate ($/$m^2$) (2006)	Rate ($/$m^2$) (2011)	Cost ($) (2006)	Cost ($) (2011)
Bio Retention Basin A	Figure 7.2	1480	Open Space	Advised by RCC $104/m²	Advised by RCC $127/m²	153,920	187,960
Bio Retention Basin B	Figure 7.2	740	Open Space	Advised by RCC $104/m²	Advised by RCC $127/m²	76,960	93,980
Bio Retention Basin C	Figure 7.2	800	Open Space	Advised by RCC $104/m²	Advised by RCC $127/m²	83,200	101,600
Bio Retention Basin D	Figure 7.2	2450	Urban Residential	Advised by RCC $343/m²	Advised by RCC $417/m²	840,350	1,021,650
Bio Retention Basin E	Figure 7.2	1150	Open Space	Advised by RCC $104/m²	Advised by RCC $127/$m^2$	119,600	146,050
Bio Retention Basin F	Figure 7.2	1550	Open Space	Advised by RCC $104/m²	Advised by RCC $127/m²	161,200	196,850

Bio Retention Basin G	Figure 7.2	350	Open Space	Advised by RCC $104/m²	Advised by RCC* $127/m²	36,400	44,450
Bio Retention Basin H	Figure 7.2	1000	Open Space	Advised by RCC $104/m²	Advised by RCC* $127/m²	104,000	127,000
Bio Retention Basin I	Figure 7.2	1240	Open Space	Advised by RCC $104/m²	Advised by RCC $127/m²	128,960	157,480
Bio Retention Basin J	Figure 7.2	3400	Open Space	Advised by RCC $104/m²	Advised by RCC $127/m²	353,600	431,800
Bio Retention Basin K	Figure 7.2	460	Urban Residential	Advised by RCC $343/m²	Advised by RCC $417/m²	157,780	191,820
Bio Retention Basin L	Figure 7.2	2850	Open Space	Advised by RCC $104/m²	Advised by RCC $127/m²	296,400	361,950
Bio Retention Basin M	Figure 7.2	800	Open Space	Advised by RCC $104/m²	Advised by RCC $127/m²	83,200	101,600
Detention Basin 8b	Figure 7.1	370	Urban Residential	Advised by RCC $343/m²	Advised by RCC $417/m²	171,500	213,500
Total Cost ($)						**2,767,070**	**3,377,690**

The 100 year ARI flood extent (Flood Layer, V3 of the RPS) is also considered to be trunk infrastructure; however it is understood that this land will remain in private ownership as a dedication and therefore no land acquisition is required for the waterway corridors within the Structure Plan Area.

The acquisition of land for stormwater quality treatment devices has been determined using the land values for the Thornlands area as provided and advised by RCC. It should be noted

that acquisition of land for GPT's has not been included as it is anticipated that the devices will be located within drainage reserves or easements.

Table 9.3 provides an outline of the calculated infrastructure charges (2006 and 2011) for the Kinross Road Structure Plan.

Table 9.3 Summary of Infrastructure Charges for Kinross Road

Item Description	2011 Charge ($/Ha)	2006 Charge ($/Ha)
Base Stormwater Quantity Infrastructure Charge - Eastern Portion	76,074	63,517
Base Stormwater Quality Infrastructure Charge - Eastern Portion	187,786	156,052
Base Total Stormwater Infrastructure Charge - Eastern Portion	263,860	219,569
Base Stormwater Quantity Infrastructure Charge - Western Portion	0	0
Base Stormwater Quality Infrastructure Charge - Western Portion	216,412	180,209
Base Total Stormwater Infrastructure Charge - Western Portion	216,412	180,209

The total cost (present value term for 2011) for all trunk stormwater infrastructure in the structure plan area is $11.39 Million including land acquisition. The Total Base Infrastructure Charge (2011) for the western and eastern portion of the structure plan area is respectively $216,412/ha and $263,860/ha. Appendix C provides a summary of infrastructure charge calculations and assumptions used for the calculations.

It should be noted no Stormwater Quantity Charge is anticipated for the western portion of the structure plan area for the reasons outlined in Section 5.2.4.

These Base Infrastructure Charges (2011) for Stormwater Quantity for eastern portion includes the following:

- Detention basins
- Scour Protection at the outlet of each basins
- Land Acquisitions

The Base Infrastructure Charge (2011) for Stormwater Quality for eastern portion includes the following:

- Treatment devices
- Land Acquisitions

Once the sequencing of development has been established, the base infrastructure charges can be adjusted accordingly.

10. CONCLUSIONS/RECOMMENDATIONS

This study has been prepared for the purposes of quantifying stormwater quantity and quality aspects of the development of the Kinross Road Structure Plan Area.

The study has quantified stormwater infrastructure requirements relating to water quantity and water quality measures for the catchment. These measures have been defined in order to ensure that the proposed development can be undertaken without resulting in adverse stormwater management outcomes and to address Council's Codes and Policies relating to both water quantity and water quality for the development.

This study has included a comprehensive assessment of both stormwater flooding and water quality under a range of scenarios to assist in determining infrastructure upgrade works to appropriately manage and address any impacts resulting from the planned development works. Trunk stormwater infrastructure has been identified in this report and these include measures to address stormwater drainage in addition to water quality measures. It is noted that an evaluation of the potential for water reuse should be undertaken for development sites where dams are to be retained or alternative water supply sources are available.

The infrastructure upgrade works have been discussed and presented as part of this report and cost estimates have also been prepared and are documented in this study for the respective upgrade measures that have been determined. The construction cost estimates represent budget cost allocations based upon conceptual infrastructure sizing and should be updated as part of the future detailed design of the infrastructure works. Stormwater infrastructure charges schedules have been calculated using the identified trunk infrastructure and associated infrastructure construction cost estimates as well as land acquisition cost.

The total cost (present value term for 2011) for all trunk stormwater infrastructure in the structure plan area is $11.39 Million including land acquisition. The Total Base Infrastructure Charge (2011) for the western and eastern portion of the structure plan area is respectively $216,412/ha and $263,860/ha. Appendix C provides a summary of infrastructure charge calculations and assumptions used for the calculations.

It is therefore recommended that Council adopt the outcomes from this report for the purposes of guiding the future direction of the planned Kinross Road Development Area as this relates to stormwater quantity and quality elements of the development.

11. QUALIFICATIONS

1. In preparing this report and estimate of costs, Engeny has exercised the degree of skill and care and diligence normally exercised by members of the engineering profession and has acted in accordance with accepted practices of engineering design principles.

2. Engeny has used all reasonable endeavours to inform itself of the parameters and requirements of the project and has taken all reasonable steps to ensure that the report and costs estimate is as accurate and comprehensive as possible given the information upon which it is based.

3. It is not intended that this report and costs estimate represent a final assessment of the feasibility of the project.

4. Engeny reserves the right to review and amend all calculations, cost estimates and/or opinions included or referred to in the report if:

   (a) additional sources of information not presently available (for whatever reason) are provided or become known to Engeny; or

   (b) Engeny considers it prudent to revise the estimate in light of any information which becomes known to it after the date of submission.

5. If any warranty would be implied whether by law, custom or otherwise, that warranty is to the full extent permitted by law excluded.

6. This report and cost estimate is for the use of the party to whom it is addressed and for no other persons. No responsibility is accepted to any third party for the whole or part of the contents of this report and cost estimate.

12. REFERENCES

1. Statutory Guideline 01/09, Priority Infrastructure Plans and Infrastructure Charges Schedule, Department of Infrastructure and Planning, 2009.

2. Kinross Road Structure Plan Site Issues and Values Summary Report (Parsons Brinckerhoff, 2006);

3. Kinross Road Draft Structure Plan (RCC 2008);

4. Hilliards Creek Catchment Management Plan (JWP 2007); and

5. “Australian Rainfall and Runoff (ARR2000)” The Institution of Engineers Australia.

Appendix A

Stormwater Quantity Infrastructure

Construction Cost Estimates

Redland CITY COUNCIL

DESIGN ESTIMATE

PROJECT DELIVERY GROUP

DESIGN SEVICES

Project:	Kinross Road Structure Plan		
Description of Works:	Detention Basin No. 6		
Works Program:	Residential Street	**Prepared By:**	-
Client:	Infrastructure Planning	**Estimate Date:**	17/06/2011
Program Year:	10/11	**Revision:**	P1 - Preliminary Issue
Allocation / Budget:	$0	**Construction:**	External

Cap/Op - C if working on capital job i.e. install = Capital, repair/maintain = Operational

Line No	Task	C/O	Asset Definition	Description	Units	Qty	Rate	Total
				Preliminary Items				
	6303	C	Disperse	Site Establishment & Disestablishment Including Final Site Specific Safety Plan	Item		1	$10,000.00
	6010	C	Disperse	Traffic Control & Public Safety Including Final Site Specific Traffic Management Plan	Item		1	$2,000.00
	6217	C	Disperse	Testing Soil & Pavement During Construction	Item	2	500	$1,000.00
	6320	C	Disperse	Locate Existing Services	Item	2	750	$1,500.00
			Disperse	**Site Preparation**				
	6354	C	Disperse	Clear & Grub Site	Item	1	2000	$2,000.00
	6302	C	Disperse	Alter / Adjust / Remove / Repair anything	Item	1	5000	$5,000.00
				Earthworks				
	6054	C	Disperse	Earthworks to Spoil - loose quantity. Bulking factor from Bank to Loose 120%.	m^3	4500	30	$135,000.00
				Pipes, Culvert, Pits & Headwalls				
	6401	C	Stormwater Pipes	Supply & Lay Bedding Material Backfill	No.	20	50	$1,000.00
	6430	C	Stormwater Pipes	Excavate/lay/backfill 1050mm RC pipe	m	80	322	$25,760.00
	6318	C	Open Drains	Supply & Lay Scour protection	Item	1	10000	$10,000.00
	6443	C	Headwalls	Supply & Install Precast Headwall ø1050mm	No.	4	1000	$4,000.00
				Driveways				
	6132	C	Sealed Driveway	Supply and Construct Bitumen Driveways	m^2	200	28	$5,600.00
				Furniture				
	6073	C	Fences	Supply & Install Timber Bollards	No.	20	62	$1,240.00
	6077	C	Fences	Supply & Install Fencing	m	50	70	$3,500.00
				Signage and Pavement Marking				
	6003	O	Signage	Supply & Install Miscellaneous Signs - Plate & Standard	No.	4	180	$720.00
				Landscaping				
	6180	O	Landscaping	Supply Plant & Establish Trees	Item	15	50	$750.00
	6350	O	Landscaping	Supply & Install Turf Incl. 1 Initial Watering	m^2	250	6	$1,500.00
	6378	O	Landscaping	Maintain & Water Turf	Visit	6	100	$600.00
	6377	O	Landscaping	Supply & Install Topsoil	m^3	25	56.5	$1,412.50
				Project Construction On Costs				
	6441	C	Disperse	Sediment & Erosion Control	%		2%	$4,251.65
	6329	C	Disperse	Contingencies	%		15%	$31,887.38
	6300	C	Disperse	RCC Operations & Maintenance	%		0%	$0.00
	6300	C	Disperse	Construction On Costs - External Construction	%		11%	$23,384.08
	6039	C	Disperse	Survey Setout - External Construction	%		2.7%	$5,739.73
				Subtotal:				**$277,845.33**
				Project Delivery Group Oncosts				
	6300	C	Disperse	Project Delivery Group / Corporate Overhead	%		11%	$30,562.99
	6033	C	Disperse	External Design	Item			$0.00
				Subtotal:				**$308,408.31**
				Portable Long Service Leave Oncosts				
	6330	C	Disperse	Portable Long Service Leave Levy	%		0.425%	$1,310.74
				Subtotal:				**$309,719.05**
				Grand Total Construct:	**09/10**			**$309,719.05**
				Operational Value	09/10			$4,982.50
				Capital Value	09/10			$304,736.55
				Add Risk	%		5%	$15,485.95
				Add Escalation	%		10%	$30,971.90
				Grand Total Construct:	**10/11**			**$356,176.91**
				Operational Value	10/11			$5,729.88
				Capital Value	10/11			$350,447.03
				Add Risk	%		5%	$17,808.85
				Add Escalation	%		10%	$35,617.69
				Grand Total Construct:	**11/12**			**$409,603.44**
				Operational Value	11/12			$6,589.36
				Capital Value	11/12			$403,014.09
				Add Risk	%		5%	$20,480.17
				Add Escalation	%		10%	$40,960.34
				Grand Total Construct:	**12/13**			**$471,043.96**

Please be aware that the estimate currently exceeds the current budget allocation. Please provide direction/ advice as to where additional funds are to be sort

Design Services Manager _____

Infrastructure Planning Manager _____

Redland CITY COUNCIL

DESIGN ESTIMATE

PROJECT DELIVERY GROUP

DESIGN SEVICES

Project:	Kinross Road Structure Plan		
Description of Works:	Detention Basin No. 7		
Works Program:	Residential Street	**Prepared By:**	-
Client:	Infrastructure Planning	**Estimate Date:**	17/06/2010
Program Year:	10/11	**Revision:**	P1 - Preliminary Issue
Allocation / Budget:	$0	**Construction:**	External

Cap/Op - C if working on capital job i.e. install = Capital, repair/maintain = Operational

Line No	Task	C/O	Asset Definition	Description	Units	Qty	Rate	Total
				Preliminary Items				
	6303	C	Disperse	Site Establishment & Disestablishment Including Final Site Specific Safety Plan	Item		1	$10,000.00
	6010	C	Disperse	Traffic Control & Public Safety Including Final Site Specific Traffic Management Plan	Item		1	$2,000.00
	6217	C	Disperse	Testing Soil & Pavement During Construction	Item	2	500	$1,000.00
	6320	C	Disperse	Locate Existing Services	Item	2	750	$1,500.00
			Disperse	**Site Preparation**				
	6354	C	Disperse	Clear & Grub Site	Item	1	2000	$2,000.00
	6302	C	Disperse	Alter / Adjust / Remove / Repair anything	Item	1	5000	$5,000.00
				Earthworks				
	6054	C	Disperse	Earthworks to Spoil - loose quantity. Bulking factor from Bank to Loose 120%.	m^3	4000	30	$120,000.00
				Pipes, Culvert, Pits & Headwalls				
	6401	C	Stormwater Pipes	Supply & Lay Bedding Material Backfill	No.	60	50	$3,000.00
	6424	C	Stormwater Pipes	Excavate/lay/backfill 750mm RC pipe	m	80	232	$18,560.00
	6318	C	Open Drains	Supply & Lay Scour protection	Item	1	10000	$10,000.00
	6443	C	Headwalls	Supply & Install 4xPrecast Headwall	No.	4	1000	$4,000.00
				Driveways				
	6132	C	Sealed Driveway	Supply and Construct Bitumen Driveways	m^2	200	28	$5,600.00
				Furniture				
	6073	C	Fences	Supply & Install Timber Bollards	No.	20	62	$1,240.00
	6077	C	Fences	Supply & Install Fencing	m	50	70	$3,500.00
				Signage and Pavement Marking				
	6003	O	Signage	Supply & Install Miscellaneous Signs - Plate & Standard	No.	4	180	$720.00
				Landscaping				
	6180	O	Landscaping	Supply Plant & Establish Trees	Item	15	50	$750.00
	6350	O	Landscaping	Supply & Install Turf Incl. 1 Initial Watering	m^2	250	6	$1,500.00
	6378	O	Landscaping	Maintain & Water Turf	Visit	6	100	$600.00
	6377	O	Landscaping	Supply & Install Topsoil	m^3	25	56.5	$1,412.50
				Project Construction On Costs				
	6441	C	Disperse	Sediment & Erosion Control	%		2%	$3,847.65
	6329	C	Disperse	Contingencies	%		15%	$28,857.38
	6300	C	Disperse	RCC Operations & Maintenance	%		0%	$0.00
	6300	C	Disperse	Construction On Costs - External Construction	%		11%	$21,162.08
	6039	C	Disperse	Survey Setout - External Construction	%		2.7%	$5,194.33
				Subtotal:				**$251,443.93**
				Project Delivery Group Oncosts				
	6300	C	Disperse	Project Delivery Group / Corporate Overhead	%		11%	$27,658.83
	6033	C	Disperse	External Design	Item			$0.00
				Subtotal:				**$279,102.76**
				Portable Long Service Leave Oncosts				
	6330	C	Disperse	Portable Long Service Leave Levy	%		0.425%	$1,186.19
				Subtotal:				**$280,288.95**
				Grand Total Construct:	**09/10**			**$280,288.95**
				Operational Value	09/10			$4,982.50
				Capital Value	09/10			$275,306.45
				Add Risk	%		5%	$14,014.45
				Add Escalation	%		10%	$28,028.89
				Grand Total Construct:	**10/11**			**$322,332.29**
				Operational Value	10/11			$5,729.88
				Capital Value	10/11			$316,602.41
				Add Risk	%		5%	$16,116.61
				Add Escalation	%		10%	$32,233.23
				Grand Total Construct:	**11/12**			**$370,682.13**
				Operational Value	11/12			$6,589.36
				Capital Value	11/12			$364,092.78
				Add Risk	%		5%	$18,534.11
				Add Escalation	%		10%	$37,068.21
				Grand Total Construct:	**12/13**			**$426,284.45**

Please be aware that the estimate currently exceeds the current budget allocation. Please provide direction/ advice as to where additional funds are to be sort

Design Services Manager _____

Infrastructure Planning Manager _____

Redland CITY COUNCIL

DESIGN ESTIMATE

PROJECT DELIVERY GROUP

DESIGN SEVICES

Project:	Kinross Road Structure Plan		
Description of Works:	Detention Basin No. 8		
Works Program:	Residential Street	**Prepared By:**	-
Client:	Infrastructure Planning	**Estimate Date:**	17/06/2011
Program Year:	10/11	**Revision:**	P1 - Preliminary Issue
Allocation / Budget:	$0	**Construction:**	External

Cap/Op - C if working on capital job i.e. install = Capital, repair/maintain = Operational

Line No	Task	C/O	Asset Definition	Description	Units	Qty	Rate	Total
				Preliminary Items				
	6303	C	Disperse	Site Establishment & Disestablishment Including Final Site Specific Safety Plan	Item		1	$10,000.00
	6010	C	Disperse	Traffic Control & Public Safety Including Final Site Specific Traffic Management Plan	Item		1	$2,000.00
	6217	C	Disperse	Testing Soil & Pavement During Construction	Item	2	500	$1,000.00
	6320	C	Disperse	Locate Existing Services	Item	2	750	$1,500.00
			Disperse	**Site Preparation**				
	6354	C	Disperse	Clear & Grub Site	Item	1	2000	$2,000.00
	6302	C	Disperse	Alter / Adjust / Remove / Repair anything	Item	1	5000	$5,000.00
				Earthworks				
	6054	C	Disperse	Earthworks to Spoil - loose quantity. Bulking factor from Bank to Loose 120%.	m^3	5000	30	$150,000.00
				Pipes, Culvert, Pits & Headwalls				
	6401	C	Stormwater Pipes	Supply & Lay Bedding Material Backfill	No.	50	50	$2,500.00
	6432	C	Stormwater Pipes	Excavate/lay/backfill 1050mm RC pipe	m	80	322	$25,760.00
	6318	C	Open Drains	Supply & Lay Scour protection	Item	1	10000	$10,000.00
	6443	C	Headwalls	Supply & Install Precast Headwall	No.	4	1000	$4,000.00
				Driveways				
	6132	C	Sealed Driveway	Supply and Construct Bitumen Driveways	m^2	500	28	$14,000.00
				Furniture				
	6073	C	Fences	Supply & Install Timber Bollards	No.	40	62	$2,480.00
	6077	C	Fences	Supply & Install Fencing	m	100	70	$7,000.00
				Signage and Pavement Marking				
	6003	O	Signage	Supply & Install Miscellaneous Signs - Plate & Standard	No.	5	180	$900.00
				Landscaping				
	6180	O	Landscaping	Supply Plant & Establish Trees	Item	30	50	$1,500.00
	6350	O	Landscaping	Supply & Install Turf Incl. 1 Initial Watering	m^2	500	6	$3,000.00
	6378	O	Landscaping	Maintain & Water Turf	Visit	10	100	$1,000.00
	6377	O	Landscaping	Supply & Install Topsoil	m^3	60	56.5	$3,390.00
				Project Construction On Costs				
	6441	C	Disperse	Sediment & Erosion Control	%		2%	$4,940.60
	6329	C	Disperse	Contingencies	%		15%	$37,054.50
	6300	C	Disperse	RCC Operations & Maintenance	%		0%	$0.00
	6300	C	Disperse	Construction On Costs - External Construction	%		11%	$27,173.30
	6039	C	Disperse	Survey Setout - External Construction	%		2.7%	$6,669.81
				Subtotal:				**$322,868.21**
				Project Delivery Group Oncosts				
	6300	C	Disperse	Project Delivery Group / Corporate Overhead	%		11%	$35,515.50
	6033	C	Disperse	External Design	Item			$0.00
				Subtotal:				**$358,383.71**
				Portable Long Service Leave Oncosts				
	6330	C	Disperse	Portable Long Service Leave Levy	%		0.425%	$1,523.13
				Subtotal:				**$359,906.84**
				Grand Total Construct:	**09/10**			**$359,906.84**
				Operational Value	09/10			$9,790.00
				Capital Value	09/10			$350,116.84
				Add Risk	%		5%	$17,995.34
				Add Escalation	%		10%	$35,990.68
				Grand Total Construct:	**10/11**			**$413,892.87**
				Operational Value	10/11			$11,258.50
				Capital Value	10/11			$402,634.37
				Add Risk	%		5%	$20,694.64
				Add Escalation	%		10%	$41,389.29
				Grand Total Construct:	**11/12**			**$475,976.80**
				Operational Value	11/12			$12,947.28
				Capital Value	11/12			$463,029.53
				Add Risk	%		5%	$23,798.84
				Add Escalation	%		10%	$47,597.68
				Grand Total Construct:	**12/13**			**$547,373.32**

Please be aware that the estimate currently exceeds the current budget allocation. Please provide direction/ advice as to where additional funds are to be sort

Design Services Manager _____

Infrastructure Planning Manager _____

Redland CITY COUNCIL

DESIGN ESTIMATE

PROJECT DELIVERY GROUP

DESIGN SEVICES

Project:	Kinross Road Structure Plan		
Description of Works:	Detention Basin No. 8b		
Works Program:	Residential Street	**Prepared By:**	-
Client:	Infrastructure Planning	**Estimate Date:**	17/06/2011
Program Year:	10/11	**Revision:**	P1 - Preliminary Issue
Allocation / Budget:	$0	**Construction:**	External

Cap/Op - C if working on capital job i.e. install = Capital, repair/maintain = Operational

Line No	Task	C/O	Asset Definition	Description	Units	Qty	Rate	Total
				Preliminary Items				
	6303	C	Disperse	Site Establishment & Disestablishment Including Final Site Specific Safety Plan	Item		1	$10,000.00
	6010	C	Disperse	Traffic Control & Public Safety Including Final Site Specific Traffic Management Plan	Item		1	$2,000.00
	6217	C	Disperse	Testing Soil & Pavement During Construction	Item	2	500	$1,000.00
	6320	C	Disperse	Locate Existing Services	Item	2	750	$1,500.00
			Disperse	**Site Preparation**				
	6354	C	Disperse	Clear & Grub Site	Item	1	2000	$2,000.00
	6302	C	Disperse	Alter / Adjust / Remove / Repair anything	Item	1	5000	$5,000.00
				Earthworks				
	6054	C	Disperse	Earthworks to Spoil - loose quantity. Bulking factor from Bank to Loose 120%.	m^3	200	30	$6,000.00
				Pipes, Culvert, Pits & Headwalls				
	6401	C	Stormwater Pipes	Supply & Lay Bedding Material Backfill	No.	25	50	$1,250.00
	6446	C	Stormwater Pipes	Pipe supply & lay ø525mm FRC '2'	m	20	210	$4,200.00
	6318	C	Open Drains	Supply & Lay Scour protection	Item	1	10000	$10,000.00
	6443	C	Headwalls	Supply & Install Precast Headwall ø525mm	No.	2	680	$1,360.00
				Driveways				
	6132	C	Sealed Driveway	Supply and Construct Bitumen Driveways	m^2	150	28	$4,200.00
				Furniture				
	6073	C	Fences	Supply & Install Timber Bollards	No.	10	62	$620.00
	6077	C	Fences	Supply & Install Fencing	m	20	70	$1,400.00
				Signage and Pavement Marking				
	6003	O	Signage	Supply & Install Miscellaneous Signs - Plate & Standard	No.	4	180	$720.00
				Landscaping				
	6180	O	Landscaping	Supply Plant & Establish Trees	Item	10	50	$500.00
	6350	O	Landscaping	Supply & Install Turf Incl. 1 Initial Watering	m^2	150	6	$900.00
	6378	O	Landscaping	Maintain & Water Turf	Visit	6	100	$600.00
	6377	O	Landscaping	Supply & Install Topsoil	m^3	20	56.5	$1,130.00
				Project Construction On Costs				
	6441	C	Disperse	Sediment & Erosion Control	%		2%	$1,087.60
	6329	C	Disperse	Contingencies	%		15%	$8,157.00
	6300	C	Disperse	RCC Operations & Maintenance	%		0%	$0.00
	6300	C	Disperse	Construction On Costs - External Construction	%		11%	$5,981.80
	6039	C	Disperse	Survey Setout - External Construction	%		2.7%	$1,468.26
				Subtotal:				**$71,074.66**
				Project Delivery Group Oncosts				
	6300	C	Disperse	Project Delivery Group / Corporate Overhead	%		11%	$7,818.21
	6033	C	Disperse	External Design	Item			$0.00
				Subtotal:				**$78,892.87**
				Portable Long Service Leave Oncosts				
	6330	C	Disperse	Portable Long Service Leave Levy	%		0.000%	$0.00
				Subtotal:				**$78,892.87**
				Grand Total Construct:	**09/10**			**$78,892.87**
				Operational Value	09/10			$3,850.00
				Capital Value	09/10			$75,042.87
				Add Risk	%		5%	$3,944.64
				Add Escalation	%		10%	$7,889.29
				Grand Total Construct:	**10/11**			**$90,726.80**
				Operational Value	10/11			$4,427.50
				Capital Value	10/11			$86,299.30
				Add Risk	%		5%	$4,536.34
				Add Escalation	%		10%	$9,072.68
				Grand Total Construct:	**11/12**			**$104,335.82**
				Operational Value	11/12			$5,091.63
				Capital Value	11/12			$99,244.20
				Add Risk	%		5%	$5,216.79
				Add Escalation	%		10%	$10,433.58
				Grand Total Construct:	**12/13**			**$119,986.20**

Please be aware that the estimate currently exceeds the current budget allocation. Please provide direction/ advice as to where additional funds are to be sort

Design Services Manager _____

Infrastructure Planning Manager _____

Redland CITY COUNCIL

DESIGN ESTIMATE

PROJECT DELIVERY GROUP

DESIGN SEVICES

Project:	Kinross Road Structure Plan		
Description of Works:	Detention Basin No. 9		
Works Program:	Residential Street	**Prepared By:**	-
Client:	Infrastructure Planning	**Estimate Date:**	17/06/2011
Program Year:	10/11	**Revision:**	P1 - Preliminary Issue
Allocation / Budget:	$0	**Construction:**	External

Cap/Op - C if working on capital job i.e. install = Capital, repair/maintain = Operational

Line No	Task	C/O	Asset Definition	Description	Units	Qty	Rate	Total
				Preliminary Items				
	6303	C	Disperse	Site Establishment & Disestablishment Including Final Site Specific Safety Plan	Item		1	$10,000.00
	6010	C	Disperse	Traffic Control & Public Safety Including Final Site Specific Traffic Management Plan	Item		1	$2,000.00
	6217	C	Disperse	Testing Soil & Pavement During Construction	Item	2	500	$1,000.00
	6320	C	Disperse	Locate Existing Services	Item	2	750	$1,500.00
			Disperse	**Site Preparation**				
	6354	C	Disperse	Clear & Grub Site	Item	1	2000	$2,000.00
	6302	C	Disperse	Alter / Adjust / Remove / Repair anything	Item	1	5000	$5,000.00
				Earthworks				
	6054	C	Disperse	Earthworks to Spoil - loose quantity. Bulking factor from Bank to Loose 120%.	m^3	2000	30	$60,000.00
				Pipes, Culvert, Pits & Headwalls				
	6401	C	Stormwater Pipes	Supply & Lay Bedding Material Backfill	No.	100	50	$5,000.00
	6424	C	Stormwater Pipes	Excavate/lay/backfill 825mm RC pipe	m	60	264	$15,840.00
	6318	C	Open Drains	Supply & Lay Scour protection	Item	1	10000	$10,000.00
	6443	C	Headwalls	Supply & Install Precast Headwall	No.	2	5000	$10,000.00
				Driveways				
	6132	C	Sealed Driveway	Supply and Construct Bitumen Driveways	m^2	150	28	$4,200.00
				Furniture				
	6073	C	Fences	Supply & Install Timber Bollards	No.	10	62	$620.00
	6077	C	Fences	Supply & Install Fencing	m	20	70	$1,400.00
				Signage and Pavement Marking				
	6003	O	Signage	Supply & Install Miscellaneous Signs - Plate & Standard	No.	4	180	$720.00
				Landscaping				
	6180	O	Landscaping	Supply Plant & Establish Trees	Item	15	50	$750.00
	6350	O	Landscaping	Supply & Install Turf Incl. 1 Initial Watering	m^2	200	6	$1,200.00
	6378	O	Landscaping	Maintain & Water Turf	Visit	6	100	$600.00
	6377	O	Landscaping	Supply & Install Topsoil	m^3	35	56.5	$1,977.50
				Project Construction On Costs				
	6441	C	Disperse	Sediment & Erosion Control	%		2%	$2,676.15
	6329	C	Disperse	Contingencies	%		15%	$20,071.13
	6300	C	Disperse	RCC Operations & Maintenance	%		0%	$0.00
	6300	C	Disperse	Construction On Costs - External Construction	%		11%	$14,718.83
	6039	C	Disperse	Survey Setout - External Construction	%		2.7%	$3,612.80
				Subtotal:				**$174,886.40**
				Project Delivery Group Oncosts				
	6300	C	Disperse	Project Delivery Group / Corporate Overhead	%		11%	$19,237.50
	6033	C	Disperse	External Design	Item			$0.00
				Subtotal:				**$194,123.91**
				Portable Long Service Leave Oncosts				
	6330	C	Disperse	Portable Long Service Leave Levy	%		0.425%	$825.03
				Subtotal:				**$194,948.93**
				Grand Total Construct:	**09/10**			**$194,948.93**
				Operational Value	09/10			$5,247.50
				Capital Value	09/10			$189,701.43
				Add Risk	%		5%	$9,747.45
				Add Escalation	%		10%	$19,494.89
				Grand Total Construct:	**10/11**			**$224,191.27**
				Operational Value	10/11			$6,034.63
				Capital Value	10/11			$218,156.65
				Add Risk	%		5%	$11,209.56
				Add Escalation	%		10%	$22,419.13
				Grand Total Construct:	**11/12**			**$257,819.96**
				Operational Value	11/12			$6,939.82
				Capital Value	11/12			$250,880.15
				Add Risk	%		5%	$12,891.00
				Add Escalation	%		10%	$25,782.00
				Grand Total Construct:	**12/13**			**$296,492.96**

Please be aware that the estimate currently exceeds the current budget allocation. Please provide direction/ advice as to where additional funds are to be sort

Design Services Manager _____

Infrastructure Planning Manager _____

Redland CITY COUNCIL

DESIGN ESTIMATE

PROJECT DELIVERY GROUP

DESIGN SEVICES

Project:	Kinross Road Structure Plan		
Description of Works:	Detention Basin No. 10		
Works Program:	Residential Street	**Prepared By:**	-
Client:	Infrastructure Planning	**Estimate Date:**	17/06/2011
Program Year:	10/11	**Revision:**	P1 - Preliminary Issue
Allocation / Budget:	$0	**Construction:**	External

Cap/Op - C if working on capital job i.e. install = Capital, repair/maintain = Operational

Line No	Task	C/O	Asset Definition	Description	Units	Qty	Rate	Total
				Preliminary Items				
	6303	C	Disperse	Site Establishment & Disestablishment Including Final Site Specific Safety Plan	Item		1	$10,000.00
	6010	C	Disperse	Traffic Control & Public Safety Including Final Site Specific Traffic Management Plan	Item		1	$2,000.00
	6217	C	Disperse	Testing Soil & Pavement During Construction	Item	2	500	$1,000.00
	6320	C	Disperse	Locate Existing Services	Item	2	750	$1,500.00
			Disperse	**Site Preparation**				
	6354	C	Disperse	Clear & Grub Site	Item	1	2000	$2,000.00
	6302	C	Disperse	Alter / Adjust / Remove / Repair anything	Item	1	5000	$5,000.00
				Earthworks				
	6054	C	Disperse	Earthworks to Spoil - loose quantity. Bulking factor from Bank to Loose 120%.	m^3	1000	30	$30,000.00
				Pipes, Culvert, Pits & Headwalls				
	6401	C	Stormwater Pipes	Supply & Lay Bedding Material Backfill	No.	100	50	$5,000.00
	6446	C	Stormwater Pipes	Excavate/lay/backfill 750mm RC pipe	m	60	323	$19,380.00
	6318	C	Open Drains	Supply & Lay Scour protection	Item	1	10000	$10,000.00
	6443	C	Headwalls	Supply & Install Precast Headwall	No.	2	2500	$5,000.00
				Driveways				
	6132	C	Sealed Driveway	Supply and Construct Bitumen Driveways	m^2	150	28	$4,200.00
				Furniture				
	6073	C	Fences	Supply & Install Timber Bollards	No.	10	62	$620.00
	6077	C	Fences	Supply & Install Fencing	m	20	70	$1,400.00
				Signage and Pavement Marking				
	6003	O	Signage	Supply & Install Miscellaneous Signs - Plate & Standard	No.	4	180	$720.00
				Landscaping				
	6180	O	Landscaping	Supply Plant & Establish Trees	Item	15	50	$750.00
	6350	O	Landscaping	Supply & Install Turf Incl. 1 Initial Watering	m^2	120	6	$720.00
	6378	O	Landscaping	Maintain & Water Turf	Visit	6	100	$600.00
	6377	O	Landscaping	Supply & Install Topsoil	m^3	25	56.5	$1,412.50
				Project Construction On Costs				
	6441	C	Disperse	Sediment & Erosion Control	%		2%	$2,026.05
	6329	C	Disperse	Contingencies	%		15%	$15,195.38
	6300	C	Disperse	RCC Operations & Maintenance	%		0%	$0.00
	6300	C	Disperse	Construction On Costs - External Construction	%		11%	$11,143.28
	6039	C	Disperse	Survey Setout - External Construction	%		2.7%	$2,735.17
				Subtotal:				**$132,402.37**
				Project Delivery Group Oncosts				
	6300	C	Disperse	Project Delivery Group / Corporate Overhead	%		11%	$14,564.26
	6033	C	Disperse	External Design	Item			$0.00
				Subtotal:				**$146,966.63**
				Portable Long Service Leave Oncosts				
	6330	C	Disperse	Portable Long Service Leave Levy	%		0.425%	$624.61
				Subtotal:				**$147,591.24**
				Grand Total Construct:	**09/10**			**$147,591.24**
				Operational Value	09/10			$4,202.50
				Capital Value	09/10			$143,388.74
				Add Risk	%		5%	$7,379.56
				Add Escalation	%		10%	$14,759.12
				Grand Total Construct:	**10/11**			**$169,729.92**
				Operational Value	10/11			$4,832.88
				Capital Value	10/11			$164,897.05
				Add Risk	%		5%	$8,486.50
				Add Escalation	%		10%	$16,972.99
				Grand Total Construct:	**11/12**			**$195,189.41**
				Operational Value	11/12			$5,557.81
				Capital Value	11/12			$189,631.60
				Add Risk	%		5%	$9,759.47
				Add Escalation	%		10%	$19,518.94
				Grand Total Construct:	**12/13**			**$224,467.82**

Please be aware that the estimate currently exceeds the current budget allocation. Please provide direction/ advice as to where additional funds are to be sort

Design Services Manager _____

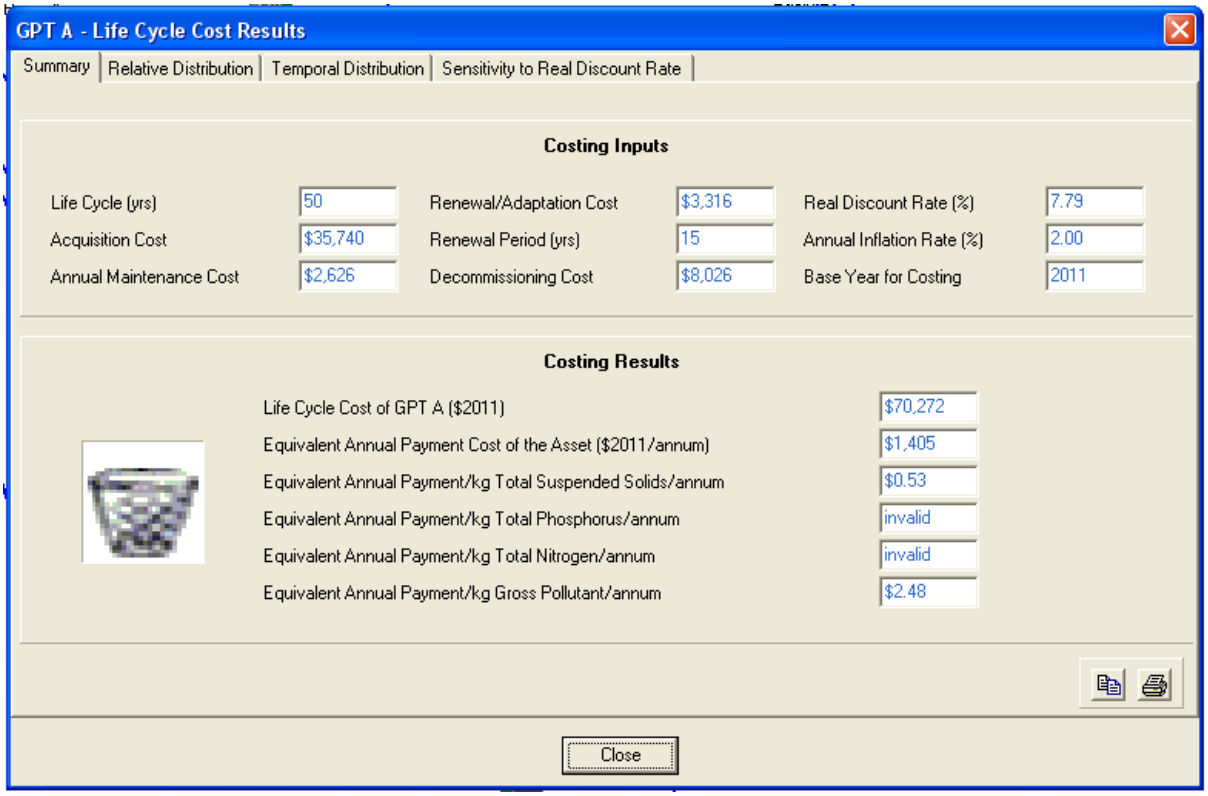
Infrastructure Planning Manager _____

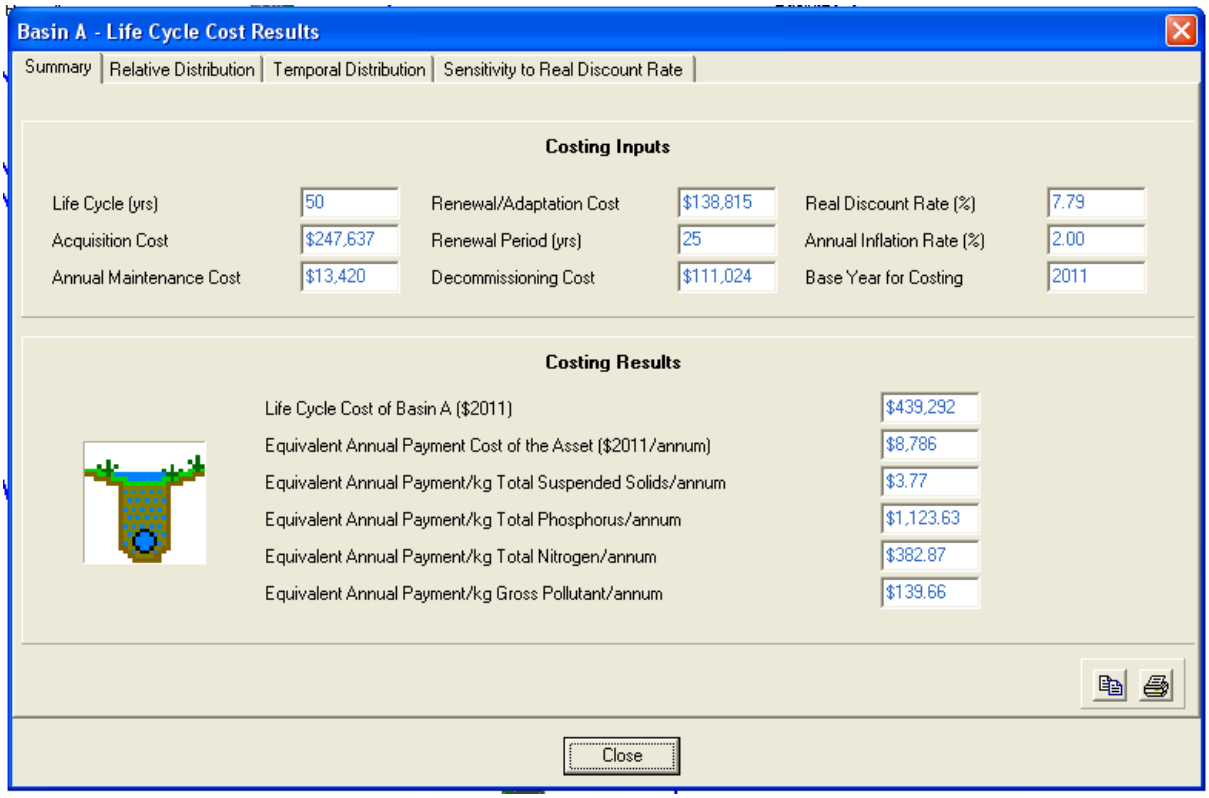
Appendix B

Stormwater Quality Infrastructure

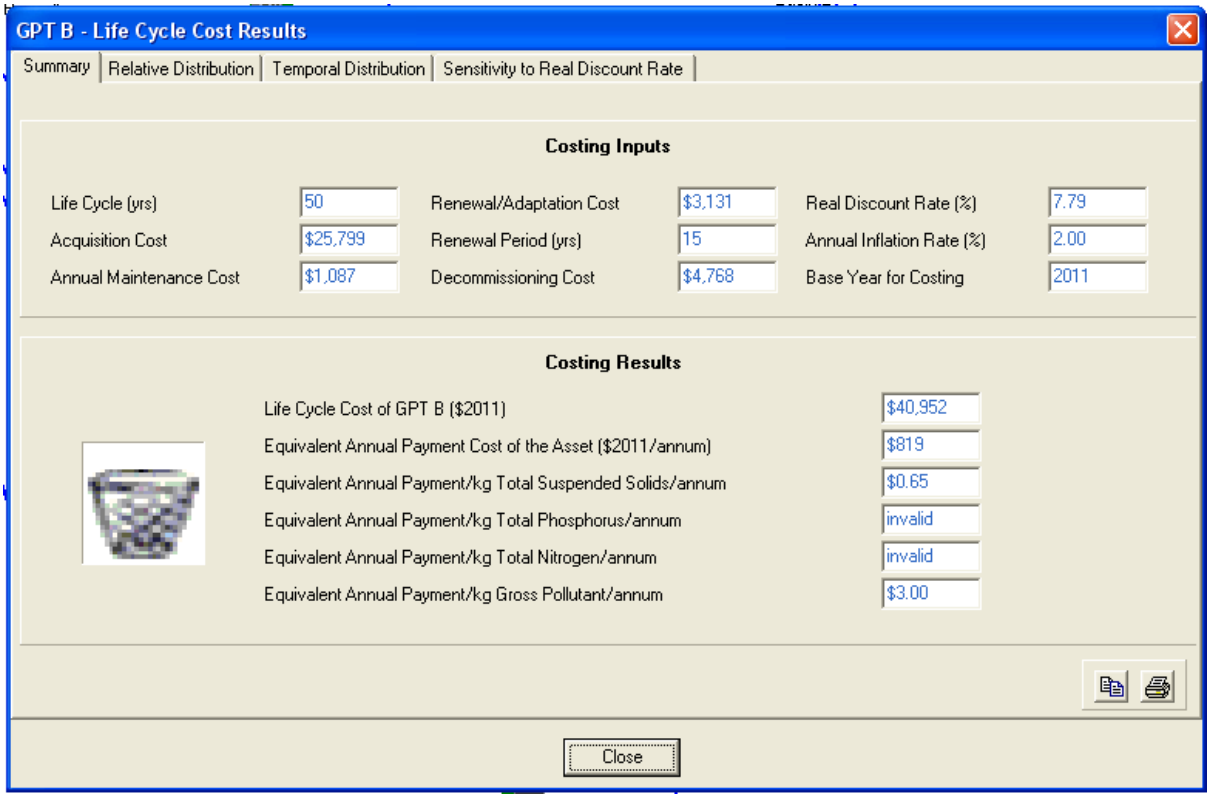
Construction Cost Estimates

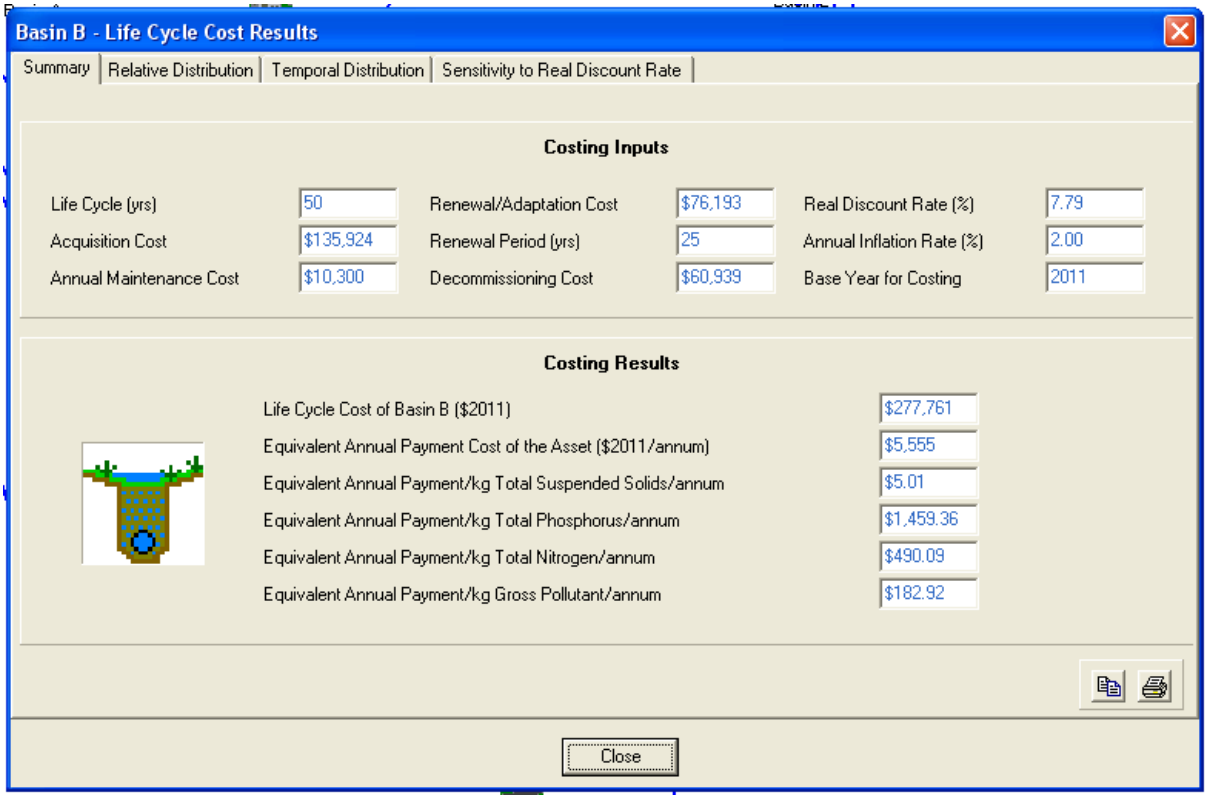
Catchment A


GPT A - Life Cycle Cost Results
Summary
Relative Distribution
Temporal Distribution
Sensitivity to Real Discount Rate
Costing Inputs
Life Cycle (yrs) 50
Acquisition Cost $35,740
Annual Maintenance Cost $2,626
Renewal/Adaptation Cost $3,316
Renewal Period (yrs) 15
Decommissioning Cost $8,026
Real Discount Rate (%) 7.79
Annual Inflation Rate (%) 2.00
Base Year for Costing 2011
Costing Results
Life Cycle Cost of GPT A ($2011) $70,272
Equivalent Annual Payment Cost of the Asset ($2011/annum) $1,405
Equivalent Annual Payment/kg Total Suspended Solids/annum $0.53
Equivalent Annual Payment/kg Total Phosphorus/annum invalid
Equivalent Annual Payment/kg Total Nitrogen/annum invalid
Equivalent Annual Payment/kg Gross Pollutant/annum $2.48
Close

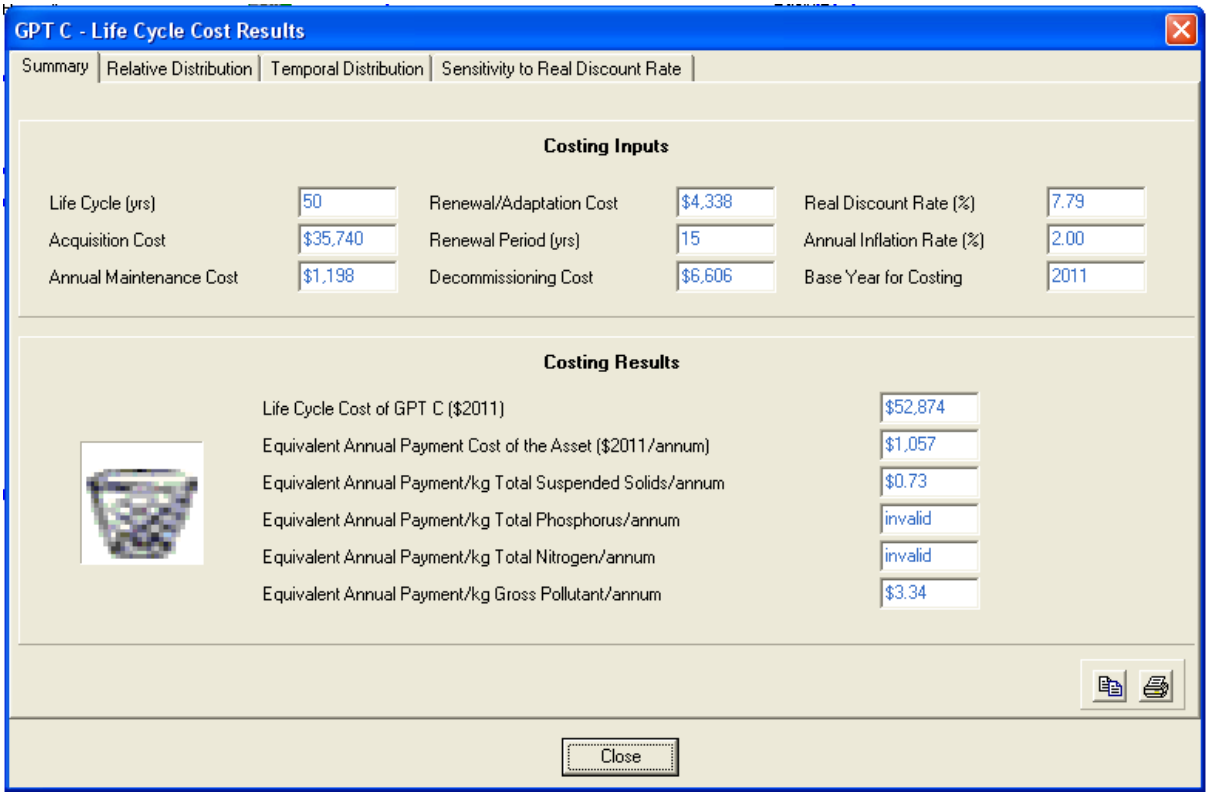

Basin A - Life Cycle Cost Results
Summary
Relative Distribution
Temporal Distribution
Sensitivity to Real Discount Rate
Costing Inputs
Life Cycle (yrs) 50
Acquisition Cost $247,637
Annual Maintenance Cost $13,420
Renewal/Adaptation Cost $138,815
Renewal Period (yrs) 25
Decommissioning Cost $111,024
Real Discount Rate (%) 7.79
Annual Inflation Rate (%) 2.00
Base Year for Costing 2011
Costing Results
Life Cycle Cost of Basin A ($2011) $439,292
Equivalent Annual Payment Cost of the Asset ($2011/annum) $8,786
Equivalent Annual Payment/kg Total Suspended Solids/annum $3.77
Equivalent Annual Payment/kg Total Phosphorus/annum $1,123.63
Equivalent Annual Payment/kg Total Nitrogen/annum $382.87
Equivalent Annual Payment/kg Gross Pollutant/annum $139.66
Close

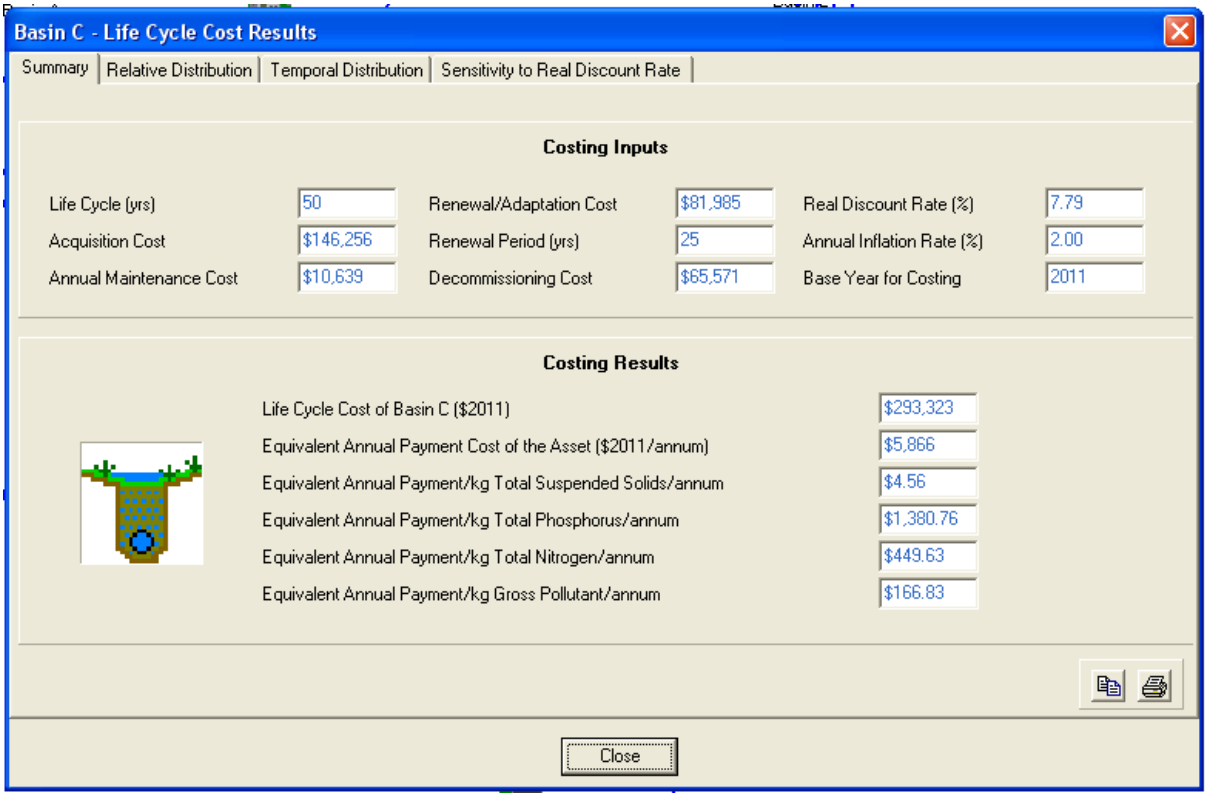
Catchment B


GPT B - Life Cycle Cost Results
Summary
Relative Distribution
Temporal Distribution
Sensitivity to Real Discount Rate
Costing Inputs
Life Cycle (yrs) 50
Acquisition Cost $25,799
Annual Maintenance Cost $1,087
Renewal/Adaptation Cost $3,131
Renewal Period (yrs) 15
Decommissioning Cost $4,768
Real Discount Rate (%) 7.79
Annual Inflation Rate (%) 2.00
Base Year for Costing 2011
Costing Results
Life Cycle Cost of GPT B ($2011) $40,952
Equivalent Annual Payment Cost of the Asset ($2011/annum) $819
Equivalent Annual Payment/kg Total Suspended Solids/annum $0.65
Equivalent Annual Payment/kg Total Phosphorus/annum invalid
Equivalent Annual Payment/kg Total Nitrogen/annum invalid
Equivalent Annual Payment/kg Gross Pollutant/annum $3.00
Close

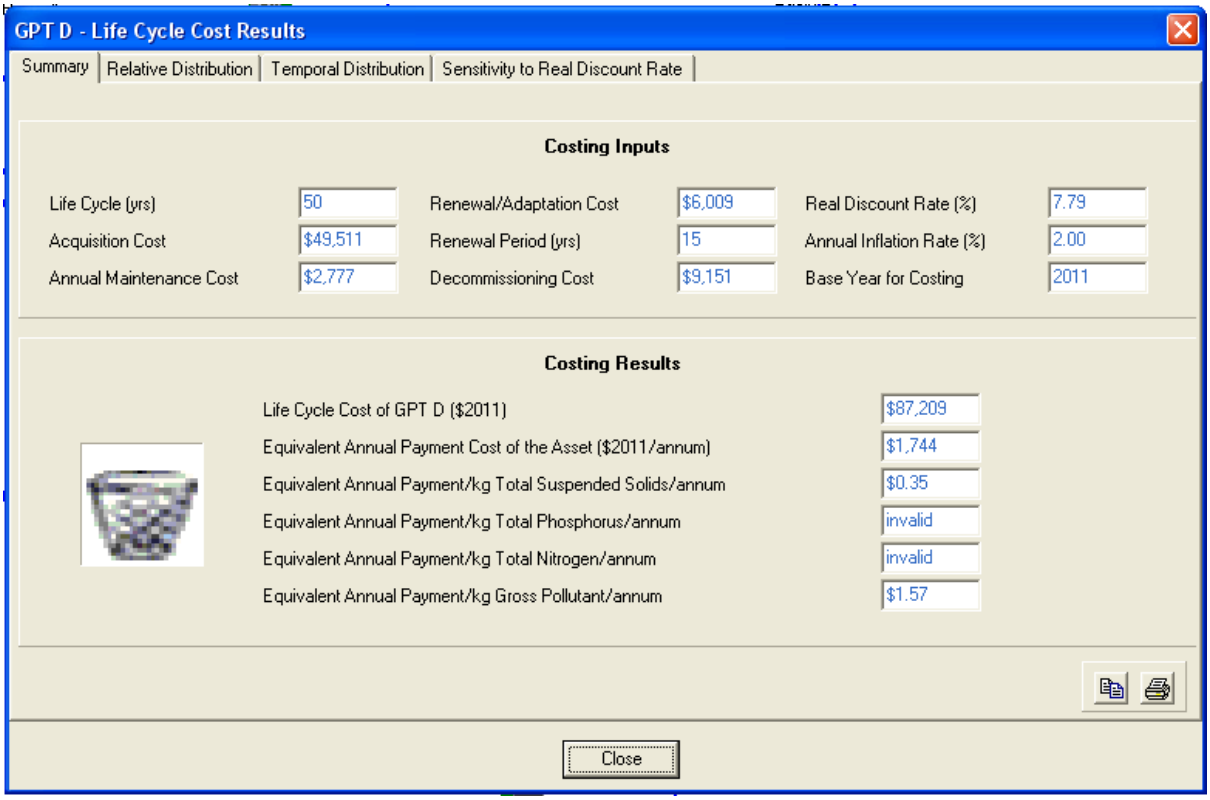

Basin B - Life Cycle Cost Results
Summary
Relative Distribution
Temporal Distribution
Sensitivity to Real Discount Rate
Costing Inputs
Life Cycle (yrs) 50
Acquisition Cost $135,924
Annual Maintenance Cost $10,300
Renewal/Adaptation Cost $76,193
Renewal Period (yrs) 25
Decommissioning Cost $60,939
Real Discount Rate (%) 7.79
Annual Inflation Rate (%) 2.00
Base Year for Costing 2011
Costing Results
Life Cycle Cost of Basin B ($2011) $277,761
Equivalent Annual Payment Cost of the Asset ($2011/annum) $5,555
Equivalent Annual Payment/kg Total Suspended Solids/annum $5.01
Equivalent Annual Payment/kg Total Phosphorus/annum $1,459.36
Equivalent Annual Payment/kg Total Nitrogen/annum $490.09
Equivalent Annual Payment/kg Gross Pollutant/annum $182.92
Close

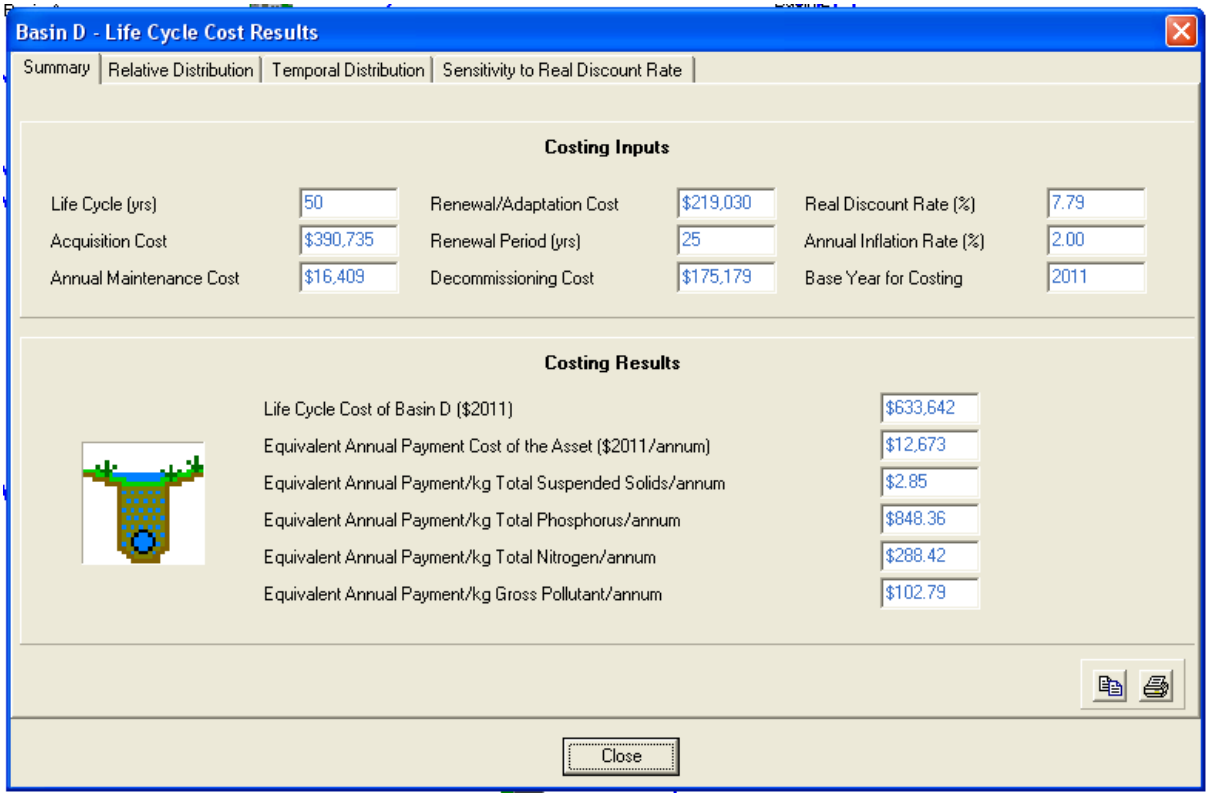
Catchment C


GPT C - Life Cycle Cost Results
Summary
Relative Distribution
Temporal Distribution
Sensitivity to Real Discount Rate
Costing Inputs
Life Cycle (yrs) 50
Acquisition Cost $35,740
Annual Maintenance Cost $1,198
Renewal/Adaptation Cost $4,338
Renewal Period (yrs) 15
Decommissioning Cost $6,606
Real Discount Rate (%) 7.79
Annual Inflation Rate (%) 2.00
Base Year for Costing 2011
Costing Results
Life Cycle Cost of GPT C ($2011) $52,874
Equivalent Annual Payment Cost of the Asset ($2011/annum) $1,057
Equivalent Annual Payment/kg Total Suspended Solids/annum $0.73
Equivalent Annual Payment/kg Total Phosphorus/annum invalid
Equivalent Annual Payment/kg Total Nitrogen/annum invalid
Equivalent Annual Payment/kg Gross Pollutant/annum $3.34
Close

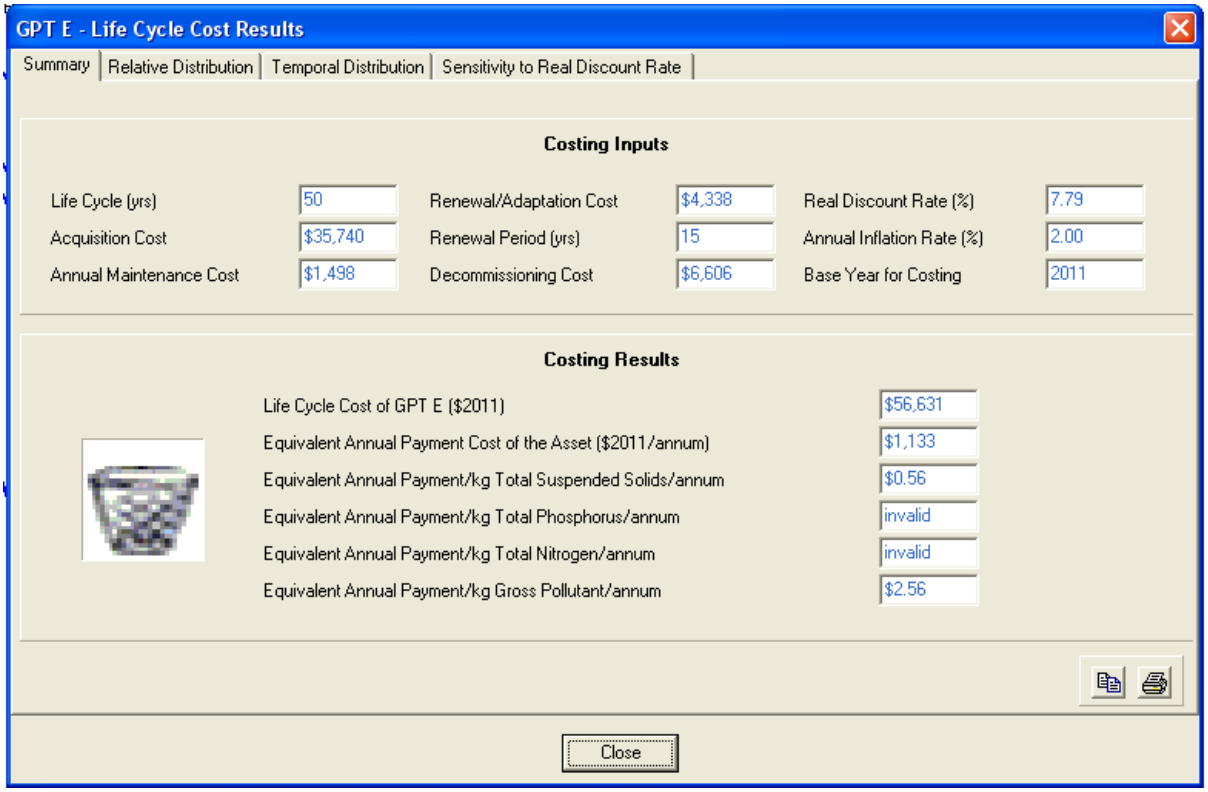

Basin C - Life Cycle Cost Results
Summary
Relative Distribution
Temporal Distribution
Sensitivity to Real Discount Rate
Costing Inputs
Life Cycle (yrs) 50
Acquisition Cost $146,256
Annual Maintenance Cost $10,639
Renewal/Adaptation Cost $81,985
Renewal Period (yrs) 25
Decommissioning Cost $65,571
Real Discount Rate (%) 7.79
Annual Inflation Rate (%) 2.00
Base Year for Costing 2011
Costing Results
Life Cycle Cost of Basin C ($2011) $293,323
Equivalent Annual Payment Cost of the Asset ($2011/annum) $5,866
Equivalent Annual Payment/kg Total Suspended Solids/annum $4.56
Equivalent Annual Payment/kg Total Phosphorus/annum $1,380.76
Equivalent Annual Payment/kg Total Nitrogen/annum $449.63
Equivalent Annual Payment/kg Gross Pollutant/annum $166.83
Close

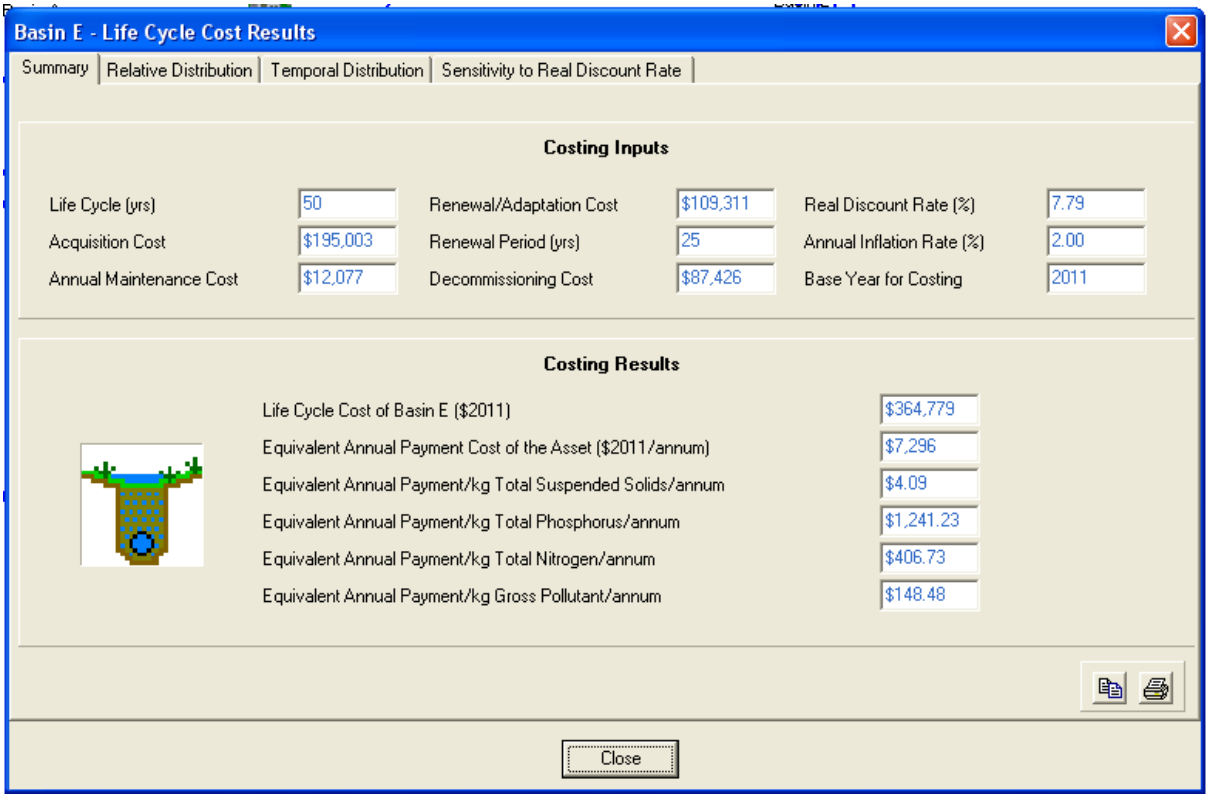
Catchment D


GPT D - Life Cycle Cost Results
Summary
Relative Distribution
Temporal Distribution
Sensitivity to Real Discount Rate
Costing Inputs
Life Cycle (yrs) 50
Acquisition Cost $49,511
Annual Maintenance Cost $2,777
Renewal/Adaptation Cost $6,009
Renewal Period (yrs) 15
Decommissioning Cost $9,151
Real Discount Rate (%) 7.79
Annual Inflation Rate (%) 2.00
Base Year for Costing 2011
Costing Results
Life Cycle Cost of GPT D ($2011) $87,209
Equivalent Annual Payment Cost of the Asset ($2011/annum) $1,744
Equivalent Annual Payment/kg Total Suspended Solids/annum $0.35
Equivalent Annual Payment/kg Total Phosphorus/annum invalid
Equivalent Annual Payment/kg Total Nitrogen/annum invalid
Equivalent Annual Payment/kg Gross Pollutant/annum $1.57
Close


Basin D - Life Cycle Cost Results
Summary
Relative Distribution
Temporal Distribution
Sensitivity to Real Discount Rate
Costing Inputs
Life Cycle (yrs) 50
Acquisition Cost $390,735
Annual Maintenance Cost $16,409
Renewal/Adaptation Cost $219,030
Renewal Period (yrs) 25
Decommissioning Cost $175,179
Real Discount Rate (%) 7.79
Annual Inflation Rate (%) 2.00
Base Year for Costing 2011
Costing Results
Life Cycle Cost of Basin D ($2011) $633,642
Equivalent Annual Payment Cost of the Asset ($2011/annum) $12,673
Equivalent Annual Payment/kg Total Suspended Solids/annum $2.85
Equivalent Annual Payment/kg Total Phosphorus/annum $848.36
Equivalent Annual Payment/kg Total Nitrogen/annum $288.42
Equivalent Annual Payment/kg Gross Pollutant/annum $102.79
Close

Catchment E


GPT E - Life Cycle Cost Results
Summary
Relative Distribution
Temporal Distribution
Sensitivity to Real Discount Rate
Costing Inputs
Life Cycle (yrs) 50
Acquisition Cost $35,740
Annual Maintenance Cost $1,498
Renewal/Adaptation Cost $4,338
Renewal Period (yrs) 15
Decommissioning Cost $6,606
Real Discount Rate (%) 7.79
Annual Inflation Rate (%) 2.00
Base Year for Costing 2011
Costing Results
Life Cycle Cost of GPT E ($2011) $56,631
Equivalent Annual Payment Cost of the Asset ($2011/annum) $1,133
Equivalent Annual Payment/kg Total Suspended Solids/annum $0.56
Equivalent Annual Payment/kg Total Phosphorus/annum invalid
Equivalent Annual Payment/kg Total Nitrogen/annum invalid
Equivalent Annual Payment/kg Gross Pollutant/annum $2.56
Close


Basin E - Life Cycle Cost Results
Summary
Relative Distribution
Temporal Distribution
Sensitivity to Real Discount Rate
Costing Inputs
Life Cycle (yrs) 50
Acquisition Cost $195,003
Annual Maintenance Cost $12,077
Renewal/Adaptation Cost $109,311
Renewal Period (yrs) 25
Decommissioning Cost $87,426
Real Discount Rate (%) 7.79
Annual Inflation Rate (%) 2.00
Base Year for Costing 2011
Costing Results
Life Cycle Cost of Basin E ($2011) $364,779
Equivalent Annual Payment Cost of the Asset ($2011/annum) $7,296
Equivalent Annual Payment/kg Total Suspended Solids/annum $4.09
Equivalent Annual Payment/kg Total Phosphorus/annum $1,241.23
Equivalent Annual Payment/kg Total Nitrogen/annum $406.73
Equivalent Annual Payment/kg Gross Pollutant/annum $148.48
Close

Catchment F

GPT F - Life Cycle Cost Results

Summary | Relative Distribution | Temporal Distribution | Sensitivity to Real Discount Rate

Costing Inputs

Life Cycle (yrs)	50	Renewal/Adaptation Cost	$5,249	Real Discount Rate (%)	7.79
Acquisition Cost	$43,247	Renewal Period (yrs)	15	Annual Inflation Rate (%)	2.00
Annual Maintenance Cost	$1,925	Decommissioning Cost	$7,993	Base Year for Costing	2011

Costing Results



Life Cycle Cost of GPT F ($2011)	$69,920
Equivalent Annual Payment Cost of the Asset ($2011/annum)	$1,398
Equivalent Annual Payment/kg Total Suspended Solids/annum	$0.48
Equivalent Annual Payment/kg Total Phosphorus/annum	invalid
Equivalent Annual Payment/kg Total Nitrogen/annum	invalid
Equivalent Annual Payment/kg Gross Pollutant/annum	$2.17

Close

Basin F - Life Cycle Cost Results

Summary | Relative Distribution | Temporal Distribution | Sensitivity to Real Discount Rate

Costing Inputs

Life Cycle (yrs)	50	Renewal/Adaptation Cost	$146,140	Real Discount Rate (%)	7.79
Acquisition Cost	$260,704	Renewal Period (yrs)	25	Annual Inflation Rate (%)	2.00
Annual Maintenance Cost	$13,727	Decommissioning Cost	$116,882	Base Year for Costing	2011

Costing Results



Life Cycle Cost of Basin F ($2011)	$457,474
Equivalent Annual Payment Cost of the Asset ($2011/annum)	$9,149
Equivalent Annual Payment/kg Total Suspended Solids/annum	$3.55
Equivalent Annual Payment/kg Total Phosphorus/annum	$1,064.00
Equivalent Annual Payment/kg Total Nitrogen/annum	$341.96
Equivalent Annual Payment/kg Gross Pollutant/annum	$128.04

Close

Catchment G

GPT G - Life Cycle Cost Results

Summary | Relative Distribution | Temporal Distribution | Sensitivity to Real Discount Rate

Costing Inputs

Life Cycle (yrs)	50	Renewal/Adaptation Cost	$3,131	Real Discount Rate (%)	7.79
Acquisition Cost	$25,799	Renewal Period (yrs)	15	Annual Inflation Rate (%)	2.00
Annual Maintenance Cost	$640	Decommissioning Cost	$4,768	Base Year for Costing	2011

Costing Results



Life Cycle Cost of GPT G ($2011)	$35,361
Equivalent Annual Payment Cost of the Asset ($2011/annum)	$707
Equivalent Annual Payment/kg Total Suspended Solids/annum	$1.22
Equivalent Annual Payment/kg Total Phosphorus/annum	invalid
Equivalent Annual Payment/kg Total Nitrogen/annum	invalid
Equivalent Annual Payment/kg Gross Pollutant/annum	$5.71

Close

Basin G - Life Cycle Cost Results

Summary | Relative Distribution | Temporal Distribution | Sensitivity to Real Discount Rate

Costing Inputs

Life Cycle (yrs)	50	Renewal/Adaptation Cost	$43,197	Real Discount Rate (%)	7.79
Acquisition Cost	$77,061	Renewal Period (yrs)	25	Annual Inflation Rate (%)	2.00
Annual Maintenance Cost	$8,020	Decommissioning Cost	$34,549	Base Year for Costing	2011

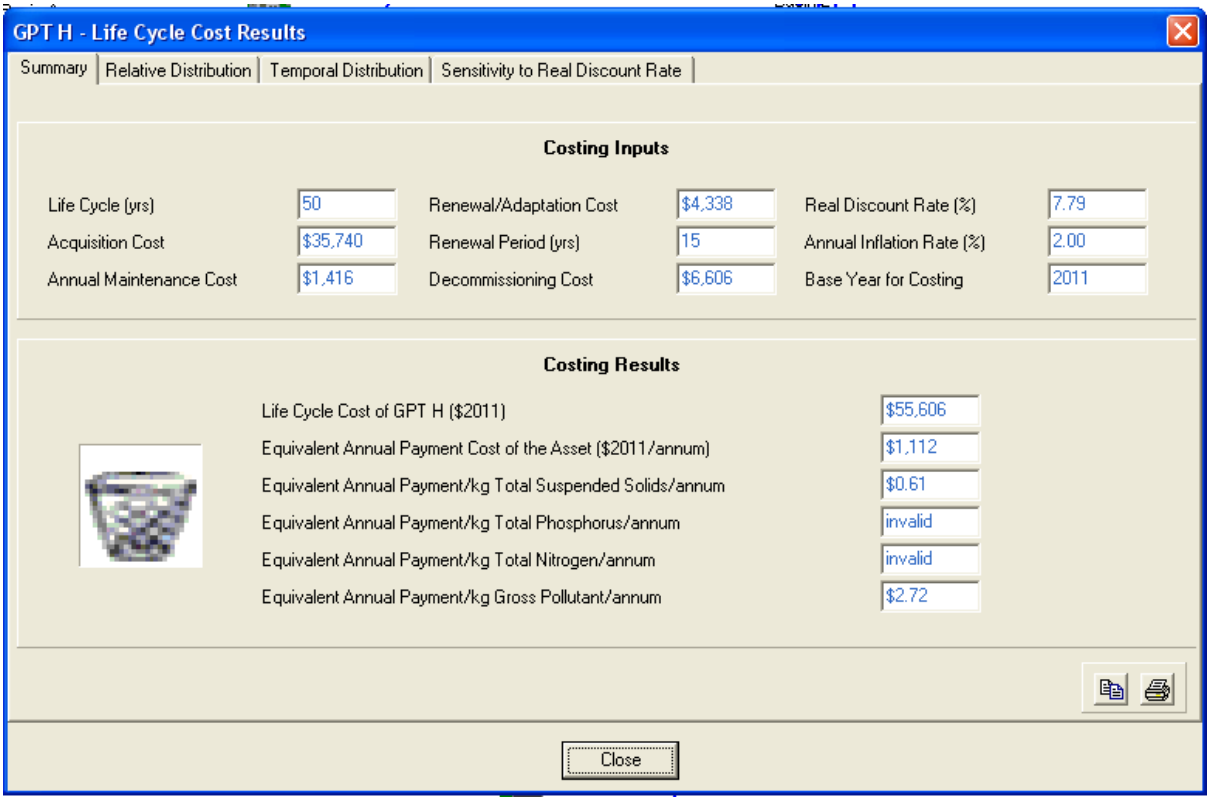
Costing Results

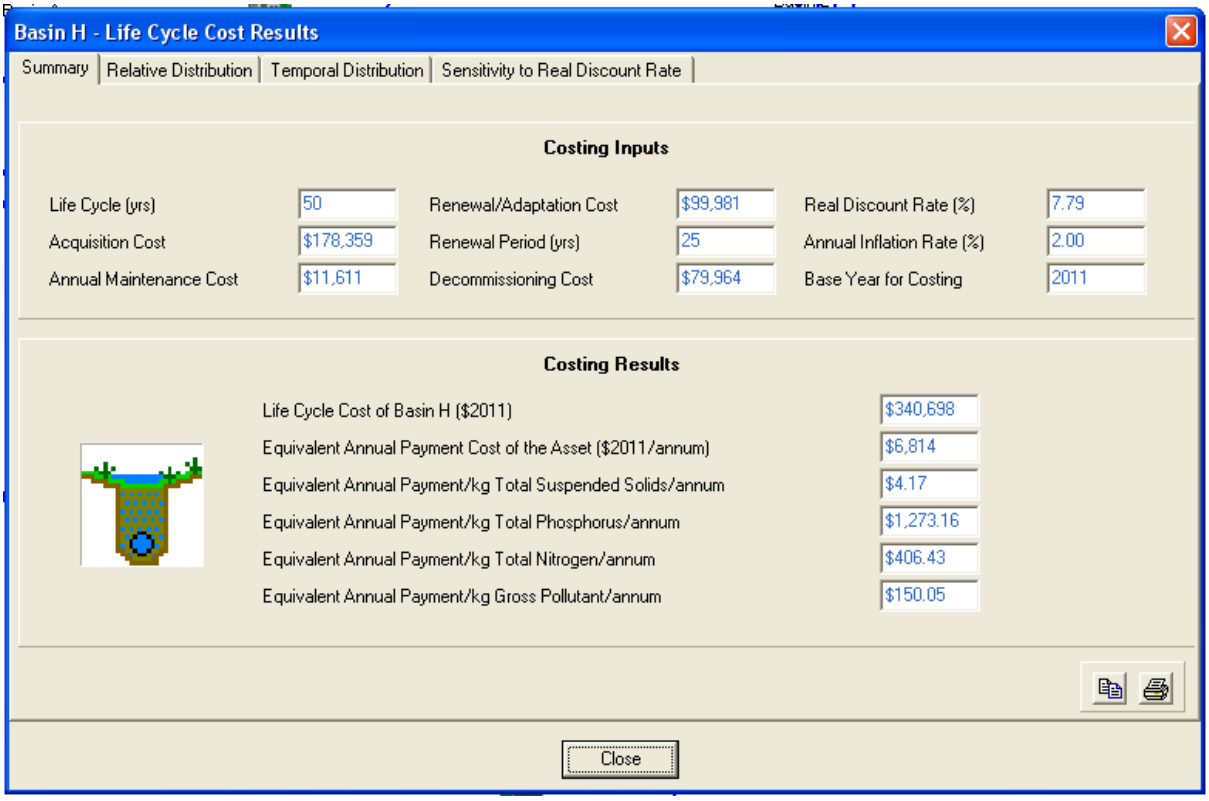


Life Cycle Cost of Basin G ($2011)	$184,697
Equivalent Annual Payment Cost of the Asset ($2011/annum)	$3,694
Equivalent Annual Payment/kg Total Suspended Solids/annum	$7.10
Equivalent Annual Payment/kg Total Phosphorus/annum	$2,217.70
Equivalent Annual Payment/kg Total Nitrogen/annum	$731.56
Equivalent Annual Payment/kg Gross Pollutant/annum	$268.38

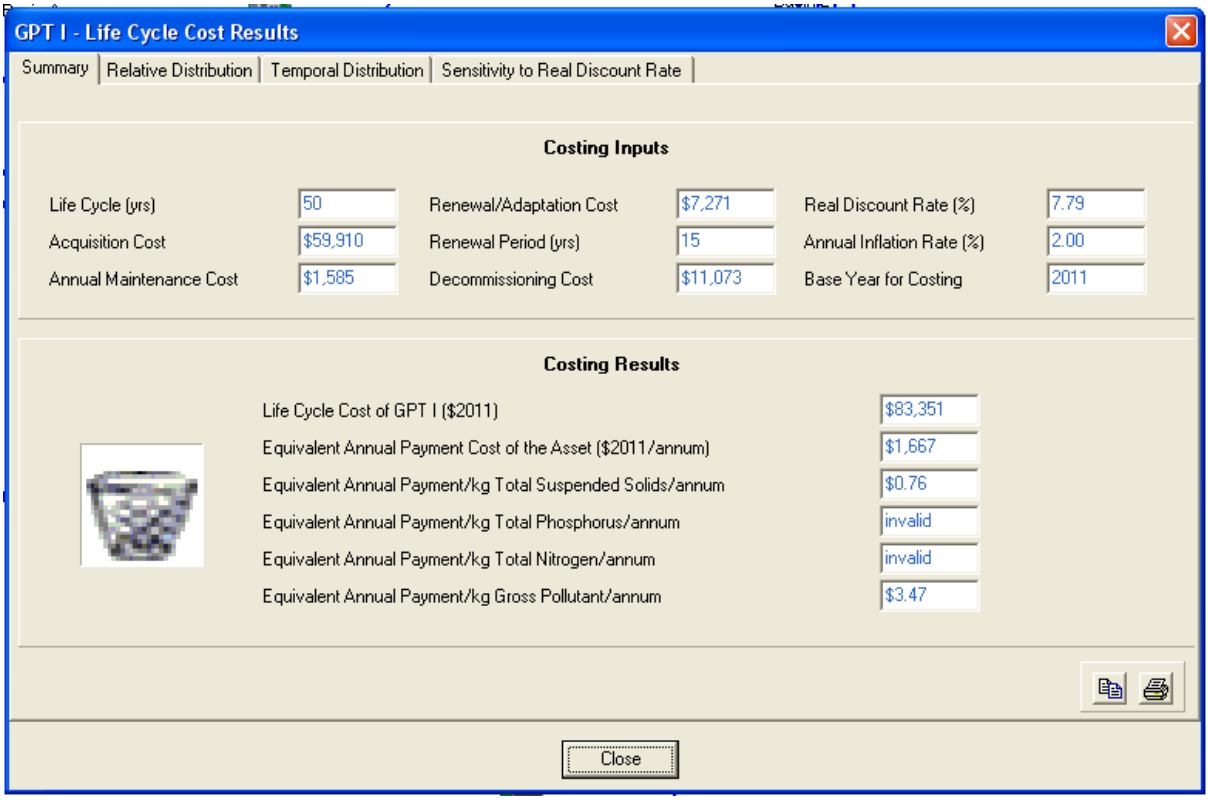
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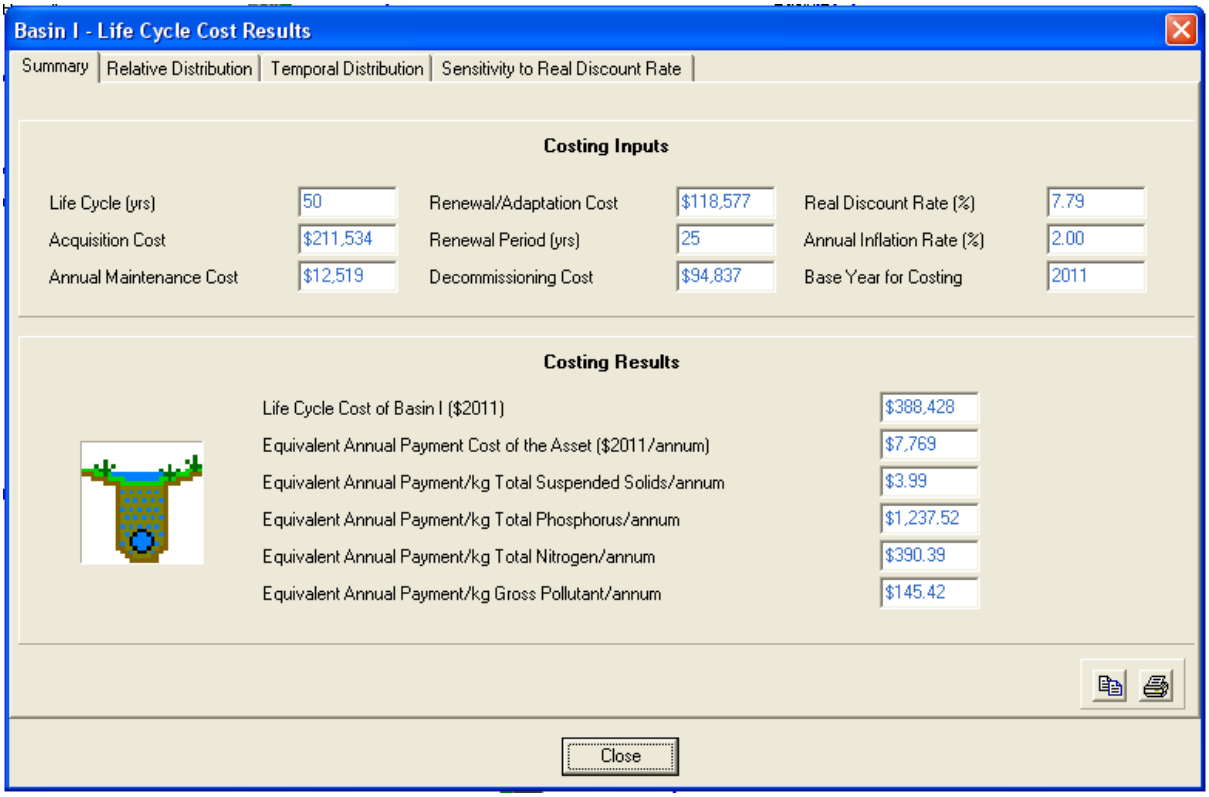
Catchment H


GPT H - Life Cycle Cost Results
Summary
Relative Distribution
Temporal Distribution
Sensitivity to Real Discount Rate
Costing Inputs
Life Cycle (yrs) 50
Acquisition Cost $35,740
Annual Maintenance Cost $1,416
Renewal/Adaptation Cost $4,338
Renewal Period (yrs) 15
Decommissioning Cost $6,606
Real Discount Rate (%) 7.79
Annual Inflation Rate (%) 2.00
Base Year for Costing 2011
Costing Results
Life Cycle Cost of GPT H ($2011) $55,606
Equivalent Annual Payment Cost of the Asset ($2011/annum) $1,112
Equivalent Annual Payment/kg Total Suspended Solids/annum $0.61
Equivalent Annual Payment/kg Total Phosphorus/annum invalid
Equivalent Annual Payment/kg Total Nitrogen/annum invalid
Equivalent Annual Payment/kg Gross Pollutant/annum $2.72
Close

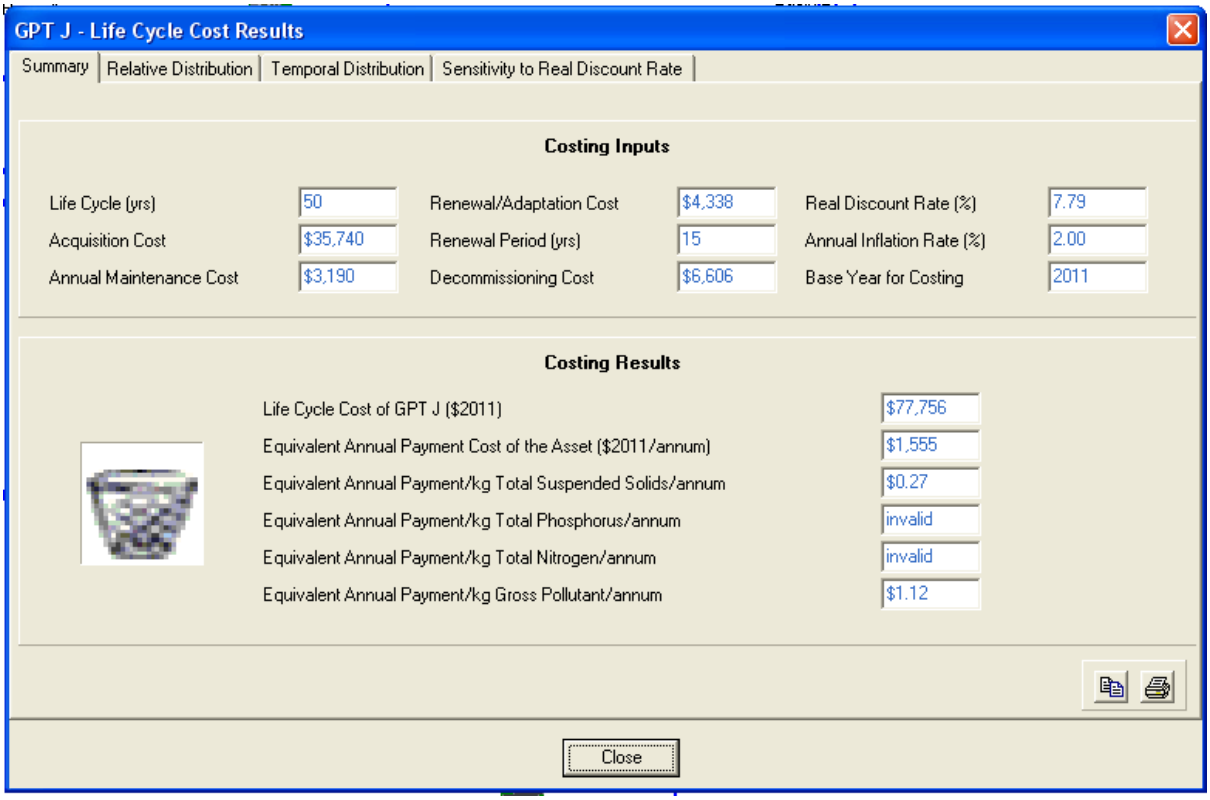

Basin H - Life Cycle Cost Results
Summary
Relative Distribution
Temporal Distribution
Sensitivity to Real Discount Rate
Costing Inputs
Life Cycle (yrs) 50
Acquisition Cost $178,359
Annual Maintenance Cost $11,611
Renewal/Adaptation Cost $99,981
Renewal Period (yrs) 25
Decommissioning Cost $79,964
Real Discount Rate (%) 7.79
Annual Inflation Rate (%) 2.00
Base Year for Costing 2011
Costing Results
Life Cycle Cost of Basin H ($2011) $340,698
Equivalent Annual Payment Cost of the Asset ($2011/annum) $6,814
Equivalent Annual Payment/kg Total Suspended Solids/annum $4.17
Equivalent Annual Payment/kg Total Phosphorus/annum $1,273.16
Equivalent Annual Payment/kg Total Nitrogen/annum $406.43
Equivalent Annual Payment/kg Gross Pollutant/annum $150.05
Close

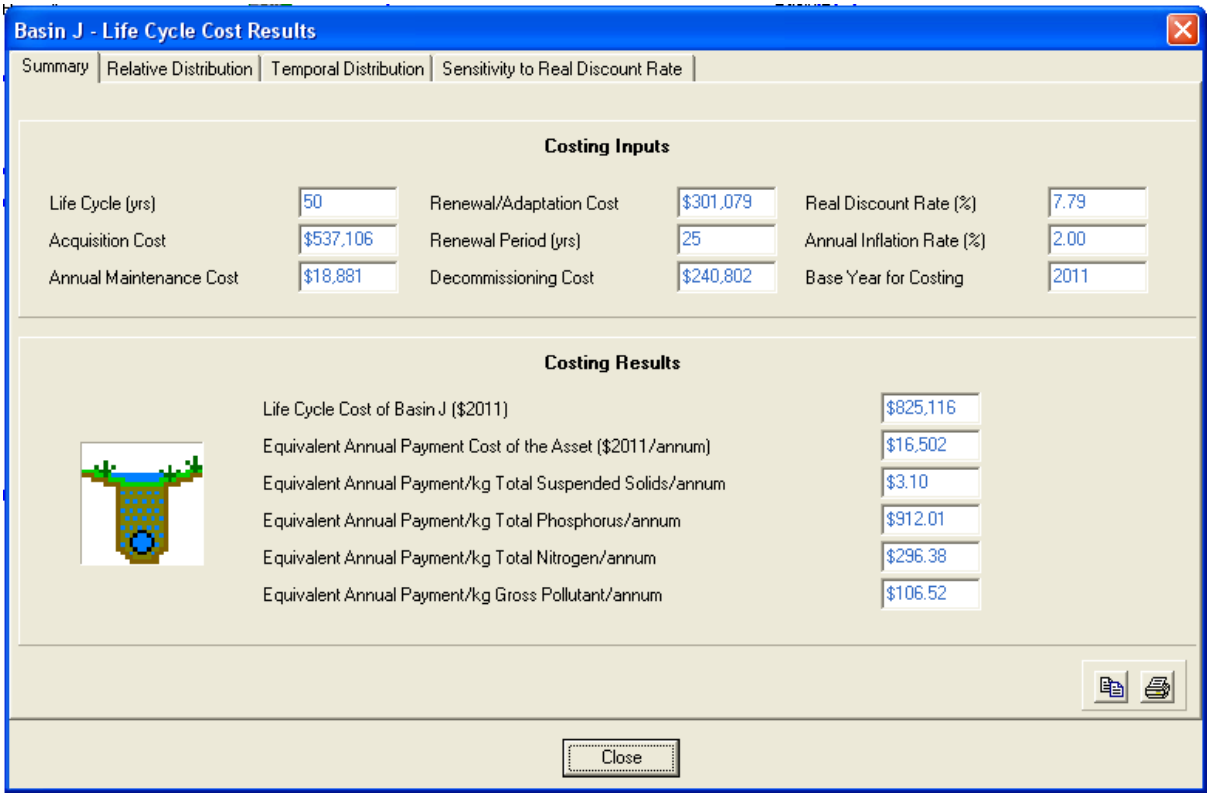
Catchment I


GPT I - Life Cycle Cost Results
Summary
Relative Distribution
Temporal Distribution
Sensitivity to Real Discount Rate
Costing Inputs
Life Cycle (yrs) 50
Acquisition Cost $59,910
Annual Maintenance Cost $1,585
Renewal/Adaptation Cost $7,271
Renewal Period (yrs) 15
Decommissioning Cost $11,073
Real Discount Rate (%) 7.79
Annual Inflation Rate (%) 2.00
Base Year for Costing 2011
Costing Results
Life Cycle Cost of GPT I ($2011) $83,351
Equivalent Annual Payment Cost of the Asset ($2011/annum) $1,667
Equivalent Annual Payment/kg Total Suspended Solids/annum $0.76
Equivalent Annual Payment/kg Total Phosphorus/annum invalid
Equivalent Annual Payment/kg Total Nitrogen/annum invalid
Equivalent Annual Payment/kg Total Nitrogen/annum $3.47
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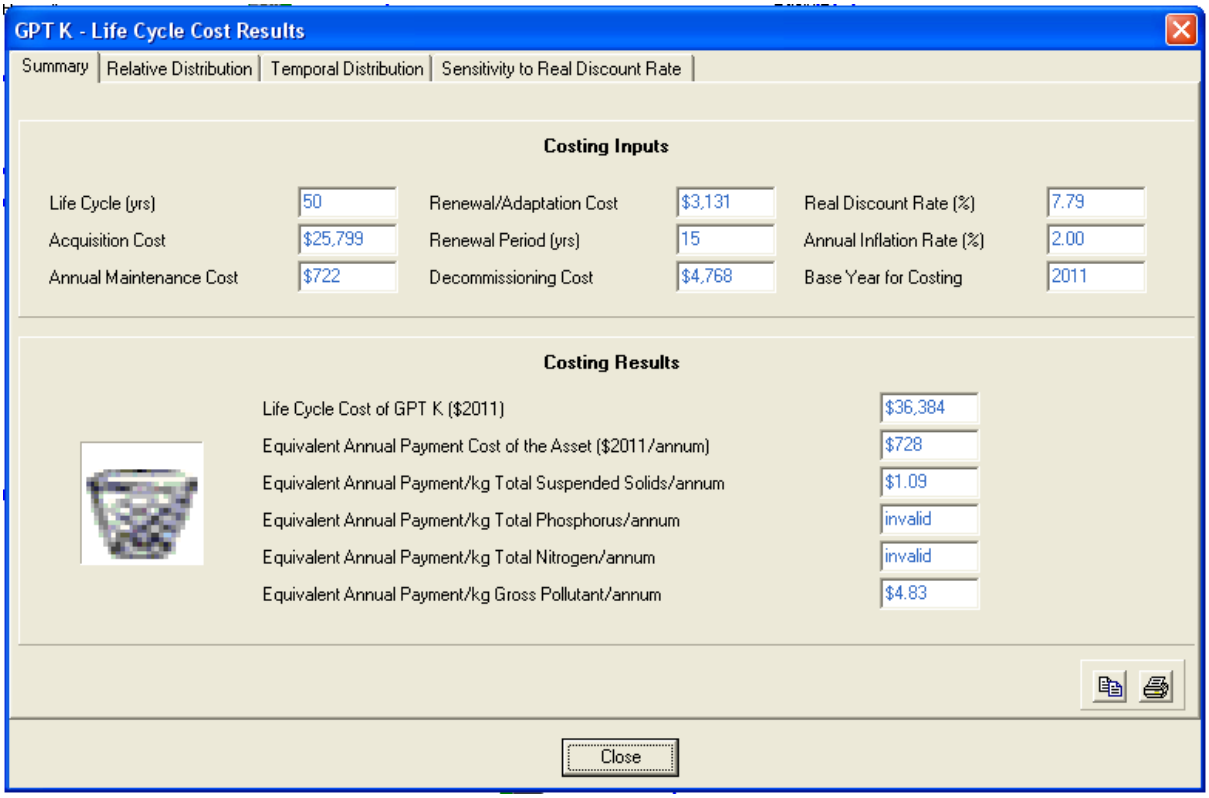

Basin I - Life Cycle Cost Results
Summary
Relative Distribution
Temporal Distribution
Sensitivity to Real Discount Rate
Costing Inputs
Life Cycle (yrs) 50
Acquisition Cost $211,534
Annual Maintenance Cost $12,519
Renewal/Adaptation Cost $118,577
Renewal Period (yrs) 25
Decommissioning Cost $94,837
Real Discount Rate (%) 7.79
Annual Inflation Rate (%) 2.00
Base Year for Costing 2011
Costing Results
Life Cycle Cost of Basin I ($2011) $388,428
Equivalent Annual Payment Cost of the Asset ($2011/annum) $7,769
Equivalent Annual Payment/kg Total Suspended Solids/annum $3.99
Equivalent Annual Payment/kg Total Phosphorus/annum $1,237.52
Equivalent Annual Payment/kg Total Nitrogen/annum $390.39
Equivalent Annual Payment/kg Gross Pollutant/annum $145.42
Close

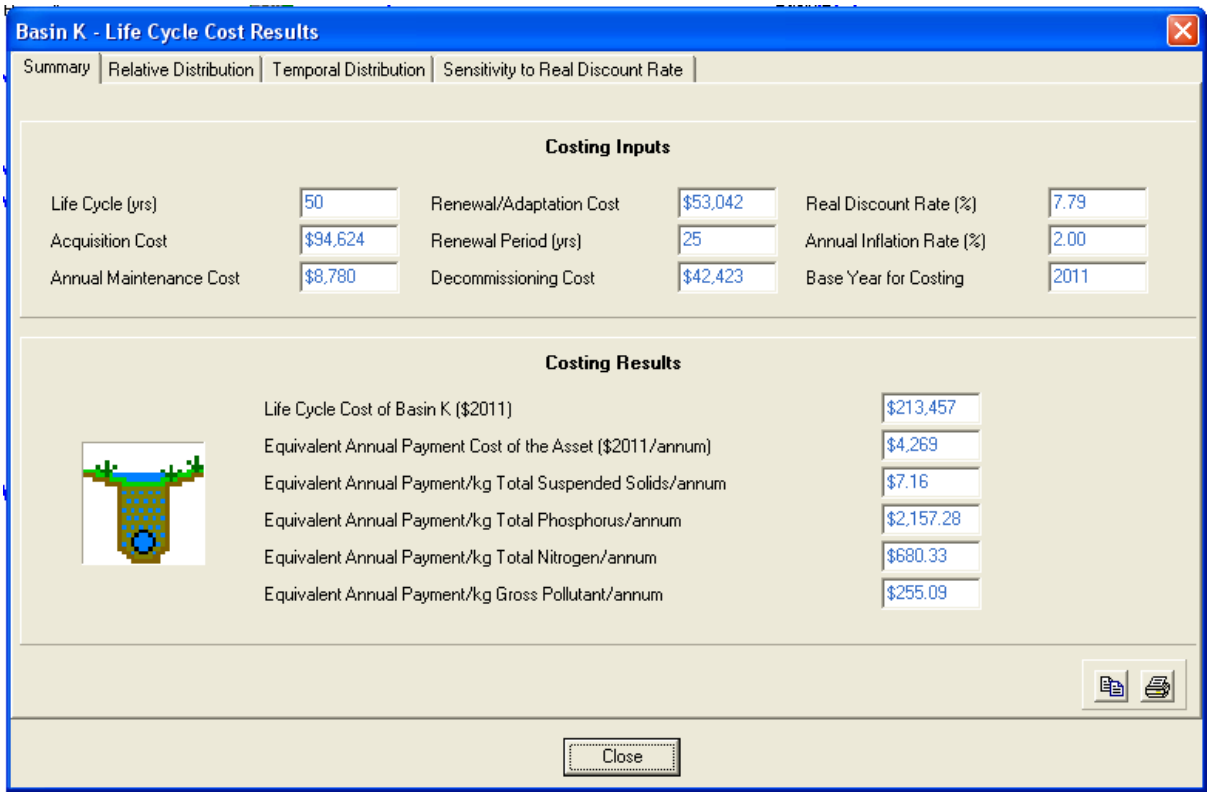
Catchment J


GPT J - Life Cycle Cost Results
Summary
Relative Distribution
Temporal Distribution
Sensitivity to Real Discount Rate
Costing Inputs
Life Cycle (yrs) 50
Acquisition Cost $35,740
Annual Maintenance Cost $3,190
Renewal/Adaptation Cost $4,338
Renewal Period (yrs) 15
Decommissioning Cost $6,606
Real Discount Rate (%) 7.79
Annual Inflation Rate (%) 2.00
Base Year for Costing 2011
Costing Results
Life Cycle Cost of GPT J ($2011) $77,756
Equivalent Annual Payment Cost of the Asset ($2011/annum) $1,555
Equivalent Annual Payment/kg Total Suspended Solids/annum $0.27
Equivalent Annual Payment/kg Total Phosphorus/annum invalid
Equivalent Annual Payment/kg Total Nitrogen/annum invalid
Equivalent Annual Payment/kg Gross Pollutant/annum $1.12
Close

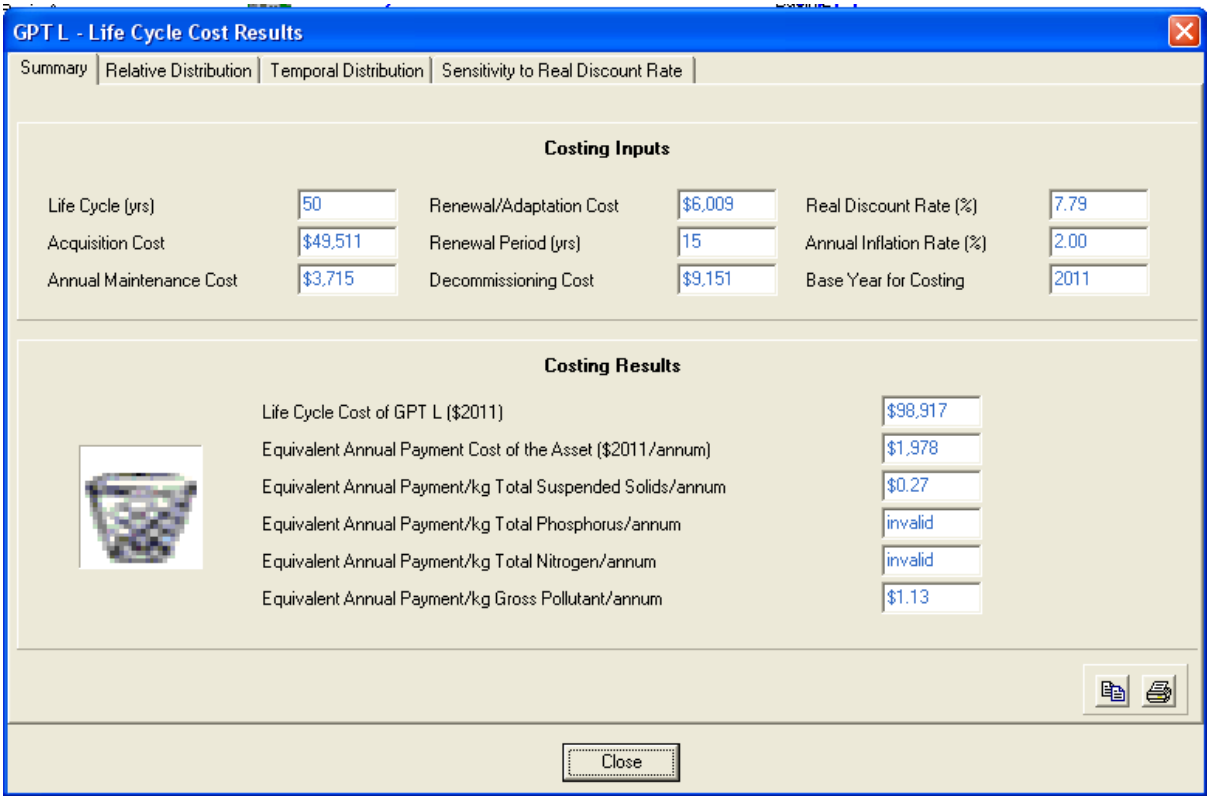

Basin J - Life Cycle Cost Results
Summary
Relative Distribution
Temporal Distribution
Sensitivity to Real Discount Rate
Costing Inputs
Life Cycle (yrs) 50
Acquisition Cost $537,106
Annual Maintenance Cost $18,881
Renewal/Adaptation Cost $301,079
Renewal Period (yrs) 25
Decommissioning Cost $240,802
Real Discount Rate (%) 7.79
Annual Inflation Rate (%) 2.00
Base Year for Costing 2011
Costing Results
Life Cycle Cost of Basin J ($2011) $825,116
Equivalent Annual Payment Cost of the Asset ($2011/annum) $16,502
Equivalent Annual Payment/kg Total Suspended Solids/annum $3.10
Equivalent Annual Payment/kg Total Phosphorus/annum $912.01
Equivalent Annual Payment/kg Total Nitrogen/annum $296.38
Equivalent Annual Payment/kg Gross Pollutant/annum $106.52
Close

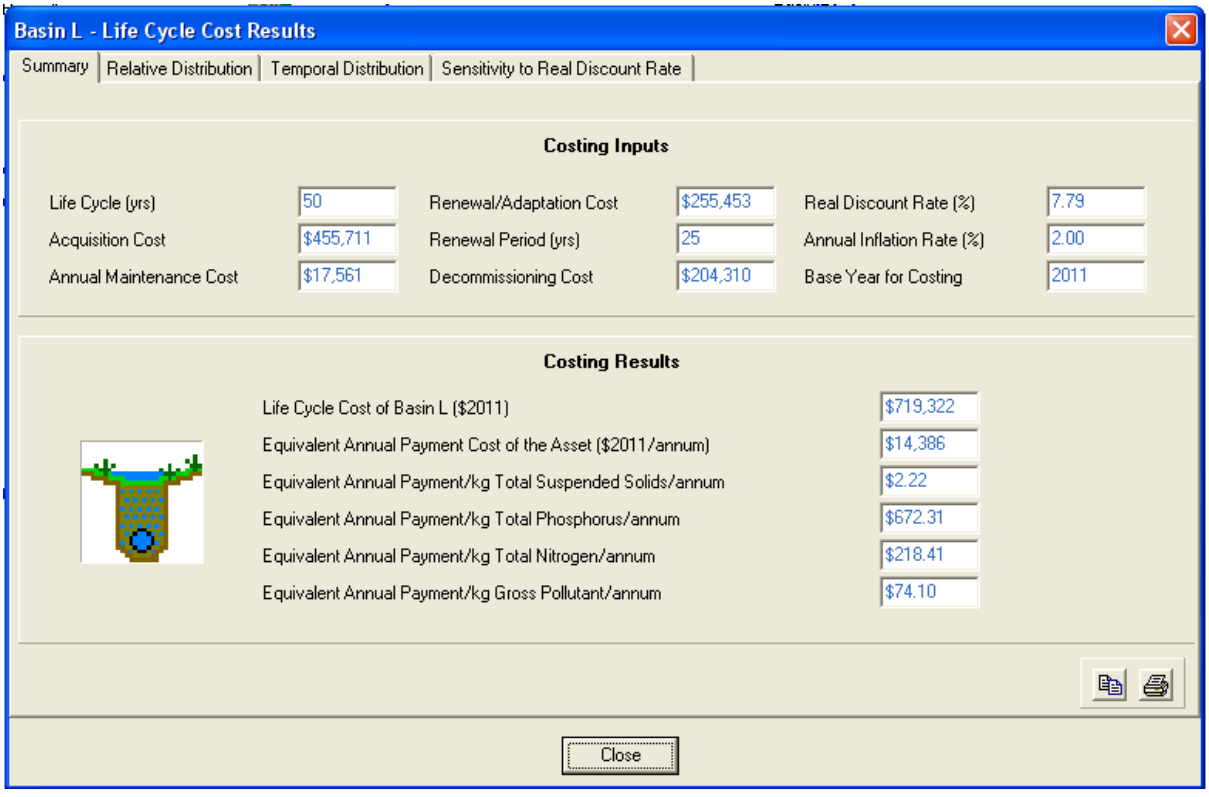
Catchment K


GPT K - Life Cycle Cost Results
Summary
Relative Distribution
Temporal Distribution
Sensitivity to Real Discount Rate
Costing Inputs
Life Cycle (yrs) 50
Acquisition Cost $25,799
Annual Maintenance Cost $722
Renewal/Adaptation Cost $3,131
Renewal Period (yrs) 15
Decommissioning Cost $4,768
Real Discount Rate (%) 7.79
Annual Inflation Rate (%) 2.00
Base Year for Costing 2011
Costing Results
Life Cycle Cost of GPT K ($2011) $36,384
Equivalent Annual Payment Cost of the Asset ($2011/annum) $728
Equivalent Annual Payment/kg Total Suspended Solids/annum $1.09
Equivalent Annual Payment/kg Total Phosphorus/annum invalid
Equivalent Annual Payment/kg Total Nitrogen/annum invalid
Equivalent Annual Payment/kg Gross Pollutant/annum $4.83
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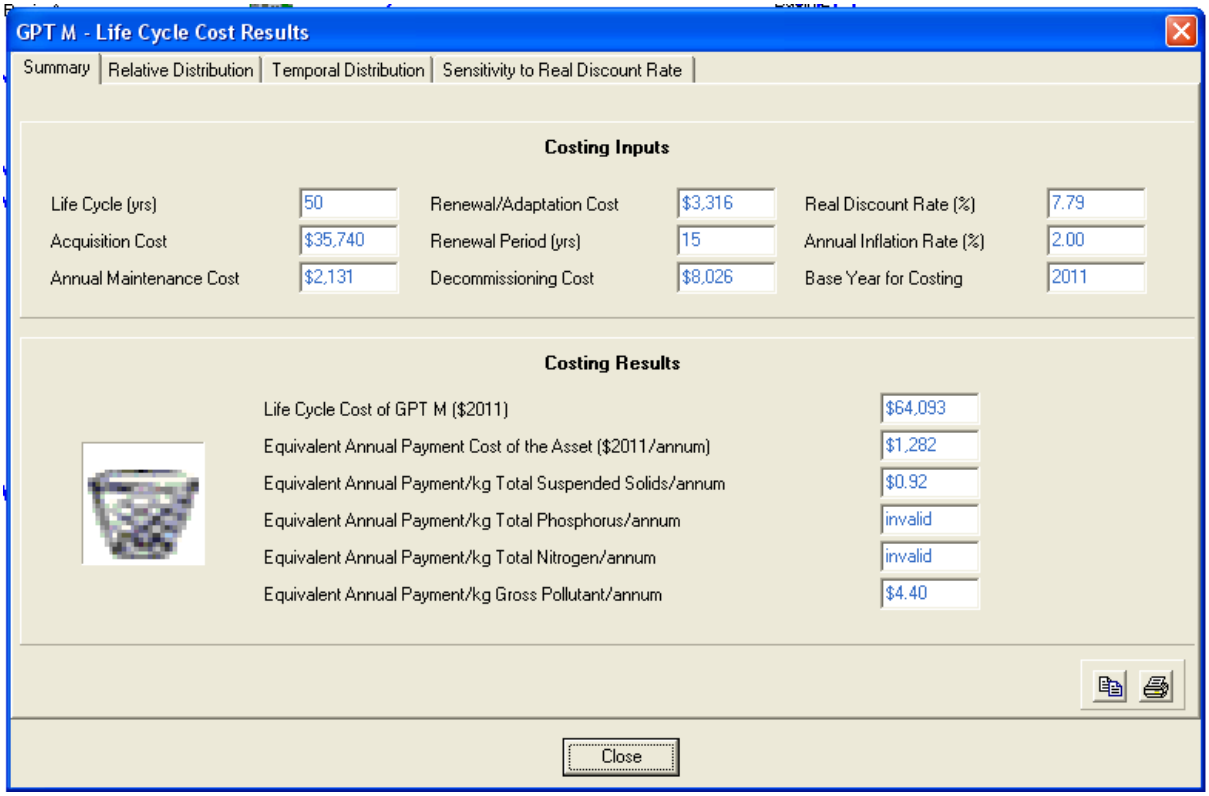

Basin K - Life Cycle Cost Results
Summary
Relative Distribution
Temporal Distribution
Sensitivity to Real Discount Rate
Costing Inputs
Life Cycle (yrs) 50
Acquisition Cost $94,624
Annual Maintenance Cost $8,780
Renewal/Adaptation Cost $53,042
Renewal Period (yrs) 25
Decommissioning Cost $42,423
Real Discount Rate (%) 7.79
Annual Inflation Rate (%) 2.00
Base Year for Costing 2011
Costing Results
Life Cycle Cost of Basin K ($2011) $213,457
Equivalent Annual Payment Cost of the Asset ($2011/annum) $4,269
Equivalent Annual Payment/kg Total Suspended Solids/annum $7.16
Equivalent Annual Payment/kg Total Phosphorus/annum $2,157.28
Equivalent Annual Payment/kg Total Nitrogen/annum $680.33
Equivalent Annual Payment/kg Gross Pollutant/annum $255.09
Close

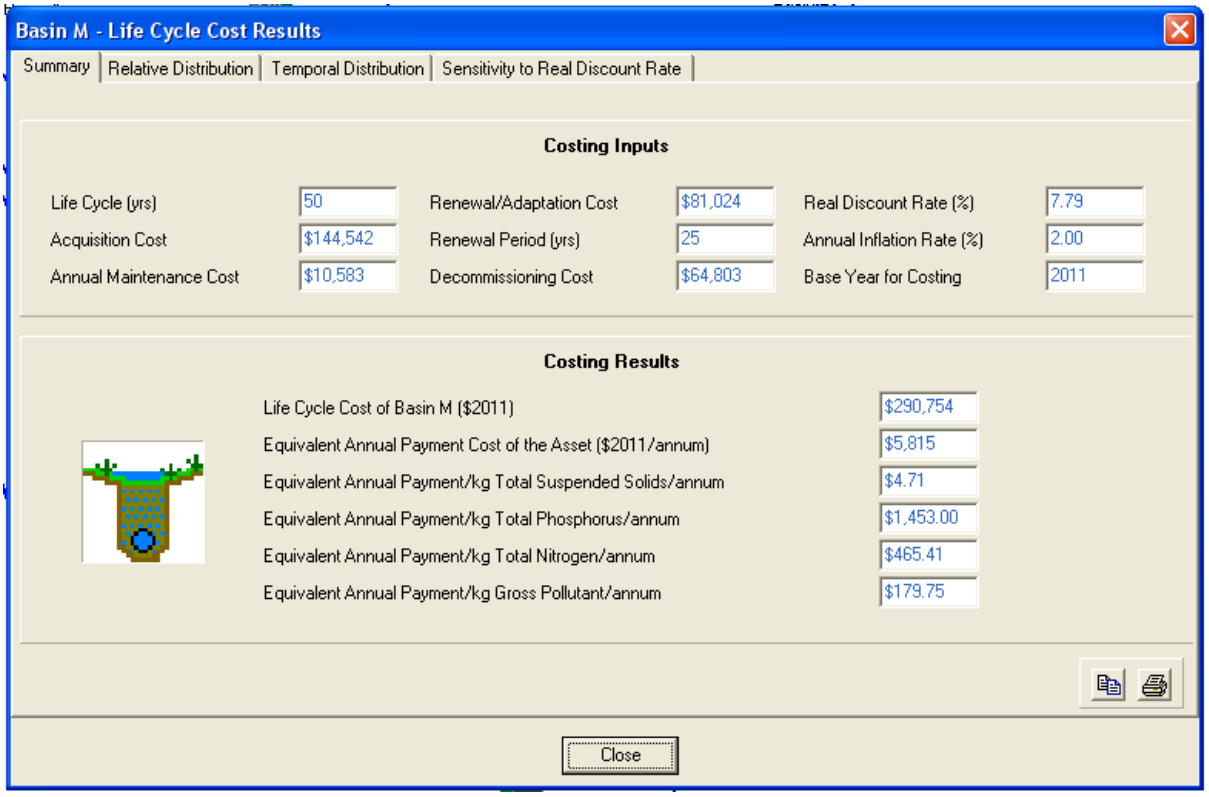
Catchment L


GPT L - Life Cycle Cost Results
Summary
Relative Distribution
Temporal Distribution
Sensitivity to Real Discount Rate
Costing Inputs
Life Cycle (yrs) 50
Acquisition Cost $49,511
Annual Maintenance Cost $3,715
Renewal/Adaptation Cost $6,009
Renewal Period (yrs) 15
Decommissioning Cost $9,151
Real Discount Rate (%) 7.79
Annual Inflation Rate (%) 2.00
Base Year for Costing 2011
Costing Results
Life Cycle Cost of GPT L ($2011) $98,917
Equivalent Annual Payment Cost of the Asset ($2011/annum) $1,978
Equivalent Annual Payment/kg Total Suspended Solids/annum $0.27
Equivalent Annual Payment/kg Total Phosphorus/annum invalid
Equivalent Annual Payment/kg Total Nitrogen/annum invalid
Equivalent Annual Payment/kg Gross Pollutant/annum $1.13
Close


Basin L - Life Cycle Cost Results
Summary
Relative Distribution
Temporal Distribution
Sensitivity to Real Discount Rate
Costing Inputs
Life Cycle (yrs) 50
Acquisition Cost $455,711
Annual Maintenance Cost $17,561
Renewal/Adaptation Cost $255,453
Renewal Period (yrs) 25
Decommissioning Cost $204,310
Real Discount Rate (%) 7.79
Annual Inflation Rate (%) 2.00
Base Year for Costing 2011
Costing Results
Life Cycle Cost of Basin L ($2011) $719,322
Equivalent Annual Payment Cost of the Asset ($2011/annum) $14,386
Equivalent Annual Payment/kg Total Suspended Solids/annum $2.22
Equivalent Annual Payment/kg Total Phosphorus/annum $672.31
Equivalent Annual Payment/kg Total Nitrogen/annum $218.41
Equivalent Annual Payment/kg Gross Pollutant/annum $74.10
Close

Catchment M


GPT M - Life Cycle Cost Results
Summary
Relative Distribution
Temporal Distribution
Sensitivity to Real Discount Rate
Costing Inputs
Life Cycle (yrs) 50
Acquisition Cost $35,740
Annual Maintenance Cost $2,131
Renewal/Adaptation Cost $3,316
Renewal Period (yrs) 15
Decommissioning Cost $8,026
Real Discount Rate (%) 7.79
Annual Inflation Rate (%) 2.00
Base Year for Costing 2011
Costing Results
Life Cycle Cost of GPT M ($2011) $64,093
Equivalent Annual Payment Cost of the Asset ($2011/annum) $1,282
Equivalent Annual Payment/kg Total Suspended Solids/annum $0.92
Equivalent Annual Payment/kg Total Phosphorus/annum invalid
Equivalent Annual Payment/kg Total Nitrogen/annum invalid
Equivalent Annual Payment/kg Gross Pollutant/annum $4.40
Close


Basin M - Life Cycle Cost Results
Summary
Relative Distribution
Temporal Distribution
Sensitivity to Real Discount Rate
Costing Inputs
Life Cycle (yrs) 50
Acquisition Cost $144,542
Annual Maintenance Cost $10,583
Renewal/Adaptation Cost $81,024
Renewal Period (yrs) 25
Decommissioning Cost $64,803
Real Discount Rate (%) 7.79
Annual Inflation Rate (%) 2.00
Base Year for Costing 2011
Costing Results
Life Cycle Cost of Basin M ($2011) $290,754
Equivalent Annual Payment Cost of the Asset ($2011/annum) $5,815
Equivalent Annual Payment/kg Total Suspended Solids/annum $4.71
Equivalent Annual Payment/kg Total Phosphorus/annum $1,453.00
Equivalent Annual Payment/kg Total Nitrogen/annum $465.41
Equivalent Annual Payment/kg Gross Pollutant/annum $179.75
Close

Appendix C

Infrastructure Charge Calculations

INFRASTRUCTURE CHARGE CALCULATIONS

Assumptions:

Table 1.1: RCC Supplied Discounting Factors

7.79%	Nominal pre-tax WACC

Year	Time Since 2006	Discounting Factor
2006	0	1.0000
2007	1	0.9277
2008	2	0.8607
2009	3	0.7985
2010	***4***	***0.7408***
2011	5	0.6872
2012	6	0.6376
2013	7	0.5915
2014	8	0.5487
2015	9	0.5091
2016	10	0.4723
2017	11	0.4382
2018	12	0.4065
2019	13	0.3771
2020	14	0.3499
2021	15	0.3246
2022	16	0.3011
2023	17	0.2794
2024	18	0.2592

Table 1.2: RCC Supplied Escalation Factors

4.77% ABS Construction Index

Year	Time Since 2006	Escalation Rate
2006	0	
2007	1	
2008	2	
2009	3	
2010	***4***	
2011	5	
2012	6	
2013	7	
2014	8	
2015	9	
2016	10	
2017	11	
2018	12	
2019	13	
2020	14	
2021	15	
2022	16	
2023	17	
2024	18	

Table 1.3: Australian ABS Road and Bridge Construction Index. Cat. No. 6427

Year	Australian ABS Index
Jun-1998	99.0
Jun-1999	100.7
Jun-2000	105.5
Jun-2001	108.2
Jun-2002	112.1
Jun-2003	118.4
Jun-2004	122.3
Jun-2005	127.8
Jun-2006	136.5
Jun-2007	141.3
Jun-2008	151.6
Jun-2009	156.4
Jun-2010	160.5
Mar-2011	162.9

Table 2: Land Value for Each Community of Interest Advised by RCC

Community Of Interest	Market Land Value $/m^2	Englobo Land Values $/m^2
Alexandra Hills	392.00	100.00
Birkdale	375.43	100.00
Capalaba	309.69	90.00
Cleveland	349.94	115.00
Ormiston	*432.21*	*125.00*

Community Of Interest	Market Land Value $/m^2	Englobo Land Values $/m^2
Redland Bay	306.70	90.00
Sheldon-Mt Cotton	239.73	80.00
Thorneside	543.48	110.00
Thornlands	**329.20***	**100.00***
Victoria Point	316.90	100.00
Wellington Point	470.76	125.00

***4.2% has been assumed as factor for escalation of land resumption cost to July 2006*

Table 3.1: Stormwater Infrastructure Construction Costs for Northern/ Eastern Catchment (Eastern Portion)

Item Description	Category	Report Reference	Cost ($) (2011) Including Additional Fees*
Detention Basins	Water Quantity	Section 8.1	2,485,617
Treatment Devices	Water Quality	Section 8.2	3,648,255
Total Cost ($)			**5,905,907**

**Including 40% Contingency and 15% consultant Fee*

Table 3.2: Stormwater Infrastructure Construction Costs for Western Catchment (Western Portion)

Item Description	Category	Report Reference	Cost ($) (2011) Including Additional Fees*
Detention Basins	Water Quantity	Section 8.1	0
Treatment Devices	Water Quality	Section 8.2	1,884,023
Total Cost ($)			**1,884,023**

**Including 40% Contingency and 15% consultant Fee*

STORMWATER INFRASTRUCTURE CHARGES - EASTERN PORTION

Table 5.1: Stormwater Quantity Infrastructure Charge per Land Use

Ultimate Land Use *[A]*	Area* (Ha) *[B]*	Impervious Percentage (%) *[C]*	Impervious Area (Ha) *[D]*	Stormwater Quantity Apportioned Infrastructure Charge ($) (Present Day Value$_{2011}$) *[E]*	Stormwater Quantity Infrastructure Charge per Land Use$_{2011}$ ($/Ha) *[F]*
Community Purposes	0.251	60	0.151	11,457	45,644
Local Centre	0.455	100	0.455	34,614	76,074
Medium Density Residential	15.760	80	12.608	959,139	60,859
Urban Residential 1	38.540	50	19.270	1,465,943	38,037

**Including land area acquired for treatment devices*

Table 5.2: Total Stormwater Quantity Infrastructure Charge

TOTAL EQUIVALENT IMPERVIOUS AREA (HA) *[G]*	**32.48Ha**
TOTAL COST OF STORMWATER QUANTITY INFRASTRUCTURE - 2011 PRICE ($) *[H]*	**$2,471,153**
TOTAL COST OF STORMWATER QUANTITY INFRASTRUCTURE - 2006 PRICE ($) *[I]*	**$2,063,271**
BASE INFRASTRUCTURE CHARGE FOR 2011 ($/HA) *[J]*	**$76,074/Ha**
BASE INFRASTRUCTURE CHARGE FOR 2006 ($/HA) *[K]*	**$63,517/Ha**
BASE INFRASTRUCTURE CHARGE FOR AVERAGE 600m^2 LOT FOR 2011 ($/LOT) *[L]*	**$2,425/Lot**
BASE INFRASTRUCTURE CHARGE FOR AVERAGE 600m^2 LOT FOR 2006 ($/LOT) *[M]*	**$2,117/Lot**

Calculations & Description

[A] – Ultimate land use type for Kinross Road

[B] – Total area for each proposed land use type within developable area (Ha) excluding land acquired for treatment devices.

[C] – Impervious percentage (%) for each land use as per RPS & ultimate land use information provided by RCC.

[D] – Total impervious area for each land use type (Ha) = *[B] x ([C]*

[E] – Apportioned infrastructure charge for present day value (2011) ($)

= *[D] x [J]*

[F] – Infrastructure charge per land use type ($/Ha)

= *[J] x ([C]/100)*

[G] – Total impervious area (Ha)

= *Sum ([D])*

[H] – Total cost of stormwater quantity infrastructure including construction costs and land acquisition (2011) ($)

[I] – Total cost of stormwater quantity infrastructure (Construction cost has been converted by applying ABS Construction Index rate (as per table 1.3) to 2011 base construction cost plus 2006 land values provided by RCC as per table 4.1)

[J] – Base infrastructure charge for 2011 ($/Ha)

= *[H]/[G]*

[K] – Base infrastructure charge for 2006

= *[I]/ [G]*

[L] – Base infrastructure charge for 2011 for an average 600m^2 lot ($/Lot)

= *[J]x* Impervious percentage for Urban Residential 1(Ha)/100/15 (No. of lots per hectare for Urban Residential 1 as advised by RCC)

[M] – Base infrastructure charge for 2006 for an average 600m^2 lot ($/Lot)

= *[K]x* Impervious percentage for Urban Residential 1(Ha)/100/15 (No. of lots per hectare for Urban Residential 1 as advised by RCC)

Table 6.1: Stormwater Quality Infrastructure Charge per Land Use

Ultimate Land Use *[A]*	**Area* (Ha)** *[B]*	**Impervious Percentage (%)** *[C]*	**Impervious Area (Ha)** *[D]*	**Stormwater Quality Apportioned Infrastructure Charge ($) (Present Day Value$_{2011}$)** *[E]*	**Stormwater Quality Infrastructure Charge per Land Use$_{2011}$ ($/Ha)** *[F]*
Community Purposes	0.251	60	0.151	28,281	112,672
Local Centre	0.455	100	0.455	85,443	187,786
Medium Density Residential	15.76	80	12.608	2,367,610	150,229
Urban Residential 1	38.54	50	19.270	3,618,642	93,893

* Including area acquired for treatment devices

Table 6.2: Total Stormwater Quality Infrastructure Charge

TOTAL EQUIVALENT IMPERVIOUS AREA (HA) *[G]*	**32.48Ha**
TOTAL COST OF STORMWATER QUALITY INFRASTRUCTURE - 2011 PRICE ($) *[H]*	**$6,099,975**
TOTAL COST OF STORMWATER QUALITY INFRASTRUCTURE - 2006 PRICE ($) *[I]*	**$5,069,139**
BASE INFRASTRUCTURE CHARGE FOR 2011 ($/HA) *[J]*	**$187,786/Ha**
BASE INFRASTRUCTURE CHARGE FOR 2006 ($/HA) *[K]*	**$156,052/Ha**
BASE INFRASTRUCTURE CHARGE FOR AVERAGE 600m^2 LOT FOR 2011 ($/LOT) *[L]*	**$6,259/Lot**
BASE INFRASTRUCTURE CHARGE FOR AVERAGE 600m^2 LOT FOR 2006 ($/LOT) *[M]*	**$5,201/Lot**

Calculations & Description

[A] – Ultimate land use type for Kinross Road

[B] – Total area for each proposed land use type within developable area (Ha) excluding land acquired for treatment devices.

[C] – Impervious percentage (%) for each land use as per RPS & ultimate land use information provided by RCC.

[D] – Total impervious area for each land use type (Ha) = *[B] x ([C]*

[E] – Apportioned infrastructure charge for present day value (2011) ($)

= *[D] x [J]*

[F] – Infrastructure charge per land use type ($/Ha)

= *[J] x ([C]/100)*

[G] – Total impervious area (Ha)

= *Sum ([D])*

[H] – Total cost of stormwater quality infrastructure including construction costs and land acquisition (2011) ($)

[I] – Total cost of stormwater quality infrastructure (Construction cost has been converted by applying ABS Construction Index rate (as per table 1.3) to 2011 base construction cost plus 2006 land values provided by RCC as per table 4.1)

[J] – Base infrastructure charge for 2011 ($/Ha)

= *[H]/[G]*

[K] – Base infrastructure charge for 2006

= *[I]/ [G]*

[L] – Base infrastructure charge for 2011 for an average 600m^2 lot ($/Lot)

= *[J]x* Impervious percentage for Urban Residential 1(Ha)/100/15 (No. of lots per hectare for Urban Residential 1 as advised by RCC)

[M] – Base infrastructure charge for 2006 for an average 600m^2 lot ($/Lot)

= *[K]x* Impervious percentage for Urban Residential 1(Ha)/100/15 (No. of lots per hectare for Urban Residential 1 as advised by RCC)

Table 7.1: Total Stormwater (Quantity & Quality) Infrastructure Charge per Land Use

Ultimate Land Use *[A]*	Area* (Ha) *[B]*	Impervious Percentage (%) *[C]*	Impervious Area (Ha) *[D]*	Total Stormwater Apportioned Infrastructure Charge ($) (Present Day Value$_{2011}$) *[E]*	Total Stormwater Infrastructure Charge per Land Use$_{2011}$ ($/Ha) *[F]*
Community Purposes	0.251	60	0.151	39,737	158,316
Local Centre	0.455	100	0.455	120,056	263,860
Medium Density Residential	15.76	80	12.608	3,326,749	211,088
Urban Residential 1	38.54	50	19.270	5,084,585	131,930

***** Including area acquired for treatment devices

Table 7.2: Total Stormwater (Quantity & Quality) Infrastructure Charge

TOTAL EQUIVALENT IMPERVIOUS AREA (HA) *[G]*	**32.48Ha**
TOTAL COST OF STORMWATER QUALITY INFRASTRUCTURE - 2011 PRICE ($) *[H]*	**$8,571,128**
TOTAL COST OF STORMWATER QUALITY INFRASTRUCTURE - 2006 PRICE ($) *[I]*	**$7,132,410**
BASE INFRASTRUCTURE CHARGE FOR 2011 ($/HA) *[J]*	**$263,860/Ha**
BASE INFRASTRUCTURE CHARGE FOR 2006 ($/HA) *[K]*	**$219,569.22/Ha**
BASE INFRASTRUCTURE CHARGE FOR AVERAGE 600m^2 LOT FOR 2011 ($/LOT) *[L]*	**$8,795/Lot**
BASE INFRASTRUCTURE CHARGE FOR AVERAGE 600m^2 LOT FOR 2006 ($/LOT) *[M]*	**$7,319/Lot**

Calculations & Description

[A] – Ultimate land use type for Kinross Road

[B] – Total area for each proposed land use type within developable area (Ha) excluding land acquired for treatment devices.

[C] – Impervious percentage (%) for each land use as per RPS & ultimate land use information provided by RCC.

[D] – Total impervious area for each land use type (Ha) = *[B] x ([C]*

[E] – Apportioned infrastructure charge for present day value (2011) ($)

= *[D] x [J]*

[F] – Infrastructure charge per land use type ($/Ha)

= *[J] x ([C]/100)*

[G] – Total impervious area (Ha)

= *Sum ([D])*

[H] – Total cost of stormwater infrastructure including construction costs and land acquisition (2011) ($)

[I] – Total cost of stormwater infrastructure (Construction cost has been converted by applying ABS Construction Index rate (as per table 1.3) to 2011 base construction cost plus 2006 land values provided by RCC as per table 4.1)

[J] – Base infrastructure charge for 2011 ($/Ha)

= *[H]/[G]*

[K] – Base infrastructure charge for 2006

= *[I]/ [G]*

[L] – Base infrastructure charge for 2011 for an average 600m^2 lot ($/Lot)

= *[J]x* Impervious percentage for Urban Residential 1(Ha)/100/15 (No. of lots per hectare for Urban Residential 1 as advised by RCC)

[M] – Base infrastructure charge for 2006 for an average 600m^2 lot ($/Lot)

= *[K]x* Impervious percentage for Urban Residential 1(Ha)/100/15 (No. of lots per hectare for Urban Residential 1 as advised by RCC)

STORMWATER INFRASTRUCTURE CHARGES - WESTERN PORTION

Table 8.1: Stormwater Quantity Infrastructure Charge per Land Use

Ultimate Land Use *[A]*	**Area* (Ha)** *[B]*	**Impervious Percentage (%)** *[C]*	**Impervious Area (Ha)** *[D]*	**Stormwater Quantity Apportioned Infrastructure Charge ($) (Present Day Value$_{2011}$)** *[E]*	**Stormwater Quantity Infrastructure Charge per Land Use$_{2011}$ ($/Ha)** *[F]*
Medium Density Residential	2.513	80	2.010	*$0*	*$0/Ha*
Urban Residential 1	19.975	50	9.988	*$0*	*$0/Ha*

* Including area acquired for treatment devices

Table 8.2: Total Stormwater Quantity Infrastructure Charge

TOTAL EQUIVALENT IMPERVIOUS AREA (HA) *[G]*	**12.00Ha**
TOTAL COST OF STORMWATER QUANTITY INFRASTRUCTURE - 2011 PRICE ($) *[H]*	**$0**
TOTAL COST OF STORMWATER QUANTITY INFRASTRUCTURE - 2006 PRICE ($) *[I]*	**$0**
BASE INFRASTRUCTURE CHARGE FOR 2011 ($/HA) *[J]*	**$0/Ha**
BASE INFRASTRUCTURE CHARGE FOR 2006 ($/HA) *[K]*	**$0/Ha**
BASE INFRASTRUCTURE CHARGE FOR AVERAGE 600m^2 LOT FOR 2011 ($/LOT) *[L]*	**$0/Lot**
BASE INFRASTRUCTURE CHARGE FOR AVERAGE 600m^2 LOT FOR 2006 ($/LOT) *[M]*	**$0/Lot**

Calculations & Description

[A] – Ultimate land use type for Kinross Road

[B] – Total area for each proposed land use type within developable area (Ha) excluding land acquired for treatment devices.

[C] – Impervious percentage (%) for each land use as per RPS & ultimate land use information provided by RCC.

[D] – Total impervious area for each land use type (Ha) = *[B] x ([C]*

[E] – Apportioned infrastructure charge for present day value (2011) ($)

= *[D] x [J]*

[F] – Infrastructure charge per land use type ($/Ha)

= *[J] x ([C]/100)*

[G] – Total impervious area (Ha)

= *Sum ([D])*

[H] – Total cost of stormwater quantity infrastructure including construction costs and land acquisition (2011) ($)

[I] – Total cost of stormwater quantity infrastructure (Construction cost has been converted by applying ABS Construction Index rate (as per table 1.3) to 2011 base construction cost plus 2006 land values provided by RCC as per table 4.2)

[J] – Base infrastructure charge for 2011 ($/Ha)

= *[H]/[G]*

[K] – Base infrastructure charge for 2006

= *[I]/ [G]*

[L] – Base infrastructure charge for 2011 for an average 600m^2 lot ($/Lot)

= *[J]x* Impervious percentage for Urban Residential 1(Ha)/100/15 (No. of lots per hectare for Urban Residential 1 as advised by RCC)

[M] – Base infrastructure charge for 2006 for an average 600m^2 lot ($/Lot)

= *[K]x* Impervious percentage for Urban Residential 1(Ha)/100/15 (No. of lots per hectare for Urban Residential 1 as advised by RCC)

Table 9.1: Stormwater Quality Infrastructure Charge per Land Use

Ultimate Land Use *[A]*	**Area* (Ha)** *[B]*	**Impervious Percentage (%)** *[C]*	**Impervious Area (Ha)** *[D]*	**Stormwater Quality Apportioned Infrastructure Charge ($) (Present Day Value$_{2011}$)** *[E]*	**Stormwater Quality Infrastructure Charge per Land Use$_{2011}$ ($/Ha)** *[F]*
Medium Density Residential	2.513	80	2.010	435,075	173,130
Urban Residential 1	19.975	50	9.988	2,161,418	108,206

* Including area acquired for treatment devices

Table 9.2: Total Stormwater Quality Infrastructure Charge

TOTAL EQUIVALENT IMPERVIOUS AREA (HA) *[G]*	**12.00Ha**
TOTAL COST OF STORMWATER QUALITY INFRASTRUCTURE - 2011 PRICE ($) *[H]*	**$2,596,493**
TOTAL COST OF STORMWATER QUALITY INFRASTRUCTURE - 2006 PRICE ($) *[I]*	**$2,162,133**
BASE INFRASTRUCTURE CHARGE FOR 2011 ($/HA) *[J]*	**$216,412/Ha**
BASE INFRASTRUCTURE CHARGE FOR 2006 ($/HA) *[K]*	**$180,209/Ha**
BASE INFRASTRUCTURE CHARGE FOR AVERAGE 600m^2 LOT FOR 2011 ($/LOT) *[L]*	**$7,214/Lot**
BASE INFRASTRUCTURE CHARGE FOR AVERAGE 600m^2 LOT FOR 2006 ($/LOT) *[M]*	**$6,007/Lot**

Calculations & Description

[A] – Ultimate land use type for Kinross Road

[B] – Total area for each proposed land use type within developable area (Ha) excluding land acquired for treatment devices.

[C] – Impervious percentage (%) for each land use as per RPS & ultimate land use information provided by RCC.

[D] – Total impervious area for each land use type (Ha) = *[B] x ([C]*

[E] – Apportioned infrastructure charge for present day value (2011) ($)

= *[D] x [J]*

[F] – Infrastructure charge per land use type ($/Ha)

= *[J] x ([C]/100)*

[G] – Total impervious area (Ha)

= *Sum ([D])*

[H] – Total cost of stormwater quality infrastructure including construction costs and land acquisition (2011) ($)

[I] – Total cost of stormwater quality infrastructure (Construction cost has been converted by applying ABS Construction Index rate (as per table 1.3) to 2011 base construction cost plus 2006 land values provided by RCC as per table 4.2)

[J] – Base infrastructure charge for 2011 ($/Ha)

= *[H]/[G]*

[K] – Base infrastructure charge for 2006

= *[I]/ [G]*

[L] – Base infrastructure charge for 2011 for an average 600m^2 lot ($/Lot)

= *[J]x* Impervious percentage for Urban Residential 1(Ha)/100/15 (No. of lots per hectare for Urban Residential 1 as advised by RCC)

[M] – Base infrastructure charge for 2006 for an average 600m^2 lot ($/Lot)

= *[K]x* Impervious percentage for Urban Residential 1(Ha)/100/15 (No. of lots per hectare for Urban Residential 1 as advised by RCC)

Table 10.1: Total Stormwater (Quantity & Quality) Infrastructure Charge per Land Use

Ultimate Land Use *[A]*	**Area* (Ha)** *[B]*	**Impervious Percentage (%)** *[C]*	**Impervious Area (Ha)** *[D]*	**Total Stormwater Apportioned Infrastructure Charge ($) (Present Day Value$_{2011}$)** *[E]*	**Total Stormwater Infrastructure Charge per Land Use$_{2011}$ ($/Ha)** *[F]*
Medium Density Residential	2.513	80	2.010	435,075	173,130
Urban Residential 1	19.975	50	9.988	2,161,418	108,206

* Including area acquired for treatment devices

Table 10.2: Total Stormwater (Quantity & Quality) Infrastructure Charge

TOTAL EQUIVALENT IMPERVIOUS AREA (HA) *[G]*	**12.00Ha**
TOTAL COST OF STORMWATER QUALITY INFRASTRUCTURE - 2011 PRICE ($) *[H]*	**$2,596,493**
TOTAL COST OF STORMWATER QUALITY INFRASTRUCTURE - 2006 PRICE ($) *[I]*	**$2,162,133**
BASE INFRASTRUCTURE CHARGE FOR 2011 ($/HA) *[J]*	**$216,412/Ha**
BASE INFRASTRUCTURE CHARGE FOR 2006 ($/HA) *[K]*	**$180,209/Ha**
BASE INFRASTRUCTURE CHARGE FOR AVERAGE 600m^2 LOT FOR 2011 ($/LOT) *[L]*	**$7,213/Lot**
BASE INFRASTRUCTURE CHARGE FOR AVERAGE 600m^2 LOT FOR 2006 ($/LOT) *[M]*	**$6,006/Lot**

Calculations & Description

[A] – Ultimate land use type for Kinross Road

[B] – Total area for each proposed land use type within developable area (Ha) excluding land acquired for treatment devices.

[C] – Impervious percentage (%) for each land use as per RPS & ultimate land use information provided by RCC.

[D] – Total impervious area for each land use type (Ha) = *[B] x ([C]*

[E] – Apportioned infrastructure charge for present day value (2011) ($)

= *[D] x [J]*

[F] – Infrastructure charge per land use type ($/Ha)

= *[J] x ([C]/100)*

[G] – Total impervious area (Ha)

= *Sum ([D])*

[H] – Total cost of stormwater infrastructure including construction costs and land acquisition (2011) ($)

[I] – Total cost of stormwater infrastructure (Construction cost has been converted by applying ABS Construction Index rate (as per table 1.3) to 2011 base construction cost plus 2006 land values provided by RCC as per table 4.2)

[J] – Base infrastructure charge for 2011 ($/Ha)

= *[H]/[G]*

[K] – Base infrastructure charge for 2006

= *[I]/ [G]*

[L] – Base infrastructure charge for 2011 for an average 600m^2 lot ($/Lot)

= *[J]x* Impervious percentage for Urban Residential 1(Ha)/100/15 (No. of lots per hectare for Urban Residential 1 as advised by RCC)

[M] – Base infrastructure charge for 2006 for an average 600m^2 lot ($/Lot)

= *[K]x* Impervious percentage for Urban Residential 1(Ha)/100/15 (No. of lots per hectare for Urban Residential 1 as advised by RCC)