Redlands Water and Waste

Water Supply System Priority Infrastructure Plan

March 2007

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Contents

1. Introduction 1
1.1 Infrastructure Agreements and Structure Plans 1
2. Service Catchments 2
3. Projected Population Growth 4
3.1 Serviced Population Growth – Water Supply 4
4. Desired Standards of Service 6
4.1 Water Supply Desired Standards of Service 6
5. Plans for Trunk Infrastructure 9
5.1 Definition of Trunk Infrastructure 9
5.2 Distribution of Costs 9
5.3 Regional and Local Water Supply Infrastructure 9
6. Infrastructure Charges Schedule 11
6.1 Valuation of Existing Infrastructure 11
6.2 Valuation of Future Infrastructure 11
6.3 Administration and Financing Costs 11
7. Infrastructure Charges Calculations 13
7.1 Methodology 13
7.2 Calculations 13
Appendix A - Conversion Factors to Equivalent Tenements 15

List of Tables

Table 3-1 : Water Supply System Population Growth 4
Table 4-1 : Proposed Water Supply Design Criteria....6
Table 4-2 : Water Peaking Factors....7
Table 4-3 : Adopted Hazen Williams Friction Factors....7
Table 4-4 : Population Densities 8
Table 6-1 : Existing Water Supply Infrastructure Valuation 11
Table 6-2 : Future Water Supply Infrastructure Valuation 11
Table 7-1 : Water Supply Trunk Infrastructure Charges Calculation 14

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

This report details Redland Shire Council's Water Supply System Priority Infrastructure Plan which replaces the existing Sewerage Headwork's Policy. The document provides the basis upon which infrastructure contributions for the water supply service for Redlands Shire.

The Priority Infrastructure Plan for Redland Shire Council is prepared in accordance with the "Infrastructure Charges Schedules: Incorporating Worked Examples and Sample Calculations" published in October 2004 by the Queensland Department of Local Government, Planning Sport and Recreation.

The Water Supply components of a Priority Infrastructure Plan generally:

- identifies the water supply priority infrastructure areas;
- includes the plans for water supply trunk infrastructure;
- states the assumptions about the projected population growth on which the plan is based;
- states the desired standards of service;
- identifies infrastructure included in the plan; and
- states the infrastructure charges schedules.

1.1 Infrastructure Agreements and Structure Plans

The water supply infrastructure charges determined in this report only apply to customers that do not have an existing infrastructure agreement in place such as the Mt Cotton Infrastructure Agreement.

For Structure Plan Areas, additional charges maybe applied to account for the additional trunk infrastructure for alternate supply sources.

2. Service Catchments

Redland Shire has a Priority Infrastructure Area in which it is responsible to supply trunk infrastructure to allow for growth to develop within the shire. Within the Redland's water supply network there are four (4) separate systems. Figure 2.1 illustrates the Water Supply Zone Boundaries which include:

- Mainland (Coochiemudlo Island),
- Southern Moreton Bay Islands,
- Dunwich,
- Amity Point, and
- Point Lookout.

The Mainland water supply system and Southern Moreton Bay Islands (SMBI) are supplied with bulk water from North Stradbroke Island Water Treatment Plant and the Capalaba Water Treatment Plant. There are two main storage locations for this system at the Alexandra Hills and Heinemann Road reservoir sites.

The mainland system is separated into 9 water supply zones:

- Alexandra Hills Low Level Zone,
- Alexandra Hills High Level Zone,
- Howlett Road High Level Zone,
- Duncan Road High Level Zone,
- Victoria Point Pressure Reducing Valve Zone,
- Mount Cotton High Level Zone,
- Heinemann Road Gravity Zone,
- Mount Cotton Reservoir High Level Zone, and
- Heinemann Road Low Level Zone.

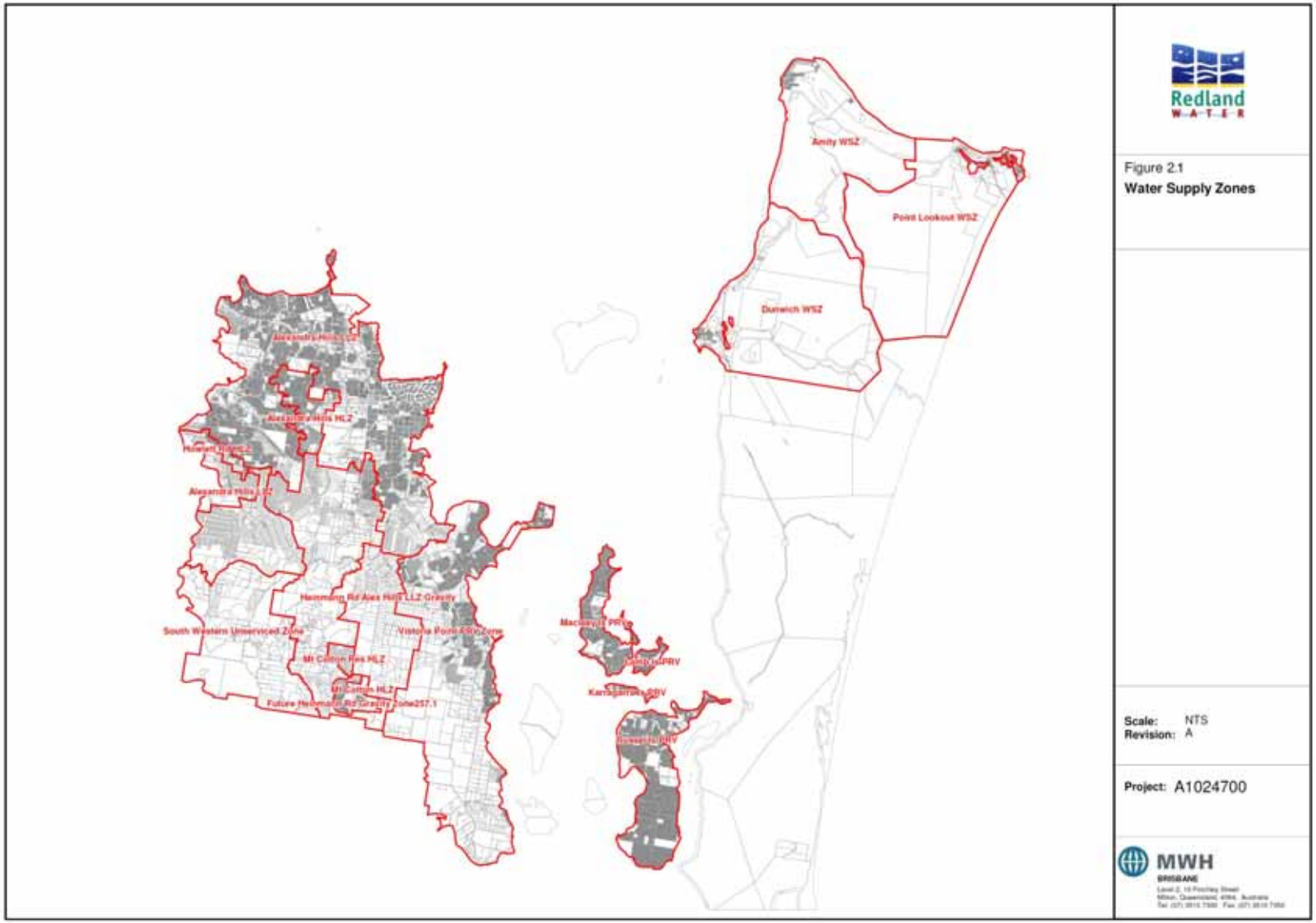
SMBI has 4 water supply zones:

- Russell Island Pressure Reducing Valve Zone,
- Karragarra Island Pressure Reducing Valve Zone,
- Lamb Island Pressure Reducing Valve Zone, and
- Macleay Island Pressure Reducing Valve Zone.

The North Stradbroke Island region consists of three small closed systems, each having a separate Water Treatment Plant. These are:

- Dunwich,
- Amity Point, and
- Point Lookout.

Each of the North Stradbroke Island systems has a supply reservoir to maintain pressures. Dunwich and Point Lookout systems have small High Level Zones that are supplied from a combination of elevated reservoirs and booster pumps.


Amity WSZ
Point Lookout WSZ
Dunwich WSZ
Alexandra Hills HLZ
Hemmant Rd Axes Hills LLZ Gravity
South Western Unserviced Zone
Victoria Point 430v Zone
Mt Cotton Res HLZ
Mt Cotton HLZ
Future Hemmant Rd Gravity Zone257.1
Macleay Is PRV
Karragarra 50RV
Redland
W A T E R
Figure 2.1
Water Supply Zones
Scale: NTS
Revision: A
Project: A1024700
MWH
BRISBANE

3. Projected Population Growth

Redland Shire is expected to undergo rapid population expansion with the ultimate population to be achieved around the year 2025. The residential population was staged to include 2008, 2013, and 2018 planning horizons.

Detached residential properties identified by billing data for existing conditions were assigned 2.8 persons per dwelling and multi family residential properties were assigned 1.8 persons per dwelling based on information provided by PIFU. An occupancy rate of 1.6 persons per dwelling was assigned to residential properties on the Southern Moreton Bay Islands. The occupancy rate has been decreasing over time and it is expected that at ultimate conditions the occupancy rate for residential properties will be 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.

3.1 Serviced Population Growth – Water Supply

The existing serviced population is estimated to be 145,670 EP including a residential component of 129,428 equivalent persons. The ultimate contributing population is estimated to be 218,984 EP including a residential component of 193,274 equivalent persons. Table 3-1 shows the growth of the serviced population to ultimate. There is a minor variation between the forecasts used for water supply and wastewater planning and the population forecast for the Shire. This is due to the transient tourist population that is experienced during peak summer period and a conversion of non-residential properties to an equivalent population to forecast future non-residential consumption.

Table 3-1 : Water Supply System Population Growth

Land Use Category	2006	2008	2013	2018	Ultimate (2025)
Residential					
Urban Residential	108,448	122,429	138,778	152,172	161,045
Medium Residential	14,055	16,976	21,497	23,544	25,536
Low Density Residential	6,926	6,968	6,874	6,816	6,693
Residential Sub Total	129,428	146,373	167,150	182,531	193,274
Non-Residential					
Commercial	4,364	4,716	5,830	6,638	6,893
Industrial	1,978	2,121	2,484	2,862	3,725
Irrigation	45	45	45	45	45
Open Space	2,771	2,953	3,037	3,098	3,138
Public	3,564	3,664	4,317	4,995	5,284
Rural	2,974	2,988	3,213	3,771	4,377

Land Use Category	2006	2008	2013	2018	Ultimate (2025)
Tourism	546	553	807	1,192	2,249
Non-Residential Sub-Total	16,242	17,040	19,733	22,600	25,711
Grand Total	145,670	163,413	186,883	205,131	218,984

4. Desired Standards of Service

4.1 Water Supply Desired Standards of Service

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. A summary of the design criteria used for sizing infrastructure is shown in Table 4-1.

Table 4-1 : Proposed Water Supply 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 4-2				
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				

Item	Description	Design Criteria
		Minimum Operating Volume of 30%
13	Elevated Storage Capacity	6 (PH – 1/12 MDMM) + Fire fighting reserve of 150 kL
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 4-3
19	Maximum Velocity	2.5 m/s

Table 4-2 : 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 4-3 : 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

Table 4-4 : Population Densities

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

Appendix A details the conversion factors to Equivalent Tenements (ET) for several different land use types.

5. Plans for Trunk Infrastructure

Plan for Trunk Infrastructure is presented in the *Derivation of Water Supply and Sewerage Infrastructure Charges* dated February 2007.

5.1 Definition of Trunk Infrastructure

In order to calculate Infrastructure Charges, it is necessary to define the trunk infrastructure managed by Council. Water supply infrastructure transports water from source(s) to each customer. The water trunk infrastructure required to provide this service is defined by the following:

- All pumping stations,
- All storage reservoirs,
- All water treatment plants,
- All water sources (bores/dams),
- Water mains:
  - Mainland and SMBI - Water mains with a combined nominal diameter of 300 mm and above,
  - NSI - Water mains with a combined nominal diameter of 225 mm and above.

5.2 Distribution of Costs

The water supply trunk infrastructure has been separated into seven (7) ICS zones; Amity Point, Alexandra Hills, Bay Islands, Dunwich, Mt Cotton, Point Lookout, and Victoria Point. The water supply ICS zone boundaries are shown in Figure 5.1.

5.3 Regional and Local Water Supply Infrastructure

Within Redland's water supply infrastructure there are Local and Regional Infrastructure:

- Regional Infrastructure is defined as the bulk supply infrastructure that supplies water to several ICS zones and therefore the cost of this infrastructure allocated to each ICS zone.
- Local Infrastructure is defined as the infrastructure that supplies water to a single ICS zone.

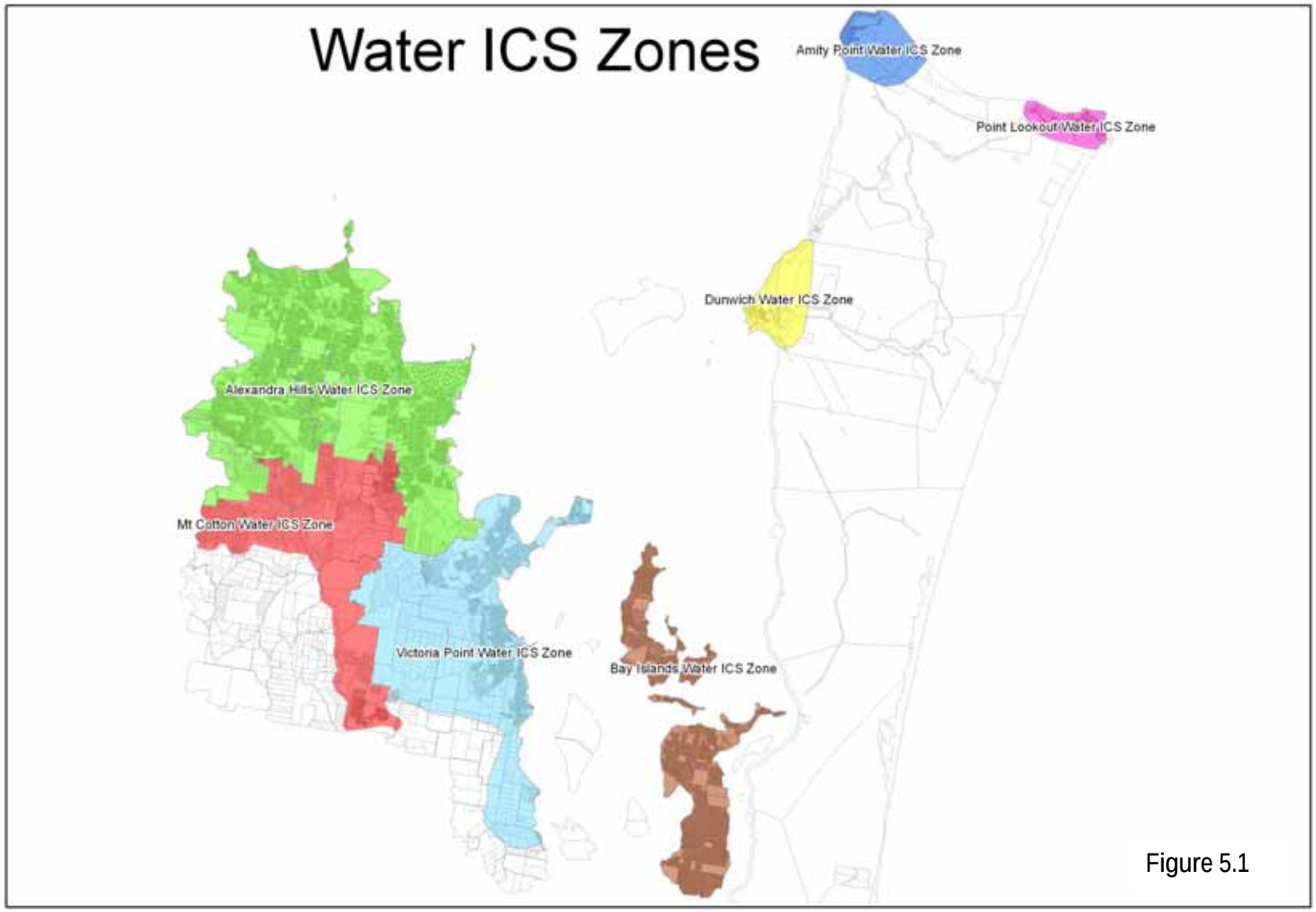

Water ICS Zones
Amity Point Water ICS Zone
Point Lookout Water ICS Zone
Dunwich Water ICS Zone
Alexandra Hills Water ICS Zone
Mt Cotton Water ICS Zone
Victoria Point Water ICS Zone
Bay Islands Water ICS Zone

Figure 5.1

6. Infrastructure Charges Schedule

The infrastructure Charges Schedules are presented in the *Derivation of Water Supply and Sewerage Infrastructure Charges* dated February 2007.

6.1 Valuation of Existing Infrastructure

The existing water supply and treatment infrastructure is valued at $365,958,825. Table 6-1 shows the breakdown of this valuation.

Table 6-1 : Existing Water Supply Infrastructure Valuation

Water Supply System	Existing Valuation	Length (km)	No. of Assets
Trunk Mains	$253,932,083	164	-
Pumping Stations	$12,425,932	-	15
Reservoirs	$17,535,632	-	21
Treatment and Bulk Supply	$82,065,178	-	5 WTP, 1 Dam, 1 Lagoon, 15 Bores
Total	$365,958,825		

6.2 Valuation of Future Infrastructure

The future additional water supply and treatment infrastructure is valued at $24,325,200. Table 6-2 shows the breakdown of this valuation.

Table 6-2 : Future Water Supply Infrastructure Valuation

Water Supply System	Future Additional Valuation
Trunk Mains	$2,899,700
Pumping Stations	$868,400
Reservoirs	$10,822,800
Valves	$247,260
Contingency Infrastructure	$4,492,900
Treatment	$0
Total Cost	$19,321,060

6.3 Administration and Financing Costs

RWW manages the infrastructure charges which consist of the administration of the charge including a three yearly review of the planning and population forecasts. The administration of the charge will require two full time equivalent staff.

The future works to be constructed by RWW will be funded using a combination of the available developer contributions collected and borrowings. It is expected that 50% of the value of future works will be financed through borrowings. As such the charge is based on the full cost of the trunk infrastructure plus the interest cost of the borrowed amount.

The administration cost is calculated as the total administration costs divided by the sum of the ultimate water supply and sewerage equivalent persons. The calculated value is $14 per EP. The financing cost has been calculated using the same method and is $21 per EP. As such, the total on-costs is a flat fee of $35 per EP or $98 per ET

7. Infrastructure Charges Calculations

7.1 Methodology

The calculation of infrastructure charges has been undertaken based on the "Infrastructure Charges Schedules: Incorporating Worked Examples and Sample Calculations" published in October 2004 by the Queensland Department of Local Government, Planning Sport and Recreation.

7.2 Calculations

Table 7.1 summaries the costs included in the Infrastructure Charges calculation. The calculation for each ICS zone's is the value of the existing trunk infrastructure plus the value of the future infrastructure divided by the zone's ultimate equivalent population.

$$\text{Water Supply Distribution Infrastructure Charge (\$/ET)} = \frac{\text{Existing Trunk Distributior Infrastructure} + \text{Future Trunk Distribution Infrastructure}}{\text{Total Equivalent Population}} * 2.8 \text{ EP / ET}$$

Water treatment charges are calculated by the value of the existing infrastructure divided by the total serviced equivalent population.

$$\text{Water Supply Treatment Infrastructure Charge (\$/ET)} = \frac{\text{Existing Treatment Infrastructure} + \text{Future Treatment Infrastructure}}{\text{Total Equivalent Population}} * 2.8 \text{ EP / ET}$$

Table 7-1 : Water Supply Trunk Infrastructure Charges Calculation

Zone	Existing Infrastructure	Future Infrastructure	Admin & Finance Cost ($/EP)	Ultimate EP	Distribution Cost ($/EP)	Bulk Supply Cost ($/EP)	Total Cost Including Admin & Finance Costs ($/EP)	Distribution Cost ($/ET)	Bulk Supply Cost ($/ET)	Total Cost Including Admin & Finance Costs($/ET)
Alexandra Hills ICS Zone	$104,611,505	$9,163,025	$35	124,589	$913	$375	$1,323	$2,557	$1,049	$3,704
Amity Point ICS Zone	$2,201,158	$0	$35	1,362	$1,616	$375	$2,026	$4,525	$1,049	$5,672
Bay Islands ICS Zone	$48,898,710	$2,959,425	$35	21,573	$2,404	$375	$2,814	$6,731	$1,049	$7,878
Dunwich ICS	$2,452,657	$1,147,800	$35	2,039	$1,766	$375	$2,175	$4,944	$1,049	$6,091
Mt Cotton ICS Zone	$39,870,181	$2,712,125	$35	17,963	$2,370	$375	$2,780	$6,637	$1,049	$7,785
Point Lookout ICS Zone	$26,494,293	$389,700	$35	5,161	$5,209	$375	$5,618	$14,584	$1,049	$15,731
Victoria Point ICS Zone	$59,365,143	$7,953,125	$35	46,295	$1,454	$375	$1,864	$4,072	$1,049	$5,219

The total valuation for bulk supply is $82,065,178 (refer to Table 6-1) and the total equivalent population is 218,984 (See Table 3-1). This results in a bulk treatment cost of $375/EP.

7.3 Example

Base water supply contributions are based on the apportionment of establishment costs for the water supply network by ultimate equivalent persons (EP) and ultimate equivalent tenements (ET).

Existing (2006) and ultimate EP and ET demand assumptions are contained in the Redland Water and Waste Water Supply Planning Report, February 2007 which can be located in the extrinsic material.

The process used to determine base infrastructure contribution for water is outlined below.

Step 1: Determine the minimum ET demand (generated by the development proposal) by the water supply ET conversion factor contained in Appendix A Table 1. This calculation establishes total ET demand. For development with more than one land use type, ET demand for each land use is multiplied by the associated ET conversion factor separately, and then totalled to establish the total ET demand.

Consider a proposed development zoned General Industry in the Victoria Point ICS zone which is 10 hectares and includes 1 hectare of parkland. Since the end use of the site is not clearly identified, the ET conversion factor from Table 1 of Appendix A is used. The Number of ET for this development would be:

(10 – 1) X 12.50 = 112.5 ET

Step 2: The base water supply infrastructure contribution is then calculated by multiplying the total ET demand from Step 1 above by the total including Administration and Finance Cost per ET contained within Table 7-1 according to the applicable ICS zone.

For a development with a total ET demand of 112.5 ET in the Victoria Point ICS zone, the total charge including Administration and Finance Cost would be:

112.5 ET X $4,920 = $553,500

Appendix A - Conversion Factors to Equivalent Tenements

Table 1 is to be used when the actual use of the proposed development has not been determined. For developments in which the end use is known and will increase the demand on the water supply system adopt Table 2.

Table 1 – ET Conversion Factors for Water Supply & Sewerage

	ET Conversion Factor	
Types of Uses	Water	Wastewater
Centre (Major, District, Neighbourhood, Local, SMBI, NSI)	As determined by local government	
Commercial Industry (per gross hectare)	12.50	12.50
General Industry (per gross hectare)	12.50	12.50
Medium Density Residential (per gross hectare)	30.00	30.00
Park Residential (per lot – 6,000m^2 average)	1.50	0.00
Low Density Residential (per lot – 2,000m^2 average)	1.25	1.25
Rural Non-Urban (per lot)	1.50	0.00
Urban Residential (per gross hectare)	10.00	10.00

NOTE: Gross hectares include all land within the development excluding parkland only.

Table 2 - ET Conversion Factor for Uses Resulting in Increased Demands or Loads

	ET Conversion Factor	
Types of Uses	Water	Wastewater
Aged Persons and Special Needs Housing		
(1) (1 bedroom)	0.33	0.33
(2) (2 bedroom)	0.57	0.5
(3) (3 bedroom)	0.76	0.63
(4) Hostel (per person)	0.28	0.33
(5) Nursing Home (per bed)	0.31	0.35
Apartment Building (per unit)	0.53	0.68
Bulky Goods Showroom (per 100m^2 floor area)	0.14	0.2
Child Care Centre (per child)	0.04	0.03
Commercial Office (per 100m^2 floor area)	0.13	0.17
Community Facility - Welfare Premises (per lot)	0.64	0.4
Display and Sale Activity (per 100m^2 floor area)	0.48	0.2
Dual Occupancy (per unit)	0.53	0.68

	ET Conversion Factor	
Types of Uses	Water	Wastewater
Dwelling House (per lot)	1	1
Education Facility		
(1) Primary School (per pupil)	0.035	0.03
(2) Secondary School (per pupil)	0.05	0.05
Garden Centre (per 100m^2 site area)	0.48	0.2
General Industry - Concrete Batching Plant (per 100m^2 site area)	0.28	0.06
General Industry (per 100m^2 floor area)	0.1	0.07
Health Care Centre (per 100m^2 site area)	0.21	0.3
Heavy Industry (per 100m^2 floor area)	4.5	6.18
Hospital (per bed)	0.93	0.93
Hotel (per 100m^2 floor area)	0.8	1.15
Indoor Recreation Facility		
(1) With shower facilities (per 100m^2 floor area)	0.45	0.6
(2) No shower facilities (per 100m^2 floor area)	0.06	0.07
Marine Services (per 100m^2 floor area)	0.1	0.07
Mobile Home Park (per site)	0.34	0.5
Multiple Dwelling (per unit)	0.53	0.68
Outdoor Recreation Facility (per 100m^2 floor area)	1.06	1.3
Refreshment Establishment (per 100m^2 floor area)	2.05	2.87
Retail Warehouse (per 100m^2 floor area)	0.14	0.2
Service Station (per 100m^2 floor area)	1.36	0.4
Shop		
(1) Over 6000m^2 floor area (per 100m^2 floor area)	0.42	0.57
(2) 200m^2 - 6000m^2 floor area (per 100m^2 floor area)	0.34	0.4
(3) Under 200m^2 (per 100m^2 floor area)	0.28	0.4
Small Lot House (per lot)	1	1
Tourist Accommodation - Caravan Park (per site)	0.34	0.5
Tourist Accommodation - Motel (bedroom)	0.23	0.32
Vehicle Depot		
(1) cars (per 100m^2 floor area)	0.06	0.03
(2) trucks (per 100m^2 floor area)	0.8	0.6
Vehicle Repair Premises (per 100m^2 floor area)	0.11	0.12
Veterinary Surgery (per lot)	0.48	0.4
Warehouse - Freight Depot (per 100m^2 floor area)	0.39	0.4

Types of Uses	ET Conversion Factor	
	Water	Wastewater
Warehouse (per 100m^2 floor area)	0.04	0.01

Note: The conversion factor to equivalent tenement for other uses that are not listed in Table 2 will be determined by a competent consultant engaged by the developer. The consultant is to be approved by the Local Government and the determination of the ET conversion factor is to be undertaken in consultation with the Local Government.