Stable Swamp Creek Flood Study
Volume 1 of 2

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Stable Swamp Creek Flood Study

Volume 1 of 2

Prepared by City Projects Office
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June 2014

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Executive Summary

The Stable Swamp Creek catchment is located within the south-western suburbs of Brisbane, covering an area of approximately 27km^2. Stable Swamp Creek winds through the suburbs of Sunnybank, Coopers Plains, and Salisbury before discharging into the downstream reaches of Oxley Creek at Rocklea. A locality plan of the Stable Swamp Creek catchment area can be found in Figure 1.1.

This study was performed using the assistance of the following modelling software packages:

- a XP RAFTS hydrological model; and
- a MIKE FLOOD 1D/2D hydraulic model.

Based on the available recorded continuous rainfall and stream height gauge data as well as Maximuim Height Gauges (MHGs), the following four significant flood events were selected for the calibration and verification of the hydrologic and hydraulic models:

- May 1996;
- January 1998;
- March 2001; and
- November 2004.

Good agreement was achieved at most of the recorded stream height locations for the calibration events. With differences between recorded and calculated levels generally within ±150mm and good agreement with the recorded level hydrographs.

The calibrated hydrologic and hydraulic models were used to analyse flood events with an annual exceedance probability (AEP) of 50%, 20%, 10%, 5%, 2%, 1%, 0.5%, 0.2% and 0.05%, as well as the probable maximum flood (PMF). Design event modelling was carried out using the Duration Independent Storm (DIS) factored rainfall methodology.

The hydraulic model was used to determine the peak flood levels along the creek for three scenarios:

- Scenario 1: Existing waterway conditions with ultimate catchment hydrology.
- Scenario 2: Existing waterway conditions plus application of Minimum Riparian Corridor (MRC), with ultimate catchment hydrology.
- Scenario 3: Existing waterway conditions plus application of Minimum Riparian Corridor (MRC) plus filling to the Waterway Corridor (WC), with ultimate catchment hydrology.

Scenario 3 peak flood levels for design events with an AEP of 50% to 1% have been tabulated in APPENDIX E. For extreme events scenarios with AEP of 0.5% and 0.2% levels have been tabulated in APPENDIX F.

Map products of modelled scenarios are contained in APPENDIX I and APPENDIX J, showing:

- peak flood levels and extent of inundation for the 50% to 0.05% AEP flood events; and
- peak flood depths for the 50% to 1% AEP flood events.

Several sensitivity scenarios were also considered as part of this study. The analysis consisted of two climate change scenarios (2050 and 2100 horizons) as well as a detailed blockage assessment of individual structures throughout the Stable Swamp Creek catchment. Further details of the analysis can be found in Section 7.0.

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Glossary of Terms

Term	Definition
Annual Exceedance Probability (AEP)	The probability that a given event will be exceeded in any one year.
Average Recurrence Interval (ARI)	The average, or expected, value of the periods between exceedances.
Catchment	The area of land draining through the main stream (as well as tributary streams) to a particular site. It always relates to an area above a specific location.
Digital Elevation Model (DEM)	A three-dimensional model of the ground surface elevation.
Duration Independent Storm (DIS)	Synthetic design storm pattern developed by BCC intended to simulate all standard design storm peak bursts.
Flood Frequency Analysis (FFA)	Method of predicting flood flows at a particular location by fitting observed values at the location to a standard statistical distribution.
Hydrograph	A graph showing how the discharge or stage/flood level at any particular location varies with time during a flood.
Intensity-Frequency-Duration curve (IFD curve)	A graphical representation of the probability that a given average rainfall intensity will occur.
Manning's 'n' or 'M'	The Gauckler–Manning coefficient, used to represent roughness in 1D/2D flow equations.
Minimum Riparian Corridor (MRC)	A zone of (nominally) 15m width either side of the main flow channel assigned for revegetation.
Pluviograph	An instrument for measuring the depth of rainfall that has fallen (ie. Rain gauge), registering the data in real time.
Probable Maximum Flood (PMF)	An extreme flood deemed to be the largest flood that could conceivably occur at a specific location.
Probable Maximum Precipitation (PMP)	The PMP is the greatest depth of precipitation for a given duration meteorologically possible over a given size storm area at a particular location at a particular time of the year
Waterway Corridor (WC)	See Section 5.4.2 for definition

ARI to AEP Conversion

ARI	AEP
2yr (approx.)	50%
5yr	20%
10yr	10%
20yr	5%
50yr	2%
100yr	1%
200yr	0.5%
500yr	0.2%
2000yr	0.05%

1.0 Introduction

The Stable Swamp Creek catchment is located within the south-western suburbs of Brisbane, covering an area of approximately 27km^2 as shown in Figure 1.1. The catchment hosts several waterways, the five of principal interest being;

- Stable Swamp Creek;
- Shelleys Creek;
- Archerfield Channel;
- North Arm (a tributary of Stable Swamp Creek); and
- South Arm (a lessor tributary of Stable Swamp Creek)

1.1 Catchment Overview

Stable Swamp Creek winds through the suburbs of Sunnybank, Coopers Plains, and Salisbury before discharging into the downstream reaches of Oxley Creek at Rocklea. Stable Swamp Creek is a largely modified system. There are few natural sections of the creek remaining. Much of the floodplain has been infilled for urban and industrial development and public open space usage.

Hydraulic structures are frequent, primarily for the many road crossings and include road, rail and footbridge crossings. The downstream reaches of Stable Swamp Creek are tidal and support mangroves and wetland areas. In these downstream reaches the floodplain is wide and interacts with the lower reaches of Oxley Creek.

The North Arm tributary originates in Coopers Plains upstream of the Beryl Roberts Basin and joins the main Stable Swamp Creek branch at Archerfield adjacent to the corner of Musgrave Road and Deal Street.

Shelleys Creek drains the southern areas or furthest upper reaches of the catchment running south to north, including Sunnybank Hills and Calamvale before becoming Stable Swamp Creek at Beenleigh Road in Sunnybank. Shelleys Creek and Stable Swamp Creek are both largely urbanised catchments with some parkland and industrial zoning.

Shelleys Creek is steep, incised and largely constrained by residential development. The creek is in a relatively natural condition until Lang Street where it becomes channelised and concrete lined to the confluence of Stable Swamp Creek at Beenleigh Road Sunnybank.

The Archerfield Channel was constructed in the 1940's as part of the Archerfield Airport development and drains areas of Archerfield and Acacia Ridge. It runs south to north and discharges into Stable Swamp Creek between Colvin Street and Beaudesert Road in Salisbury. At its upstream end, Archerfield Channel is fed from a series of detention basins before opening into a 1.5km long linear concrete lined channel at Boundary Road. The catchment is largely industrial and undeveloped land is zoned for future industrial use.

A further lessor tributary of Stable Swamp Creek, South Arm, flows through Acacia Ridge and Archerfield before joining Stable Swamp Creek at Gay Street Sunnybank. South Arm flows through large areas of Queensland Rail property and is predominately piped underground.

The total catchment area of Stable Swamp Creek is 27km^2, with the sub catchment of Shelleys Creek being 3.3km^2 and Archerfield Channel 3.1km^2. The total number of creek crossings on Stable Swamp Creek, Shelleys Creek and Archerfield Channel, is 23, 7 and 2, respectively.

1.2 Study Objectives

The primary objectives for this study are as follows:

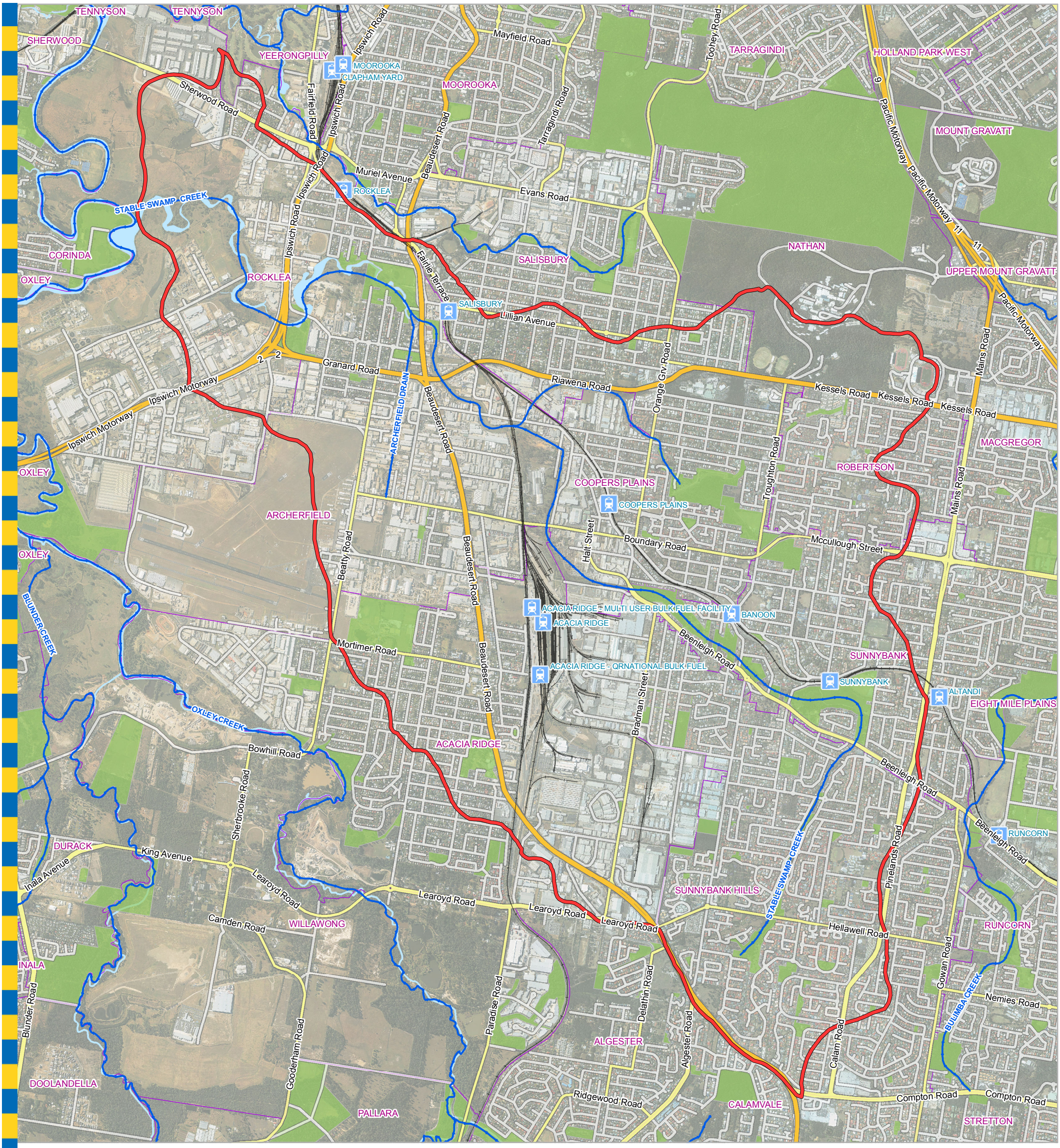
- To ensure Stable Swamp Creek has been assessed using best practice modelling techniques.
- Update the Stable Swamp Creek catchment hydrologic and hydraulic models (as required) to represent the current catchment conditions.
- Adequately calibrate and verify the models to historical storm events.
- Confirm that the hydrologic and hydraulic models are suitable to utilise for the purposes of design event and extreme event modelling.
- Estimate design and extreme flood magnitudes.
- Determine design flood levels for the full range of design and extreme events up to 0.2% AEP.
- Quantify the impacts of Minimum Riparian Corridor (MRC) and filling of the floodplain outside the Waterway Corridor (WC).
- Produce flood inundation, flood depth and flood hazard mapping for the selected range of design and extreme events up to the PMF.
- Quantify the impacts of climate change on flooding within the catchment.

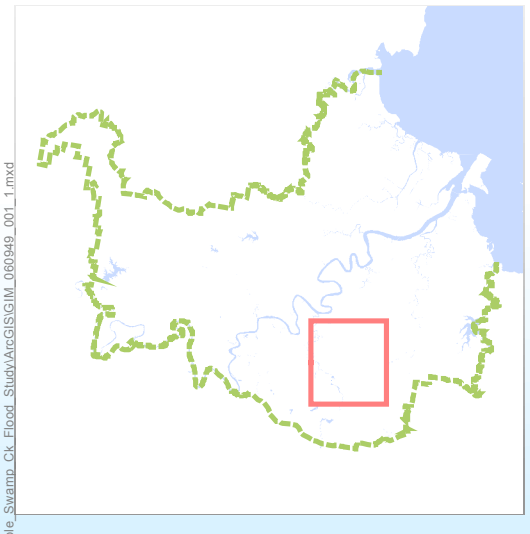
1.3 Scope of Work

The purpose of the Stable Swamp Creek Flood Study was to determine flood levels across the Stable Swamp Creek catchment for a range of design storm events. These flood levels are to be used for setting development guideline levels for proposed development in the vicinity of the Stable Swamp Creek watercourse and assessing potential flood risk.

As part of this study, the RAFTS hydrologic and MIKE11 hydraulic models of Stable Swamp Creek, developed as part of the 2000 (BCC) Catchment Flooding Report for Stable Swamp Creek Catchment Waterway Management Plan have been revised and updated (as required) to reflect current conditions of the Stable Swamp Creek catchment.

The updated Stable Swamp Creek MIKE FLOOD hydraulic model utilises a combination of one-dimensional MIKE11 and two-dimensional MIKE21 modelling. The incorporation of the two-dimensional modelling from upstream of Beenleigh Road to the confluence with Oxley Creek (Stable Swamp Creek Branch) was essential to better simulate complex floodplain flows in larger flood events. The Stable Swamp Creek Catchment locality plan is shown in Figure 1.1.





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Legend

- Railway Station
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- Major Roads
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Stable Swamp Creek Catchment

Figure 1.1

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2.0 Available Information

2.1 Previous Studies

A number of studies have been undertaken previously for the Stable Swamp Creek Catchment. The following studies have been used as reference in this study:

- BCC (2000) Catchment Flooding Report for Stable Swamp Creek Catchment Waterway Management Plan, Prepared by Water & Environment City Design for Waterways Program, Urban Management Division, Brisbane City Council.
- BCC (2000) Archerfield Drain Flood Study, Prepared by Water & Environment City Design for Waterways Program, Urban Management Division, Brisbane City Council
- BCC (2008) Archerfield Channel Flood Study Model Upgrade and Flood Mitigation Investigation, Prepared by Water & Environment City Design for Waterways Program, Urban Management Division, Brisbane City Council
- BCC (2000) Shelleys Creek Stormwater Management Plan, Prepared by Water & Environment City Design for Waterways Program, Urban Management Division, Brisbane City Council

2.2 Topographic Survey Data

2.2.1 Aerial Photography

The following sources of aerial imagery taken during different points in time were available to be used in this study:

- BCC aerial photography – 1997, 1999, 2001, 2005, 2007, 2009, 2011 and 2012
- NearMap® aerial imagery – 2009 to 2013

2.2.2 Bathymetric Survey

The following is a summary of the sourced survey information used in this study:

- Cross section survey of Stable Swamp Creek conducted between November 1998 and March 1999.
- Archerfield Channel cross section survey conducted in May 1999.
- Shelleys Creek survey undertaken in March 1999.
- Cross-section survey at Keats Street taken in June 2006 to describe channel modification since the previous survey
- Survey sections for Beryl Roberts Basin taken in August 2006
- 30 cross-sections were re-surveyed in November 2013 for the purpose of this study to assess any changes in channel geometry and to update previously surveyed data
- BCC 2009 Airborne Laser Scanning (ALS) survey data was used as the basis of the two-dimensional model DEM

2.3 Hydrometric Data and Analysis

2.3.1 Recorded Rainfall

Continuous rainfall gauges located in or near the Stable Swamp Creek catchment are shown in Figure 2.1. The available rainfall data used for calibration and verification of the hydrological and hydraulic models is summarised in Table 2.1. Rainfall contours developed by Council's flood database FloodWise were used to determine the spatial distribution of total rainfall across the catchment. An explanation of the gauges selected for each calibration event is included in Section 3 Model Development and Calibration.

It should be noted that events since 2004 have not been considered for calibration as the events were only minor in regard to local catchment flooding. For the January 2011 flood event there was significant flooding in the downstream reaches of Stable Swamp Creek due to backwater effects from Brisbane River. The local rainfall in the Stable Swamp Creek catchment during this event was considered as minor so therefore was excluded from the calibration process.

Table 2.1: Available and Adopted Rainfall Data

Gauge	Location	Operation Period	Calibration Events		Verification Events	
			Mar 01	Nov 04	May 96	Jan 98
SSR130	Musgrave Road Coopers Plains	10/03/1994 to 12/05/2003	✔✔	NA	✔✔	✔✔
OXR114	Calamvale Telstra Calamvale	16/02/1989 to present	✔✔	✔✔	✔✔	✔✔
R_R747	Dulcie Street Mt Gravatt	08/01/2001 to present	NA	✔✔	NA	✔
BMR138	Griffith University Mt Gravatt	16/02/1989 to present	✔	✔	✔✔	✔
OXR126	Beaty Road Acacia Ridge	01/06/1989 to 12/05/2003	NA	NA	✔✔	✔✔
OXR020	Corinda High School Corinda	25/05/1991 to present	✔	✔	✔✔	✔✔

✔ Data available
✔✔ Data available and adopted for calibration
NA: No data available

2.3.2 Recorded Flood Levels

2.3.2.1 Stream Gauge Data

Two continuous stream height gauges are located in the vicinity of Stable Swamp Creek. Firstly, gauge SSE129 located at Musgrave Road, Coopers Plains on Stable Swamp Creek and secondly, SSA847 located near Marshall Road, Coopers Plains which was installed in June 2006. The gauge located at Corinda High School on the western side of Oxley Creek (OXA023), was available to be used for providing calibration tailwater conditions, see Figure 2.1.

Data from these two gauges was sourced from Council maintained records to verify the adoption of calibration and verification events used in previous studies and to identify new calibration events which may have occurred since the previous studies were completed.

The Coopers Plains Stable Swamp Creek gauge was used for the calibration of the hydrologic and hydraulic models and the determination of rating curves, and the Corinda High School Oxley Creek gauge for downstream boundary conditions within Oxley Creek during calibration events. (see Table 2.2 and Figure 2.1).

At the Corinda High School Gauge OXA023, continuous height data was only available for the 1998, 2001 and 2004 calibration events. The data was considered to be unreliable for the other calibration events as the gauge was not functional during the May 1996 event.

Table 2.2: Details of continuous height recorders

Station	Owner	Period of Operation	Format of Data	MIKEFLOOD Grid Reference	
				J	K
SSE129 - Musgrave Road – Coopers Plains (Stable Swamp Creek)	BCC	30/05/89 to present	Digital	596	336
OXA023 - Corinda High School – Corinda (Oxley Creek)	BCC	22/05/1991 to present	Digital	N/A	N/A

Table 2.3: Peak Water Levels at Continuous Gauges

Continuous Gauge	Calibration Events (m AHD)		Verification Events (m AHD)		MIKEFLOOD Grid Reference	
	Mar 01	Nov 04	May 96	Jan 98	J	K
SSE129 - Musgrave Road – Coopers Plains (Stable Swamp Creek)	8.24	7.68	6.94	NA	596	336
OXA023 - Corinda High School – Corinda (Oxley Creek)	2.59	2.80	NA	1.27	N/A	N/A

2.3.2.2 MHG Data

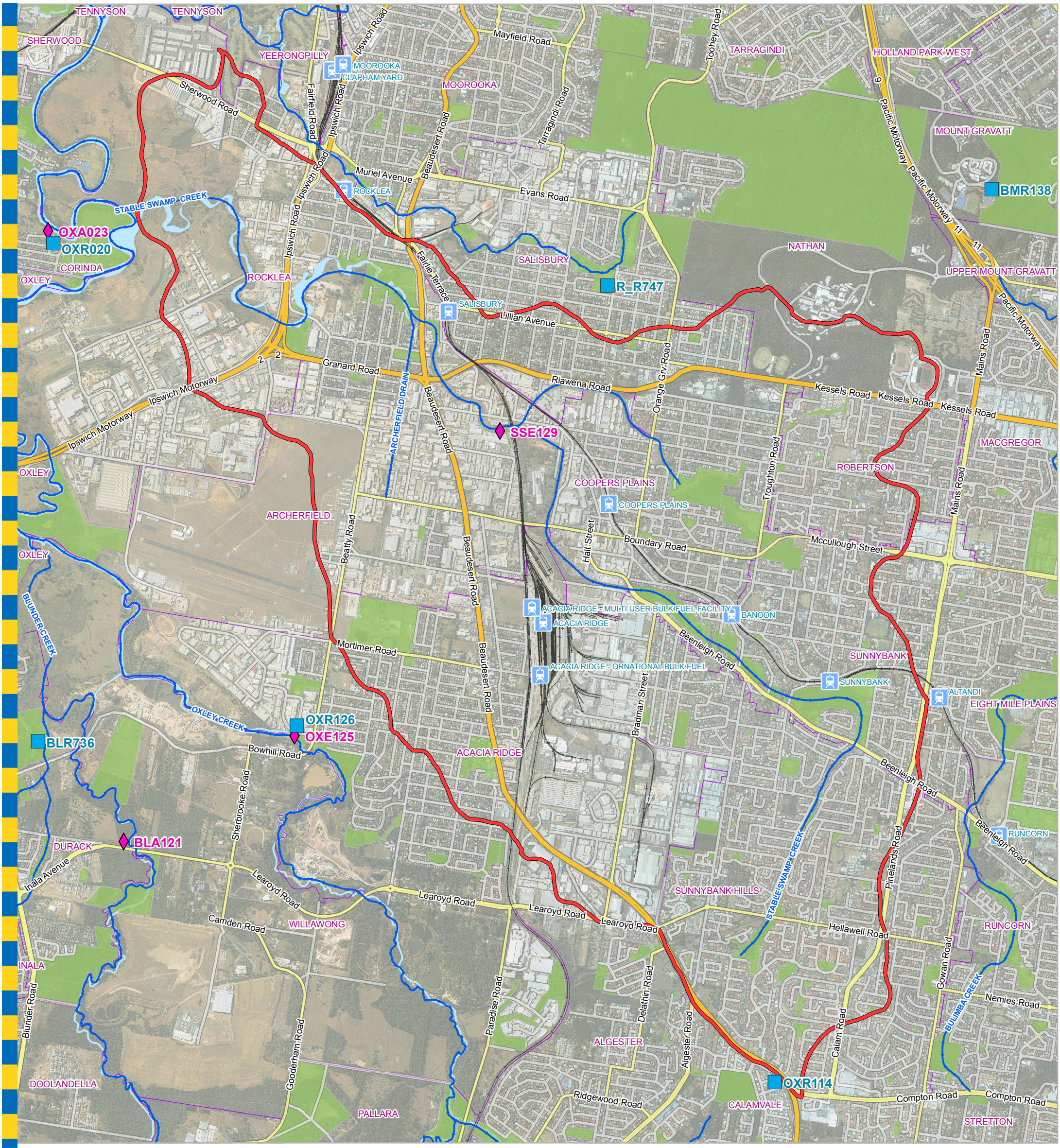
There are twenty five maximum height gauges (MHGs) within the greater Stable Swamp Creek catchment for which records are available from 1996 onwards. All except four gauges were used to source data for calibration purposes; two gauges located on Shelleys Creek branch, two on Archerfield Channel, three on North Arm and 14 on Stable Swamp Creek branch itself were used to source data for calibration purposes.

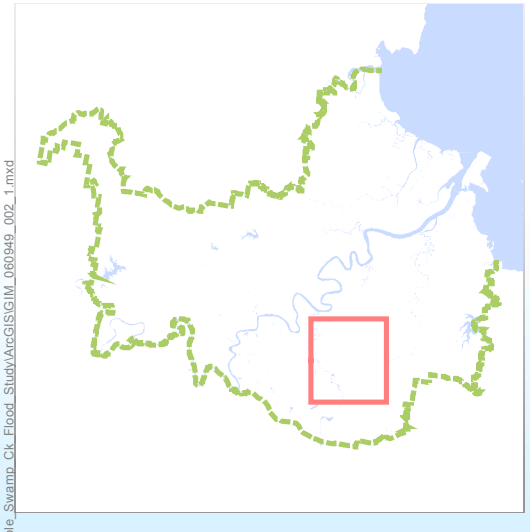
Four gauges, two on North Arm and two in Stable Swamp Creek were discarded as they were recently installed and have data available for events from 2006 onwards only. The location of each of the MHGs and their assigned MIKE11 chainage or MIKE FLOOD Grid reference is given in Table 2.4 depending on whether they fall within the 2D modal boundary. Figure 2.2 illustrates the locations of the MHGs and Table 2.5 summarises peak flood levels recorded at each MHG for the calibration events.

It was also noted that:

- Gauges SS220 and SS190 for the November 2004 event and SS120 for the March 2001 event on Stable Swamp Creek are debris level readings only as the gauges were destroyed during these events.

- Gauge SS130 on Stable Swamp Creek and Gauge SS400 for the March 2001 event on Archerfield Channel were debris level readings as the water level overtopped the maximum readable height of the gauge.





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Rainfall Gauge and Continuous Stream Gauge Locations

Figure 2.1

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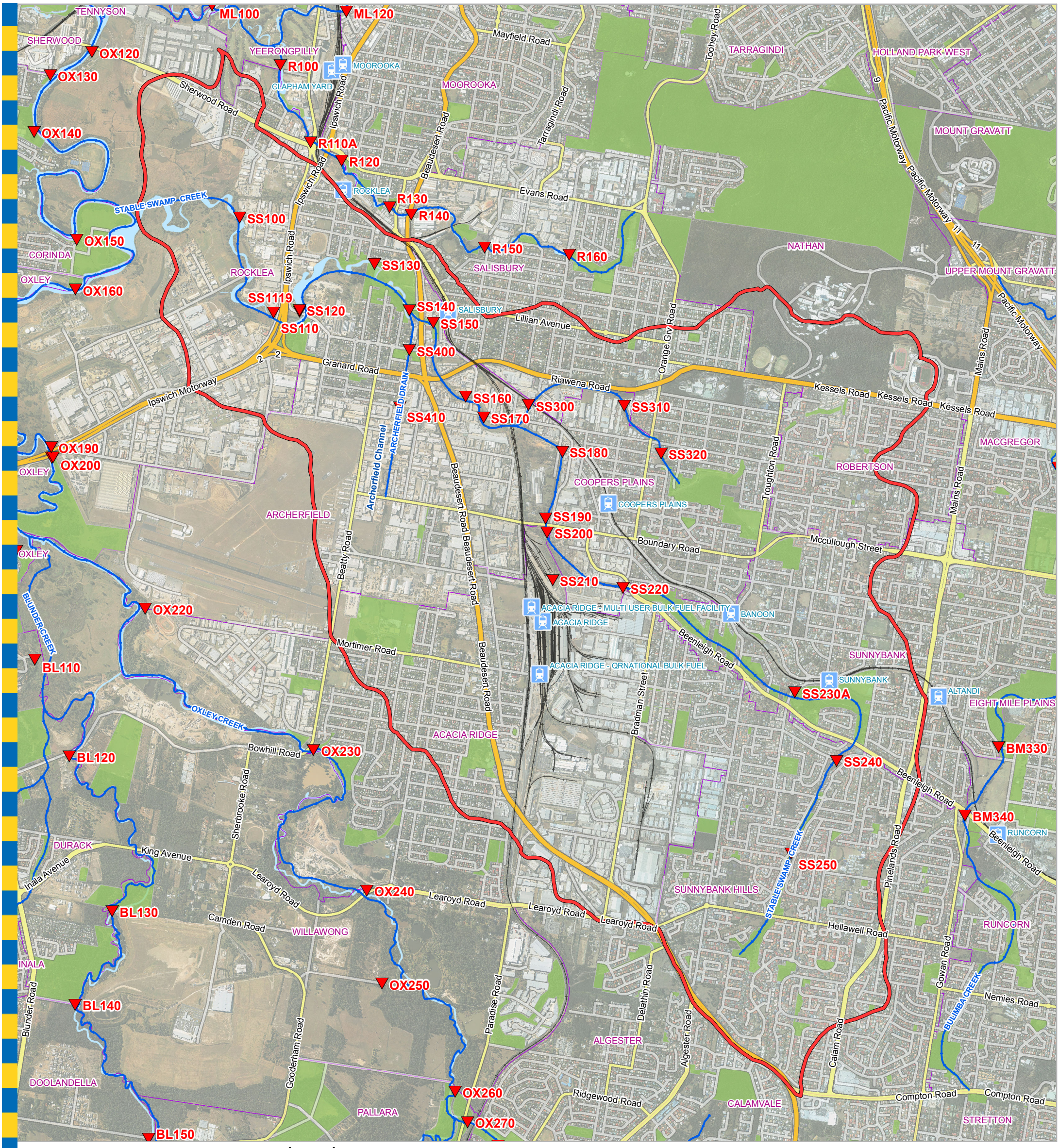

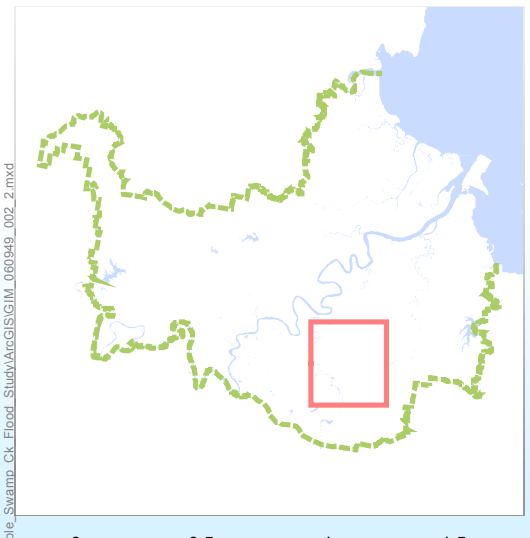

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Maximum Height Gauge Locations

Figure 2.2

GIM - 060949 - 002_2

Table 2.4: MHG Locations

Branch	Gauge Name	Easting	Northing	Approx MIKE11 Chainage	MIKEFLOOD Grid Reference		Location Description
					J	K	
Shelleys Creek	**SS250**	505056	6947812	10948			Kingman Street - Sunnybank Hills
	SS240	505426	6948571	11844			Lang Street - Sunnybank Hills
Stable Swamp Creek	**SS230A**	505080	6949140	1,430			Stones Road - Sunnybank Hills
	SS220	503680	6949990		798	75	Cnr Beenleigh Road/Gay Street - Sunnybank Hills
	SS500	503100	6950050		684	87	Gay Street - Sunnybank Hills
	SS200	503060	6950440		674	165	Boundary Road (Culvert)-Coopers Plains
	SS190	503050	6950550		672	189	Annie Street - Archerfield
	SS180	503180	6951100		699	297	Edith Street - Archerfield
	SS170	502540	6951380		570	353	Inter Alton Street/Musgrave Road - Archerfield
	SS160	502397	6951550		541	387	Norbury Street- Archerfield
	SS150	502130	6952160		488	508	Dollis Street- Archerfield
	SS140	501940	6952260		449	528	Colvin Street- Archerfield
	SS130	501653	6952630		392	604	Between Tramore Street/Leeds Street - Rocklea
	SS120	501040	6952270		270	529	Marshall Road - Rocklea
	SS110	500830	6952235		227	524	Ipswich Road - Rocklea
	SS100	500550	6953012		172	680	Franklin Street - Rocklea
Archerfield Channel	**SS400**	501940	6951930		450	463	Marshall Road (Culvert) - Archerfield
	SS410	501860	6951470		434	370	Rodwell Street - Archerfield
North Branch	**SS300**	502910	6951480		644	373	Railway Bridge (TNT Depot)- Salisbury
	SS310	503690	6951480		801	372	Between Burgess Street/Debra Street - Salisbury
	SS320	503990	6951090		861	294	Cnr Musgrave Road / Orange Grove Road

Table 2.5: Maximum Flood Height Recordings from MHGs

Branch	Gauge Name	Peak Flood Level (m AHD)			
		Event Date			
		May 96	January 98	March 01	November 04
Shelleys Creek	SS250	---	---	**52.24^**	51.41
	SS240	43.06	43.41	43.16	43.14
Stable Swamp	SS230A	NA	NA	NA	33.30
	SS220	17.74	OT	**17.45^**	DEST
	SS500	15.37	15.97	15.87	15.16
	SS200	---	11.90	12.65	---
	SS190	10.79	NA	11.76	11.84
	SS180	8.40	NA	10.02	9.33
	SS170	6.58	7.35	8.12	7.38
	SS160	6.27	6.97	7.78	6.98
	SS150	5.53	5.91	**6.61^**	6.13
	SS140	5.15	5.26	**6.23^**	5.77
	SS130	4.98	4.99	**5.95***	5.42
	SS120	4.88	4.82	**5.54~**	5.10
	SS110	4.71	4.55	5.10	5.04
	SS100	4.49	3.13	3.85	3.71
Archerfield Channel	SS400	NA	NA	**6.31***	5.92
	SS410	NA	NA	7.12	6.79
North Branch	SS300	---	7.73	9.36	---
	SS310	NA	---	12.77	---
	SS320	15.50	15.66	16.87	---

Key: **NA = No data available**
OT = gauge overtopped – no level recorded
DEST = gauge destroyed – no level recorded
^ Level from nearby debris height
~ Gauge destroyed and level from debris
*** Level over top of inner gauge therefore level from debris**
--- Level did not reach bottom of inner gauge

2.3.3 Tidal Information

Hourly level records for Oxley Creek at the Corinda High School Telemetry Gauge (OXA023) were obtained for calibration events and were used as the downstream boundary condition at Oxley Creek.

Other tidal information derived from Maritime Safety Queensland tide tables (2013 Tide Book):

- Mean High Water Springs (MHWS): 1.22 mAHD
- Highest Astronomical Tide (HAT): 1.83 mAHD

2.4 Hydraulic Structure Data

Structure information from the existing MIKE11 model was checked using available design drawings for each structure. Structure information for all structures included in the MIKE FLOOD model is summarised in the hydraulic structure reference sheets (HSRS) provided in APPENDIX C.

3.0 Model Development

3.1 Introduction

Hydrologic models simulate the catchment rainfall-runoff and, in a simplified approach, the movement of flood waters down the creeks. Hydraulic models simulate the movement of flood waters using more advanced mathematics, thereby giving a more accurate representation of flood behaviour, particularly where downstream effects and hydraulic structures are influential.

The hydrologic model for the Stable Swamp Creek System was set up based on the RAFTS software version 2009 SP1 (XP Software, 2010) and is described in Section 3.2.

The unsteady hydraulic model was developed based on MIKE FLOOD version 2011 SP7 (DHI, 2011). Unsteady models simulate the progression of a flood wave down the creek over time and therefore have the ability to simulate:

- the rise and fall of a flood;
- variations in downstream tidal effects;
- storage effects of floodplains; and
- overland flowpaths

The unsteady hydraulic model is described in Section 3.3.

3.2 Hydrologic Model

Sub-catchments are represented as nodes within the RAFTS to provide points within the model where total and localised flow hydrograph information can be extracted. The hydrologic model included a total of 88 sub-catchments or nodes to describe the 27km^2 catchment. Of these sub-catchments, 20 are located in the Shelleys Creek catchment, 31 in Archerfield Channel, 12 in North Arm and 25 in Stable Swamp Creek. Sub-catchment boundaries were determined based on a review of existing catchment delineations and updated in accordance with the local topography using one metre resolution contours and local drainage networks. A further 33 “dummy” nodes were incorporated into the model to allow flow hydrographs to be derived for tributaries upstream of junctions.

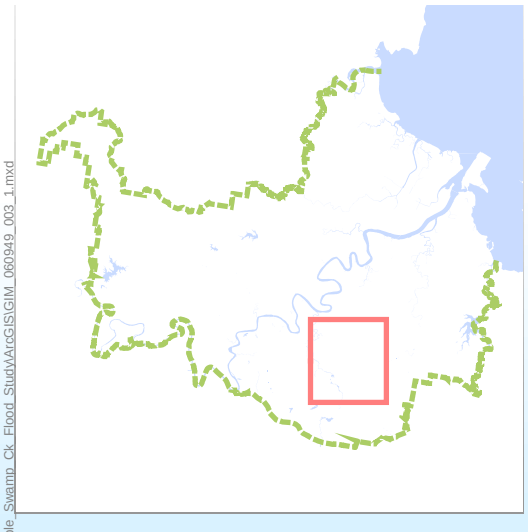
Catchment area, land use (impervious and pervious), slope and roughness (PERN) values were used to define the sub-catchments. Figure 3.1 illustrates the model layout including sub-catchments.

The determination of sub catchment size was made with consideration of ultimate land use conditions as detailed within Brisbane City Council’s City Plan 2000. Where more detail was required, such as for Beryl Roberts Park, impervious fractions were assigned based on aerial photography (2005 DigitalGlobe satellite imagery, BCC 2005). Table 3.1 broadly identifies the allocation of land use classification within Stable Swamp Creek catchment.

Table 3.1: Areas of land use – ultimate development scenario

Land Use Type	Total Area (ha)	% of Total Area
Open Space	525	19.6
Urban	1152	43.0
Commercial/ Industrial	1002	37.4
Total	2679	100.0

An average impervious value of 48% was obtained for the catchment.



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Legend

- Park Boundaries
- Suburb Boundaries
- AMTD Line (Adopted Middle Thread Distance)
- Stable Swamp Creek Catchment
- SubCatchments Boundaries
- Shelleys Creek Catchment
- Archerfield Channel Catchment

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Hydrological Model Layout

Figure 3.1

GIM - 060949 - 003_1

Table 3.2 shows the fraction impervious values adopted and Table A.1 in APPENDIX A summarises the sub-catchment properties.

Table 3.2: Adopted Fraction Impervious Values

Development Type		C10	Fraction Impervious
Commercial and Industrial		0.88	0.90
High Density Residential		0.88	0.90
Low-Medium Density Residential	Lots greater than 750 m^2	0.77	0.35
	Lots 600 m^2 to 750 m^2	0.79	0.45
	Lots 450 m^2 to 600 m^2	0.81	0.55
	Lots 300 m^2 to 450 m^2	0.83	0.65
Rural Residential		0.74	0.20
Open Space, Parks, etc.		0.70	0.00

Note: The above table is an amalgam of the Brisbane City Council Department of Works Supplement to QUDM (Brisbane City Council 1994, p.QUDM-BCC-2) and the Queensland Urban Drainage Manual (QUDM) (Neville Jones & Associates and Australian Water Engineering, 1993, Tables 5.04.1 and 5.04.2). The Supplement lists the variation in 10 year event runoff coefficient for various land uses while QUDM relates runoff coefficient to fraction impervious.

RAFTS allows each sub-catchment to be divided into two sub-areas to reflect impervious and pervious portions. Due to the extent of catchment development, this approach was followed for all sub-catchments in the model.

The fraction impervious of sub-catchments was determined in accordance with the Brisbane City Council Department of Works Supplement to QUDM (Brisbane City Council 1994, p.QUDM-BCC-2) and the Queensland Urban Drainage Manual (QUDM) (Neville Jones & Associates and Australian Water Engineering 1993, Tables 5.04.2 and 5.04.1).

The impervious fraction in the RAFTS software was set to zero for pervious areas and 100% for impervious areas. PERN values, which are a multiplication factor applied to the storage delay time coefficient “B” in the storage discharge relationship of the RAFTS hydrologic simulation at each to take into account the roughness of each subcatchment (Aitken, 1975) and were set to 0.05 and 0.025 for pervious and impervious subcatchments respectively

The drainage paths of the Stable Swamp Creek catchment are represented in the RAFTS model by a number of links, including channel routing links, lagging links and dummy lag links with zero lag time.

Creek cross sections are a requirement for and were applied to routing links and were sourced from channel surveys of Stable Swamp Creek, Shelleys Creek and Archerfield Channel. In the majority of cases, reaches in the RAFTS model extended across a number of surveyed cross sections. In each case, the cross section considered to be most representative of the reach was input to the RAFTS model.

Mannings ‘n’ values for each cross section were initially derived from those applied to the previously developed hydraulic model and then varied within reasonable limits as part of the calibration process. Dummy link lags were used to connect tributaries to the main drainage line and to allow for additional nodes required for hydrograph derivation purposes. In all cases, a zero lag time was assigned to dummy links.

Full details regarding each link used in the model (including length, slope, adopted cross section and Mannings ‘n’ values) are listed in Table A.1 in APPENDIX A.

3.3 Hydraulic Model

The extent of the Stable Swamp Creek MIKE FLOOD coupled 1-D (MIKE11) and 2-D (MIKE21) model is shown in Figures 3.2-3.4, and includes the following features:

MIKE11 Component:

- Approx 130 cross sections
- 22 branches
- 21 broad crested weirs and 34 culverts to describe road/pedestrian crossings and pipe crossings within the model
- 21 lateral inflows to points within the model
- 3 inflows to the upstream end of 1D branches

MIKE21 Component:

- 867x901 Grid cells @ 5m spacing
- 15 coupled 1D-2D linked structures, 8 of which with weirs modelled in the 2D domain
- 3 drop structures incorporated into DEM
- 1 structure modelled purely as a 2D structure (rail yard railway crossing)
- 29 local catchment inflow points
- Upstream boundaries connected to MIKE11 model

3.3.1 Branch Layout

The Stable Swamp Creek MIKE FLOOD model consists of four main branches;

- Shelleys Creek (Chainage 10000 – 12165, 1D only);
- Stable Swamp Creek (Chainage 737 – 2810, 2810-mouth in 2D);
- Archerfield Channel (2D Only); and
- North Arm (Chainage 0 – 287, 287-mouth in 2D)

Branch descriptions are provided in Table B.1 in APPENDIX B.

3.3.2 MIKE11 Model Cross Sections

Cross sections were sourced from new and existing survey and existing MIKE11 hydraulic models. The cross section database in the MIKE11 model references data origin, namely BCC survey or airborne laser scanning (ALS) data.

All cross sections are processed using the total area, hydraulic radius option for a minimum of 60 equidistant points. Bank markers 1, 2 and 3 define the left extent, invert and right extent of the cross sections, respectively.

Table B.2 in APPENDIX B lists the MIKE11 cross-section chainages, their adopted middle thread (AMTD) equivalent distance from the mouth of the watercourse and the BCC survey reference. Any changes to the surveyed cross-sections are described in this table.

3.3.3 MIKE21 Model Bathymetry

The MIKE21 model bathymetry is based on the BCC 2009 ALS data which includes the channel optimisation works performed adjacent to Gay and Halt Street constructed in 2000. The following modifications were made to the raw ALS data to form the MIKE21 model bathymetry:

- Upstream and downstream boundaries were modified to allow flows to smoothly transition into and out of the model limiting potential instabilities.
- Cells within the main channel were lowered to simulate the surveyed bed level at cross section locations and interpolated between sections to better represent low flow conveyance.

- Heavily vegetated areas with ground survey cross section data were reduced to better represent ground levels beneath the vegetated canopy. It is known that ALS levels are not reliable in heavily vegetated areas.
- Structures with weirs modelled in 2D have had the road level modified to incorporate additional guard rail height assuming 100% blockage (where necessary).
- Cells coupled to MIKE11 sections around structures and boundaries were reduced to the level of the invert of the associated cross section. Adjacent cells were subsequently interpolated to allow smooth flow into the coupled cells.

3.3.4 Model Parameters

3.3.4.1 Model Roughness

Mannings 'n' values from the existing MIKE11 model were reviewed based on site inspection and aerial photography and are largely retained unchanged from previous models.

Manning's 'M' values were used to define land use areas in the MIKE21 model domain which are consistent with the values used in the existing MIKE11 model as shown in Table 3.3.

Table 3.3: MIKE FLOOD Model Roughness Parameters

Land Use	Manning's 'M' Value	Equivalent Manning's 'n' Value
Heavy Vegetation/Mangrove Areas	16.666	0.06
Urban/residential Areas	10	0.1
Grassland	20-25	0.03-0.035
Open Waterways	40	0.025
Streets/Roadways	50	0.02
Buildings	5	0.2

3.3.4.2 Other Model Parameters

Other notable model parameters are listed in Table 3.4:

Table 3.4: Other MIKE FLOOD Model Parameters

Parameter	Parameter Value
Drying Depth	0.02m
Flooding Depth	0.05m
Simulation Timestep	0.5s
Eddy Viscosity	Map File: between 1.0 and 5.0

3.3.5 Hydraulic Structures

Each of the 38 crossings, road and footbridge, are modelled with a combination of culverts and weirs. As a part of the model updating process and to improve model stability, all weirs and culverts have been converted and arranged in a single branch, online assembly. A summary of hydraulic structures including chainage and a description is provided in Table B.3 in APPENDIX B.

3.3.6 Model inflows

A total of 53 inflows were defined and applied to the hydraulic model to reflect the hydrologic behaviour of the creek. The large number of inflows minimised localised increases in flow due to concentrated local inflows. An inflow was defined for the upstream boundary of Shelleys Creek, Archerfield Channel, Riawena Road, Beryl Roberts Main Channel and Beryl Roberts Tributary.

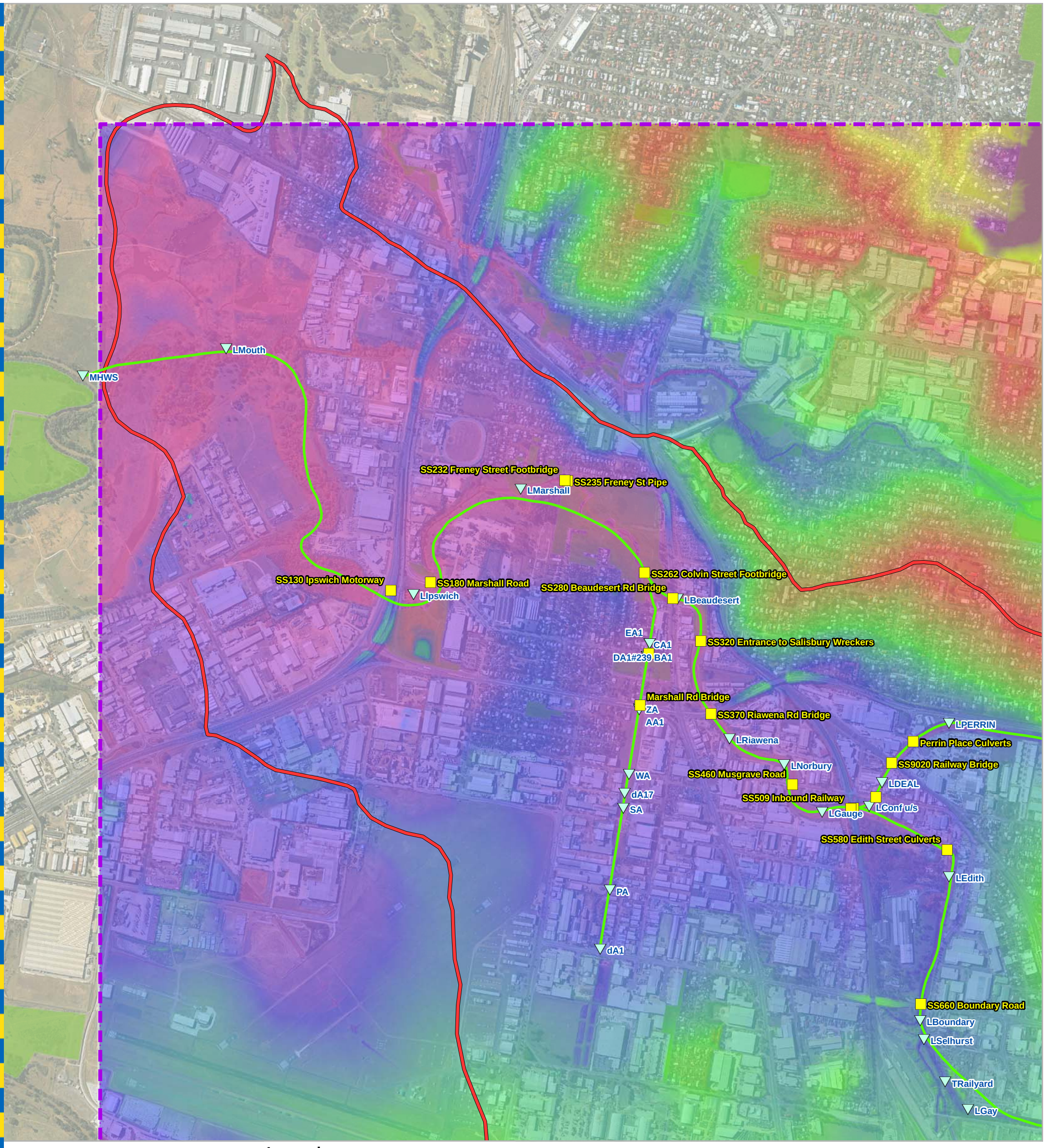
The location of each inflow is shown in Figures 3.2-3.4. A complete listing and description of inflows is provided in Table B.4 in APPENDIX B.

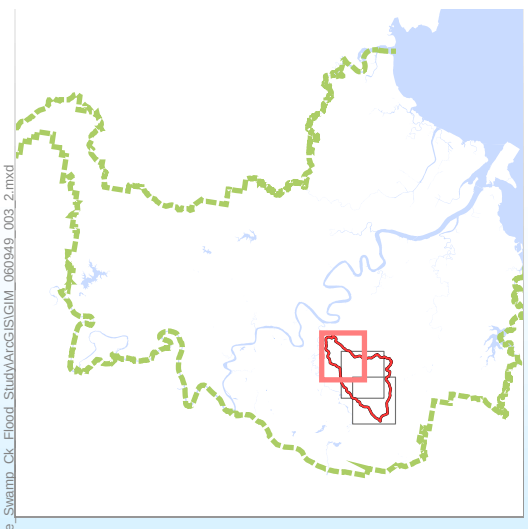
3.3.7 Tailwater Conditions

Hourly level records for Oxley Creek at the Corinda High School Telemetry Gauge (OXA023) were obtained for calibration and verification events and were used to inform the downstream boundary condition at Oxley Creek. However, for the 1996 event this gauge was not operational therefore a static tail water level of 4.4mAHD was utilized based upon surveyed levels from the event adjacent to the downstream boundary.

3.3.8 Model Peer Review

As part of this study an independent peer review was done by DHI as the industry professional who develops and utilises the MIKE FLOOD software along with many other hydraulic software packages. The model peer review was done on the Scenario 1 – Existing Conditions (see section 5.4.1 for more details on scenarios) which was based on the final calibration model and any recommendations were immediately adopted. The peer review report can be found in APPENDIX D.





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Legend

- Stable Swamp Creek Structures
- Model Inflows
- MIKE11 Cross Sections
- Stable Swamp Creek AMTD Line
- 2D Model Boundary
- Stable Swamp Creek Catchment
- Park Boundaries

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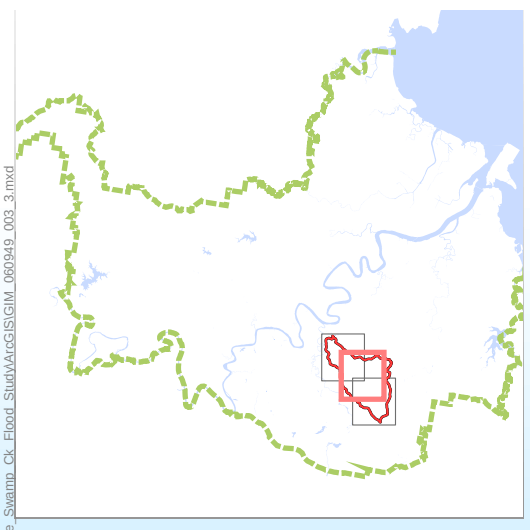
MIKE FLOOD Model Layout Map 1 of 3

Figure 3.2

GIM - 060949 - 003_2

SS235 Freney St Pipe
LMarshall
SS262 Colvin Street Footbridge
SS280 Beaudesert Rd Bridge
LBeaudesert
EA1
CA1
DA1#239 BA1
SS320 Entrance to Salisbury Wreckers
Marshall Rd Bridge
ZA
AA1
SS370 Riawena Rd Bridge
LRiawena
LNorbury
SS460 Musgrave Road
WA
dA17
SA
SS509 Inbound Railway
LGauge
LConf u/s
LDEAL
LPERRIN
Perrin Place Culverts
SS9020 Railway Bridge
LELMA
LDEBRA
Orange Grove Rd Bridge
LORANGEGR
Musgrave Rd Bridge 2
Baroda St Footbridge
LMUSGRAVE
SS580 Edith Street Culverts
LEdith
TBERYLDUM
Peringa St Footbridge
Barham St Bridge
Beryl Roberts Basin Outlet
PA
dA1
SS660 Boundary Road
LBoundary
LSelhurst
TRailyard
LGay
TBERYLDUM2
SS750 Beenleigh Road Culverts
LBeenle
LGaddes
SS870 Dyson Avenue Footbridge
LDyson
LJackson
SS910 Keats St Bridge
LKeats
LFeltwell
LStones
SS950 Stones Road Pipe
SS960 Stones Road Culvert
LS-20-Lang
SS1090 Lang St Drop Structure
SS1090 Lang St Footbridge
LR-19
LQ-18
LP-17-CHILT
Chilton St Culvert



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Legend

- Stable Swamp Creek Structures
- Model Inflows
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MIKE FLOOD Model Layout
Map 2 of 3

Figure 3.3

GIM - 060949 - 003_3

TRailyard
LGay
SS750 Beenleigh Road Culverts
LBeenle
LGaddes
SS870 Dyson Avenue Footbridge
LDyson
LJackson
SS910 Keats St Bridge
LKeats
SS960 Stones Road Bridge
LStones
LFeltwell
LWoff
SS950 Stones Road Pipe
SS960 Stones Road Culvert
SS1050 Beenleigh Road Bridge
LT-21
SS1090 Lang St Drop Structure
LS-20-Lang
SS1090 Lang St Footbridge
LR-19
Chilton St Culvert
LQ-18
LP-17-CHILT
LO-16-ASH
Kingman St Footbridge
LN-15-KENT
LM-14
LL-13
Basin_culvert
Hellawell Rd Culvert
TI-9-HELLDS
TJ-10-HELL
Forestlea Place - Pipe
TF-6
TDUM1

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Metres
Scale 1:15000 on A3

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Revision : 0
Publication Date : 12 Jun 2014
Project Number : 060949

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Legend

- Stable Swamp Creek Structures
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- Stable Swamp Creek AMTD Line
- 2D Model Boundary
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MIKE FLOOD Model Layout Map 3 of 3

Figure 3.4

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4.0 Model Calibration

4.1 Selection of Calibration and Verification Events

Calibration events were selected by considering the relative size of the event and the availability of data for each event. Events prior to 1984 were discarded as significant flood mitigation works were completed during 1983 – 1984 and survey data for the creek was collected in 1999.

The 1996 and 1998 events have been specified as verification events as there was significant mitigation works performed adjacent to Gay Street and Halt Streets in 2000 which is represented in the available ALS data. There was no readily available ALS data prior to the commencement of the works therefore it will not be represented in the 1996 and 1998 model verification simulations.

The January 2011 and January 2013 events did not cause significant local flooding in Stable Swamp Creek. However, lower reaches were impacted due to backwater effects from Brisbane River and Oxley Creek flows.

Calibration Events

- March 2001
- November 2004.

Verification Events

- May 1996
- January 1998

4.2 Hydrologic Model Calibration

Hydrologic model calibration was undertaken by comparing model generated flows to flows calculated using rating curves previously developed for the Musgrave Road stream gauge (SSE129). The RAFTS model parameter BX[1] was varied to improve the match of modelled flows to recorded events at the Musgrave Road stream gauge.

Initial and continuing losses were estimated based on the previous five days of rainfall for each historical event and adjusted to improve calibration with recorded data at the Musgrave Road gauge. The adopted losses are summarised in Table 4.1 and antecedent conditions for each event are discussed in further detail in Section 4.3. The calibration process demonstrated a BX value = 1 was the most appropriate factor. The BX value is a factor applied to the storage delay time coefficient (B) in the RAFTS simulation. The RAFTS default value of 0.285 was used for the storage non-linearity exponent “n”.

Table 4.1: Initial and Continuing Loss Rates

Event	Initial Loss (mm)		Continuing Loss (mm/h)	
	Pervious	Impervious	Pervious	Impervious
January 1998	50	50	0	0
March 2001	50	50	0	0
November 2004	10	10	0	0
May 1996	10	10	0	0

4.3 Hydraulic Model Calibration

Manning’s n values were varied to improve the correlation of the modelled discharge and peak level with recorded data. Adopted manning’s n values were not varied across calibration events and the values were chosen to represent the best calibration outcome with all events taken into consideration.

A summary of differences between the recorded and modelled flood levels at each of the MHGs is given in Table 4.2. Each event is analysed in more detail in the following sections.

[1] The RAFTS parameter BX is a multiplication factor for the B parameter, where B = storage delay time coefficient

Table 4.2: Difference between Recorded and Modelled Flood Levels

Branch	Gauge ID	Approx Mike11 Chainage	MIKEFLOOD Grid Reference		May-96	Jan-98	Mar-01	Nov-04
			J	K				
Shelleys Creek	SS250	10948			**---**	**---**	**-0.46^**	0.27
	SS240	11844			-0.08	0.39	0.35	0.29
Stable Swamp	SS230A	1,430			**NA**	**NA**	**NA**	0.21
	SS220		798	75	-0.12	**OT**	**0.84^**	**DEST**
	SS500		*684*	*87*	-0.60	-0.13	-0.10	0.34
	SS200		674	165	**---**	1.11	0.47	**---**
	SS190		672	189	0.43	**NA**	**0.30~**	-0.14
	SS180		699	297	0.45	**NA**	0.25	0.49
	SS170		570	353	0.00	0.42	0.20	0.19
	SS160		541	387	-0.05	0.43	0.23	0.20
	SS150		488	508	0.01	0.35	**0.05^**	0.13
	SS140		449	528	-0.12	0.17	**-0.11^**	-0.20
	SS130		392	604	-0.02	0.32	**0.13***	0.07
	SS120		270	529	-0.08	0.14	**0.35~**	0.13
	SS110		227	524	-0.08	0.13	0.03	-0.28
	SS100		172	680	-0.07	0.49	0.04	-0.01
Archerfield Channel	SS400		450	463	**NA**	**NA**	**0.34***	0.29
	SS410		434	370	**NA**	**NA**	-0.01	0.14
North Branch	SS300		644	373	**---**	1.11	0.20	**---**
	SS310		801	372	**NA**	**---**	0.56	**---**
	SS320		861	294	-0.31	0.93	0.06	**---**

Key: **NA = No data available**
OT = gauge overtopped – no level recorded
DEST = gauge destroyed – no level recorded
^ Level from nearby debris height
~ Gauge destroyed and level from debris

*** Level over top of inner gauge therefore level from debris**
--- Level did not reach bottom of inner gauge

4.3.1 March 2001 Calibration Event

Occurring on the 9th March, this flash flood event was triggered by intense rainfall associated with a band of thunderstorms across South East Queensland. The stream gauge at Musgrave Road indicates this is the largest event recorded during the period of operation of this gauge and it is the largest event modelled as part of the calibration process. The event was well documented with the continuous stream gauge at Musgrave Road and 19 maximum height gauges recording peak flood levels.

Rainfall records from four rainfall stations are available for this event. The recorded data has been plotted on an Intensity-Frequency-Duration (IFD) curve as shown in Figure 4.1. The gauges recorded similar intensities during this event with AEP's of approximately 1-2% for durations between 1 and 3 hours with the exception of BMR138 which was greater than 1% AEP.

Gauges SSR130 and OXR114 were selected as the source for rainfall data input for the event. Due to the rainfall distribution and similarity of the data recorded at the other nearby gauges with available data, it was considered satisfactory to apply the data from these two gauges only. The intensity of rainfall recorded at the BMR138 gauge was considered unreasonable to be applied to the Stable Swamp Creek catchment so the data was excluded from the simulation.

The simulated rainfall distribution has OXR114 data applied to the Shelleys Creek branch downstream to the Woff node and the SSR130 gauge data was applied to the remainder of the catchment. Table A.2 in APPENDIX A summarises the rainfall distribution adopted for the event.

Almost no rainfall was recorded for the five days prior to the March 2001 rainfall event. Therefore it can be assumed that the antecedent conditions were a relatively dry catchment and low creek water levels and an initial loss of 50mm was adopted.

A reasonable match was achieved with recorded levels, particularly through the centre of the catchment. The MIKE FLOOD model suggests the Beryl Roberts Basin spillway would have been in operation during the 2001 event, with a modelled peak water level of approximately 22.3m AHD in the basin. BCC staff who witnessed the 2001 event confirmed the basin did overtop in 2001. It should be noted that the model assumes that there is no blockage of the outlet for Beryl Roberts basin. The grate within the basin has the potential to collect debris during major events and this may have contributed to recorded levels within the basin.

The modelled water level hydrograph is consistent with the recorded data. There is a good match with the rising limb and timing of the peak. The modelled peak level at the gauge was higher than the recorded peak however the difference is minimal and is considered a fair match.

Recorded and modelled peak flood levels for the March 2001 event are presented in Table 4.3. A comparison of the recorded vs. MIKE FLOOD modelled peak water level hydrograph at the Musgrave Road continuous stream gauge for the 2001 event is provided in Figure 4.2.

Figure 4.1: IFD Curve - March 2001 Event

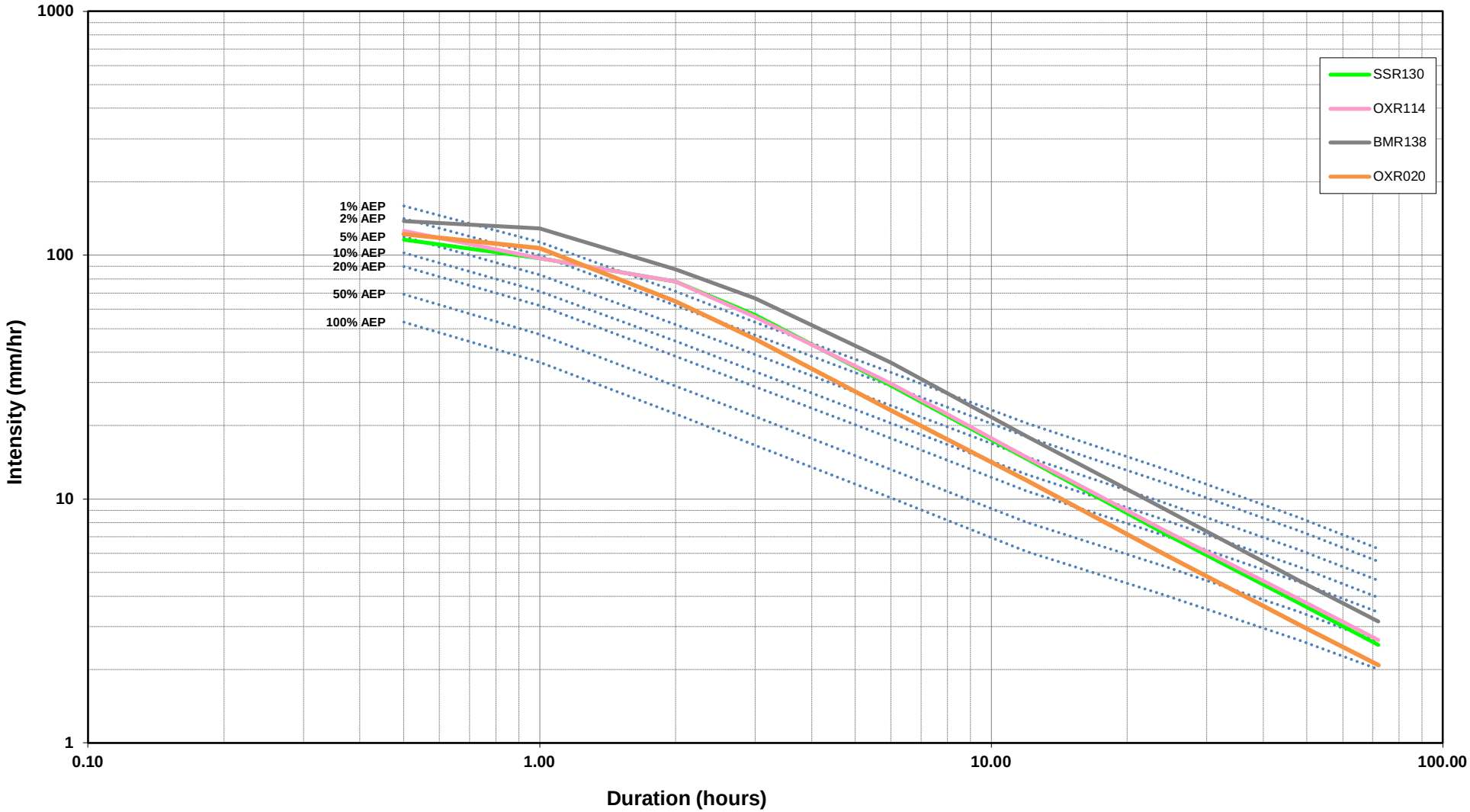
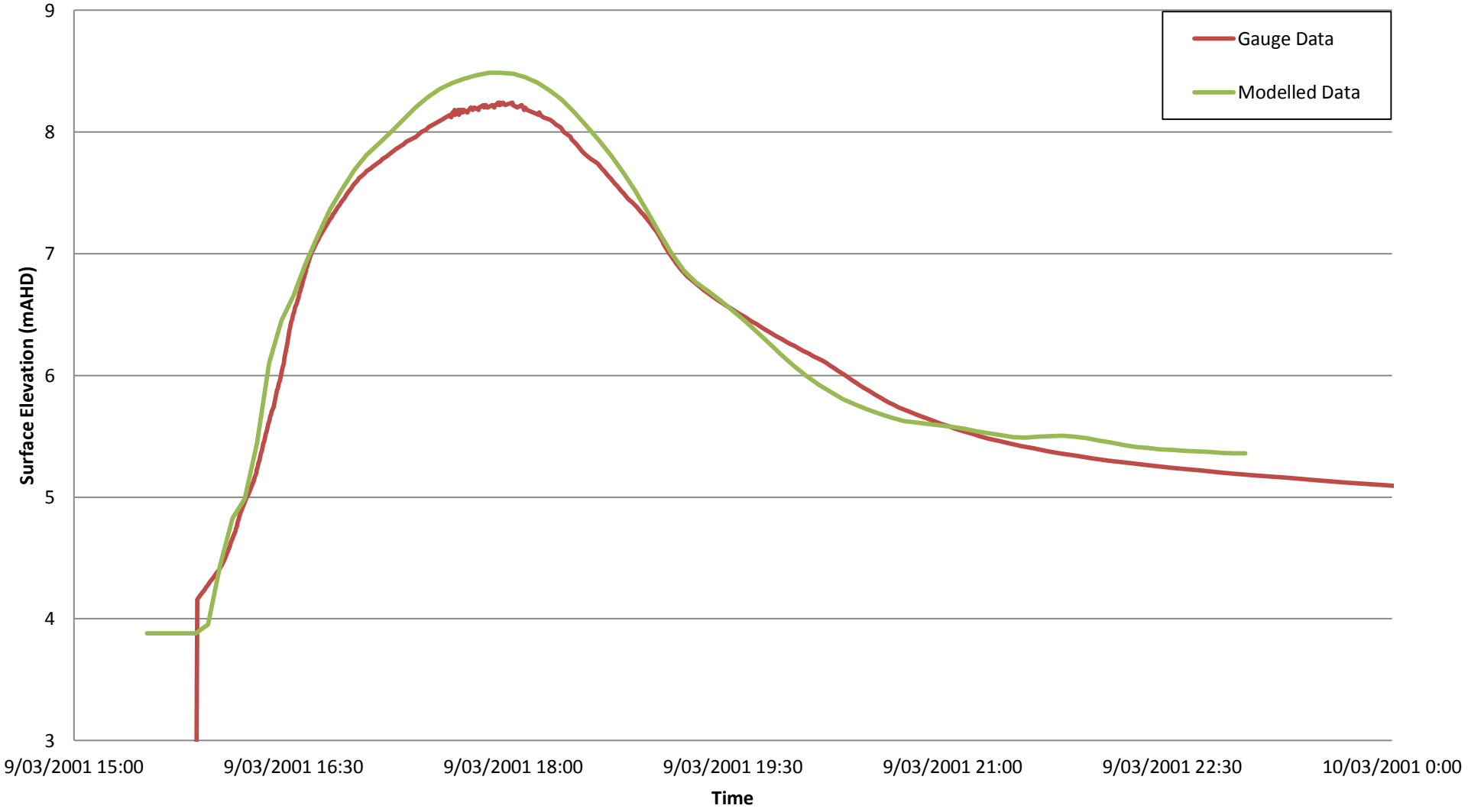


Table 4.3: Recorded & Modelled Peak Flood Levels, May 2001

Branch	Gauge ID	Description	May 01 Recorded Level (m)	May 01 Modelled Level (m)	Difference (m)
Shelleys Creek	SS250	Kingman Street	**52.24^**	51.78	-0.46
	SS240	Lang Street	43.16	43.51	0.35
Stable Swamp	SS230A	Stones Road	**NA**	-	-
	SS220	Beenleigh Road	**17.45^**	18.29	0.84
	SS500	Gay Street	15.87	15.77	-0.10
	SS200	Boundary Road	12.65	13.12	0.47
	SS190	Annie Street	11.76	12.06	0.30
	SS180	Edith Street	10.02	10.27	0.25
	SS170	Musgrave Road	8.12	8.32	0.20
	SS160	Norbury Street	7.78	8.01	0.23
	SS150	Dollis Street	**6.61^**	6.66	0.05
	SS140	Colvin Street	**6.23^**	6.12	-0.11
	SS130	Tramore Street	**5.95***	6.08	0.13
	SS120	Marshall Road	**5.54~**	5.89	0.35
	SS110	Ipswich Road	5.10	5.13	0.03
	SS100	Franklin Street	3.85	3.89	0.04
Archerfield Channel	SS400	Marshall Road	**6.31***	6.65	0.34
	SS410	Rodwell Street	7.12	7.11	-0.01
North Branch	SS300	Railway Bridge	9.36	9.56	0.20
	SS310	Burgess Street	12.77	13.33	0.56
	SS320	Orange Grove Road	16.87	16.94	0.06

Key: **NA = No data available**
OT = gauge overtopped – no level recorded
DEST = gauge destroyed – no level recorded
^ Level from nearby debris height
~ Gauge destroyed and level from debris
*** Level over top of inner gauge therefore level from debris**
--- Level did not reach bottom of inner gauge

Figure 4.2 - 2001 Event Calibration Results Plot - SSE129



4.3.2 November 2004 Calibration Event

This event occurred on the 7th November 2004 and along with the 2001 and 1998 events was one of the largest events in the last decade. Similar to the 1998 and 2001 events, flooding was caused by intense rainfall associated with a band of thunderstorms across South East Queensland. The continuous stream gauge at Musgrave Road and 16 maximum height gauges recorded peak flood levels.

Minor amounts of rainfall were recorded at nearby gauges within the five days prior to this event, enough to dampen the catchment and therefore initial losses of 10mm were adopted for this calibration event.

Rainfall records from four rainfall stations located within the vicinity of the catchment are available over this period. The recorded data has been plotted on an Intensity-Frequency-Duration (IFD) curve as shown in Figure 4.3. The gauges recorded similar intensities for given durations during this event with AEP's of approximately 10% and 2% for durations between 1 and 3 hours respectively.

Continuous rainfall data from two rainfall gauges OXR114 and R_R747 was selected. As there was no available data for the SSR130 gauge, data from the nearby R_R747 gauge in Salisbury was considered to be a suitable substitute due to its proximity. As with the 2001 event, due to the rainfall distribution and similarity of the data recorded at the other nearby gauges, rainfall from these two gauges has been applied across the catchment.

As with the 2001 event, rainfall from the OXR114 gauge was applied to the Shelleys Creek branch. The remainder of the catchment utilised rainfall data from the R_R747 gauge, refer to Table A.2 in APPENDIX A.

A reasonable match was achieved with recorded levels, although flood levels in Shelleys Creek are over estimated but are still within accepted tolerances. The MIKE FLOOD model suggests the Beryl Roberts Basin spillway would have been in operation during the 2004 event, with a modelled peak water level of approximately 22.2m AHD in the basin. BCC staff who witnessed the 2004 event confirmed the basin did overtop in 2004. It should be noted that the model assumes that there is no blockage of the outlet for Beryl Roberts basin. The grate within the basin has the potential to collect debris during major events and this may have contributed to recorded levels within the basin.

The modelled water level hydrograph at the gauge is consistent with the recorded data. There is a good match with the rising limb and timing of the peak. The modelled peak level at the gauge was higher than the recorded peak however the difference is minimal and is considered a fair match.

Recorded and modelled peak flood levels for the November 2004 event are presented in Table 4.4. A comparison of the recorded vs. MIKE 11 modelled peak water level hydrograph at the Musgrave Road continuous stream gauge for the November 2004 event is provided in Figure 4.4.

Figure 4.3: IFD Curve - November 2004 Event

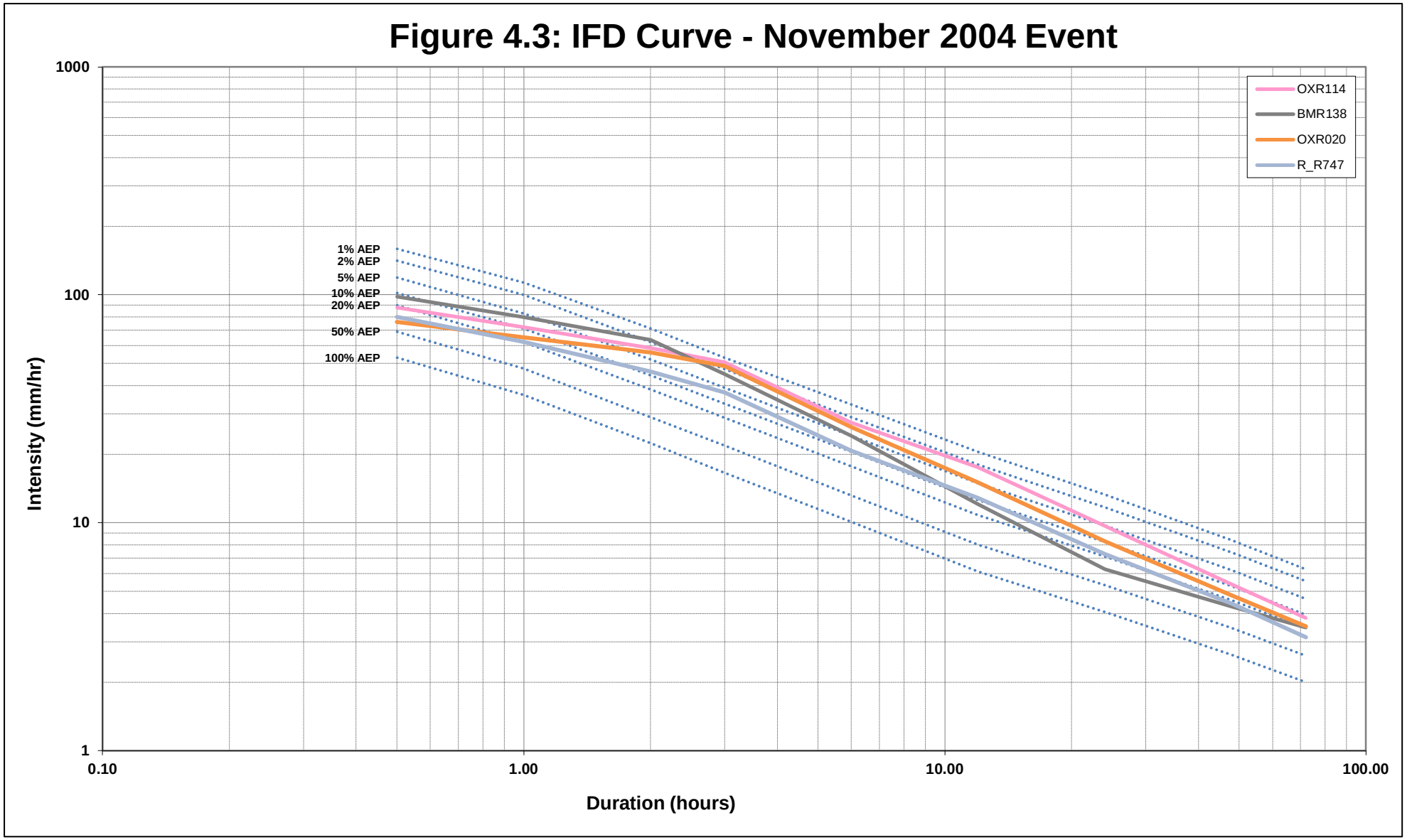
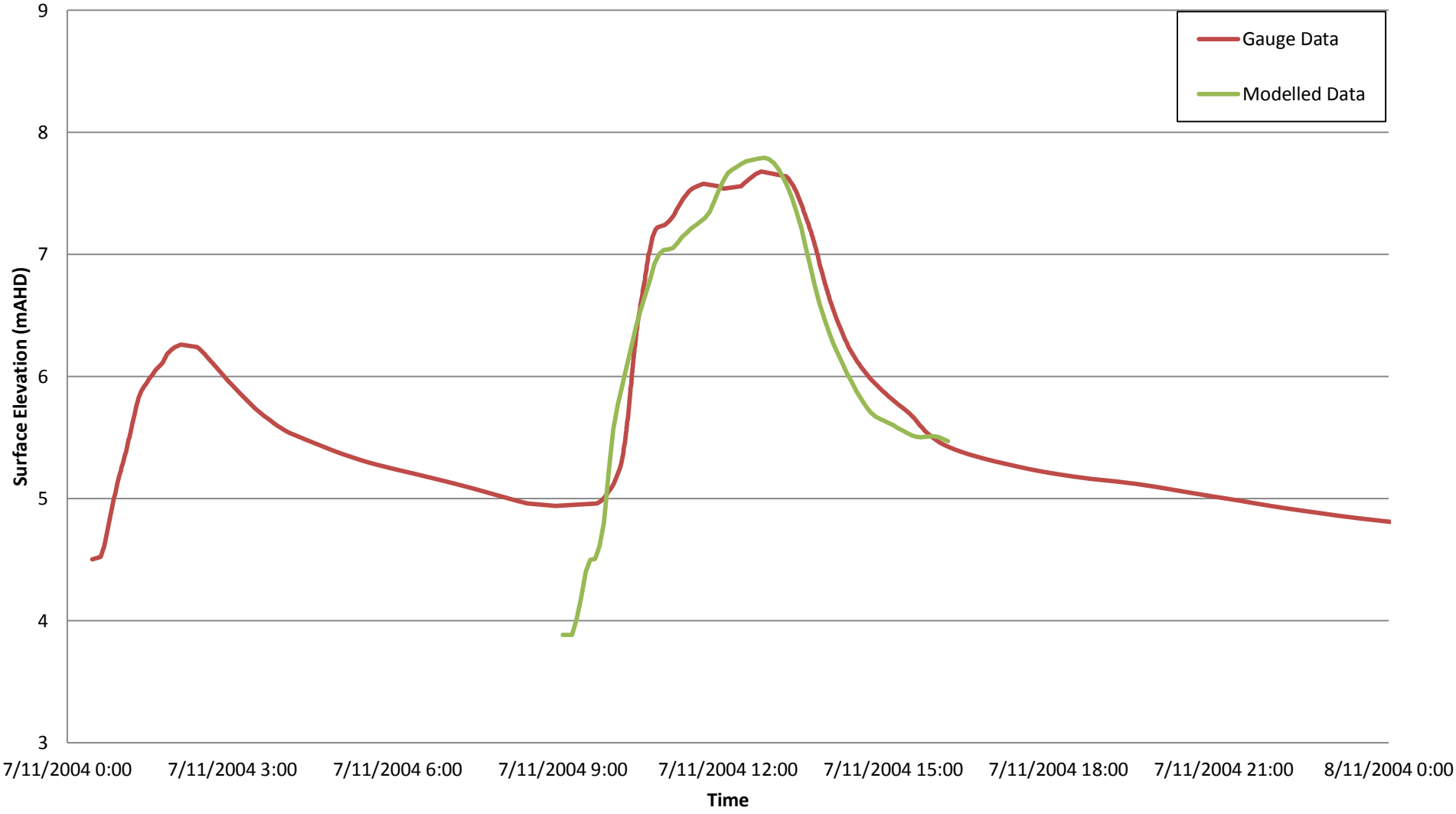


Table 4.4: Recorded & Modelled Peak Flood Levels, November 2004

Branch	Gauge ID	Description	Nov 04 Recorded Level (m)	Nov 04 Modelled Level (m)	Difference (m)
Shelleys Creek	SS250	Kingman Street	51.41	51.68	0.27
	SS240	Lang Street	43.14	43.43	0.29
Stable Swamp	SS230A	Stones Road	33.30	33.51	0.21
	SS220	Beenleigh Road	**DEST**	-	-
	SS500	Gay Street	15.16	15.50	0.34
	SS200	Boundary Road	**---**	-	-
	SS190	Annie Street	11.84	11.70	-0.14
	SS180	Edith Street	9.33	9.82	0.49
	SS170	Musgrave Road	7.38	7.57	0.19
	SS160	Norbury Street	6.98	7.18	0.20
	SS150	Dollis Street	6.13	6.26	0.13
	SS140	Colvin Street	5.77	5.57	-0.20
	SS130	Tramore Street	5.42	5.49	0.07
	SS120	Marshall Road	5.10	5.23	0.13
	SS110	Ipswich Road	5.04	4.76	-0.28
	SS100	Franklin Street	3.71	3.70	-0.01
Archerfield Channel	SS400	Marshall Road	5.92	6.21	0.29
	SS410	Rodwell Street	6.79	6.93	0.14
North Branch	SS300	Railway Bridge	**---**	-	-
	SS310	Burgess Street	**---**	-	-
	SS320	Orange Grove Road	**---**	-	-

Key: **NA = No data available**
OT = gauge overtopped – no level recorded
DEST = gauge destroyed – no level recorded
^ Level from nearby debris height
~ Gauge destroyed and level from debris
*** Level over top of inner gauge therefore level from debris**
--- Level did not reach bottom of inner gauge

Figure 4.4 - 2004 Event Calibration Results Plot - SSE129



4.3.3 May 1996 Verification Event

A smaller event in Stable Swamp Creek than the January 1998 and March 2001 events, the event occurred on the 5th May 1996 and was relatively small with flows less than a third of the 2001 flows recorded at the Musgrave Road gauge. The recorded peak downstream levels for this event are due to backwater effects from the Brisbane River which occurred the day after the local flows had subsided within Stable Swamp Creek.

Rainfall records from five rainfall gauges, located within the vicinity of the catchment, are available over this period. See Table 2.1 and Figure 2.1 for available gauge data and gauge locations. The recorded data has been plotted on an Intensity-Frequency-Duration (IFD) curve as shown in Figure 4.5. The recorded intensities at each of the gauges vary for given durations during this event. AEP's vary from less than 100% up to approximately 50% for durations between up to 3 hours. However, for longer periods the intensity of rainfall was more significant but would not heavily impact the Stable Swamp Creek Catchment with its short return period.

Gauges utilised include SSR130, OXR114, BMR138, OXR126, OXR020. Refer to Table A.2 in APPENDIX A for sub-catchment breakdown and rainfall gauge data application.

A significant amount of rainfall was recorded in the five days leading up to the event, therefore an initial loss of 10mm and a continuing loss rate 0mm/h was adopted in the RAFTS model for the May 1996 event.

The majority of the modelled levels are within the 300mm tolerance recommended by BCC with the exception of MHGs located from Beenleigh Road to Musgrave Road. This may be due to the channel realignment works performed after this event which has been incorporated into the model and has not modified for verification events.

The modelled water level hydrograph at the gauge is consistent with the recorded data. The rising limb and timing of the peak are earlier than the recorded levels. However, this may be due to the timing of the tides and backflow from Brisbane River during this event as only a static water level was used for the downstream boundary conditions. The modelled peak level at the gauge was a good match to the recorded peak level.

Recorded and modelled peak flood levels for the May 1996 event are presented in Table 4.5. A comparison of the recorded vs. MIKE FLOOD modelled peak water level hydrograph at the Musgrave Road continuous stream gauge for the May 1996 event is provided in Figure 4.6.

Figure 4.5: IFD Curve - May 1996 Event

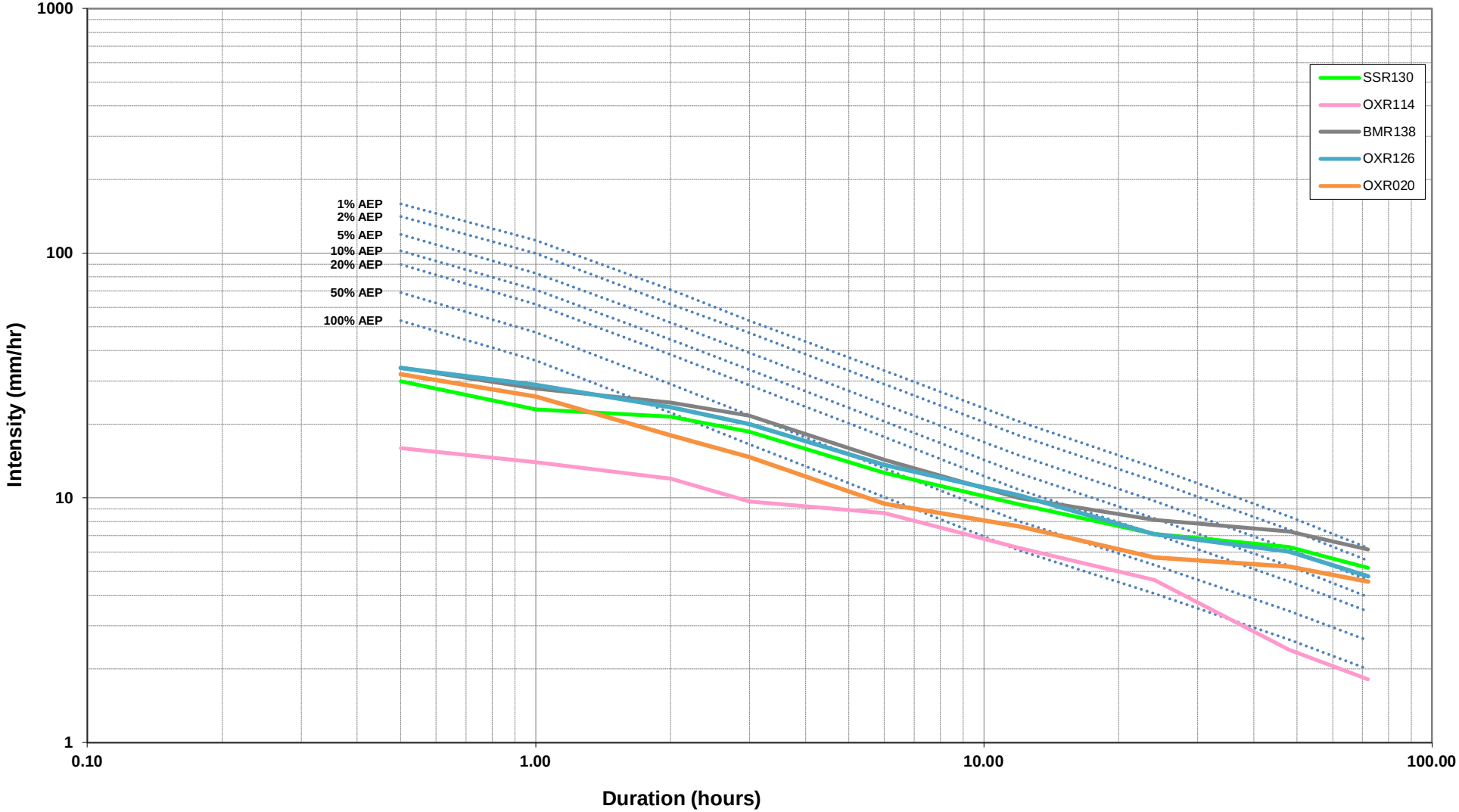
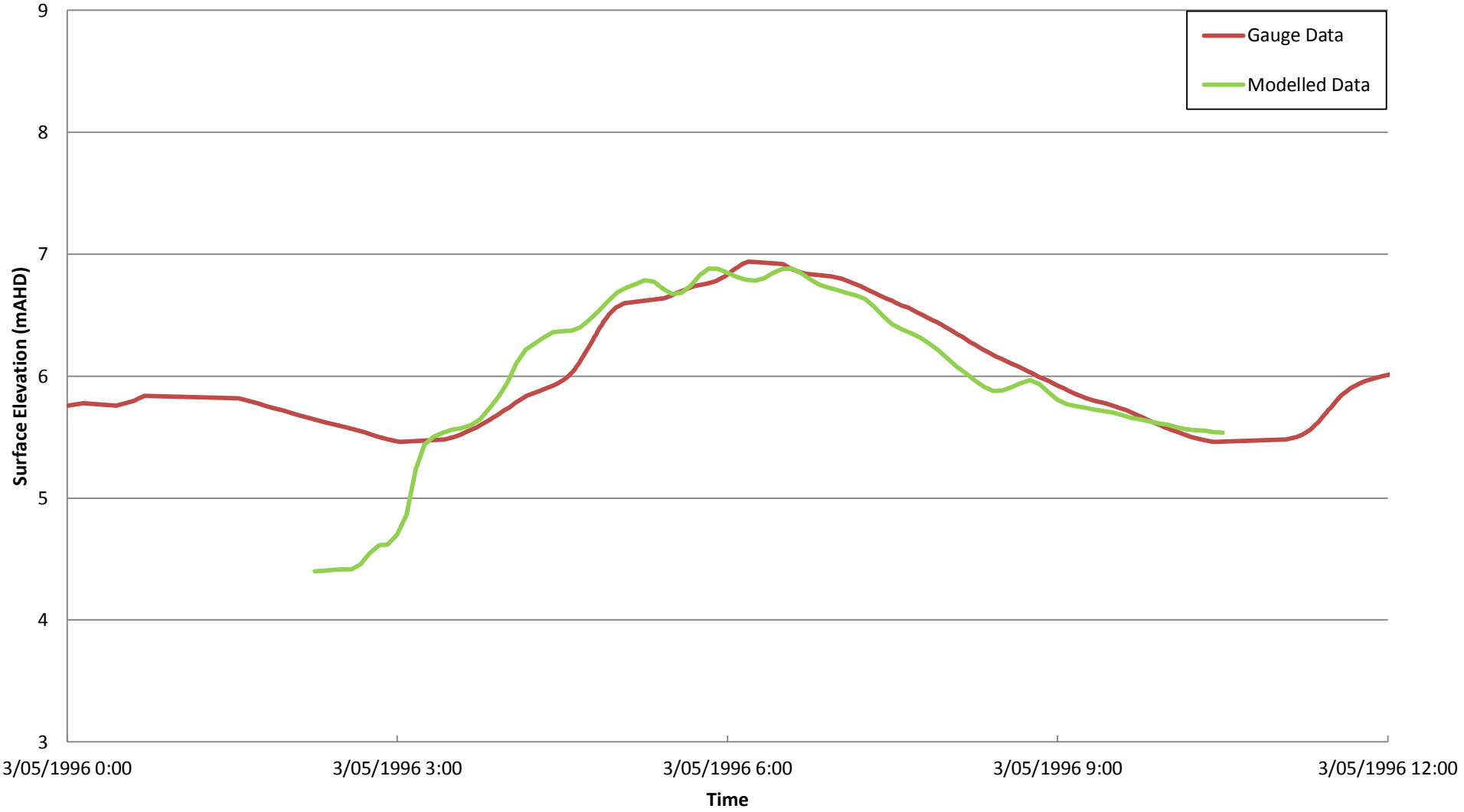


Table 4.5: Recorded & Modelled Peak Flood Levels, May 1996

Branch	Gauge ID	Description	May 96 Recorded Level (m)	May 96 Modelled Level (m)	Difference (m)
Shelleys Creek	SS250	Kingman Street	**---**	-	-
	SS240	Lang Street	43.06	42.98	-0.08
Stable Swamp	SS230A	Stones Road	**NA**	-	-
	SS220	Beenleigh Road	17.74	17.62	-0.12
	SS500	Gay Street	15.37	14.77	-0.60
	SS200	Boundary Road	**---**	-	-
	SS190	Annie Street	10.79	11.22	0.43
	SS180	Edith Street	8.40	8.85	0.45
	SS170	Musgrave Road	6.58	6.58	0.00
	SS160	Norbury Street	6.27	6.22	-0.05
	SS150	Dollis Street	5.53	5.54	0.01
	SS140	Colvin Street	5.15	5.03	-0.12
	SS130	Tramore Street	4.98	4.96	-0.02
	SS120	Marshall Road	4.88	4.80	-0.08
	SS110	Ipswich Road	4.71	4.63	-0.08
	SS100	Franklin Street	4.49	4.42	-0.07
Archerfield Channel	SS400	Marshall Road	**NA**	-	-
	SS410	Rodwell Street	**NA**	-	-
North Branch	SS300	Railway Bridge	**---**	-	-
	SS310	Burgess Street	**NA**	-	-
	SS320	Orange Grove Road	15.50	15.19	-0.31

Key: **NA = No data available**
OT = gauge overtopped – no level recorded
DEST = gauge destroyed – no level recorded
^ Level from nearby debris height
~ Gauge destroyed and level from debris
*** Level over top of inner gauge therefore level from debris**
--- Level did not reach bottom of inner gauge

Figure 4.6 - 1996 Event Verification Results Plot - SSE129



4.3.4 January 1998 Verification Event

The January 1998 event occurred on the 28th day of the month and was triggered by severe thunderstorms resulting in flash flooding in Brisbane's southern suburbs. The event was ranked by the Stable Swamp Creek Stormwater Management Plan (SMP) Flooding Technical Report (City Design, June 2000) as the second most severe event to be recorded in Stable Swamp Creek, after December 1978.

However recorded maximum height gauge readings indicate the event was less severe than the March 2001 and November 2004 events. Although the Musgrave Road stream gauge failed near the beginning of the event, 13 MHGs were operational.

Total rainfall and rainfall intensity was recorded at six rainfall stations as shown in Table 2.1 and has been plotted on an Intensity-Frequency-Duration (IFD) curve as shown in Figure 4.7. Rainfall gauge stations indicate there was zero recorded rainfall at all nearby gauges for at least five days prior to the event and the catchment could be therefore considered relatively dry and creek levels likely to be low. An initial loss of 50mm and 0mm continuous loss was adopted to allow a maximum amount of infiltration losses at the beginning of the event in consideration of the antecedent conditions.

Generally the calibration of this event shows modelled levels higher than the recorded levels. Sensitivity runs using BX = 3 and 50mm/hr initial loss, 0 mm/hr continuing loss in the RAFTS model resulted in a particularly good calibration for the 1998 event. However, a BX =1 was found to provide a significantly improved calibration for both the larger 2001 and 2004 events. This may be due to the channel realignment works performed after this event which has been incorporated into the model and has not modified for verification events.

Recorded and modelled peak flood levels for the January 1998 event are presented in Table 4.6. Hydrograph calibration could not be undertaken for the Musgrave Road stream gauging station as the gauge failed early in the event.

Figure 4.7: IFD Curve - January 1998 Event

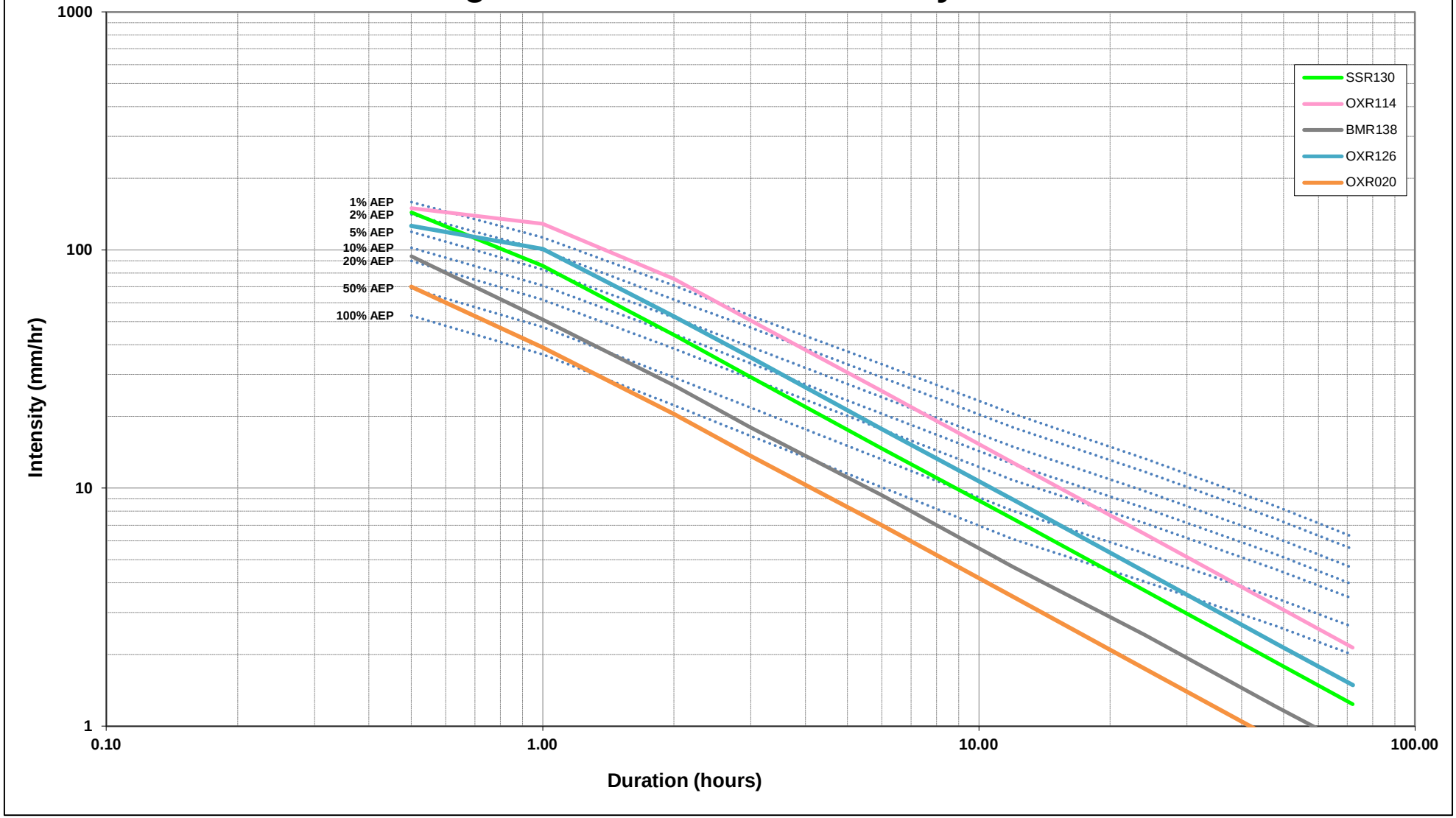


Table 4.6: Recorded & Modelled Peak Flood Levels, January 1998

Branch	Gauge ID	Description	Jan 98 Recorded Level (m)	Jan 98 Modelled Level (m)	Difference (m)
Shelleys Creek	SS250	Kingman Street	**---**	-	-
	SS240	Lang Street	43.41	43.80	0.39
Stable Swamp	SS230A	Stones Road	**NA**	-	-
	SS220	Beenleigh Road	**OT**	-	-
	SS500	Gay Street	15.97	15.84	-0.13
	SS200	Boundary Road	11.90	13.01	1.11
	SS190	Annie Street	**NA**	-	-
	SS180	Edith Street	**NA**	-	-
	SS170	Musgrave Road	7.35	7.77	0.42
	SS160	Norbury Street	6.97	7.40	0.43
	SS150	Dollis Street	5.91	6.26	0.35
	SS140	Colvin Street	5.26	5.43	0.17
	SS130	Tramore Street	4.99	5.31	0.32
	SS120	Marshall Road	4.82	4.96	0.14
	SS110	Ipswich Road	4.55	4.68	0.13
	SS100	Franklin Street	3.13	3.62	0.49
Archerfield Channel	SS400	Marshall Road	**NA**	-	-
	SS410	Rodwell Street	**NA**	-	-
North Branch	SS300	Railway Bridge	7.73	8.84	1.11
	SS310	Burgess Street	**---**	-	-
	SS320	Orange Grove Road	15.66	16.59	0.93

Key: **NA = No data available**
OT = gauge overtopped – no level recorded
DEST = gauge destroyed – no level recorded
^ Level from nearby debris height
~ Gauge destroyed and level from debris
*** Level over top of inner gauge therefore level from debris**
--- Level did not reach bottom of inner gauge

4.4 Calibration and verification summary

A reasonable calibration was achieved for the Stable Swamp Creek MIKE FLOOD model. The following comments should be noted:

- Model was reviewed by DHI with some minor recommendations which were adopted and calibration re-run. The peer review report can be found in APPENDIX D.

- Modelled results for the MHG between Riawena Road and Boundary Road are consistently above recorded levels.

- Results consistently match well through the centre of the model from downstream of Riawena Road at Coopers Plains to the confluence of Oxley Creek.

- Model results are often higher in the upper reaches of the model than recorded results. This may be considered acceptable on the basis that it is conservative.

5.0 Design Event Analysis

5.1 Overview

Design event modelling was undertaken using the calibrated RAFTS and MIKE FLOOD models.

Flood levels and discharges for design events were estimated by undertaking a flood frequency analysis to determine flows in the Stable Swamp Creek for a range of reoccurrence events. The discharges determined from the flood frequency analysis were then compared to the discharges calculated using duration independent storms synthesised as proposed in Morris (1996). Factors were derived for the synthetic storms to provide the best possible agreement between the peak flows predicted by the synthetic storms and the peak flows predicted by the flood frequency analysis.

The factors were then applied to the duration independent storms (DIS) in the RAFTS model to determine inflow hydrographs for all design events at various locations throughout the catchment. The MIKE FLOOD hydraulic model was then used to determine flood levels throughout the catchment.

A flood frequency analysis of RAFTS model flows based on Brisbane CBD rainfall was undertaken in 2000. The analysis assumed historically recorded Brisbane CBD rainfall was representative of rainfall in the Stable Swamp Creek catchment as a whole. This frequency analysis was considered suitable for the purposes of this study on the basis that the inclusion of an additional seven years of recorded data was unlikely to change the outcomes of the flood frequency analysis significantly. The following sections detail the flood frequency analysis and derivation of design rainfall events using DIS storms undertaken in June 2000.

5.2 Flood Frequency Analysis

5.2.1 Historical Rainfall Data

The most severe recorded rainfall events from each year between 1911 and 1998 (inclusive), for a range of standard durations were selected. The rainfall recorded at gauges located within the Brisbane Central Business District (CBD) was used for analysis rather than data collected within the Stable Swamp Creek catchment due to the long and continuous record available via the CBD gauges. Further, given the relatively close proximity of the Stable Swamp Creek catchment to the Brisbane CBD, it was considered that the use of the CBD data was acceptable.

A range of standard duration storms, from 30 minutes to 24 hours, was applied to the catchment to ensure that the peak discharge was calculated at all points along the creek, regardless of the critical time of concentration of each point.

The standard duration storms used in the analysis were:

- 30 minutes
- 1 hour
- 1.5 hours
- 2 hours
- 3 hours
- 4 hours
- 6 hours
- 12 hours
- 24 hours

The longer standard duration rainfall events i.e. between 3 and 24 hours, were applied to the catchment to ensure that the rainfall events critical to the detention basin in the North Branch of the catchment (i.e. Beryl Roberts Park) were considered.

Discharges in Stable Swamp Creek were calculated for the nine standard duration rainfall events for each of the 88 years of rainfall data. Four key representative locations in the catchment were then selected to perform the flood frequency analysis:

- Boundary Road
- Gauging Station near intersection of Musgrave Road and Interstate Railway.
- Ipswich Motorway
- Orange Grove Road (North Branch)

5.2.2 Methodology

The 88 annual peak discharges at each of the six locations listed above were ranked from highest to lowest.

The annual exceedance probability (AEP) of each calculated discharged was determined using the Weibull formula (Institution of Engineers Australia 1987, p203):

$$AEP = \frac{r}{N+1}$$

Where r = rank of discharge
N = number of annual peak discharges

The peak annual discharge series at each location (on a logarithmic scale) was plotted against the average recurrence interval of the storms (on a normal distribution scale). A line of best fit was drawn through these annual peak discharge series to determine the anticipated design discharge at each location, for return periods ranging from 2 years to 100 years.

5.2.3 Application of Duration Independent Storm Pattern

The duration independent synthetic storm for a given average recurrence interval contains the highest intensity bursts of rainfall for all durations. Therefore, one rainfall event can be applied to the entire catchment to determine the peak discharge at all points along a waterway, rather than the large number of rainfall temporal patterns representing the range of standard storm durations presented in Australian Rainfall and Runoff.

Therefore, factored synthetic storms were applied to the Stable Swamp Creek catchment to achieve calculated discharges consistent with those determined from the flood frequency analysis.

5.2.4 Derivation of Flood Frequency Factors

The peak flow rates determined from the flood frequency analysis and unfactored duration independent synthetic storms are presented in Table 5.1 and Table 5.2.

Based on the peak flows predicted by the flood frequency analysis, factors were applied to the duration independent synthetic storms to provide flow rates which agreed as closely as possible with the results of the frequency analysis. See figures 5.1-5.4 for the flood frequency plots of Boundary Road, Gauging Station, Ipswich Motorway and Orange Grove Road respectively. The factors derived for the synthetic storms are shown in Table 5.3.

Table 5.1: Peak Discharges Resulting from Statistical Analysis

AEP (%)	Statistically Estimated Peak Discharge (m^3/s)			
	Boundary Road	Gauging Station	Ipswich Motorway	Orange Grove Road
50	77.0	104.0	100.0	14.0
20	110.0	152.0	150.0	18.0
10	134.0	185.0	190.0	27.0
5	156.0	220.0	225.0	36.0
2	186.0	265.0	282.0	51.0
1	215.0	315.0	325.0	65.0

Table 5.2: Peak Discharges Resulting from Unfactored Synthetic Storms

AEP (%)	Unfactored Synthetic Storm Peak Discharge (m^3/s)			
	Boundary Road	Gauging Station	Ipswich Motorway	Orange Grove Road
50	99.4	138.4	136.6	16.4
20	133.5	176.4	186.5	38
10	159.6	216.8	225.8	51
5	190.1	272.7	276.3	61.7
2	239.4	341.3	350.9	88.8
1	277.8	408.1	418.9	107.1

Table 5.3: Duration Independent Storm Maximum Discharge Reduction Factors

ARI	AEP	DIS Factor
100 Year	1%	0.9
50 Year	2%	0.88
20 Year	5%	0.86
10 Year	10%	0.86
5 Year	20%	0.84
2 Year	50%	0.81

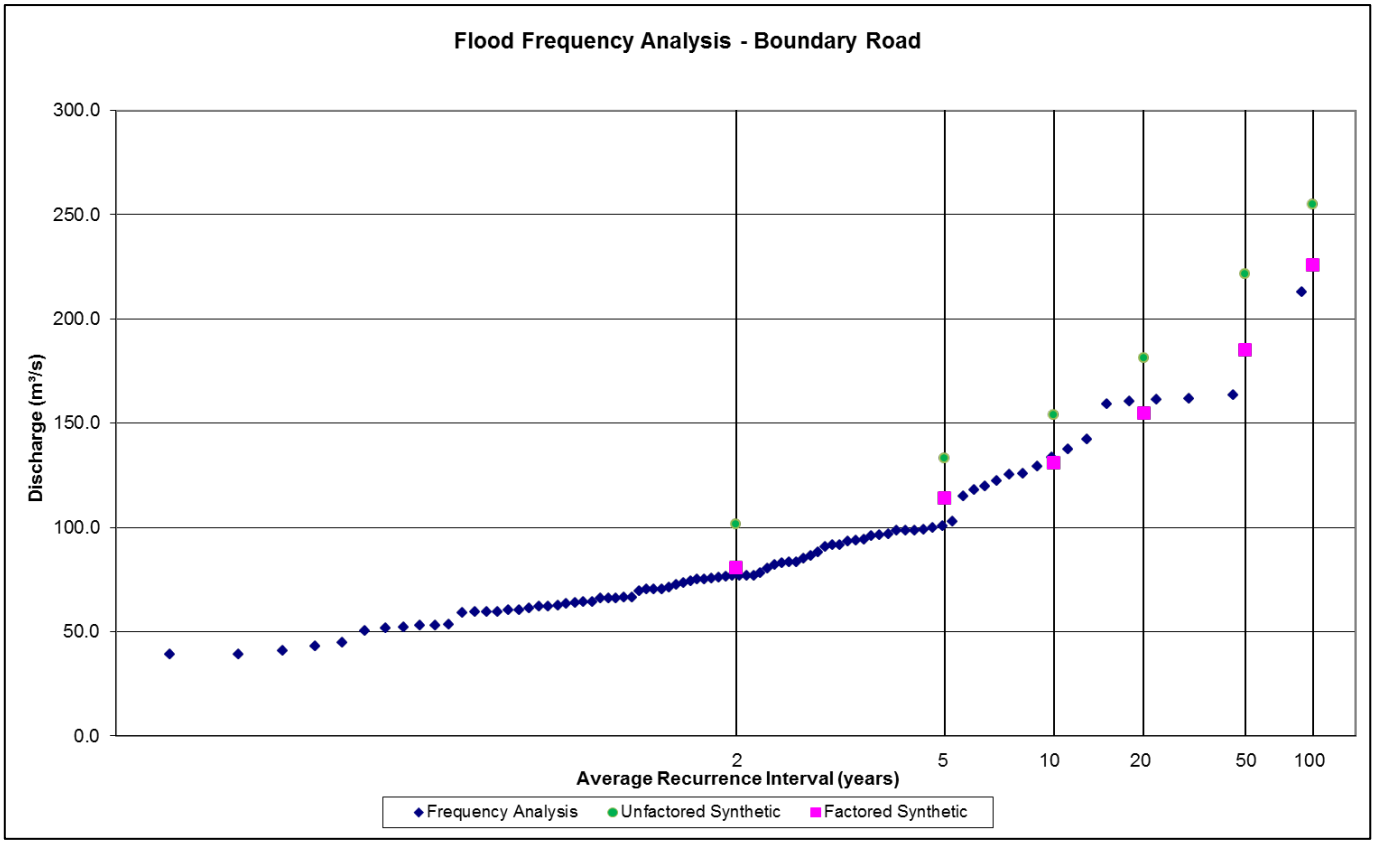


Figure 5.1: Boundary Road Flood Frequency Analysis results

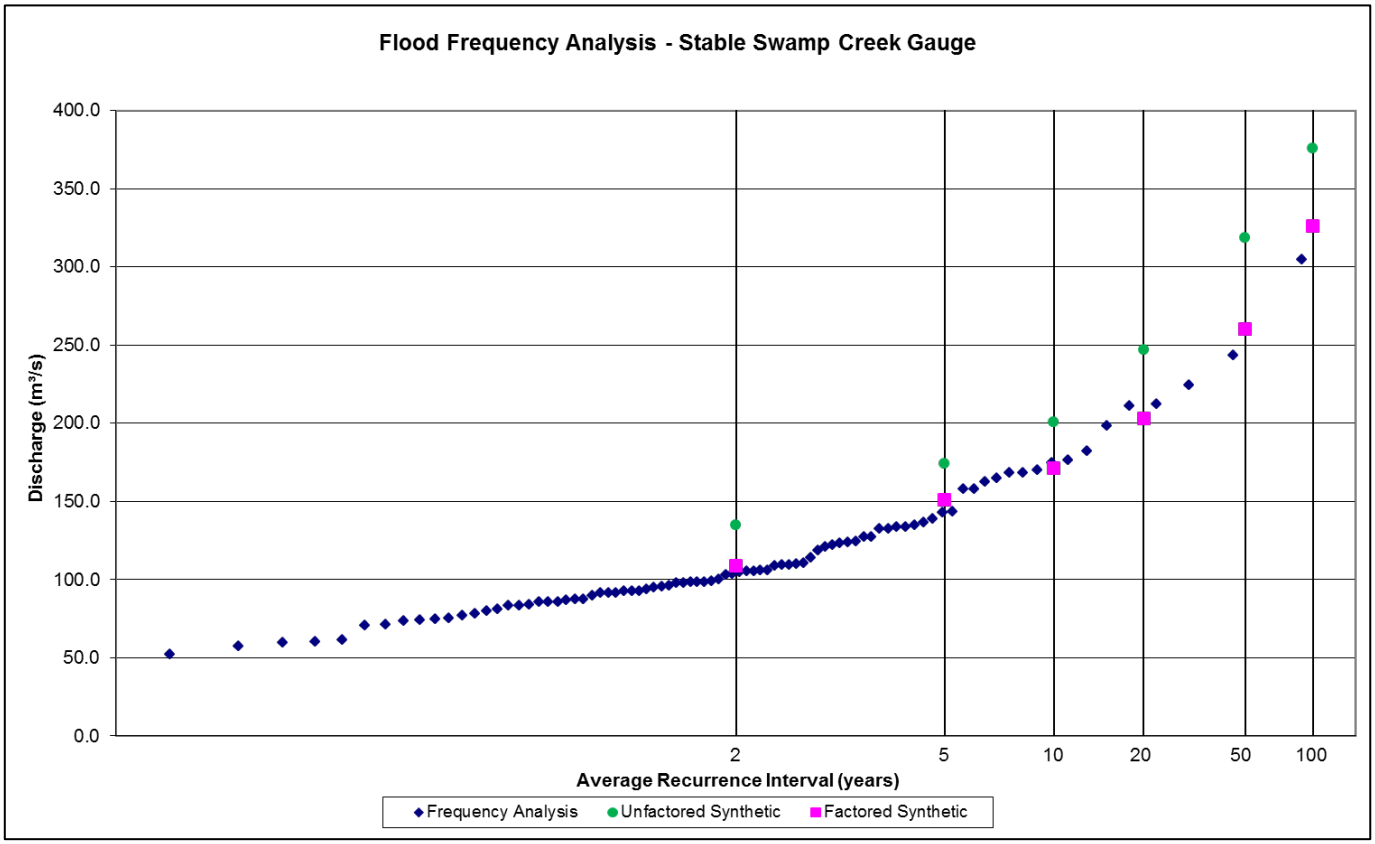


Figure 5.2: Stable Swamp Gauge Station Flood Frequency Analysis results

Data Source: Appendix D: BCC in draft, *Stable Swamp Creek Catchment Waterway Management Plan, Catchment Flooding Report*, prepared by Cardno MBK for BCC, Final Draft June 2000

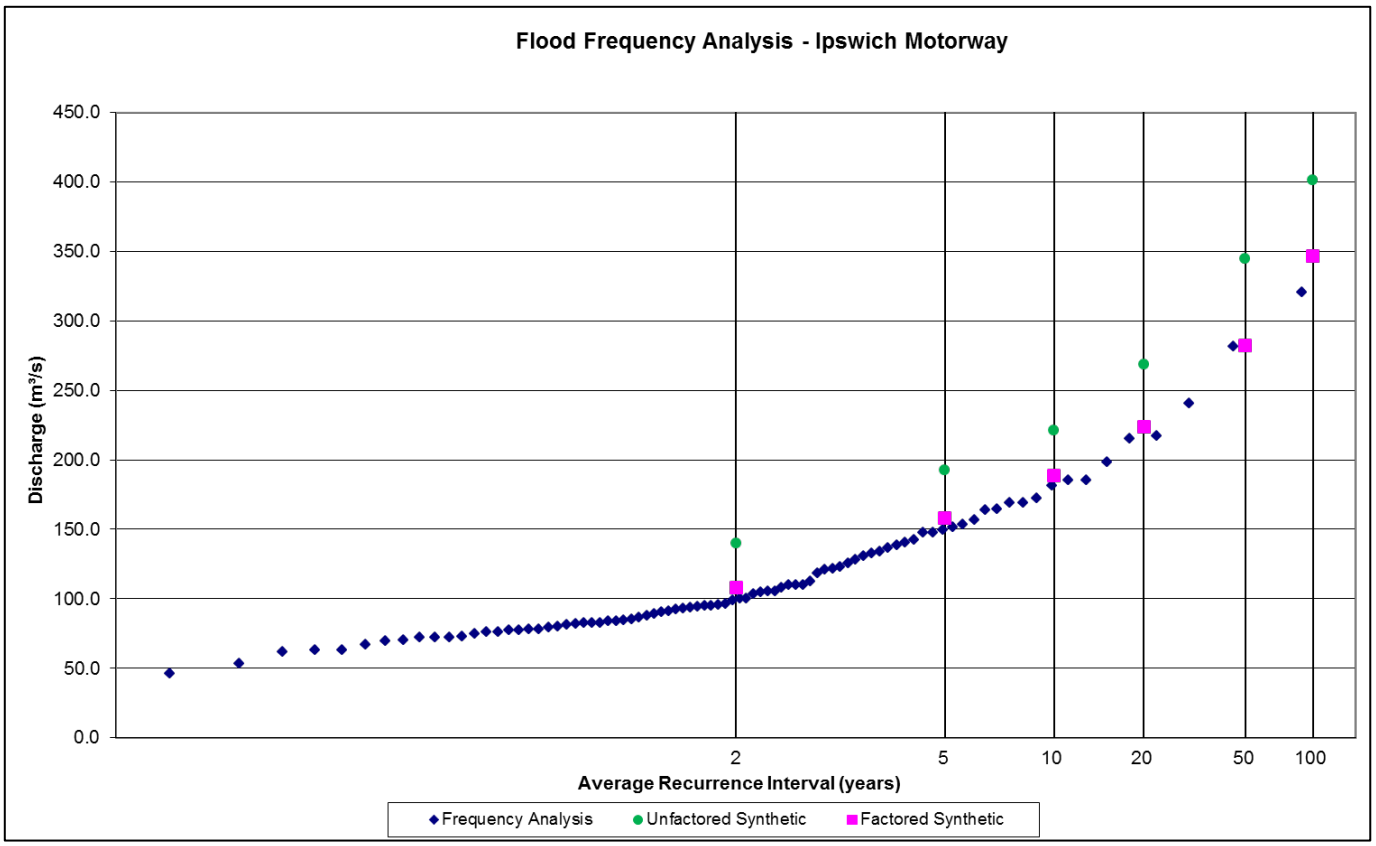


Figure 5.3: Ipswich Motorway Flood Frequency Analysis results

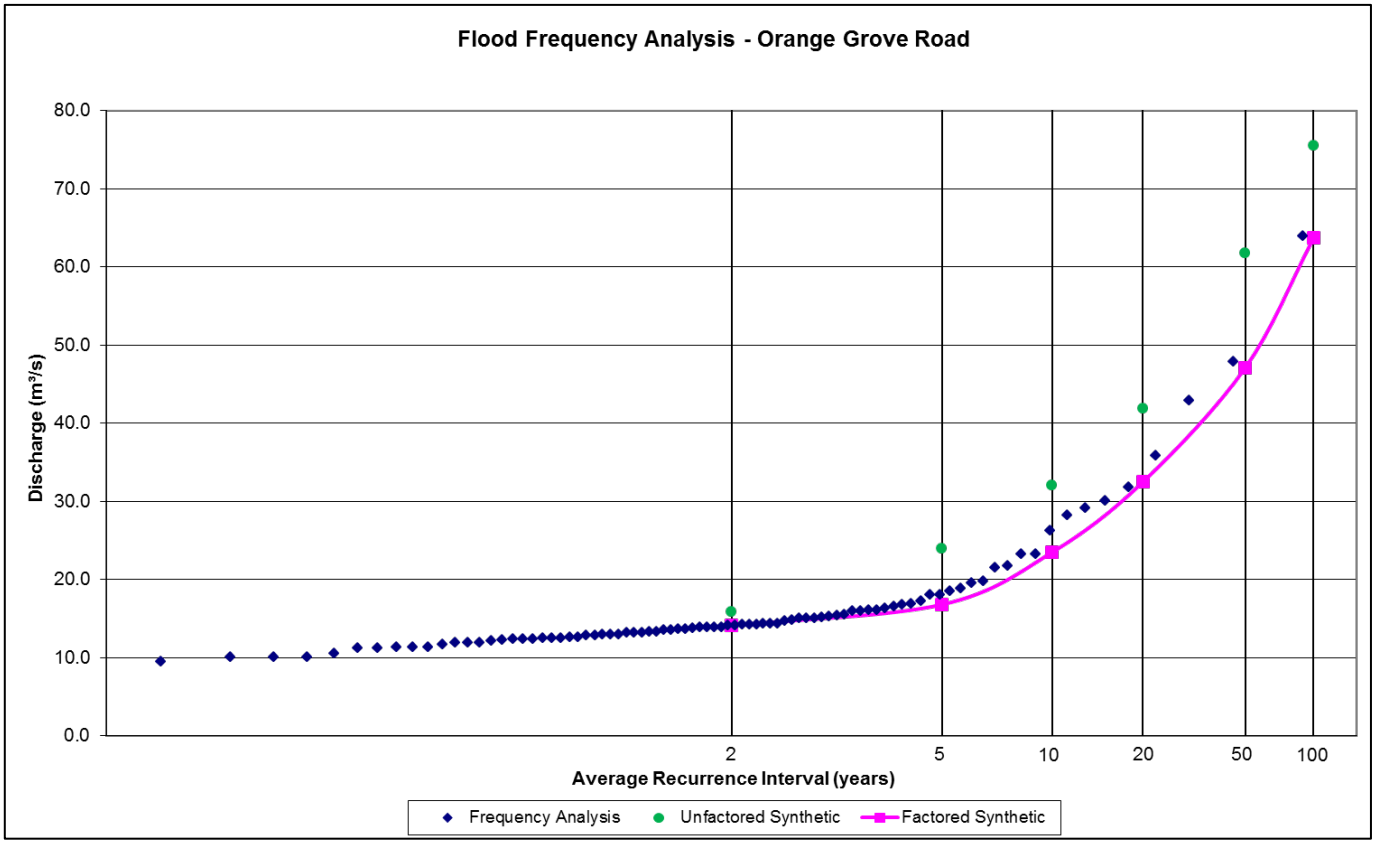


Figure 5.4: Orange Grove Road Flood Frequency Analysis results

Data Source: Appendix D: BCC in draft, *Stable Swamp Creek Catchment Waterway Management Plan, Catchment Flooding Report*, prepared by Cardno MBK for BCC, Final Draft June 2000

5.3 Design Hydrology

The RAFTS model used for calibration represents the catchment in its existing state of development. To consider future development, the impervious areas associated with certain sub-catchments were modified to represent changes in land use under ultimate catchment development. These were the only modifications made to the calibrated hydrologic model.

The factored synthetic storms as described in Section 5.2.3 were used for the design event modelling of Stable Swamp Creek. Design events with AEP of 50%, 20%, 10%, 5%, 2%, and 1% were modelled in RAFTS assuming ultimate catchment development. The hydrograph outputs from the factored RAFTS simulations were used as input into the hydraulic model.

Table 5.4 summarises future land uses for each sub-catchment based on the City Plan (2000)
Table 5.5 details the calculated impervious and pervious areas.

5.4 Design Hydraulics

The calibrated Stable Swamp Creek MIKE FLOOD model described in Section 3.0 was updated to represent conditions in the Stable Swamp Creek catchment as at August 2013. Waterway crossings and creek mitigation works constructed after the Stable Swamp Creek survey were included. Additionally, cross sections and model bathymetry were altered to:

- limit the effective flow widths to the Waterway Corridors limits as defined in Section 5.4.1 below, and
- represent minimum (vegetated) riparian corridor widths.

RAFTS design event flows based on the factored synthetic events were applied to the MIKE FLOOD model. All inflow point locations are identical to those in the calibration model.

A tailwater boundary equivalent to Mean High Water Springs (MHWS) at the Corinda gauge (1.22m AHD) was adopted for all design event modelling up to the 1% AEP event.

The ultimate development scenario was considered for the 50%, 20%, 10%, 5%, 2%, and 1% AEP design events.

5.4.1 Design Event Scenarios

The hydraulic model was used to determine flood levels and flood inundation extents for the 50%, 20%, 10%, 5%, 2%, and 1% AEP events.

The following scenarios were simulated in the hydrologic and hydraulic models:

- Scenario 1: Existing Waterway Conditions
- Scenario 2: Minimum Riparian Corridor (MRC)
- Scenario 3: Filling to the Waterway Corridor (WC) + Minimum Riparian Corridor (MRC)

Table 5.4: Summary of Land Uses for RAFTS Sub-catchments

Catchment ID	Ultimate Land Use Breakdown		
	% Open space	% Urban	% Commercial-Industrial
A1	25	75	0
B2	11	89	0
C3	15	85	0
D4	15	85	0
E5	25	75	0
F6	32	68	0
G7	6	94	0
H8	6	94	0
I9	66	34	0
J10	25	75	0
K12	62	38	0
L13	36	64	0
M14	6	94	0
N15	19	81	0
O16	6	94	0
P17	6	94	0
Q18	6	94	0
R19	0	100	0
S20	0	100	0
T21	0	82	18
Woff	47	53	0
Feltwell	36	64	0
Stones	55	45	0
Keats	36	64	0
Jackson	10	75	15
Dyson	32	68	0
Gaddes	47	53	0
Beenl W	47	53	0
Gay	0	0	100
Wanless	-	-	-

Catchment ID	Ultimate Land Use Breakdown		
	% Open space	% Urban	% Commercial-Industrial
Rail 1	32	38	30
Rail 2	7	20	73
Railyard	7	15	78
Selhurst	15	30	55
Boundary	10	0	90
Edith	9	60	31
Conf U/S	50	0	50
Basin	-	-	-
Musgrave	0	100	0
Orange	0	100	0
Debra	3	25	72
Elma	49	46	5
Perrin	25	45	30
Deal	50	0	50
Gauge	10	0	90
Norbury	6	40	54
Riawena	0	0	100
Beaudesert	5	40	55
Marshal	48	27	25
Ipswich	21	10	69
Mouth	40	0	60
Beryl A	55	45	0
Beryl B	9	91	0
Beryl C	28	72	0
Beryl E	25	75	0
Beryl F	32	68	0
AA	29	10	61
BA	31	50	64
CA	35	10	55
DA	77	0	23

Catchment ID	Ultimate Land Use Breakdown		
	% Open space	% Urban	% Commercial-Industrial
EA	43	57	0
FA	21	30	49
GA	25	75	0
HA	-13	30	83
IA	32	30	38
ABAS1	-	-	-
JA	7	10	83
ABAS2	-	-	-
KA	10	55	35
LA	38	15	47
MA	27	43	30
NA	36	20	44
OA	0	0	100
PA	0	0	100
QA	0	0	100
RA	11	0	89
SA	5	0	95
TA	78	0	22
UA	77	0	23
XA	0	0	100
YA	22	0	78
VA	0	40	65
WA	5	70	25
ZA	0	0	100
AA1	0	80	20
BA1	8	60	32
CA1	8	60	32
DA1	8	60	32
A1	0	0	100

Table 5.5: Summary of Impervious areas for RAFTS Sub-catchments

Catchment Number	Ultimate Catchment Development	
	% Pervious	% Impervious
A1	60	40
B2	53	47
C3	55	45
D4	55	45
E5	60	40
F6	64	36
G7	50	50
H8	50	50
I9	82	18
J10	60	40
K12	80	20
L13	66	34
M14	50	50
N15	57	43
O16	50	50
P17	50	50
Q18	50	50
R19	40	60
S20	40	60
T21	40	60
Woff	72	28
Feltwell	66	34
Stones	76	24
Keats	66	34
Jackson	47	53
Dyson	64	36
Gaddes	72	28
Beenl W	72	28
Gay	10	90
Wanless	0	100

Catchment Number	Ultimate Catchment Development	
	% Pervious	% Impervious
Rail 1	53	47
Rail 2	24	76
Railyard	22	78
Selhurst	35	65
Boundary	19	81
Edith	40	60
Conf U/S	55	45
Basin	0	100
Musgrave	60	40
Orange Grove	60	40
Debra	22	78
Elma	71	29
Perrin	49	51
Deal	55	45
Gauge	19	81
Norbury	30	70
Riawena	10	90
Beaudesert	30	70
Marshal	63	37
Ipswich	33	67
Mouth	46	54
Beryl A	76	24
Beryl B	52	48
Beryl C	62	38
Beryl E	60	40
Beryl F	64	36
AA	40	60
BA	40	60
CA	45	55
DA	80	20

Catchment Number	Ultimate Catchment Development	
	% Pervious	% Impervious
EA	70	30
FA	40	60
GA	60	40
HA	10	90
IA	0	100
ABAS1	0	100
JA	20	80
ABAS2	0	100
KA	40	60
LA	50	50
MA	50	50
NA	50	50
OA	10	90
PA	10	90
QA	10	90
RA	20	80
SA	15	85
TA	80	20
UA	80	20
XA	10	90
YA	30	70
VA	20	80
WA	40	60
ZA	10	90
AA1	40	60
BA1	40	60
CA1	40	60
DA1	40	60
EA1	10	90

5.4.2 Modeling of Waterway Corridors

Waterway corridors are an integral part of the Council's Planning Scheme for Brisbane. City Plan describes waterway corridors as:

"The corridors along a waterway indicated on the Planning Scheme maps. These corridors are defined by:

- *A flood regulation line (FRL)*
- *A local plan environmental corridor or a waterway corridor (WC)*
- *A waterway corridor defined in a stormwater management plan*
- *A waterway corridor defined in a waterway management plan.*

If more than one of these is available for a particular waterway, the largest applies.

If there is no FRL described in local plan, SMP or WMP, a 30 metre distance measured on each side from the centre line of the waterway would apply" (BCC 2000, vol. 1, ch. 3, p. 75)

These corridors identify zones where water flow and flood storage, water quality, ecology and open space, and recreational and amenity values are to be preserved and/or managed in an ecologically sustainable manner.

Waterway corridors are represented in the hydraulic model by the exclusion of the conveyance and/or water storage characteristics of the watercourse beyond the limits of the waterway corridor location. Essentially, this practice assumes that filling and development will ultimately occur beyond the boundary of the waterway corridors.

The waterway corridors have been included in the hydraulic models for the Ultimate Scenario flood events. Traditionally, the inclusion of waterway corridors within the hydraulic model was simulated by 'walling off' the zone outside of the waterway corridor, as shown in Figure 5.5.

Note: Best practise suggests that an appropriate Manning's roughness value be applied to these 'walls' (i.e. not assumed to be frictionless) to ensure correct calculation of wetted perimeter at each cross-section.

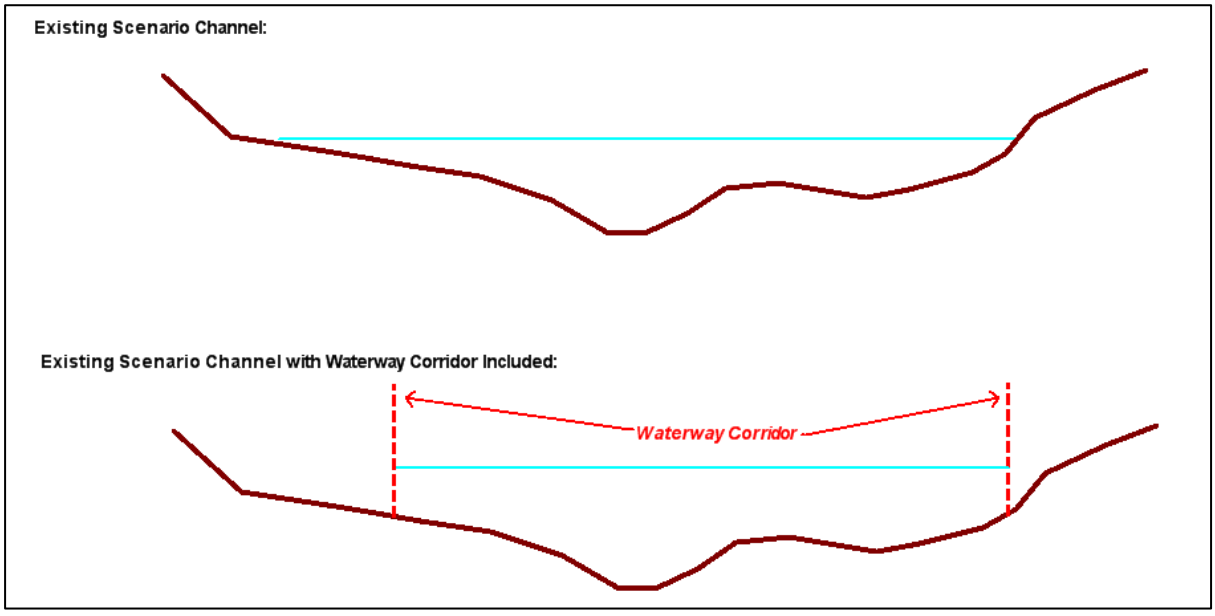


Figure 5.5: Implementation of Waterway Corridor using 'Walling Off' Method

This methodology has proved satisfactory when simulating 50% AEP to 1% AEP design flood events. However, when simulating larger flows such as 0.5% AEP and 0.2% AEP design events, prior experience has shown that the Waterway Corridor 'walls' resulted in conservatively high water levels and stability issues in some hydraulic modelling software packages.

For this flood study, the following alternative method for simulating the presence of a Waterway Corridor was adopted:

1. Implement Waterway Corridor within the hydraulic model using the 'walling off' methodology and include Minimum Riparian Corridor assumptions.
2. Simulate the Ultimate Case 1% AEP, Duration Independent Storm flood event.
3. Take the resulting Ultimate Case 1% AEP, Duration Independent Storm flood levels and add 300mm development freeboard.
4. In areas outside the Waterway Corridor raise the terrain model to this height until natural surface level is intersected, as shown in Figure 5.6.

This alternative method of simulating Waterway Corridors allows for more accurate and stable modelling of larger flow events (I.e. 0.5% and 0.2% AEP events), in particular when utilising two-dimensional hydraulic modelling packages. Extreme event modelling is discussed further in Section 6.0.

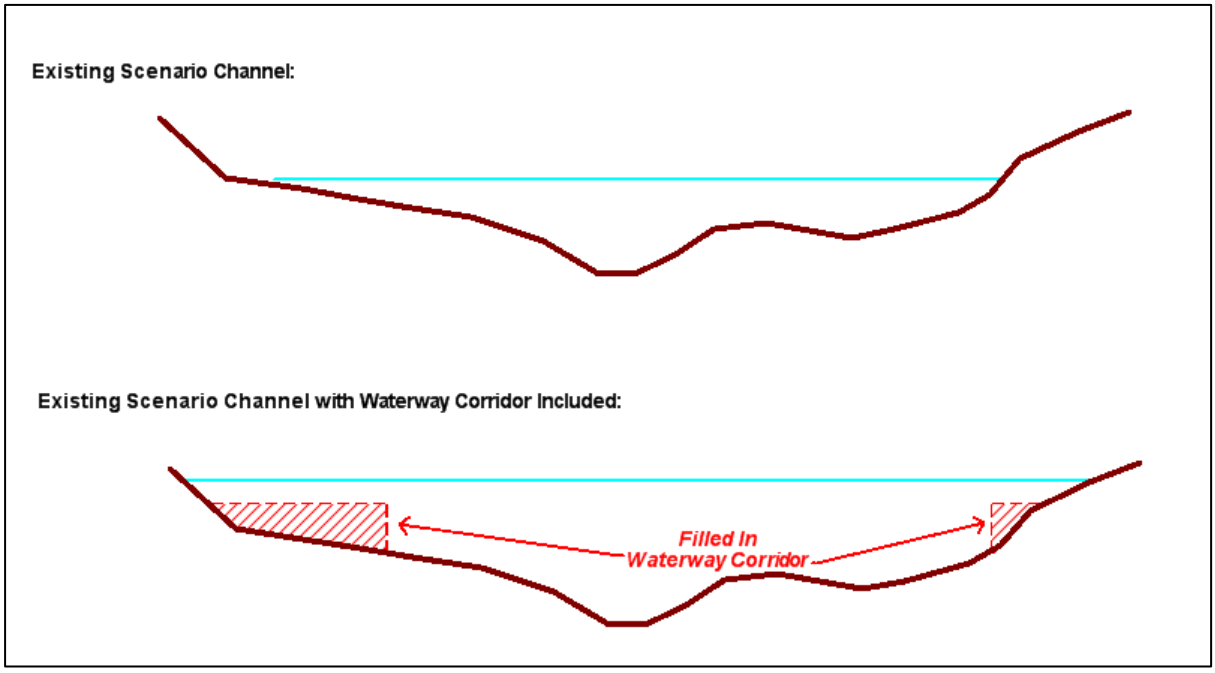


Figure 5.6: Implementation of Waterway Corridor using 'Filling' Method

5.4.3 Minimum Riparian (Vegetated) Corridor

Vegetation beside a waterway is called riparian vegetation. It is a key contributor to waterway health, acting as a buffer between the waterway and adjacent lands. A well vegetated riparian zone can improve water quality by filtering overland flow and reducing erosion along creek banks. Shady trees protect vulnerable organisms from extremes of temperature; root systems and woody debris become habitat for fauna; and organic matter sustains aquatic food webs. Vegetation also provides habitat and forage for fauna and adds to a waterway's recreational value.

This study calculates anticipated flood levels assuming a minimum vegetated riparian corridor width along the entire creek system. It does not in any way imply that Council is planning to establish a

minimum riparian vegetated corridor width in the creek catchment. The minimum vegetated riparian corridor is modelled solely in recognition that at some unspecified time in the future, revegetation may occur, either through natural regeneration or as a result of planting programs. The results of this modelling are intended to ensure that the habitable floor levels of new developments within the floodplain take account of future revegetation.

Minimum vegetated riparian corridors have been applied to the main channels modelled in the hydraulic model. The minimum vegetated riparian corridors were simulated as dense vegetation (i.e. Manning's n value of 0.15) extending from the top of the low flow channel for a minimum width of 15 m on both sides of the creek. Where there is no obvious low flow channel, the vegetation was applied at the anticipated 50% AEP flood level on the basis that this size event is generally contained within the bed and banks of the low flow channel.

The riparian corridor with a Manning's n value of 0.15 was added to applicable creek cross-sections and MIKE21 grid cells in the MIKE FLOOD model. Where the existing Manning's 'n' value in that region is higher than 0.15, the existing value has not been altered.

The specific Minimum Riparian Corridor (MRC) assumptions for each branch of Stable Swamp Creek are outlined below:

- Archerfield Channel:
  Constrained by buildings, Archerfield Channel is largely a trapezoidal concrete lined channel therefore it is understood there will be no future vegetation in the Archerfield Channel floodway and a MRC corridor was not applied.

- North Branch:
  As a part of flood mitigation works the lower reaches of North Branch, below Orange Grove Road comprises a constructed trapezoidal channel. No revegetation was allowed in the original design of this channel. Therefore it is understood that no future vegetation is planned for this reach and a MRC corridor was not applied. For the remainder of the North Branch above Orange Grove Road and below beryl Roberts Basin a MRC has been applied.

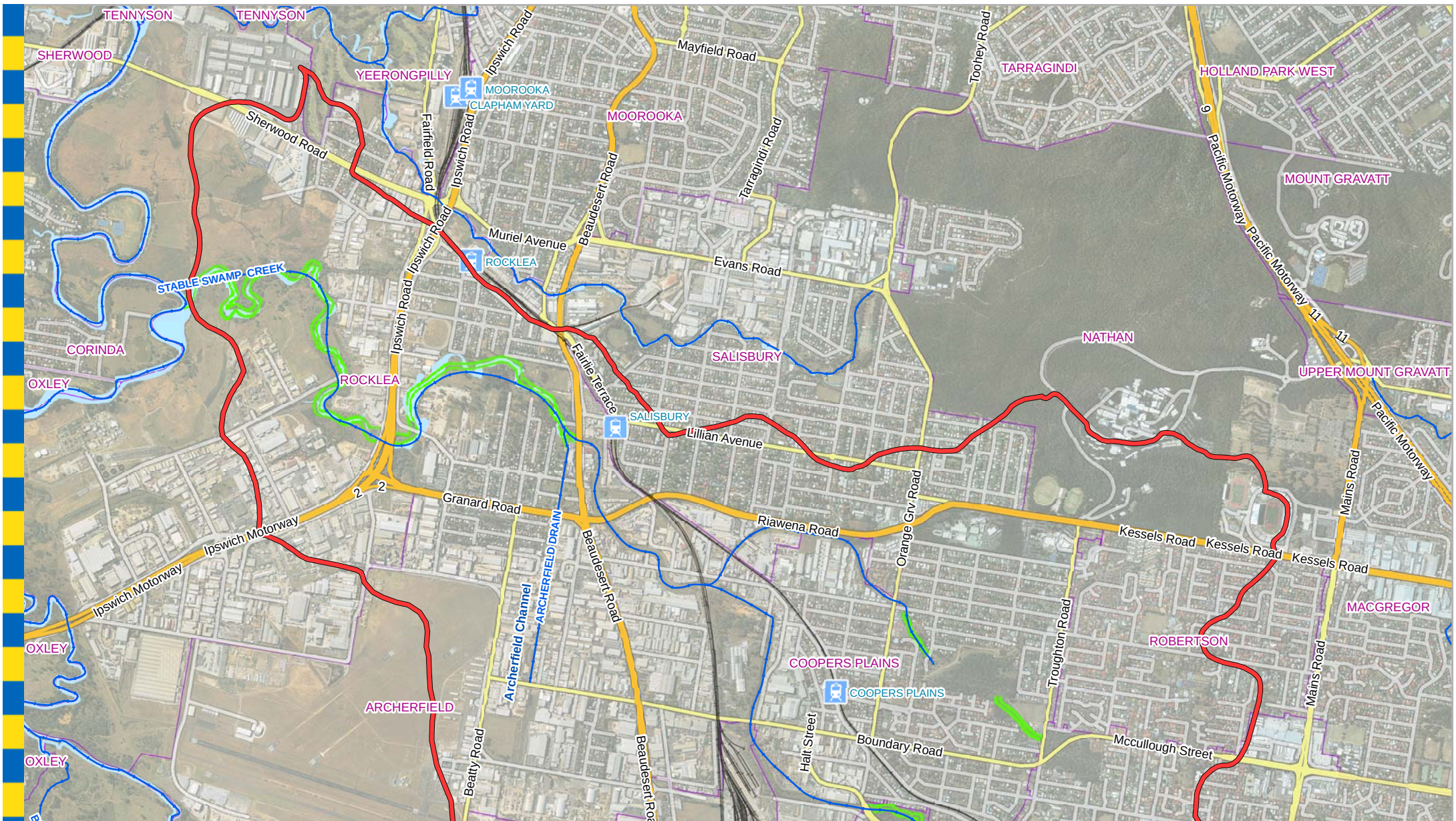
- Shelleys Creek Branch:
  Revegetation is considered to be possible for the entire length of the Shelleys Creek branch and therefore a 15m wide MRC corridor has been applied.

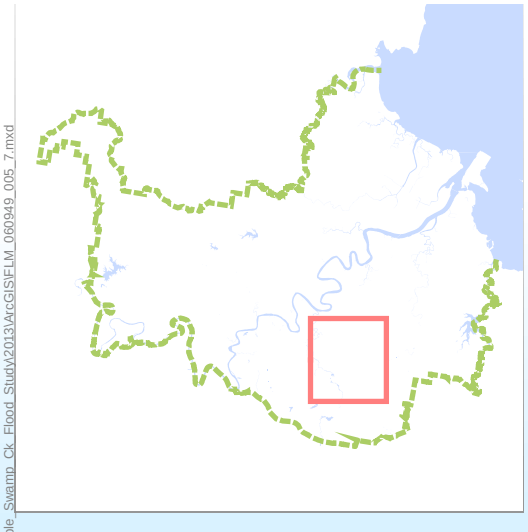
- Stable Swamp Main Branch:
  The upstream reaches of Stable Swamp, immediately downstream from Beenleigh Road crossing in Sunnybank Hills to the Beenleigh Road crossing at Coopers Plains is considered to have potential for further revegetation and therefore the MRC corridor has been applied.

- From downstream of Beenleigh Road to upstream of Boundary Road in Cooper Plains, a constructed channel with designed revegetation levels of up to a Manning's 'n' value of 0.08.

- From downstream of Boundary Road in Coopers Plains to the Beaudesert Road crossing in Rocklea, mitigation works were completed in conjunction with those of North Branch and to a similar design. Therefore the modelling undertaken has assumed no revegetation (MRC corridor) in this reach.

For the remainder of Stable Swamp Creek, extending from Beaudesert Road crossing to the confluence with Oxley Creek, Manning's values of n = 0.15 have been adopted in the MRC corridor to account for possible future vegetation. Figure 5.7 shows applied MRC areas as described above.





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Project Number : 060949

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Legend

- AMTD Line (Adopted Middle Thread Distance)
- Stable Swamp Creek Catchment
- Railway Station
- Railway Line
- Freeways/Highways
- Major Roads
- Streets
- Modelled Minimum Riparian Corridors (MRC)
- Park Boundaries
- Suburb Boundaries

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City Projects Office
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060949 Stable Swamp Creek Flood Study

Modelled Minimum Riparian Corridor Locations

Figure 5.7

FLM - 060949 - 005_7

5.5 Design Event Results

5.5.1 Design Levels

Anticipated flood levels were calculated for the 50%, 20%, 10%, 5%, 2%, and 1% AEP Scenario 3 – ultimate case events assuming the presence of:

- future development as outlined in City Plan (2000);
- waterway corridors (as described in Section 5.4.1);
- minimum vegetated riparian corridor (as described in Section 5.4.2); and
- tailwater level equivalent to MHWS.

Anticipated peak modelled flood levels calculated for the Scenario 3 (Ultimate catchment development) simulations from the MIKE FLOOD model are summarised in tables in APPENDIX E.

5.5.2 Hydraulic Structure Data

APPENDIX C of this report contains Hydraulic Structure Reference Sheets. These data sheets incorporate structure dimensions, flood immunity, modelled flood levels, velocities and associated flow results for all Scenario 1 (Existing development conditions) MIKE FLOOD design simulations.

5.5.3 Flood Mapping

5.5.3.1 Scenario 1 – Existing Case

Flood Extent mapping of the 50%, 20%, 10%, 5%, 2%, and 1% AEP Scenario 1 – Existing Case events surfaces can be found in APPENDIX I.

5.5.3.2 Scenario 3 – Ultimate Case

Ultimate scenario planning level surfaces were required to be generated and mapped. Within the flood modelling context, the ultimate scenario involves modifying the flood model topography to represent a fully developed floodplain in accordance with CityPlan and in most instances applying an allowance for a riparian corridor. This process generally results in design flood levels being increased. Council requires these increased levels to then be mapped against the current floodplain topography thus providing a flood extent that is conservative, extends beyond the “existing” flood extent and ‘flags’ the additional properties that could potentially be at flood risk in the future and should have development controls (planning levels) applied.

With the move to ‘two-dimensional’ flood models, the production of flood levels, extents and depth-velocity products is inherent in simulating a model, i.e. a flood map is a direct output from a model simulation removing the requirement to apply a separate process. For the “existing” case simulations, the model is run and the direct output is able to be mapped or referenced in a GIS environment. In order to simulate the “ultimate” scenario, the model topography must be modified to represent filling associated with development. This in turn affects the resulting flood mapping with the flood extent limited to the edge of the filled floodplain. Post processing of the model output is required to represent the modelled flood levels against the current floodplain conditions.

The WaterRide stretching tool was selected for the purpose of processing the “ultimate” case results and producing the planning flood levels and surfaces. The stretching calculation starts at the north-easterly corner where it identifies each “dry cell” which is located immediately adjacent to the “wet cells”. It then calculates a water level for the dry cell by interpolating the neighbouring flood levels. If the assigned flood level is higher than the ground level for that cell, then the cell will be identified as wet. If this condition is not met (ie water level is less than ground level) then this cell will be identified as dry. This is an iterative process and continues counter clockwise until there is no wet cell left in a single revolution. The better control the process a tolerance is adopted in the determination of a wet cell, being a water depth of 300mm.

From experience to date, it is known that the WaterRide stretching tool alone cannot provide robust surface and level information in all conditions. Therefore, a thorough review of each surface produced by the tool was undertaken and manual intervention applied to the process to ensure suitable outcomes. To help with the initial review process, a comparison of the stretched extent with calculated flood extents including existing scenarios and larger events was undertaken. To modify the stretched surface, break lines were used to limit the expansion of the surface and to stop the “leakage” (upstream higher water level projecting to the downstream lower area) of the surface in problematic areas. Applying break lines at the right place enhances the produced flood levels and surfaces and minimises the anomalies across the flood extent.

In general, the modified areas are mostly observed around tight bends, at structures with high head losses, steep areas where the water can leak, stream junctions where cross-flow is likely, parallel channels, secondary paths and breakout areas. Specific applications and implications of the break lines for this flood study are outlined in Table G.1 and shown in Figure G.1 in APPENDIX G.

Despite the review of the stretched surfaces and the inclusion of break lines to manipulate the stretching process, the process and outputs are still subject to limitations as follows:

- The application of break lines will result in significant steps in the generated surface in some locations
- The application of break lines is highly subjective in some locations
- The application of break lines will not necessarily be consistent across all design events (i.e. they will change in number and location depending on the magnitude of the design event considered)
- The stretching process may not be readily repeatable (i.e. the output has not come directly from a model simulation and if model outputs change, it cannot be guaranteed that the process will not need further refinement to produce acceptable results)

Flood level contour and depth mapping of flood surfaces using the above methodology can be found in APPENDIX J for the 50%, 20%, 10%, 5%, 2%, and 1% AEP Scenario 3 – Ultimate Case events.

6.0 Rare and Extreme Event Analysis

6.1 Overview

This section details the derivation and results of the following rare to extreme design events:

- 0.5% AEP event
- 0.2% AEP event
- 0.05% AEP event, and
- Probable Maximum Precipitation (PMP)

Table 6.1 indicates the modelled scenarios considered in the extreme event modelling, noting that all extreme events were modelled using ultimate hydrological conditions. These scenarios have been previously described in Section 5.4.

Table 6.1: Modelled Extreme Event Scenarios

Event	Scenario 1	Scenario 2	Scenario 3
0.5% AEP	✓	×	✓
0.2% AEP	✓	×	✓
0.05% AEP	✓	×	×
PMP	✓	×	×

6.2 Hydrologic Modeling

6.2.1 0.5% and 0.2% AEP Events

For the 200 and 500 Year ARI events, the CRC-Forge rainfall depth data was derived for the Stable Swamp Creek catchment. To avoid running multiple storms for different storm durations, the Duration Independent Storm (DIS) method was used with a factor of 1.0 to capture the worst possible rainfall regime.

6.2.2 0.05% AEP Event

For the 0.05% AEP event, the CRC-Forge methodology was also adopted. However, as the rainfall data using this method is catchment independent, it has been extracted based on an average catchment size of 60 km^2 located at the north-west part of Brisbane. Rainfall depth varies by less than 10% across the area therefore for an extreme event this was considered an acceptable approach. To avoid running multiple storms for different storm durations, the Duration Independent Storm (DIS) method was used with a factor of 1.0 to capture the worst possible rainfall regime.

6.2.3 PMP Event

For the PMP scenario, the rainfall depth was derived a 6 hour temporal pattern from the Generalised Short Duration Method (GSDM). For the tropical and subtropical coastal areas it is recommended that this method be used to estimate the PMP over areas up to 520 km^2 and for durations up to 6 hours. For the purpose of PMP estimation for Brisbane creeks and to be consistent across the Brisbane area, an average catchment size of 60 km2 and moisture adjustment factor of 0.85 was adopted for the derivation of the hyetograph input into RAFTS.

6.3 Hydraulic Modeling

6.3.1 Tailwater conditions

For all extreme event scenarios the Tailwater condition was set to a fixed level equal to the Highest Astronomical Tide (HAT) level of 1.83m AHD.

6.3.2 Hydraulic Structures

Modification to structures was not required for modelling of extreme events. Model stability was not an issue during simulations.

6.4 Results and Mapping

6.4.1 Peak Flood Levels

Tabulated peak flood level results for the 0.5% AEP and 0.2% AEP Scenario 3 simulations have been provided in APPENDIX F for all tributaries within the Stable Swamp Creek catchment.

6.4.2 Flood Mapping Products

Flood Extent mapping for the 0.5%, 0.2% and 0.05% AEP Scenario 1 events have been provided in APPENDIX I.

Flood level contour mapping for the 0.5% AEP and 0.2% AEP Scenario 3 events have been provided in APPENDIX J.

Note: the 0.5% AEP and 0.2% AEP Scenario 3 event mapping was performed using the same procedure as outlined in Section 5.5.3. For the Scenario 1 simulations no modifications to the results were required.

7.0 Sensitivity Analyses

7.1 Climate Change

7.1.1 Background

Council's Natural Environment, Water and Sustainability (NEWS) Branch required longer term planning horizons to be considered in their program of flood studies by considering extreme flood events and potential climate change impacts. At this time, State Planning Policy 3/11 (now superseded by the Coastal Protection State Planning Regulatory Provision) and the Inland Flood Study (DERM, 2010) had provided guidance on assessing the potential impacts on communities and development of projected climate change effects, including sea level rise and increased rainfall intensities.

The SPP 3/11 outlined the following factors to be used by local government to determine planning levels for appropriate planning horizons (2050, 2070 and 2100):

- *A sea-level rise factor of 0.8 metres;*
- *An increase in the maximum cyclone intensity by 10 per cent; and*
- *Where a relevant storm-tide inundation assessment has not been completed in relation to a proposed development, the coastal hazard area is taken to be all land between high water mark and a minimum default 100-year Design Storm Tide Event level of 1.5 metres above the level of Highest Astronomical Tide for all developments in SEQ.*

The Inland Flooding Study outlines the rationale for adopting an interim methodology for assessing flooding risk in Queensland:

1. *The proposed methodology is to factor a 5 per cent increase in rainfall intensity at Annual Exceedance Probabilities (AEP) of 1% (100 yr ARI), 0.5% (200 yr ARI) and 0.2% (500 yr ARI) per degree of global temperature increase for all rainfall events recommended in SPP 1/03 for the location and design of new development.*
2. *The following temperatures and timeframes should be used for the purposes of applying the climate change factor in Recommendation 1:*
    a. *2C by 2050*
    b. *3C by 2070*
    c. *4C by 2100*

To enable BCC to understand and plan for the impacts of climate change on flooding in the Stable Swamp Creek catchment, an analysis was undertaken, which can be summarised as follows:

- 2050 Planning Horizon
    - 10% increase in rainfall intensity
    - 0.3 m increase in mean sea level

- 2100 Planning Horizon
    - 20 % increase in rainfall intensity
    - 0.8 m increase in mean sea level

7.1.2 Modelled Scenarios

The MIKE FLOOD hydraulic model was used to determine the impacts due to climate change for the 1%, 0.5% and 0.2% AEP events. Factored adjustments were made to the design rainfall for each climate change scenario using RAFTS to produce the inflow hydrographs into the MIKE FLOOD model.

Table 7.1 outlines the modelled events and adjusted rainfall and Tailwater conditions as described in Section 7.1.1.

Table 7.1: Climate Change Modelling Scenarios

Event	Scenarios	Factored Rainfall	Adopted Tailwater	
			Condition	Level (m AHD)
1% AEP - CC2050	1 and 3	+10%	MHWS + 0.3m	1.52
1% AEP - CC2100	1 and 3	+20%	MHWS + 0.8m	2.02
0.5% AEP - CC2050	1	+10%	MHWS + 0.3m	1.52
0.5% AEP - CC2100	1	+20%	MHWS + 0.8m	2.02
0.2% AEP - CC2100	1	+20%	MHWS + 0.8m	2.02

7.1.3 Results

A comparison table of the 1% AEP design event versus the 1% AEP CC2050 and CC2100 climate change event results can be found in APPENDIX H.

7.2 Structure Blockage Assessment

7.2.1 Overview

Blockage of hydraulic structures is a common cause of increasing flood risk over and above the risk due to the intensity of the rainfall event. Current guidance recommends that designers of hydraulic structures should make allowances for the risk of blockage in the design. However, current guidance does not stipulate that blockage is required to be included as part of the determination of the overall design flood level.

BCC has taken the approach to include the blockage of selected hydraulic structures as part of a sensitivity analysis. This approach will allow BCC to understand the potential impacts should the selected hydraulic structures become blocked during an event.

7.2.2 Selection of Hydraulic Structures

The selection of structures to be assessed for impacts due to blockage was based on the following criteria:

- The areas upstream of the structure contain dense vegetation or potential debris such as industrial materials, bins, cars, etc.
- The hydraulic significance of the structure. i.e. if the structure is considerably overtopped during a 1% AEP event, it was not anticipated to have any significant impact on flood levels once blocked and would not be assessed.
- The size and type of structure

Table 7.2 lists structures in Stable Swamp Creek that were considered for the blockage assessment.

Table 7.2: List of Structures considered for Blockage Assessment

No	Structure /name	Branch	AMTD	Size(m)	Assessed (Yes/No)
1	Forestlea Place	Shelleys Creek	10043	1/0.45	No
2	Hellawell Rd Box Culvert	Shelleys Creek	10392	3 / 3.05 X 1.85	Yes
3	Basin Box Culvert	Shelleys Creek	10517	1 / 2.4 X 1.2	Yes
4	Kingman St Foot Bridge	Shelleys Creek	10964	2 Span /15.5	Yes
5	Chilton St Box Culvert	Shelleys Creek	11448	3 / 3.05 X 1.85	Yes
6	Lang St – Drop structure	Shelleys Creek	11864	12.3 X 1.21	Yes
	Lang St - Pedestrian bridge	Shelleys Creek	11864	2.7 X 0.9	
7	Beenleigh Rd	Shelleys Creek	12045	5/ 2.75 X 1.86	No
8	Stones Rd – Pipe Culvert	Stable Swamp Creek	1437	6 / 1.5	Yes
9	Keats St – Box Culvert	Stable Swamp Creek	1633	1 / 0.8 X 2.06	Yes
	Keats St– Box Culvert	Stable Swamp Creek	1633	2 / 3.1 X 1.8	
10	Dyson Ave – Pedestrian Bridge	Stable Swamp Creek	1955	1 Span/ 8.5 m	Yes
11	Beryl Roberts Basin –Pipe Outlet	North Arm	350	1 /1.95	Yes
12	Barham Street	North Arm	76	3 / 1.15 X 0.9	No
13	Peringa St Foot bridge	North Arm	147	1 Span /14 m	Yes
14	Ipswich Motorway	Stable Swamp Creek	8047	2 span bridge	No
15	Beaudesert Rd Culvert	Stable Swamp Creek	6430	4 X 2.43 X 3.23	No
	Beaudesert Rd Culvert	Stable Swamp Creek	6430	8 X 2.43 X 2.48	
16	Beenleigh Rd – Box Culvert	Stable Swamp Creek	3046	5 /3.55 X 2.25	Yes
17	Musgrave Rd Pipe Culvert	North Arm	392	6 /1.5	Yes
18	Boundary Rd Box Culvert	Stable Swamp Creek	3983	9 / 3 X 3	Yes
19	Edith St Box Culvert	Stable Swamp Creek	4640	6 /3.7 X 2.75	Yes
20	Orange grove Rd Pipe Culvert	North Arm	483	6 /1.5	Yes
21	Perrin Place Box Culvert	North Arm	1594	3 /2.04 X 2.7	Yes
	Perrin Place Box Culvert	North Arm	1594	2 /3.2 X 2.92	
22	Musgrave Rd Bridge	Stable Swamp Creek	5408	2 span / 17.5	Yes
	Musgrave Rd Bridge	Stable Swamp Creek	5408	6 /3.62 X 2.18	
23	Riawena Rd Bridge	Stable Swamp Creek	5880	8 / 3.85 X 3.7	Yes
	Riawena Rd Bridge	Stable Swamp Creek	5880	2 /3.85 X 4.27	
24	Granard Rd Box Culvert	Archerfield Channel	2018	2 / 2.13 X 1.12	Yes
25	Musgrave Rd Box Culvert	North Arm	1862	3 / 3.05 X 2.15	Yes
26	Marshall Rd Culvert	Archerfield Channel	2231	1 X 2.12 X 1.23	No
27	Railway Bridge	North Arm	1710		No
28	Marshall Rd Culvert	Stable Swamp Creek	7803	1 / 2.62 X 1.99	No

7.2.3 Blockage Scenarios

The blockage analysis has been carried out with the scenario 1, 1% AEP design event. Structures were modelled individually to ensure that the blockage impacts would not be masked by impacts from other blocked crossings.

The Queensland Urban Drainage Manual (QUDM, 2013) was used to determine the degree of blockage for each structure. QUDM recommends that for box culverts less than 5m wide or 3m high assume 20% blockage at the sidewalls. It also specifies to assume 25% bottom-up blockage due to sediment unless this was not likely to occur. This was achieved by raising the invert level of the structure in the model and adjusting the structure geometry accordingly.

For the screened culvert at the outlet of Beryl Roberts Basin, QUDM recommends a blockage factor of 50% which was applied by adjusting the culvert geometry and invert levels accordingly.

As there is no specific reference in QUDM to assess blockage of pipe culverts, these were modelled by adjusting the pipe diameter to reduce the total flow area by the assumed 20%.

For bridge structures with opening heights greater than 3m QUDM suggests to assume no blockage so these were not assessed. For Bridge crossings less than 3m clear opening height, QUDM suggests to judge the level of blockage depending on the risk of debris rafts and large floating debris that could impact the structure. Also for piers the level of blockage is dependent on the risk of debris wrapping around the piers causing blockage.

APPENDICES

APPENDIX A - Hydrologic Model Parameters
APPENDIX B - Hydraulic Model Parameters
APPENDIX C - Hydraulic Structure Reference Sheets
APPENDIX D - Model Peer Review
APPENDIX E - Design Event Peak Flood Levels
APPENDIX F - Extreme Event Peak Flood Levels
APPENDIX G - Flood Mapping Generation and Limitations
APPENDIX H - Climate Change Event Peak Flood Level Comparison

APPENDIX A - Hydrologic Model Parameters

Table A.1: Hydrologic Model Sub-Catchment Properties - Ultimate Catchment Development

RAFTS Sub-Catchment Name	Total Area (ha)	Slope (%)	Open Space (ha)	Commercial/ Industrial (ha)	Urban Area (ha)	Pervious (ha)	Impervious (ha)
Shelleys Creek							
A-1	17.2	3.0	0.9	0.0	15.5	10.3	6.9
B-2	22.2	2.3	0.0	3.3	18.9	11.8	10.4
C-3	20.2	2.3	2.0	0.0	18.2	11.1	9.1
D-4	19.5	2.3	3.9	0.0	15.6	10.7	8.8
E-5	5.4	2.3	1.3	0.0	4.0	3.2	2.1
F-6	25.4	2.3	3.8	0.0	21.6	16.3	9.2
G-7	18.38	2.3	0.9	0.0	17.5	9.2	9.2
H-8	11.09	2.3	0.0	0.0	11.1	5.6	5.6
I-9-HellDS	13.61	2.3	1.4	0.0	12.2	11.2	2.4
K-12	8.18	2.3	0.0	0.0	8.2	6.5	1.6
J-10-Hell	6.92	2.3	1.7	0.0	5.2	4.2	2.6
L-13	13.95	3.3	2.8	0.0	11.2	9.2	4.7
M-14	22.64	3.3	2.3	0.0	20.4	11.3	11.3
N-15-Kent	37.63	3.3	3.8	0.0	33.9	21.5	16.2
O-16-Ash	25.77	4.2	1.3	0.0	24.5	12.9	12.9
P-17-Chilt	16.17	4.5	1.6	0.0	14.6	8.1	8.1
Q-18	20.76	5.0	1.0	0.0	19.7	10.4	10.4
R-19	4.64	5.0	0.7	0.0	3.9	1.9	2.8
S-20-Lang	7.26	5.0	0.7	0.0	6.5	2.9	4.4
T-21	22.89	4.4	0.0	0.0	22.9	9.2	13.7
Stable Swamp Creek (upstream of North Arm)							
Woff	32.3	6.3	8.1	0.0	24.2	23.3	9.0
Feltwell	43.6	1.7	13.1	0.0	30.5	28.8	14.8
Stones	21.6	6.7	8.6	0.0	13.0	16.4	5.2
Keats	26.6	6.2	2.7	10.6	13.3	17.6	9.0
Jackson	39.8	3.5	4.0	0.0	35.8	18.9	20.9
Dyson	29.1	5.5	7.3	0.0	21.8	18.6	10.5
Gaddes	38.7	3.3	9.7	0.0	29.0	27.9	10.8
Beenl W	47.0	3.0	11.8	11.8	23.5	33.8	13.2
Gay	15.4	2.0	0.0	15.4	0.0	1.5	13.9
Wanless	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rail 1	93.9	2.0	14.1	32.9	47.0	49.8	44.1
Rail 2	230.3	3.0	23.0	172.7	34.5	56.4	173.9
Railyard	138.4	1.5	6.9	90.0	41.5	30.5	108.0
Selhurst	47.8	2.2	2.4	38.2	7.2	16.7	31.1
Boundary	61.1	1.6	3.1	39.7	18.3	11.6	49.5
Edith	57.4	2.5	0.0	51.7	5.7	23.0	34.4

RAFTS Sub-Catchment Name	Total Area (ha)	Slope (%)	Open Space (ha)	Commercial/ Industrial (ha)	Urban Area (ha)	Pervious (ha)	Impervious (ha)
Conf U/S	11.4	1.0	0.0	11.4	0.0	6.3	5.1
North Arm							
Beryl A	63.1	8.0	63.1	0.0	0.0	48.0	15.1
Beryl B	75.6	3.3	7.6	0.0	68.0	38.6	37.0
Beryl C	45.9	5.0	9.2	0.0	36.7	28.5	17.5
Beryl E	83.8	4.0	12.6	0.0	71.2	50.3	33.5
Beryl F	44.1	3.0	11.0	0.0	33.1	28.3	15.9
Beryl Basin	0.0	0.0	0.0	0.0	0.0	0.00	0
Musgrave	15.3	4.5	3.8	0.0	11.5	9.2	6.1
Orange Grove	16.8	5.0	0.8	0.0	16.0	10.1	6.7
Debra	12.2	3.0	1.5	2.4	9.8	2.8	9.5
Elma	117.3	5.0	23.5	0.0	93.8	83.9	33.4
Perrin	48.4	3.0	0.0	31.5	16.9	23.7	24.7
Deal	8.6	1.0	0.0	8.6	0.0	4.7	3.9
Stable Swamp (downstream of North Arm)							
Gauge	28.0	0.8	0.0	28.0	0.0	5.3	22.7
Norbury	63.4	2.3	0.0	50.7	12.7	19.0	44.4
Riawena	21.6	1.7	0.0	20.5	1.1	2.2	19.4
Beaudest	20.6	5.0	2.1	16.5	2.1	6.2	14.4
Arch D/S	0.001	0.001	0.0	0.0	0.0	0.0	0.0
Ipswich	55.8	0.8	11.3	39.6	5.7	18.4	37.4
Marshall	102.6	2.5	43.4	27.2	38.0	65.2	37.4
Mouth	274.4	0.5	109.8	164.6	0.0	126.2	148.2
Archerfield Channel							
AA	15.4	3.4	0.0	0.0	15.4	6.2	9.2
BA	11.1	2.7	3.9	0.0	7.2	4.4	6.7
CA	16.5	3.2	0.0	0.0	16.5	7.4	9.1
DA	10.0	1.0	10.0	0.0	0.0	8.0	2.0
EA	18.8	1.7	9.4	0.0	9.4	13.2	5.6
FA	6.7	1.4	0.0	0.0	6.7	2.7	4.0
GA	18.6	2.6	9.3	9.3	0.0	7.4	11.2
HA	18.5	0.4	0.0	18.5	0.0	1.9	16.7
IA	17.4	2.4	0.0	17.4	0.0	8.7	8.7
ABAS1	1.5	2.3	-	-	-	0.0	1.5
JA	10.6	2.3	1.1	8.5	1.1	2.1	8.5
ABAS2	1.0	2.3	-	-	-	0.0	1.0
KA	5.9	2.5	0.9	1.8	3.2	2.4	3.5
LA	7.6	1.5	0.8	5.7	1.1	3.8	3.8
MA	14.8	1.0	14.8	0.0	0.0	7.4	7.4
NA	11.0	1.0	0.0	11.0	0.0	5.5	5.5

RAFTS Sub-Catchment Name	Total Area (ha)	Slope (%)	Open Space (ha)	Commercial/ Industrial (ha)	Urban Area (ha)	Pervious (ha)	Impervious (ha)
OA	8.1	0.4	0.0	8.1	0.0	0.8	7.3
PA	4.3	0.4	0.0	4.3	0.0	0.4	3.9
QA	5.6	0.3	0.0	5.6	0.0	0.6	5.0
RA	4.6	0.5	0.0	4.6	0.0	0.9	3.7
SA	14.8	0.4	0.0	14.8	0.0	2.2	12.6
TA	17.4	0.8	17.4	0.0	0.0	13.9	3.5
UA	9.9	0.9	8.4	1.5	0.0	7.9	2.0
VA	6.3	1.0	0.0	4.4	1.9	1.4	5.6
WA	2.3	1.2	0.0	3.6	1.6	2.1	3.1
XA	7.0	0.1	0.0	6.3	0.0	0.6	5.7
YA	5.2	0.1	0.0	2.3	0.0	0.7	1.6
ZA	6.2	0.8	0.0	6.2	0.0	0.6	5.6
AA1	7.6	1.6	0.8	1.1	5.3	3.0	4.6
BA1	10.0	1.6	1.3	0.0	7.5	4.0	6.0
CA1	3.3	0.1	0.4	0.0	2.5	1.3	2.0
DA1#239	7.7	2.4	1.0	0.0	5.8	3.1	4.6
EA1	1.8	0.1	0.5	1.4	0.0	0.2	1.6
TOTALS	**2679**	**-**	**525**	**1002**	**1152**	**1263**	**1416**

Table A.2: RAFTS Model – Rainfall Assignment and Rainfall Totals - Calibration Events

Node	January 1998 Event		March 2001 Event		November 2004 Event		May 1996 Event	
	Rainfall Gauge	Total Rainfall (mm)	Rainfall Gauge	Total Rainfall (mm)	Rainfall Gauge	Total Rainfall (mm)	Rainfall Gauge	Total Rainfall (mm)
A1	OXR114	153	OXR114	178	OXR114	256	BMR138	219
B2	OXR114	153	OXR114	178	OXR114	256	BMR138	219
C3	OXR114	153	OXR114	178	OXR114	256	BMR138	219
D4	OXR114	153	OXR114	178	OXR114	256	BMR138	219
E5	OXR114	153	OXR114	178	OXR114	256	BMR138	219
F6	OXR114	153	OXR114	178	OXR114	256	BMR138	219
G7	OXR114	153	OXR114	178	OXR114	256	BMR138	219
H8	OXR114	153	OXR114	178	OXR114	256	BMR138	219
I9	OXR114	153	OXR114	178	OXR114	256	BMR138	219
J10	OXR114	153	OXR114	178	OXR114	256	BMR138	219
K12	OXR114	153	OXR114	178	OXR114	256	BMR138	219
L13	OXR114	153	OXR114	178	OXR114	256	BMR138	219
M14	OXR114	153	OXR114	178	OXR114	256	BMR138	219
N15	OXR114	153	OXR114	178	OXR114	256	BMR138	219
O16	OXR114	153	OXR114	178	OXR114	256	BMR138	219
P17	OXR114	153	OXR114	178	OXR114	256	BMR138	219
Q18	OXR114	153	OXR114	178	OXR114	256	BMR138	219
R19	OXR114	153	OXR114	178	OXR114	256	BMR138	219
S20	OXR114	153	OXR114	178	OXR114	256	BMR138	219
T21	OXR114	153	OXR114	178	OXR114	256	BMR138	219
Woff	SSR130	89	SSR130	175	R_R747	211	BMR138	219
Feltwell	SSR130	89	SSR130	175	R_R747	211	BMR138	219
Stones	SSR130	89	SSR130	175	R_R747	211	BMR138	219
Keats	SSR130	89	SSR130	175	R_R747	211	BMR138	219
Jackson	SSR130	89	SSR130	175	R_R747	211	BMR138	219
Dyson	SSR130	89	SSR130	175	R_R747	211	BMR138	219
Gaddes	SSR130	89	SSR130	175	R_R747	211	BMR138	219
Beenl W	SSR130	89	SSR130	175	R_R747	211	BMR138	219
Gay	SSR130	89	SSR130	175	R_R747	211	BMR138	219
Wanless	SSR130	89	SSR130	175	R_R747	211	BMR138	219
Rail 1	OXR126	107	SSR130	175	R_R747	211	OXR126	192
Rail 2	OXR126	107	SSR130	175	R_R747	211	OXR126	192
Railyard	SSR130	89	SSR130	175	R_R747	211	OXR126	192
Selhurst	SSR130	89	SSR130	175	R_R747	211	BMR138	219
Boundary	SSR130	89	SSR130	175	R_R747	211	BMR138	219
Edith	SSR130	89	SSR130	175	R_R747	211	SSR130	196
Conf U/S	SSR130	89	SSR130	175	R_R747	211	SSR130	196
Basin	SSR130	89	SSR130	175	R_R747	211	BMR138	219
Musgrave	SSR130	89	SSR130	175	R_R747	211	BMR138	219

Node	January 1998 Event		March 2001 Event		November 2004 Event		May 1996 Event	
	Rainfall Gauge	Total Rainfall (mm)	Rainfall Gauge	Total Rainfall (mm)	Rainfall Gauge	Total Rainfall (mm)	Rainfall Gauge	Total Rainfall (mm)
OrangeGr	SSR130	89	SSR130	175	R_R747	211	BMR138	219
Debra	SSR130	89	SSR130	175	R_R747	211	BMR138	219
Elma	SSR130	89	SSR130	175	R_R747	211	BMR138	219
Perrin	SSR130	89	SSR130	175	R_R747	211	SSR130	196
Deal	SSR130	89	SSR130	175	R_R747	211	SSR130	196
Gauge	SSR130	89	SSR130	175	R_R747	211	SSR130	196
Norbury	SSR130	89	SSR130	175	R_R747	211	SSR130	196
Riawena	SSR130	89	SSR130	175	R_R747	211	SSR130	196
Beaudest	SSR130	89	SSR130	175	R_R747	211	SSR130	196
Marshall	SSR130	89	SSR130	175	R_R747	211	BMR138	219
Ipswich	SSR130	89	SSR130	175	R_R747	211	BMR138	219
Mouth	OXR020	42	SSR130	175	R_R747	211	OXR020	157
Beryl A	SSR130	89	SSR130	175	R_R747	211	BMR138	219
Beryl B	SSR130	89	SSR130	175	R_R747	211	BMR138	219
Beryl C	SSR130	89	SSR130	175	R_R747	211	BMR138	219
Beryl E	SSR130	89	SSR130	175	R_R747	211	BMR138	219
Beryl F	SSR130	89	SSR130	175	R_R747	211	BMR138	219
AA	OXR126	107	SSR130	175	R_R747	211	OXR126	192
BA	OXR126	107	SSR130	175	R_R747	211	OXR126	192
CA	OXR126	107	SSR130	175	R_R747	211	OXR126	192
DA	OXR126	107	SSR130	175	R_R747	211	OXR126	192
EA	OXR126	107	SSR130	175	R_R747	211	OXR126	192
FA	OXR126	107	SSR130	175	R_R747	211	OXR126	192
HA	OXR126	107	SSR130	175	R_R747	211	OXR126	192
IA	OXR126	107	SSR130	175	R_R747	211	OXR126	192
JA	SSR130	89	SSR130	175	R_R747	211	OXR126	192
KA	SSR130	89	SSR130	175	R_R747	211	OXR126	192
LA	SSR130	89	SSR130	175	R_R747	211	OXR126	192
MA	SSR130	89	SSR130	175	R_R747	211	OXR126	192
NA	SSR130	89	SSR130	175	R_R747	211	OXR126	192
OA	SSR130	89	SSR130	175	R_R747	211	OXR126	192
PA	SSR130	89	SSR130	175	R_R747	211	OXR126	192
QA	SSR130	89	SSR130	175	R_R747	211	OXR126	192
RA	SSR130	89	SSR130	175	R_R747	211	OXR126	192
SA	SSR130	89	SSR130	175	R_R747	211	OXR126	192
TA	SSR130	89	SSR130	175	R_R747	211	OXR126	192
UA	SSR130	89	SSR130	175	R_R747	211	OXR126	192
XA	SSR130	89	SSR130	175	R_R747	211	OXR126	192
YA	SSR130	89	SSR130	175	R_R747	211	OXR126	192
VA	SSR130	89	SSR130	175	R_R747	211	OXR126	192

Node	January 1998 Event		March 2001 Event		November 2004 Event		May 1996 Event	
	Rainfall Gauge	Total Rainfall (mm)	Rainfall Gauge	Total Rainfall (mm)	Rainfall Gauge	Total Rainfall (mm)	Rainfall Gauge	Total Rainfall (mm)
WA	SSR130	89	SSR130	175	R_R747	211	OXR126	192
ZA	SSR130	89	SSR130	175	R_R747	211	OXR126	192
AA1	SSR130	89	SSR130	175	R_R747	211	OXR126	192
BA1	SSR130	89	SSR130	175	R_R747	211	OXR126	192
CA1	SSR130	89	SSR130	175	R_R747	211	OXR126	192
DA1	SSR130	89	SSR130	175	R_R747	211	OXR126	192
EA1	SSR130	89	SSR130	175	R_R747	211	OXR126	192

APPENDIX B - Hydraulic Model Parameters

Table B.1: Stable Swamp Model – MIKE11 Branches

Branch Name	Upstream Chainage (m)	Downstream Chainage (m)	Upstream Junction		Downstream Junction		Branch Type
			Branch	Chainage (m)	Branch	Chainage (m)	
Beryl Roberts Basin	0	389					Regular
Beryl Roberts Main	0	388			Beryl Roberts Basin	0	Regular
Beryl Roberts Spillway	0	24	Beryl Roberts Basin	314	Beryl Roberts Basin	375	Regular
Beryl Roberts Trib	0	260			Beryl Roberts Basin	0	Regular
North Branch	0	1900	Beryl Roberts Basin	389	MIKE21 US Boundary	-	Regular
Shelleys Creek	10000	12165			Stable Swamp Creek	737	Regular
Stable Swamp Creek	737	2810	Shelleys Creek	12165	MIKE21 US Boundary	-	Regular

Table B.2: Stable Swamp Model – MIKE11 Cross Sections

BCC Cross Section	AMTD (m)	MIKE11 Branch	MIKE11 Chainage (m)	Comments
SS780	7360	Stable Swamp Creek	2810	Original Ground Survey Section
SS790	7496	Stable Swamp Creek	2674	Original Ground Survey Section
SS800	7654	Stable Swamp Creek	2516	Original Ground Survey Section
SS810	7753	Stable Swamp Creek	2417	Original Ground Survey Section
SS820	7854	Stable Swamp Creek	2316	Original Ground Survey Section
SS830	7931	Stable Swamp Creek	2240	Original Ground Survey Section
SS840	8040	Stable Swamp Creek	2132	Original Ground Survey Section
SS850	8132	Stable Swamp Creek	2040	Original Ground Survey Section
SS860	8209	Stable Swamp Creek	1962	Dyson Avenue Pedestrian Bridge
Section 2	8221	Stable Swamp Creek	1950	Keats Street Park 2007 survey
Section 9	8312	Stable Swamp Creek	1859	Keats Street Park 2007 survey
Section 12	8348	Stable Swamp Creek	1823	Keats Street Park 2007 survey
Section 15	8381	Stable Swamp Creek	1790	Keats Street Park 2007 survey
Section 16	8391	Stable Swamp Creek	1780	Keats Street Park 2007 survey
Section 17	8400	Stable Swamp Creek	1771	Keats Street Park 2007 survey
Section 19	8416	Stable Swamp Creek	1755	Keats Street Park 2007 survey
Section 3	8450	Stable Swamp Creek	1721	Keats Street Park 2007 survey
Section 2	8506	Stable Swamp Creek	1665	Keats Street Park 2007 survey
SS900	8535	Stable Swamp Creek	1641	Bridge Keats Street
SS920	8550	Stable Swamp Creek	1625	Original Ground Survey Section
SS922	8554	Stable Swamp Creek	1618	Original Ground Survey Section
SS928	8580	Stable Swamp Creek	1593	Maximum Height Gauge 12 – SS230
SS930	8595	Stable Swamp Creek	1577	Original Ground Survey Section
Section 1	8658	Stable Swamp Creek	1514	Keats Street Park 2007 survey
SS938	8725	Stable Swamp Creek	1447	Original Ground Survey Section
Copy of SS965	8728	Stable Swamp Creek	1441	Original Ground Survey Section
SS965	8742	Stable Swamp Creek	1430	Bridge Stones Road - 2007
SS970	8975	Stable Swamp Creek	1272	Original Ground Survey Section
SS980	9115	Stable Swamp Creek	1199	Original Ground Survey Section
SS990	9216	Stable Swamp Creek	1059	Original Ground Survey Section
SS1000	9319	Stable Swamp Creek	960	Original Ground Survey Section

BCC Cross Section	AMTD (m)	MIKE11 Branch	MIKE11 Chainage (m)	Comments
SS1010	9443	Stable Swamp Creek	859	Original Ground Survey Section
SS1020	8209	Stable Swamp Creek	737	Original Ground Survey Section
SS1030	9530	Shelleys Creek	12165	Original Ground Survey Section
SS1040	9626	Shelleys Creek	12069	Bridge - Beenleigh Road 2
SS1060	9655	Shelleys Creek	12041	Original Ground Survey Section
SS1070	9769	Shelleys Creek	11928	Original Ground Survey Section
SS1078	9833	Shelleys Creek	11869	Maximum Height Gauge 13
SS1080	9834	Shelleys Creek	11867	Original Ground Survey Section
Copy of SS1080	9837	Shelleys Creek	11866	Lang Street Drop Structure
Copy of SS1080	9838	Shelleys Creek	11865	Edited Ground Survey Section
Copy of SS1100	9839	Shelleys Creek	11862	Lang Street Pedestrian Bridge
SS1100	9841	Shelleys Creek	11848	Channel section at Lang Street Bridge (U/S face)
SS1105	9849	Shelleys Creek	11844	Maximum Height Gauge 13A
Copy of SS1110	9932	Shelleys Creek	11766	Edited Ground Survey Section
SS1110	10003	Shelleys Creek	11709	Original Ground Survey Section
SS1120	10121	Shelleys Creek	11638	Original Ground Survey Section
SS1130	10180	Shelleys Creek	11520	Chilton Road (Downstream)
Copy of SS1140	10215	Shelleys Creek	11485	Edited Ground Survey Section
Copy of SS1140	10230	Shelleys Creek	11470	Edited Ground Survey Section
SS1140	10238	Shelleys Creek	11462	Original Ground Survey Section
SS1160	10257	Shelleys Creek	11443	Original Ground Survey Section
Copy of SS160	10270	Shelleys Creek	11430	Edited Ground Survey Section
SS1170	10386	Shelleys Creek	11314	Original Ground Survey Section
SS1180	10477	Shelleys Creek	11223	Original Ground Survey Section
SS1190	10566	Shelleys Creek	11134	Original Ground Survey Section
SS1200	10664	Shelleys Creek	11036	Original Ground Survey Section
SS1203	10731	Shelleys Creek	10969	Original Ground Survey Section
SS1204	10735	Shelleys Creek	10965	Original Ground Survey Section
Copy of SS1204	10738	Shelleys Creek	10962	Original Ground Survey Section
SS1210	10752	Shelleys Creek	10948	Original Ground Survey Section
SS1220	10834	Shelleys Creek	10866	Original Ground Survey Section
SS1230	10879	Shelleys Creek	10821	Original Ground Survey Section

BCC Cross Section	AMTD (m)	MIKE11 Branch	MIKE11 Chainage (m)	Comments
SS1240	10971	Shelleys Creek	10729	Original Ground Survey Section
SS1250	11070	Shelleys Creek	10630	Original Ground Survey Section
Copy of SS1260	11180	Shelleys Creek	10520	Edited Ground Survey Section
SS1260	11186	Shelleys Creek	10514	Original Ground Survey Section
SS1270	11288	Shelleys Creek	10412	Original Ground Survey Section
SS1290	11314	Shelleys Creek	10386	Original Ground Survey Section
SS1297	11324	Shelleys Creek	10376	Original Ground Survey Section
SS1298	11331	Shelleys Creek	10369	Original Ground Survey Section
SS1299	11384	Shelleys Creek	10316	Original Ground Survey Section
SS1300	11417	Shelleys Creek	10283	Original Ground Survey Section
SS1308	11471	Shelleys Creek	10229	Original Ground Survey Section
SS1309	11500	Shelleys Creek	10200	Original Ground Survey Section
SS1310	11513	Shelleys Creek	10187	Original Ground Survey Section
SS1320	11609	Shelleys Creek	10091	Original Ground Survey Section
SS1324	11653	Shelleys Creek	10047	Original Ground Survey Section
SS1328	11661	Shelleys Creek	10039	Original Ground Survey Section
Copy of S1330	11690	Shelleys Creek	10010	Edited Ground Survey Section
SS1330	11700	Shelleys Creek	10000	Original Ground Survey Section
SS9170	13671	North Arm	284	Original Ground Survey Section
SS9180	13796	North Arm	158	Original Ground Survey Section
SS9190	13804	North Arm	150	Bridge Peringa Street Pedestrian
SS9210	13810	North Arm	144	Original Ground Survey Section
SS9220	13875	North Arm	80	Bridge Barham Street
SS9240	13881	North Arm	72	Original Ground Survey Section
SS9250	13934	North Arm	0	Original Ground Survey Section

Table B.3: Stable Swamp Model – Hydraulic Structures

Location Description	Branch	AMTD	MIKE11 Chainage (m)	Structure Description	Modelled as
Ipswich Motorway	Stable Swamp Creek	2126	-	Corrugated Iron Culverts: 3 - 9.20w x 5.83h Oval Pipes	2D Weir + 1D Irregular Culvert
Marshall Road	Stable Swamp Creek	2370	-	Culverts: 5 - 2.65w x 1.99h RCBCs	1D Weir + 1D Rectangular Culvert
Freney Street Pedestrian Bridge	Stable Swamp Creek	3139	-	Timber Footbridge: 4 spans – Total = 36.5m	2D Bathymetry
Freney Street Pipe Crossing	Stable Swamp Creek	3184	-	Steel Pipeline: 800mm diameter, 117.1m long	2D Bathymetry
Colvin Street Pedestrian Bridge	Stable Swamp Creek	3596	-	Timber Footbridge: 2 spans – Total = 18.2m	2D Bathymetry
Beaudesert Road	Stable Swamp Creek	3743	-	Culverts: 8 - 2.43w x 2.48h; 4 - 2.43w x 3.23h RCBCs	2D Weir + 2x 1D Rectangular Culverts
Riawena Road	Stable Swamp Creek	4293	-	Culverts: 8 - 3.85w x 3.70h; 2 - 3.85w x 4.27h RCBCs	2D Weir + 2x 1D Rectangular Culverts
Musgrave Road (Main Branch)	Stable Swamp Creek	4765	-	Culverts: 6 - 3.62w x 3.14h; 2 - 3.62w x 4.40h RCBCs	Weir + 1 Rectangular + 1 Irregular Culverts
Interstate Railway - Inbound	Stable Swamp Creek	5096	-	Bridge: 6 spans - Total = 59.4m	2D Bathymetry
Interstate Railway - Outbound	Stable Swamp Creek	5107	-	Bridge: 2 spans - Total = 29.6m	2D Bathymetry
Edith Street	Stable Swamp Creek	5533	-	Culverts: 6 - 3.70w x 2.75h RCBCs	1D Weir +1D Rectangular Culvert
Boundary Road	Stable Swamp Creek	6190	-	Culverts: 9 - 3.00w x 3.00h RCBCs	2D Weir + 1D Rectangular Culvert
Beenleigh Road (West)	Stable Swamp Creek	7127	-	Culverts: 5 - 3.55w x 2.25h RCBCs	2D Weir + 1D Rectangular Culvert
Dyson Avenue Pedestrian Bridge	Stable Swamp Creek	8218	1955	Steel Footbridge: 1 span - Total = 16.5m	1D Weir + 1D Irregular Culvert
Keats Street	Stable Swamp Creek	8540	1633	Culverts: 2 – 3.1w x 1.80h; 1 - 0.80w x 2.06h RCBCs	1D Weir + 1x 1D Rectangular + 1x 1D Irregular Culvert
Stones Road	Stable Swamp Creek	8736	1437	Bridge: 1 span Total = 21m	1D Weir + 1D Irregular Culvert
Musgrave Road (North Branch - West)	North Branch	92	-	Culverts: 3 - 3.05w x 2.15h RCBCs	1D Weir + 1D Rectangular Culvert
Brisbane-Beenleigh Railway	North Branch	244	-	Bridge: 5 spans - Total = 45.4m	1D Weir + 1D Irregular Culvert
Perrin Place	North Branch	360	-	Culverts: 3 - 2.04w x 2.70h; 2 - 3.20w x 2.92h RCBCs	1D Weir + 2x 1D Rectangular Culverts
Orange Grove Road	North Branch	1470	-	Culverts: 6 - 1500mm diameter RCPs	2D Weir + 1D Circular Culvert
Musgrave Road (North Branch - East)	North Branch	1562	-	Culverts: 6 - 1500mm diameter RCPs	1D Weir + 1D Circular Culvert
Baroda Street Pedestrian Bridge	North Branch	1646	-	Steel Deck: 1 span - Total = 7.8m	1D Weir + 1D Irregular Culvert
Peringa Street Pedestrian Bridge	North Branch	1807	147	Steel Footbridge: 1 span - Total = 14.7m	1D Weir + 1D Irregular Culvert

Location Description	Branch	AMTD	MIKE11 Chainage (m)	Structure Description	Modelled as
Barham Street	North Branch	1878	76	Culverts: 3 - 1.15w x 0.90h RCBCs	1D Weir + 1D Rectangular Culvert
Marshall Road	Archerfield Channel	310	-	Culverts: 4 – 2.12w x 1.23h RCBCs	2D Weir + 1D Rectangular Culvert
Granard Road	Archerfield Channel	510	-	Culverts: 2- 2.13w x 1.12h RCBCs	2D Weir + 1D Rectangular Culvert
Beenleigh Road (East)	Shelleys Creek		12045	Culverts: 5 - 2.75w x 1.86h RCBCs	1D Weir + 1D Rectangular Culvert
Lang Street Drop Structure	Shelleys Creek		11868	Drop Structure: 6.85w x 1.49 drop	1D Weir
Lang Street Pedestrian Bridge	Shelleys Creek		11864	Timber Footbridge: 1 span – Total = 12.3m; Culverts: 6 - 2.70w x 0.90h RCBCs	1D Weir + 2x 1D Rectangular Culverts
Lang Street	Shelleys creek		11864	Culverts: 1-12.3w x 1.21h ; 6-2.7w x 0.9h RCBCs	1D Weir + 2x 1D Rectangular Culverts
Chilton Street	Shelleys creek		11448	Culverts: 3-3w x 1.8h RCBC	1D Weir + 1D Rectangular Culvert
Kingman Street	Shelleys creek		10964	Pedestrian Bridge	1D Weir + 1D Irregular Culvert
Hellawell Road	Shelleys creek		10592	Culverts: 3-3w x 1.8h RCBC	1D Weir + 1D Rectangular Culvert
Forestlea Place	Shelleys creek		10043	Culverts: 1- 450mm diameter RCPs	1D Weir + 1D Circular Culvert

Table B.4: Stable Swamp Model – Inflows

Name of Inflow	Point of Inflow to MIKE FLOOD			
	Branch	MIKE11 Chainage (m)	MIKE21 Grid Reference	
			J	K
LDEAL	North Branch	-	640	361
LPERRIN	North Branch	-	695	407
LDEBRA	North Branch	-	800	373
LELMA	North Branch	-	836	400
LORANGEGR	North Branch	-	852	319
LMUSGRAVE	North Branch	284	-	-
LMOUTH	Stable Swamp Creek	-	106	714
LIPSWICH	Stable Swamp Creek	-	261	513
LMARSHALL	Stable Swamp Creek	-	346	600
LBEAUDEST	Stable Swamp Creek	-	474	510
LRIAWENA	Stable Swamp Creek	-	517	396
LNORBURY	Stable Swamp Creek	-	563	376
LGAUGE	Stable Swamp Creek	-	592	336
LCONF U/S	Stable Swamp Creek	-	629	339
LEDITH	Stable Swamp Creek	-	696	283
LBOUNDARY	Stable Swamp Creek	-	646	173
LSELHURST	Stable Swamp Creek	-	674	150
TRAILYARD	Stable Swamp Creek	-	686	91
LGAY	Stable Swamp Creek	-	711	93
LBEENL W	Stable Swamp Creek	2674	-	-
LGADDES	Stable Swamp Creek	2132	-	-
LDYSON	Stable Swamp Creek	1831	-	-
LJACKSON	Stable Swamp Creek	1773	-	-
LKEATS	Stable Swamp Creek	1577	-	-
LSTONES	Stable Swamp Creek	1272	-	-
LFELTWELL	Stable Swamp Creek	1059	-	-
LWOFF	Stable Swamp Creek	960	-	-
TBERYLDUM	Beryl Roberts Trib	0	-	-
TBERYLDUM2	Beryl Roberts Main	0	-	-
TDA1	Archerfield Channel	-	410	225
TPA	Archerfield Channel	-	418	272
TSA	Archerfield Channel	-	429	339
TDA17	Archerfield Channel	-	431	351
TWA	Archerfield Channel	-	434	367
TAA1	Archerfield Channel	-	442	418
TZA	Archerfield Channel	-	442	419
TBA1	Archerfield Channel	-	450	462
TCA1	Archerfield Channel	-	450	463
TDA1#239	Archerfield Channel	-	451	473
TEA1	Archerfield Channel	-	451	473
TDUM1	Shelleys creek	10000	-	-
TF-6	Shelleys creek	10091	-	-
TJ-10-HELL	Shelleys creek	10386	-	-
TI-9-HELLDS	Shelleys creek	10412	-	-
LL-13	Shelleys creek	10630	-	-
LM-14	Shelleys creek	10821	-	-
LN-15-KENT	Shelleys creek	10948	-	-
LO-16-ASH	Shelleys creek	11223	-	-
LP-17-CHILT	Shelleys creek	11443	-	-
LQ-18	Shelleys creek	11520	-	-
LR-19	Shelleys creek	11638	-	-
LS-20-Lang	Shelleys creek	11844	-	-
LT-21	Shelleys creek	12041	-	-

APPENDIX C - Hydraulic Structure Reference Sheets

Notes:

Tabulated results in this section are based on Scenario 1 – Existing catchment conditions.

** Where discharges and flow widths above structure cannot be accurately determined due to complex two-dimensional flows or the flood conveyance width over the structure being too large.*

- No data available/Not applicable.

HYDRAULIC STRUCTURE REFERENCE SHEET

Creek:	**NORTH ARM**
Location:	**BARHAM ST, COOPERS PLAINS**

Immunity Rating:	Less than 50 % AEP

DATE OF SURVEY: 1998	UBD REF: 200 E13
SURVEYED CROSS SECTION ID: SS9230	BCC ASSET ID: Barham St
MODEL ID: SS_BARHAM_ST	AMTD (m): 1878
STRUCTURE DESCRIPTION: BOX CULVERTS	

STRUCTURE SIZE: 3 / 1150 x 900
For Culverts: Number of cells/pipes & sizes For Bridges: Number of Spans and their lengths

U/S INVERT LEVEL (m): 15.68 U/S OBVERT LEVEL (m)

D/S INVERT LEVEL (m): 15.66 D/S OBVERT LEVEL (m)
For culverts give floor level. For bridges give bed level

For Culverts
LENGTH OF CULVERT BARREL AT INVERT (m): 4.82

LENGTH OF CULVERT BARREL AT OBVERT (m): 4.82

TYPE OF LINING: Grouted stone pitching
(e.g. concrete, stones, brick, corrugated iron)

IS THERE A SURVEYED WEIR PROFILE?
If yes give details ie. Plan number and/or survey book number.Note: This section should be at the highest part of the road eg crown, kerb, hand rails guard rails whichever is higher.

WEIR WIDTH (m): 4.82 PIER WIDTH (m):

(In direction of flow, ie. distance from u/s face to d/s face)

LOWEST POINT OF WEIR (m AHD): 16.99

HEIGHT OF GUARDRAILS:

DESCRIPTION OF ALL HAND AND GUARD RAILS AND HEIGHTS TO TOP AND UNDERSIDE OF GUARD RAILS:

PLAN NUMBER: W5501/111A

BRIDGE OR CULVERT DETAILS:

Wingwall/Headwall details, entrance details eg. pipe flush with embankment or projecting, socket or square end, entrance rounding, levels.
For bridges, details of piers and section under bridge including abutment details. Specify Survey Book No.

CONSTRUCTION DATE OF CURRENT STRUCTURE:

HAS THE STRUCTURE BEEN UPGRADED?
If yes, explain type and date of upgrade. Include plan number and location if applicable.

ADDITIONAL COMMENTS:

CREEK	**NORTH ARM**
LOCATION	**BARHAM ST, COOPERS PLAINS**

AEP (%)	DISCHARGE (m^3/s)	U/S WATER LEVEL (m AHD)	D/S WATER LEVEL (m AHD)	AFFLUX (mm)	FLOW WIDTH ABOVE STRUCTURE (m)	FLOW DEPTH ABOVE STRUCTURE (m)	VELOCITY (m/s)	
							Weir	Structure
0.05	186.7	19.51	19.33	0.18	107.9	2.52	3.0	3.9
0.2	155.8	19.40	19.15	0.25	106.9	2.41	2.9	3.9
1	103.6	19.16	18.74	0.42	100.1	2.18	2.8	3.9
2	85.5	19.06	18.53	0.52	97.6	2.07	2.7	3.9
5	62.4	18.87	18.23	0.64	93.0	1.89	2.7	3.9
10	46.0	18.65	17.97	0.67	86.7	1.65	2.7	3.9
20	33.7	18.37	17.71	0.66	74.3	1.37	2.5	3.8
50	18.4	17.48	17.20	0.28	29.7	0.81	2.2	3.9

Creek:	**NORTH ARM**
Location:	**PERINGA ST FOOTBRIDGE, COOPERS PLAINS**

Immunity Rating:	20 % AEP

DATE OF SURVEY: 1998	UBD REF: 200 E13
SURVEYED CROSS SECTION ID: SS9200	BCC ASSET ID: Peringa St Footbridge
MODEL ID: NB_PERINGA_ST	AMTD (m): 1807
STRUCTURE DESCRIPTION: BRIDGE	

STRUCTURE SIZE: SINGLE SPAN / 14m
For Culverts: Number of cells/pipes & sizes For Bridges: Number of Spans and their lengths

U/S INVERT LEVEL (m) 14.79 U/S OBVERT LEVEL (m)

D/S INVERT LEVEL (m) 14.55 D/S OBVERT LEVEL (m)
For culverts give floor level. For bridges give bed level

For Culverts
LENGTH OF CULVERT BARREL AT INVERT (m): 2.62

LENGTH OF CULVERT BARREL AT OBVERT (m): 2.62

TYPE OF LINING: Grouted stone pitching
(e.g. concrete, stones, brick, corrugated iron)

IS THERE A SURVEYED WEIR PROFILE?
If yes give details ie. Plan number and/or survey book number.Note: This section should be at the highest part of the road eg crown, kerb, hand rails guard rails whichever is higher.

WEIR WIDTH (m): 2.62 PIER WIDTH (m):

(In direction of flow, ie. distance from u/s face to d/s face)

LOWEST POINT OF WEIR (m AHD): 16.88

HEIGHT OF GUARDRAILS:

DESCRIPTION OF ALL HAND AND GUARD RAILS AND HEIGHTS TO TOP AND UNDERSIDE OF GUARD RAILS:

PLAN NUMBER: B1600

BRIDGE OR CULVERT DETAILS:

Wingwall/Headwall details, entrance details eg. pipe flush with embankment or projecting, socket or square end, entrance rounding, levels.
For bridges, details of piers and section under bridge including abutment details. Specify Survey Book No.

CONSTRUCTION DATE OF CURRENT STRUCTURE:

HAS THE STRUCTURE BEEN UPGRADED?
If yes, explain type and date of upgrade. Include plan number and location if applicable.

ADDITIONAL COMMENTS:

CREEK	**NORTH ARM**
LOCATION	**PERINGA ST FOOTBRIDGE, COOPERS PLAINS**

AEP (%)	DISCHARGE (m^3/s)	U/S WATER LEVEL (m AHD)	D/S WATER LEVEL (m AHD)	AFFLUX (mm)	FLOW WIDTH ABOVE STRUCTURE (m)	FLOW DEPTH ABOVE STRUCTURE (m)	VELOCITY (m/s)	
							Weir	Structure
0.05	186.7	18.79	18.57	0.22	97.6	1.90	2.8	3.9
0.2	155.9	18.61	18.34	0.27	97.8	1.73	2.7	3.4
1	103.3	18.18	17.86	0.31	82.6	1.30	2.4	3.5
2	84.9	17.92	17.65	0.27	52.6	1.03	2.2	3.5
5	62.4	17.51	17.31	0.21	39.5	0.64	1.7	3.5
10	46.0	17.19	16.97	0.22	28.4	0.31	1.2	3.3
20	33.8	16.85	16.61	0.24	-	-	-	3.1
50	18.4	16.35	16.04	0.31	-	-	-	6.7

HYDRAULIC STRUCTURE REFERENCE SHEET

Creek:	**NORTH ARM**
Location:	**MUSGRAVE RD, COOPERS PLAINS**

Immunity Rating:	50 % AEP

DATE OF SURVEY: 1998	UBD REF: 200 D13
SURVEYED CROSS SECTION ID: SS9200	BCC ASSET ID: Musgrave Rd 2
MODEL ID: NB_MUSGRAVE_RD	AMTD (m): 1570

STRUCTURE DESCRIPTION: PIPE CULVERTS

STRUCTURE SIZE: 6 / 1500 diameter

For Culverts: Number of cells/pipes & sizes For Bridges: Number of Spans and their lengths

U/S INVERT LEVEL (m) 12.765 U/S OBVERT LEVEL (m)

D/S INVERT LEVEL (m) 12.57 D/S OBVERT LEVEL (m)

For culverts give floor level. For bridges give bed level

For Culverts

LENGTH OF CULVERT BARREL AT INVERT (m): 16.8

LENGTH OF CULVERT BARREL AT OBVERT (m): 16.8

TYPE OF LINING: Grouted stone pitching

(e.g. concrete, stones, brick, corrugated iron)

IS THERE A SURVEYED WEIR PROFILE?

If yes give details ie. Plan number and/or survey book number.Note: This section should be at the highest part of the road eg crown, kerb, hand rails guard rails whichever is higher.

WEIR WIDTH (m): 16.8 PIER WIDTH (m):

(In direction of flow, ie. distance from u/s face to d/s face)

LOWEST POINT OF WEIR (m AHD): 15.19

HEIGHT OF GUARDRAILS:

DESCRIPTION OF ALL HAND AND GUARD RAILS AND HEIGHTS TO TOP AND UNDERSIDE OF GUARD RAILS:

PLAN NUMBER: B1998

BRIDGE OR CULVERT DETAILS:

Wingwall/Headwall details, entrance details eg. pipe flush with embankment or projecting, socket or square end, entrance rounding, levels.
For bridges, details of piers and section under bridge including abutment details. Specify Survey Book No.

CONSTRUCTION DATE OF CURRENT STRUCTURE:

HAS THE STRUCTURE BEEN UPGRADED?

If yes, explain type and date of upgrade. Include plan number and location if applicable.

ADDITIONAL COMMENTS:

Creek:	**NORTH ARM**
Location:	**MUSGRAVE RD, COOPERS PLAINS**

AEP (%)	DISCHARGE (m3/s)	U/S WATER LEVEL (m AHD)	D/S WATER LEVEL (m AHD)	AFFLUX (mm)	FLOW WIDTH ABOVE STRUCTURE (m)	FLOW DEPTH ABOVE STRUCTURE (m)	VELOCITY (m/s)	
							Weir	Structure
0.05	25.7	17.38	16.99	0.39	15.3	2.19	5.2	2.2
0.2	24.7	17.19	16.83	0.36	16.2	2.00	6.0	2.1
1	22.6	16.79	16.50	0.29	15.6	1.60	4.8	2.0
2	21.4	16.61	16.35	0.26	16.8	1.42	4.9	1.9
5	23.0	16.33	16.14	0.20	16.8	1.14	5.7	1.7
10	19.9	16.04	15.88	0.17	16.7	0.87	5.0	1.8
20	18.2	15.56	15.43	0.13	16.3	0.37	3.4	1.5
50	12.6	14.95	14.88	0.08	15.0	0	-	1.1

HYDRAULIC STRUCTURE REFERENCE SHEET

Creek:	**NORTH ARM**
Location:	**ORANGE GROVE RD, COOPERS PLAINS**

Immunity Rating:	20 % AEP

DATE OF SURVEY: 1998	UBD REF: 200 D13
SURVEYED CROSS SECTION ID:	BCC ASSET ID: Orange Grove Rd
MODEL ID: NB_ORANGE_GROOVE_RD	AMTD (m): 1470
STRUCTURE DESCRIPTION: PIPE CULVERTS	

STRUCTURE SIZE: 6 / 1500 diameter
For Culverts: Number of cells/pipes & sizes For Bridges: Number of Spans and their lengths

U/S INVERT LEVEL (m) 12.51 U/S OBVERT LEVEL (m)

D/S INVERT LEVEL (m) 12.35 D/S OBVERT LEVEL (m)
For culverts give floor level. For bridges give bed level

For Culverts
LENGTH OF CULVERT BARREL AT INVERT (m): 22

LENGTH OF CULVERT BARREL AT OBVERT (m): 22

TYPE OF LINING: Grouted stone pitching
(e.g. concrete, stones, brick, corrugated iron)

IS THERE A SURVEYED WEIR PROFILE?
If yes give details ie. Plan number and/or survey book number.Note: This section should be at the highest part of the road eg crown, kerb, hand rails guard rails whichever is higher.

WEIR WIDTH (m): 22 PIER WIDTH (m):

(In direction of flow, ie. distance from u/s face to d/s face)

LOWEST POINT OF WEIR (m AHD): 15.56

HEIGHT OF GUARDRAILS:

DESCRIPTION OF ALL HAND AND GUARD RAILS AND HEIGHTS TO TOP AND UNDERSIDE OF GUARD RAILS:

PLAN NUMBER: W1998

BRIDGE OR CULVERT DETAILS:

Wingwall/Headwall details, entrance details eg. pipe flush with embankment or projecting, socket or square end, entrance rounding, levels.
For bridges, details of piers and section under bridge including abutment details. Specify Survey Book No.

CONSTRUCTION DATE OF CURRENT STRUCTURE:

HAS THE STRUCTURE BEEN UPGRADED?
If yes, explain type and date of upgrade. Include plan number and location if applicable.

ADDITIONAL COMMENTS:

Creek:	**NORTH ARM**
Location:	**ORANGE GROVE RD, COOPERS PLAINS**

AEP (%)	DISCHARGE (m^3/s)	U/S WATER LEVEL (m AHD)	D/S WATER LEVEL (m AHD)	AFFLUX (mm)	FLOW WIDTH ABOVE STRUCTURE (m)	FLOW DEPTH ABOVE STRUCTURE (m)	VELOCITY (m/s)	
							Weir	Structure
0.05	208.8	16.84	16.00	0.84	17.1	1.29	3.6	3.8
0.2	174.1	16.68	15.77	0.91	17.2	1.14	3.2	3.9
1	114.3	16.35	15.27	1.08	17.2	0.79	2.6	3.9
2	91.9	16.19	15.03	1.16	17.2	0.65	2.6	10.6
5	65.1	15.95	14.68	1.27	17.2	0.41	2.1	3.8
10	45.0	15.63	14.35	1.28	17.2	0.09	1.7	3.8
20	33.7	14.80	14.10	0.70	15.4	0	-	3.2
50	19.7	14.24	13.70	0.54	12.8	0	-	2.0

Creek:	**STABLE SWAMP CREEK**
Location:	**STONES RD, SUNNYBANK**

Immunity Rating:	1% AEP

DATE OF SURVEY: 1998	UBD REF: 220 H1
SURVEYED CROSS SECTION ID: SS960	BCC ASSET ID: Stones Road Culvert
MODEL ID: NB_STONES_RD	AMTD (m): 8735

STRUCTURE DESCRIPTION: PIPE CULVERTS

STRUCTURE SIZE: 6 / 1500 diameter
For Culverts: Number of cells/pipes & sizes For Bridges: Number of Spans and their lengths

U/S INVERT LEVEL (m) 29.682 U/S OBVERT LEVEL (m)

D/S INVERT LEVEL (m) 29.682 D/S OBVERT LEVEL (m)
For culverts give floor level. For bridges give bed level

For Culverts
LENGTH OF CULVERT BARREL AT INVERT (m): 10.9

LENGTH OF CULVERT BARREL AT OBVERT (m): 10.9

TYPE OF LINING: Grouted stone pitching
(e.g. concrete, stones, brick, corrugated iron)

IS THERE A SURVEYED WEIR PROFILE?
If yes give details ie. Plan number and/or survey book number.Note: This section should be at the highest part of the road eg crown, kerb, hand rails guard rails whichever is higher.

WEIR WIDTH (m): 10.9 PIER WIDTH (m):

(In direction of flow, ie. distance from u/s face to d/s face)

LOWEST POINT OF WEIR (m AHD): 34.57

HEIGHT OF GUARDRAILS:

DESCRIPTION OF ALL HAND AND GUARD RAILS AND HEIGHTS TO TOP AND UNDERSIDE OF GUARD RAILS:

PLAN NUMBER: W12317

BRIDGE OR CULVERT DETAILS:

Wingwall/Headwall details, entrance details eg. pipe flush with embankment or projecting, socket or square end, entrance rounding, levels.
For bridges, details of piers and section under bridge including abutment details. Specify Survey Book No.

CONSTRUCTION DATE OF CURRENT STRUCTURE:

HAS THE STRUCTURE BEEN UPGRADED?
If yes, explain type and date of upgrade. Include plan number and location if applicable.

ADDITIONAL COMMENTS:

Creek:	**STABLE SWAMP CREEK**
Location:	**STONES RD, SUNNYBANK**

AEP (%)	DISCHARGE (m^3/s)	U/S WATER LEVEL (m AHD)	D/S WATER LEVEL (m AHD)	AFFLUX (mm)	FLOW WIDTH ABOVE STRUCTURE (m)	FLOW DEPTH ABOVE STRUCTURE (m)	VELOCITY (m/s)	
							Weir	Structure
0.05	249.9	34.41	33.48	0.94	-	-	-	5.1
0.2	210.3	34.25	33.35	0.90	-	-	-	5.1
1	143.1	33.94	33.11	0.84	-	-	-	5.2
2	121.1	33.80	32.98	0.82	-	-	-	5.1
5	96.4	33.71	32.77	0.94	-	-	-	4.5
10	80.0	33.59	32.55	1.04	-	-	-	4.5
20	65.2	33.47	32.30	1.16	-	-	-	4.4
50	42.9	33.19	31.85	1.33	-	-	-	4.2

Creek: **NORTH ARM**	**Immunity Rating:** 5% AEP
Location: **PERRIN PLACE, SALISBURY**	

DATE OF SURVEY: 1998	UBD REF: 199 R11
SURVEYED CROSS SECTION ID: SS9042	BCC ASSET ID: Perrin Place
MODEL ID: NB_PERRIN_PL	AMTD (m): 360
STRUCTURE DESCRIPTION: BOX CULVERTS	

STRUCTURE SIZE: 3 / 2040 x 2700
For Culverts: Number of cells/pipes & sizes For Bridges: Number of Spans and their lengths

U/S INVERT LEVEL (m) 6.15 U/S OBVERT LEVEL (m)

D/S INVERT LEVEL (m) 6.16 D/S OBVERT LEVEL (m)
For culverts give floor level. For bridges give bed level

For Culverts
LENGTH OF CULVERT BARREL AT INVERT (m): 14.6

LENGTH OF CULVERT BARREL AT OBVERT (m): 14.6

TYPE OF LINING: Grouted stone pitching
(e.g. concrete, stones, brick, corrugated iron)

IS THERE A SURVEYED WEIR PROFILE?
If yes give details ie. Plan number and/or survey book number.Note: This section should be at the highest part of the road eg crown, kerb, hand rails guard rails whichever is higher.

WEIR WIDTH (m): 14.6 PIER WIDTH (m):

(In direction of flow, ie. distance from u/s face to d/s face)

LOWEST POINT OF WEIR (m AHD): 9.56

HEIGHT OF GUARDRAILS:

DESCRIPTION OF ALL HAND AND GUARD RAILS AND HEIGHTS TO TOP AND UNDERSIDE OF GUARD RAILS:

PLAN NUMBER:

BRIDGE OR CULVERT DETAILS:

Wingwall/Headwall details, entrance details eg. pipe flush with embankment or projecting, socket or square end, entrance rounding, levels.
For bridges, details of piers and section under bridge including abutment details. Specify Survey Book No.

CONSTRUCTION DATE OF CURRENT STRUCTURE:

HAS THE STRUCTURE BEEN UPGRADED?
If yes, explain type and date of upgrade. Include plan number and location if applicable.

ADDITIONAL COMMENTS:

Creek:	**NORTH ARM**
Location:	**PERRIN PLACE, SALISBURY**

AEP (%)	DISCHARGE (m^3/s)	U/S WATER LEVEL (m AHD)	D/S WATER LEVEL (m AHD)	AFFLUX (mm)	FLOW WIDTH ABOVE STRUCTURE (m)	FLOW DEPTH ABOVE STRUCTURE (m)	VELOCITY (m/s)	
							Weir	Structure
0.05	111.2	10.99	10.90	0.09	22.6	1.45	2.7	1.8
0.2	94.2	10.71	10.61	0.10	22.4	1.15	2.4	1.7
1	62.9	10.13	10.04	0.09	22.5	0.57	1.6	1.6
2	54.0	9.83	9.74	0.09	22.9	0.28	1.1	1.4
5	37.6	31.07	30.90	0.18	-	-	-	1.1
10	31.5	9.09	9.02	0.07	-	-	-	0.9
20	27.5	8.90	8.83	0.07	-	-	-	0.8
50	20.6	8.61	5.55	3.06	-	-	-	0.7

Creek:	**NORTH ARM**
Location:	**PERRIN PLACE, SALISBURY**

Immunity Rating:	5% AEP

DATE OF SURVEY: 1998	UBD REF: 199 R11
SURVEYED CROSS SECTION ID: SS9042	BCC ASSET ID: Perrin Place
MODEL ID: NB_PERRIN_PL	AMTD (m): 360
STRUCTURE DESCRIPTION: BOX CULVERTS	

STRUCTURE SIZE: 2 / 3200 x 2920
For Culverts: Number of cells/pipes & sizes For Bridges: Number of Spans and their lengths

U/S INVERT LEVEL (m) 6.15 U/S OBVERT LEVEL (m)

D/S INVERT LEVEL (m) 6.16 D/S OBVERT LEVEL (m)
For culverts give floor level. For bridges give bed level

For Culverts
LENGTH OF CULVERT BARREL AT INVERT (m): 14.6

LENGTH OF CULVERT BARREL AT OBVERT (m): 14.6

TYPE OF LINING: Grouted stone pitching
(e.g. concrete, stones, brick, corrugated iron)

IS THERE A SURVEYED WEIR PROFILE?
If yes give details ie. Plan number and/or survey book number.Note: This section should be at the highest part of the road eg crown, kerb, hand rails guard rails whichever is higher.

WEIR WIDTH (m): 14.6 PIER WIDTH (m):

(In direction of flow, ie. distance from u/s face to d/s face)

LOWEST POINT OF WEIR (m AHD): 9.56

HEIGHT OF GUARDRAILS:

DESCRIPTION OF ALL HAND AND GUARD RAILS AND HEIGHTS TO TOP AND UNDERSIDE OF GUARD RAILS:

PLAN NUMBER:

BRIDGE OR CULVERT DETAILS:

Wingwall/Headwall details, entrance details eg. pipe flush with embankment or projecting, socket or square end, entrance rounding, levels.
For bridges, details of piers and section under bridge including abutment details. Specify Survey Book No.

CONSTRUCTION DATE OF CURRENT STRUCTURE:

HAS THE STRUCTURE BEEN UPGRADED?
If yes, explain type and date of upgrade. Include plan number and location if applicable.

ADDITIONAL COMMENTS:

Creek:	**NORTH ARM**
Location:	**PERRIN PLACE, SALISBURY**

AEP (%)	DISCHARGE (m^3/s)	U/S WATER LEVEL (m AHD)	D/S WATER LEVEL (m AHD)	AFFLUX (mm)	FLOW WIDTH ABOVE STRUCTURE (m)	FLOW DEPTH ABOVE STRUCTURE (m)	VELOCITY (m/s)	
							Weir	Structure
0.05	111.2	10.99	10.90	0.09	22.6	1.45	2.7	1.9
0.2	94.2	10.71	10.61	0.10	22.4	1.15	2.4	1.8
1	62.9	10.13	10.04	0.09	22.5	0.57	1.6	1.6
2	54.0	9.83	9.74	0.09	22.9	0.28	1.1	1.5
5	37.6	31.07	30.90	0.18	-	-	-	1.1
10	31.5	9.09	9.02	0.07	-	-	-	0.9
20	27.5	8.90	8.83	0.07	-	-	-	0.8
50	20.6	8.61	8.55	0.06	-	-	-	0.7

Creek:	**STABLE SWAMP CREEK**
Location:	**KEATS ST, SUNNYBANK**

Immunity Rating:	1% AEP

DATE OF SURVEY: 1998	UBD REF: 200 H20
SURVEYED CROSS SECTION ID: SS910	BCC ASSET ID: Keats Street Bridge
MODEL ID: NB_KEATS_ST	AMTD (m): 8543
STRUCTURE DESCRIPTION: BOX CULVERTS	

STRUCTURE SIZE: 2 / 3100 x 1800
For Culverts: Number of cells/pipes & sizes For Bridges: Number of Spans and their lengths

U/S INVERT LEVEL (m) 27.16 U/S OBVERT LEVEL (m)

D/S INVERT LEVEL (m) 27.14 D/S OBVERT LEVEL (m)
For culverts give floor level. For bridges give bed level

For Culverts
LENGTH OF CULVERT BARREL AT INVERT (m): 13.25

LENGTH OF CULVERT BARREL AT OBVERT (m): 13.25

TYPE OF LINING: Grouted stone pitching
(e.g. concrete, stones, brick, corrugated iron)

IS THERE A SURVEYED WEIR PROFILE?
If yes give details ie. Plan number and/or survey book number.Note: This section should be at the highest part of the road eg crown, kerb, hand rails guard rails whichever is higher.

WEIR WIDTH (m): 13.25 PIER WIDTH (m):

(In direction of flow, ie. distance from u/s face to d/s face)

LOWEST POINT OF WEIR (m AHD): 29.98

HEIGHT OF GUARDRAILS:

DESCRIPTION OF ALL HAND AND GUARD RAILS AND HEIGHTS TO TOP AND UNDERSIDE OF GUARD RAILS:

PLAN NUMBER: W4393

BRIDGE OR CULVERT DETAILS:

Wingwall/Headwall details, entrance details eg. pipe flush with embankment or projecting, socket or square end, entrance rounding, levels.
For bridges, details of piers and section under bridge including abutment details. Specify Survey Book No.

CONSTRUCTION DATE OF CURRENT STRUCTURE:

HAS THE STRUCTURE BEEN UPGRADED?
If yes, explain type and date of upgrade. Include plan number and location if applicable.

ADDITIONAL COMMENTS:

Creek:	**STABLE SWAMP CREEK**
Location:	**KEATS ST, SUNNYBANK**

AEP (%)	DISCHARGE (m^3/s)	U/S WATER LEVEL (m AHD)	D/S WATER LEVEL (m AHD)	AFFLUX (mm)	FLOW WIDTH ABOVE STRUCTURE (m)	FLOW DEPTH ABOVE STRUCTURE (m)	VELOCITY (m/s)	
							Weir	Structure
0.05	260.3	31.74	30.11	1.64	156.6	1.76	3.3	6.3
0.2	217.9	31.56	29.90	1.66	150.2	1.59	3.3	6.3
1	147.9	31.33	29.38	1.95	118.3	1.35	2.3	4.9
2	125.2	31.17	29.12	2.05	108.2	1.20	2.2	4.8
5	99.5	30.88	28.80	2.08	88.4	0.90	2.0	4.5
10	82.4	30.60	28.56	2.04	68.0	0.62	1.6	4.3
20	67.0	30.23	28.32	1.92	13.3	0.25	1.0	4.1
50	44.3	29.43	27.90	1.54	-	-	-	3.5

Creek:	**STABLE SWAMP CREEK**
Location:	**KEATS ST, SUNNYBANK**

Immunity Rating:	1% AEP

DATE OF SURVEY: 1998	UBD REF: 200 H20
SURVEYED CROSS SECTION ID: SS910	BCC ASSET ID: Keats Street Bridge
MODEL ID: NB_KEATS_ST	AMTD (m): 8543
STRUCTURE DESCRIPTION: BOX CULVERTS	

STRUCTURE SIZE: 1 / 800 x 2060
For Culverts: Number of cells/pipes & sizes For Bridges: Number of Spans and their lengths

U/S INVERT LEVEL (m) 27.16 U/S OBVERT LEVEL (m)

D/S INVERT LEVEL (m) 27.14 D/S OBVERT LEVEL (m)
For culverts give floor level. For bridges give bed level

For Culverts
LENGTH OF CULVERT BARREL AT INVERT (m): 13.25

LENGTH OF CULVERT BARREL AT OBVERT (m): 13.25

TYPE OF LINING: Grouted stone pitching
(e.g. concrete, stones, brick, corrugated iron)

IS THERE A SURVEYED WEIR PROFILE?
If yes give details ie. Plan number and/or survey book number.Note: This section should be at the highest part of the road eg crown, kerb, hand rails guard rails whichever is higher.

WEIR WIDTH (m): 13.25 PIER WIDTH (m):

(In direction of flow, ie. distance from u/s face to d/s face)

LOWEST POINT OF WEIR (m AHD): 29.98

HEIGHT OF GUARDRAILS:

DESCRIPTION OF ALL HAND AND GUARD RAILS AND HEIGHTS TO TOP AND UNDERSIDE OF GUARD RAILS:

PLAN NUMBER: W4393

BRIDGE OR CULVERT DETAILS:

Wingwall/Headwall details, entrance details eg. pipe flush with embankment or projecting, socket or square end, entrance rounding, levels.
For bridges, details of piers and section under bridge including abutment details. Specify Survey Book No.

CONSTRUCTION DATE OF CURRENT STRUCTURE:

HAS THE STRUCTURE BEEN UPGRADED?
If yes, explain type and date of upgrade. Include plan number and location if applicable.

ADDITIONAL COMMENTS:

Creek:	**STABLE SWAMP CREEK**
Location:	**KEATS ST, SUNNYBANK**

AEP (%)	DISCHARGE (m^3/s)	U/S WATER LEVEL (m AHD)	D/S WATER LEVEL (m AHD)	AFFLUX (mm)	FLOW WIDTH ABOVE STRUCTURE (m)	FLOW DEPTH ABOVE STRUCTURE (m)	VELOCITY (m/s)	
							Weir	Structure
0.05	260.3	31.74	30.11	1.64	156.6	1.76	3.3	6.2
0.2	217.9	31.56	29.90	1.66	150.2	1.59	3.3	6.2
1	147.9	31.33	29.38	1.95	118.3	1.35	2.3	5.3
2	125.2	31.17	29.12	2.05	108.2	1.20	2.2	5.1
5	99.5	30.88	28.80	2.08	88.4	0.90	2.0	4.9
10	82.4	30.60	28.56	2.04	68.0	0.62	1.6	4.6
20	67.0	30.23	28.32	1.92	13.3	0.25	1.0	4.2
50	44.3	29.43	27.90	1.54	-	-	-	3.7

Creek:	**NORTH ARM**
Location:	**RAILWAY BRIDGE, SALISBURY**

Immunity Rating:	5% AEP

DATE OF SURVEY: 1998	UBD REF: 199 R11
SURVEYED CROSS SECTION ID: SS9020	BCC ASSET ID: Railway Bridge
MODEL ID: NB_RLW_BRIDGE	AMTD (m): 4748

STRUCTURE DESCRIPTION: BRIDGE

STRUCTURE SIZE: 5 SPANS / 9m
For Culverts: Number of cells/pipes & sizes For Bridges: Number of Spans and their lengths

U/S INVERT LEVEL (m) 6.19 U/S OBVERT LEVEL (m)

D/S INVERT LEVEL (m) 5.96 D/S OBVERT LEVEL (m)
For culverts give floor level. For bridges give bed level

For Culverts
LENGTH OF CULVERT BARREL AT INVERT (m): 6.7

LENGTH OF CULVERT BARREL AT OBVERT (m): 6.7

TYPE OF LINING: Grouted stone pitching
(e.g. concrete, stones, brick, corrugated iron)

IS THERE A SURVEYED WEIR PROFILE?
If yes give details ie. Plan number and/or survey book number.Note: This section should be at the highest part of the road eg crown, kerb, hand rails guard rails whichever is higher.

WEIR WIDTH (m): 6.7 PIER WIDTH (m):

(In direction of flow, ie. distance from u/s face to d/s face)

LOWEST POINT OF WEIR (m AHD): 9.36

HEIGHT OF GUARDRAILS:

DESCRIPTION OF ALL HAND AND GUARD RAILS AND HEIGHTS TO TOP AND UNDERSIDE OF GUARD RAILS:

PLAN NUMBER: W5501/90

BRIDGE OR CULVERT DETAILS:

Wingwall/Headwall details, entrance details eg. pipe flush with embankment or projecting, socket or square end, entrance rounding, levels.
For bridges, details of piers and section under bridge including abutment details. Specify Survey Book No.

CONSTRUCTION DATE OF CURRENT STRUCTURE:

HAS THE STRUCTURE BEEN UPGRADED?
If yes, explain type and date of upgrade. Include plan number and location if applicable.

ADDITIONAL COMMENTS:

Creek:	**NORTH ARM**
Location:	**RAILWAY BRIDGE, SALISBURY**

AEP (%)	DISCHARGE (m^3/s)	U/S WATER LEVEL (m AHD)	D/S WATER LEVEL (m AHD)	AFFLUX (mm)	FLOW WIDTH ABOVE STRUCTURE (m)	FLOW DEPTH ABOVE STRUCTURE (m)	VELOCITY (m/s)	
							Weir	Structure
0.05	119.0	10.70	10.66	0.04	49.9	1.35	1.3	1.0
0.2	107.0	10.30	10.26	0.04	66.4	0.94	1.0	1.0
1	73.0	9.71	9.66	0.05	49.7	0.35	0.5	1.1
2	58.3	9.43	9.38	0.05	-	-	-	1.0
5	39.9	9.08	9.04	0.05	-	-	-	0.9
10	33.0	8.80	8.75	0.04	-	-	-	1.0
20	29.4	8.53	8.48	0.04	-	-	-	1.1
50	23.2	8.12	8.07	0.05	-	-	-	0.7

Creek:	**NORTH ARM**
Location:	**MUSGRAVE RD,SALISBURY**

Immunity Rating:	Less than 50% AEP

DATE OF SURVEY: 1998	UBD REF: 199 R11
SURVEYED CROSS SECTION ID: SS9002	BCC ASSET ID: Musgrave Rd
MODEL ID: NB_MUSGRAVE_RD	AMTD (m): 4748
STRUCTURE DESCRIPTION: BOX CULVERTS	

STRUCTURE SIZE: 3 / 3050 x 2150
For Culverts: Number of cells/pipes & sizes For Bridges: Number of Spans and their lengths

U/S INVERT LEVEL (m) 4.83 U/S OBVERT LEVEL (m)

D/S INVERT LEVEL (m) 4.78 D/S OBVERT LEVEL (m)
For culverts give floor level. For bridges give bed level

For Culverts
LENGTH OF CULVERT BARREL AT INVERT (m): 13.5

LENGTH OF CULVERT BARREL AT OBVERT (m): 13.5

TYPE OF LINING: Grouted stone pitching
(e.g. concrete, stones, brick, corrugated iron)

IS THERE A SURVEYED WEIR PROFILE?
If yes give details ie. Plan number and/or survey book number.Note: This section should be at the highest part of the road eg crown, kerb, hand rails guard rails whichever is higher.

WEIR WIDTH (m): 13.5 PIER WIDTH (m):

(In direction of flow, ie. distance from u/s face to d/s face)

LOWEST POINT OF WEIR (m AHD): 7.37

HEIGHT OF GUARDRAILS:

DESCRIPTION OF ALL HAND AND GUARD RAILS AND HEIGHTS TO TOP AND UNDERSIDE OF GUARD RAILS:

PLAN NUMBER: W5501

BRIDGE OR CULVERT DETAILS:

Wingwall/Headwall details, entrance details eg. pipe flush with embankment or projecting, socket or square end, entrance rounding, levels.
For bridges, details of piers and section under bridge including abutment details. Specify Survey Book No.

CONSTRUCTION DATE OF CURRENT STRUCTURE:

HAS THE STRUCTURE BEEN UPGRADED?
If yes, explain type and date of upgrade. Include plan number and location if applicable.

ADDITIONAL COMMENTS:

Creek:	**NORTH ARM**
Location:	**MUSGRAVE RD,SALISBURY**

AEP (%)	DISCHARGE (m^3/s)	U/S WATER LEVEL (m AHD)	D/S WATER LEVEL (m AHD)	AFFLUX (mm)	FLOW WIDTH ABOVE STRUCTURE (m)	FLOW DEPTH ABOVE STRUCTURE (m)	VELOCITY (m/s)	
							Weir	Structure
0.05	91.1	10.61	10.57	0.04	15.5	3.24	2.6	2.5
0.2	97.3	10.19	10.14	0.04	15.6	2.82	3.0	2.2
1	69.9	9.52	9.46	0.06	43.1	1.06	2.8	2.4
2	62.3	9.18	9.12	0.06	15.1	1.82	2.5	2.5
5	53.7	8.74	8.68	0.06	15.2	1.37	2.1	2.6
10	54.6	8.48	8.42	0.06	15.5	1.10	2.0	2.7
20	57.9	8.21	8.10	0.11	15.6	0.84	1.6	2.8
50	55.3	7.83	7.76	0.06	15.3	0.44	1.3	2.8

Creek:	**STABLE SWAMP CREEK**
Location:	**DYSON AVENUE PEDESTRIAN BRIDGE, SUNNYBANK**

Immunity Rating:	Less than 50% AEP

DATE OF SURVEY: 1998	UBD REF: 200 G19
SURVEYED CROSS SECTION ID: SS870	BCC ASSET ID: Dyson Avenue
MODEL ID: SS_DYSON_AVE	AMTD (m): 8215
STRUCTURE DESCRIPTION: BRIDGE	

STRUCTURE SIZE: SINGLE SPAN / 8.5 m
For Culverts: Number of cells/pipes & sizes — For Bridges: Number of Spans and their lengths

U/S INVERT LEVEL (m) 22.68 — U/S OBVERT LEVEL (m)

D/S INVERT LEVEL (m) 22.68 — D/S OBVERT LEVEL (m)
For culverts give floor level. — For bridges give bed level

For Culverts
LENGTH OF CULVERT BARREL AT INVERT (m): 1.32

LENGTH OF CULVERT BARREL AT OBVERT (m): 1.32

TYPE OF LINING: Grouted stone pitching
(e.g. concrete, stones, brick, corrugated iron)

IS THERE A SURVEYED WEIR PROFILE?
If yes give details ie. Plan number and/or survey book number.Note: This section should be at the highest part of the road eg crown, kerb, hand rails guard rails whichever is higher.

WEIR WIDTH (m): 1.32 — PIER WIDTH (m):

(In direction of flow, ie. distance from u/s face to d/s face)

LOWEST POINT OF WEIR (m AHD): 26.09

HEIGHT OF GUARDRAILS:

DESCRIPTION OF ALL HAND AND GUARD RAILS AND HEIGHTS TO TOP AND UNDERSIDE OF GUARD RAILS:

PLAN NUMBER: B0670

BRIDGE OR CULVERT DETAILS:

Wingwall/Headwall details, entrance details eg. pipe flush with embankment or projecting, socket or square end, entrance rounding, levels.
For bridges, details of piers and section under bridge including abutment details. Specify Survey Book No.

CONSTRUCTION DATE OF CURRENT STRUCTURE: 1-JUL-84

HAS THE STRUCTURE BEEN UPGRADED?
If yes, explain type and date of upgrade. Include plan number and location if applicable.

ADDITIONAL COMMENTS:

Creek:	**STABLE SWAMP CREEK**
Location:	**DYSON AVENUE PEDESTRIAN BRIDGE, SUNNYBANK**

AEP (%)	DISCHARGE (m^3/s)	U/S WATER LEVEL (m AHD)	D/S WATER LEVEL (m AHD)	AFFLUX (mm)	FLOW WIDTH ABOVE STRUCTURE (m)	FLOW DEPTH ABOVE STRUCTURE (m)	VELOCITY (m/s)	
							Weir	Structure
0.05	321.2	27.64	26.64	1.00	123.2	1.55	3.3	5.5
0.2	310.7	27.67	26.65	1.02	124.9	1.57	2.8	5.6
1	161.3	27.05	25.75	1.30	68.0	0.98	2.1	4.4
2	136.3	26.74	25.53	1.20	44.2	0.64	1.7	4.3
5	108.2	26.33	25.25	1.08	36.0	0.24	1.1	4.0
10	89.5	25.97	25.03	0.94	-	-	-	3.8
20	72.8	25.70	24.82	0.88	-	-	-	3.7
50	49.9	25.28	24.48	0.80	-	-	-	3.4

Creek:	**STABLE SWAMP CREEK**
Location:	**BEENLEIGH RD, SUNNYBANK**

Immunity Rating:	50% AEP

DATE OF SURVEY: 1998	UBD REF: 200 C17
SURVEYED CROSS SECTION ID: SS750	BCC ASSET ID: Beenleigh Road
MODEL ID: SS_BEENLEIGH_RD	AMTD (m): 7102

STRUCTURE DESCRIPTION: BOX CULVERTS

STRUCTURE SIZE: 5 / 3550 x 2250
For Culverts: Number of cells/pipes & sizes For Bridges: Number of Spans and their lengths

U/S INVERT LEVEL (m) 15.66 U/S OBVERT LEVEL (m)

D/S INVERT LEVEL (m) 15.55 D/S OBVERT LEVEL (m)
For culverts give floor level. For bridges give bed level

For Culverts
LENGTH OF CULVERT BARREL AT INVERT (m): 32.56

LENGTH OF CULVERT BARREL AT OBVERT (m): 32.56

TYPE OF LINING: Grouted stone pitching
(e.g. concrete, stones, brick, corrugated iron)

IS THERE A SURVEYED WEIR PROFILE?
If yes give details ie. Plan number and/or survey book number.Note: This section should be at the highest part of the road eg crown, kerb, hand rails guard rails whichever is higher.

WEIR WIDTH (m): 32.56 PIER WIDTH (m):

(In direction of flow, ie. distance from u/s face to d/s face)

LOWEST POINT OF WEIR (m AHD): 17.57

HEIGHT OF GUARDRAILS:

DESCRIPTION OF ALL HAND AND GUARD RAILS AND HEIGHTS TO TOP AND UNDERSIDE OF GUARD RAILS:

PLAN NUMBER: B8029

BRIDGE OR CULVERT DETAILS:

Wingwall/Headwall details, entrance details eg. pipe flush with embankment or projecting, socket or square end, entrance rounding, levels.
For bridges, details of piers and section under bridge including abutment details. Specify Survey Book No.

CONSTRUCTION DATE OF CURRENT STRUCTURE:

HAS THE STRUCTURE BEEN UPGRADED?
If yes, explain type and date of upgrade. Include plan number and location if applicable.

ADDITIONAL COMMENTS:

Creek:	**STABLE SWAMP CREEK**
Location:	**BEENLEIGH RD, SUNNYBANK**

AEP (%)	DISCHARGE (m^3/s)	U/S WATER LEVEL (m AHD)	D/S WATER LEVEL (m AHD)	AFFLUX (mm)	FLOW WIDTH ABOVE STRUCTURE (m)	FLOW DEPTH ABOVE STRUCTURE (m)	VELOCITY (m/s)	
							Weir	Structure
0.05	230.2	19.15	19.16	-0.01	23.5	2.12	4.1	2.3
0.2	205.5	19.05	19.06	-0.01	23.5	1.98	4.0	2.3
1	147.6	18.90	18.79	0.11	23.5	1.65	2.7	2.2
2	132.5	18.93	18.68	0.25	24.1	1.53	2.6	2.2
5	108.2	18.82	18.54	0.28	23.8	1.36	2.2	2.1
10	99.1	18.74	18.44	0.30	23.9	1.22	1.8	2.1
20	80.8	18.49	18.34	0.15	23.8	0.98	0.7	2.0
50	57.4	18.22	18.08	0.14	-	-	-	3.0

Creek:	**STABLE SWAMP CREEK**
Location:	**BOUNDARY RD, ACACIA RIDGE**

Immunity Rating:	50% AEP

DATE OF SURVEY: 1998	UBD REF: 199 R15
SURVEYED CROSS SECTION ID: SS660	BCC ASSET ID: Boundary Road
MODEL ID: SS_BOUNDARY_RD	AMTD (m): 6180
STRUCTURE DESCRIPTION: BOX CULVERTS	

STRUCTURE SIZE: 9 / 3000 x 3000
For Culverts: Number of cells/pipes & sizes For Bridges: Number of Spans and their lengths

U/S INVERT LEVEL (m) 9.59 U/S OBVERT LEVEL (m)

D/S INVERT LEVEL (m) 9.35 D/S OBVERT LEVEL (m)
For culverts give floor level. For bridges give bed level

For Culverts
LENGTH OF CULVERT BARREL AT INVERT (m): 27.5

LENGTH OF CULVERT BARREL AT OBVERT (m): 27.5

TYPE OF LINING: Grouted stone pitching
(e.g. concrete, stones, brick, corrugated iron)

IS THERE A SURVEYED WEIR PROFILE?
If yes give details ie. Plan number and/or survey book number.Note: This section should be at the highest part of the road eg crown, kerb, hand rails guard rails whichever is higher.

WEIR WIDTH (m): 27.5 PIER WIDTH (m):

(In direction of flow, ie. distance from u/s face to d/s face)

LOWEST POINT OF WEIR (m AHD): 12.43

HEIGHT OF GUARDRAILS:

DESCRIPTION OF ALL HAND AND GUARD RAILS AND HEIGHTS TO TOP AND UNDERSIDE OF GUARD RAILS:

PLAN NUMBER: W5555

BRIDGE OR CULVERT DETAILS:

Wingwall/Headwall details, entrance details eg. pipe flush with embankment or projecting, socket or square end, entrance rounding, levels.
For bridges, details of piers and section under bridge including abutment details. Specify Survey Book No.

CONSTRUCTION DATE OF CURRENT STRUCTURE:

HAS THE STRUCTURE BEEN UPGRADED?
If yes, explain type and date of upgrade. Include plan number and location if applicable.

ADDITIONAL COMMENTS:

Creek:	**STABLE SWAMP CREEK**
Location:	**BOUNDARY RD, ACACIA RIDGE**

AEP (%)	DISCHARGE (m^3/s)	U/S WATER LEVEL (m AHD)	D/S WATER LEVEL (m AHD)	AFFLUX (mm)	FLOW WIDTH ABOVE STRUCTURE (m)	FLOW DEPTH ABOVE STRUCTURE (m)	VELOCITY (m/s)	
							Weir	Structure
0.05	392.5	13.65	12.65	1.00	36.8	1.22	4.3	2.9
0.2	373.0	13.52	12.56	0.96	37.5	1.10	3.7	2.8
1	296.7	13.31	12.36	0.95	36.8	0.91	2.9	2.5
2	263.4	13.13	12.30	0.83	37.2	0.75	3.3	2.4
5	224.9	12.89	12.12	0.77	36.8	0.50	2.6	2.3
10	206.6	12.67	11.96	0.71	37.2	0.29	2.2	2.3
20	169.7	12.31	11.84	0.47	-	-	-	2.2
50	135.6	12.08	11.62	0.46	-	-	-	1.9


Focus!

Creek:	**STABLE SWAMP CREEK**
Location:	**EDITH ST,COOPERS PLAINS**

Immunity Rating:	Less than 50% AEP

DATE OF SURVEY: 1998	UBD REF: 200 A13
SURVEYED CROSS SECTION ID: SS580	BCC ASSET ID: Edith Street
MODEL ID: SS_EDITH_ST	AMTD (m): 5515
STRUCTURE DESCRIPTION: BOX CULVERTS	

STRUCTURE SIZE: 6 / 3700 x 2750
For Culverts: Number of cells/pipes & sizes For Bridges: Number of Spans and their lengths

U/S INVERT LEVEL (m) 6.02 U/S OBVERT LEVEL (m)

D/S INVERT LEVEL (m) 5.99 D/S OBVERT LEVEL (m)
For culverts give floor level. For bridges give bed level

For Culverts
LENGTH OF CULVERT BARREL AT INVERT (m): 8.6

LENGTH OF CULVERT BARREL AT OBVERT (m): 8.6

TYPE OF LINING: Grouted stone pitching
(e.g. concrete, stones, brick, corrugated iron)

IS THERE A SURVEYED WEIR PROFILE?
If yes give details ie. Plan number and/or survey book number.Note: This section should be at the highest part of the road eg crown, kerb, hand rails guard rails whichever is higher.

WEIR WIDTH (m): 8.6 PIER WIDTH (m):

(In direction of flow, ie. distance from u/s face to d/s face)

LOWEST POINT OF WEIR (m AHD): 8.93

HEIGHT OF GUARDRAILS:

DESCRIPTION OF ALL HAND AND GUARD RAILS AND HEIGHTS TO TOP AND UNDERSIDE OF GUARD RAILS:

PLAN NUMBER: W6242

BRIDGE OR CULVERT DETAILS:

Wingwall/Headwall details, entrance details eg. pipe flush with embankment or projecting, socket or square end, entrance rounding, levels.
For bridges, details of piers and section under bridge including abutment details. Specify Survey Book No.

CONSTRUCTION DATE OF CURRENT STRUCTURE:

HAS THE STRUCTURE BEEN UPGRADED?
If yes, explain type and date of upgrade. Include plan number and location if applicable.

ADDITIONAL COMMENTS:

Creek:	**STABLE SWAMP CREEK**
Location:	**EDITH ST,COOPERS PLAINS**

AEP (%)	DISCHARGE (m^3/s)	U/S WATER LEVEL (m AHD)	D/S WATER LEVEL (m AHD)	AFFLUX (mm)	FLOW WIDTH ABOVE STRUCTURE (m)	FLOW DEPTH ABOVE STRUCTURE (m)	VELOCITY (m/s)	
							Weir	Structure
0.05	145.7	10.91	10.85	0.06	34.2	1.98	1.8	1.9
0.2	142.8	10.60	10.53	0.06	34.0	1.67	1.8	1.9
1	132.5	10.21	10.15	0.06	33.8	1.29	1.8	2.2
2	134.3	10.07	10.00	0.07	33.8	1.15	1.8	2.0
5	132.4	9.86	9.79	0.08	33.8	0.94	1.8	2.0
10	130.1	9.66	9.58	0.08	34.0	0.73	1.8	1.8
20	124.6	9.49	9.41	0.09	34.0	0.56	1.6	1.8
50	105.4	9.20	9.12	0.08	34.2	0.29	1.1	1.7

Creek:	**STABLE SWAMP CREEK**
Location:	**OUTBOUND RAILWAY BRIDGE, COOPERS PLAINS**

Immunity Rating:	1 % AEP

DATE OF SURVEY: 1998	UBD REF: 199 Q12
SURVEYED CROSS SECTION ID: SS511	BCC ASSET ID: Outbound Railway
MODEL ID: SS_OUTBOUND_RLW	AMTD (m): 5075
STRUCTURE DESCRIPTION: BRIDGE	

STRUCTURE SIZE: 2 SPANS / 15m
For Culverts: Number of cells/pipes & sizes For Bridges: Number of Spans and their lengths

U/S INVERT LEVEL (m) 4.19 U/S OBVERT LEVEL (m)

D/S INVERT LEVEL (m) 4.16 D/S OBVERT LEVEL (m)
For culverts give floor level. For bridges give bed level

For Culverts
LENGTH OF CULVERT BARREL AT INVERT (m): 3.82

LENGTH OF CULVERT BARREL AT OBVERT (m): 3.82

TYPE OF LINING: Grouted stone pitching
(e.g. concrete, stones, brick, corrugated iron)

IS THERE A SURVEYED WEIR PROFILE?
If yes give details ie. Plan number and/or survey book number.Note: This section should be at the highest part of the road eg crown, kerb, hand rails guard rails whichever is higher.

WEIR WIDTH (m): 3.82 PIER WIDTH (m):

(In direction of flow, ie. distance from u/s face to d/s face)

LOWEST POINT OF WEIR (m AHD): 10.69

HEIGHT OF GUARDRAILS:

DESCRIPTION OF ALL HAND AND GUARD RAILS AND HEIGHTS TO TOP AND UNDERSIDE OF GUARD RAILS:

PLAN NUMBER: W6242

BRIDGE OR CULVERT DETAILS:

Wingwall/Headwall details, entrance details eg. pipe flush with embankment or projecting, socket or square end, entrance rounding, levels.
For bridges, details of piers and section under bridge including abutment details. Specify Survey Book No.

CONSTRUCTION DATE OF CURRENT STRUCTURE:

HAS THE STRUCTURE BEEN UPGRADED?
If yes, explain type and date of upgrade. Include plan number and location if applicable.

ADDITIONAL COMMENTS:

Creek:	**STABLE SWAMP CREEK**
Location:	**OUTBOUND RAILWAY BRIDGE, COOPERS PLAINS**

AEP (%)	DISCHARGE (m^3/s)	U/S WATER LEVEL (m AHD)	D/S WATER LEVEL (m AHD)	AFFLUX (mm)	FLOW WIDTH ABOVE STRUCTURE (m)	FLOW DEPTH ABOVE STRUCTURE (m)	VELOCITY (m/s)	
							Weir	Structure
0.05	543.9	9.72	9.41	0.31	-	-	-	5.8
0.2	471.5	9.25	9.09	0.16	-	-	-	5.6
1	377.6	8.65	8.63	0.02	-	-	-	5.5
2	332.1	8.40	8.41	-0.01	-	-	-	7.4
5	269.0	8.14	8.12	0.02	-	-	-	6.7
10	226.5	7.95	7.92	0.03	-	-	-	6.6
20	191.6	7.76	7.71	0.05	-	-	-	2.9
50	139.7	7.44	7.40	0.04	-	-	-	2.5

Creek:	**STABLE SWAMP CREEK**
Location:	**INBOUND RAILWAY BRIDGE, COOPERS PLAINS**

Immunity Rating:	1 % AEP

DATE OF SURVEY: 1998	UBD REF: 199 Q12
SURVEYED CROSS SECTION ID: SS511	BCC ASSET ID: Inbound Railway
MODEL ID: SS_INBOUND_RLW	AMTD (m): 5075
STRUCTURE DESCRIPTION: BRIDGE	

STRUCTURE SIZE: 2 SPANS / 15m
For Culverts: Number of cells/pipes & sizes For Bridges: Number of Spans and their lengths

U/S INVERT LEVEL (m) 4.19 U/S OBVERT LEVEL (m)

D/S INVERT LEVEL (m) 4.16 D/S OBVERT LEVEL (m)
For culverts give floor level. For bridges give bed level

For Culverts
LENGTH OF CULVERT BARREL AT INVERT (m): 3.82

LENGTH OF CULVERT BARREL AT OBVERT (m): 3.82

TYPE OF LINING: Grouted stone pitching
(e.g. concrete, stones, brick, corrugated iron)

IS THERE A SURVEYED WEIR PROFILE?
If yes give details ie. Plan number and/or survey book number.Note: This section should be at the highest part of the road eg crown, kerb, hand rails guard rails whichever is higher.

WEIR WIDTH (m): 3.82 PIER WIDTH (m):

(In direction of flow, ie. distance from u/s face to d/s face)

LOWEST POINT OF WEIR (m AHD): 10.69

HEIGHT OF GUARDRAILS:

DESCRIPTION OF ALL HAND AND GUARD RAILS AND HEIGHTS TO TOP AND UNDERSIDE OF GUARD RAILS:

PLAN NUMBER: W6242

BRIDGE OR CULVERT DETAILS:

Wingwall/Headwall details, entrance details eg. pipe flush with embankment or projecting, socket or square end, entrance rounding, levels.
For bridges, details of piers and section under bridge including abutment details. Specify Survey Book No.

CONSTRUCTION DATE OF CURRENT STRUCTURE:

HAS THE STRUCTURE BEEN UPGRADED?
If yes, explain type and date of upgrade. Include plan number and location if applicable.

ADDITIONAL COMMENTS:

Creek:	**STABLE SWAMP CREEK**
Location:	**INBOUND RAILWAY BRIDGE, COOPERS PLAINS**

AEP (%)	DISCHARGE (m^3/s)	U/S WATER LEVEL (m AHD)	D/S WATER LEVEL (m AHD)	AFFLUX (mm)	FLOW WIDTH ABOVE STRUCTURE (m)	FLOW DEPTH ABOVE STRUCTURE (m)	VELOCITY (m/s)	
							Weir	Structure
0.05	543.9	9.72	9.41	0.31	-	-	-	5.8
0.2	471.5	9.25	9.09	0.16	-	-	-	5.6
1	377.6	8.65	8.63	0.02	-	-	-	5.5
2	332.1	8.40	8.41	-0.01	-	-	-	7.4
5	269.0	8.14	8.12	0.02	-	-	-	6.7
10	226.5	7.95	7.92	0.03	-	-	-	6.6
20	191.6	7.76	7.71	0.05	-	-	-	2.9
50	139.7	7.44	7.40	0.04	-	-	-	2.5

Creek: **STABLE SWAMP CREEK**	**Immunity Rating:** Less than 50 % AEP
Location: **MUSGRAVE RD BRIDGE, COOPERS PLAINS**	

DATE OF SURVEY: 1998	UBD REF: 199 P11
SURVEYED CROSS SECTION ID: SS460	BCC ASSET ID: Musgrave Road
MODEL ID: SS_MUSGRAVE_RD	AMTD (m): 4748
STRUCTURE DESCRIPTION: BOX CULVERTS	
STRUCTURE SIZE: 6 / 3620 x 3140 For Culverts: Number of cells/pipes & sizes For Bridges: Number of Spans and their lengths	
U/S INVERT LEVEL (m) 4.22	U/S OBVERT LEVEL (m)
D/S INVERT LEVEL (m) 4.2 For culverts give floor level.	D/S OBVERT LEVEL (m) For bridges give bed level
For Culverts LENGTH OF CULVERT BARREL AT INVERT (m): 11.05	
LENGTH OF CULVERT BARREL AT OBVERT (m): 11.05	
TYPE OF LINING: Grouted stone pitching (e.g. concrete, stones, brick, corrugated iron)	
IS THERE A SURVEYED WEIR PROFILE? If yes give details ie. Plan number and/or survey book number.Note: This section should be at the highest part of the road eg crown, kerb, hand rails guard rails whichever is higher.	
WEIR WIDTH (m): 11.05	PIER WIDTH (m):
(In direction of flow, ie. distance from u/s face to d/s face)	
LOWEST POINT OF WEIR (m AHD): 2.83	
HEIGHT OF GUARDRAILS:	
DESCRIPTION OF ALL HAND AND GUARD RAILS AND HEIGHTS TO TOP AND UNDERSIDE OF GUARD RAILS:	
PLAN NUMBER: W5501	
BRIDGE OR CULVERT DETAILS: Wingwall/Headwall details, entrance details eg. pipe flush with embankment or projecting, socket or square end, entrance rounding, levels. For bridges, details of piers and section under bridge including abutment details. Specify Survey Book No.	
CONSTRUCTION DATE OF CURRENT STRUCTURE:	
HAS THE STRUCTURE BEEN UPGRADED? If yes, explain type and date of upgrade. Include plan number and location if applicable.	
ADDITIONAL COMMENTS:	

Creek:	**STABLE SWAMP CREEK**
Location:	**MUSGRAVE RD BRIDGE, COOPERS PLAINS**

AEP (%)	DISCHARGE (m^3/s)	U/S WATER LEVEL (m AHD)	D/S WATER LEVEL (m AHD)	AFFLUX (mm)	FLOW WIDTH ABOVE STRUCTURE (m)	FLOW DEPTH ABOVE STRUCTURE (m)	VELOCITY (m/s)	
							Weir	Structure
0.05	216.2	9.23	9.17	0.06	43.1	6.40	1.3	1.4
0.2	213.3	8.86	8.80	0.06	15.3	6.03	1.4	1.4
1	192.4	8.43	8.37	0.06	15.3	6.68	1.3	1.4
2	177.8	8.20	8.14	0.06	43.1	5.38	1.3	1.4
5	153.6	7.86	7.79	0.06	43.4	5.03	1.3	1.6
10	131.5	7.60	7.54	0.06	15.2	5.65	1.2	1.5
20	113.7	7.37	7.31	0.06	43.5	4.54	1.1	1.5
50	87.2	7.01	6.94	0.07	43.5	4.18	1.3	2.8

Creek:	**STABLE SWAMP CREEK**
Location:	**MUSGRAVE RD BRIDGE, COOPERS PLAINS**

Immunity Rating:	Less than 50 % AEP

DATE OF SURVEY: 1998	UBD REF: 199 P11
SURVEYED CROSS SECTION ID: SS460	BCC ASSET ID: Musgrave Road
MODEL ID: SS_MUSGRAVE_RD	AMTD (m): 4748
STRUCTURE DESCRIPTION: BOX CULVERTS	

STRUCTURE SIZE: 6 / 3620 x 3140
For Culverts: Number of cells/pipes & sizes For Bridges: Number of Spans and their lengths

U/S INVERT LEVEL (m) 4.22 U/S OBVERT LEVEL (m)

D/S INVERT LEVEL (m) 4.2 D/S OBVERT LEVEL (m)
For culverts give floor level. For bridges give bed level

For Culverts
LENGTH OF CULVERT BARREL AT INVERT (m): 11.05

LENGTH OF CULVERT BARREL AT OBVERT (m): 11.05

TYPE OF LINING: Grouted stone pitching
(e.g. concrete, stones, brick, corrugated iron)

IS THERE A SURVEYED WEIR PROFILE?
If yes give details ie. Plan number and/or survey book number.Note: This section should be at the highest part of the road eg crown, kerb, hand rails guard rails whichever is higher.

WEIR WIDTH (m): 11.05 PIER WIDTH (m):

(In direction of flow, ie. distance from u/s face to d/s face)

LOWEST POINT OF WEIR (m AHD): 2.83

HEIGHT OF GUARDRAILS:

DESCRIPTION OF ALL HAND AND GUARD RAILS AND HEIGHTS TO TOP AND UNDERSIDE OF GUARD RAILS:

PLAN NUMBER: W5501

BRIDGE OR CULVERT DETAILS:

Wingwall/Headwall details, entrance details eg. pipe flush with embankment or projecting, socket or square end, entrance rounding, levels.
For bridges, details of piers and section under bridge including abutment details. Specify Survey Book No.

CONSTRUCTION DATE OF CURRENT STRUCTURE:

HAS THE STRUCTURE BEEN UPGRADED?
If yes, explain type and date of upgrade. Include plan number and location if applicable.

ADDITIONAL COMMENTS:

Creek:	**STABLE SWAMP CREEK**
Location:	**MUSGRAVE RD BRIDGE, COOPERS PLAINS**

AEP (%)	DISCHARGE (m^3/s)	U/S WATER LEVEL (m AHD)	D/S WATER LEVEL (m AHD)	AFFLUX (mm)	FLOW WIDTH ABOVE STRUCTURE (m)	FLOW DEPTH ABOVE STRUCTURE (m)	VELOCITY (m/s)	
							Weir	Structure
0.05	216.2	9.23	9.17	0.06	43.1	6.40	1.3	1.4
0.2	213.3	8.86	8.80	0.06	15.3	6.03	1.4	1.4
1	192.4	8.43	8.37	0.06	15.3	6.68	1.3	1.4
2	177.8	8.20	8.14	0.06	43.1	5.38	1.3	1.4
5	153.6	7.86	7.79	0.06	43.4	5.03	1.3	1.6
10	131.5	7.60	7.54	0.06	15.2	5.65	1.2	1.5
20	113.7	7.37	7.31	0.06	43.9	4.54	1.1	1.5
50	87.2	7.01	6.94	0.07	43.9	4.18	1.3	2.8

Creek:	**STABLE SWAMP CREEK**
Location:	**RIAWENA RD BRIDGE, SALISBURY**

Immunity Rating:	10 % AEP

DATE OF SURVEY: 1998	UBD REF: 199 N10
SURVEYED CROSS SECTION ID: SS370	BCC ASSET ID: Riawena Road
MODEL ID: SS_RIAWENA_RD	AMTD (m): 4275

STRUCTURE DESCRIPTION: BOX CULVERTS

STRUCTURE SIZE: 8 / 3850 x 3700
For Culverts: Number of cells/pipes & sizes For Bridges: Number of Spans and their lengths

U/S INVERT LEVEL (m) 3.14 U/S OBVERT LEVEL (m)

D/S INVERT LEVEL (m) 3.14 D/S OBVERT LEVEL (m)
For culverts give floor level. For bridges give bed level

For Culverts
LENGTH OF CULVERT BARREL AT INVERT (m): 34.37

LENGTH OF CULVERT BARREL AT OBVERT (m): 34.37

TYPE OF LINING: Grouted stone pitching
(e.g. concrete, stones, brick, corrugated iron)

IS THERE A SURVEYED WEIR PROFILE?
If yes give details ie. Plan number and/or survey book number.Note: This section should be at the highest part of the road eg crown, kerb, hand rails guard rails whichever is higher.

WEIR WIDTH (m): 34.37 PIER WIDTH (m):

(In direction of flow, ie. distance from u/s face to d/s face)

LOWEST POINT OF WEIR (m AHD): 6.61

HEIGHT OF GUARDRAILS:

DESCRIPTION OF ALL HAND AND GUARD RAILS AND HEIGHTS TO TOP AND UNDERSIDE OF GUARD RAILS:

PLAN NUMBER: W6214

BRIDGE OR CULVERT DETAILS:

Wingwall/Headwall details, entrance details eg. pipe flush with embankment or projecting, socket or square end, entrance rounding, levels.
For bridges, details of piers and section under bridge including abutment details. Specify Survey Book No.

CONSTRUCTION DATE OF CURRENT STRUCTURE:

HAS THE STRUCTURE BEEN UPGRADED?
If yes, explain type and date of upgrade. Include plan number and location if applicable.

ADDITIONAL COMMENTS:

Creek:	**STABLE SWAMP CREEK**
Location:	**RIAWENA RD BRIDGE, SALISBURY**

AEP (%)	DISCHARGE (m^3/s)	U/S WATER LEVEL (m AHD)	D/S WATER LEVEL (m AHD)	AFFLUX (mm)	FLOW WIDTH ABOVE STRUCTURE (m)	FLOW DEPTH ABOVE STRUCTURE (m)	VELOCITY (m/s)	
							Weir	Structure
0.05	389.778	8.34	7.76	0.58	60.7	1.78	3.72	2.662
0.2	368.169	7.98	7.43	0.55	60.9	1.37	3.76	2.518
1	329.067	7.59	7.11	0.48	60.7	1.02	3.7	2.242
2	303.067	7.4	6.94	0.46	60.6	0.83	3.14	2.085
5	273.435	7.02	6.75	0.27	60.6	0.52	0.39	1.882
10	233.156	6.77	6.58	0.19	-	-	-	1.631
20	197.613	6.59	6.42	0.17	-	-	-	1.584
50	148.145	6.29	6.11	0.18	-	-	-	1.475

Creek: **STABLE SWAMP CREEK**	**Immunity Rating:** 10 % AEP
Location: **RIAWENA RD BRIDGE, SALISBURY**	

DATE OF SURVEY: 1998	UBD REF: 199 N10
SURVEYED CROSS SECTION ID: SS370	BCC ASSET ID: Riawena Road
MODEL ID: SS_RIAWENA_RD	AMTD (m): 4275
STRUCTURE DESCRIPTION: BOX CULVERTS	
STRUCTURE SIZE: 8 / 3850 x 3700 For Culverts: Number of cells/pipes & sizes For Bridges: Number of Spans and their lengths	
U/S INVERT LEVEL (m) 3.14	U/S OBVERT LEVEL (m)
D/S INVERT LEVEL (m) 3.14 For culverts give floor level.	D/S OBVERT LEVEL (m) For bridges give bed level
For Culverts LENGTH OF CULVERT BARREL AT INVERT (m): 34.37	
LENGTH OF CULVERT BARREL AT OBVERT (m): 34.37	
TYPE OF LINING: Grouted stone pitching (e.g. concrete, stones, brick, corrugated iron)	
IS THERE A SURVEYED WEIR PROFILE? If yes give details ie. Plan number and/or survey book number.Note: This section should be at the highest part of the road eg crown, kerb, hand rails guard rails whichever is higher.	
WEIR WIDTH (m): 34.37	PIER WIDTH (m):
(In direction of flow, ie. distance from u/s face to d/s face)	
LOWEST POINT OF WEIR (m AHD): 6.61	
HEIGHT OF GUARDRAILS:	
DESCRIPTION OF ALL HAND AND GUARD RAILS AND HEIGHTS TO TOP AND UNDERSIDE OF GUARD RAILS:	
PLAN NUMBER: W6214	
BRIDGE OR CULVERT DETAILS: Wingwall/Headwall details, entrance details eg. pipe flush with embankment or projecting, socket or square end, entrance rounding, levels. For bridges, details of piers and section under bridge including abutment details. Specify Survey Book No.	
CONSTRUCTION DATE OF CURRENT STRUCTURE:	
HAS THE STRUCTURE BEEN UPGRADED? If yes, explain type and date of upgrade. Include plan number and location if applicable.	
ADDITIONAL COMMENTS:	

Creek:	STABLE SWAMP CREEK
Location:	RIAWENA RD BRIDGE, SALISBURY

AEP (%)	DISCHARGE (m^3/s)	U/S WATER LEVEL (m AHD)	D/S WATER LEVEL (m AHD)	AFFLUX (mm)	FLOW WIDTH ABOVE STRUCTURE (m)	FLOW DEPTH ABOVE STRUCTURE (m)	VELOCITY (m/s)	
							Weir	Structure
0.05	389.8	8.34	7.76	0.58	60.7	1.78	3.7	2.7
0.2	368.2	7.98	7.43	0.55	60.9	1.37	3.8	2.5
1	329.1	7.59	7.11	0.48	60.7	1.02	3.7	2.2
2	303.1	7.40	6.94	0.46	60.6	0.83	3.1	2.1
5	273.4	7.02	6.75	0.27	60.6	0.52	0.4	1.9
10	233.2	6.77	6.58	0.19	-	-	-	1.6
20	197.6	6.59	6.42	0.17	-	-	-	1.6
50	148.1	6.29	6.11	0.18	-	-	-	1.5

NO PICTURE

Creek: **STABLE SWAMP CREEK**	**Immunity Rating:** Less than 50 % AEP
Location: **BEAUDESERT RD BRIDGE, ROCKLEA**	

DATE OF SURVEY: 1998	UBD REF: 199 M9
SURVEYED CROSS SECTION ID: SS280	BCC ASSET ID: Beaudesert Road
MODEL ID: SS_BEAUDESERT_RD	AMTD (m): 3725
STRUCTURE DESCRIPTION: BOX CULVERTS	
STRUCTURE SIZE: 8 / 2430 x 2480 For Culverts: Number of cells/pipes & sizes For Bridges: Number of Spans and their lengths	
U/S INVERT LEVEL (m) 2.57 D/S INVERT LEVEL (m) 2.41 For culverts give floor level.	U/S OBVERT LEVEL (m) D/S OBVERT LEVEL (m) For bridges give bed level
For Culverts LENGTH OF CULVERT BARREL AT INVERT (m): 26.35 LENGTH OF CULVERT BARREL AT OBVERT (m): 26.35 TYPE OF LINING: Grouted stone pitching (e.g. concrete, stones, brick, corrugated iron)	
IS THERE A SURVEYED WEIR PROFILE? If yes give details ie. Plan number and/or survey book number.Note: This section should be at the highest part of the road eg crown, kerb, hand rails guard rails whichever is higher.	
WEIR WIDTH (m): 26.35 (In direction of flow, ie. distance from u/s face to d/s face) LOWEST POINT OF WEIR (m AHD): 5.25	PIER WIDTH (m):
HEIGHT OF GUARDRAILS: DESCRIPTION OF ALL HAND AND GUARD RAILS AND HEIGHTS TO TOP AND UNDERSIDE OF GUARD RAILS:	
PLAN NUMBER: MRD153850 BRIDGE OR CULVERT DETAILS: Wingwall/Headwall details, entrance details eg. pipe flush with embankment or projecting, socket or square end, entrance rounding, levels. For bridges, details of piers and section under bridge including abutment details. Specify Survey Book No.	
CONSTRUCTION DATE OF CURRENT STRUCTURE: HAS THE STRUCTURE BEEN UPGRADED? If yes, explain type and date of upgrade. Include plan number and location if applicable. ADDITIONAL COMMENTS:	

Creek:	**STABLE SWAMP CREEK**
Location:	**BEAUDESERT RD BRIDGE, ROCKLEA**

AEP (%)	DISCHARGE (m^3/s)	U/S WATER LEVEL (m AHD)	D/S WATER LEVEL (m AHD)	AFFLUX (mm)	FLOW WIDTH ABOVE STRUCTURE (m)	FLOW DEPTH ABOVE STRUCTURE (m)	VELOCITY (m/s)	
							Weir	Structure
0.05	*	7.39	7.31	0.08	*	2.15	*	2.2
0.2	*	6.96	6.82	0.14	*	1.73	*	2.2
1	*	6.57	6.38	0.19	*	1.31	*	2.1
2	*	6.41	6.22	0.19	*	1.17	*	2.1
5	*	6.23	6.04	0.19	*	1.00	*	2.1
10	*	6.09	5.92	0.18	*	0.85	*	2.0
20	*	5.96	5.80	0.16	*	0.71	*	2.0
50	*	5.67	5.52	0.15	*	0.42	*	1.9

Creek: **STABLE SWAMP CREEK**	**Immunity Rating:** Less than 50 % AEP
Location: **BEAUDESERT RD BRIDGE, ROCKLEA**	

DATE OF SURVEY: 1998	UBD REF: 199 M9
SURVEYED CROSS SECTION ID: SS280	BCC ASSET ID: Beaudesert Road
MODEL ID: SS_BEAUDESERT_RD	AMTD (m): 3725
STRUCTURE DESCRIPTION: BOX CULVERTS	
STRUCTURE SIZE: 4 / 2430 x 3230 For Culverts: Number of cells/pipes & sizes For Bridges: Number of Spans and their lengths	
U/S INVERT LEVEL (m) 2.57 D/S INVERT LEVEL (m) 2.41 For culverts give floor level.	U/S OBVERT LEVEL (m) D/S OBVERT LEVEL (m) For bridges give bed level
For Culverts LENGTH OF CULVERT BARREL AT INVERT (m): 26.35 LENGTH OF CULVERT BARREL AT OBVERT (m): 26.35 TYPE OF LINING: Grouted stone pitching (e.g. concrete, stones, brick, corrugated iron)	
IS THERE A SURVEYED WEIR PROFILE? If yes give details ie. Plan number and/or survey book number.Note: This section should be at the highest part of the road eg crown, kerb, hand rails guard rails whichever is higher.	
WEIR WIDTH (m): 26.35 (In direction of flow, ie. distance from u/s face to d/s face) LOWEST POINT OF WEIR (m AHD): 5.25	PIER WIDTH (m):
HEIGHT OF GUARDRAILS: DESCRIPTION OF ALL HAND AND GUARD RAILS AND HEIGHTS TO TOP AND UNDERSIDE OF GUARD RAILS:	
PLAN NUMBER: MRD153850 BRIDGE OR CULVERT DETAILS: Wingwall/Headwall details, entrance details eg. pipe flush with embankment or projecting, socket or square end, entrance rounding, levels. For bridges, details of piers and section under bridge including abutment details. Specify Survey Book No.	
CONSTRUCTION DATE OF CURRENT STRUCTURE: HAS THE STRUCTURE BEEN UPGRADED? If yes, explain type and date of upgrade. Include plan number and location if applicable. ADDITIONAL COMMENTS:	

Creek:	**STABLE SWAMP CREEK**
Location:	**BEAUDESERT RD BRIDGE, ROCKLEA**

AEP (%)	DISCHARGE (m^3/s)	U/S WATER LEVEL (m AHD)	D/S WATER LEVEL (m AHD)	AFFLUX (mm)	FLOW WIDTH ABOVE STRUCTURE (m)	FLOW DEPTH ABOVE STRUCTURE (m)	VELOCITY (m/s)	
							Weir	Structure
0.05	*	7.39	7.31	0.08	*	2.15	*	2.2
0.2	*	6.96	6.82	0.14	*	1.73	*	2.2
1	*	6.57	6.38	0.19	*	1.31	*	2.1
2	*	6.41	6.22	0.19	*	1.17	*	2.1
5	*	6.23	6.04	0.19	*	1.00	*	2.1
10	*	6.09	5.92	0.18	*	0.85	*	2.0
20	*	5.96	5.80	0.16	*	0.71	*	2.0
50	*	5.67	5.52	0.15	*	0.42	*	1.9

Creek:	**STABLE SWAMP CREEK**
Location:	**COLVIN ST PEDESTRIAN BRIDGE, ROCKLEA**

Immunity Rating:	Less than 50 % AEP

DATE OF SURVEY: 1998	UBD REF: 199 M8
SURVEYED CROSS SECTION ID: SS262	BCC ASSET ID: Colvin Street
MODEL ID: SS_COLVIN_ST	AMTD (m): 3590
STRUCTURE DESCRIPTION: BRIDGE	
STRUCTURE SIZE: SINGLE SPAN / 20m For Culverts: Number of cells/pipes & sizes — For Bridges: Number of Spans and their lengths	
U/S INVERT LEVEL (m) 0.71	U/S OBVERT LEVEL (m)
D/S INVERT LEVEL (m) 0.71 For culverts give floor level.	D/S OBVERT LEVEL (m) For bridges give bed level
For Culverts LENGTH OF CULVERT BARREL AT INVERT (m): 3.5	
LENGTH OF CULVERT BARREL AT OBVERT (m): 3.5	
TYPE OF LINING: Grouted stone pitching (e.g. concrete, stones, brick, corrugated iron)	
IS THERE A SURVEYED WEIR PROFILE? If yes give details ie. Plan number and/or survey book number.Note: This section should be at the highest part of the road eg crown, kerb, hand rails guard rails whichever is higher.	
WEIR WIDTH (m): 3.5	PIER WIDTH (m):
(In direction of flow, ie. distance from u/s face to d/s face)	
LOWEST POINT OF WEIR (m AHD): 4.765	
HEIGHT OF GUARDRAILS:	
DESCRIPTION OF ALL HAND AND GUARD RAILS AND HEIGHTS TO TOP AND UNDERSIDE OF GUARD RAILS:	
PLAN NUMBER: B9857	
BRIDGE OR CULVERT DETAILS: Wingwall/Headwall details, entrance details eg. pipe flush with embankment or projecting, socket or square end, entrance rounding, levels. For bridges, details of piers and section under bridge including abutment details. Specify Survey Book No.	
CONSTRUCTION DATE OF CURRENT STRUCTURE:	
HAS THE STRUCTURE BEEN UPGRADED? If yes, explain type and date of upgrade. Include plan number and location if applicable.	
ADDITIONAL COMMENTS:	

Creek:	**STABLE SWAMP CREEK**
Location:	**COLVIN ST PEDESTRIAN BRIDGE, ROCKLEA**

AEP (%)	DISCHARGE (m^3/s)	U/S WATER LEVEL (m AHD)	D/S WATER LEVEL (m AHD)	AFFLUX (mm)	FLOW WIDTH ABOVE STRUCTURE (m)	FLOW DEPTH ABOVE STRUCTURE (m)	VELOCITY (m/s)	
							Weir	Structure
0.05	-	7.17	7.17	0	-	-	-	2.51
0.2	-	6.6	6.6	0	-	-	-	2.56
1	-	6.04	6.04	0	-	-	-	2.57
2	-	5.81	5.81	0	-	-	-	2.56
5	-	5.56	5.56	0	-	-	-	2.55
10	-	5.38	5.38	0	-	-	-	2.54
20	-	5.22	5.22	0	-	-	-	2.5
50	-	4.96	4.95	0.01	-	-	-	2.47

Creek:	**STABLE SWAMP CREEK**
Location:	**FRENEY ST PIPE BRIDGE, ROCKLEA**

Immunity Rating:	Less than 50 % AEP

DATE OF SURVEY: 1998	UBD REF: 199 K7
SURVEYED CROSS SECTION ID: SS235	BCC ASSET ID: Freney Street
MODEL ID: SS_FRENEY_ST	AMTD (m): 3230
STRUCTURE DESCRIPTION: PIPE BRIDGE	
STRUCTURE SIZE: 2 SPANS / 19.5m For Culverts: Number of cells/pipes & sizes For Bridges: Number of Spans and their lengths	
U/S INVERT LEVEL (m) 0.86	U/S OBVERT LEVEL (m)
D/S INVERT LEVEL (m) 0.86 For culverts give floor level.	D/S OBVERT LEVEL (m) For bridges give bed level
For Culverts LENGTH OF CULVERT BARREL AT INVERT (m): 1	
LENGTH OF CULVERT BARREL AT OBVERT (m): 1	
TYPE OF LINING: Grouted stone pitching (e.g. concrete, stones, brick, corrugated iron)	
IS THERE A SURVEYED WEIR PROFILE? If yes give details ie. Plan number and/or survey book number.Note: This section should be at the highest part of the road eg crown, kerb, hand rails guard rails whichever is higher.	
WEIR WIDTH (m): 1	PIER WIDTH (m):
(In direction of flow, ie. distance from u/s face to d/s face)	
LOWEST POINT OF WEIR (m AHD): 3.46	
HEIGHT OF GUARDRAILS:	
DESCRIPTION OF ALL HAND AND GUARD RAILS AND HEIGHTS TO TOP AND UNDERSIDE OF GUARD RAILS:	
PLAN NUMBER:	
BRIDGE OR CULVERT DETAILS: Wingwall/Headwall details, entrance details eg. pipe flush with embankment or projecting, socket or square end, entrance rounding, levels. For bridges, details of piers and section under bridge including abutment details. Specify Survey Book No.	
CONSTRUCTION DATE OF CURRENT STRUCTURE:	
HAS THE STRUCTURE BEEN UPGRADED? If yes, explain type and date of upgrade. Include plan number and location if applicable.	
ADDITIONAL COMMENTS:	

Creek:	**STABLE SWAMP CREEK**
Location:	**FRENEY ST PIPE BRIDGE, ROCKLEA**

AEP (%)	DISCHARGE (m^3/s)	U/S WATER LEVEL (m AHD)	D/S WATER LEVEL (m AHD)	AFFLUX (mm)	FLOW WIDTH ABOVE STRUCTURE (m)	FLOW DEPTH ABOVE STRUCTURE (m)	VELOCITY (m/s)	
							Weir	Structure
0.05	-	7.17	7.17	0	-	-	-	2.5
0.2	-	6.60	6.60	0	-	-	-	2.6
1	-	6.04	6.04	0	-	-	-	2.6
2	-	5.81	5.81	0	-	-	-	2.6
5	-	5.56	5.56	0	-	-	-	2.6
10	-	5.38	5.38	0	-	-	-	2.5
20	-	5.22	5.22	0	-	-	-	2.5
50	-	4.96	4.95	0.01	-	-	-	2.5

Creek: **STABLE SWAMP CREEK**	**Immunity Rating:** Less than 50 % AEP
Location: **FRENEY ST PEDESTRIAN BRIDGE, ROCKLEA**	

DATE OF SURVEY: 1998	UBD REF: 199 K7
SURVEYED CROSS SECTION ID: SS235	BCC ASSET ID: Freney Street
MODEL ID: SS_FRENEY_ST	AMTD (m): 3160
STRUCTURE DESCRIPTION: PEDESTRIAN BRIDGE	
STRUCTURE SIZE: 2 SPANS / 19.5m For Culverts: Number of cells/pipes & sizes For Bridges: Number of Spans and their lengths	
U/S INVERT LEVEL (m) 0.86	U/S OBVERT LEVEL (m)
D/S INVERT LEVEL (m) 0.86 For culverts give floor level.	D/S OBVERT LEVEL (m) For bridges give bed level
For Culverts LENGTH OF CULVERT BARREL AT INVERT (m): 1	
LENGTH OF CULVERT BARREL AT OBVERT (m): 1	
TYPE OF LINING: Grouted stone pitching (e.g. concrete, stones, brick, corrugated iron)	
IS THERE A SURVEYED WEIR PROFILE? If yes give details ie. Plan number and/or survey book number.Note: This section should be at the highest part of the road eg crown, kerb, hand rails guard rails whichever is higher.	
WEIR WIDTH (m): 1	PIER WIDTH (m):
(In direction of flow, ie. distance from u/s face to d/s face)	
LOWEST POINT OF WEIR (m AHD): 3.46	
HEIGHT OF GUARDRAILS:	
DESCRIPTION OF ALL HAND AND GUARD RAILS AND HEIGHTS TO TOP AND UNDERSIDE OF GUARD RAILS:	
PLAN NUMBER:	
BRIDGE OR CULVERT DETAILS: Wingwall/Headwall details, entrance details eg. pipe flush with embankment or projecting, socket or square end, entrance rounding, levels. For bridges, details of piers and section under bridge including abutment details. Specify Survey Book No.	
CONSTRUCTION DATE OF CURRENT STRUCTURE:	
HAS THE STRUCTURE BEEN UPGRADED? If yes, explain type and date of upgrade. Include plan number and location if applicable.	
ADDITIONAL COMMENTS:	

Creek:	**STABLE SWAMP CREEK**
Location:	**FRENEY ST PEDESTRIAN BRIDGE, ROCKLEA**

AEP (%)	DISCHARGE (m^3/s)	U/S WATER LEVEL (m AHD)	D/S WATER LEVEL (m AHD)	AFFLUX (mm)	FLOW WIDTH ABOVE STRUCTURE (m)	FLOW DEPTH ABOVE STRUCTURE (m)	VELOCITY (m/s)	
							Weir	Structure
0.05	-	7.12	7.12	0	-	-	-	0.7
0.2	-	6.54	6.54	0	-	-	-	0.7
1	-	5.96	5.96	0	-	-	-	0.6
2	-	5.70	5.70	0	-	-	-	0.5
5	-	5.41	5.41	0	-	-	-	0.5
10	-	5.20	5.20	0	-	-	-	0.5
20	-	5.01	5.01	0	-	-	-	0.6
50	-	4.69	4.68	0.01	-	-	-	0.7

Creek: **STABLE SWAMP CREEK**	**Immunity Rating:** Less than 50 % AEP
Location: **MARSHALL RD BRIDGE, ROCKLEA**	

DATE OF SURVEY: 1998	UBD REF: 199 I9
SURVEYED CROSS SECTION ID: SS180	BCC ASSET ID: Marshall Road
MODEL ID: SS_MARSHALL_RD	AMTD (m): 2345
STRUCTURE DESCRIPTION: BOX CULVERTS	
STRUCTURE SIZE: 5 / 2650 x 1990 For Culverts: Number of cells/pipes & sizes For Bridges: Number of Spans and their lengths	
U/S INVERT LEVEL (m) 0.24	U/S OBVERT LEVEL (m)
D/S INVERT LEVEL (m) 0.23 For culverts give floor level.	D/S OBVERT LEVEL (m) For bridges give bed level
For Culverts LENGTH OF CULVERT BARREL AT INVERT (m): 14.7	
LENGTH OF CULVERT BARREL AT OBVERT (m): 14.7	
TYPE OF LINING: Grouted stone pitching (e.g. concrete, stones, brick, corrugated iron)	
IS THERE A SURVEYED WEIR PROFILE? If yes give details ie. Plan number and/or survey book number.Note: This section should be at the highest part of the road eg crown, kerb, hand rails guard rails whichever is higher.	
WEIR WIDTH (m): 14.7	PIER WIDTH (m):
(In direction of flow, ie. distance from u/s face to d/s face)	
LOWEST POINT OF WEIR (m AHD): 2.92	
HEIGHT OF GUARDRAILS:	
DESCRIPTION OF ALL HAND AND GUARD RAILS AND HEIGHTS TO TOP AND UNDERSIDE OF GUARD RAILS:	
PLAN NUMBER: W8217	
BRIDGE OR CULVERT DETAILS: Wingwall/Headwall details, entrance details eg. pipe flush with embankment or projecting, socket or square end, entrance rounding, levels. For bridges, details of piers and section under bridge including abutment details. Specify Survey Book No.	
CONSTRUCTION DATE OF CURRENT STRUCTURE:	
HAS THE STRUCTURE BEEN UPGRADED? If yes, explain type and date of upgrade. Include plan number and location if applicable.	
ADDITIONAL COMMENTS:	

Creek:	**STABLE SWAMP CREEK**
Location:	**MARSHALL RD BRIDGE, ROCKLEA**

AEP (%)	DISCHARGE (m^3/s)	U/S WATER LEVEL (m AHD)	D/S WATER LEVEL (m AHD)	AFFLUX (mm)	FLOW WIDTH ABOVE STRUCTURE (m)	FLOW DEPTH ABOVE STRUCTURE (m)	VELOCITY (m/s)	
							Weir	Structure
0.05	73.6	6.99	6.93	0.05	44.6	3.94	1.3	1.7
0.2	71.2	6.36	6.31	0.05	11.6	4.17	1.2	1.5
1	67.2	5.73	5.67	0.06	11.6	3.73	1.2	1.6
2	64.8	5.44	5.39	0.06	11.4	3.53	1.2	1.5
5	14.9	5.09	5.03	0.06	11.5	3.31	1.1	1.7
10	56.1	4.86	4.80	0.06	21.7	1.88	1.2	1.8
20	52.0	4.65	4.59	0.06	20.6	1.76	1.2	1.7
50	45.0	4.31	4.25	0.06	11.4	2.69	1.2	1.7

Creek:	**STABLE SWAMP CREEK**
Location:	**IPSWICH MWY BRIDGE, ROCKLEA**

Immunity Rating:	1 % AEP

DATE OF SURVEY: 1998	UBD REF: 199 H8
SURVEYED CROSS SECTION ID: SS130	BCC ASSET ID: Ipswich Motorway
MODEL ID: SS_IPSWICH_MWY	AMTD (m): 2100

STRUCTURE DESCRIPTION: PIPE CULVERTS

STRUCTURE SIZE: 3 / 7250 diameter

For Culverts: Number of cells/pipes & sizes For Bridges: Number of Spans and their lengths

U/S INVERT LEVEL (m) -0.53 U/S OBVERT LEVEL (m)

D/S INVERT LEVEL (m) -0.53 D/S OBVERT LEVEL (m)

For culverts give floor level. For bridges give bed level

For Culverts

LENGTH OF CULVERT BARREL AT INVERT (m): 107

LENGTH OF CULVERT BARREL AT OBVERT (m): 107

TYPE OF LINING: Grouted stone pitching

(e.g. concrete, stones, brick, corrugated iron)

IS THERE A SURVEYED WEIR PROFILE?

If yes give details ie. Plan number and/or survey book number.Note: This section should be at the highest part of the road eg crown, kerb, hand rails guard rails whichever is higher.

WEIR WIDTH (m): 107 PIER WIDTH (m):

(In direction of flow, ie. distance from u/s face to d/s face)

LOWEST POINT OF WEIR (m AHD): 5.79

HEIGHT OF GUARDRAILS:

DESCRIPTION OF ALL HAND AND GUARD RAILS AND HEIGHTS TO TOP AND UNDERSIDE OF GUARD RAILS:

PLAN NUMBER: MRD219229

BRIDGE OR CULVERT DETAILS:

Wingwall/Headwall details, entrance details eg. pipe flush with embankment or projecting, socket or square end, entrance rounding, levels.
For bridges, details of piers and section under bridge including abutment details. Specify Survey Book No.

CONSTRUCTION DATE OF CURRENT STRUCTURE:

HAS THE STRUCTURE BEEN UPGRADED?

If yes, explain type and date of upgrade. Include plan number and location if applicable.

ADDITIONAL COMMENTS:

Creek:	**STABLE SWAMP CREEK**
Location:	**IPSWICH MWY BRIDGE, ROCKLEA**

AEP (%)	DISCHARGE (m^3/s)	U/S WATER LEVEL (m AHD)	D/S WATER LEVEL (m AHD)	AFFLUX (mm)	FLOW WIDTH ABOVE STRUCTURE (m)	FLOW DEPTH ABOVE STRUCTURE (m)	VELOCITY (m/s)	
							Weir	Structure
0.05	535.3	6.84	6.12	0.72	44.8	1.06	-	4.3
0.2	446.7	6.27	5.80	0.46	45.2	0.48	-	3.6
1	345.1	5.64	5.38	0.26	-	-	-	2.8
2	299.1	5.36	5.16	0.19	-	-	-	2.5
5	255.8	4.99	4.82	0.17	-	-	-	2.2
10	220.5	4.77	4.63	0.13	-	-	-	1.9
20	188.3	4.55	4.45	0.10	-	-	-	1.7
50	141.3	4.21	4.15	0.06	-	-	-	1.3

Creek:	**SHELLEYS CREEK**
Location:	**FORESTLEA PLACE, SUNNYBANK HILLS**

Immunity Rating:	Less than 50 % AEP

DATE OF SURVEY: 1998	UBD REF: 220 G10
SURVEYED CROSS SECTION ID: SS1330	BCC ASSET ID: Forestlea Place
MODEL ID: SH_FORESTELEA_PL	AMTD (m): 11650

STRUCTURE DESCRIPTION: PIPE CULVERTS

STRUCTURE SIZE: 1 / 450 diameter
For Culverts: Number of cells/pipes & sizes For Bridges: Number of Spans and their lengths

U/S INVERT LEVEL (m): 63.02 U/S OBVERT LEVEL (m)

D/S INVERT LEVEL (m): 62.92 D/S OBVERT LEVEL (m)
For culverts give floor level. For bridges give bed level

For Culverts
LENGTH OF CULVERT BARREL AT INVERT (m): 2.7

LENGTH OF CULVERT BARREL AT OBVERT (m): 2.7

TYPE OF LINING: Grouted stone pitching
(e.g. concrete, stones, brick, corrugated iron)

IS THERE A SURVEYED WEIR PROFILE?
If yes give details ie. Plan number and/or survey book number.Note: This section should be at the highest part of the road eg crown, kerb, hand rails guard rails whichever is higher.

WEIR WIDTH (m): 2.7 PIER WIDTH (m):

(In direction of flow, ie. distance from u/s face to d/s face)

LOWEST POINT OF WEIR (m AHD): 64.56

HEIGHT OF GUARDRAILS:

DESCRIPTION OF ALL HAND AND GUARD RAILS AND HEIGHTS TO TOP AND UNDERSIDE OF GUARD RAILS:

PLAN NUMBER: W5501/111A

BRIDGE OR CULVERT DETAILS:

Wingwall/Headwall details, entrance details eg. pipe flush with embankment or projecting, socket or square end, entrance rounding, levels.
For bridges, details of piers and section under bridge including abutment details. Specify Survey Book No.

CONSTRUCTION DATE OF CURRENT STRUCTURE:

HAS THE STRUCTURE BEEN UPGRADED?
If yes, explain type and date of upgrade. Include plan number and location if applicable.

ADDITIONAL COMMENTS:

CREEK	**SHELLEYS CREEK**
LOCATION	**FORESTLEA PL, SUNNYBANK HILLS**

AEP (%)	DISCHARGE (m^3/s)	U/S WATER LEVEL (m AHD)	D/S WATER LEVEL (m AHD)	AFFLUX (mm)	FLOW WIDTH ABOVE STRUCTURE (m)	FLOW DEPTH ABOVE STRUCTURE (m)	VELOCITY (m/s)	
							Weir	Structure
0.05	26.8	65.19	64.37	0.81	44.9	0.63	1.9	4.2
0.2	30.6	65.23	64.38	0.85	45.5	0.67	2.0	4.3
1	19.8	65.09	64.13	0.97	43.6	0.53	1.7	4.1
2	17.0	65.05	64.04	1.01	43.1	0.49	1.7	4.0
5	13.8	65.00	63.94	1.07	42.2	0.44	1.6	4.0
10	11.9	64.97	63.86	1.10	41.6	0.41	1.5	3.9
20	10.1	64.93	63.79	1.14	40.9	0.37	1.4	3.9
50	7.4	64.88	63.67	1.21	39.5	0.32	1.3	3.8

NO PICTURES

Creek:	**SHELLEYS CREEK**
Location:	**HELLAWELL RD, SUNNYBANK HILLS**

Immunity Rating:	10 % AEP

DATE OF SURVEY: 1998	UBD REF: 220 H9
SURVEYED CROSS SECTION ID: SS1290	BCC ASSET ID: Hellawell Rd Culv
MODEL ID: SH_HELLAWELL_RD	AMTD (m): 11250

STRUCTURE DESCRIPTION: BOX CULVERTS

STRUCTURE SIZE: 3 / 3050 x 1850
For Culverts: Number of cells/pipes & sizes For Bridges: Number of Spans and their lengths

U/S INVERT LEVEL (m): 57.73 U/S OBVERT LEVEL (m)

D/S INVERT LEVEL (m): 57.63 D/S OBVERT LEVEL (m)
For culverts give floor level. For bridges give bed level

For Culverts
LENGTH OF CULVERT BARREL AT INVERT (m): 19.7

LENGTH OF CULVERT BARREL AT OBVERT (m): 19.7

TYPE OF LINING: Grouted stone pitching
(e.g. concrete, stones, brick, corrugated iron)

IS THERE A SURVEYED WEIR PROFILE?
If yes give details ie. Plan number and/or survey book number.Note: This section should be at the highest part of the road eg crown, kerb, hand rails guard rails whichever is higher.

WEIR WIDTH (m): 19.7 PIER WIDTH (m):

(In direction of flow, ie. distance from u/s face to d/s face)

LOWEST POINT OF WEIR (m AHD): 60.01

HEIGHT OF GUARDRAILS:

DESCRIPTION OF ALL HAND AND GUARD RAILS AND HEIGHTS TO TOP AND UNDERSIDE OF GUARD RAILS:

PLAN NUMBER: W6626

BRIDGE OR CULVERT DETAILS:

Wingwall/Headwall details, entrance details eg. pipe flush with embankment or projecting, socket or square end, entrance rounding, levels.
For bridges, details of piers and section under bridge including abutment details. Specify Survey Book No.

CONSTRUCTION DATE OF CURRENT STRUCTURE:

HAS THE STRUCTURE BEEN UPGRADED?
If yes, explain type and date of upgrade. Include plan number and location if applicable.

ADDITIONAL COMMENTS:

CREEK	**SHELLEYS CREEK**
LOCATION	**HELLAWELL RD, SUNNYBANK HILLS**

AEP (%)	DISCHARGE (m^3/s)	U/S WATER LEVEL (m AHD)	D/S WATER LEVEL (m AHD)	AFFLUX (mm)	FLOW WIDTH ABOVE STRUCTURE (m)	FLOW DEPTH ABOVE STRUCTURE (m)	VELOCITY (m/s)	
							Weir	Structure
0.05	81.6	61.21	60.75	0.46	50.8	1.20	3.4	3.0
0.2	75.8	61.10	60.65	0.45	38.4	1.09	2.2	3.0
1	53.1	60.65	60.29	0.36	24.8	0.64	1.6	2.7
2	45.6	60.44	60.13	0.31	18.9	0.43	1.3	2.5
5	36.8	60.16	59.92	0.23	6.4	0.15	0.8	2.2
10	31.4	59.93	59.78	0.16	-	-	-	1.9
20	26.8	59.74	59.64	0.10	-	-	-	1.6
50	18.6	59.45	59.37	0.07	-	-	-	1.4

Creek:	**SHELLEYS CREEK**
Location:	**BASIN CULVERT, SUNNYBANK HILLS**

Immunity Rating:	Less than 50 % AEP

DATE OF SURVEY: 1998	UBD REF: 220 H7
SURVEYED CROSS SECTION ID: SS1250	BCC ASSET ID: basin_culv
MODEL ID: SH_HELLAWELL_RD	AMTD (m): 10980

STRUCTURE DESCRIPTION: BOX CULVERTS

STRUCTURE SIZE: 1 / 2400 x 1200
For Culverts: Number of cells/pipes & sizes For Bridges: Number of Spans and their lengths

U/S INVERT LEVEL (m): 55.76 U/S OBVERT LEVEL (m)

D/S INVERT LEVEL (m): 55.71 D/S OBVERT LEVEL (m)
For culverts give floor level. For bridges give bed level

For Culverts
LENGTH OF CULVERT BARREL AT INVERT (m): 6

LENGTH OF CULVERT BARREL AT OBVERT (m): 6

TYPE OF LINING: Grouted stone pitching
(e.g. concrete, stones, brick, corrugated iron)

IS THERE A SURVEYED WEIR PROFILE?
If yes give details ie. Plan number and/or survey book number.Note: This section should be at the highest part of the road eg crown, kerb, hand rails guard rails whichever is higher.

WEIR WIDTH (m): 6 PIER WIDTH (m):

(In direction of flow, ie. distance from u/s face to d/s face)

LOWEST POINT OF WEIR (m AHD): 58.7

HEIGHT OF GUARDRAILS:

DESCRIPTION OF ALL HAND AND GUARD RAILS AND HEIGHTS TO TOP AND UNDERSIDE OF GUARD RAILS:

PLAN NUMBER:

BRIDGE OR CULVERT DETAILS:

Wingwall/Headwall details, entrance details eg. pipe flush with embankment or projecting, socket or square end, entrance rounding, levels.
For bridges, details of piers and section under bridge including abutment details. Specify Survey Book No.

CONSTRUCTION DATE OF CURRENT STRUCTURE:

HAS THE STRUCTURE BEEN UPGRADED?
If yes, explain type and date of upgrade. Include plan number and location if applicable.

ADDITIONAL COMMENTS:

CREEK	**SHELLEYS CREEK**
LOCATION	**BASIN CULVERT, SUNNYBANK HILLS**

AEP (%)	DISCHARGE (m^3/s)	U/S WATER LEVEL (m AHD)	D/S WATER LEVEL (m AHD)	AFFLUX (mm)	FLOW WIDTH ABOVE STRUCTURE (m)	FLOW DEPTH ABOVE STRUCTURE (m)	VELOCITY (m/s)	
							Weir	Structure
0.05	109.3	59.65	57.07	2.58	74.9	0.95	2.3	5.0
0.2	98.1	59.58	56.97	2.61	74.8	0.88	2.2	5.0
1	69.4	59.38	56.68	2.70	74.5	0.68	2.0	4.8
2	59.5	59.30	56.57	2.73	74.4	0.60	1.9	4.7
5	48.0	59.20	56.44	2.77	74.3	0.50	1.7	4.6
10	40.8	59.14	56.35	2.79	74.2	0.44	1.6	4.5
20	34.9	59.08	56.26	2.81	74.1	0.38	1.5	4.5
50	24.6	58.95	56.11	2.85	72.9	0.25	1.2	4.3

NO PICTURES

Creek:	**SHELLEYS CREEK**
Location:	**KINGMAN ST FOOTBRIDGE, SUNNYBANK HILLS**

Immunity Rating:	20 % AEP

DATE OF SURVEY: 1998	UBD REF: 220 I6
SURVEYED CROSS SECTION ID: SS1204	BCC ASSET ID: Kingman St Footbridge
MODEL ID: SH_KINGSMAN_ST	AMTD (m): 10680

STRUCTURE DESCRIPTION: BRIDGE

STRUCTURE SIZE: 2 SPANS / 15.5m
For Culverts: Number of cells/pipes & sizes For Bridges: Number of Spans and their lengths

U/S INVERT LEVEL (m): 49.3 U/S OBVERT LEVEL (m)

D/S INVERT LEVEL (m): 49.25 D/S OBVERT LEVEL (m)
For culverts give floor level. For bridges give bed level

For Culverts
LENGTH OF CULVERT BARREL AT INVERT (m): 2.62

LENGTH OF CULVERT BARREL AT OBVERT (m): 2.62

TYPE OF LINING: Grouted stone pitching
(e.g. concrete, stones, brick, corrugated iron)

IS THERE A SURVEYED WEIR PROFILE?
If yes give details ie. Plan number and/or survey book number.Note: This section should be at the highest part of the road eg crown, kerb, hand rails guard rails whichever is higher.

WEIR WIDTH (m): 2.62 PIER WIDTH (m):

(In direction of flow, ie. distance from u/s face to d/s face)

LOWEST POINT OF WEIR (m AHD): 51.7

HEIGHT OF GUARDRAILS:

DESCRIPTION OF ALL HAND AND GUARD RAILS AND HEIGHTS TO TOP AND UNDERSIDE OF GUARD RAILS:

PLAN NUMBER: B1200

BRIDGE OR CULVERT DETAILS:

Wingwall/Headwall details, entrance details eg. pipe flush with embankment or projecting, socket or square end, entrance rounding, levels.
For bridges, details of piers and section under bridge including abutment details. Specify Survey Book No.

CONSTRUCTION DATE OF CURRENT STRUCTURE: 01-JUL-1985

HAS THE STRUCTURE BEEN UPGRADED?
If yes, explain type and date of upgrade. Include plan number and location if applicable.

ADDITIONAL COMMENTS:

CREEK	**SHELLEYS CREEK**

LOCATION	KINGMAN ST FOOTBRIDGE, SUNNYBANK HILLS

AEP (%)	DISCHARGE (m^3/s)	U/S WATER LEVEL (m AHD)	D/S WATER LEVEL (m AHD)	AFFLUX (mm)	FLOW WIDTH ABOVE STRUCTURE (m)	FLOW DEPTH ABOVE STRUCTURE (m)	VELOCITY (m/s)	
							Weir	Structure
0.05	154.5	52.64	52.59	0.05	21.7	0.94	2.2	3.0
0.2	136.8	52.49	52.44	0.05	19.9	0.79	2.0	3.1
1	106.5	52.07	52.03	0.04	11.9	0.37	1.3	3.1
2	80.1	51.90	51.86	0.04	8.7	0.20	0.9	3.1
5	64.3	51.67	51.62	0.04	-	-	-	3.0
10	54.4	51.51	51.46	0.05	-	-	-	3.0
20	45.7	51.37	51.30	0.07	-	-	-	2.9
50	31.5	51.11	51.00	0.11	-	-	-	2.6

Creek:	**SHELLEYS CREEK**
Location:	**CHILTON ST, SUNNYBANK HILLS**

Immunity Rating:	Less than 50 % AEP

DATE OF SURVEY: 1998	UBD REF: 220 J4
SURVEYED CROSS SECTION ID: SS1150	BCC ASSET ID: Chilton Street Culvert
MODEL ID: SH_CHILTON_ST	AMTD (m): 10190

STRUCTURE DESCRIPTION: BOX CULVERTS

STRUCTURE SIZE: 3 / 3050 x 1850
For Culverts: Number of cells/pipes & sizes For Bridges: Number of Spans and their lengths

U/S INVERT LEVEL (m): 43.91 U/S OBVERT LEVEL (m)

D/S INVERT LEVEL (m): 43.94 D/S OBVERT LEVEL (m)
For culverts give floor level. For bridges give bed level

For Culverts
LENGTH OF CULVERT BARREL AT INVERT (m): 17.2

LENGTH OF CULVERT BARREL AT OBVERT (m): 17.2

TYPE OF LINING: Grouted stone pitching
(e.g. concrete, stones, brick, corrugated iron)

IS THERE A SURVEYED WEIR PROFILE?
If yes give details ie. Plan number and/or survey book number.Note: This section should be at the highest part of the road eg crown, kerb, hand rails guard rails whichever is higher.

WEIR WIDTH (m): 17.2 PIER WIDTH (m):

(In direction of flow, ie. distance from u/s face to d/s face)

LOWEST POINT OF WEIR (m AHD): 46.45

HEIGHT OF GUARDRAILS:

DESCRIPTION OF ALL HAND AND GUARD RAILS AND HEIGHTS TO TOP AND UNDERSIDE OF GUARD RAILS:

PLAN NUMBER: W5579

BRIDGE OR CULVERT DETAILS:

Wingwall/Headwall details, entrance details eg. pipe flush with embankment or projecting, socket or square end, entrance rounding, levels.
For bridges, details of piers and section under bridge including abutment details. Specify Survey Book No.

CONSTRUCTION DATE OF CURRENT STRUCTURE:

HAS THE STRUCTURE BEEN UPGRADED?
If yes, explain type and date of upgrade. Include plan number and location if applicable.

ADDITIONAL COMMENTS:

CREEK	**SHELLEYS CREEK**
LOCATION	**CHILTON ST, SUNNYBANK HILLS**

AEP (%)	DISCHARGE (m^3/s)	U/S WATER LEVEL (m AHD)	D/S WATER LEVEL (m AHD)	AFFLUX (mm)	FLOW WIDTH ABOVE STRUCTURE (m)	FLOW DEPTH ABOVE STRUCTURE (m)	VELOCITY (m/s)	
							Weir	Structure
0.05	178.6	48.62	48.31	0.31	82.2	2.17	3.1	2.6
0.2	155.8	48.47	48.17	0.31	78.8	2.02	3.0	2.6
1	114.7	48.07	47.79	0.28	67.3	1.62	2.7	2.4
2	90.9	47.91	47.65	0.26	60.4	1.46	2.6	2.3
5	72.7	47.69	47.45	0.24	48.7	1.24	2.4	2.2
10	60.8	47.50	47.28	0.22	40.4	1.05	2.2	2.1
20	50.6	47.32	47.11	0.20	31.8	0.87	2.0	2.0
50	35.1	46.92	46.75	0.17	21.9	0.46	1.5	1.8

Creek:	**SHELLEYS CREEK**
Location:	**LANG ST PEDESTRIAN BRIDGE, SUNNYBANK HILLS**

Immunity Rating:	Less than 50 % AEP

DATE OF SURVEY: 1998	UBD REF: 220 K3
SURVEYED CROSS SECTION ID: SS1090	BCC ASSET ID: Lang Street
MODEL ID: SH_LANG_ST	AMTD (m): 9840

STRUCTURE DESCRIPTION: PEDESTRIAN BRIDGE

STRUCTURE SIZE: 1 / 12m
For Culverts: Number of cells/pipes & sizes For Bridges: Number of Spans and their lengths

U/S INVERT LEVEL (m): 42.28 U/S OBVERT LEVEL (m)

D/S INVERT LEVEL (m): 42.28 D/S OBVERT LEVEL (m)
For culverts give floor level. For bridges give bed level

For Culverts
LENGTH OF CULVERT BARREL AT INVERT (m): 2.44

LENGTH OF CULVERT BARREL AT OBVERT (m): 2.44

TYPE OF LINING: Grouted stone pitching
(e.g. concrete, stones, brick, corrugated iron)

IS THERE A SURVEYED WEIR PROFILE?
If yes give details ie. Plan number and/or survey book number.Note: This section should be at the highest part of the road eg crown, kerb, hand rails guard rails whichever is higher.

WEIR WIDTH (m): 2.44 PIER WIDTH (m):

(In direction of flow, ie. distance from u/s face to d/s face)

LOWEST POINT OF WEIR (m AHD): 42.89

HEIGHT OF GUARDRAILS:

DESCRIPTION OF ALL HAND AND GUARD RAILS AND HEIGHTS TO TOP AND UNDERSIDE OF GUARD RAILS:

PLAN NUMBER: B1220

BRIDGE OR CULVERT DETAILS:

Wingwall/Headwall details, entrance details eg. pipe flush with embankment or projecting, socket or square end, entrance rounding, levels.
For bridges, details of piers and section under bridge including abutment details. Specify Survey Book No.

CONSTRUCTION DATE OF CURRENT STRUCTURE: 1-JUL-1966

HAS THE STRUCTURE BEEN UPGRADED?
If yes, explain type and date of upgrade. Include plan number and location if applicable.

ADDITIONAL COMMENTS:

CREEK	**SHELLEYS CREEK**
LOCATION	**LANG ST PEDESTRIAN BRIDGE, SUNNYBANK HILLS**

AEP (%)	DISCHARGE (m^3/s)	U/S WATER LEVEL (m AHD)	D/S WATER LEVEL (m AHD)	AFFLUX (mm)	FLOW WIDTH ABOVE STRUCTURE (m)	FLOW DEPTH ABOVE STRUCTURE (m)	VELOCITY (m/s)	
							Weir	Structure
0.05	195.4	44.53	44.33	0.20	134.8	1.64	2.6	2.6
0.2	167.6	44.37	44.15	0.22	127.7	1.48	2.5	2.5
1	114.7	43.98	43.78	0.20	105.5	1.09	2.3	2.5
2	97.7	43.82	43.65	0.17	79.8	0.93	2.2	2.3
5	77.8	43.61	43.49	0.11	52.7	0.72	1.9	2.1
10	64.9	43.47	43.39	0.08	39.7	0.58	1.8	1.9
20	53.5	43.35	43.29	0.06	31.1	0.46	1.6	1.7
50	35.9	43.15	43.13	0.03	22.1	0.26	1.2	1.3

Creek:	**SHELLEYS CREEK**
Location:	**LANG ST PEDESTRIAN BRIDGE, SUNNYBANK HILLS**

Immunity Rating:	Less than 50 % AEP

DATE OF SURVEY: 1998	UBD REF: 220 K3
SURVEYED CROSS SECTION ID: SS1080	BCC ASSET ID: Lang Street
MODEL ID: SH_LANG_ST	AMTD (m): 9840

STRUCTURE DESCRIPTION: DROP STRUCTURE

STRUCTURE SIZE: 1 / 12300 x 1210
For Culverts: Number of cells/pipes & sizes For Bridges: Number of Spans and their lengths

U/S INVERT LEVEL (m): 41.67 U/S OBVERT LEVEL (m)

D/S INVERT LEVEL (m): 41.67 D/S OBVERT LEVEL (m)
For culverts give floor level. For bridges give bed level

For Culverts
LENGTH OF CULVERT BARREL AT INVERT (m): 2.44

LENGTH OF CULVERT BARREL AT OBVERT (m): 2.44

TYPE OF LINING: Grouted stone pitching
(e.g. concrete, stones, brick, corrugated iron)

IS THERE A SURVEYED WEIR PROFILE?
If yes give details ie. Plan number and/or survey book number.Note: This section should be at the highest part of the road eg crown, kerb, hand rails guard rails whichever is higher.

WEIR WIDTH (m): 2.44 PIER WIDTH (m):

(In direction of flow, ie. distance from u/s face to d/s face)

LOWEST POINT OF WEIR (m AHD): 41.33

HEIGHT OF GUARDRAILS:

DESCRIPTION OF ALL HAND AND GUARD RAILS AND HEIGHTS TO TOP AND UNDERSIDE OF GUARD RAILS:

PLAN NUMBER:

BRIDGE OR CULVERT DETAILS:

Wingwall/Headwall details, entrance details eg. pipe flush with embankment or projecting, socket or square end, entrance rounding, levels.
For bridges, details of piers and section under bridge including abutment details. Specify Survey Book No.

CONSTRUCTION DATE OF CURRENT STRUCTURE:

HAS THE STRUCTURE BEEN UPGRADED?
If yes, explain type and date of upgrade. Include plan number and location if applicable.

ADDITIONAL COMMENTS:

CREEK	**SHELLEYS CREEK**
LOCATION	**LANG ST DROP STRUCTURE, SUNNYBANK HILLS**

AEP (%)	DISCHARGE (m^3/s)	U/S WATER LEVEL (m AHD)	D/S WATER LEVEL (m AHD)	AFFLUX (mm)	FLOW WIDTH ABOVE STRUCTURE (m)	FLOW DEPTH ABOVE STRUCTURE (m)	VELOCITY (m/s)	
							Weir	Structure
0.05	195.5	44.33	43.35	0.98	53.7	3.00	-	3.4
0.2	167.5	44.15	43.14	1.00	53.7	2.82	-	3.3
1	114.7	43.78	42.77	1.01	53.7	2.45	-	3.0
2	97.7	43.65	42.56	1.09	53.7	2.32	-	2.9
5	77.8	43.49	42.19	1.30	53.7	2.16	-	2.7
10	64.9	43.38	41.88	1.50	53.7	2.05	-	2.6
20	53.5	43.29	41.64	1.64	53.7	1.96	-	2.5
50	35.9	43.12	41.24	1.89	51.8	1.79	-	2.4

Creek:	**SHELLEYS CREEK**
Location:	**BEENLEIGH RD, SUNNYBANK**

Immunity Rating:	10 % AEP

DATE OF SURVEY: 1998	UBD REF: 220 K3
SURVEYED CROSS SECTION ID: SS1050	BCC ASSET ID: Beenleigh Road
MODEL ID: SH_LANG_ST	AMTD (m): 9640

STRUCTURE DESCRIPTION: BOX CULVERTS

STRUCTURE SIZE: 5 / 2750 x 1860
For Culverts: Number of cells/pipes & sizes For Bridges: Number of Spans and their lengths

U/S INVERT LEVEL (m): 39.38 U/S OBVERT LEVEL (m)

D/S INVERT LEVEL (m): 39 D/S OBVERT LEVEL (m)
For culverts give floor level. For bridges give bed level

For Culverts
LENGTH OF CULVERT BARREL AT INVERT (m): 26.6

LENGTH OF CULVERT BARREL AT OBVERT (m): 26.6

TYPE OF LINING: Grouted stone pitching
(e.g. concrete, stones, brick, corrugated iron)

IS THERE A SURVEYED WEIR PROFILE?
If yes give details ie. Plan number and/or survey book number. Note: This section should be at the highest part of the road eg crown, kerb, hand rails guard rails whichever is higher.

WEIR WIDTH (m): 26.6 PIER WIDTH (m):

(In direction of flow, ie. distance from u/s face to d/s face)

LOWEST POINT OF WEIR (m AHD): 41.45

HEIGHT OF GUARDRAILS:

DESCRIPTION OF ALL HAND AND GUARD RAILS AND HEIGHTS TO TOP AND UNDERSIDE OF GUARD RAILS:

PLAN NUMBER: W6381

BRIDGE OR CULVERT DETAILS:

Wingwall/Headwall details, entrance details eg. pipe flush with embankment or projecting, socket or square end, entrance rounding, levels.
For bridges, details of piers and section under bridge including abutment details. Specify Survey Book No.

CONSTRUCTION DATE OF CURRENT STRUCTURE:

HAS THE STRUCTURE BEEN UPGRADED?
If yes, explain type and date of upgrade. Include plan number and location if applicable.

ADDITIONAL COMMENTS:

CREEK	**SHELLEYS CREEK**
LOCATION	**BEENLEIGH RD, SUNNYBANK**

AEP (%)	DISCHARGE (m^3/s)	U/S WATER LEVEL (m AHD)	D/S WATER LEVEL (m AHD)	AFFLUX (mm)	FLOW WIDTH ABOVE STRUCTURE (m)	FLOW DEPTH ABOVE STRUCTURE (m)	VELOCITY (m/s)	
							Weir	Structure
0.05	205.5	42.65	41.69	0.96	134.8	1.20	2.6	4.7
0.2	175.4	42.48	41.52	0.95	119.8	1.03	2.5	4.7
1	120.0	42.26	41.13	1.13	96.2	0.81	1.8	4.1
2	101.9	42.07	40.96	1.11	71.8	0.62	1.6	4.0
5	81.1	41.65	40.74	0.91	12.7	0.20	1.0	3.9
10	67.8	41.25	40.58	0.68	-	-	-	3.6
20	55.8	41.02	40.42	0.60	-	-	-	3.4
50	37.1	40.62	40.11	0.51	-	-	-	3.0

Creek:	**ARCHERFIELD DRAIN**
Location:	**GRANARD RD, ARCHERFIELD**

Immunity Rating:	Less than 50 % AEP

DATE OF SURVEY: 1998	UBD REF: 199 I10
SURVEYED CROSS SECTION ID:	BCC ASSET ID: Granard_Rd
MODEL ID: SS_GRANARD_RD	AMTD (m): 520

STRUCTURE DESCRIPTION: BOX CULVERTS

STRUCTURE SIZE: 2 / 2130 x 1120
For Culverts: Number of cells/pipes & sizes For Bridges: Number of Spans and their lengths

U/S INVERT LEVEL (m): 4.21 U/S OBVERT LEVEL (m)

D/S INVERT LEVEL (m): 4 D/S OBVERT LEVEL (m)
For bridges give bed level

For culverts give floor level.

For Culverts
LENGTH OF CULVERT BARREL AT INVERT (m): 28

LENGTH OF CULVERT BARREL AT OBVERT (m): 28

TYPE OF LINING: Grouted stone pitching
(e.g. concrete, stones, brick, corrugated iron)

IS THERE A SURVEYED WEIR PROFILE?
If yes give details ie. Plan number and/or survey book number.Note: This section should be at the highest part of the road eg crown, kerb, hand rails guard rails whichever is higher.

WEIR WIDTH (m): 28 PIER WIDTH (m):5.85

(In direction of flow, ie. distance from u/s face to d/s face)

LOWEST POINT OF WEIR (m AHD): 16.99

HEIGHT OF GUARDRAILS:

DESCRIPTION OF ALL HAND AND GUARD RAILS AND HEIGHTS TO TOP AND UNDERSIDE OF GUARD RAILS:

PLAN NUMBER: MRD219231

BRIDGE OR CULVERT DETAILS:

Wingwall/Headwall details, entrance details eg. pipe flush with embankment or projecting, socket or square end, entrance rounding, levels.
For bridges, details of piers and section under bridge including abutment details. Specify Survey Book No.

CONSTRUCTION DATE OF CURRENT STRUCTURE:

HAS THE STRUCTURE BEEN UPGRADED?
If yes, explain type and date of upgrade. Include plan number and location if applicable.

ADDITIONAL COMMENTS:

CREEK	**ARCHERFIELD DRAIN**
LOCATION	**GRANARD RD, ARCHERFIELD**

AEP (%)	DISCHARGE (m^3/s)	U/S WATER LEVEL (m AHD)	D/S WATER LEVEL (m AHD)	AFFLUX (mm)	FLOW WIDTH ABOVE STRUCTURE (m)	FLOW DEPTH ABOVE STRUCTURE (m)	VELOCITY (m/s)	
							Weir	Structure
0.05	*	7.60	7.60	0.01	*	1.75	1.8	1.9
0.2	*	7.14	7.13	0.01	*	1.29	1.8	1.9
1	*	6.69	6.68	0.01	*	0.84	1.8	1.9
2	*	6.49	6.48	0.00	*	0.64	1.8	2.1
5	*	6.28	6.27	0.01	*	0.43	1.8	1.9
10	*	6.19	6.11	0.08	*	0.34	1.8	1.9
20	*	6.15	5.98	0.17	*	0.30	1.8	1.9
50	*	6.09	5.81	0.29	*	0.24	1.8	1.9


Tradelink
Gold Coast
Beaudesert

HYDRAULIC STRUCTURE REFERENCE SHEET

Creek:	**ARCHERFIELD DRAIN**
Location:	**MARSHALL RD, ARCHERFIELD**

Immunity Rating:	Less than 50 % AEP

DATE OF SURVEY: 1998	UBD REF: 199 I9
SURVEYED CROSS SECTION ID:	BCC ASSET ID: Marshall_Rd
MODEL ID: SS_MARSHALL_RD	AMTD (m): 310

STRUCTURE DESCRIPTION: BOX CULVERTS

STRUCTURE SIZE: 4 / 2120 x 1230
For Culverts: Number of cells/pipes & sizes For Bridges: Number of Spans and their lengths

U/S INVERT LEVEL (m): 3.14 U/S OBVERT LEVEL (m)

D/S INVERT LEVEL (m): 3.11 D/S OBVERT LEVEL (m)
For bridges give bed level

For culverts give floor level.

For Culverts
LENGTH OF CULVERT BARREL AT INVERT (m): 14

LENGTH OF CULVERT BARREL AT OBVERT (m): 14

TYPE OF LINING: Grouted stone pitching
(e.g. concrete, stones, brick, corrugated iron)

IS THERE A SURVEYED WEIR PROFILE?
If yes give details ie. Plan number and/or survey book number.Note: This section should be at the highest part of the road eg crown, kerb, hand rails guard rails whichever is higher.

WEIR WIDTH (m): 14 PIER WIDTH (m): 4.87

(In direction of flow, ie. distance from u/s face to d/s face)

LOWEST POINT OF WEIR (m AHD): 16.99

HEIGHT OF GUARDRAILS:

DESCRIPTION OF ALL HAND AND GUARD RAILS AND HEIGHTS TO TOP AND UNDERSIDE OF GUARD RAILS:

PLAN NUMBER: W8217

BRIDGE OR CULVERT DETAILS:

Wingwall/Headwall details, entrance details eg. pipe flush with embankment or projecting, socket or square end, entrance rounding, levels.
For bridges, details of piers and section under bridge including abutment details. Specify Survey Book No.

CONSTRUCTION DATE OF CURRENT STRUCTURE:

HAS THE STRUCTURE BEEN UPGRADED?
If yes, explain type and date of upgrade. Include plan number and location if applicable.

ADDITIONAL COMMENTS:

CREEK	**ARCHERFIELD DRAIN**
LOCATION	**MARSHALL RD, ARCHERFIELD**

AEP (%)	DISCHARGE (m^3/s)	U/S WATER LEVEL (m AHD)	D/S WATER LEVEL (m AHD)	AFFLUX (mm)	FLOW WIDTH ABOVE STRUCTURE (m)	FLOW DEPTH ABOVE STRUCTURE (m)	VELOCITY (m/s)	
							Weir	Structure
0.05	*	7.55	7.54	0.01	*	2.68	1.2	1.2
0.2	*	7.09	7.08	0.02	*	2.22	1.2	1.3
1	*	6.65	6.63	0.02	*	1.78	1.2	1.4
2	*	6.46	6.43	0.03	*	1.59	1.2	1.5
5	*	6.24	6.21	0.03	*	1.37	1.2	1.5
10	*	6.08	6.04	0.04	*	1.21	1.2	1.4
20	*	5.93	5.89	0.04	*	1.06	1.2	1.4
50	*	5.62	5.57	0.05	*	0.75	1.2	1.2

APPENDIX D - Model Peer Review

Brisbane City Council
City Projects Office
Level 1, Green Square, 505 St Pauls Terrace
Fortitude Valley
QLD 4006

Att: Trent Laves

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dhi@dhigroup.com
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Ref:	Init:	Date:
43801442	MOBA	6 February 2014

Stable Swamp Creek MIKE FLOOD Model Development – Assistance and Review

Dear Trent

In accordance with your request, we have reviewed the MIKE FLOOD model developed by Brisbane City Council (BCC) with the purpose of assessing whether the model is technically sound, physically realistic and appropriate for the purpose of assessing the potential for flooding in the Stable Swamp Creek catchment. This letter report summarises our findings at the post-calibration stage of the model build with brief recommendations where appropriate.

General Overview

BCC has recently developed a coupled 1D/2D MIKE FLOOD model of the Stable Swamp Creek catchment located approximately 9km south-west of the Brisbane CBD. Stable Swamp Creek discharges into Oxley Creek. The developed MIKE FLOOD model covers an area of approximately 19km^2. A 2D MIKE 21 model (5m grid size) is used to model the floodplain. Structures such as culverts, weirs and bridges are represented in a 1D MIKE 11 model. The model is coupled via MIKE FLOOD. For this review, the model calibrated to the March 2001 event and the corresponding results were assessed.

MIKE 21 Model

Bathymetry

The selection of a 5m grid size is appropriate considering the scale of features that have been resolved in the MIKE 11 model. Stable Swamp Creek is approximately 10m wide in the upstream part of the catchment, and, as such, the model represents the conveyance of the creek through two grid cells. This is generally considered too few cells to properly resolve the transverse velocity distribution in the channel or to accurately represent channel volumes. However, as the creek does not convey the majority of the flood, the lack of fine scale channel representation in the upstream part of the catchment is not considered to influence on the model results.

No obvious interpolation errors or rapidly changing/erroneous bed levels were observed in the grid data. The modelled area is sufficient as the flood surface does not push up against ‘dry land’ cells.

Time Step and Courant Number
For MIKE FLOOD applications DHI recommends that a Courant number of less than 1 is maintained. With a time step of 0.5 seconds the maximum Courant number is approximately 0.8 and within the recommended guideline.

Flooding and Drying Depths
Flooding and drying are enabled, as they must be for inland flooding applications. A flooding depth of 0.05 m and a drying depth of 0.02 m have been applied. These values are within the values generally recommended by DHI and are entirely valid for this application.

Boundaries and Source Points
One downstream boundary and twenty nine source points have been incorporated in the MIKE 21 model. The downstream boundary is specified as a varying tidal water level boundary. The bathymetry has been modified at the boundary location by constructing a four cells wide ramp to ensure smooth transition of flow into and out of the domain. All of the source point inflows have been applied to one grid cell. For larger flood events including design events, the large source point inflows should be distributed across multiple cells to avoid excessive velocities or 'jetting' occurring at source point locations.

Initial Surface Elevation
The initial surface elevation file specified is appropriate. The downstream boundary cells are all wet at commencement of the simulation with water levels of 0.33 m (depth 2.12 m). The water level of 0.33m at the downstream boundary matches the water level at the first time step in the time series boundary file. This is a valid approach of modelling the boundary condition.

Eddy Viscosity
Various empirical relationships exist for estimating appropriate values of eddy viscosity in the absence of observed eddy behaviour. High eddy values will normally smooth out the flow variability by transferring the high energy flow from one grid cell to the neighbouring cells with lower energies. A flux based eddy viscosity of $0.5m^2/s$ has been applied globally. This value is within the guidelines recommended by DHI for a grid size of 5m. However, it is recommended to use a velocity based eddy viscosity for inland flooding applications. At coupled cells an eddy viscosity of $5m^2/s$ was used to promote stability.

Resistance
Seven different zones of resistance have been defined. These represent waterways, roads, residential/urban areas, industrial areas, dense vegetation, sparse vegetation and mangroves. Based on visual inspection of aerial photography the number of regions and Manning's M values defined for these regions are generally appropriate.

MIKE 11 Model

Network
The MIKE 11 model consists of twenty two branches; Stable Swamp Creek and North Branch are coupled to the MIKE 21 model using standard links. Most of the MIKE 11 branches are small, with lengths varying from 10m to 130m. These branches have been used to represent link channels, bridges and other hydraulic structures likely to affect flood conditions. For structures with lengths that exceeded 10m (two grid cells) only a culvert was modelled in MIKE 11. The overland flow on top of the culvert is modelled in the 2D domain. This is the correct approach to avoid duplication of flow capacity. The roughness for the majority of culverts has been set to 0.02 (Manning's n) and is considered appropriate.

Cross Sections
Cross sections upstream and downstream of structures have a natural shape and their width has been reduced to the approximate width of the structure. The cross-sections were enlarged if they were smaller than the structure dimensions. This is necessary to ensure a realistic head loss across the

structure. All cross sections in the model have monotonically increasing conveyance curves. The invert levels of the cross sections match the level 'z' values in the MIKE 21 bathymetry to which the cross sections are coupled. This improves model stability and is considered good modelling practice.

Transversely distributed relative resistance has been applied to each cross section, with higher values applied to the floodplains and lower values applied to the main channels. The bed resistance implementation is considered appropriate.

Boundary Conditions
Fifty six boundary conditions have been assigned in the boundary file. Water level boundaries have been defined at both ends of the branches used to represent structures. This is the necessary and accepted approach when coupling branches to a MIKE 21 grid. Inflow boundaries and point source inflows have been defined at the upstream ends of the three main branches. A constant water level has been used at the downstream MIKE 11 boundary for Stable Swamp Creek and North Branch which are both coupled to the MIKE 21 model domain using a standard couple. Overall, the MIKE11 boundary conditions are found to be appropriate.

Hydrodynamic Parameters
The Delta value on the Default Parameters tab of the HD11 file is used to control the time centring of the solution scheme. The solution scheme is fully centred in time when delta is equal to 0.5. A delta value greater than 0.5 will have a dissipative effect on the wave front; but can also improve model stability. A value of 0.7 was found to have been applied. This is acceptable for MIKE FLOOD applications where time steps are small.

MIKE FLOOD Model

The MIKE FLOOD platform is used to allow the exchange of water between the MIKE 21 and MIKE 11 models. The following sections describe the types of linking and the associated parameters currently defined in the models.

Standard and Structure Links
Thirty two standard and structure links have been defined in the model. Depth adjustment has been activated, as all structures except for one (AD_Granard_Rd) are coupled to two or more MIKE 21 cells.

A momentum factor of one has been applied to all links, which is appropriate. Exponential smoothing factors of 0.1 and 0.2 have been applied to all links. The exponential smoothing factor introduces smoothing of the water level values transferred between the models. A value of one means no smoothing will be applied whereas a value closer to zero creates strong smoothing in the model and may aid stability. The adopted exponential smoothing factors are appropriate.

MIKE FLOOD Results
The MIKE 21 model has a five minute save interval and produces a result file of approximately 800MB. Both the save intervals and the model result file sizes are appropriate. The MIKE 11 model has a five minute save step as well.

An animation of the overland water movement did not show water experiencing sharp changes in flow direction at any locations. The overland flow velocity is generally low with an average maximum current velocity of 0.6m/s. At three grid cells the maximum current velocity exceeds 5m/s. These cells are located in the vicinity of coupled cells. The high velocities are likely a result of a high bed level gradient. It is recommended to review the bathymetry in these areas and smooth out the bed elevations where possible.

Minor instabilities in modelled discharges were observed in the MIKE 11 result file at four structures; see Figure 1 to Figure 4. However, these instabilities do not translate to a water surface level instability and are, therefore, not considered to have a significant influence on the model results. The instabilities do not occur at the peak, but at the rising and falling limb of the flood wave where the head

losses across the structures are negligible. In the case of the SS_Beenleigh_Rd_2 structure (see Figure 4) an adjustment of the MIKE 11 cross-section width to match the number of MIKE 21 cells it is coupled to significantly improves the stability in modelled discharge through the structure, see Figure 5.

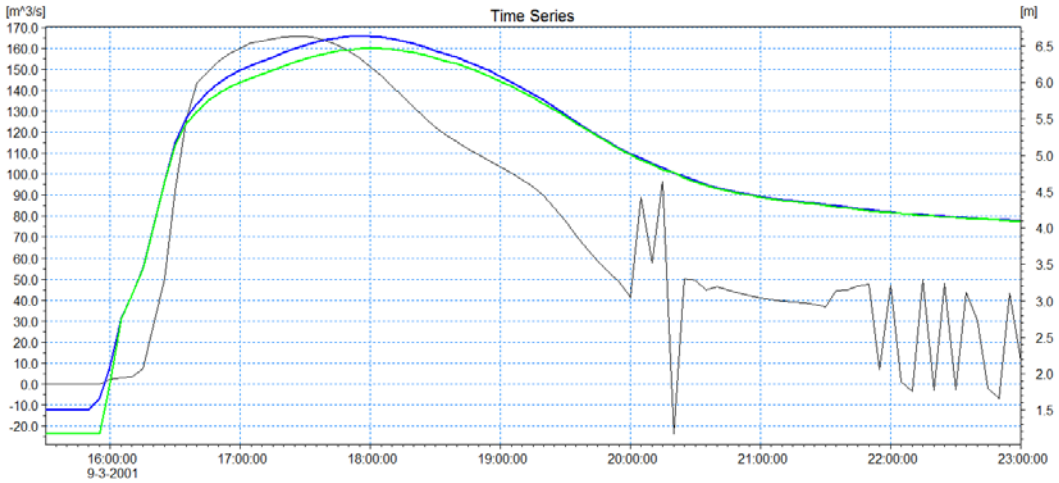


Figure 1 Model results at SS_Beaudesert_Rd (blue: water level upstream, green: water level downstream, black: structure discharge)

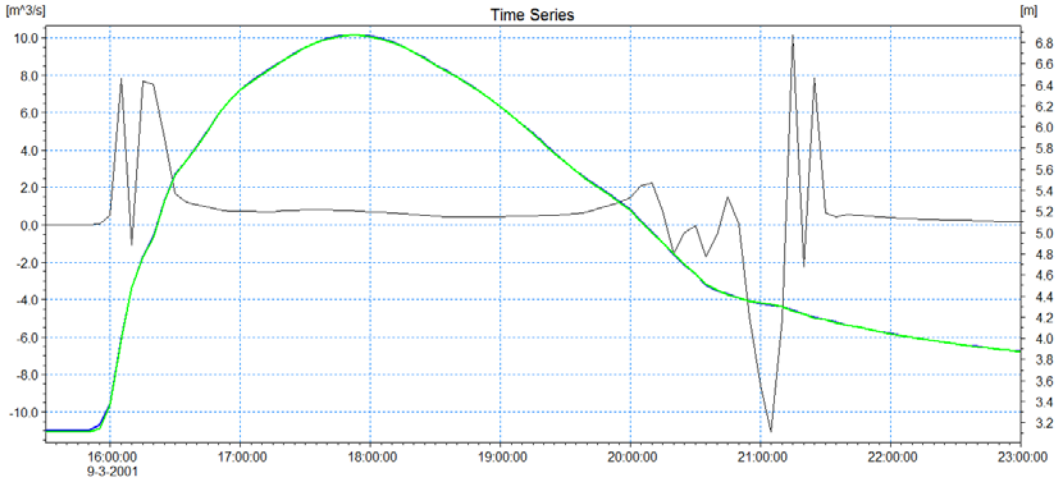


Figure 2 Model results at AD_Marshall_Rd (blue: water level upstream, green: water level downstream, black: structure discharge)

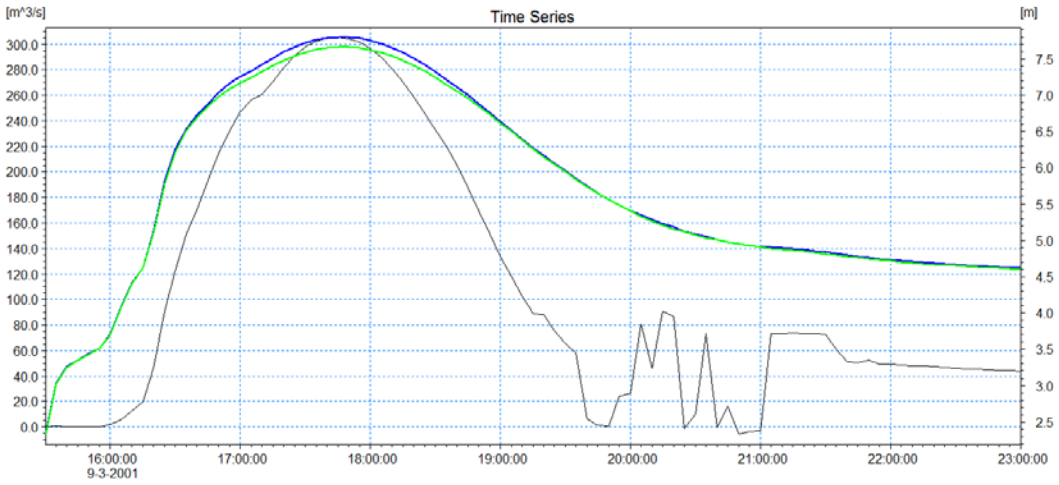


Figure 3 Model results at SS_Riawena_Rd (blue: water level upstream, green: water level downstream, black: structure discharge)

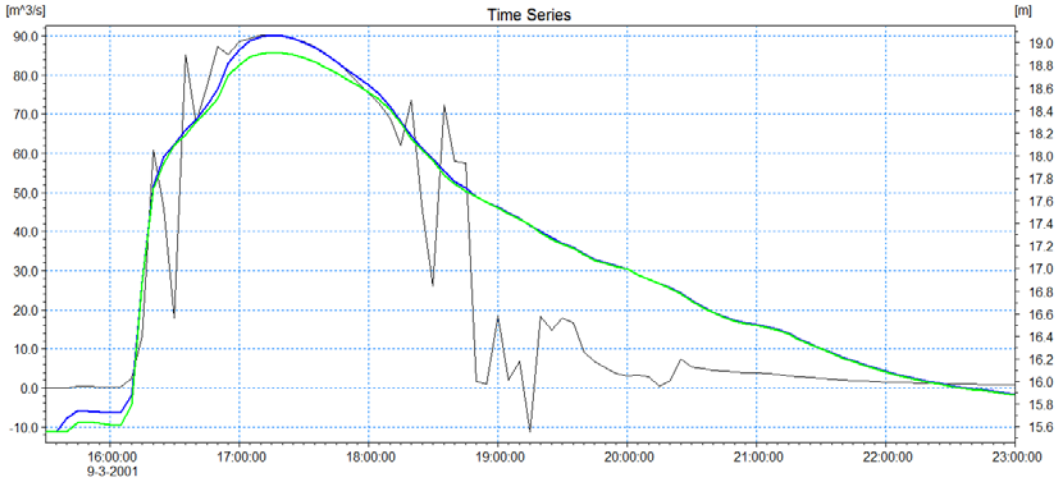


Figure 4 Model results at SS_Beenleigh_Rd_2 (blue: water level upstream, green: water level downstream, black: structure discharge)

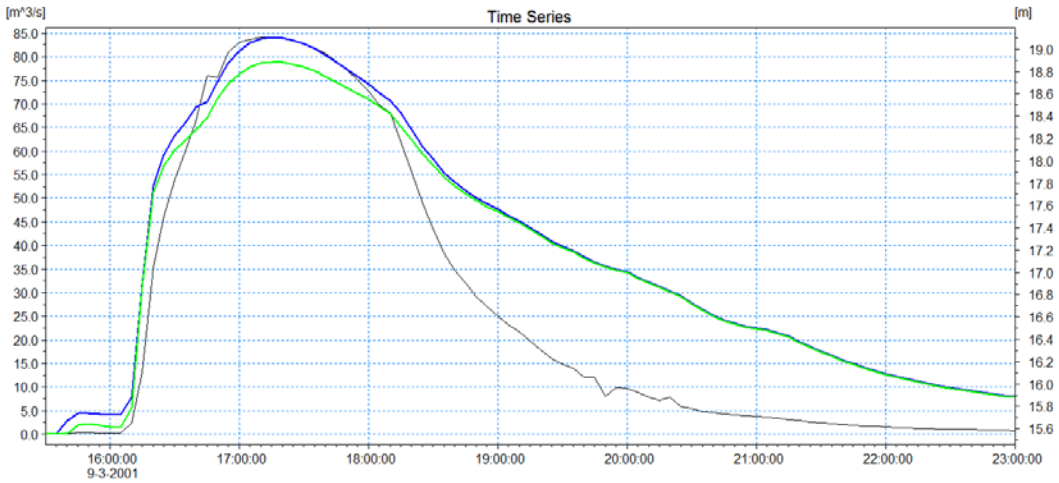


Figure 5 Model results at SS_Beenleigh_Rd_2 after making minor modifications to cross-section (blue: water level upstream, green: water level downstream, black: structure discharge)

Summary

Overall the model has been built within the generally accepted guidelines. With the following recommendations the model will be suitable to proceed with running the design events and assessing the potential for flooding within the Stable Swamp Creek catchment.

Key recommendations:

- Review the MIKE 21 bathymetry in areas where the maximum current velocities are very high;
- Change the eddy formulation type from flux based to velocity based;
- Review each coupled structure discharge plot in the MIKE 11 result file for instabilities and assessment in context of the structure's hydraulic impact on the results;
- Increase the cross section width upstream and downstream of the SS_Beenleigh_Rd_2 structure to match the total width of MIKE 21 cells it is coupled to; and
- Rerun the model with mass error recorded to confirm that the MIKE 11 instabilities do not affect the total water balance.

Please do not hesitate to contact me if you require further clarification.

Kind regards

DHI

Monika Balicki
Senior Engineer

APPENDIX E - Design Event Peak Flood Levels

Stable Swamp Creek

XSecID	M11 Chainage (m)	AMTD (m)	Scenario 3-UltimateConditions - Peak Levels					
			50% AEP	20% AEP	10% AEP	5% AEP	2% AEP	1% AEP
		0	1.22	1.22	1.22	1.22	1.22	1.22
		100	1.97	2.07	2.12	2.17	2.23	2.26
		200	2.73	2.93	3.02	3.12	3.23	3.31
		300	2.78	2.98	3.08	3.17	3.29	3.37
		400	2.86	3.05	3.15	3.24	3.36	3.44
		500	2.91	3.10	3.19	3.29	3.41	3.49
		600	3.06	3.25	3.34	3.43	3.56	3.65
		700	3.22	3.41	3.51	3.61	3.75	3.85
		800	3.27	3.47	3.58	3.69	3.84	3.95
		900	3.32	3.52	3.62	3.73	3.89	4.00
		1000	3.39	3.61	3.72	3.84	4.01	4.14
		1100	3.50	3.73	3.86	4.00	4.20	4.34
		1200	3.54	3.79	3.93	4.08	4.29	4.45
		1300	3.66	3.94	4.09	4.25	4.48	4.65
		1400	3.73	4.02	4.18	4.35	4.58	4.76
		1500	3.85	4.17	4.34	4.52	4.78	4.97
		1600	4.08	4.37	4.51	4.69	4.95	5.14
		1700	4.30	4.69	4.90	5.12	5.40	5.60
		1800	4.39	4.80	5.02	5.24	5.53	5.74
		1900	4.42	4.84	5.06	5.28	5.58	5.78
		2000	4.47	4.88	5.11	5.34	5.65	5.86
		2010	4.46	4.88	5.11	5.34	5.64	5.86
Ipswich Mwy Bridge Culvert								
		2190	4.64	5.14	5.45	5.76	6.23	6.61
		2200	4.64	5.14	5.45	5.76	6.23	6.61
		2300	4.64	5.15	5.46	5.77	6.24	6.62
		2330	4.66	5.16	5.47	5.79	6.25	6.63
Marshall Road Crossing								
		2360	4.66	5.16	5.47	5.78	6.25	6.63
		2400	4.76	5.24	5.54	5.84	6.30	6.68
		2500	4.79	5.26	5.56	5.87	6.32	6.70
		2600	4.87	5.36	5.66	5.98	6.45	6.83
		2700	5.00	5.50	5.80	6.11	6.58	6.96
		2800	5.05	5.54	5.84	6.16	6.62	7.00
		2900	5.08	5.57	5.86	6.18	6.65	7.03
		3000	5.09	5.58	5.88	6.19	6.66	7.04
		3100	5.13	5.61	5.90	6.22	6.69	7.07
		3200	5.19	5.66	5.95	6.27	6.73	7.11
		3300	5.22	5.70	5.99	6.30	6.77	7.15
		3400	5.27	5.73	6.02	6.34	6.80	7.18
		3500	5.35	5.80	6.08	6.39	6.85	7.23
		3600	5.42	5.85	6.13	6.43	6.89	7.26
		3700	5.76	6.11	6.34	6.62	7.05	7.40
Beaudesrt Road Bridge								
		3750	6.08	6.45	6.68	6.97	7.38	7.72
		3800	6.06	6.39	6.61	6.88	7.29	7.63
		3900	6.17	6.56	6.81	7.12	7.58	7.94
		4000	6.23	6.63	6.89	7.20	7.65	8.01
		4100	6.26	6.65	6.91	7.24	7.70	8.06
		4200	6.34	6.74	7.01	7.34	7.81	8.17
		4240	6.41	6.82	7.09	7.43	7.89	8.25
Riawena Road Crossing								
		4310	6.57	7.02	7.35	7.75	8.27	8.67
		4400	6.59	7.04	7.38	7.79	8.30	8.70
		4500	6.73	7.19	7.53	7.94	8.47	8.89
		4600	6.80	7.26	7.59	8.00	8.54	8.96
		4700	6.90	7.38	7.73	8.17	8.75	9.20
		4712	6.92	7.39	7.74	8.18	8.76	9.21
Musgrave Road Crossing								
		4783	7.15	7.61	7.94	8.35	8.91	9.35
		4800	7.16	7.62	7.95	8.37	8.93	9.37
		4900	7.25	7.69	8.01	8.42	8.99	9.42
		5000	7.34	7.74	8.05	8.45	8.98	9.41
		5050	7.48	7.83	8.09	8.45	8.87	9.31
Railway Bridge								
		5100	7.53	7.89	8.14	8.45	8.97	9.39
		5200	7.91	8.27	8.54	8.99	9.55	9.98

XSecID	M11 Chainage (m)	AMTD (m)	Scenario 3-UltimateConditions - Peak Levels					
			50% AEP	20% AEP	10% AEP	5% AEP	2% AEP	1% AEP
		5300	8.31	8.67	8.93	9.32	9.83	10.24
		5400	8.64	8.97	9.27	9.59	10.06	10.43
		5490	9.05	9.40	9.67	9.98	10.46	10.81
Edith Street Crossing								
		5540	9.43	9.79	10.05	10.36	10.86	11.27
		5600	9.60	9.92	10.16	10.46	10.96	11.36
		5700	9.90	10.19	10.40	10.68	11.14	11.50
		5800	10.29	10.54	10.73	10.96	11.34	11.65
		5900	10.64	10.94	11.17	11.41	11.77	12.05
		6000	11.19	11.46	11.67	11.91	12.28	12.56
		6100	11.61	11.87	12.08	12.33	12.73	13.01
		6140	11.77	12.03	12.24	12.48	12.88	13.16
Boundary Road Crossing								
		6220	12.19	12.50	12.86	13.17	13.58	13.89
		6300	12.87	13.24	13.54	13.79	14.12	14.35
		6400	13.34	13.72	14.00	14.01	14.30	14.52
		6500	13.81	14.19	14.46	14.52	14.79	14.99
		6600	14.28	14.64	14.78	14.92	15.11	15.24
		6700	14.75	15.12	15.24	15.38	15.59	15.73
		6800	15.22	15.61	15.85	16.06	16.27	16.40
		6900	16.99	17.29	17.48	17.69	17.97	18.23
		7000	17.80	18.12	18.32	18.55	18.86	19.13
		7092	18.31	18.69	18.93	19.20	19.57	19.87
Beenleigh Road Crossing								
		7112	18.39	18.85	19.05	19.28	19.64	19.94
SS780	2810	7360	20.21	20.61	20.80	21.00	21.30	21.51
SS790	2674	7496	20.50	20.89	21.08	21.28	21.57	21.78
SS800	2516	7654	21.16	21.59	21.80	22.00	22.26	22.46
SS810	2417	7753	21.27	21.71	21.93	22.14	22.42	22.62
SS820	2316	7854	21.75	22.12	22.32	22.53	22.81	23.02
SS830	2240	7931	22.24	22.62	22.83	23.05	23.35	23.57
SS840	2132	8040	22.47	22.87	23.10	23.35	23.68	23.92
SS850	2040	8132	23.22	23.63	23.87	24.12	24.46	24.72
SS860	1962	8209	24.46	24.81	25.02	25.25	25.55	25.78
Dyson Avenue Pedestrian Bridge Crossing								
Section 2	1950	8221	25.25	25.69	25.95	26.33	26.76	27.09
Section 9	1859	8317	25.53	26.00	26.27	26.60	27.01	27.33
Section 12	1823	8353	25.60	26.07	26.34	26.68	27.09	27.41
Section 15	1790	8386	25.76	26.23	26.50	26.82	27.22	27.53
Section 16	1780	8396	25.79	26.27	26.54	26.86	27.26	27.58
Section 17	1771	8405	26.02	26.46	26.73	27.04	27.42	27.73
Section 19	1755	8421	26.49	26.87	27.13	27.39	27.74	28.01
Section 3	1721	8455	27.37	27.73	27.96	28.19	28.49	28.75
Section 2	1665	8511	27.75	28.18	28.42	28.66	28.99	29.25
SS900	1641	8535	27.87	28.30	28.55	28.80	29.13	29.40
Keats Street Bridge								
SS920	1625	8550	29.40	30.21	30.58	30.88	31.17	31.33
SS922	1618	8554	29.43	30.22	30.59	30.89	31.18	31.35
SS928	1593	8580	29.98	30.52	30.82	31.07	31.35	31.51
SS930	1577	8595	30.05	30.58	30.87	31.12	31.39	31.56
Section 1	1514	8658	30.25	30.78	31.06	31.31	31.58	31.75
SS938	1447	8725	31.76	32.22	32.46	32.70	32.95	33.09
SS960	1441	8728	31.83	32.28	32.53	32.77	33.01	33.15
Stones Road Crossing								
SS965	1430	8742	33.17	33.46	33.58	33.70	33.82	33.96
SS970	1272	8902	34.36	34.52	34.60	34.68	34.78	34.87
SS980	1199	8975	35.89	36.03	36.11	36.17	36.26	36.32
SS990	1059	9115	37.38	37.67	37.78	37.89	38.03	38.12
SS1000	960	9216	38.32	38.56	38.67	38.76	38.89	38.98
SS1010	859	9319	39.00	39.20	39.30	39.39	39.51	39.60
SS1020	737	-	39.37	39.63	39.77	39.91	40.08	40.20

Archerfield Channel

XSecID	M11 Chainage (m)	AMTD (m)	Scenario 3-UltimateConditions - Peak Levels					
			50% AEP	20% AEP	10% AEP	5% AEP	2% AEP	1% AEP
		0	5.50	5.91	6.17	6.47	6.92	7.29
		100	5.62	6.00	6.25	6.54	6.99	7.35
		200	5.63	6.00	6.25	6.55	6.99	7.36

XSecID	M11 Chainage (m)	AMTD (m)	Scenario 3-UltimateConditions - Peak Levels					
			50% AEP	20% AEP	10% AEP	5% AEP	2% AEP	1% AEP
		290	5.80	6.08	6.27	6.56	7.00	7.36
Marshall Road Crossing								
		320	5.85	6.13	6.29	6.56	7.00	7.37
		400	5.95	6.22	6.38	6.57	7.01	7.37
		490	6.15	6.41	6.56	6.73	7.02	7.38
Granard Road Crossing								
		530	6.31	6.54	6.68	6.84	7.05	7.38
		600	6.34	6.56	6.71	6.87	7.08	7.39
		700	6.39	6.60	6.73	6.88	7.09	7.39
		800	6.97	7.12	7.22	7.31	7.41	7.49
		900	7.16	7.28	7.41	7.51	7.65	7.75
		980	7.81	8.12	8.28	8.44	8.62	8.74
		1000	7.82	8.13	8.30	8.45	8.63	8.76

North Arm

XSecID	M11 Chainage (m)	AMTD (m)	Scenario 3-UltimateConditions - Peak Levels					
			50% AEP	20% AEP	10% AEP	5% AEP	2% AEP	1% AEP
		0	7.61	8.01	8.29	8.63	9.19	9.64
		70	7.85	8.21	8.52	8.87	9.45	9.91
Musgrave Road Crossing - West								
		100	7.95	8.38	8.68	9.01	9.57	10.04
		200	8.04	8.52	8.83	9.15	9.69	10.15
		220	8.05	8.55	8.87	9.18	9.72	10.18
Railway Bridge								
		250	8.12	8.63	8.95	9.26	9.80	10.24
		300	8.22	8.67	8.99	9.30	9.83	10.26
		340	8.43	8.75	9.05	9.36	9.86	10.29
Perrin Place Crossing								
		380	8.63	8.92	9.21	9.52	10.03	10.43
		400	8.66	8.93	9.21	9.53	10.02	10.43
		500	8.96	9.20	9.37	9.70	10.17	10.55
		600	9.17	9.42	9.57	9.86	10.31	10.68
		700	9.39	9.62	9.76	10.06	10.50	10.84
		800	9.65	9.87	9.99	10.32	10.77	11.10
		900	10.37	10.63	10.76	11.06	11.50	11.79
		1000	11.45	11.64	11.76	12.02	12.44	12.71
		1100	11.98	12.16	12.40	12.68	13.06	13.33
		1200	12.36	12.73	12.99	13.26	13.62	13.87
		1300	12.89	13.27	13.49	13.74	14.09	14.34
		1400	13.41	13.80	14.03	14.30	14.64	14.87
		1450	13.72	14.13	14.39	14.72	15.10	15.34
Orange Groove Road Crossing								
		1490	14.19	15.01	15.81	16.16	16.52	16.75
		1500	14.44	15.05	15.83	16.18	16.54	16.77
		1550	14.88	15.49	16.01	16.32	16.66	16.89
Musgrave Road Crossing -East								
		1590	15.00	15.67	16.19	16.52	16.90	17.16
		1590	15.00	15.67	16.19	16.52	16.90	17.16
SS9170	284	1670	15.28	15.99	16.48	16.85	17.23	17.50
SS9180	158	1796	16.11	16.69	17.08	17.45	17.85	18.14
SS9190	150	1804	16.17	16.75	17.13	17.50	17.91	18.19
Peringa Street FootBridge Crossing								
SS9210	144	1810	16.40	16.91	17.25	17.64	18.06	18.32
SS9220	80	1874	17.25	17.77	18.05	18.33	18.66	18.88
Barham Street Crossing								
SS9240	72	1882	17.81	18.42	18.69	18.88	19.05	19.15
SS9250	0	1954	17.90	18.51	18.78	18.99	19.18	19.30

Berryl Roberts Basin

XSecID	M11 Chainage (m)	AMTD (m)	Scenario 3-UltimateConditions - Peak Levels					
			50% AEP	20% AEP	10% AEP	5% AEP	2% AEP	1% AEP
	389.433	-	17.90	18.51	18.78	18.99	19.18	19.30
	375	-	17.91	18.52	18.79	19.00	19.20	19.33
	375	-	17.91	18.52	18.79	19.00	19.20	19.33
Berryl Robert Basin Spillway								
	313.55	-	21.86	22.12	22.23	22.31	22.41	22.49

XSecID	M11 Chainage (m)	AMTD (m)	Scenario 3-UltimateConditions - Peak Levels					
			50% AEP	20% AEP	10% AEP	5% AEP	2% AEP	1% AEP
	313.55	-	21.86	22.12	22.23	22.31	22.41	22.49
	161.19	-	21.86	22.13	22.24	22.32	22.42	22.50
	78.74	-	21.87	22.13	22.25	22.34	22.45	22.54
	0.164215	-	21.88	22.16	22.28	22.38	22.51	22.60

Shelleys Creek

XSecID	M11 Chainage (m)	AMTD (m)	Scenario 3-UltimateConditions - Peak Levels					
			50% AEP	20% AEP	10% AEP	5% AEP	2% AEP	1% AEP
SS1030	12165	9530	39.37	39.63	39.77	39.91	40.08	40.20
SS1040	12069	9626	40.08	40.38	40.54	40.71	40.93	41.09
Beenleigh Road Bridge								
SS1060	12041	9655	40.60	41.00	41.24	41.56	41.98	42.20
SS1070	11928	9769	41.04	41.43	41.66	41.94	42.31	42.54
SS1080	11869	9833	41.22	41.63	41.86	42.14	42.51	42.74
SS1078	11867	9834	43.08	43.21	43.28	43.36	43.48	43.57
Copy of SS1080	11866	9837	43.08	43.21	43.28	43.36	43.48	43.57
Copy of SS1080	11865	9838	43.09	43.21	43.28	43.36	43.48	43.57
Lang Street Pedestrian Bridge								
SS1100	11862	9839	43.11	43.25	43.35	43.46	43.62	43.75
Copy of SS1100	11848	9841	43.12	43.27	43.36	43.47	43.63	43.77
SS1105	11844	9849	43.13	43.28	43.38	43.49	43.65	43.79
Copy of SS1110	11766	9932	43.87	44.16	44.31	44.47	44.69	44.86
SS1110	11709	10003	44.37	44.70	44.88	45.06	45.30	45.49
SS1120	11638	10121	45.05	45.39	45.57	45.76	46.02	46.22
SS1130	11520	10180	46.40	46.66	46.81	46.96	47.17	47.33
Copy of SS1140	11485	10215	46.68	47.04	47.21	47.38	47.60	47.77
Copy of SS1140	11470	10230	46.76	47.13	47.31	47.48	47.72	47.89
SS1140	11462	10238	46.76	47.13	47.31	47.49	47.73	47.91
Chilton Street Crossing								
SS1160	11443	10257	46.91	47.32	47.52	47.70	47.93	48.10
Copy of SS1160	11430	10270	46.94	47.35	47.55	47.74	47.98	48.15
SS1170	11314	10386	47.61	48.00	48.20	48.40	48.67	48.87
SS1180	11223	10477	48.55	48.89	49.06	49.26	49.52	49.73
SS1190	11134	10566	49.30	49.61	49.78	49.96	50.21	50.41
SS1200	11036	10664	50.29	50.59	50.75	50.92	51.17	51.37
SS1203	10969	10731	51.19	51.54	51.72	51.91	52.19	52.40
SS1204	10965	10735	51.22	51.57	51.75	51.94	52.22	52.43
Kingsman FootBridge Crossing								
Copy of SS1204	10962	10738	51.23	51.58	51.76	51.96	52.24	52.46
SS1210	10948	10752	51.47	51.80	51.98	52.16	52.42	52.62
SS1220	10866	10834	51.98	52.27	52.43	52.60	52.84	53.03
SS1230	10821	10879	52.36	52.62	52.76	52.89	53.10	53.26
SS1240	10729	10971	53.74	53.93	54.02	54.13	54.29	54.41
SS1250	10630	11070	55.09	55.31	55.43	55.55	55.73	55.87
Copy of SS1260	10520	11180	56.12	56.28	56.37	56.46	56.61	56.72
Detention Basin Culvert								
SS1260	10514	11186	58.95	59.08	59.14	59.20	59.30	59.38
SS1270	10412	11288	59.37	59.63	59.77	59.92	60.13	60.29
Hellawell Road Crossing								
SS1290	10386	11314	59.44	59.73	59.93	60.15	60.44	60.65
SS1297	10376	11324	59.46	59.75	59.94	60.17	60.45	60.66
SS1298	10369	11331	59.47	59.76	59.95	60.18	60.46	60.67
SS1299	10316	11384	60.02	60.24	60.38	60.54	60.78	60.96
SS1300	10283	11417	60.34	60.57	60.70	60.85	61.06	61.23
SS1308	10229	11471	61.00	61.19	61.29	61.42	61.60	61.75
SS1309	10200	11500	61.38	61.56	61.66	61.78	61.94	62.08
SS1310	10187	11513	61.54	61.72	61.82	61.93	62.09	62.22
SS1320	10091	11609	63.10	63.26	63.35	63.44	63.57	63.67
SS1324	10047	11653	63.67	63.79	63.86	63.94	64.04	64.13
Forestlea Place Crossing								
SS1328	10039	11661	64.88	64.93	64.97	65.00	65.05	65.09
Copy of S1330	10010	11690	64.93	65.01	65.05	65.09	65.15	65.20
SS1330	10000	11700	65.11	65.18	65.22	65.26	65.31	65.36

APPENDIX F - Extreme Event Peak Flood Levels

Stable Swamp Creek

XSecID	M11 Chainage (m)	AMTD (m)	Scenario 3-UltimateConditions - Peak Levels	
			0.5% AEP	0.2% AEP
		0	1.83	1.83
		100	2.60	2.61
		200	3.37	3.39
		300	3.43	3.45
		400	3.50	3.53
		500	3.56	3.59
		600	3.72	3.76
		700	3.93	3.97
		800	4.05	4.09
		900	4.09	4.13
		1000	4.24	4.29
		1100	4.46	4.51
		1200	4.57	4.63
		1300	4.79	4.85
		1400	4.91	4.98
		1500	5.12	5.19
		1600	5.29	5.36
		1700	5.76	5.83
		1800	5.89	5.96
		1900	5.94	6.01
		2000	6.03	6.10
		2010	6.02	6.09
Ipswich Mwy Bridge Culvert				
		2190	6.95	7.11
		2200	6.95	7.11
		2300	6.96	7.12
		2330	6.97	7.14
Marshall Road Crossing				
		2360	6.97	7.14
		2400	7.02	7.18
		2500	7.04	7.20
		2600	7.17	7.34
		2700	7.30	7.47
		2800	7.34	7.51
		2900	7.37	7.53
		3000	7.39	7.55
		3100	7.41	7.58
		3200	7.46	7.62
		3300	7.50	7.66
		3400	7.53	7.69
		3500	7.57	7.74
		3600	7.61	7.78
		3700	7.74	7.91
Beaudesrt Road Bridge				
		3750	8.03	8.18
		3800	7.95	8.10
		3900	8.25	8.40
		4000	8.31	8.48
		4100	8.35	8.53
		4200	8.45	8.63
		4240	8.52	8.71
Riawena Road Crossing				
		4310	8.94	9.14
		4400	8.98	9.18
		4500	9.17	9.37
		4600	9.24	9.46
		4700	9.50	9.72
		4712	9.50	9.72
Musgrave Road Crossing				
		4783	9.65	9.88
		4800	9.68	9.91
		4900	9.73	9.97
		5000	9.71	9.88
		5050	9.63	9.75
Railway Bridge				
		5100	9.72	10.05
		5200	10.26	10.61

XSecID	M11 Chainage (m)	AMTD (m)	Scenario 3-UltimateConditions - Peak Levels	
			0.5% AEP	0.2% AEP
		5300	10.51	10.81
		5400	10.71	10.96
		5490	11.05	11.28
Edith Street Crossing				
		5540	11.53	11.76
		5600	11.61	11.84
		5700	11.73	11.95
		5800	11.86	12.08
		5900	12.24	12.43
		6000	12.74	12.98
		6100	13.22	13.47
		6140	13.38	13.64
Boundary Road Crossing				
		6220	14.17	14.50
		6300	14.53	14.82
		6400	14.68	14.96
		6500	15.14	15.39
		6600	15.33	15.51
		6700	15.84	16.00
		6800	16.53	16.67
		6900	18.43	18.58
		7000	19.41	19.56
		7092	20.25	20.43
Beenleigh Road Crossing				
		7112	20.32	20.51
SS780	2810	7360	21.76	22.04
SS790	2674	7496	22.03	22.33
SS800	2516	7654	22.71	23.00
SS810	2417	7753	22.87	23.19
SS820	2316	7854	23.28	23.63
SS830	2240	7931	23.82	24.22
SS840	2132	8040	24.21	24.69
SS850	2040	8132	25.04	25.60
SS860	1962	8209	26.06	26.56
Dyson Avenue Pedestrian Bridge Crossing				
Section 2	1950	8221	27.59	27.84
Section 9	1859	8317	27.80	28.06
Section 12	1823	8353	27.87	28.14
Section 15	1790	8386	27.99	28.25
Section 16	1780	8396	28.03	28.29
Section 17	1771	8405	28.15	28.41
Section 19	1755	8421	28.39	28.62
Section 3	1721	8455	29.05	29.22
Section 2	1665	8511	29.57	29.75
SS900	1641	8535	29.73	29.93
Keats Street Bridge				
SS920	1625	8550	31.53	31.66
SS922	1618	8554	31.54	31.68
SS928	1593	8580	31.72	31.87
SS930	1577	8595	31.77	31.92
Section 1	1514	8658	31.97	32.12
SS938	1447	8725	33.26	33.36
SS960	1441	8728	33.33	33.43
Stones Road Crossing				
SS965	1430	8742	34.13	34.24
SS970	1272	8902	34.99	35.07
SS980	1199	8975	36.43	36.48
SS990	1059	9115	38.26	38.33
SS1000	960	9216	39.12	39.20
SS1010	859	9319	39.76	39.83
SS1020	737	-	40.45	40.48

Archerfield Channel

XSecID	M11 Chainage (m)	AMTD (m)	Scenario 3-UltimateConditions - Peak Levels	
			0.5% AEP	0.2% AEP
		0	7.64	7.81
		100	7.70	7.88
		200	7.70	7.89

XSecID	M11 Chainage (m)	AMTD (m)	Scenario 3-UltimateConditions - Peak Levels	
			0.5% AEP	0.2% AEP
		290	7.71	7.91
Marshall Road Crossing				
		320	7.72	7.91
		400	7.73	7.92
		490	7.74	7.93
Granard Road Crossing				
		530	7.74	7.94
		600	7.74	7.94
		700	7.74	7.94
		800	7.75	7.94
		900	7.87	7.99
		980	8.90	9.02
		1000	8.91	9.04

North Arm

XSecID	M11 Chainage (m)	AMTD (m)	Scenario 3-UltimateConditions - Peak Levels	
			0.5% AEP	0.2% AEP
		0	9.94	10.29
		70	10.22	10.58
Musgrave Road Crossing - West				
		100	10.39	10.70
		200	10.55	10.83
		220	10.58	10.86
Railway Bridge				
		250	10.66	10.93
		300	10.67	10.94
		340	10.71	10.99
Perrin Place Crossing				
		380	10.85	11.16
		400	10.85	11.15
		500	11.00	11.31
		600	11.11	11.43
		700	11.26	11.57
		800	11.50	11.78
		900	12.13	12.41
		1000	13.01	13.23
		1100	13.63	13.86
		1200	14.16	14.42
		1300	14.66	14.90
		1400	15.14	15.32
		1450	15.62	15.86
Orange Groove Road Crossing				
		1490	17.03	17.20
		1500	17.06	17.23
		1550	17.21	17.38
Musgrave Road Crossing -East				
		1590	17.50	17.68
		1590	17.50	17.68
SS9170	284	1670	17.79	17.97
SS9180	158	1796	18.46	18.68
SS9190	150	1804	18.51	18.74
Peringa Street FootBridge Crossing				
SS9210	144	1810	18.64	18.91
SS9220	80	1874	19.16	19.39
Barham Street Crossing				
SS9240	72	1882	19.28	19.40
SS9250	0	1954	19.46	19.60

Berryl Roberts Basin

XSecID	M11 Chainage (m)	AMTD (m)	Scenario 3-UltimateConditions - Peak Levels	
			0.5% AEP	0.2% AEP
	389.433	-	19.46	19.60
	375	-	19.48	19.63
	375	-	19.48	19.63
Berryl Robert Basin Spillway				
	313.55	-	22.58	22.67

XSecID	M11 Chainage (m)	AMTD (m)	Scenario 3-UltimateConditions - Peak Levels	
			0.5% AEP	0.2% AEP
	313.55	-	22.58	22.67
	161.19	-	22.60	22.69
	78.74	-	22.65	22.75
	0.164215	-	22.71	22.82

Shelleys Creek

XSecID	M11 Chainage (m)	AMTD (m)	Scenario 3-UltimateConditions - Peak Levels	
			0.5% AEP	0.2% AEP
SS1030	12165	9530	40.45	40.48
SS1040	12069	9626	41.40	41.45
Beenleigh Road Bridge				
SS1060	12041	9655	42.42	42.37
SS1070	11928	9769	42.79	42.79
SS1080	11869	9833	43.00	43.06
SS1078	11867	9834	43.71	43.83
Copy of SS1080	11866	9837	43.71	43.84
Copy of SS1080	11865	9838	43.71	43.84
Lang Street Pedestrian Bridge				
SS1100	11862	9839	43.95	44.10
Copy of SS1100	11848	9841	43.96	44.11
SS1105	11844	9849	43.98	44.14
Copy of SS1110	11766	9932	45.09	45.29
SS1110	11709	10003	45.74	45.96
SS1120	11638	10121	46.48	46.74
SS1130	11520	10180	47.57	47.78
Copy of SS1140	11485	10215	48.01	48.22
Copy of SS1140	11470	10230	48.14	48.36
SS1140	11462	10238	48.15	48.37
Chilton Street Crossing				
SS1160	11443	10257	48.32	48.51
Copy of SS1160	11430	10270	48.37	48.57
SS1170	11314	10386	49.14	49.38
SS1180	11223	10477	50.01	50.24
SS1190	11134	10566	50.68	50.90
SS1200	11036	10664	51.64	51.88
SS1203	10969	10731	52.68	52.91
SS1204	10965	10735	52.70	52.94
Kingsman FootBridge Crossing				
Copy of SS1204	10962	10738	52.75	52.99
SS1210	10948	10752	52.89	53.13
SS1220	10866	10834	53.29	53.51
SS1230	10821	10879	53.48	53.69
SS1240	10729	10971	54.58	54.75
SS1250	10630	11070	56.05	56.24
Copy of SS1260	10520	11180	56.88	57.04
Detention Basin Culvert				
SS1260	10514	11186	59.48	59.58
SS1270	10412	11288	60.48	60.67
Hellawell Road Crossing				
SS1290	10386	11314	60.88	61.10
SS1297	10376	11324	60.90	61.12
SS1298	10369	11331	60.90	61.13
SS1299	10316	11384	61.17	61.38
SS1300	10283	11417	61.44	61.62
SS1308	10229	11471	61.93	62.11
SS1309	10200	11500	62.25	62.41
SS1310	10187	11513	62.39	62.56
SS1320	10091	11609	63.82	63.96
SS1324	10047	11653	64.27	64.38
Forestlea Place Crossing				
SS1328	10039	11661	65.18	65.23
Copy of S1330	10010	11690	65.29	65.34
SS1330	10000	11700	65.44	65.51

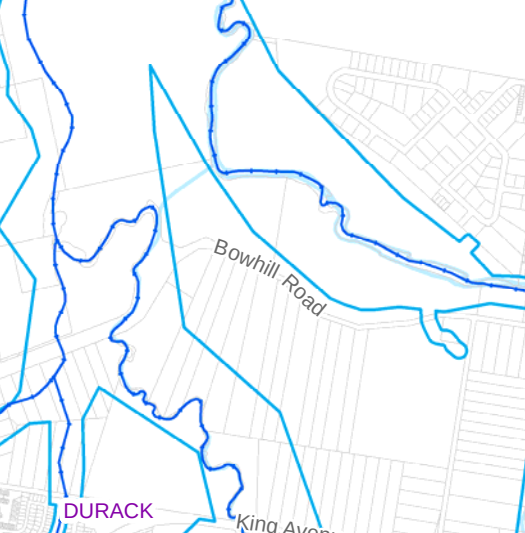
APPENDIX G - Flood Mapping Generation and Limitations

Table G.1: Limitations of the WaterRide software in flood surface generation

Limitation Number	Limitation Type	Location Description	Additional Comments
1	Break lines added to control flow at Gay St drop structure	Gay St drop structure, Stable Swamp Creek	There is a large headloss through this area, which equates to a steep flood gradient. Therefore, breaklines were required to help project the flood slope down the overland flow paths along Selhurst and Lensworth Streets. Without the application of breaklines, the upsteam level at Gat St would be incorrectly projected to downstream areas.
2	Break line added to restrict weir flow at structure	Boundary Rd structure, Stable Swamp Creek	The breakline applied at the structure maintains the headloss across the structure and therefore doesn't allow weir flow to occur on the western downstream floodplain along Richland Rd. In reality, weir flow across the structure occurs in higher events.
3	Break lines added to restrict and control flow downstream of structure	Downstream of Boundary Rd structure (in the vicinity of Meadow/Boyland/Richland Avenues), Stable Swamp Creek	Break lines were applied in the higher events to limit the water level stretching downstream of Boundary Rd on the western floodplain to Meadow and Boyland Avenues. In the vicinity of Boyland and Richland Ave's, flood levels were stretched from upstream and downstream of the railway to meet at this point.
4	Break line added along structure to separate flow from two separate channels	Beaudesert Road, Stable Swamp Creek and Archerfield Drain	A break line was applied along Beaudesert road to separate the two varying water level profiles from Stable Swamp Creek and Archerfield Channel. In some larger events the impact of the flows/levels from Stable Swamp Creek may be underestimated in this area.
5	Break lines added to control flood level gradient along channel	Archerfield Drain	Due to the steep flood profile, breaklines were added perpendicular to the flow to control the flood level stretching downstream. However, in some areas, gaps exist on the floodplain where the lower channel levels cannot stretch out across the existing terrain. In these areas known overland flow paths along Beatty Rd and Boniface St may not be represented.
6	Break line added to restrict weir flow at structure	Orange Grove crossing, North Arm tributary	Break lines were required at this crossing to limit higher levels upstream of the structure to break out and leak downstream as far as the railway line. As this is a known overflow path based on the existing case results, the break lines were applied to allow the properties immediately downstream of the crossing to be intersect with the higher levels.
-	Break lines added to control flood level gradient along channel	All other areas	For reaches downstream of Beaudesert road and along North Arm between Orange Grove Road and Perrin Place, the stretching method has projected levels onto the floodplain in a reasonable manner with only minor break lines required to stop small leaks which were considered unreasonable

TENNYSON
SHERWOOD
YEERONGPILLY
Hansen Street
HOLLAND PARK WEST
TARRAGINDI
TooheyRoad
Ansdell Street
MOOROOKA
Fairfield Road
MOUNT GRAVATT
Evans Road
Pacific Motorway
CORINDA
Ipswich Road
SALISBURY
NATHAN
UPPER MOUNT GRAVATT
ROCKLEA
Dunn Road
Granard Road
Riawena Road
Kessels Road
MACGREGOR
Musgrave Road
ROBERTSON
OXLEY
Boundary Road
COOPERS PLAINS
ARCHERFIELD
Beaudesert Road
Turton Street
Comley Street
Beatty Road
SUNNYBANK
EIGHT MILE PLAINS
Bradman Street
Stones Road
Bowhill Road
ACACIA RIDGE
Beenleigh Road
Dew Street
DURACK
King Avenue
Watson Road
SUNNYBANK HILLS
Learoyd Road
Hellawell Road
RUNCORN
WILLAWONG
INALA
Gowan Road
Blunder Road
Gooderham Road
Paradise Road
ALGESTER
DOOLANDELLA
PALLARA
Algester Road
CALAMVALE
STRETTON

1 2 3 4 5 5 6



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Legend

- Break Lines
- AMTD Line (Adopted Middle Thread Distance)
- City Plan Waterway Corridors
- Stable Swamp Creek Catchment
- Waterway/Waterbody

1% AEP

- Scenario 3 - Flood Inundation Extent
- Scenario 1 - Flood Inundation Extent

Mapping Issue Areas

- Area 1
- Area 2
- Area 3
- Area 4
- Area 5
- Area 6

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060949 Stable Swamp Creek Flood Study

Flood Mapping Limitation Areas

Figure G.1

FLM - 060949 - 00G_1

APPENDIX H - Climate Change Event Peak Flood Level Comparison

Stable Swamp Creek

XSecID	M11 Chainage (m)	AMTD (m)	Scenario 3-Ultimate Conditions - Peak Levels		
			1% AEP	1% AEP CC1	1% AEP CC2
		0	1.22	1.52	2.02
		100	2.26	2.43	2.69
		200	3.31	3.35	3.37
		300	3.37	3.40	3.43
		400	3.44	3.48	3.51
		500	3.49	3.53	3.56
		600	3.65	3.69	3.73
		700	3.85	3.90	3.94
		800	3.95	4.01	4.05
		900	4.00	4.05	4.09
		1000	4.14	4.20	4.25
		1100	4.34	4.42	4.46
		1200	4.45	4.53	4.58
		1300	4.65	4.74	4.79
		1400	4.76	4.86	4.92
		1500	4.97	5.07	5.13
		1600	5.14	5.24	5.30
		1700	5.60	5.71	5.77
		1800	5.74	5.84	5.90
		1900	5.78	5.89	5.95
		2000	5.86	5.97	6.04
		2010	5.86	5.97	6.03
Ipswich Mwy Bridge Culvert					
		2190	6.61	6.84	6.98
		2200	6.61	6.84	6.98
		2300	6.62	6.85	6.98
		2330	6.63	6.86	7.00
Marshall Road Crossing					
		2360	6.63	6.86	7.00
		2400	6.68	6.90	7.04
		2500	6.70	6.92	7.06
		2600	6.83	7.06	7.20
		2700	6.96	7.19	7.33
		2800	7.00	7.23	7.37
		2900	7.03	7.25	7.39
		3000	7.04	7.27	7.41
		3100	7.07	7.29	7.44
		3200	7.11	7.33	7.48
		3300	7.15	7.37	7.52
		3400	7.18	7.40	7.56
		3500	7.23	7.44	7.60
		3600	7.26	7.47	7.64
		3700	7.40	7.61	7.77
Beaudesrt Road Bridge					
		3750	7.72	7.89	8.06
		3800	7.63	7.80	7.97
		3900	7.94	8.11	8.28
		4000	8.01	8.18	8.36
		4100	8.06	8.22	8.41
		4200	8.17	8.33	8.51
		4240	8.25	8.41	8.58
Riawena Road Crossing					
		4310	8.67	8.84	9.01
		4400	8.70	8.89	9.05
		4500	8.89	9.07	9.23
		4600	8.96	9.15	9.31
		4700	9.20	9.40	9.56
		4712	9.21	9.41	9.57
Musgrave Road Crossing					
		4783	9.35	9.54	9.72
		4800	9.37	9.57	9.75
		4900	9.42	9.62	9.81
		5000	9.41	9.59	9.76
		5050	9.31	9.51	9.67
Railway Bridge					
		5100	9.39	9.61	9.85
		5200	9.98	10.20	10.37

XSecID	M11 Chainage (m)	AMTD (m)	Scenario 3-Ultimate Conditions - Peak Levels		
			1% AEP	1% AEP CC1	1% AEP CC2
		5300	10.24	10.43	10.61
		5400	10.43	10.61	10.78
		5490	10.81	10.96	11.13
Edith Street Crossing					
		5540	11.27	11.42	11.60
		5600	11.36	11.52	11.68
		5700	11.50	11.65	11.81
		5800	11.65	11.78	11.93
		5900	12.05	12.16	12.27
		6000	12.56	12.66	12.79
		6100	13.01	13.11	13.25
		6140	13.16	13.25	13.42
Boundary Road Crossing					
		6220	13.89	13.99	14.23
		6300	14.35	14.43	14.58
		6400	14.52	14.59	14.72
		6500	14.99	15.06	15.18
		6600	15.24	15.29	15.34
		6700	15.73	15.80	15.85
		6800	16.40	16.48	16.54
		6900	18.23	18.35	18.44
		7000	19.13	19.31	19.42
		7092	19.87	20.13	20.26
Beenleigh Road Crossing					
		7112	19.94	20.20	20.34
SS780	2810	7360	21.51	21.64	21.78
SS790	2674	7496	21.78	21.91	22.05
SS800	2516	7654	22.46	22.59	22.72
SS810	2417	7753	22.62	22.75	22.89
SS820	2316	7854	23.02	23.16	23.29
SS830	2240	7931	23.57	23.71	23.84
SS840	2132	8040	23.92	24.08	24.23
SS850	2040	8132	24.72	24.89	25.06
SS860	1962	8209	25.78	25.93	26.08
Dyson Avenue Pedestrian Bridge Crossing					
Section 2	1950	8221	27.09	27.38	27.61
Section 9	1859	8317	27.33	27.60	27.82
Section 12	1823	8353	27.41	27.67	27.89
Section 15	1790	8386	27.53	27.79	28.00
Section 16	1780	8396	27.58	27.83	28.04
Section 17	1771	8405	27.73	27.97	28.17
Section 19	1755	8421	28.01	28.22	28.40
Section 3	1721	8455	28.75	28.92	29.06
Section 2	1665	8511	29.25	29.43	29.57
SS900	1641	8535	29.40	29.58	29.74
Keats Street Bridge					
SS920	1625	8550	31.33	31.43	31.54
SS922	1618	8554	31.35	31.45	31.55
SS928	1593	8580	31.51	31.62	31.73
SS930	1577	8595	31.56	31.66	31.78
Section 1	1514	8658	31.75	31.86	31.98
SS938	1447	8725	33.09	33.18	33.26
SS960	1441	8728	33.15	33.24	33.33
Stones Road Crossing					
SS965	1430	8742	33.96	34.04	34.14
SS970	1272	8902	34.87	34.93	34.99
SS980	1199	8975	36.32	36.37	36.43
SS990	1059	9115	38.12	38.18	38.26
SS1000	960	9216	38.98	39.04	39.12
SS1010	859	9319	39.60	39.67	39.75
SS1020	737	-	40.20	40.29	40.45

Archerfield Channel

XSecID	M11 Chainage (m)	AMTD (m)	Scenario 3-Ultimate Conditions - Peak Levels		
			1% AEP	1% AEP CC1	1% AEP CC2
		0	7.29	7.50	7.67
		100	7.35	7.56	7.73
		200	7.36	7.56	7.73

XSecID	M11 Chainage (m)	AMTD (m)	Scenario 3-Ultimate Conditions - Peak Levels		
			1% AEP	1% AEP CC1	1% AEP CC2
		290	7.36	7.57	7.74
Marshall Road Crossing					
		320	7.37	7.58	7.75
		400	7.37	7.58	7.75
		490	7.38	7.59	7.76
Granard Road Crossing					
		530	7.38	7.60	7.77
		600	7.39	7.60	7.77
		700	7.39	7.60	7.77
		800	7.49	7.61	7.77
		900	7.75	7.82	7.89
		980	8.74	8.83	8.90
		1000	8.76	8.84	8.91

North Arm

XSecID	M11 Chainage (m)	AMTD (m)	Scenario 3-Ultimate Conditions - Peak Levels		
			1% AEP	1% AEP CC1	1% AEP CC2
		0	9.64	9.85	10.07
		70	9.91	10.13	10.34
Musgrave Road Crossing - West					
		100	10.04	10.26	10.48
		200	10.15	10.39	10.62
		220	10.18	10.41	10.65
Railway Bridge					
		250	10.24	10.48	10.72
		300	10.26	10.50	10.74
		340	10.29	10.53	10.77
Perrin Place Crossing					
		380	10.43	10.67	10.93
		400	10.43	10.66	10.92
		500	10.55	10.81	11.03
		600	10.68	10.92	11.14
		700	10.84	11.07	11.28
		800	11.10	11.32	11.51
		900	11.79	11.98	12.13
		1000	12.71	12.87	13.01
		1100	13.33	13.51	13.64
		1200	13.87	14.04	14.17
		1300	14.34	14.51	14.67
		1400	14.87	15.00	15.14
		1450	15.34	15.51	15.63
Orange Groove Road Crossing					
		1490	16.75	16.90	17.04
		1500	16.77	16.92	17.07
		1550	16.89	17.05	17.22
Musgrave Road Crossing -East					
		1590	17.16	17.34	17.50
		1590	17.16	17.34	17.50
SS9170	284	1670	17.50	17.66	17.79
SS9180	158	1796	18.14	18.31	18.46
SS9190	150	1804	18.19	18.37	18.51
Peringa Street FootBridge Crossing					
SS9210	144	1810	18.32	18.49	18.64
SS9220	80	1874	18.88	19.03	19.16
Barham Street Crossing					
SS9240	72	1882	19.15	19.22	19.28
SS9250	0	1954	19.30	19.39	19.46

Berryl Roberts Basin

XSecID	M11 Chainage (m)	AMTD (m)	Scenario 3-Ultimate Conditions - Peak Levels		
			1% AEP	1% AEP CC1	1% AEP CC2
	389.433	-	19.30	19.39	19.46
	375	-	19.33	19.41	19.48
	375	-	19.33	19.41	19.48
Berryl Robert Basin Spillway					
	313.55	-	22.49	22.54	22.58

XSecID	M11 Chainage (m)	AMTD (m)	Scenario 3-Ultimate Conditions - Peak Levels		
			1% AEP	1% AEP CC1	1% AEP CC2
	313.55	-	22.49	22.54	22.58
	161.19	-	22.50	22.55	22.60
	78.74	-	22.54	22.59	22.65
	0.164215	-	22.60	22.66	22.71

Shelleys Creek

XSecID	M11 Chainage (m)	AMTD (m)	Scenario 3-Ultimate Conditions - Peak Levels		
			1% AEP	1% AEP CC1	1% AEP CC2
SS1030	12165	9530	40.20	40.29	40.45
SS1040	12069	9626	41.09	41.20	41.42
Beenleigh Road Bridge					
SS1060	12041	9655	42.20	42.33	42.42
SS1070	11928	9769	42.54	42.68	42.79
SS1080	11869	9833	42.74	42.89	43.00
SS1078	11867	9834	43.57	43.64	43.71
Copy of SS1080	11866	9837	43.57	43.65	43.71
Copy of SS1080	11865	9838	43.57	43.65	43.72
Lang Street Pedestrian Bridge					
SS1100	11862	9839	43.75	43.85	43.95
Copy of SS1100	11848	9841	43.77	43.87	43.96
SS1105	11844	9849	43.79	43.89	43.99
Copy of SS1110	11766	9932	44.86	44.98	45.10
SS1110	11709	10003	45.49	45.62	45.74
SS1120	11638	10121	46.22	46.36	46.48
SS1130	11520	10180	47.33	47.45	47.57
Copy of SS1140	11485	10215	47.77	47.90	48.01
Copy of SS1140	11470	10230	47.89	48.02	48.14
SS1140	11462	10238	47.91	48.04	48.16
Chilton Street Crossing					
SS1160	11443	10257	48.10	48.22	48.33
Copy of SS1160	11430	10270	48.15	48.27	48.38
SS1170	11314	10386	48.87	49.01	49.15
SS1180	11223	10477	49.73	49.88	50.01
SS1190	11134	10566	50.41	50.56	50.68
SS1200	11036	10664	51.37	51.51	51.65
SS1203	10969	10731	52.40	52.56	52.69
SS1204	10965	10735	52.43	52.58	52.71
Kingsman FootBridge Crossing					
Copy of SS1204	10962	10738	52.46	52.62	52.76
SS1210	10948	10752	52.62	52.77	52.90
SS1220	10866	10834	53.03	53.17	53.30
SS1230	10821	10879	53.26	53.39	53.50
SS1240	10729	10971	54.41	54.51	54.60
SS1250	10630	11070	55.87	55.97	56.07
Copy of SS1260	10520	11180	56.72	56.81	56.89
Detention Basin Culvert					
SS1260	10514	11186	59.38	59.43	59.49
SS1270	10412	11288	60.29	60.41	60.51
Hellawell Road Crossing					
SS1290	10386	11314	60.65	60.79	60.91
SS1297	10376	11324	60.66	60.80	60.93
SS1298	10369	11331	60.67	60.81	60.93
SS1299	10316	11384	60.96	61.08	61.20
SS1300	10283	11417	61.23	61.35	61.46
SS1308	10229	11471	61.75	61.85	61.95
SS1309	10200	11500	62.08	62.17	62.26
SS1310	10187	11513	62.22	62.31	62.40
SS1320	10091	11609	63.67	63.75	63.82
SS1324	10047	11653	64.13	64.19	64.25
Forestlea Place Crossing					
SS1328	10039	11661	65.09	65.12	65.15
Copy of S1330	10010	11690	65.20	65.23	65.26
SS1330	10000	11700	65.36	65.39	65.42