Redland Water & Waste

Water Supply Planning Report

March 2007

Redland Water

Water Supply Planning Report

Contents

Table of Acronyms

Description	Acronym
Average Day Demand	ADD
Desired Standards of Service	DSS
Equivalent Person	EP
Equivalent Tenement	ET
Flow Control Valve	FCV
Geographic Information Systems	GIS
High Level Zone	HLZ
Infrastructure Charges Schedule	ICS
Litres per Second	L/s
Low Level Zone	LLZ
Max Day (also known as Peak Day)	MD or PD
Mean Day Max Month	MDMM
Max Hour (also known as Peak Hour)	MH or PH
Megalitres per Day	ML/d
Non Revenue Water	NRW
North Stradbroke Island	NSI
Planning Information and Forecasting Unit	PIFU
Pressure Reducing Valve	PRV
Pumping Station	PS
Redlands Planning Scheme	RPS
Redlands Shire Council	RSC
Redlands Water and Waste	RWW
Southern Moreton Bay Island	SMBI
Water Services Association Australia	WSAA
Water Supply Zone	WSZ
Water Treatment Plant	WTP

1. INTRODUCTION

1.1 Background to the Study

This report is based on the infrastructure charges review undertaken by Opus International Consultants (PCA) Ltd and the Water Supply Planning report, dated 29 January 2007, prepared by MWH Australia. MWH Australia was commissioned by Redland Water & Waste (RWW) to undertake a Master Planning Study of the Redland sewerage and water supply systems. This report focuses on the water supply system only and is a revision of the previous Master Planning Study due to the recent adoption by Council of a revised Redlands Planning Scheme (effective from 30 March 2006).

The purpose of the study was to:

- Review existing documents and prepare updated information incorporating additional issues such as;
  - Revised population forecasts utilising the land use categories contained in the adopted Redlands Planning scheme.
  - RWWs intention to adopt the WSAA standards.
  - Demand management initiatives including pressure management, leakage and water restrictions. Although the demand required from pressure and leakage management was considered, no infrastructure for pressure and leakage has been specifically included.
- Update the water supply hydraulic model with the latest information in InfoWater format.
- Revise Desired Standards of Service (DSS)
- Develop a Capital Works Program (CWP) to provide for ultimate development augmentations were considered in conjunction with renewal requirements.
- Provide inputs for the Infrastructure Charges Scheme (ICS).

1.2 Study Outcomes

The output from the study provided:

- A report detailing the Desired Standards of Service for the water supply network.
- Updated water supply hydraulic model in InfoWater format.
- A planning report that describes the required infrastructure necessary to accommodate the ultimate population projections,
- A separate PIP report for water supply and wastewater,
- A separate Infrastructure Charges Schedules report for water supply and wastewater,
- GIS compatible data layer of the water supply and sewerage charge contributions areas,
- Updated water supply and wastewater policies, where necessary.

2. DEMAND REVIEW

2.1 Background

The study utilised the recently adopted planning scheme of Redland Shire Council (effective 30 March 2006) as the basis for evaluating demand projections.

In order to assess the water supply system performance over the various planning horizons from existing (2006) to ultimate, a GIS-based EP population model was developed. This model was based on the GHD population model, with advice from the RSC planning advisors with respect to non-residential forecast.

The ultimate population was determined to occur at 2025 based on growth projections obtained from RSC planning advisors. Projected populations were assigned to each property within the existing Redland Digital Cadastral Database DCDB for each of the 2008, 2013, 2018 and ultimate planning horizons. The population model was developed based on the following information:

- Population projection data from Department of Local Government's Planning Information and Forecasting Unit (PIFU)
- Redlands Planning Scheme (RPS) in GIS format
- Population Model (GHD) which is being utilised in the development of the ICS for all applicable RSC Infrastructure.
- Redland Shire DCDB (RWW)
- Billing data (RSC)

2.2 Existing (2006) Population

Redland Shire's Water Supply network supplies a majority of the Mainland (including Coochiemudlo Island), Southern Moreton Bay Islands (SMBI) and North Stradbroke Island (NSI). PIFU population projections are for the whole shire. For water planning purposes the Mainland, Southern Moreton Bay Islands and North Stradbroke Island was considered within the scope of the project.

Existing populations were calculated using a number of different methods, based on land-use and lot sizes. Detached residential properties identified by billing data were assigned 2.8 persons per dwelling based on information provided by PIFU. Multi Family residential properties were assigned 1.8 persons per dwelling based on information provided by PIFU. Residential properties on the Southern Moreton Bay Islands were assigned an occupancy rate of 1.6 persons per dwelling based on information provided by RSC planning advisors. Council provides water services to approximately 96.5% of the residential population, with the remaining being self-sustaining. Table 2.1 indicates which Planning Scheme Zones have been allocated into the Population Forecast Land Use Zones.

Table 2.1: Allocation of Planning Scheme Zones into Demand Forecast Land Use Zones

Planning Scheme Zones	Land Use Code
Commercial Industry	Commercial
Community Purposes	Public
Conservation	Unzoned
District Centre	Public
Emerging Urban Community	Urban Residential
Environmental Protection	Open Space
General Industry	Industrial
Investigation Zone	Unzoned
Island Industry	Industrial
Local Centre	Commercial
Low Density Residential	Low Density Residential
Major Centre	Commercial
Marine Activity	Unzoned
Medium Density Residential	Medium Density Residential
Mixed Zone	Unzoned
Neighbourhood Centre	Public
Open Space	Open Space
Park Residential	Low Density Residential
Point Lookout Centre	Public
Point Lookout Residential	Urban Residential
Point Lookout Tourist	Tourism
Rural Non Urban	Rural
Southern Moreton Bay Islands (SMBI) Centre	Public
Southern Moreton Bay Islands (SMBI) Industry	Industrial
Southern Moreton Bay Islands (SMBI) Residential	Urban Residential
Unzoned	Unzoned
Urban Residential	Urban Residential

The residential average daily demand was calculated utilising billing data and confirmed using long term production and consumption models. These models considered a reduction over time as demand management initiatives and leakage reduction programs take effect (see Section 2.5.2 for further details), and an increase due to discretionary use. Discretionary usage is defined as usage not controlled by fixtures, and includes external usage, or the use of dishwashers, baths, spas or pools. The non-residential average daily demand was calculated in a similar manner with billing data being utilised where possible. The densities in Table 2.3 were utilized if no other information was available.

Table 2.2: Summary of 2006 Equivalent Population

Land-use Category	Water (EP)
Mainland	
Residential	
Urban Residential	99,379
Medium Density Residential	14,013
Low Density Residential	6,892
Residential Sub-Total	120,284
Non-Residential	
Commercial	4,236
Industrial	1,957
Irrigation	45
Open Space	2,685
Public	3,414
Rural	2,507
Tourism	0
Non-Residential Sub-Total	14,844
Mainland Total	135,128
SMBI	
Residential	
Urban Residential	4,949
Medium Density Residential	0
Low Density Residential	0
Residential Sub-Total	4,949
Non-Residential	
Commercial	15
Industrial	1
Irrigation	0
Rural	84
Open Space	23
Public	265
Tourism	0
Non-Residential Sub-Total	388
SMBI Total	5,338
NSI	
Residential	
Urban Residential	4,120
Medium Density Residential	42
Low Density Residential	34

Land-use Category	Water (EP)
Residential Sub-Total	4,195
Non-Residential	
Commercial	113
Industrial	20
Irrigation	0
Rural	2
Open Space	127
Public	202
Tourism	546
Non-Residential Sub-Total	1,010
NSI Total	5,205
Redland Shire	
Residential Total	129,428
Non-Residential Total	16,242
Grand Total	145,670

2.3 Ultimate Population Projection

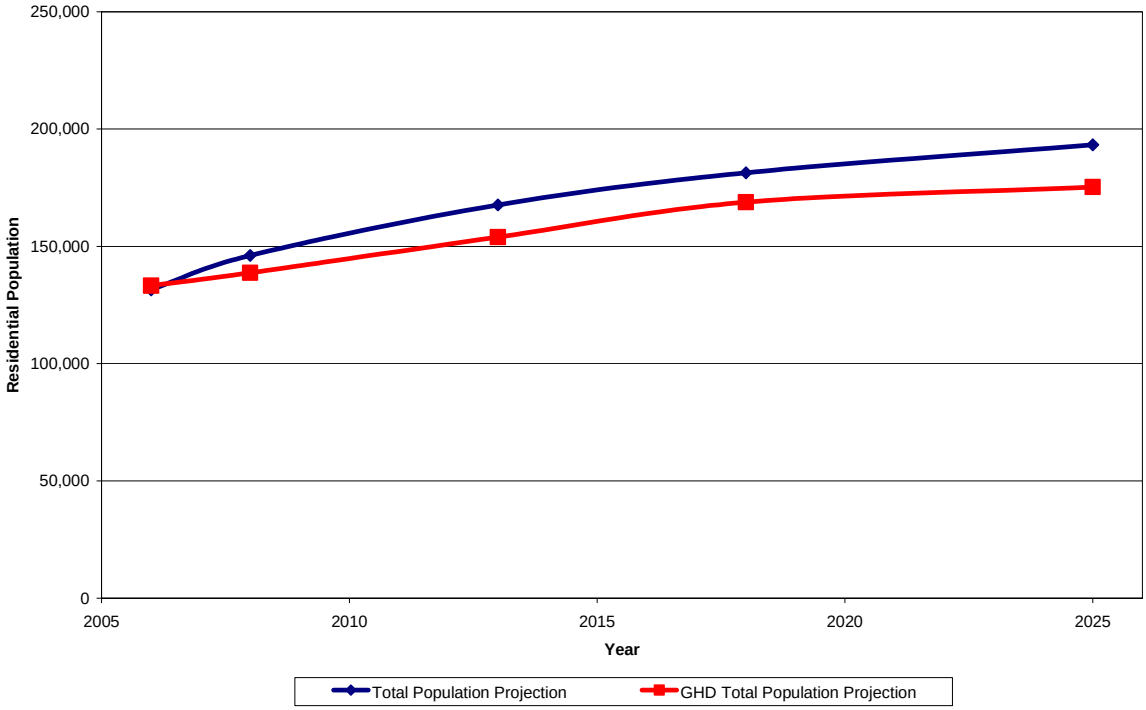
The ultimate populations were calculated utilising Council's Planning Scheme. Detached residential properties identified by billing data were assigned 2.7 persons per dwelling and Multi Family residential properties were assigned 1.7 persons per dwelling. The occupancy rates were based on information provided by RSC planning advisors regarding the GHD population model assumptions. Residential properties on the Southern Moreton Bay Islands were assigned an occupancy rate of 1.6 persons per dwelling based on information provided by RSC planning advisors.

2.3.1 Total Residential Population Projection

RWW supplied an ICS population model created by GHD, this model was used to develop the residential populations so that consistency is maintained with other RSC ICS projections. The projected ultimate residential population totalled 193,224 and was split between the Mainland (166,212), SMBI (22,042) and NSI (5,019).

Figure 2.1 shows the projected residential population compared with the supplied GHD population forecast for Redland Shire. It can be seen that there is a minor variation between the two forecasts. This is due to the transient tourist population that is experienced during peak summer period on SMBI and NSI. The transient population is approximately 16,600 at ultimate. For the mainland there is only a minor difference in ultimate populations, with the mainland having 166,212 persons in the demand forecast and 165,936 persons in the population forecast supplied by GHD.

Figure 2.1 Total Projected Residential Population for Redland Shire



2.3.2 Distribution of Ultimate Residential Population

The ultimate residential population for Redland Shire has been distributed utilising the adopted Redland Planning Scheme and the GHD population model. MWH completed a regional study to revise the adopted densities for greenfield development and large in-fill areas, and confirmed the densities utilising historic water billing records. The ultimate ET was calculated using the average density by land zoning as shown in Table 2.3. The remaining growth will be from infill development.

As expected the growth in the mainland residential population dominates the shire with only the tourist portion of NSI being of any significance with 2,249 EP. The transient tourist population that is experienced during the peak summer period on SMBI and NSI is approximately 16,600 at ultimate and falls into urban residential population projections.

Table 2.3: Average Density of Land Zonings

Land Use	Adopted Density (ET)
Centre (Major, District, Neighbourhood, Local, SMBI, Pt Lookout)	Based on water billing data, due to variance.
Commercial Industry (per gross hectare)	15
General Industry (per gross hectare)	20
Irrigation/Open Space (per gross hectare)	3.7
Low Density Residential (per lot - 2000m^2 average)	1.25
Medium Density Residential (per gross hectare)	30
Park Residential (per lot - 6000m^2 average)	1.5
Public/Government (per gross hectare)	15
Rural Non-Urban (per lot)	1.5
Tourist Industry (per gross hectare)	15
Urban Residential (per gross hectare)	10

The mainland is characterised by the majority of the residential population being located in the north and east of the shire. The south-western portions (south of Sheldon) are comprised of conservation and rural non-urban areas.

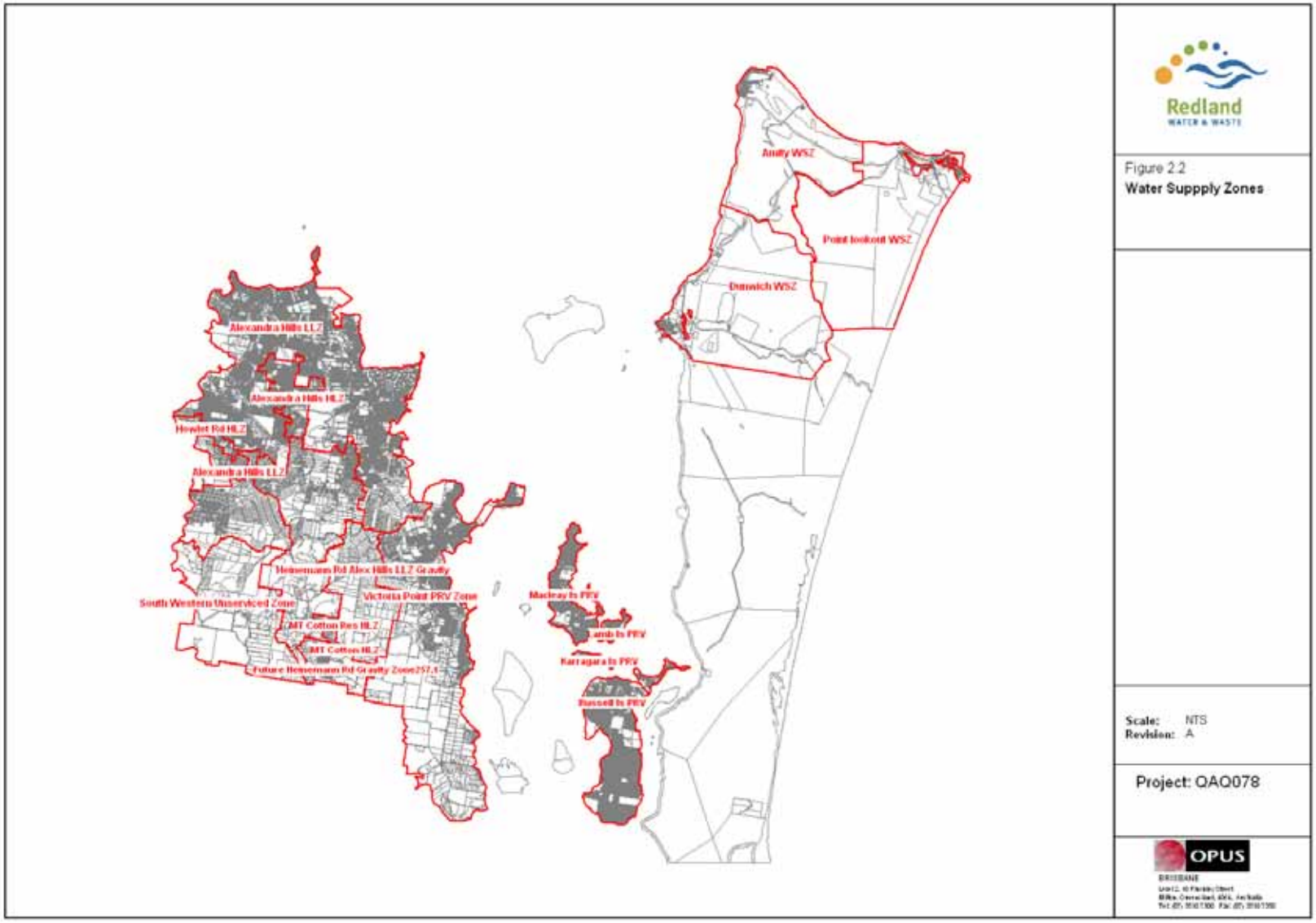
The resultant predicted distribution of growth amongst the water supply zones is shown in Table 2.4. Figure 2.2 shows the Water Supply Zones for the Mainland, Southern Moreton Bay Islands and North Stradbroke Island.

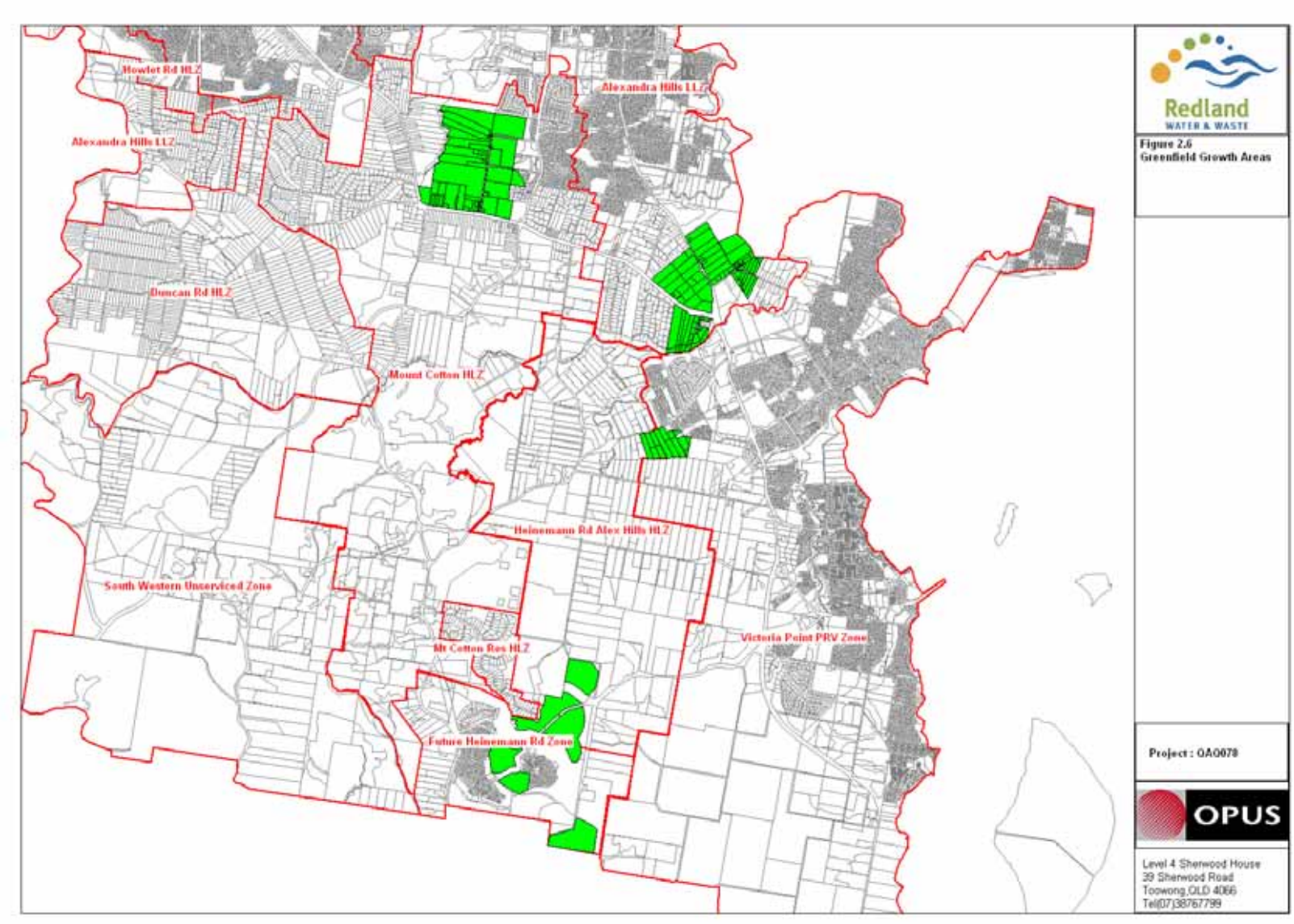
2.3.3 Land Use Breakdown & Growth

An assessment of the land use zoning breakdown and growth across Redland Shire Council has been made from the above population data and the adopted Redlands Planning Scheme as at November 2006.

Land use zones within the system used for modelling were:

- Urban Residential (RES_1)
- Medium Density Residential (RES_2)
- Low Density Residential (RES_3)
- Commercial (COM)
- Industrial (IND)
- Irrigation (IRR)
- Public (PUB)
- Tourist (TOU)
- Irrigation (IRR)


Redland
WATER & WASTE
Figure 2.2
Water Suppply Zones
Amity WSZ
Point lookout WSZ
Dunwich WSZ
Alexandra Hills LLZ
Alexandra Hills HLZ
Howlet Rd HLZ
Alexandra Hills LLZ
Heinemann Rd Alex Hills LLZ Gravity
South Western Unserviced Zone
Victoria Point PRV Zone
MT Cotton Res HLZ
MT Cotton HLZ
Future Heinemann Rd Gravity Zone257.5
Macleay Is PRV
Lamb Is PRV
Karragara Is PRV
Russell Is PRV
Scale: NTS
Revision: A
Project: QAQ078
OPUS
BRISBANE


Howlet Rd HLZ
Alexandra Hills LLZ
Alexandra Hills LLZ
Duncan Rd HLZ
Mount Cotton HLZ
Heinemann Rd Alex Hills HLZ
South Western Unserviced Zone
Mt Cotton Res HLZ
Victoria Point PRV Zone
Future Heinemann Rd Zone
Redland
WATER & WASTE
Figure 2.6
Greenfield Growth Areas
Project : QA0078
OPUS
Level 4 Sherwood House
39 Sherwood Road
Toowong,QLD 4066
Tel(07)38767799

2.3.4 Greenfield Regions

There are several Greenfield developments that were identified during the ultimate population distribution process. Greenfield developments were defined as over a 1000 EP of development in a discrete area. Figure 2.6 shows the Greenfield regions within Redland Shire. The Greenfield developments identified were as follows:

- Kinross Road – Kinross Road is currently undeveloped and has an ultimate EP of 4,100 EP.
- South East Thornlands – The Greenfield development located near the corner of Boundary Road and Cleveland-Redland Bay Road has an expected ultimate EP of 3,000EP.
- Southern Redlands Bay - The Greenfield development located along Cleveland-Redland Bay Road has an expected ultimate EP of 5,000 – 8,000EP and is not considered in the PIP or in this study.
- Mt Cotton – Mt Cotton is currently being developed and is expected to have an ultimate EP of 7,000 EP.

Table 2.4: Summary of Growth by Water Supply Zone

Water Supply Zone	Existing (2006)(EP)	Ultimate (2025) (EP)	Growth to Ultimate (EP)
Mainland			
Alexandra Hills HLZ	9,443	10,035	592
Alexandra Hills LLZ	87,482	113,179	25,698
Duncan Road HLZ	1,892	1,912	20
Future Heinmann Road Gravity Zone	2,121	3,487	1,365
Heinmann Road Alex Hills LLZ Gravity	1,138	2,944	1,806
Howlett Road HLZ	1,375	1,375	0
Mt Cotton HLZ	3,585	12,234	8,649
Mt Cotton Res HLZ	297	330	33
South Western Unserviced Zone	0	0	0
Victoria Point PRV Zone	27,794	43,351	15,557
Mainland Total	135,127	188,848	53,721
SMBI			
Karragarra Island	270	568	298
Lamb Island	558	1,379	822
Macleay Island	2,315	7,356	5,041
Russel Island	2,194	12,269	10,075
SMBI Total	5,338	21,573	16,235
NSI			
Amity Point	1,044	1,362	318

Water Supply Zone	Existing (2006)(EP)	Ultimate (2025) (EP)	Growth to Ultimate (EP)
Booran Street HLZ	1,071	2,177	1,106
Dunwich	1,095	1,671	577
Illawong Crescent Reservoir HLZ	36	101	64
Point Lookout	1,175	2,286	1,111
Tazi Reservoir HLZ	263	267	4
Tramican Street HLZ	521	699	178
NSI Total	5,205	8,563	3,358
Redland Shire			
Grand Total	145,670	218,984	73,314

The total projected water EP growth of Redland Shire is 73,314. The mainland accounts for 73.1% of that growth through a 53,721 increase in EP. SMBI has a growth of 16,235 EP which accounts for 22.3% of the projected Redland Shire growth. NSI has a growth of 3,358 EP which accounts for 4.6% of the projected Redland Shire growth.

No Conservation or Environmental land zones are identified for development under the adopted Redland Planning Scheme.

2.3.5 Distribution of Ultimate Non-Residential Population

Non-residential land use accounts for 11.3% of the ultimate development capacity of 25,711 EP. Figure 2.7, Figure 2.8 and Figure 2.9 shows the breakdown of the total non-residential demand for ultimate for the Mainland, SMBI and NSI.

Figure 2.7 Breakdown of the Ultimate Non-Residential Development for the Mainland

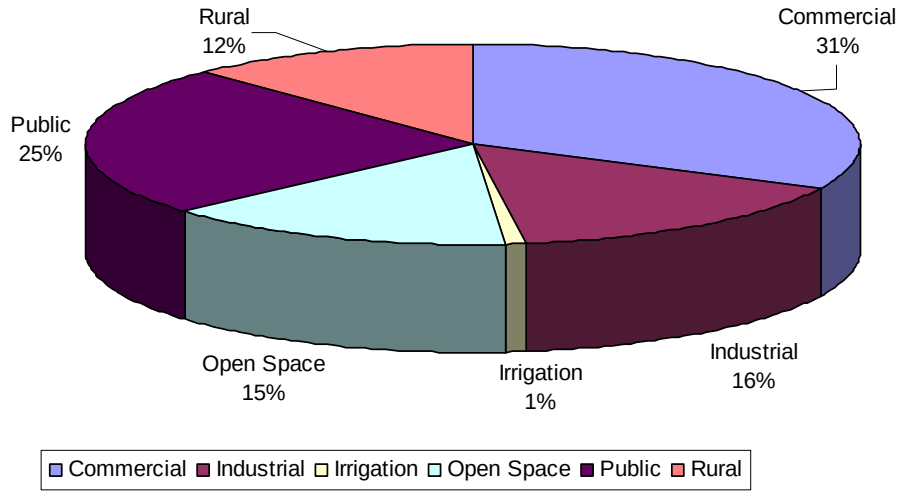


Figure 2.8 Breakdown of the Ultimate Non-Residential Development for SMBI

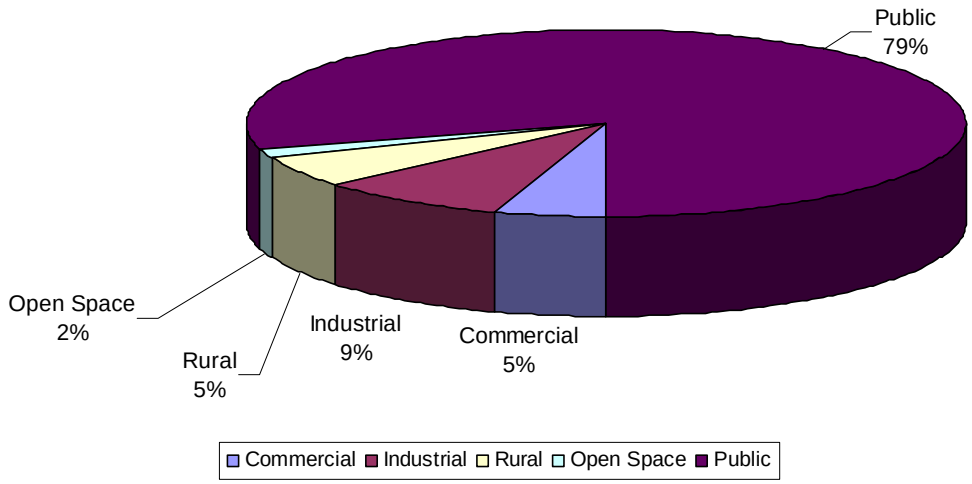
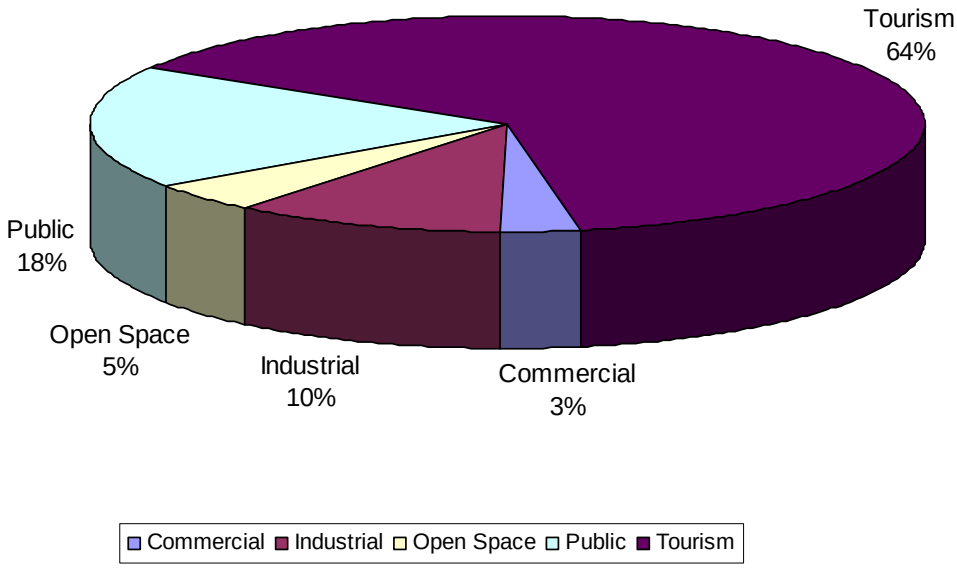


Figure 2.9 Breakdown of the Ultimate Non-Residential Development for the NSI



Populations for non-residential zones were calculated by applying the respective EP/ha densities for water supply servicing as shown in Table 2.3. Open space areas were treated separately for water, with only the areas that are known to be irrigated being taken into account, new open space areas have not been included in determining water infrastructure requirements. Open space zoned areas also include some facilities such as club houses, halls, etc. These have been accounted for by using water consumption billing information.

2.3.6 Summary of Adopted Ultimate (2025) Population

The total Redland Shire serviced EP at ultimate development is 218,984 with the mainland comprising 86.2% of the demand, SMBI comprising 9.9% and NSI the remaining 3.9% of demand. A breakdown of ultimate populations developed for water supply planning purposes has been summarised in Table 2.5 below.

Table 2.5: Summary of Ultimate (2025) EP

Landuse Category	Water (EP)
Mainland	
Residential	
Urban Residential	136,044
Medium Density Residential	25,510
Low Density Residential	6,658
Residential Sub-Total	168,212
Non-Residential	
Commercial	6,704
Industrial	3,229
Irrigation	45
Open Space	3,052
Public	5,099
Rural	2,507
Tourism	0
Non-Residential Sub-Total	20,636
Mainland Total	188,848
SMBI	
Residential	
Urban Residential	20,042
Medium Density Residential	0
Low Density Residential	0
Residential Sub-Total	20,042
Non-Residential	
Commercial	76
Industrial	131
Irrigation	0
Rural	84
Open Space	23
Public	1,217
Tourism	0
Non-Residential Sub-Total	1,531

Landuse Category	Water (EP)
NSI Total	21,573
NSI	
Residential	
Urban Residential	4,959
Medium Density Residential	26
Low Density Residential	35
Residential Sub-Total	5,019
Non-Residential	
Commercial	113
Industrial	365
Irrigation	0
Rural	2
Open Space	162
Public	653
Tourism	2,249
Non-Residential Sub-Total	3,544
SMBI Total	8,563
Redland Shire	
Residential Total	193,274
Non-Residential Total	25,711
Grand Total	218,984

2.4 Staging Analysis

2.4.1 Staging of Residential Population

Redland Shire is expected to undergo significant population expansion with the ultimate planing population expected in the year 2025. The residential population was staged to include 2008, 2013, and 2018 planning horizons. The staging of the residential population was projected using the population model formed by GHD and supplied by RWW to MWH.

Table 2.6 summarises the total residential population projections for each of the planning years by suburbs within Redlands Shire. Appendix A shows a comparison of the following table with the GHD model population forecast. Figure 2.10 indicates the suburbs and water supply zones within Redland's Shire.

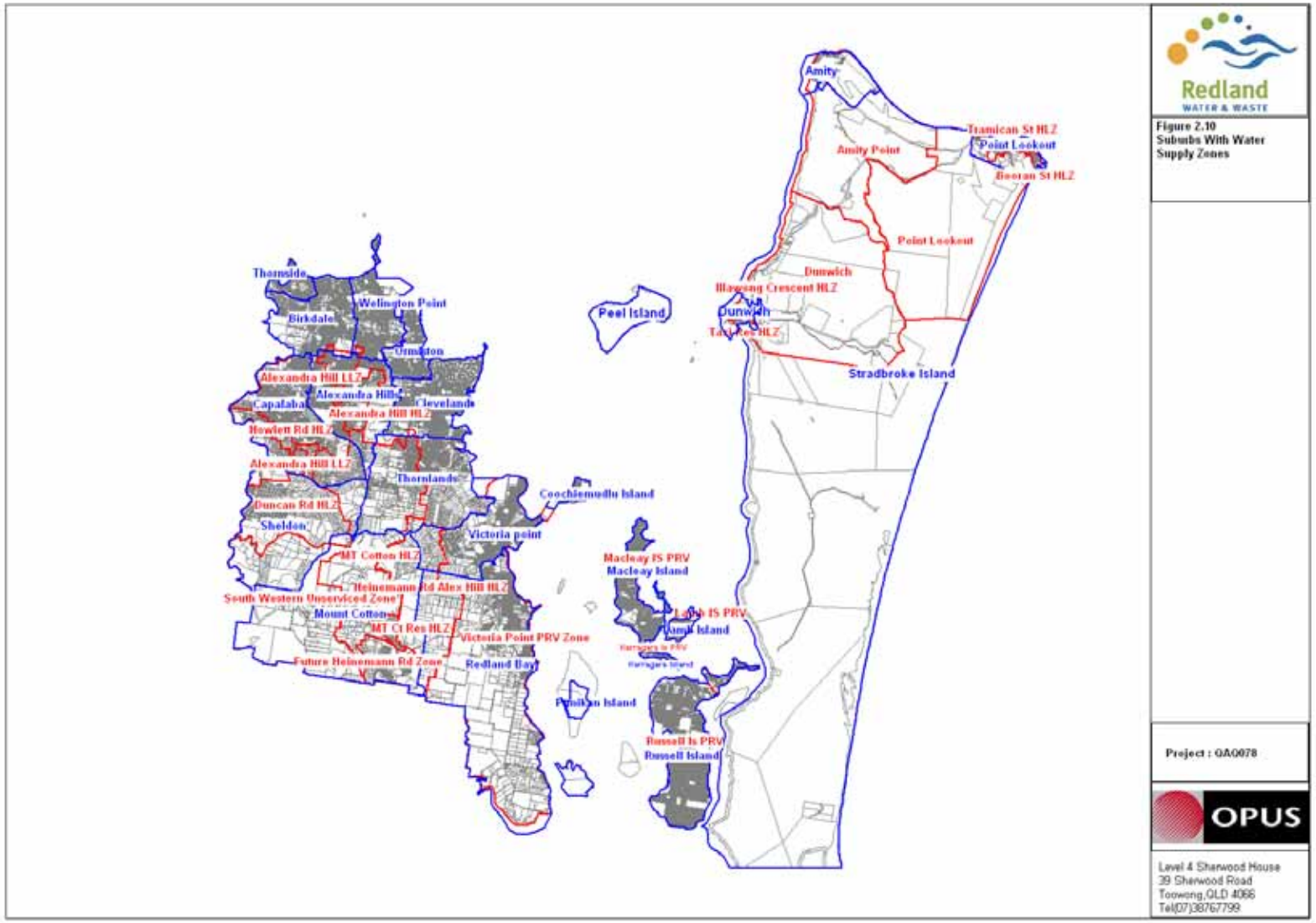

Redland
WATER & WASTE
Figure 2.10
Suburbs With Water
Supply Zones
Amity
Tramican St HLZ
Point Lookout
Amity Point
Beeran St HLZ
Point Lookout
Dunwich
Illawong Crescent HLZ
Dunwich
Peel Island
Tay Res HLZ
Stradbroke Island
Thornside
Wellington Point
Birkdale
Ormiston
Alexandra Hill LLZ
Alexandra Hill
Capalaba
Cleveland
Alexandra Hill HLZ
Howlett Rd HLZ
Alexandra Hill LLZ
Thornlands
Coochiemudlo Island
Duncan Rd HLZ
Sheldon
Victoria point
Macleay IS PRV
Macleay Island
MT Cotton HLZ
Heinemann Rd Alex Hill HLZ
South Western Unserviced Zone
Mount Cotton
Lamb IS PRV
Lamb Island
MT Ct Res HLZ
Victoria Point PRV Zone
Future Heinemann Rd Zone
Redland Bay
Karragarra Island
Russell Is PRV
Russell Island
Project : QA0078
OPUS
Level 4 Sherwood House
39 Sherwood Road
Toowong,QLD 4066
Tel(07)38767799

Table 2.6 Adopted Residential Populations by Suburbs

Suburb	Existing	2008	2013	2018	Ultimate
Alexandra Hills	16,541	16,711	16,882	17,047	17,229
Amity Point	1,001	1,057	1,121	1,142	1,169
Birkdale	12,802	15,697	15,729	15,773	16,155
Capalaba	16,147	17,374	17,416	17,519	17,728
Cleveland	14,954	15,012	15,138	16,188	16,875
Coochiemudlo Island	1,578	1,911	2,283	2,405	2,494
Dunwich	1,057	1,170	1,291	1,328	1,373
Karragarra Island	243	310	449	553	553
Lamb Island	543	686	1,064	1,319	1,319
Macleay Island	2,143	3,060	5,243	6,732	6,732
Mount Cotton	2,452	7,879	7,879	7,879	8,949
Ormiston	6,298	6,867	6,867	7,935	8,277
Perulpa Island	52	69	116	146	146
Point Lookout	2,103	2,241	2,394	2,441	2,443
Redland Bay	10,361	10,757	13,310	18,068	19,649
Russell Island	1,968	3,573	8,247	11,300	11,300
Sheldon	1,480	1,487	1,490	1,491	1,500
Stradbroke Island	34	34	35	35	35
Thorneside	4,111	4,141	4,468	4,836	4,978
Thornlands	8,847	11,245	14,593	16,175	20,582
Victoria Point	13,395	13,653	17,960	18,752	19,878
Wellington Point	11,318	11,438	13,174	13,467	13,909
Total					
Mainland Residential EP Total	120,284	132,261	144,906	157,543	166,212
SMBI Residential EP Total	5,206	9,609	17,402	22,042	22,042
NSI Residential EP Total	5,338	4,503	4,841	4,947	5,019
Water EP Total	129,428	146,373	167,150	182,531	193,274
Growth in Period		16,945	20,777	15,381	10,743

2.4.2 Staging of Non-Residential EP

The staging of non-residential equivalent population was assumed to be linear from existing to ultimate with all non-residential areas fully developed at ultimate. The non-residential population was assigned to each of the staging years 2008, 2013 and 2018.

2.4.3 Summary of Staged Population

The adopted staged populations for Redland Shire water planning purposes are summarised in Table 2.7. It should be noted that Low Density Residential has an overall reduction in EP projection over the planning period due to densification of low density residential to higher density residential, and a progressive reduction in the average household size.

Table 2.7 Summary of Adopted 2006 to Ultimate EP

Landuse Category	Existing 2006	2008	2013	2018	Ultimate 2025
Mainland					
Residential					
Urban Residential	99,379	110,298	118,882	127,236	136,044
Medium Density Residential	14,013	16,940	21,468	23,517	25,510
Low Density Residential	6,892	6,934	6,839	6,781	6,658
Residential Sub-Total	120,284	134,172	147,190	157,533	168,212
Non-Residential					
Commercial	4,236	4,584	5,686	6,473	6,704
Industrial	1,957	2,061	2,326	2,592	3,229
Irrigation	45	45	45	45	45
Open Space	2,685	2,867	2,951	3,012	3,052
Public	3,414	3,494	4,138	4,816	5,099
Rural	2,507	2,507	2,507	2,507	2,507
Tourism	0	0	0	0	0
Non-Residential Sub-Total	14,844	15,558	17,653	19,445	20,636
Mainland Total	135,128	149,730	164,843	176,978	188,848
SMBI					
Residential					
Urban Residential	4,949	7,698	15,119	20,051	20,042
Medium Density Residential	0	0	0	0	0
Low Density Residential	0	0	0	0	0
Residential Sub-Total	4,949	7,698	15,119	20,051	20,042
Non-Residential					
Commercial	15	19	31	52	76
Industrial	1	12	39	79	131
Irrigation	0	0	0	0	0
Rural	84	84	84	84	84
Open Space	23	23	23	23	23
Public	265	283	435	891	1,217
Tourism	0	0	0	0	0

Landuse Category	Existing 2006	2008	2013	2018	Ultimate 2025
Non-Residential Sub-Total	388	421	612	1,129	1,531
SMBI Total	5,338	8,119	15,731	21,180	21,573
NSI					
Residential					
Urban Residential	4,120	4,433	4,777	4,885	4,959
Medium Density Residential	42	36	29	27	26
Low Density Residential	34	34	35	35	35
Residential Sub-Total	4,195	4,503	4,841	4,947	5,019
Non-Residential					
Commercial	113	113	113	113	113
Industrial	20	48	119	191	365
Irrigation	0	0	0	0	0
Rural	2	2	2	2	2
Open Space	127	147	156	156	162
Public	202	198	271	373	653
Tourism	546	553	807	1,192	2,249
Non-Residential Sub-Total	1,010	1,061	1,468	2,027	3,544
NSI Total	5,205	5,564	6,309	6,973	8,563
Redland Shire					
Residential Total	129,428	146,373	167,150	182,531	193,274
Non-Residential Total	16,242	17,040	19,733	22,600	25,711
Grand Total	145,670	163,413	186,883	205,131	218,984

2.5 Demand Analysis

2.5.1 Overview

Water supply demands for Redland Shire were calculated from the Redland Shire population model described above. The demands were allocated to the InfoWater model using a nearest pipe spatial routine. Each customer category in the model was allocated a demand profile that aligns with the peaking factors determined in the Desired Standards of Service (See Table 3.2).

2.5.2 Demand per Equivalent Person (EP)

Due to the implementation of demand management strategies, the average demand per equivalent person is assumed to reduce over the study period, from 320 L/EP/day in 2006 to 300 L/EP/day at Ultimate, as shown in Table 3.1. This is based on historical demand analysis and future potable reduction opportunities as demonstrated in the Redland Shire's IUWM Opportunities Memorandum for

the Regional Water Supply Strategy. These figures include an 8% Non Revenue Water component and a 40% increase in Discretionary Use within the shire. Discretionary usage is defined as usage not controlled by fixtures, and includes external usage, or the use of dishwashers, baths, spas or pools.

2.6 Summary of Ultimate Demands

Zone by zone summaries for Average Day, Mean Day Maximum Month, Maximum Day and Maximum Hour are tabulated below in Table 2.8.

Table 2.8 Summary of Ultimate Demands

Supply Zone	Units	Condition			
		AD	MDMM	MD	MH
Mainland					
Alexandra Hills HLZ	ML/d	3.0	4.2	5.7	-
	L/s	34.8	48.8	66.2	146.3
Alexandra Hills LLZ	ML/d	33.7	47.1	63.9	-
	L/s	389.5	545.3	740.1	1636.0
Duncan Road HLZ	ML/d	0.6	0.8	1.1	-
	L/s	6.6	9.3	12.6	27.9
Heinmann Rd Alex Hills	ML/d	0.9	1.2	1.7	-
	L/s	10.2	14.3	19.4	42.9
Howlett Rd HLZ	ML/d	0.4	0.6	0.8	-
	L/s	4.8	6.7	9.1	20.1
Mt Cotton HLZ	ML/d	3.7	5.1	7.0	-
	L/s	42.5	59.5	80.7	178.4
Mt Cotton Res HLZ	ML/d	0.1	0.1	0.2	-
	L/s	1.1	1.6	2.2	4.8
Victoria Point PRV Z	ML/d	13.0	18.2	24.7	-
	L/s	150.5	210.7	286.0	632.2
Total Mainland	ML/d	55.3	77.4	105.1	-
	L/s	640.1	896.2	1216.3	2688.6
SMBI					
Russell Island PRV Zone	ML/d	3.2	4.5	6.1	-
	L/s	37.3	52.2	70.9	156.6
Russell Island East Zone	ML/d	0.4	0.6	0.8	-
	L/s	4.9	6.9	9.4	20.7
Karragarra Island PRV Zone	ML/d	0.2	0.2	0.3	-
	L/s	2.0	2.8	3.8	8.3

Supply Zone	Units	Condition			
		AD	MDMM	MD	MH
Lamb Island PRV Zone	ML/d	0.4	0.6	0.8	-
	L/s	4.8	6.7	9.1	20.1
Macleay Island PRV Zone	ML/d	2.2	3.1	4.2	-
	L/s	25.5	35.8	48.5	107.3
Total SMBI	ML/d	6.4	9.0	12.2	-
	L/s	74.5	104.3	141.6	313.0
NSI					
Amity WSZ	ML/d	0.4	0.6	0.8	-
	L/s	4.7	6.6	9.0	19.9
Booran Street HLZ	ML/d	0.6	0.9	1.2	-
	L/s	7.4	10.4	14.1	31.1
Dunwich WSZ	ML/d	0.5	0.7	1.0	-
	L/s	5.8	8.1	11.0	24.4
Illawong Reservoir HLZ	ML/d	0.0	0.0	0.1	-
	L/s	0.3	0.5	0.7	1.5
Point Lookout WSZ	ML/d	0.7	1.0	1.3	-
	L/s	7.9	11.1	15.1	33.3
Tazi Reservoir HLZ	ML/d	0.1	0.1	0.2	-
	L/s	0.9	1.3	1.8	3.9
Tramican Street HLZ	ML/d	0.2	0.3	0.4	-
	L/s	2.4	3.4	4.6	10.2
Total NSI	ML/d	2.6	3.6	4.9	-
	L/s	29.6	41.4	56.2	124.3

2.7 Demand Summary

The Redland Shire system demands are summarised in Table 2.9. The Average Day Demand (ADD) increases from the existing 46.61 ML/d to an ultimate developed demand of 65.70 ML/d. The current network has a water treatment and supply capacity of 110.3 ML/day, (52ML/day from Capalaba, 52.5 ML/day from NSI and a combined output of 5.8 ML/day from Amity Point, Point Lookout and Dunwich)

Table 2.9 Demand Summary

Water Supply	Existing	2008	2013	2018	2025
ADD (ML/d)					
Mainland	43.24	47.91	52.75	53.09	56.65
SMBI	1.71	2.60	5.03	6.35	6.47
NSI	1.67	1.78	2.02	2.09	2.57
Total Demand	46.61	52.29	59.80	61.54	65.70
MDMM (ML/d)					
Mainland	60.54	67.08	73.85	74.33	79.32
SMBI	2.39	3.64	7.05	8.90	9.06
NSI	2.33	2.49	2.83	2.93	3.60
Total Demand	65.26	73.21	83.72	86.16	91.97
MD (ML/d)					
Mainland	82.16	91.04	100.22	100.88	107.64
SMBI	3.25	4.94	9.56	12.07	12.30
NSI	3.16	3.38	3.84	3.97	4.88
Total Demand	88.57	99.36	113.62	116.92	124.82

3. DESIGN CRITERIA

3.1 Water Design Criteria

The *Desired Standards of Service Review – Water* prepared by MWH and dated 1 August 2006 defines the adopted standards of service for the Redland water supply system. Table 3.1 below presents the proposed design criteria.

Table 3.1 – Proposed Water Design Criteria

Item	Description	Design Criteria				
Water Demand:						
1	Average Day Demand (AD) (L/EP/day) Including NRW	Existing	2008	2013	2018	Ultimate
		320	320	320	300	300
Global Demand Peaking Factors						
2	Mean Day Maximum Month / Average Day (MDMM / AD)	1.4				
3	Peak Day / Average Day (PD / AD)	1.9				
4	Peaking Factors for Various Land Uses	Refer to Table 3.2				
Peak Demand Periods						
5	Peak Period Duration	3 x Peak Day				
System Pressure						
6	Minimum Operating Pressure	22 m at property boundary				
7	Maximum Operating Pressure	60 m at property boundary				
Fire Fighting Requirements						
8	System Pressure	12 m minimum at the property boundary or within the network				
9	Fire Flow	Residential - 15 L/s (simultaneous) Comm / industrial - 30 L/s Special risk/hazard land use –assess on case by case basis.				
10	Background demand	PH for > 3,000 EP zones 2/3 PH for < 2,000 EP zones Interpolate for 2,000-3,000 EP				
11	Reservoir level for Fire Flow analysis	Level determined on 3rd peak day				
Reservoir Storage						
12	Ground Level Storage Capacity	Design case - 3 x PD Minimum Operating Volume of 30%				
13	Elevated Storage Capacity	6 (PH – 1/12 MDMM) + Fire fighting reserve of 150 kL				

Item	Description	Design Criteria
Pumping Capacity		
14	Duty Pump Capacity	24 hour operation with full standby
15	Pumps serving Elevated Reservoirs	(6 PH – Operating Volume) /(6 x 3600)
16	Standby Pump Capacity	To match duty, except where more than one duty pump or as determined by risk assessment
Pipeline Design		
17	Mains Capacity	MDMM for distribution MDMM for mains supplying ground level reservoirs PH for reticulation
18	Friction Default Values	Hazen Williams formula using the friction factors outlined in Table 3.3.
19	Maximum Velocity	2.5 m/s

Table 3.2: Water Peaking Factors

Land Use	Global Peaking Factors		MDMM / AD	MD / AD	MH / AD
	MDMM/ AD	MD/AD			
Urban Residential, Residential Low Density, Park Residential	1.4	1.9	1.45	1.99	4.2
Medium Density Residential			1.3	1.8	3.13
Major Centre, District Centres, Local Shopping, Service Commercial, General & Service Industries, Special Rural, Rural Non-Urban			1.2	1.3	2.5
Tourist, Business & Accommodation			2.2	2.21	5.2
Special Facilities/Public Purpose			1.2	1.3	2.5

Table 3.3: Adopted Hazen Williams Friction Factors

Mains	Diameter (mm)	Adopted 'C' Value
Distribution	< 300	120
	300 – 600	130
	> 600	135
Reticulation	≤ 150	100
	200 – 300	110
	> 300	120

4. MODEL DEVELOPMENT

4.1 Description of Water Supply System

The water supply network includes the mainland system from Thorneside in the north to the Logan River in the south and east from the Tingalpa Reservoir to the Southern Moreton Bay (SMBI) and North Stradbroke Islands (NSI).

The study region includes the mainland areas of Birkdale, Alexandra Hills, Sheldon, Thorneside, Capalaba, Wellington Point, Victoria Point, Redland Bay, the Southern Moreton Bay Islands of Russell, Lamb, Macleay and Karragarra Islands and North Stradbroke Island.

The mainland water supply system and Southern Moreton Bay Islands (SMBI) are supplied with bulk water from the North Stradbroke Island Treatment Plant and the Capalaba Water Treatment Plant. There are two main storage locations for this system, the Alexandra Hills and Heinemann Road reservoir sites. SMBI is typically supplied from the Heinemann Road reservoir and NSI Treatment Plant, except in emergency situations where Capalaba supplies the entire network.

The North Stradbroke Island supplies consist of three small closed systems. These systems are Dunwich, Amity Point and Point Lookout with each having their own Water Treatment Plant. Each of the North Stradbroke Island systems has its own elevated reservoir to maintain pressures whilst Dunwich and Point Lookout supply zones have small High Level Zones that are supplied from combinations of elevated reservoirs and booster pumps.

4.2 Overview of Model

The InfoWater model used for analysis of the Redland Shire Water supply system was supplied by RWW. It has been assumed all of the previous Capital Work Program augmentations for 2003 and 2008 have not been implemented. The supplied Infowater model contains 12,268 pipes totalling 1,067 km in length, 16 pumping stations and 22 storage reservoirs.

4.3 Model Updates

The model has been updated in accordance with memorandums supplied by RWW. The following summarises the changes made to the model:

- "MWH Proposed Augmentations" dated 23 March 2006 (M02_MWH_Augmentations (Rev1).doc). This memorandum detailed changes to Howlett HLZ, Dunwich Booster Pump and high level network operations, Grant Ave at Point Lookout, and included details regarding changes to past augmentations that RWW require to be included in the model.
- "Upgrade to Existing (MWH 2003) System Model" dated 15 March 2006 (Upgrade to Existing System_to_5_4_06.Doc). This memorandum included changes to the connection on

the corner of Finucane Road and Mcdonald Road, abandoning pipe 1104100, and Howlett HLZ changes.

Following additional consultation with RWW, the following additional changes were made to the model:

- Revision of the elevations and top water levels of the reservoirs within the network;
- Revision of the output capacity of the water treatment plants; and
- Changes to the operation of the Mt Cotton PRV.

4.4 Allocation of Demands

The demands in the InfoWater model were updated based on the population model derived for this project. These demands were loaded onto the Redland Shire InfoWater hydraulic model using InfoWater's Demand Allocator. The allocation process involved allocating a meter layer that contained the demand category of each individual lot using a spatial "closest pipe" routine.

Mains less than 300mm diameter were considered suitable for demand allocation purposes as they represented those mains serving houses and domestic connections. No demands were allocated to mains greater than 300mm in diameter. The demand allocation process was undertaken for all planning scenarios from existing through to ultimate

Table 4.1 summaries the difference between the demand that was allocated into the model and the projected demand, by water supply zone.

Table 4.1 Allocated Demand Summary

	Allocation Difference %				
Zone	2006	2008	2013	2018	2025
Alexandra Hills HLZ	-0.24%	0.32%	0.23%	0.65%	0.10%
Alexandra Hills LLZ	0.75%	0.59%	-0.12%	-0.27%	-0.40%
Duncan Road HLZ	0.30%	-0.40%	0.23%	0.20%	0.44%
Heinmann Rd Alex Hills WSZ	0.09%	-0.13%	0.02%	-0.70%	0.46%
Howlett Rd HLZ	-0.04%	0.73%	-0.40%	0.99%	0.33%
Mt Cotton HLZ	0.63%	0.14%	-0.93%	0.12%	0.10%
Mt Cotton Res HLZ	0.98%	0.27%	0.16%	0.21%	0.30%
Victoria Point PRV Zone	0.16%	-0.62%	-0.06%	-0.40%	-0.09%
Amity WSZ	-0.42%	0.13%	-0.91%	-0.84%	0.22%
Booran Street HLZ	0.11%	0.52%	-0.24%	-0.90%	0.87%
Dunwich WSZ	-0.86%	-0.53%	-0.06%	-0.45%	-0.06%
Illawong Crescent HL	-3.57%	2.14%	-1.88%	-1.12%	0.23%
Point Lookout WSZ	0.43%	-0.26%	-0.81%	0.48%	0.67%
Tazi Reservoir HLZ	-0.49%	-0.09%	0.23%	0.20%	0.20%
Tramican Street HLZ	-0.02%	-0.88%	-0.19%	-0.08%	-0.67%
Karragarra Is PRV	-0.16%	0.31%	0.03%	-0.85%	-0.20%
Lamb Is PRV	0.24%	-1.22%	1.35%	1.56%	1.27%
Macleay Is PRV	0.64%	-0.13%	-0.10%	0.58%	0.97%
Russel Is East	0.00%	0.00%	0.00%	0.00%	0.00%
Russel Is PRV	-1.01%	-0.13%	0.80%	-0.73%	0.16%
SMBI Trunk	0.00%	0.00%	0.00%	0.00%	0.00%
Grand Total	0.49%	0.25%	-0.08%	-0.21%	-0.14%

4.5 Pumping Stations

The model supplied by Redlands Water had 16 existing pumping stations with a total of 35 modelled pumps within the Redland Shire water supply system required for either bulk transfer or as boosters. It has been assumed that the pumping curves and operational controls provided in the model are reflective of the actual system operation.

4.6 Bulk Water Supply Boundary Conditions

The Mainland and Southern Moreton Bay Islands are supplied by the North Stradbroke Island WTP and the Capalaba WTP. The bulk water supply boundary conditions used to model the system from existing to ultimate are shown in Table 4.2.

Table 4.2 Boundary Condition Data

Supply Source	TWL Clear Water Tank (m AHD)	Available Inflow (ML/d)	Control of Supply
Capalaba WTP	21.79	52	Alexandra Hills reservoir level and Capalaba WTP clear water tanks
Herring Lagoon	108.6	35.5	Heinemann Road reservoir level, NSI clear water tanks and flow control valve
NSI Boreholes	108.6	22.6	Heinemann Road reservoir level, NSI clear water tanks and flow control valve
Dunwich Boreholes	10.8	1.4	Rainbow Crescent reservoir level and Dunwich WTP reservoir level
Point Lookout Boreholes	27.39	3.0	Point Lookout reservoir level and Point Lookout WTP reservoir level
Amity Point Boreholes	13.6	1.4	Amity Point reservoir level and Amity Point WTP reservoir level

5. SYSTEM PERFORMANCE

5.1 Existing System Performance

In order to assess the performance of the existing water supply system, the model was used with the updated demands. The DSS formed the basis for the identification of poor performance areas throughout the system with respect to storage requirements, pumping performance, bulk supply, pipe pressures and velocities.

The existing system was modelled to determine areas that were currently below the Desired Standards of Service. These areas (described in Section 5.2.2) were then augmented to achieve the Desired Standards of Service. Appendix B details the augmentations that are required for the ultimate system demand; those staged in 2006 are required for the existing system demand.

5.1.1 Existing Bulk Water Supply and Storage

Currently the North Stradbroke Island Treatment Plant has its total possible capacity listed at 52.5 ML/day (see Table 4.2). The NSI water treatment plant has two separate treatment processes, one for ground water and the other for surface water taken from Herring Lagoon. Herring Lagoon has a licence to extract 35.5ML/d however only approximately 8ML/d can be extracted at present due to a restriction in the allowable drop in water level. The treatment plant has a capacity of 30ML to treat water from Herring Lagoon. RWW has a licence to extract 22.6ML of groundwater each day.

The Capalaba Water Treatment Plant has a design capacity of 80ML/day, although its operating capacity is only 52 ML/d due to limitation in manganese treatment. It obtains its raw water from the Leslie Harrison Dam. The three treatment plants on North Stradbroke Island of Dunwich, Amity Point and Point Lookout have capacities of 1.4 ML/day, 1.4 ML/day, and 3 ML/day respectively.

5.1.2 Existing Distribution System Deficiencies

From the modelling a number of system deficiencies were identified which require immediate investigation. The existing system deficiencies are:

- Dunwich Water Supply Zone – The high level zone within the Dunwich water supply system currently experiences pressures of greater than 100m due to large elevation differences. To overcome this, Dunwich will require a new 150mm diameter main (504m long) to connect Illawong Res to the high level zone. This main will coincide with the upgrade of the pumping station at Rainbow Crescent Reservoir and the installation of a PRV along Rainbow Crescent. See Appendix C for further details.

- Alexandra Hills Reservoir – Alexandra Hills Reservoir is currently undersized for 3 consecutive peak day demands, and will need to be upgraded from 45.5 ML to 65.5 ML

- Heinmann Road Reservoir – Heinmann Road Reservoir is currently undersized for 3 consecutive peak day demands, and will need to be upgraded from 18.2 ML to 40.5 ML. It is also recommended that a telemetry connection be installed on the float valve on the inlet of Heinmann Road Reservoir.

- High Pressure Areas - It is recommended that RWW implement a pressure management strategy to achieve the DSS.

5.2 Ultimate System Performance

To determine ultimate infrastructure requirements the ultimate demands were modelled using the existing network to identify problem areas (see Section 5.3.2). Augmentations were then created and tested to optimise system performance and achieve the Desired Standards of Service. For the purpose of this study only trunk infrastructure was reviewed.

5.2.1 Ultimate Bulk Water Supply and Storage

Table 5.1 shows the performance of the water treatment plants within the network under ultimate demand.

Table 5.1 Treatment Plant Performance

Treatment Plant	Capacity (ML/day)	Existing Required Capacity (ML/day)	Ultimate Required Capacity (ML/day)	Comment
Capalaba	52	45	49	
NSI				
Bores	22.6	37.5	44	
Herring Lagoon	35.5			Treatment Plant Capacity of 30ML/day, current only able to supply 8ML/day due to licensing requirements.
Dunwich	1.4	0.9	1	
Point Lookout	3	1.9	2.6	
Amity Point	1.4	0.4	0.8	

Table 5.1 shows that the systems treatment plants have the capacity to service the ultimate demand. The system will require a number of storage augmentations to achieve the Desired Standards of Service at Ultimate development, the staging and details are listed in Appendix B, Table B3 (Reservoirs).

5.2.2 Ultimate Distribution System Deficiencies

An assessment of pressures and pipe velocities was undertaken in Infowater to determine the performance of the trunk system. A number of areas within the network were identified as requiring augmentation to achieve the Desired Standards of Service requirements. A zone-by-zone discussion of these areas is provided below:

5.2.2.1 Alexandra Hills Low Level Zone

Areas of poor performance or augmentation within Alexandra Hills Low Level Zone requiring discussion are as follows:

- Thornlands Road and King Street: Insufficient residual pressure is delivered to this area resulting from high headloss in the 100mm diameter main along both Thornlands Road and King Street.

5.2.2.2 Victoria Point PRV Zone

Areas of poor performance or augmentation within Victoria Point PRV Zone requiring discussion are as follows:

- Kalmia Drive, School of Arts Road and Cleveland Redland Bay Road: Insufficient residual pressure (approximately 12m) is delivered to this area at Maximum Hour, due to high head losses within the mains leading from the Serpentine Road Pressure Reducing Valve.

- Coochiemudlo Island: Residual pressure below the standards of service is delivered to this area at Maximum Hour. High head losses (up to 15 m) occur through the mains leading to Coochiemudlo Island. Augmentation of the mains along Colburn Avenue on the mainland and Victoria Drive to Eprapah Street on Coochiemudlo Island enable Maximum Hour pressures at Coochiemudlo Island to meet the Desired Standards of Service.
- Redland Bay: Extensions to the trunk mains in the Redlands Bay area were required to provide water supply to the ultimate population.

5.2.2.3 Mt Cotton Zone

Areas of poor performance or augmentation within Mt Cotton Zone requiring discussion are as follows:

- Mt Cotton: Mt Cotton will undergo significant changes to its operations, with extensions for new developments at the summit of Mt Cotton.
- Kinross Road: Kinross Road will experience low pressures (17m) at ultimate due to high velocities within the mains supplying the area.

5.3 Contingency Infrastructure

RWW conducted a contingency planning study in December 2002. The purpose of the study was to assess the systems capacity in the event of Capalaba WTP or North Stradbroke Island WTP going offline. The report concluded that augmentations to the system were required so that either of the water sources could supply water to the network during a short term event, such as a drought, an occurrence of a blue green algal bloom or a water treatment plant going offline.

The report recommends a 3 phase installation of the proposed augmentations. It has been assumed that phases 1 and 2 are constructed in 2008 and phase 3 is constructed in 2013. Table 5.2 shows the contingency infrastructure augmentations recommended by the report.

Table 5.2 Contingency Infrastructure Augmentations

Item	Description of Work	Diameter (mm)	Length (m)	Phase	Estimated Cost
CON1	Reverse pump at Eprapah Creek PS			2	$130,000
CON2	Install FCV at Mt Cotton Reservoir inlet			2	$123,600
CON3	Install an augmentation on Cleveland-Redland Bay Road. Augmentation between Bunker Road and Ziegenfusz Road	500	2530	3	$4,164,300
CON4	Mount Cotton PRV			1	$75,000
Total					$4,492,900

6. STAGING ANALYSIS

The staging of the augmentations designed to resolve poor network performance under ultimate demand is discussed in this section. Assessments were undertaken for staged development at the intermediate years of 2008, 2013 and 2018.

6.1 Storage Requirements

The storage performance of each reservoir was assessed for all staging years to determine the required storage defined in the DSS. The capacity was calculated according to the formula:

- Storage = 3(MD – MDMM) x1.3

Table 6.1 shows the required storage increase:

Table 6.1 Additional Existing Storage Requirements

Reservoir	Additional Storage Required (ML)	Year
Alexandra Hills Reservoir	20.0	2006
Dunwich Reservoir (Rainbow Crescent)	0.3	2006
Dunwich Reservoir (Illawong Reservoir)	1.7	2006
Heinemann Road Reservoir	22.3	2006
Alexandra Hills Reservoir	32.6	2025
Point Lookout Reservoir Complex	5.7	2008

See Appendix B, Table B3 (Reservoirs) for all of the necessary details regarding the augmentations required in Table 6.1.

6.2 Pump Station Requirements

The network requires several pump stations to be upgraded and one new station to be constructed to meet ultimate development requirements. The pump stations that require augmentation are as follows:

- Mainland - Coochiemudlo Island's maximum hour pressure falls below the standards of service and will require a 7.5 kW pump station to be installed in 2013. The new pump station will provide adequate pressure for the ultimate population of Coochiemudlo Island.
- Rainbow Crescent – A new pump with a duty of 6 L/s at 85m head with an equivalent stand-by is required at Rainbow Crescent to provide supply to the proposed combined Illawong HLZ. This upgrade is required at the 2006 planning horizon. It is proposed the Illawong and Tazi booster pumps are decommissioned when this upgrade is in operation. This pump station augmentation will be commissioned once Illawong Reservoir has been upgraded to 280kL.

- Point Lookout - Upgrades of the Point Lookout WTP pump station are required at 2008 to provide sufficient capacity to meet the large growth in demand in this area. The current pumping arrangement, of two duty pumps (duty – approx 10 L/s at 63m head) and one stand-by pump of equivalent duty can meet existing demand. In 2008 an additional duty pump of equivalent capacity is required for operation to deliver MD demand to the Point Lookout system through to Ultimate.

See Appendix B, Table B4 (Pumping Stations) for all of the cost and pump specifications details regarding the pumping station augmentations.

6.3 Pressure Reducing Valve Settings

A number of Pressure Reducing Valves (PRVs) exist within the Redland Shire water supply system. The staged settings of these valves are given in Table 6.2. Refer to Appendix B, Table B5 (Valves) for details regarding valve augmentations required.

Table 6.2 Pressure Reducing Valve Settings

Pressure Reducing Valve	Pressure Reducing Valve Setting (m)					
	Elevation (m)	Existing	2008	2013	2018	Ultimate (2025)
Serpentine PRV	12.75	58	60	60	60	70
Bunker North PRV	5.0	77	77	77	77	77
Giles Road PRV	45.0	73	73	73	73	73
Bunker Road South PRV	10	62	77	77	77	77
Russell Island PRV	15.25	65	65	65	65	65
Karragarra Island PRV	6.75	60	65	65	65	65
Lamb Island PRV	7.75	58	65	65	65	65
Macleay Island PRV	6.75	60	65	65	65	65
Russel Island East	12	55	55	55	55	55

6.4 Distribution and Reticulation System

Table 6.3 provides a summary of the required mains augmentations, excluding contingency planning augmentations. For all of the necessary details regarding the proposed augmentations to the existing Redland Shire water supply network see Appendix B, Table B1 (Trunk Mains) and Table B2 (Reticulation Mains). All works are detailed in the figures provided in Appendix C.

Table 6.3 Mains Augmentation Summary

	Reticulation Mains		Trunk Mains	
	Length (m)	Cost ($)	Length (m)	Cost ($)
Existing	623	$256,100	790	$333,000
2008	2,039	$956,600	1,424	$1,052,000
2013	3,442	$1,320,200	315	$190,400
2018	3,789	$1,623,800	455	$360,800
Ultimate	8,150	$3,541,100	1,204	$953,500
Total	18,042	7,697,800	4,187	2,889,700

7. CAPITAL WORKS PROGRAM

7.1 Overview

In accordance with the methodology described in the preceding chapters a Capital Works Program (CWP) has been developed and is detailed in Tables 7.2 and 7.3. Rates used in the calculation of the Infrastructure Costs were derived from a review of current construction costs, as well as costs currently used by a number of authorities and councils in the South East Queensland region. The cost rates used to develop the Infrastructure Costs are based on December 2006 and are presented in Appendix D.

These rates account for the cost of site preparation, installation of the assets, detailed design, project management and restoration of the construction site. The cost rates are derived as an average of anticipated site conditions, and multipliers are used where the conditions under which the asset is to be constructed is seen to be more difficult.

The unit rates for water mains are based on construction at minimum depth in greenfield conditions with good soil. A site difficulty factor is used to account for construction of water mains in other conditions such as trenchless construction, deep water mains and poor ground conditions. Table 7.1 shows the adopted site factors used to estimate the cost of future capital works. A site difficulty factor of 1.3 (moderate conditions has been adopted for estimating the costs.

Table 7.1 Site Multiplier for Future Augmentation

Difficulty Category	Example	Site Difficulty Multiplier
Fair	Some street crossings, residential areas	1.1
Moderate	Some rock in residential areas	1.3
Difficult	Commercial areas, poor ground conditions	1.7
Very Difficult	Thrust boring, extensive rock, poor ground conditions	2.0

7.2 Trunk Main Augmentations

The Redland Water Supply Network will require 3.9 km of trunk main augmentation works through to ultimate development at a total cost of $2,530,280. These augmentations, excluding contingency planning augmentations, are summarised in Table 7.2.

Table 7.2 Trunk Mains Summary

Diameter (mm)	Length (m)	Cost ($)
100	504	$160,500
225	605	$365,400
250	664	$449,700
300	2,414	$1,914,220
Total	4,187	$2,889,820

Further details regarding the Trunk Main Infrastructure Augmentations can be found in Appendix B, Table B1 (Trunk Mains).

7.3 Reticulation Mains

The Redland Water Supply Network will require 18.3 km of reticulation augmentation works through to ultimate development at a total cost of $7,328,790. These augmentations are summarised in Table 7.3.

Table 7.3 Reticulation Mains Summary

Diameter (mm)	Length (m)	Cost ($)
100	2,560	$814,900
150	13,377	$5,733,000
200	2,099	$1,145,700
225	7	$4,200
Total	18,042	$7,697,800

Further details regarding the Reticulation Mains Infrastructure Augmentations can be found in Appendix B, Table B2 (Reticulation Mains).

7.4 Reservoir, Pumping Stations and Valves

Appendix B, Tables B3 (Reservoirs), B4 (Pumping Stations) and B5 (Valves) describes the augmentations required for reservoirs, pumping stations and valves.

Table 7.4 Reservoir, Pumping Station and Valve Summary

Year	No. of Pumps	No. of Reservoirs	No of Valves	No. of Contingency Assets
2006	2	4		0
2008	2	0		5
2013	1	0	1	3
2018	0	0	1	0
2025	0	1		0
Cost ($)	$998,400	$9,470,800	$247,200	$6,970,800

7.5 Redland Shire Cost Summary

7.5.1 Mainland Cost Summary

The cost per staging year through to ultimate development at 2025 by water supply zone is summarised below in Table 7.5.

Table 7.5 Mainland Cost Summary

	Existing 2006	2008	2013	2018	Ultimate 2025	Total
Mainland						
Alexandra Hills HLZ						
Trunk Mains	$0	$0	$0	$0	$0	$0
Reticulation Mains	$0	$0	$0	$0	$0	$0
Reservoirs	$0	$0	$0	$0	$0	$0
Pumps	$0	$0	$0	$0	$0	$0
Valves	$0	$0	$0	$0	$0	$0
Total	$0	$0	$0	$0	$0	$0
Alexandra Hills LLZ						
Trunk Mains	$0	$0	$0	$360,800	$0	$360,800
Reticulation Mains	$70,500	$0	$0	$217,400	$191,400	$479,300
Reservoirs	$2,827,600	$0	$0	$0	$3,262,500	$6,090,100
Pumps	$0	$0	$0	$0	$0	$0
Valves	$0	$0	$0	$0	$0	$0
Total	$2,898,100	$0	$0	$578,200	$3,453,900	$6,930,200
Howlett Road HLZ						
Trunk Mains	$0	$0	$0	$0	$0	$0
Reticulation Mains	$177,600	$0	$0	$0	$0	$177,600
Reservoirs	$0	$0	$0	$0	$0	$0
Pumps	$0	$0	$0	$0	$0	$0
Valves	$0	$0	$0	$0	$0	$0
Total	$177,600	$0	$0	$0	$0	$177,600
Victoria Point PRV Zone						
Trunk Mains	$0	$1,052,000	$190,400	$0	$953,500	$2,195,900
Reticulation Mains	$0	$0	$713,400	$313,100	$3,349,700	$4,376,200
Reservoirs	$2,827,600	$0	$0	$0	$0	$2,827,600
Pumps	$0	$0	$217,100	$0	$0	$217,100
Valves	$0	$0	$0	$0	$0	$0
Total	$2,827,600	$1,052,000	$1,120,900	$313,100	$4,303,200	$9,616,800
New Heinemann Road Gravity Zone						
Trunk Mains	$0	$0	$0	$0	$0	$0
Reticulation Mains	$0	$956,600	$446,900	$0	$0	$1,403,500
Reservoirs	$0	$0	$0	$0	$0	$0
Pumps	$0	$0	$0	$0	$0	$0
Valves	$0	$0	$0	$0	$0	$0
Total	$0	$956,600	$446,900	$0	$0	$1,403,500
Heinemann Road LLZ						
Trunk Mains	$0	$0	$0	$0	$0	$0
Reticulation Mains	$0	$0	$0	$0	$0	$0
Reservoirs	$0	$0	$0	$0	$0	$0
Pumps	$0	$0	$0	$0	$0	$0

	Existing 2006	2008	2013	2018	Ultimate 2025	Total
Mainland						
Valves	$0	$0	$0	$0	$0	$0
Total	$0	$0	$0	$0	$0	$0
Mt Cotton HLZ						
Trunk Mains	$0	$0	$0	$0	$0	$0
Reticulation Mains	$0	$0	$159,900	$1,093,300	$0	$1,253,200
Reservoirs	$0	$0	$0	$0	$0	$0
Pumps	$0	$0	$0	$0	$0	$0
Valves	$0	$130,000	$0	$0	$0	$130,000
Total	$0	$130,000	$159,900	$1,093,300	$0	$1,383,200
Total Mainland						
Trunk Mains	$0	$1,052,000	$190,400	$360,800	$953,500	$2,556,700
Reticulation Mains	$248,100	$956,600	$1,320,200	$1,623,800	$3,541,100	$7,689,800
Reservoirs	$5,655,200	$0	$0	$0	$3,262,500	$8,917,700
Pumps	$0	$0	$217,100	$0	$0	$217,100
Valves	$0	$130,000	$0	$0	$0	$130,000
Total Mainland	$5,903,300	$2,138,600	$1,727,700	$1,984,600	$7,757,100	$19,511,300

The mainland expenditure of $19,511,300 is 72.5% of the Redland Shire total expenditure on water augmentations through to ultimate development.

7.5.2 Southern Moreton Bay Islands Cost Summary

Table 7.6 shows the SMBI cost summary from existing development through to ultimate development.

	Existing 2006	2008	2013	2018	Ultimate 2025	Total
NSI						
Russel Island						
Trunk Mains	$0	$0	$0	$0	$0	$0
Reticulation Mains	$0	$0	$0	$0	$0	$0
Reservoirs	$0	$0	$0	$0	$0	$0
Pumps	$0	$0	$0	$0	$0	$0
Valves	$0	$0	$123,630	$123,630	$0	$247,260
Total	$0	$0	$123,630	$123,630	$0	$247,260

The NSI expenditure of $247,200 is 0.9% of the Redland Shire total expenditure on water augmentations through to ultimate development.

7.5.3 North Stradbroke Island Cost Summary

Table 7.6 shows the NSI cost summary from existing development through to ultimate development.

Table 7.6 NSI Cost Summary

	Existing 2006	2008	2013	2018	Ultimate 2025	Total
NSI						
Dunwich, Tazi and Illawong						
Trunk Mains	$160,500	$0	$0	$0	$0	$160,500
Reticulation Mains	$0	$0	$0	$0	$0	$0
Reservoirs	$553,100	$0	$0	$0	$0	$553,100
Pumps	$434,200	$0	$0	$0	$0	$434,200
Valves	$0	$0	$0	$0	$0	$0
Total	$1,147,800	$0	$0	$0	$0	$1,147,800
Amity Point						
Trunk Mains	$0	$0	$0	$0	$0	$0
Reticulation Mains	$0	$0	$0	$0	$0	$0
Reservoirs	$0	$0	$0	$0	$0	$0
Pumps	$0	$0	$0	$0	$0	$0
Valves	$0	$0	$0	$0	$0	$0
Total	$0	$0	$0	$0	$0	$0
Point Lookout, Tramican Street HLZ and Booran Street HLZ						
Trunk Mains	$172,500	$0	$0	$0	$0	$172,500
Reticulation Mains	$8,000	$0	$0	$0	$0	$8,000
Reservoirs	$0	$1,352,000	$0	$0	$0	$1,352,000
Pumps	$0	$217,100	$0	$0	$0	$217,100
Valves	$0	$0	$0	$0	$0	$0
Total	$180,500	$1,569,100	$0	$0	$0	$1,749,600
Total NSI						
Trunk Mains	$333,000	$0	$0	$0	$0	$333,000
Reticulation Mains	$8,000	$0	$0	$0	$0	$8,000
Reservoirs	$553,100	$1,352,000	$0	$0	$0	$1,905,100
Pumps	$434,200	$217,100	$0	$0	$0	$651,300
Valves	$0	$0	$0	$0	$0	$0
Total NSI	$1,328,300	$1,569,100	$0	$0	$0	$2,897,400

The NSI expenditure of $2,897,400 is 10.8% of the Redland Shire total expenditure on water augmentations through to ultimate development.

7.6 Redland Shire CWP Summary

The total Capital Works Program for Redland Shire is $26,911,600 (including contingency items) to meet the Desired Standards of Service through to ultimate development.

Reservoir expenditure comprises the largest portion of capital expenditure with $10,822,800. Reticulation mains comprise expenditure of $7,697,800 through to ultimate development. Trunk main augmentations comprise $2,889,700 of the total Redland Shire CWP. Significant expenditure of $5,655,200 is required for reservoirs to meet the Desired Standards of Service for existing development and a further $5,167,600 by 2025. Pumps expenditure total $998,400 to meet the DSS through to ultimate development. Contingency planning expenditure total $4,492,900.

Table 7.7 summarises the Redland Shire Capital Works Program.

Table 7.7 Redland Shire Total Cost

	Existing	2008	2013	2018	Ultimate	Total
Mainland						
Trunk Mains	$0	$1,052,000	$190,400	$360,800	$953,500	$2,556,700
Reticulation Mains	$248,100	$956,600	$1,320,200	$1,623,800	$3,541,100	$7,689,800
Reservoirs	$5,655,200	$0	$0	$0	$3,262,500	$8,917,700
Pumps	$0	$0	$217,100	$0	$0	$217,100
Valves	$0	$0	$0	$0	$0	$0
Total Mainland	$5,903,300	$2,008,600	$1,727,700	$1,984,600	$7,757,100	$19,381,300
SMBI						
Trunk Mains	$0	$0	$0	$0	$0	$0
Reticulation Mains	$0	$0	$0	$0	$0	$0
Reservoirs	$0	$0	$0	$0	$0	$0
Pumps	$0	$0	$0	$0	$0	$0
Valves	$0	$0	$123,630	$123,630	$0	$247,260
Total SMBI	$0	$0	$123,600	$123,600	$0	$247,260
NSI						
Trunk Mains	$333,000	$0	$0	$0	$0	$333,000
Reticulation Mains	$8,000	$0	$0	$0	$0	$8,000
Reservoirs	$553,100	$1,352,000	$0	$0	$0	$1,905,100
Pumps	$434,200	$217,100	$0	$0	$0	$651,300
Valves	$0	$0	$0	$0	$0	$0
Total NSI	$1,328,300	$1,569,100	$0	$0	$0	$2,897,400
Redland Shire						
Trunk Mains	$333,000	$1,052,000	$190,400	$360,800	$953,500	$2,889,700
Reticulation Mains	$256,100	$956,600	$1,320,200	$1,623,800	$3,541,100	$7,697,800
Reservoirs	$6,208,300	$1,352,000	$0	$0	$3,262,500	$10,822,800
Pumps	$434,200	$217,100	$217,100	$0	$0	$868,400
Valves	$0	$0	$123,630	$123,630	$0	$247,260
Total Redland Shire	$7,231,600	$3,577,700	$1,851,330	$2,108,230	$7,757,100	$22,525,960

8. CONCLUSIONS AND RECOMMENDATIONS

Based on the assessment of the Redland water supply system it is concluded that:

1. The existing contributing population is estimated to be 145,670 EP including a residential component of 129,428 persons.

2. The ultimate contributing population is estimated to be 218,984 EP including a residential component of 193,274 persons. Ultimate development is expected to be achieved at around the year 2025.

3. Augmentations and improvement works for the system have been determined to meet the Desired Standards of Service. The total estimated value of the Capital Works Program to serve to the ultimate development is $26,525,960 comprising:

    - Trunk mains: $2,899,700
    - Reticulation mains: $7,697,800
    - Reservoirs: $10,822,800
    - Pumping stations: $868,400
    - Valves: $247,260
    - Contingency Planning: $4,492,900

4. Under the current system operational philosophy, pumping station upgrades are not required for the mainland system.

Based on the outcomes of the Redland water supply system master planning study it is recommended that:

1. The high pressure areas within the network be investigated and addressed through pressure management or changes to the network's PRV settings.

2. A fire flow analysis study is undertaken following the current fire flow guideline review by DNRW.

3. The Redland water supply model be calibrated using field verification to confirm accuracy of the model's results.

9. REFERENCES

1. Population projection data from Department of Local Government's Planning Information and Forecasting Unit (PIFU).

2. Redland Digital Cadastral Data Base incorporating property use and land zoning information.

3. Water Supply & Sewerage Infrastructure Charges Schedule Final Report – Stage 3 Desired Standards of Service Review, MWH Australia, April 2005.

4. Water Supply System Planning Study Final Report, MWH Australia, Feb 2005.

5. QDNRM Water Supply Guidelines, Queensland Department of Natural Resources, Mines and Water, March 2005.

6. IPA Infrastructure Guidelines - Infrastructure Charges Schedule, Department of Local Government's Planning, October 2004.

7. Redland Shire's IUWM Opportunities Memorandum - Regional Water Supply Strategy, Prepared by MWH Australia for the Queensland Department of Natural Resources, Mines and Water, June 2006.

8. Contingency Planning – Loss of Source Water Supply, MWH Australia, December 2002.

Appendix A - Redland Shire Population Forecast Comparison

The populations in the tables below represent the distribution of the population model used for the modelling of the master planning report (MWH) and the information supplied by RSC regarding the GHD population model. The balance population is significantly different. This is as a result of MWH including transient population within their projections.

	MWH 06	RWW 06	MWH 08	RWW 08	MWH 13	RWW 13
Alexandra Hills	16,541	17,738	16,711	17,783	16,882	17,916
Birkdale	12,802	14,749	15,697	15,058	15,729	16,002
Capalaba	16,147	18,212	17,374	18,624	17,416	19,867
Cleveland	14,954	14,148	15,012	14,406	15,138	15,304
Ormiston	6,298	5,786	6,867	5,903	6,867	6,399
Redland Bay	10,361	10,668	10,757	11,801	13,310	15,257
Sheldon - Mt Cotton	3,932	5,429	9,366	5,924	9,369	7,467
Thorneside	4,111	3,510	4,141	3,524	4,468	3,637
Thornlands	8,847	11,200	11,245	12,705	14,593	15,700
Victoria Point	13,395	14,174	13,653	14,673	17,960	16,297
Wellington Point	11,318	10,544	11,438	10,893	13,174	11,917
Balance (NSI + SMBI)	10,722	7,070	14,112	7,382	22,244	8,151
Total	129,428	133,228	146,373	138,676	167,150	153,914

	MWH 18	RWW 18	MWH 25	RWW 25
Alexandra Hills	17,047	18,026	17,229	18,046
Birkdale	15,773	17,011	16,155	17,445
Capalaba	17,519	21,101	17,728	21,546
Cleveland	16,188	16,170	16,875	16,320
Ormiston	7,935	7,093	8,277	7,412
Redland Bay	18,068	19,087	19,649	20,881
Sheldon - Mt Cotton	9,370	9,573	10,450	10,929
Thorneside	4,836	3,799	4,978	3,836
Thornlands	16,175	17,464	20,582	18,449
Victoria Point	18,752	17,783	19,878	18,045
Wellington Point	13,467	12,813	13,909	13,027
Balance (NSI + SMBI)	27,402	8,905	27,565	10,729
Total	182,531	168,825	193,273	176,665

Appendix B - Redland Shire System Augmentations

Table B1 – Trunk Mains

Aug ID	Model ID	Water Supply Zone	Install Year	Length	Diameter	Rate	Difficulty Rating	Total Construction Cost as at 31 Dec 2006	Comments
AUG013	MWH2171	Victoria Point PRV Zone	2013	314.9	225	$465	1.3	$190,400	Reduce head loss within mains
AUG023	MWH2411	Victoria Point PRV Zone	2025	4.2	225	$465	1.3	$2,500	Reduce head loss within mains
AUG010	MWH1175	Victoria Point PRV Zone	2008	664.1	250	$521	1.3	$449,700	Reduce head loss within mains
AUG008	MWH1173	Victoria Point PRV Zone	2008	759.6	300	$610	1.3	$602,300	Reduce head loss within mains
AUG020	MWH2031	Victoria Point PRV Zone	2025	957.6	300	$610	1.3	$759,300	Reduce head loss within mains
AUG021	MWH2139	Victoria Point PRV Zone	2025	241.8	300	$610	1.3	$191,700	Reduce head loss within mains
AUG034	MWH2393	Alexandra Hills LLZ	2018	455	300	$610	1.3	$360,800	Reduce head loss within mains
AUG005	MWH2203	Dunwich (Tazi, Illawong)	2006	504.2	100	$245	1.3	$160,500	Connect Reservoir
AUG047	MWH2123	Booran Street HLZ	2006	164.4	225	$465	1.3	$99,400	Reduce head loss within mains
AUG048	MWH2121	Booran Street HLZ	2006	121	225	$465	1.3	$73,100	Reduce head loss within mains
CON3		Alexandra Hills LLZ	2013	2,530	500	1,266	1.3	$4,164,300	Contingency Planning

Table B2 – Reticulation Mains

Aug ID	Model ID	Water Supply Zone	Install Year	Length	Diameter	Rate	Difficulty Rating	Total Construction Cost as at 31 Dec 2006	Comments
AUG006	MWH939	Alexandra Hills LLZ	2006	98.2	100	$245	1.3	$31,300	Reduce head loss within mains
AUG007	MWH2127	Tramican Street HLZ	2006	12	100	$245	1.3	$3,900	Reduce head loss within mains
AUG016	MWH2083	New Heinemann Road Gravity Zone	2013	1404	100	$245	1.3	$446,900	Reduce head loss within mains
AUG033	MWH2395	Alexandra Hills LLZ	2025	31.1	100	$245	1.3	$9,900	Reduce head loss within mains
AUG037	MWH1103	Victoria Point PRV Zone	2025	692.8	100	$245	1.3	$220,600	Reduce head loss within mains
AUG038	MWH2215	Victoria Point PRV Zone	2025	321.9	100	$245	1.3	$102,500	Reduce head loss within mains
AUG001	MWH927	Howlett Road Booster Zone	2006	198.8	150	$330	1.3	$85,300	Reduce head loss within mains
AUG002	MWH921	Howlett Road Booster Zone	2006	179.5	150	$330	1.3	$77,000	Reduce head loss within mains
AUG003	MWH2049	Alexandra Hills LLZ	2006	91.5	150	$330	1.3	$39,300	Reduce head loss within mains
AUG004	MWH913	Howlett Road Booster Zone	2006	36.2	150	$330	1.3	$15,600	Reduce head loss within mains
AUG011	MWH2087	New Heinemann Road Gravity Zone	2008	759.1	150	$330	1.3	$325,400	Reduce head loss within mains
AUG012	MWH2085	New Heinemann Road Gravity Zone	2008	573.1	150	$330	1.3	$245,700	Reduce head loss within mains
AUG014	MWH2149	Victoria Point PRV Zone	2013	274.9	150	$330	1.3	$117,900	Reduce head loss within mains
AUG015	MWH2151	Victoria Point PRV Zone	2013	237.8	150	$330	1.3	$102,000	Reduce head loss within mains
AUG017	MWH2439	Mount Cotton HLZ	2013	373.1	150	$330	1.3	$160,000	Reduce head loss within mains
AUG018	MWH2389	Victoria Point PRV Zone	2018	730.6	150	$330	1.3	$313,200	Reduce head loss within mains
AUG019	MWH2375	Victoria Point PRV Zone	2025	607.7	150	$330	1.3	$260,500	Reduce head loss within mains
AUG025	MWH2145	Victoria Point PRV Zone	2025	122.4	150	$330	1.3	$52,500	Reduce head loss within mains
AUG026	MWH1097	Victoria Point PRV Zone	2025	918.5	150	$330	1.3	$393,700	Reduce head loss within mains

Aug ID	Model ID	Water Supply Zone	Install Year	Length	Diameter	Rate	Difficulty Rating	Total Construction Cost as at 31 Dec 2006	Comments
AUG027	MWH1105	Victoria Point PRV Zone	2025	904.2	150	$330	1.3	$387,600	Reduce head loss within mains
AUG028	MWH1099	Victoria Point PRV Zone	2025	846.1	150	$330	1.3	$362,700	Reduce head loss within mains
AUG029	MWH1095	Victoria Point PRV Zone	2025	704.6	150	$330	1.3	$302,000	Reduce head loss within mains
AUG030	MWH1107	Victoria Point PRV Zone	2025	626.8	150	$330	1.3	$268,700	Reduce head loss within mains
AUG031	MWH2143	Victoria Point PRV Zone	2025	601.3	150	$330	1.3	$257,800	Reduce head loss within mains
AUG032	MWH1087	Alexandra Hills LLZ	2018	507.3	150	$330	1.3	$217,500	Reduce head loss within mains
AUG035	MWH1109	Victoria Point PRV Zone	2025	103.8	150	$330	1.3	$44,500	Reduce head loss within mains
AUG036	MWH1085	Alexandra Hills LLZ	2025	17	150	$330	1.3	$7,300	Reduce head loss within mains
AUG039	MWH2383	Victoria Point PRV Zone	2025	259.6	150	$330	1.3	$111,300	Reduce head loss within mains
AUG040	P47	Mount Cotton HLZ	2018	681	150	$330	1.3	$291,900	Supply New Area
AUG041	P45	Mount Cotton HLZ	2018	34	150	$330	1.3	$14,600	Supply New Area
AUG042	P59	Mount Cotton HLZ	2018	280	150	$330	1.3	$120,100	Supply New Area
AUG043	P51	Mount Cotton HLZ	2018	781	150	$330	1.3	$334,800	Supply New Area
AUG044	P57	Mount Cotton HLZ	2018	264	150	$330	1.3	$113,200	Supply New Area
AUG045	P53	Mount Cotton HLZ	2018	242	150	$330	1.3	$103,800	Supply New Area
AUG046	P55	Mount Cotton HLZ	2018	269	150	$330	1.3	$115,300	Supply New Area
AUG009	MWH2089	New Heinemann Road Gravity Zone	2008	706.5	200	$420	1.3	$385,700	Reduce head loss within mains
AUG022	MWH2141	Victoria Point PRV Zone	2025	1073.1	200	$420	1.3	$1,036,400	Reduce head loss within mains
AUG024	MWH1079	Alexandra Hills LLZ	2025	319.1	200	$420	1.3	$442,200	Reduce head loss within mains
AUG050	MWH2303	Booran Street HLZ	2006	6.9	225	$465	1.3	$13,800	Reduce head loss within mains
AUG051	MWH2153	Victoria Point PRV Zone	2013	939.5	150	$330	1.3	$1,641,700	Reduce head loss within mains

Aug ID	Model ID	Water Supply Zone	Install Year	Length	Diameter	Rate	Difficulty Rating	Total Construction Cost as at 31 Dec 2006	Comments
AUG052	MWH2155	Victoria Point PRV Zone	2013	212.4	150	$330	1.3	$441,200	Reduce head loss within mains

Table B3 – Reservoirs

Install Year	Description	Model ID	Water Supply Zone	Volume (ML)	Construction Cost as at 31 Dec 2006
2006	New reservoir at Alexandra Hills reservoir complex	MWH7006	Alexandra Hills LLZ	20.0	$2,827,600
2056	New reservoir at Alexandra Hills reservoir complex	MWH7006	Alexandra Hills LLZ	32.6	$3,262,500
2006	New reservoir at Heinemann Road	MWH7012	Victoria Point	22.2	$2,827,600
2006	Upgrade of Illawong Reservoir from 90kL to 280kL	MWH7038	Dunwich	0.3	$189,000
2006	New reservoir at Rainbow Crescent (Dunwich)	MWH7028	Dunwich	1.7	$364,100
2008	New reservoir at Point Lookout reservoir complex	MWH7088	Point Lookout	5.7	$1,352,000

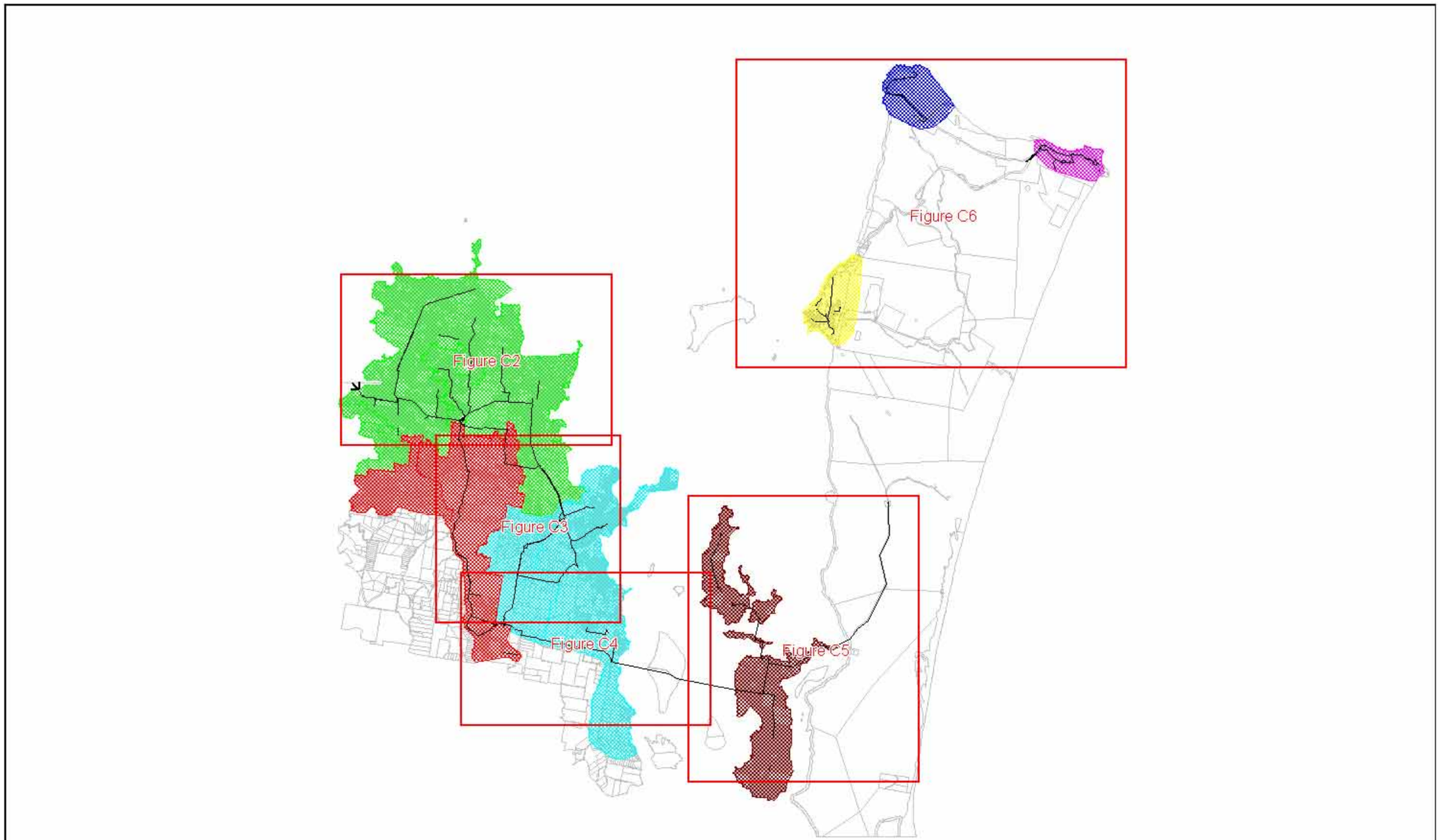
Table B4 – Pump Stations

Install Year	Description	Model ID	Water Supply Zone	Power (kW)	Construction Cost as at 31 Dec 2006
2006	Rainbow Crescent reservoir and pump station complex (new duty pump)	MWH5111	Dunwich	9.7	$217,100
2006	Rainbow Crescent reservoir and pump station complex (new standby pump)	MWH5129	Dunwich	9.7	$217,100
2008	Point lookout (new duty pump)	MWH5119	Point Lookout	8.2	$217,100
2008	Reverse pump at Eprapah Creek PS (contingency Planning)	CON1	Mt Cotton	-	$130,000
2013	Coochiemudlo Island Booster Pump Station	COOCH1	Victoria Point	7.5	$217,100

Table B5 – Valves

Install Year	Model ID	Water Supply Zone	Diameter (mm)	Setting	Cost as at 31 Dec 2006
2008	CON4	Mt Cotton		PRV (contingency planning)	$75,000
2008	CON2	Mt Cotton	300	FCV (contingency planning)	$123,630
2013	MWH9035	Russel Island	375	65m	$123,630
2018	MWH9071	Russel Island	375	SMBI MDMM demand	$123,630

Appendix C - Redland Shire System Augmentations Figures



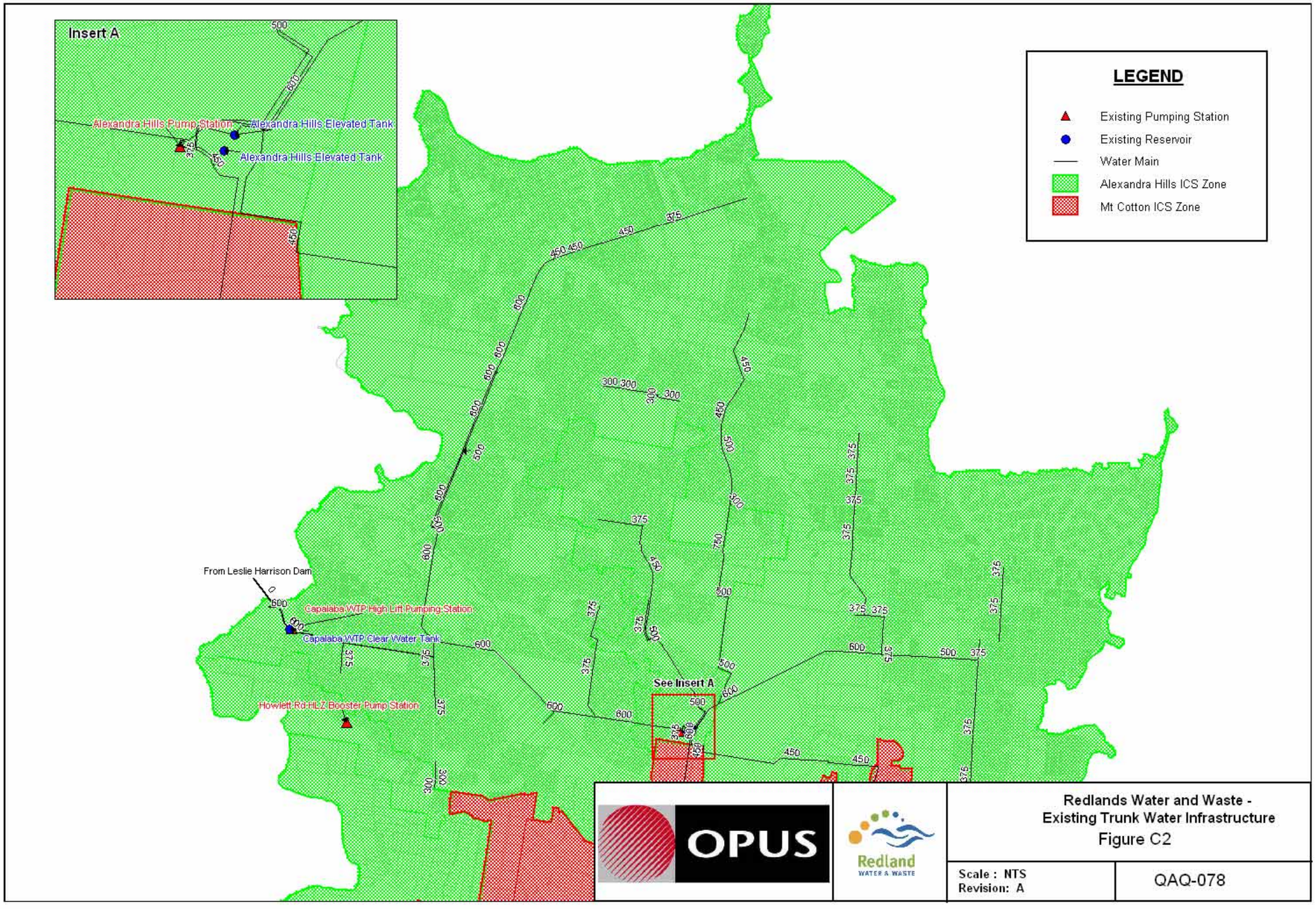
OPUS

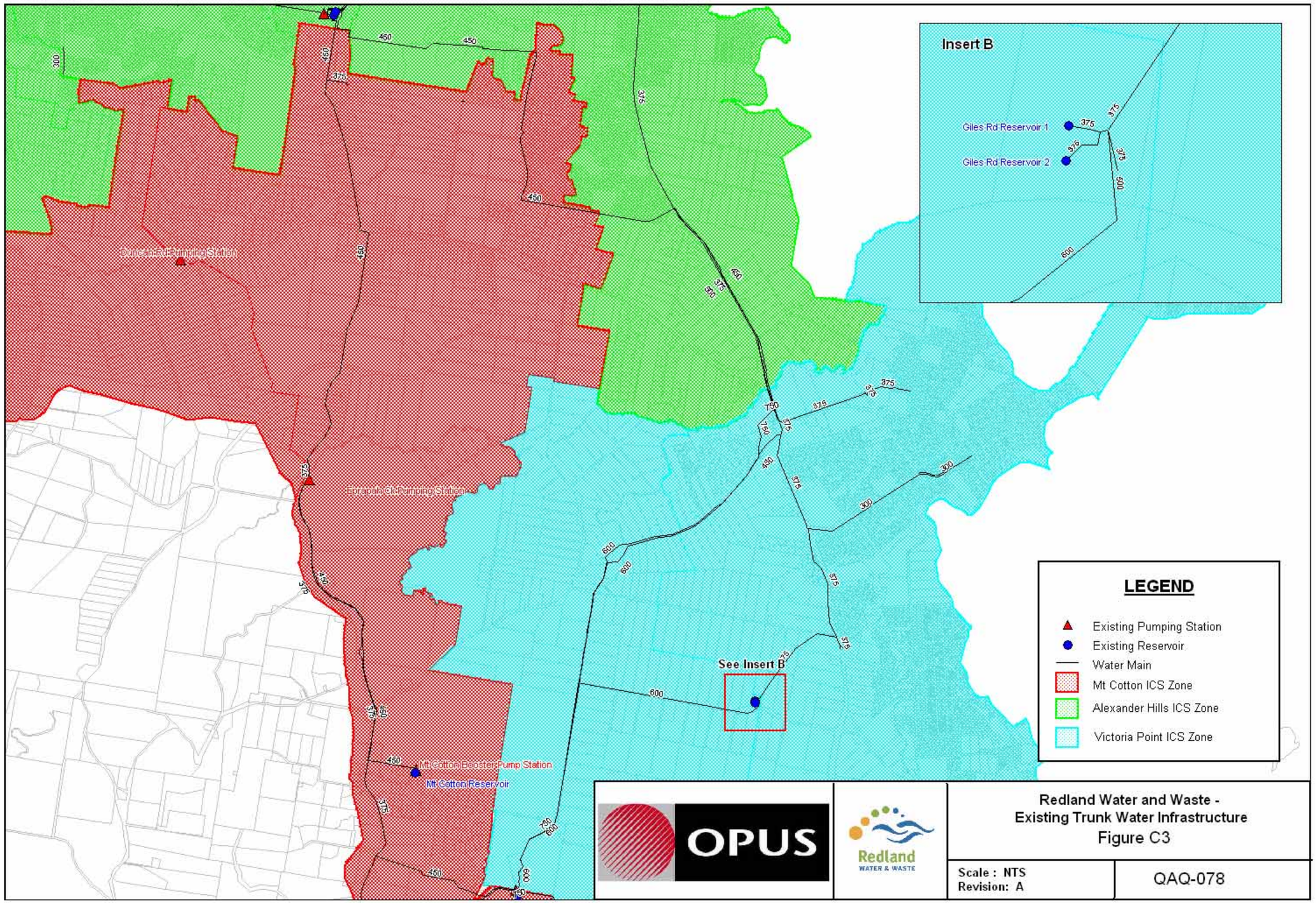
Redland
WATER & WASTE

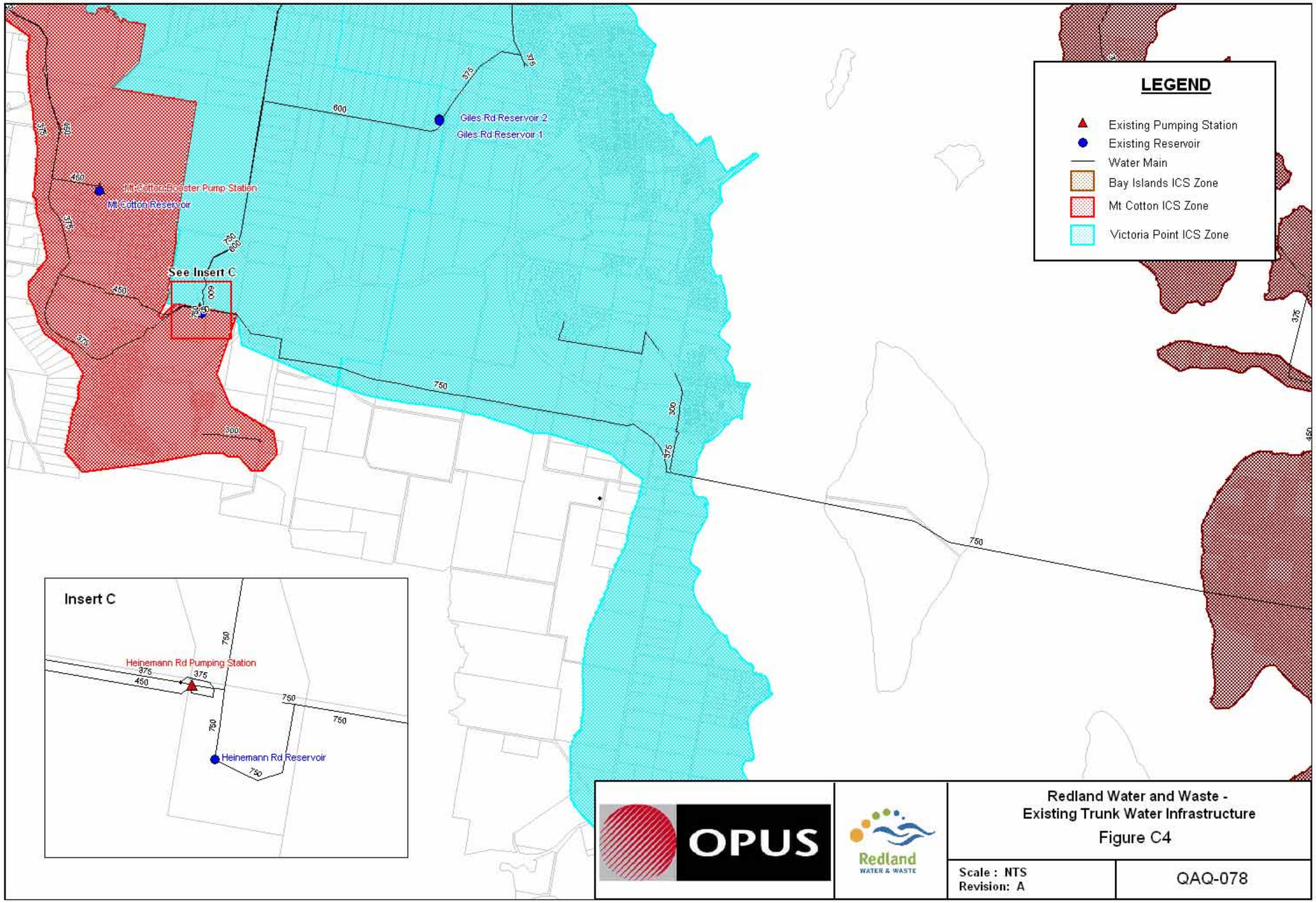
Redland Water and Waste -
Existing Trunk Water Infrastructure
Figure C1

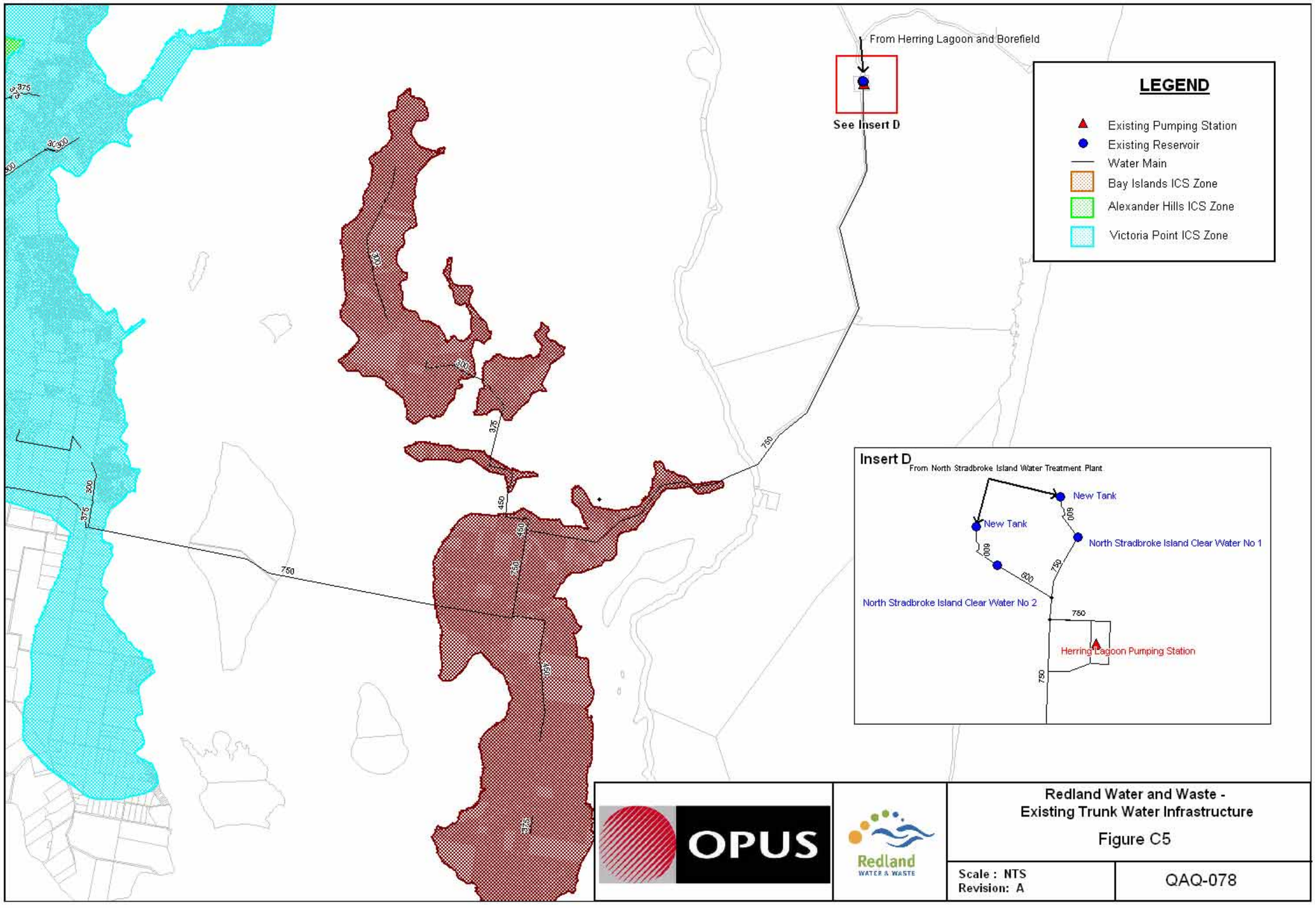
Scale : NTS
Revision: A

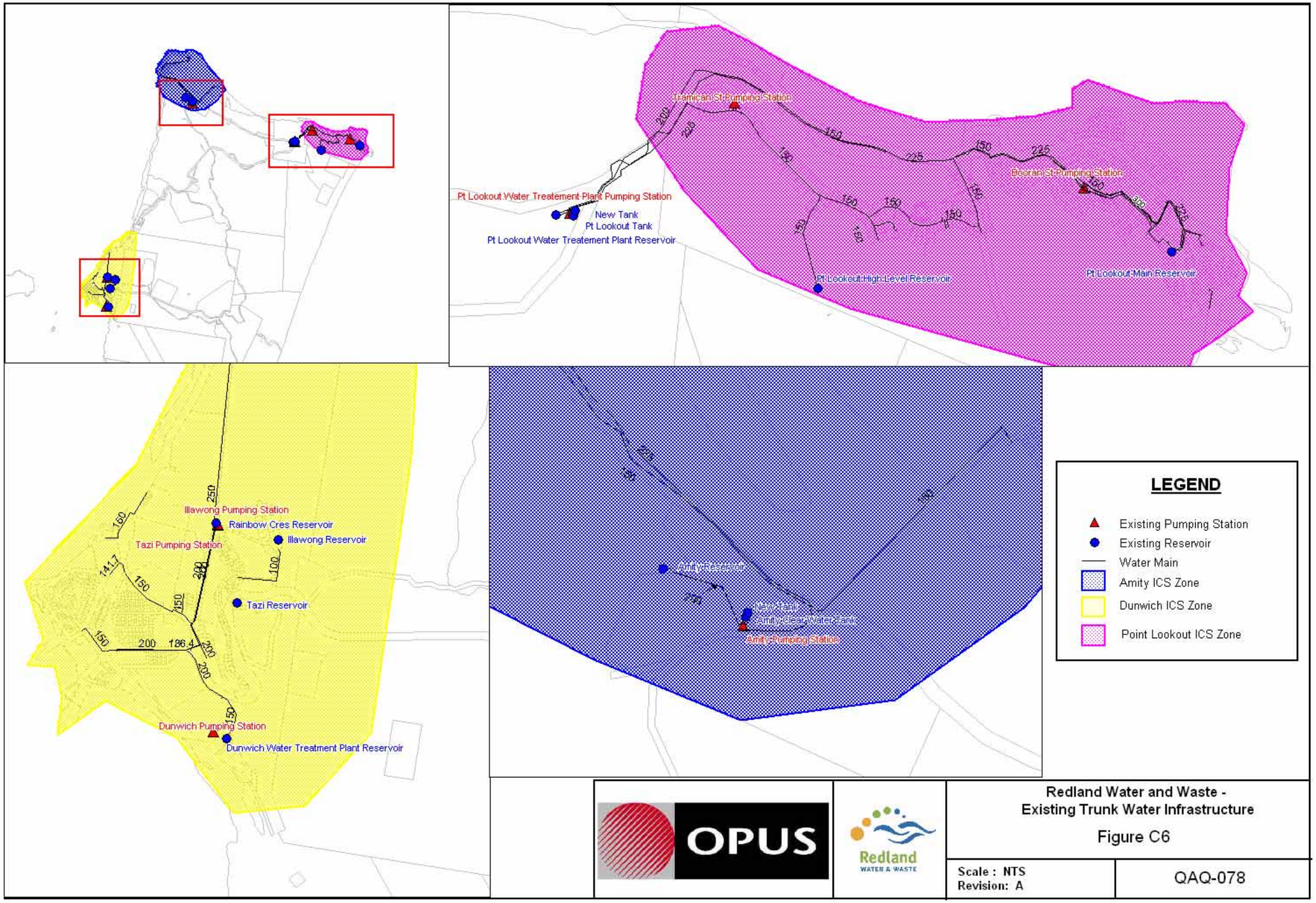
QAQ-078


Insert A
Alexandra Hills Pump Station
Alexandra Hills Elevated Tank
Alexandra Hills Elevated Tank
LEGEND
Existing Pumping Station
Existing Reservoir
Water Main
Alexandra Hills ICS Zone
Mt Cotton ICS Zone
From Leslie Harrison Dam
Capalaba WTP High Lift Pumping Station
Capalaba WTP Clear Water Tank
Howlett Rd HLZ Booster Pump Station
See Insert A
OPUS
Redland
WATER & WASTE
Redlands Water and Waste -
Existing Trunk Water Infrastructure
Figure C2
Scale : NTS
Revision: A
QAQ-078


Insert B
Giles Rd Reservoir 1
Giles Rd Reservoir 2
Duncan Rd Pumping Station
Ephraim Ck Pumping Station
Mt Cotton Booster Pump Station
Mt Cotton Reservoir
See Insert B
LEGEND
Existing Pumping Station
Existing Reservoir
Water Main
Mt Cotton ICS Zone
Alexander Hills ICS Zone
Victoria Point ICS Zone
OPUS
Redland
WATER & WASTE
Redland Water and Waste -
Existing Trunk Water Infrastructure
Figure C3
Scale : NTS
Revision: A
QAQ-078


LEGEND
Existing Pumping Station
Existing Reservoir
Water Main
Bay Islands ICS Zone
Mt Cotton ICS Zone
Victoria Point ICS Zone
Giles Rd Reservoir 2
Giles Rd Reservoir 1
Mt Cotton Booster Pump Station
Mt Cotton Reservoir
See Insert C
Insert C
Heinemann Rd Pumping Station
Heinemann Rd Reservoir
OPUS
Redland
WATER & WASTE
Redland Water and Waste -
Existing Trunk Water Infrastructure
Figure C4
Scale : NTS
Revision: A
QAQ-078


From Herring Lagoon and Borefield
See Insert D
LEGEND
Existing Pumping Station
Existing Reservoir
Water Main
Bay Islands ICS Zone
Alexander Hills ICS Zone
Victoria Point ICS Zone
Insert D
From North Stradbroke Island Water Treatment Plant
New Tank
New Tank
North Stradbroke Island Clear Water No 1
North Stradbroke Island Clear Water No 2
Herring Lagoon Pumping Station
600
600
600
750
750
750
750
750
750
450
450
450
375
375
375
300
300
OPUS
Redland
WATER & WASTE
Redland Water and Waste -
Existing Trunk Water Infrastructure
Figure C5
Scale : NTS
Revision: A
QAQ-078

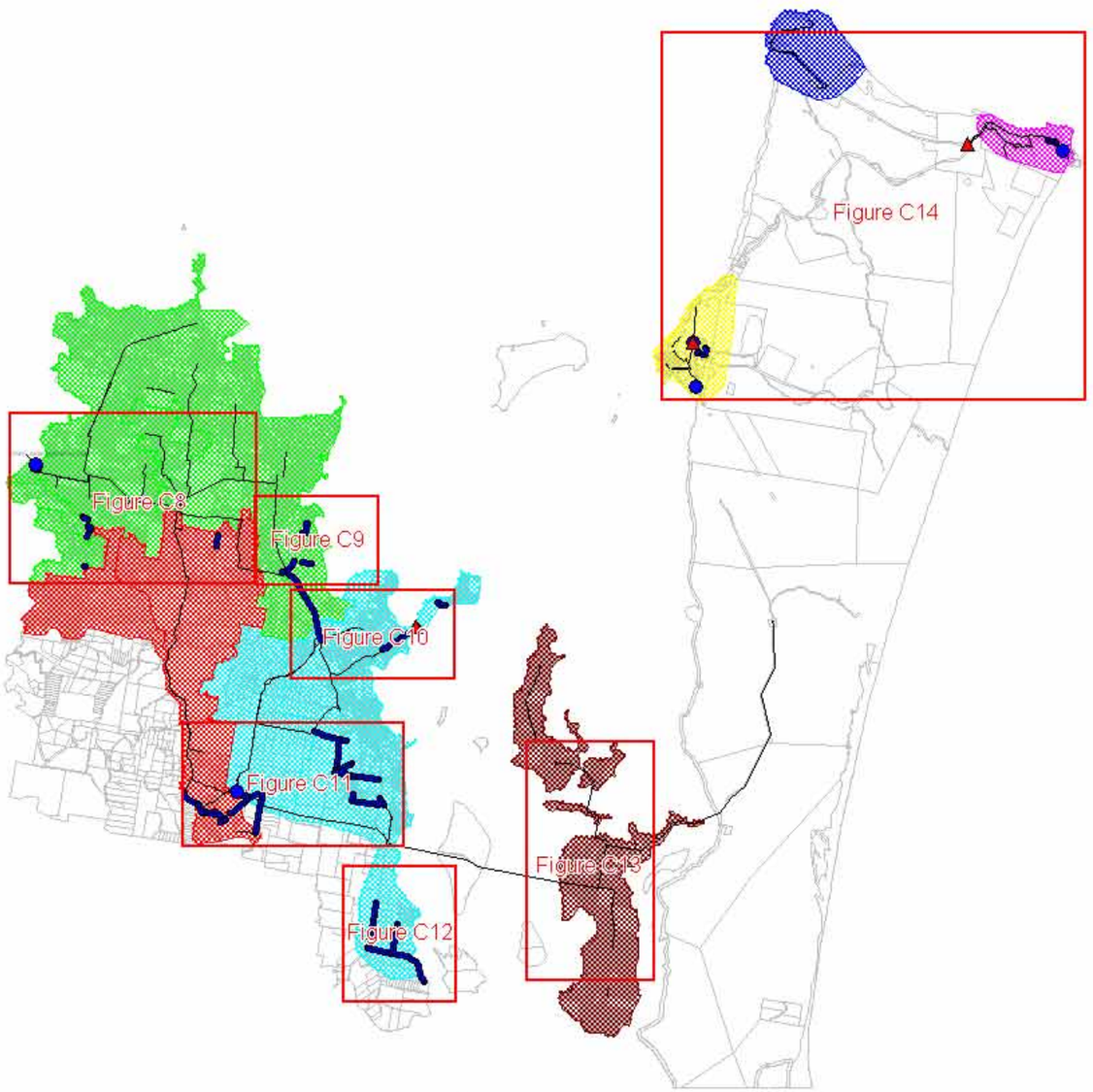


Redland Water and Waste -
Existing Trunk Water Infrastructure

Figure C6

Scale : NTS
Revision: A

QAQ-078



OPUS

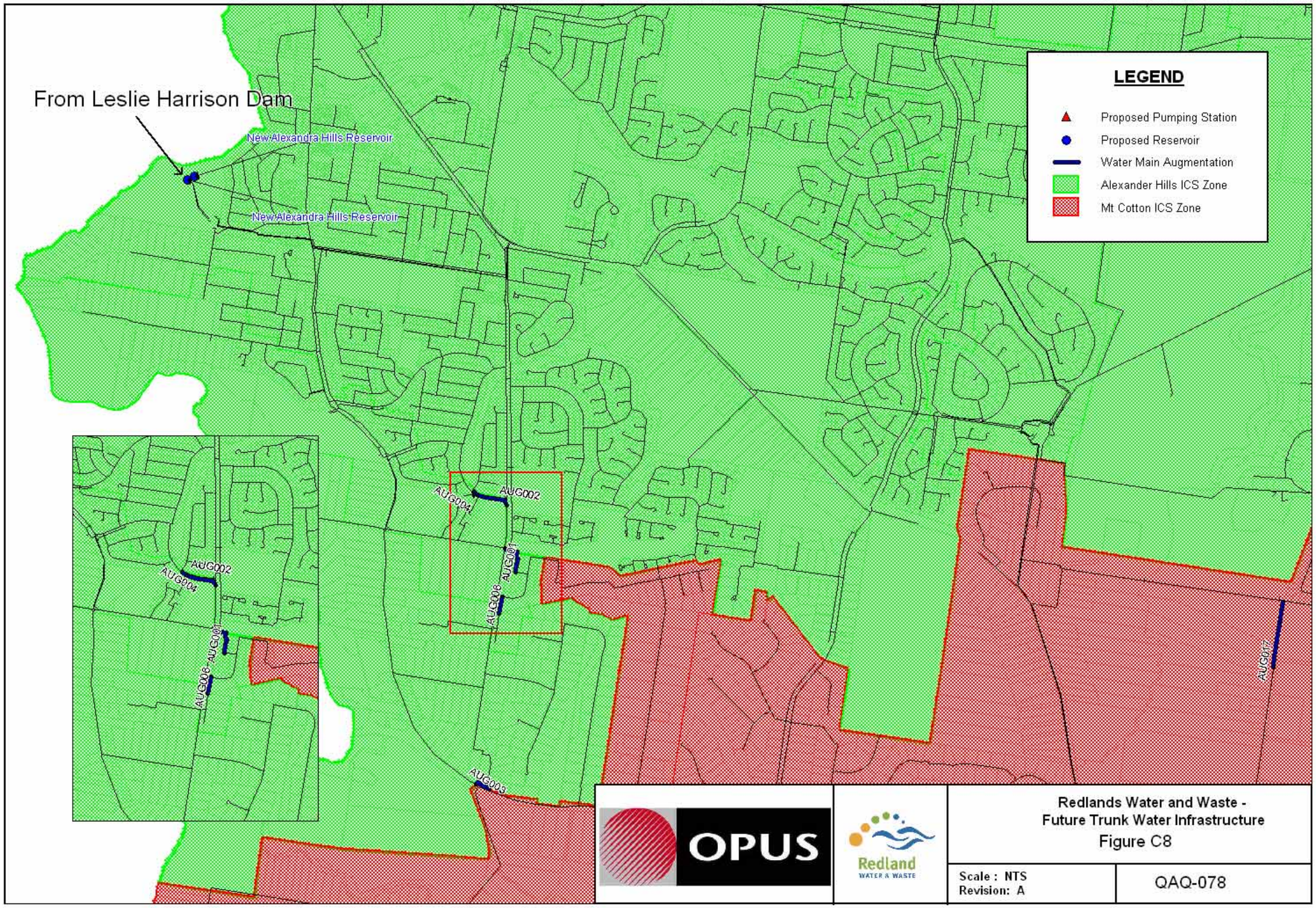
Redland WATER & WASTE

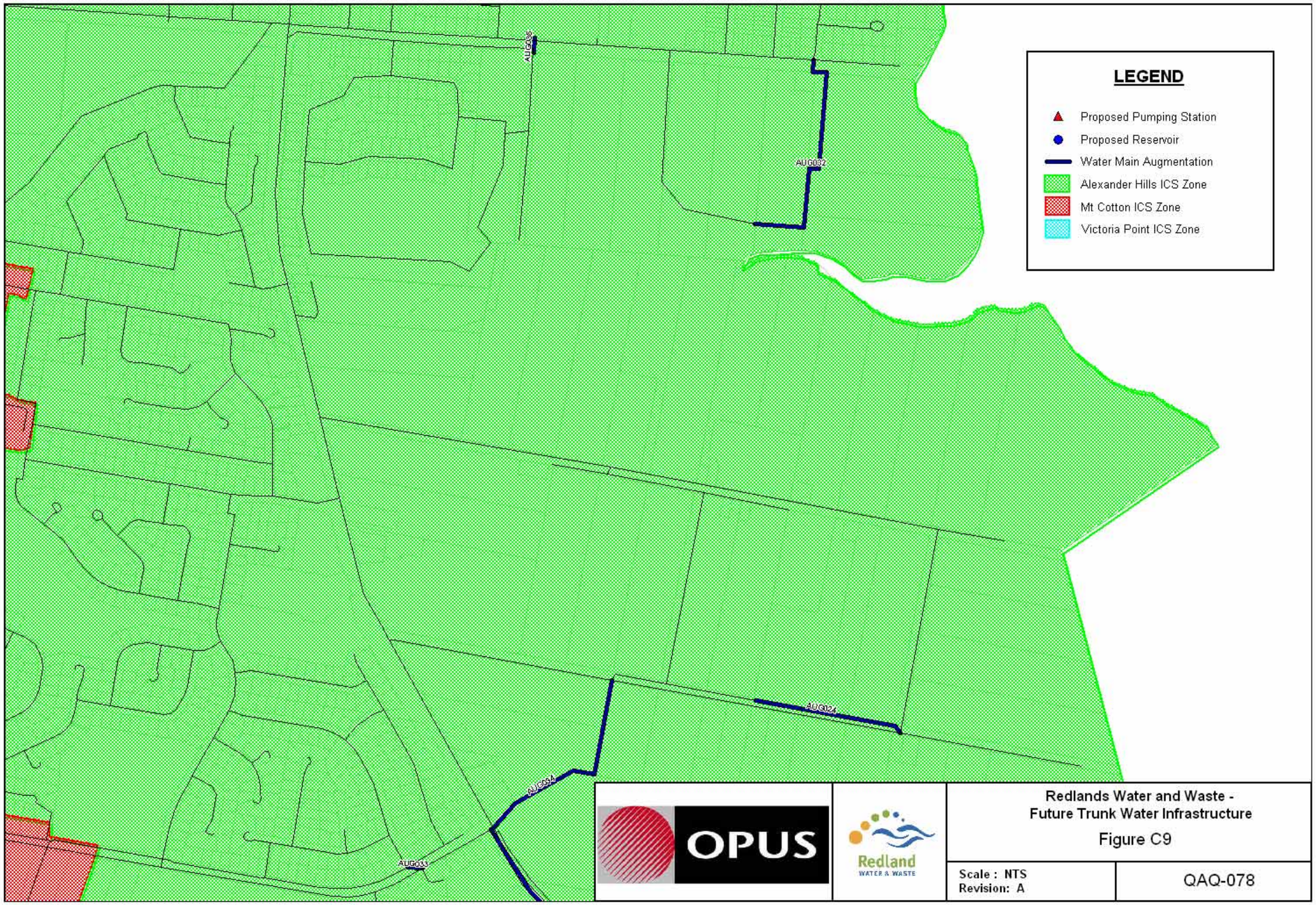
Redlands Water and Waste -
Future Trunk Water Infratructure

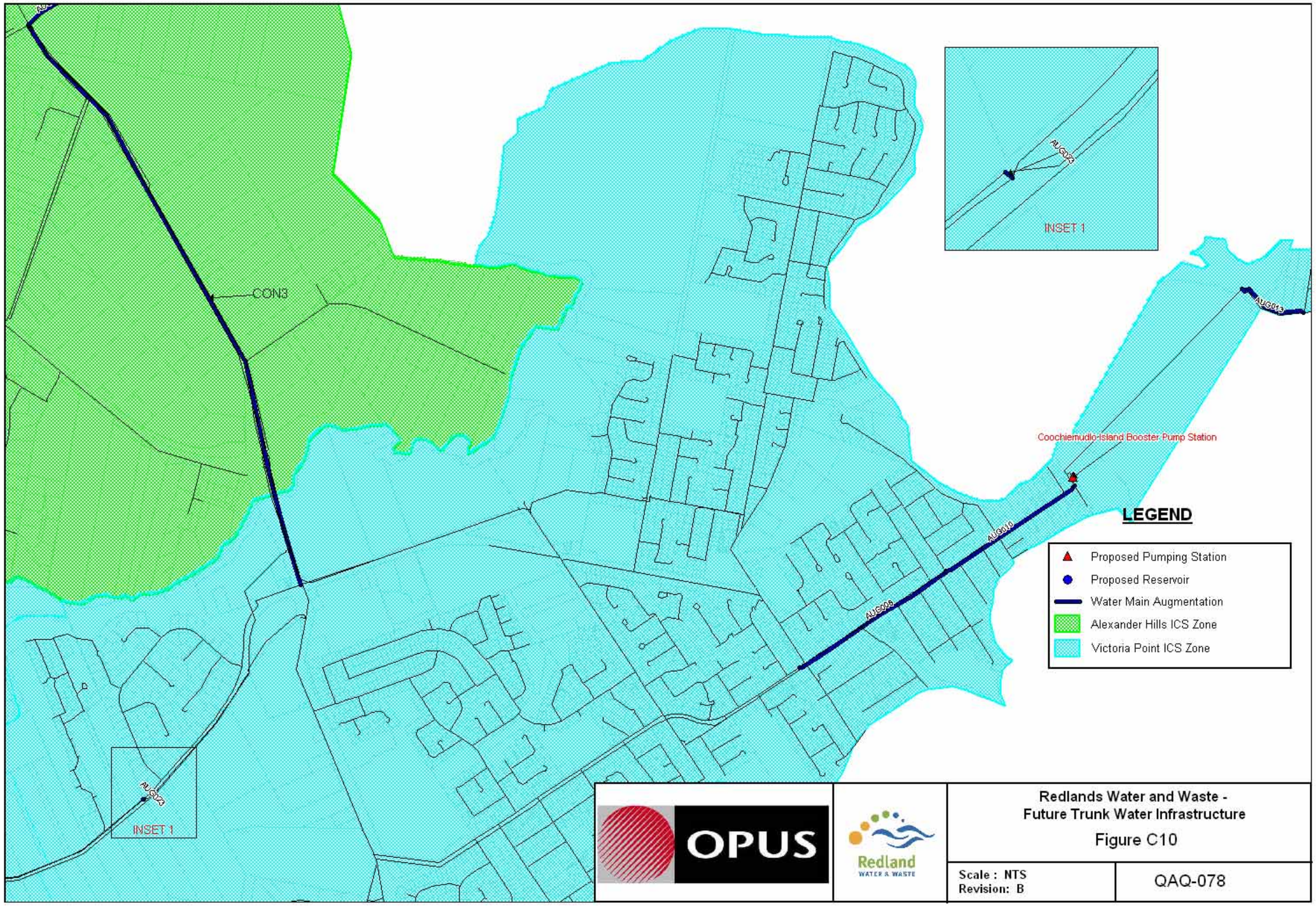
Figure C7

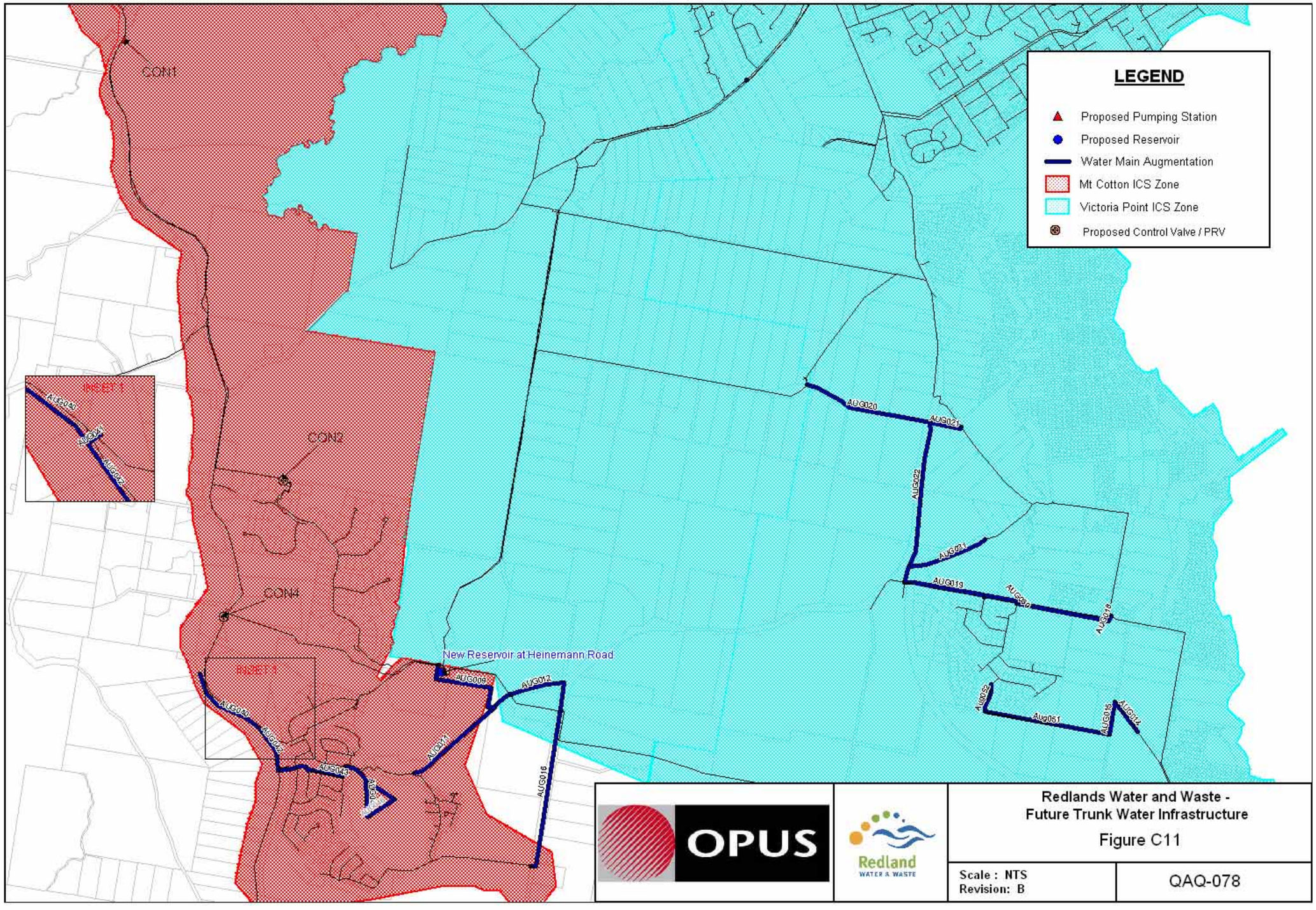
Scale : NTS
Revision: A

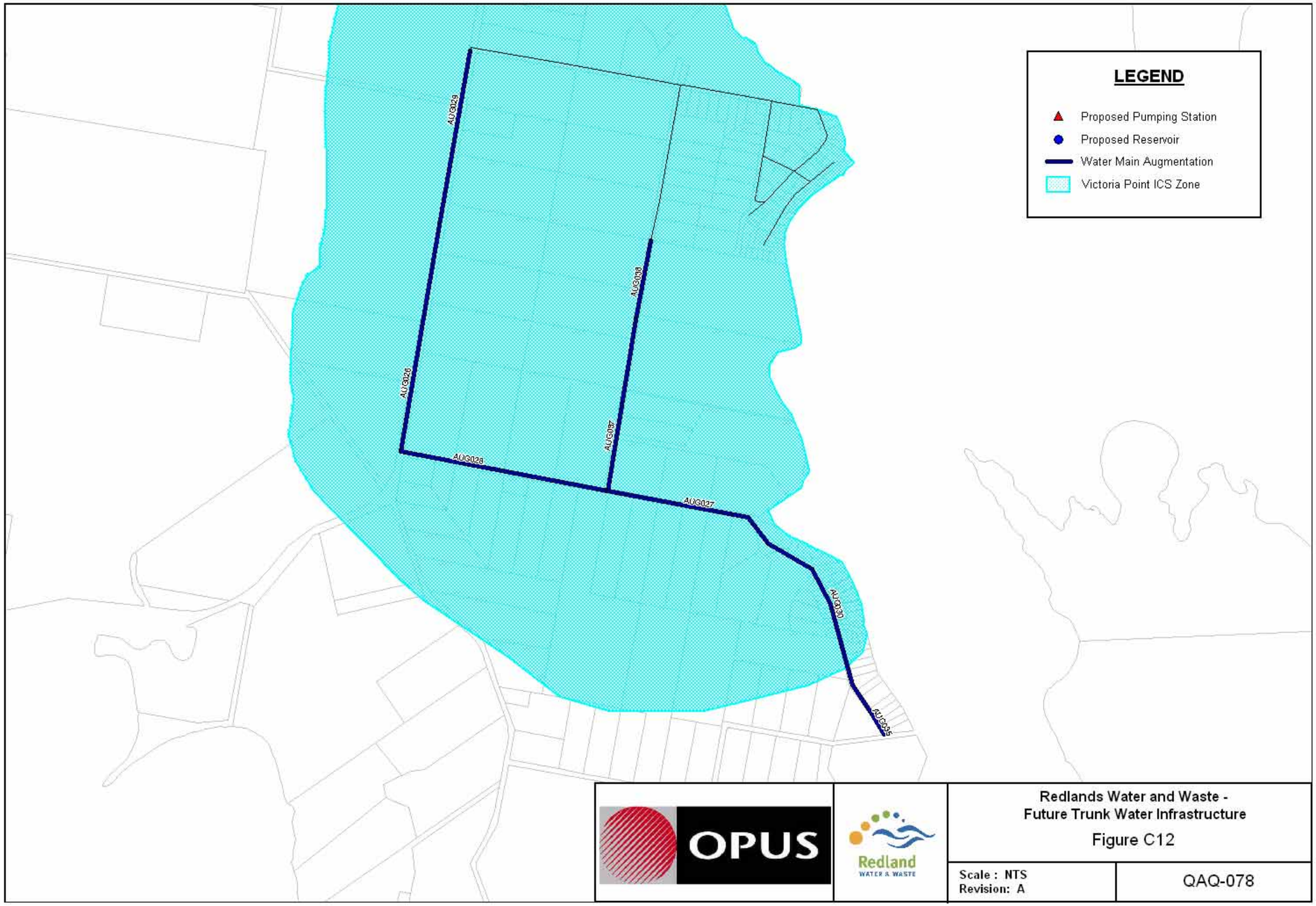
QAQ-078


From Leslie Harrison Dam
New Alexandra Hills Reservoir
New Alexandra Hills Reservoir
LEGEND
Proposed Pumping Station
Proposed Reservoir
Water Main Augmentation
Alexander Hills ICS Zone
Mt Cotton ICS Zone
AUG002
AUG004
AUG001
AUG003
AUG007
OPUS
Redland
WATER & WASTE
Redlands Water and Waste -
Future Trunk Water Infrastructure
Figure C8
Scale : NTS
Revision: A
QAQ-078


AUG036
AUG032
AUG024
AUG034
AUG033
LEGEND
Proposed Pumping Station
Proposed Reservoir
Water Main Augmentation
Alexander Hills ICS Zone
Mt Cotton ICS Zone
Victoria Point ICS Zone
OPUS
Redland
WATER & WASTE
Redlands Water and Waste -
Future Trunk Water Infrastructure
Figure C9
Scale : NTS
Revision: A
QAQ-078


CON3
AUG02
INSET 1
AUG013
Coochiemudlo Island Booster Pump Station
AUG010
AUG009
AUG02A
INSET 1
LEGEND
Proposed Pumping Station
Proposed Reservoir
Water Main Augmentation
Alexander Hills ICS Zone
Victoria Point ICS Zone
OPUS
Redland
WATER & WASTE
Redlands Water and Waste -
Future Trunk Water Infrastructure
Figure C10
Scale : NTS
Revision: B
QAQ-078


LEGEND
Proposed Pumping Station
Proposed Reservoir
Water Main Augmentation
Mt Cotton ICS Zone
Victoria Point ICS Zone
Proposed Control Valve / PRV
CON1
CON2
CON4
INSET 1
INSET 2
New Reservoir at Heinemann Road
AUG040
AUG041
AUG042
AUG043
AUG044
AUG009
AUG012
AUG011
AUG018
AUG020
AUG021
AUG022
AUG023
AUG019
AUG017
AUG016
AUG052
AUG051
AUG015
AUG014
OPUS
Redland
WATER & WASTE
Redlands Water and Waste -
Future Trunk Water Infrastructure
Figure C11
Scale : NTS
Revision: B
QAQ-078



OPUS

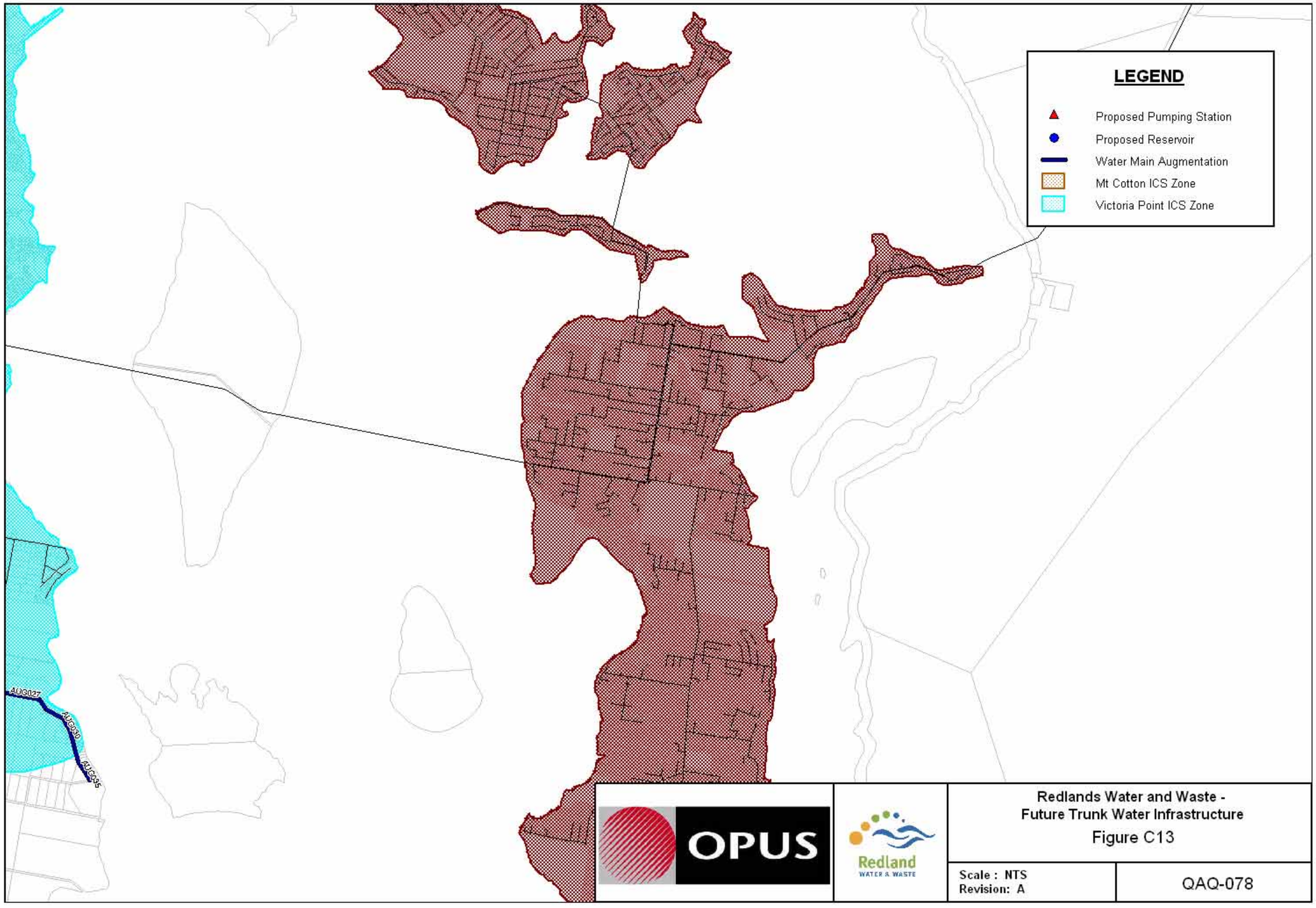
Redland WATER & WASTE

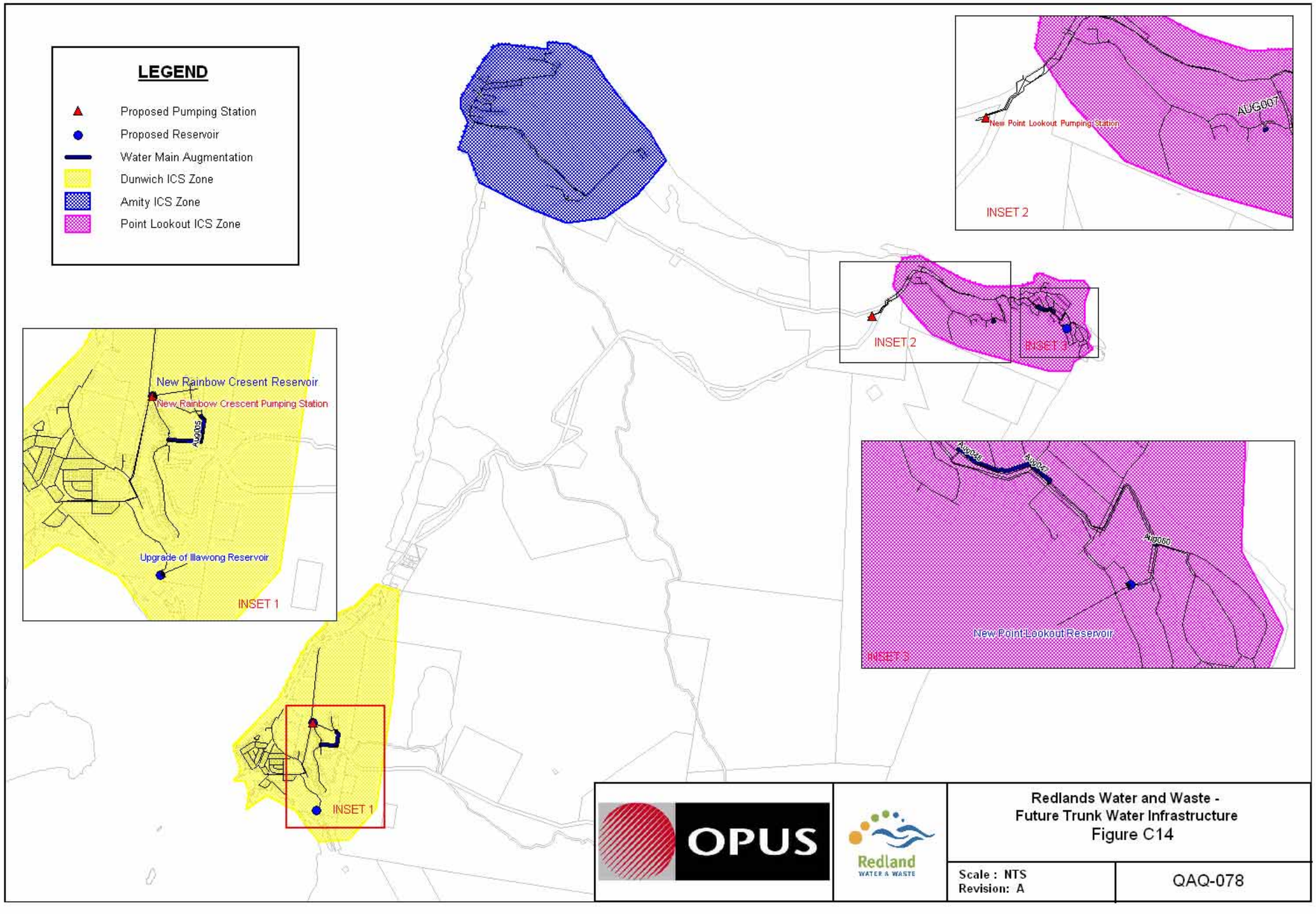
Redlands Water and Waste -
Future Trunk Water Infrastructure

Figure C12

Scale : NTS
Revision: A

QAQ-078


LEGEND
Proposed Pumping Station
Proposed Reservoir
Water Main Augmentation
Mt Cotton ICS Zone
Victoria Point ICS Zone
AUG127
AUG930
AUG935
OPUS
Redland
WATER & WASTE
Redlands Water and Waste -
Future Trunk Water Infrastructure
Figure C13
Scale : NTS
Revision: A
QAQ-078


LEGEND
Proposed Pumping Station
Proposed Reservoir
Water Main Augmentation
Dunwich ICS Zone
Amity ICS Zone
Point Lookout ICS Zone
New Rainbow Cresent Reservoir
New Rainbow Crescent Pumping Station
AUG005
Upgrade of Illawong Reservoir
INSET 1
INSET 1
New Point Lookout Pumping Station
AUG007
INSET 2
INSET 2
INSET 3
AUG045
AUG047
AUG060
New Point Lookout Reservoir
INSET 3
OPUS
Redland
WATER & WASTE
Redlands Water and Waste -
Future Trunk Water Infrastructure
Figure C14
Scale : NTS
Revision: A
QAQ-078

Appendix D – Cost Rates

These rates are as at December 2006 and account for the cost of site preparation, installation of the assets, detailed design, project management and restoration of the construction site. The cost rates are derived as an average of anticipated site conditions, and multipliers are used where the conditions under which the asset is to be constructed is seen to be more difficult. The cost rates were developed following a review of cost rates of different councils within South East Queensland.

Water Supply Mains:

Main Diameter	Cost ($/m)
50	$148
80	$206
100	$245
150	$330
200	$420
225	$465
250	$521
300	$610
375	$873
400	$951
450	$1,109
500	$1,266
525	$1,345
600	$1,520
660	$1,735
675	$1,781
700	$1,868
750	$2,040

Pumping Stations:

Total Pumping Station (kW)	Civil ($)	Pipework & Equipment ($)	Mechincal ($/kW)	Electrical ($/kW)	Total ($)
10	$105,242	$39,090	$1,450	$5,831	$217,142
20	$111,685	$41,882	$1,396	$5,584	$293,173
30	$123,498	$50,473	$1,353	$5,359	$375,326
40	$136,385	$54,124	$1,310	$5,133	$448,244
50	$148,198	$60,246	$1,267	$4,908	$517,188
75	$179,340	$75,495	$1,160	$4,339	$667,211
100	$209,410	$90,744	$1,052	$3,769	$782,333
150	$218,001	$136,170	$1,042	$3,705	$1,066,163
200	$227,666	$181,488	$1,031	$3,630	$1,341,295
300	$244,848	$279,213	$1,009	$2,234	$1,497,010
500	$281,360	$349,016	$967	$1,901	$2,064,026
1000	$370,494	$489,159	$419	$1,750	$3,028,921
1500	$460,701	$725,953	$419	$1,396	$3,908,978

Water Supply Reservoirs:

Capacity (ML)	Cost ($)
0.02	$46,200
0.05	$85,900
0.3	$189,000
0.5	$314,700
1	$364,100
2	$615,300
3	$781,800
4	$1,064,200
5	$1,451,900
8	$1,645,200
10	$1,851,400
15	$2,221,900
18	$2,544,100
20	$2,827,600
30	$3,262,500
35	$3,805,900
50	$4,713,300