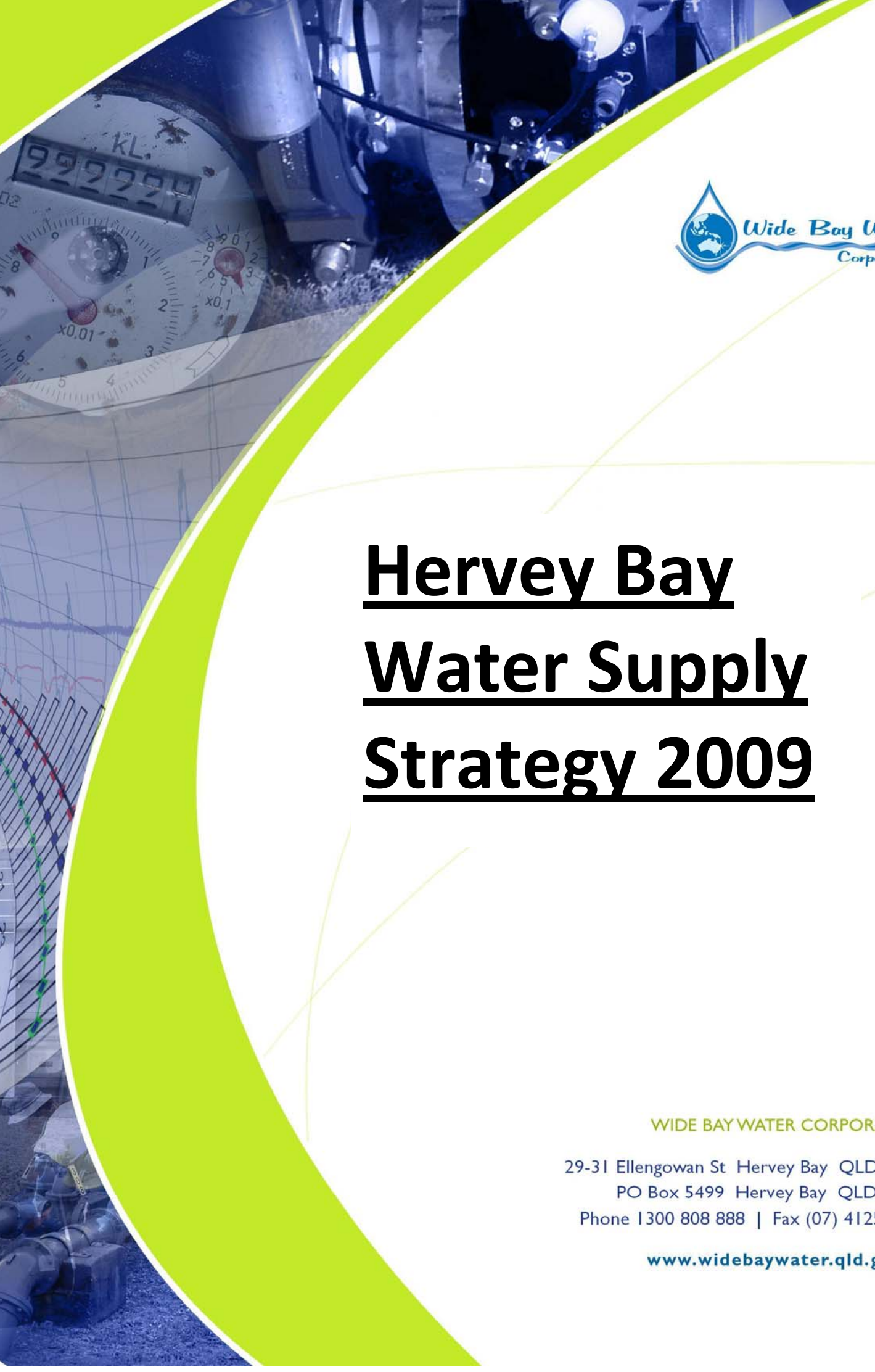

Hervey Bay Water Supply Strategy 2009

WIDE BAY WATER CORPORATION

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TABLE OF CONTENTS

1.0 INTRODUCTION

Previous water supply infrastructure planning for the Hervey Bay network was completed in 2001 by Cardno MBK under the *Hervey Bay Strategic Water Supply Planning Report* and followed with an Addendum report that was completed in 2004. Population growth and development has continued to occur in the Hervey Bay region since that report was adopted, which has necessitated that the existing and projected water supply infrastructure needs of the City be reassessed in view of revised populations, water consumption figures and projected development sequences. Population density, as an Equivalent Dwelling (ED), has increased by 4.1% to that identified in the 2004 addendum report, but water consumption per dwelling has decreased by 24.8% due primarily to:

1. Demand management principles developed and implemented by Wide Bay Water Corporation
2. Public Education on water use
3. Public awareness and response to drought management

This Water Supply Strategy's main objective has been to evaluate the existing water supplies capacity to meet projected population growth and water consumption and to identify infrastructure augmentations required to satisfactorily manage these demands to the year 2031, with major infrastructure to 2040.

A major part of the investigation included the reassessment of the water supply requirements to those areas of the existing network that are developing at a rate significantly greater than was previously planned.

The primary objectives of this Report are to:

- Assess the existing water supply demand based on recently recorded flow data with the current demand management regimes in place;
- Assess the projected water supply demand, up to 2031, based on revised population projections undertaken by Fraser Coast Regional Council and the Planning Information and Forecasting Unit (PIFU; *Queensland Dept of Local Government and Planning*);
- Identify the capacity of the existing raw water sources and determine the most appropriate method of augmentation to meet community and demand growth;
- Consider the impacts of climate change on potential raw water supplies;
- Identify the water treatment requirements for the Hervey Bay area and determine the most appropriate method of supply for treated water to the community in the future;
- Evaluate the impacts that the revised population projections and development sequencing will have on the major water supply infrastructure components (e.g. treatment plants, pump stations, reservoirs, trunk mains);
- Allocate the revised water supply demands to the hydraulic model, identify where the system 'fails' and determine the most efficient option for intervention;
- Identify the additional waters supply infrastructure options and the appropriate construction timing required to deliver the desired Standards of Service (SOS) to Wide Bay Water Corporation customers;
- Establish a preferred strategy from the options proposed for water supply infrastructure planning up to 2031, with major infrastructure to 2040.

1.1 Study Area

The study area is consistent with the previous supply infrastructure planning reports and incorporates all the reticulated water supply networks located within the former Hervey Bay local government area controlled by Wide Bay Water Corporation. The study area consists of Hervey Bay, Toogoom, Burrum Heads, Howard, River Heads, Booral and Torbanlea.

2.0 OBJECTIVES

2.1 Objectives of the Study

The aim of the investigation was to review existing and projected population projections and water consumption to enable development of a strategic development plan and associated capital works program for the 20 year planning horizon to the year 2030. Consistent with the work required to achieve these aims, a population model and a detailed water network model have been prepared. These models will allow Wide Bay Water Corporation to periodically undertake system analyses on the water supply system to verify and amend the 20 year works program as necessary.

The principal objectives of the study were to:

- **build** a population model, which is capable of determining existing equivalent dwelling (ED) population and predicting future populations for nominated development or planning horizons;

- **review** the performance of the existing water supply scheme and identify areas which do not provide the adopted Standards of Service to consumers;

- **develop** calibrated water network models for the existing water supply system and for each of the five (5) year planning horizons to the year 2030 system;

- **produce** a 20 year capital works program based on the results of the hydraulic modelling, detailed economic analysis and financial implications associated with the various augmentation options developed;

2.2 Standards of Service

A Statement of Corporate Intent has been adopted between Fraser Coast Regional Council and Wide Bay Water Corporation to identify the commercial relationship between the two entities and to ensure an acceptable standard of service is provided to all customers. This document sets the quantity, quality and reliability requirements of the scheme. The main requirements that affect the preparation of this report are as follows:

- the number of permissible hours of water discontinuity – maximum 5 hours;
- 99% of all premises will have water pressure of 20 metres or greater for 90% of the year;
- all premises will have a flow available of 20 L/min or greater for 90% of the year; and
- the quality of water at the point of delivery is to meet NHMRC guidelines 95% of the time.
- Wide Bay Water also aims to satisfy the following standards of service contained within the QWRC Guidelines, commonly known as the “DNR Guidelines”:
- maximum residual pressure should not exceed 80 metres;
- the reticulation network shall be capable of providing a fire flow in residential areas during the peak demand period of 15 L/s while maintaining a minimum residual pressure of 12 metres; and
- the reticulation network shall be capable of providing a fire flow in commercial areas during the peak demand period of 30 L/s while maintaining a minimum residual pressure of 12 metres.

3.0 EXISTING SYSTEM

3.1 System Overview

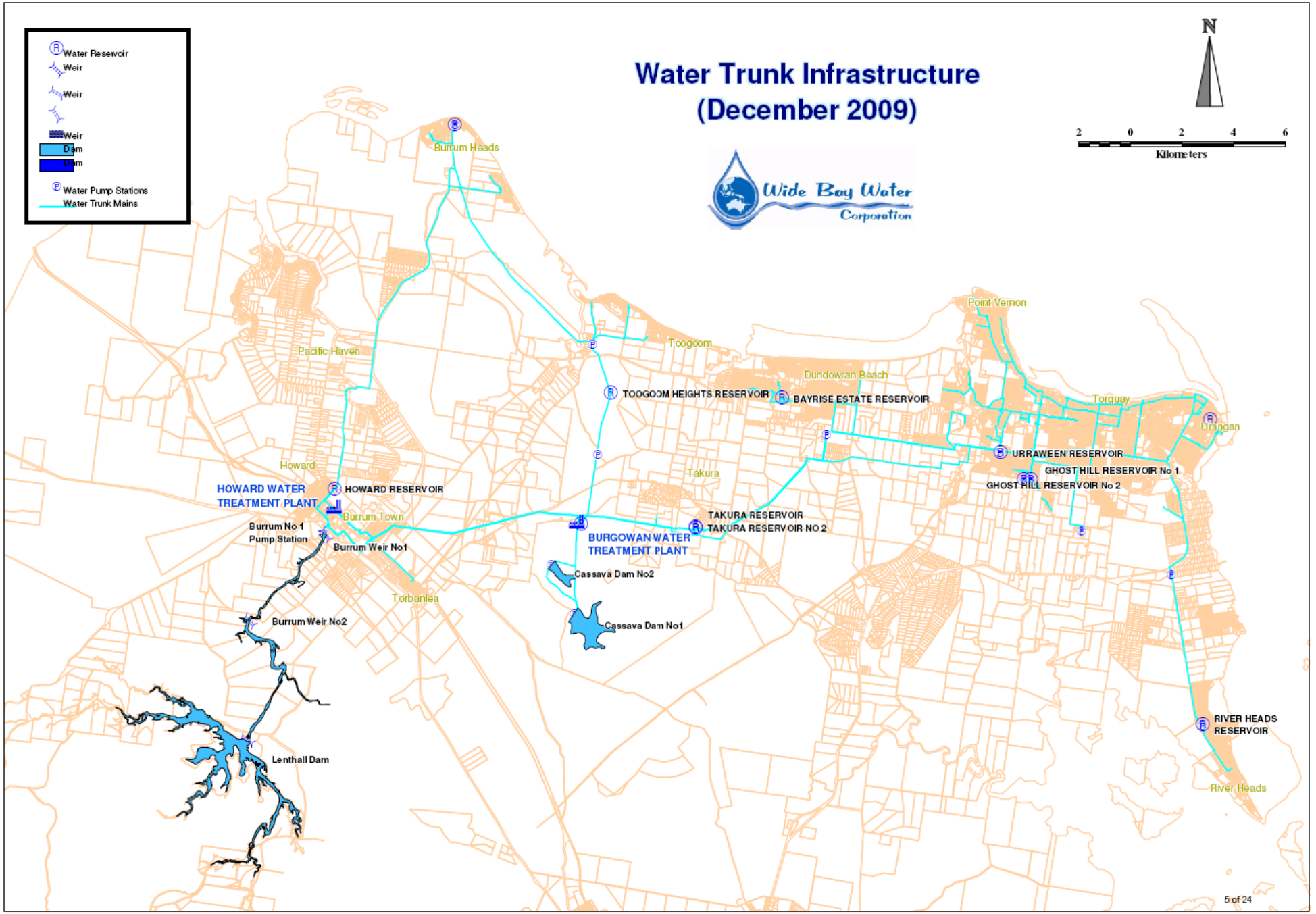
WBWC's existing raw water supply is based on the Burrum River where three storages have been constructed (ie. Burrum No 1 and Burrum No 2 Weirs and Lenthall's Dam), and two relatively small dams near the Burgowan WTP (Cassava 1 and Cassava 2).

Water from the Burrum River system supplies both Howard and Burgowan WTPs while the Cassava Dams can supplement supply to Burgowan WTP. A new 600 mm raw water main and pumping station were completed in the latter part of the year 2009 to supplement the existing 375mm main that was constructed in 2000. These mains supply raw water to either the Burgowan WTP's or the Cassava Dams from the Burrum River.

Most of the treated water from the Howard WTP and the two Burgowan WTP's is transferred to the Takura reservoir system, which includes Takura No.1 (1ML) and Takura No.2 (9ML). From Takura, water gravitates to the 32ML Urraween reservoir and from there it is pumped up to the Ghost Hill reservoirs. Hervey Bay City and River Heads are supplied from the Ghost Hill No.2 reservoir. The water distribution network also supplies the townships of Howard, Torbanlea, Toogoom, Burrum Heads and Dundowran.

To monitor the flow of water throughout the reticulation network, Wide Bay Water has established 15 separate water demand areas. Each of these demand areas are supplied via a single distribution main that is metered constantly. The water demand area metering system is one part of Wide Bay Water's extensive leak detection program. It aims to identify areas with high night time flows which can indicate leaks in the water infrastructure.

The identification of zones with leakage problems enables the Corporation to allocate capital and resources more efficiently and effectively. These demand management areas are also used for pressure management of the distribution network.


Water Trunk Infrastructure
(December 2009)
Wide Bay Water Corporation
N
2 0 2 4 6
Kilometers
Water Reservoir
Weir
Weir
Weir
Dam
Dam
Water Pump Stations
Water Trunk Mains
Burrum Heads
Pacific Haven
Howard
HOWARD WATER TREATMENT PLANT
HOWARD RESERVOIR
Burrum Town
Burrum No 1 Pump Station
Burrum Weir No1
Torbanlea
Burrum Weir No2
Lenthall Dam
Toogoom
TOOGOOM HEIGHTS RESERVOIR
Takura
BURGOWAN WATER TREATMENT PLANT
TAKURA RESERVOIR
TAKURA RESERVOIR NO 2
Cassava Dam No2
Cassava Dam No1
Dundowran Beach
BAYRISE ESTATE RESERVOIR
Point Vernon
Torquay
Urangan
URRAWEEN RESERVOIR
GHOST HILL RESERVOIR No 1
GHOST HILL RESERVOIR No 2
RIVER HEADS RESERVOIR
River Heads
5 of 24

3.2 Bulk Supply System Performance

The bulk supply system consists of the following assets:

1. Howard WTP, clear water storage and pumping station;
2. Burgowan WTP's (2 No.), clear water storage and pumping station;
3. Bulk treated water delivery mains (DN 300mm (currently decommissioned due to repeated failures) and DN 450mm), from Howard to the Takura reservoirs;
4. Bulk treated water delivery main (DN 600mm and DN 500mm) from Burgowan to Takura and Urraween reservoirs;
5. Takura Reservoir No. 1 and No. 2 – volume of 1.0 ML and 9.0 ML respectively;
6. Bulk treated water delivery main (450 and 500mm) from Takura Reservoir to Urraween Reservoir;
7. Urraween Reservoir – volume of 32 ML
8. Urraween Pumping Station; and
9. Bulk treated water delivery mains (500mm and 450mm) from Urraween Reservoir to Ghost Hill reservoirs.

Water for the Hervey Bay system is treated at either the Howard or Burgowan WTPs. The Howard WTP is the original treated water plant for Hervey Bay and is capable of delivering around 250 L/s for a 20 hour period or approximately 18 ML per day. There is a 2 ML clear water storage at the WTP site from which water is pumped to the townships of Burrum Heads, Toogoom and Torbanlea, and to the Takura reservoirs. The bulk delivery main to the Takura reservoirs from Howard is the 450 mm diameter water main. The 300 mm diameter main has reached the end of its working life and has been decommissioned.

The original Burgowan WTP was constructed in 1993 to increase the treated water capacity of the Hervey Bay system. The plant's capacity is approximately 125 L/s over a 20 hour period or approximately 9.5 – 10 ML per day. The second Burgowan WTP was constructed in 2005 and has a treated water capacity of 20 Ml/d and utilises an advanced treatment process to enable treatment of raw water from a number of different sources. There is a 25 ML clear water storage at the WTP site from which water is pumped to both the Takura and Urraween reservoirs via a 600mm/500mm diameter trunk main.

3.3 Distribution System

In this report, the distribution system has been defined as that infrastructure that delivers water from the bulk supply assets to the individual water districts. These mains are typically required to deliver the maximum hour demands throughout the system. However, in some cases they also provide flow to the various service reservoirs located within a number of the water districts (eg. Howard, Toogoom Heights, Bayrise Estate and River Heads reservoirs).

Currently, the Urraween pumping station and Ghost Hill No. 1 and No. 2 reservoirs service the Hervey Bay communities of Point Vernon, Pialba, Scarness, Torquay and Urangan. The Urraween pumping station pumps directly to the Ghost Hill reservoirs via an existing 500 mm diameter water main. A pump station was constructed adjacent to the Ghost Hill No.2 reservoir to supply to a high level zone at the top of Ghost Hill. From Ghost Hill water gravitates to Point Vernon and Pialba via the existing 450 mm and 375 mm diameter distribution mains, while Scarness, Torquay and Urangan are serviced via the 600 mm, 450 mm and 300 mm distribution mains.

River Heads is also supplied from these distribution mains in Boundary Road. However, to ensure standards of service are satisfied during peak demand periods, the pressure is boosted by the Booral booster pump station. Wide Bay Water has developed a high level and low level distribution network at River Heads to reduce the maximum hour loading on the 150 mm diameter main which services the area, to reduce pressure to the low lying areas and to utilise the 1.0 ML River Heads reservoir and pumping station which is currently not in use.

The Takura reservoirs service the districts of Dundowran, Bayrise and Craignish via 375 mm and 250 mm diameter distribution mains. The Dundowran pumping station and Bayrise Estate reservoir are utilised to provide high and low level pressure systems for the area and to provide better utilisation of existing infrastructure.

The Howard WTP pumps water to the Takura reservoirs which supplies water by gravity to the Burrum Heads community via a 300mm/150 mm diameter distribution main. The 150 mm diameter supply mains to Burrum Heads from the Toogoom system has also been closed at Beelbi Creek but is available to provide an emergency supply if required.

The Howard WTP also provides water to the Toogoom community. Water is pumped from Howard to the Toogoom Heights reservoir. Water can also gravitate from the Takura reservoirs to the Toogoom Heights reservoir. In recent years, during peak demand periods and when the Howard pumping station is not operating, the Toogoom Bush pumping station has had to be used to pump water into the Toogoom Heights reservoir. A 150 mm diameter distribution water main runs from the reservoir into the township. There is a booster pumping station on Toogoom Road however this pumping station is not currently in use. A pressure reducing valve located in Toogoom Road and after the supply main to Burrum Heads is used to set the hydraulic grade for Toogoom at 55 m AHD as most of the land within the district has an elevation of RL 5.0 m AHD (approximately).

3.4 Reticulation Network

The network's reticulation system comprises 100 mm, 150 mm and 200 mm diameter water mains to which the majority of service connections are made. These mains are required to provide both maximum hour demands and fire fighting flows.

The majority of the Hervey Bay Water supply system has network mains able to meet all design parameters. However, there is an area in the south west of the township of Howard where pressures fall below 20 metres under maximum hour demands. There are also some problem areas in Toogoom due to the coastal strip development and long single feed mains (up to 2.5 km) which service residential customers. These single feed mains have high headlosses and are of concern in terms of maintaining security of supply.

The more elevated areas at Ghost Hill, Craignish, Dundowran and East Booral are serviced by booster pumps and this supply methodology will need to continue due to their elevation relative to the storages.

The adoption of the water demand districts strategy within the main Hervey Bay township has resulted in substantial reduction of unaccounted water within the system. However it has resulted in a number of dead end mains with supply from only one direction at the district boundaries. While it would appear consideration has been given to maintaining looped mains within the boundaries of the water districts, the reality is that these dead end mains are difficult to avoid. They can lead to poor water quality and in some cases may limit the ability of the reticulation system to meet the adopted standards of service (refer Section 2.1) with respect to residual pressure during peak demand periods and the provision of fire flows. The affect of the district boundaries on the ability of the reticulation system to provide the adopted levels of service has been examined as part of this investigation. The current water district design strategy has addressed the majority of these issues and now uses multiple metered inlet mains and modulated pressure reduction valves to overcome any perceived water quality problems.

4.0 POPULATION PROJECTIONS AND WATER DEMAND

4.1 Existing ED Demand

Wide Bay Water has carried out a number of consumption analyses based on the significant amount of data gathered by the water district meters and from individual service meters. The rate per service is defined as litres/Equivalent Dwelling/day (l/ED/d). The rate adopted was 590l/ED/day which is considered to be an appropriate demand for future planning purposes in Hervey Bay.

4.2 Future ED Demand

The estimated consumption for future demand remains at 590l/ED/day. Demands will change with changing population and development density. Within the next 20 years the Planning Scheme for Hervey Bay provides for Urangan, Pialba, Scarness and Torquay to evolve into High and Medium Density development areas due to the proximity of facilities and beach access. In addition to infill development, the Scheme also provides for significant Low Density residential development to occur in the Doolong Flats area and from Mariners Cove to Ansons Road at Dundowran. The industrial areas in Pialba, Lower Mountain Road and the Airport Industrial Estate will also develop steadily to meet the increasing demand from residential growth and major commercial nodes are planned to develop at Pialba, Torquay, Scarness and Urangan.

Total ED projections for each of the 5 year design horizons from the year 2006 to the year 2031 are detailed in Table 4.1 below. Estimated daily requirements using this demand horizon enables comparison with previous strategy documentation.

TABLE 4.1: Design Equivalent Dwelling Projections

Year	Total Residential Population ED	Total Non-Residential Population ED	Total Population ED
2006	22721	6854	29575
2011	26774	7614	34388
2016	31305	8372	39677
2021	36303	9217	45520
2026	41376	10023	51399
2031 (ULT)	44220	13920	58140

TABLE 4.2: Estimated Daily Water Requirements

Year	Average Day (ML/D)	Mean Day Maximum Month (ML/D)	Peak Day (ML/D)
2006	17.5	22.7	27.9
2011	20.3	26.4	32.5
2016	23.4	30.4	37.5
2021	26.9	34.9	43.0
2026	30.3	39.4	49.0
2031 (ULT)	34.3	44.6	54.9

4.3 Demand Allocation

Demand allocation is dependent on the number of equivalent dwellings (ED's) either existing or permitted under the planning scheme on a particular site. Over the twenty year strategy the amount of residential and non-residential development will increase. PIFU has forecast that the occupancy rate for residential areas will decrease from 2.5 to 2.3 persons per ED and this has been built into the population model. However, despite occupancy numbers

decreasing, the Burnett Regional Strategy has forecast that the demand per person (l/person/day) will increase due to higher living standards and a higher incidence of the use of dishwashers and swimming pools. For these reasons demand has been forecast to maintain 590 L/ED/day throughout the planning period.

4.4 Demand Types

The demand types have been simplified into two groups. They are residential and non-residential. Residential Demand encompasses all residential development including low, medium and high density residential development. Non-residential development includes commercial, industrial, educational, sporting and recreational and health related premises. The relative percentage of each demand type within each Demand Management Area varies throughout Hervey Bay. Areas that have a high percentage of residential demand include Point Vernon, Eli Waters, Urraween, Wondunna and Kawungan, whereas Scarness, Pialba, Torquay and Urangan have significant amounts of both residential and non-residential demand.

4.5 Peaking Factors

The peaking factors adopted for the average day, mean day maximum month, maximum day and peak hour hydraulic analyses were applied in the modelling process.

Average Day Demand is equal to the total consumption recorded for the year divided by the number of days in the year.

Average Day (AD) = 590 L/ED/D x No. of ED's

Peak Day Demand is the demand expected to occur one day (usually in summer) every year. It is relevant to the Hervey Bay Water Service area and reflects data recorded through water meter readings/SCADA monitoring system as a ratio to Average Day (AD). It is calculated by multiplying Average Day by 1.6.

Peak Day (PD) = Average Day x 1.6 (Peaking Factor)

Mean Day Maximum Month Demand is the average demand expected to be experienced over the maximum month of the year. Mean day maximum month for domestic connections is calculated by multiplying average day demand by 1.3. This ratio is representative of the Hervey Bay water consumption data.

Mean Day Maximum Month (MDMM) = Average Day x 1.3 (Peaking Factor)

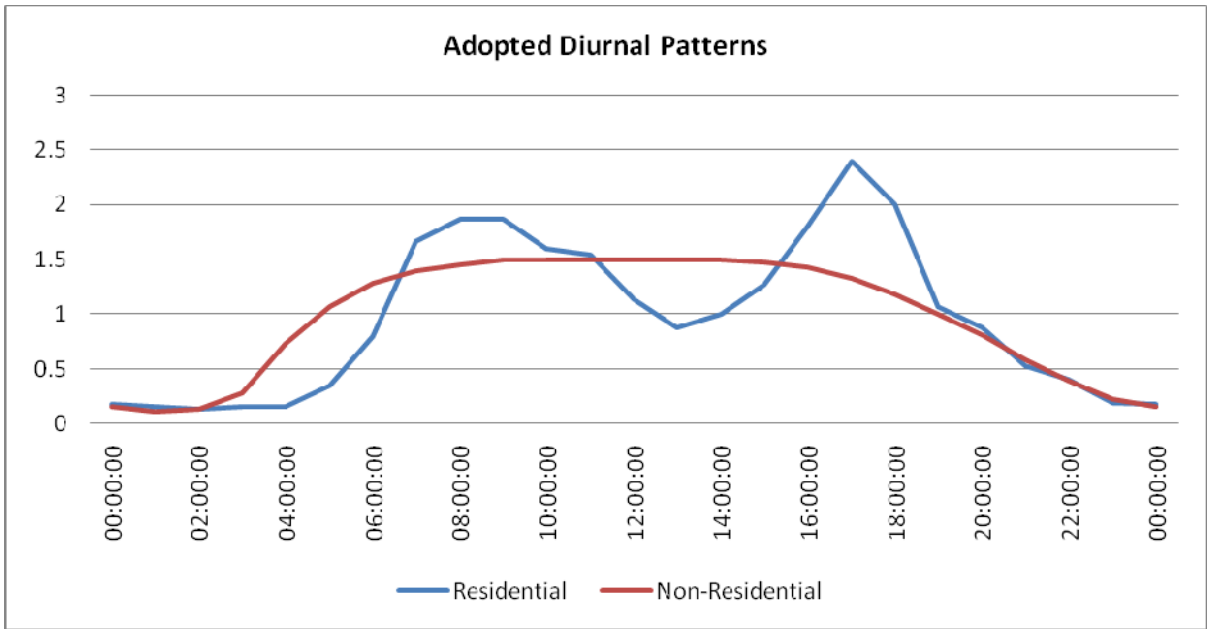
Peak Hour Demand is the peak rate of consumption in any hour of the day. It should be noted that for small numbers of dwellings (less than 100) the peak hour demand is likely to rise since there is less diversity of water usage. The maximum hour demand depends on the type of land use within a district.

Peak Hour (PH) = Peak Day x 2.25 (Residential Peaking Factor)
Peak Hour (PH) = Peak Day x 1.5 (Non Residential Peaking Factor)

4.6 Diurnal Profiles

Diurnal profiles take into account diurnal variations of demand for different land uses. The residential diurnal profile represents water usage by a dwelling over a 24 hour period. The second profile denotes usage by non-residential properties. In the model, the profiles apply diurnal factors on an hourly basis to establish a snapshot of the flow rate at any given time. The diurnal curves adopted for the investigation are illustrated in Figure 4.1 below.

Figure 4.1: Diurnal Curves



The peaking factors for Peak Day and Mean Day Maximum Month were applied to these curves using the number of ED's to estimate demand for each scenario in the model for Hervey Bay. Based on the estimated design horizon populations and the demand criteria detailed above, the average day, mean day maximum month and maximum day demands have been plotted and compared at each 5-year time interval. Figures 4.2, 4.3 and 4.4 below represent total demand as they include both residential and non-residential components.

Figure 4.2: Average Day Demand

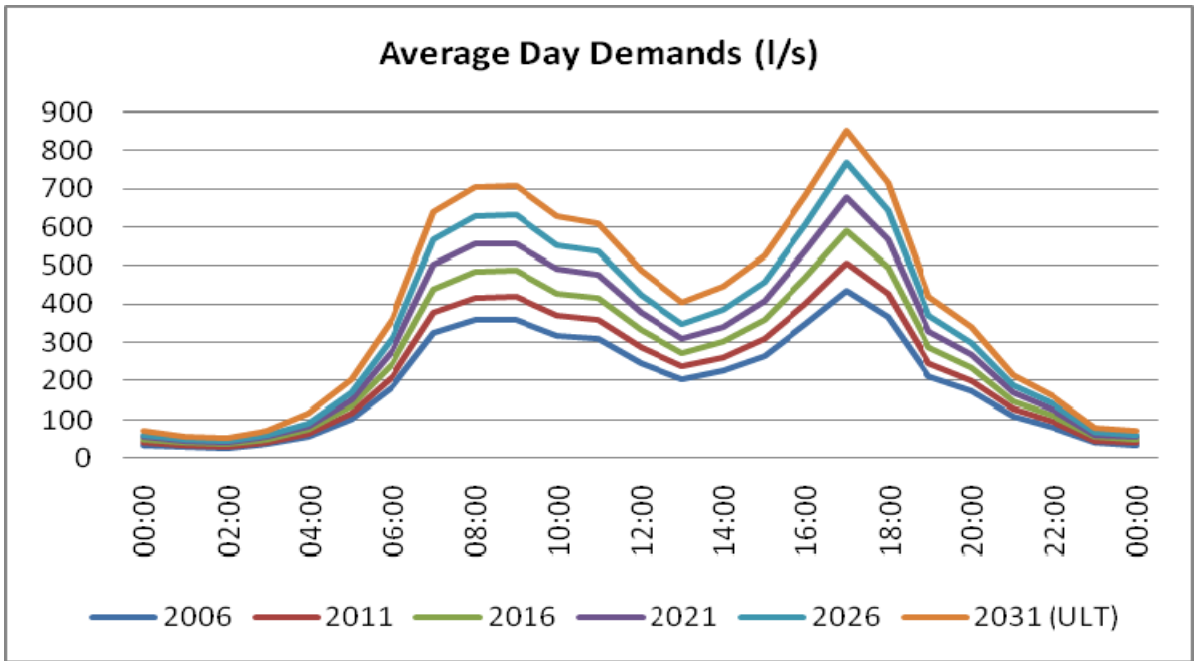


Figure 4.3: MDMM Demand

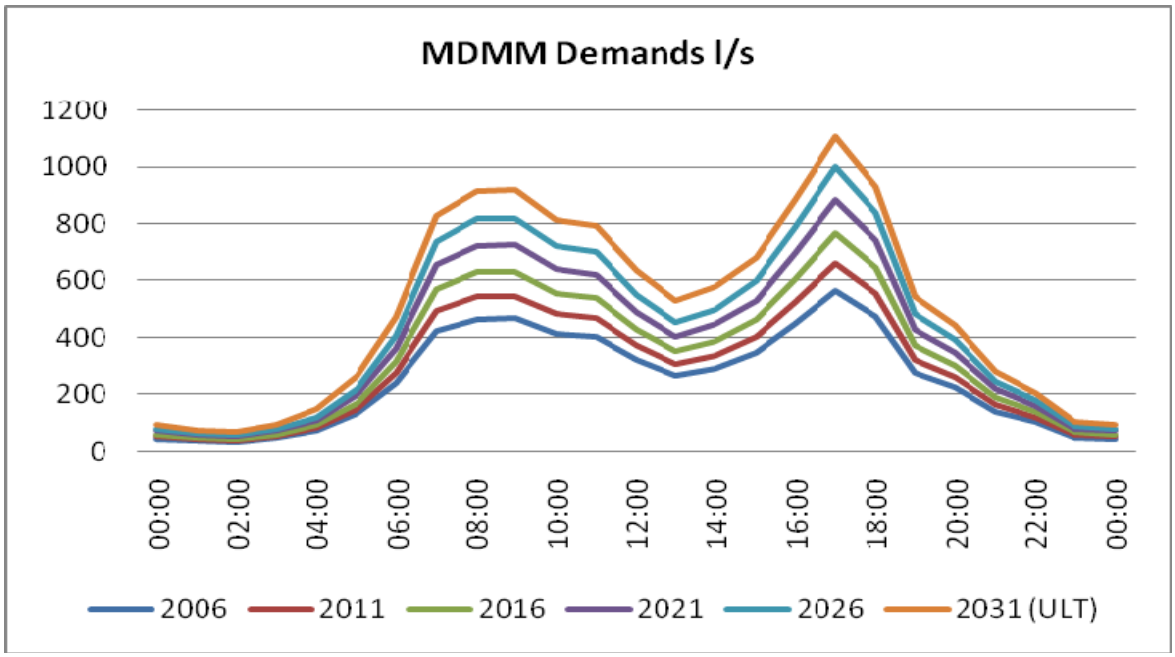
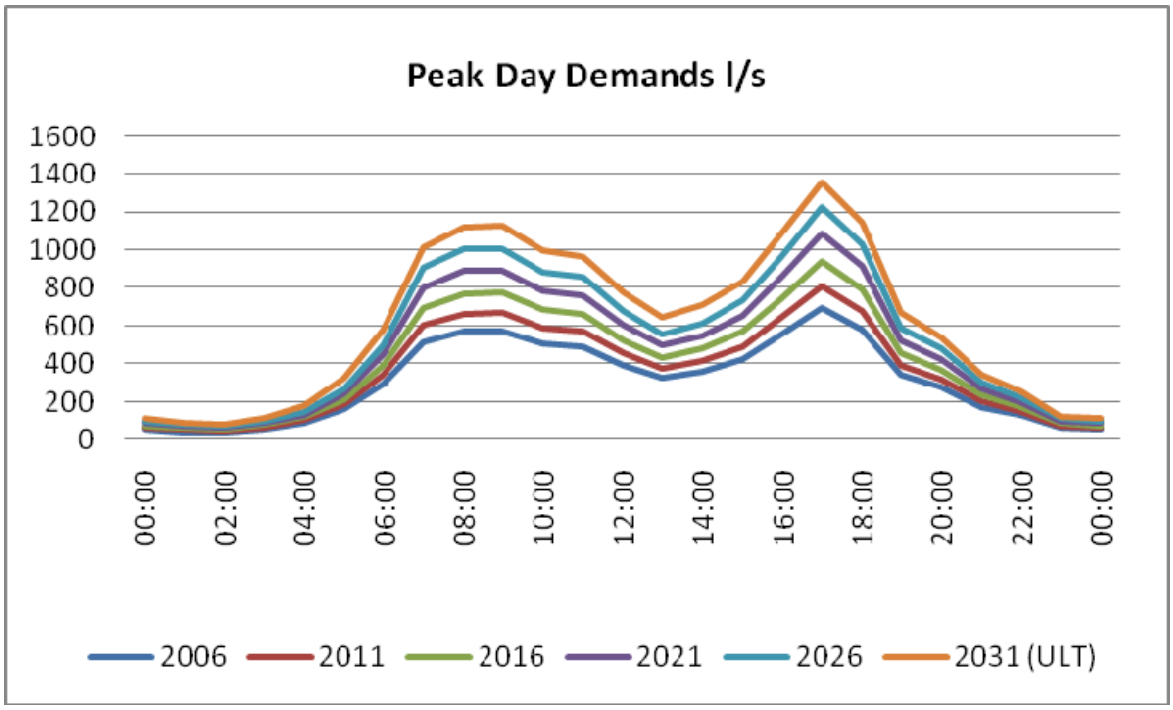


Figure 4.4: Peak Day Demand



5.0 RAW WATER SOURCE

5.1 Lenthall Dam

Lenthall Dam was constructed in 1983 to augment the Burrum River catchment and provide water supplies to the Hervey Bay area. A further 2.0m raising (to RL 26.0m) was completed in 2007 and provided for approximately 27,900 Ml of commandable storage plus an additional 3,084 Ml in Burrum No.1 and No.2.

The approvals process to raise Lenthall's by 2.0m took close to 10 years and resulted in almost doubling the storage capacity of the reservoir. When HBCC made the decision to raise the dam in 1996, the intention was to raise the water level by 6.0m, but this was subsequently reduced to 2.0m to address community concerns with the environmental impacts of the larger raising.

As part of the 2.0m raising, WBWC purchased all private properties to RL 30.0m on the idea that there may be the potential to further raise the dam by up to 4.0m. The 2.0m raising was accomplished by utilisation of the Crest gate system that was developed in South Africa with the gates designed to be raised by an additional 2.0m (to RL 28.0m) with minor modifications to the gates and support structure.

To enable raising Lenthall's Dam to RL 26.0m, the Corporation was required to obtain a Resource Operations Licence from the State Government. This license was developed in conjunction with the Mary Basin Water Resource Plan and details operating conditions and water allocation for the Burrum system. The licence provides for a 14,425 ML/annum allocation including 405 ML/annum for irrigators.

The remaining 14,020 Ml/annum after irrigators equates to 38.4 ML/ day, more than double the 2009 water consumption in the Hervey Bay area.

To raise the existing dam water level above RL 26.0m will entail an extremely detailed analysis of the yield of the Burrum system along with the associated environmental and social impacts of a further raising.

Initial estimates of yield indicate that the existing 14,020 ML/annum would increase to around 20,000 ML/annum with 100% security and the dam water level at RL 30.0m.

Risk of Failure and Environmental Flows

In order to develop a source strategy, it is necessary to make a decision as to what risk of failure will be acceptable as well as suitable environmental flow allowances associated with any dam raising. The existing Resource Operations License details environmental flows from Lenthall dam to be maintained within the Burrum River. These flows mainly relate to fishway flows for six months of the year, and the first post winter flood to provide a simulated flush in the river. The Corporation has a requirement from the DPI to construct a fishway on the Burrum River at the Burrum No.1 weir, but this has not happened to date and there is some concern regarding the effectiveness of such a facility.

The planning for the source strategy for Hervey Bay area has traditionally been based on a 1% monthly failure risk case or 99% monthly reliability. This level of reliability is often adopted for water supply storages in Queensland, particularly if a Drought Management Strategy is included in the reservoir operating rules. However, as part of the development of the Interim Resource Operations License (IROL), WBWC was required to identify a 100% reliability which was achieved by incorporation of a Drought Management Strategy for the supply.

To raise the dam water level above RL 26.0m, WBWC will be required to review the existing yield analysis and meet the environmental flow conditions identified within the Water Resource Plan, both of which will be difficult to achieve. It should also be noted that the Wide Bay Burnett Regional Water Supply Strategy makes no provision for additional water to be sourced from the Burrum system.

Social and Cultural Impacts

One of the reasons behind the decision to raise Lenthall's Dam by 2.0m rather than 6.0m was the impact to culturally sensitive areas such as the Wongi Waterholes. To raise the dam water level beyond the existing level will inundate the waterholes and create conflict with the local indigenous community and environmental groups.

The development of a Cultural Heritage Management Plan would identify how these impacts could be mitigated, but community resentment to these impacts could be high.

Development Impacts

The raising of Lenthall's Dam beyond the existing RL26.0m can be undertaken in a number of different ways:

1. An additional 2.0m by modification to the existing Crest Gates (49,000 ML Storage Volume). Gates will not be able to drop to top of existing spillway crest.
2. An additional 4.0m by raising the existing crest by 2.0m and installation of 2.0m Crest Gates (81,000 ML Storage Volume)

All options will require the raising of the existing dam embankment to provide the required flood security as identified in the ANCOLD Guidelines and required by the Queensland Dam Safety Regulator. Previous reports undertaken by GHD have indicated that the intake tower and dam embankment would need to be raised to 39.0m to cater for a RL 30.0m storage volume, this is approximately 5.5m above the existing embankment level. This issue would require consideration with the Dam Safety Regulator as dam security requirements are changing on a regular basis and any design will need to undertaken to meet the appropriate requirements at that time.

The following table identifies the projected costs for a further raising of Lenthall's Dam:

Item	**Raising to RL 28.0m**	**Raising to RL 30.0m – Crest and Gates**
Raise Existing Crest		$9.5m
Raise Embankment and Intake Tower	$5.5m	$12.0m
Modify Gates & Replace	$9.0m	$7.5m
Upstream Impacts	$7.5m	$7.5m
TOTAL	**$22.0m**	**$36.0m**

Note: These costs do not include GST or construction of a second treatment module at Burgowan.

5.2 Mary River

The Mary River has for many years been the preferred option for additional raw water source for the expanding Hervey Bay area. Reports undertaken by SKP in 1990 and JWP in 1994 identified the Mary River as the preferred source of water for HBCC following the raising of Lenthall's Dam. A further report was undertaken for WBWC by JWP in 2001 to review source options which included a detailed analysis of the options of taking water from the Mary River. The following recommendations were tabled in the 2001 report:

It is recommended that Wide Bay Water:-

1. Notes that previous planning and Council resolutions have adopted a 2 m raising of Lenthalls Dam to be the preferred short-term augmentation of the water supply source and adopts Alternative 2 (Mary River Transfer Scheme) of this report as the preferred long-term augmentation of the water supply source, following the 2 m raising of Lenthalls Dam. The Mary River Transfer Scheme will nominally be required by the year 2022/23.

2. Adopts Option 2A (Transfer/Treat at Burgowan Water Treatment Plant) of this report as the preferred strategy to apply to the treatment and transfer infrastructure components of the water supply system.

3. Develops operating rules to apply to the extraction of water from the Cassava Dam source.

4. Adopts the works program given in Appendix A of this report, which integrates the preferred source and treatment/transfer strategies, at approximate capital expenditure of $38M over a 50 year period.

5. When developing overall infrastructure charges, adopts an infrastructure charge of $1917 per equivalent tenement to apply for the source, treatment and transfer infrastructure components of the water supply system.

6. Adopts this report and forwards it on to the DNRM for approval as a planning report.

In May 2002, the State Government commenced development of the Water Resource (Mary Basin) Plan. This plan incorporated the Burrum River catchment and the entire Mary River system. The Draft Water Resource Plan (WRP) was produced in November 2005 and the final plan adopted by Government in July 2006. To implement the WRP, the State Government needs to adopt a Resource Operations Plan (ROP). Initially the intention was for the ROP to be adopted within 18 months of completion of the WRP, but this has not happened and the State Government cannot provide a definitive date for completion due to the time frame in obtaining approvals for construction of the Traveston Crossing Dam.

The Draft and final WRP identified: *'To support the rapid population growth expected in South East Queensland and the Wide Bay area, the draft plan provides for a 'strategic reserve' to be sourced from the Mary River to ensure that – …'*

With the State Governments decision to move forward with the Traveston Crossing Dam, the regulators have made an arbitrary decision to exclude the Wide Bay from utilisation of the 'strategic reserve' available in the Mary River (other than a small previously agreed supply to Maryborough) and allocate the entire reserve to SE Queensland.

In 2007, the State Government announced the development of a Wide Bay Burnett Regional Water Supply Strategy.

The following project Goal and Statement are taken from the project web site:

- **Project Goal**

'The goal of the project is to develop a regional strategy that provides a framework for meeting urban, industrial, mining and agricultural water demand in the Wide Bay Burnett region for the next 50 years. The strategy aims to achieve optimum social, economic, cultural and environmental outcomes.'

- **Project Statement**

The strategy is being developed in response to representations from agricultural, urban and industrial water user groups for a coordinated approach for assessing water resources and water supply options in the Wide Bay Burnett region.

The strategy will:

- examine current water demands for urban, industrial and agricultural purposes;
- estimate the additional water demand for anticipated regional growth;
- determine the capacity of existing water supply facilities to meet current and future water demands;
- recommend preferred water supply options to match demand while meeting social, economic, cultural and environmental benchmarks;
- identify demand management measures and improve water-use efficiency;
- examine alternatives for securing additional water supplies and/or secure sites to meet future water infrastructure needs, if available or required.

Completion of the strategy was anticipated to be in the second half of 2009, but to date only a draft document has been produced.

The Draft Wide Bay Burnett Regional Water Supply Strategy (WBBRWSS) makes no provision for water supply to Hervey Bay from the Mary River, but pushes supply north to the Burnett River. This was in contrast to the requests of WBWC for a supply to the Hervey Bay community from the Mary River as per all the Corporations previous reports.

Irrespective of the Water Resource Plan and WBBRWSS, a supply from the Mary River is still a very viable option for WBWC as an alternative raw water supply source for Hervey Bay.

Based upon the report previously tabled by JWP in 2001, the following are the anticipated costs for construction of a pipeline from the Mary River barrage to the Burgowan WTP:

Item	**Description**	**Cost**
Purchase Allocation	Purchase 8,000 Ml allocation @ $2,500/ Ml	$20,000,000
Intake	600mm intake and suction pipe	$ 950,000
Pump Station	250 l/s pump Station (21.6ML/day)	$ 2,100,000
Pipeline	450mm pipeline to Burgowan WTP (33 km)	$15,300,000
TOTAL		**$38,350,000**

Note: These costs do not include GST or construction of a second treatment module at Burgowan.
Therefore, the total development cost would be $38.4m or $4,800/ ML with an annual operating cost of $1.25m or $155/ Ml.

5.3 Burnett River

Raw water supplies from the Burnett River (Paradise Dam) have not been considered in any previous reports. The Paradise Dam was developed by the State Government and is operated by SunWater and when full holds approximately 300,000 Ml. Construction of the dam was completed in 2005 and makes available 124,000 ML of medium priority water and 20,000 ML of high priority water. The dam is situated approximately 20kms north-west of Biggenden and 80kms south-west of Bundaberg.

The Paradise Dam provides water to a number of irrigation schemes in the Burnett/ Bundaberg region including Childers. The existing infrastructure at Childers could provide raw water to the Corporations treatment plant at Howard via a 31 km pipeline. Due to demand for irrigation water from this system, water would only be available for 8 months of the year and then only 7,800 Ml (29.3 Ml/day) for that period. Provided raw water quality was high, the Howard WTP could treat up to 20 Ml/day and would need augmentation to treat the higher volume delivered from the Burnett system.

The State Governments Regional Water Supply Strategy (RWSS) identifies the Burnett supply as the preferred alternative supply to the Hervey Bay area. This is not consistent with the beliefs of WBWC and has come about as a result of the State Governments preference to reduce demand on the Mary River system and make more water available to SE Queensland from that system. As part of the development of the RWSS, the State made a determination that no water would be made available to Hervey Bay from the Mary River even though the previously developed Water Resource Plan identified a resource as being available.

Item	**Description**	**Cost**
Purchase Allocation	Purchase 7,800 Ml allocation @ $2,500/ Ml	$19,500,000
Pump Station	376 l/s pump Station (32.5ML/day)	$ 2,600,000
Pipeline	600 mm pipeline to Howard (31 km)	$20,780,000
Pipeline	600 mm pipeline Howard to Burgowan WTP (12 km)	$ 8,500,000
TOTAL		**$51,380,000**

Note: These costs do not include GST or construction of a second treatment module at Burgowan.

Due to the nature of this project, it would not be viable to stage construction as demand dictates as it would be necessary to construct all works at the same time.

Therefore, the total development cost would be $51.4m or $6,590/ ML with an annual operating cost of $1.87m or $240/ Ml.

5.4 Fraser Island

Fraser Island is situated off the south east coast of Queensland near the regional towns of Hervey Bay and Maryborough. The Island is approximately 125 km long and up to 25 km wide and covers an area of over 1600 square km. It is located entirely within the Fraser Coast Regional Council boundary and is the world's largest sand island. The Island is predominantly national park (>90%) with only a small portion being freehold land.

Fraser Island received additional environmental protection when it was covered under the *Wild Rivers Act 2005*. This wild river declaration for Fraser Island is known as the *Fraser Wild Rivers Declaration 2007* and commenced on the assent of the *Wild Rivers and Other Legislation Amendment Act 2007*. The *Wild Rivers Act 2005* provides a framework to preserve Queensland's wild rivers, which are in natural or near natural condition.

The entire Island is protected under this Act and is divided into 4 types of area:

1. High preservation area, located around the streams and lakes of Fraser Island
2. The preservation area, the majority of the remaining area
3. The sub artesian area, contained mainly in the preservation area
4. The designated urban area, the four communities of Orchid Beach, Happy Valley, Eurong and Kingfisher Bay Resort

During the public consultation process, to decide if Fraser Island should be declared a Wild River Area, Wide Bay Water Corporation (WBWC) made a submission (17/2/06) to the then Department of Natural Resources and Mines stating its objections. WBWC holds the view that Fraser Island does not require further regulation on water entitlements and its extraction and that restricting access to these water resources will potentially create greater harm to the environment by necessitating the construction of other water source infrastructure on the mainland such as dams.

WBWC has received local community and Indigenous (Butchulla) support for extraction of water in a controlled manner from Fraser Island. There has however, been strong support from the environmental groups particularly the Fraser Island Defenders Organisation (FIDO) for no further water extraction from the Island from any source.

This report looks at this new legislation and its effect on Councils ability to source bulk water supply for the residents of the Fraser Coast. This report includes a précis of the relevant parts from each policy, code or declaration that is empowered under the Wild Rivers Act 2005 and an example of a recent application to extract water from North Stradbroke Island.

Apart from the EPA entitlement of 50 ML per annum there are currently 19 licences issued for the extraction of groundwater (total 373 ML per annum) which is used mainly for commercial purposes, with a smaller amount for public supply.

Climate and Hydrology

Fraser Island is situated in a subtropical climatic zone. Rainfall is seasonal but predominantly falls between the months of December to April (Dept. of Environment and Heritage 2005). Mean annual rainfall is 1269 mm (Bureau of Meteorology 2004) but reaches 1800 mm on the higher dunes located in the centre of the Island (UNEP 2005). Typical daytime temperatures on the island range between 22° C to 29° C in the summer and 14° C to 21° C degrees in winter. Average humidity does not fluctuate markedly for seasonal variations, 68% in spring, and 73% in summer.

Estimated ground water reserves within the sands of Fraser Island are about 10 -20 million ML, of which almost 6 million ML are above sea level. A large volume of fresh water floats on top of the denser saline water within the sand.

Most stream flows in the Fraser Wild River Area are driven by the discharge from the dune aquifers underlying the Island with an estimated outflow from all streams at 325 ML per day. Smaller perched aquifers in the area also

discharge water which ultimately contributes to the base flow of these streams. The estimated average annual recharge of the aquifer system is about 150,000 ML per year (Dept of Environment and Heritage 2005).

Land forms and Geomorphology

The dominant land forms on Fraser Island are sand dune systems and wetlands. Bedrock under the dunes is about 30 – 60 m below sea level. In the centre of the wild river area, sand dunes are up to 240 m high which run most of the length of the Island. West of the high central dunes the topography grades to lower and gentler sloping sand hills.

Fraser Island's extremely diverse range of wetlands includes:

- A variety of lakes, including perch, barrage and window lakes
- Complex coastal wetlands, estuaries and coastal creeks
- Permanent and temporary freshwater swamps, including fens

The Island has approximately 100 lakes which are unusual because of their number, size, elevation and depth.

Streams of the wild river area have their origins in the large sand dunes that dominate the area. Channels are low to moderately sinuous. Flooding is not significant across the dunes of the Island because of the permeable sands (Commission of Inquiry 1990a)

Vegetation

Only a relatively small area of vegetation has been cleared by logging from the Fraser Island Wild River Area. The area features a high diversity of relatively undisturbed plant communities including rain forest, eucalypt forest, wet and dry heath lands, melaleuca woodlands and callitris forest. Over 600 different plant species are found on the island, with 19 species of flora identified as rare, vulnerable or endangered (Fraser Island World Heritage Area Scientific Advisory Committee 2004).

Land Use

Nature conservation and recreation activities are the main land uses in the wild river area.
Fraser Island has been used for:

- As an Indigenous reserve (set aside in 1860)
- For selective logging of forests (late 1800s to 1991)
- For mining of mineral sands (1970 – 1975)

There are no commercial agricultural activities, aquaculture, or forestry operations on the Island today.
In 1992 the entire Island was declared a World Heritage Area and has been managed since then to conserve its natural features. The Great Sandy Strait has also been declared a "Ramsar Wetland" of international significance

Natural values

One of the most important values of a wild river declaration is to maintain the biophysical integrity of the area. It is expected that a wild river area will have a natural or near natural:

- Flow regime (limited taking of water and no dams or weirs)
- Geomorphic processes (natural movement of sediment through the streams)
- Riparian vegetation functioning (intact native vegetation, stable stream banks and a working link between the land and aquatic ecosystems)
- Water quality
- Wildlife corridors (ability for fauna to move freely between areas)

Together these values support biodiversity, diverse in stream habitats and healthy ecosystems. They also support scenic and cultural values and economic activities such as eco tourism and fishing.

Ramsar Convention

The Ramsar convention or *Convention on Wetlands of International Importance* provides the main direction for the sustainable management of wetlands. The agreement was signed in 1971 and included Australia and 17 other countries. The Ramsar convention aims to reduce global loss of wetlands and conserve and manage remaining wetlands.

Wetlands are defined as areas of permanent or periodic/intermittent inundation, whether natural or artificial with water that is static or flowing, fresh, brackish or salt, including areas of marine water, the depth of which at low tide does not exceed 6 m.

The Queensland Government has direct responsibility for the protection of wetlands shared with Local Government and Federal Government (for wetlands of international significance). Queensland sites listed under the Ramsar Convention include Bowling Green Bay, Moreton Bay, Shoalwater Bay, Currawinya Lakes, Corio Bay and **Great Sandy Strait.**

The main policy document that provides direction on how wetlands are to be managed in Queensland is the Strategy for the Conservation and Management of Queensland Wetlands.

The Wetlands Strategy has four objectives:

- *To avoid further loss or degradation of natural wetlands, **unless overriding public interest can be shown***
- *To ensure a comprehensive and adequate representation of wetlands in the conservation reserve system*
- *To base the management and use of natural wetlands on ecologically sustainable management and integrated catchment management practices*
- *To develop community awareness of, and respect for, the values and benefits of wetlands, and involvement in their management*

The Federal Government administers the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). This act protects the environment and in particular, matters of national environmental significance (ie. Ramsar – listed wetlands and threatened species and communities). The EPBC Act streamlines the national environmental assessment and approvals process, protects Australian biodiversity and integrates management of important natural and cultural places.

World Heritage Listing

Fraser Island was inscribed on the World Heritage List in December 1992 as a 'natural property' on the basis that the Island's values satisfy the second and third criteria for natural values significance. These are:

- *NC2 – outstanding examples representing significant on- going geological processes, biological evolution and man's interaction with his natural environment; and*
- *NC3 – contain superlative natural phenomena, formations or features*

The Fraser Island World Heritage Area Scientific Advisory Committee (FIWHASAC) recently reviewed the World Heritage Values using the revised criteria for natural properties. The committee found that:

"Extensive scientific information exists to support the assessment that Fraser Island demonstrates outstanding universal value within all four new natural criteria for World Heritage listing. Hence all these values and the attributes that define them should be afforded equal consideration in the management for their protection and presentation"

Commonwealth Legislation

The commonwealth legislation governing the management of World Heritage Areas is the *Environment Protection & Biodiversity Conservation Act 1999*. This act replaces the *World Heritage Properties Conservation Act 1983* and ensures up front protection and improved management for the world heritage values of Australia's World Heritage Properties.

Note:- Under the Act a person must not without approval under the Act, take an action that has or will have, or is likely to have, a significant impact on matters of national environmental significance including the heritage values of a declared World Heritage property. Such an action may attract a civil penalty of $5.5 million or a criminal penalty of seven (7) years imprisonment. An 'action' includes a project, development, undertaking or an activity or series of activities. A person proposing to take an action that the person thinks may be prohibited by the Act without approval must refer the action to the Commonwealth Minister for the Environment for a decision on whether or not the action needs an approval.

State legislation

Fraser Island is managed as a recreation area in accordance with the provisions of the *Recreation Areas Management Act 1988* (RAM Act). The WHA continues to be managed under the provisions of this act and provides for the setting apart of land and waters throughout Queensland as recreation areas and for the management of those activities. This act is administered by the Recreation Areas Management Authority which consists of the Minister charged with the administration of the *Nature Conservation Act 1992* and the *Forestry Act 1959*.

The main objective of the RAM Act is to "provide, coordinate, integrate and improve recreational planning, recreational facilities and recreational management on recreational areas, taking into account their conservation, recreation, education and production values and the interests of the proprietors". A characteristic of the RAM Act is that it facilitates management of recreation activities in areas under multiple types of tenure.

The RAM Act is under review to improve its effectiveness and bring it more in line with the *Nature Conservation Act 1992* and *Nature Conservation Regulation 1994* which applies to protected areas such as national parks. More than 98% of Fraser Island's 165,280 hectares is part of the larger Great Sandy National Park. The boundary of the 'Park' occurs at high water mark. The Ram Act facilitates control of activities that occur on the beach, as the Fraser island recreation area includes land to the low water mark.

The *Nature Conservation Act 1992* is based on principles to conserve biological diversity, ecologically sustainable use of wildlife, ecologically sustainable development and international criteria developed by the World Conservation Union for establishing and managing protected areas.

Local Government and Regional Statutory Controls

Local Government planning and development assessment and approval is undertaken in accordance with the *Environmental Protection Act 1994* (EP Act) and the *Integrated Planning Act 1997* (IPA). The two acts work together to protect the environment and manage the processes and impact of development.

The EP Act aims to protect Queensland's environment while allowing for Environmentally Sustainable Development (ESD). ESD principles are to improve quality of life, now and in the future, while maintaining ecological processes upon which life depends.

The IPA establishes a framework to co ordinate and integrate planning, and to manage development assessment at the local, regional and State levels so that its effect is managed in ecologically sustainable ways.

For Strategic Planning the *Great Sandy Region Management Plan (1994)* is the principle strategic planning document for natural and cultural resource management in the region.

Environmental Protection (Water) Policy 1997
Fraser Island Environmental Values and Water Quality Objectives
Basin No.139 EPA March 2006

This document is subordinate legislation under the *Environmental Protection Act 1994*. The EPP (Water) provides a framework for:

- Identifying environmental values for Queensland Waters, and deciding the water quality objectives to protect or enhance those environmental values; and
- Including the identified environmental values and water quality objectives under Schedule 1 of the EPP (Water)

This policy covers the following waters on Fraser island:-

1. Fresh, Coastal and Estuarine surface waters
2. Ground water, and
3. Wetlands

The extent of these waters is shown on plan WQ1391

A number of Environmental Values (EVs) have been set up to protect these waters, the one of interest for this study is "Suitability of Drinking Water Supplies" which is applicable to Fresh (non tidal) waters. EVs are supported by Water Quality Objectives (WQOs) which are long term goals for water quality management.

These are numerical concentration levels (ie. total phosphorous < 20 micrograms per litre) or narrative statements of indicators established for receiving waters to protect and support the EVs for those waters.

Where more than one EV applies to a category of water, adoption of the most stringent WQO applies. This Policy breaks the categories into Water type; the grouping of interest for this report is "Freshwater" which includes (Lowland, Upland, and Dams/Reservoirs), Wetlands and Ground water.

Wild Rivers Code
Natural Resources and Water February 2007

The natural values to be preserved through a wild river declaration are:

- Hydrological Processes (unimpeded runoff, stream flow, aquifer and spring recharge)
- Geomorphic processes (unimpaired movement of sediments along the river system resulting in stable beds, banks and sediment delivery to estuaries, floodplains and downstream reaches)
- Water quality (of sufficient physical, chemical and biological quality to meet human and ecological needs)
- Riparian function (intact riparian trees, shrubs and sedges to protect stream banks and to provide food and habitat for native animals), and
- Wildlife corridors (sufficient areas of natural habitat within and along the river system to allow the native fauna to migrate within their natural ranges)

Note:- Proposed development activities are assessed for their potential impact on these natural values.

Wild River requirements for certain developments and activities are applied through existing assessment processes under these Acts. Several parts of this code relate to assessments made under the IDAS set out in the IPA. This code must be read in conjunction with the relevant Wild River declaration. The code only applies to assessable and self assessable development and other activities for which there are Wild River requirements listed in the declaration. Each part of the code contains a 'purpose' and a series of required outcomes or performance criteria that a new development or activity must achieve for it to comply.

Note: some acts prohibit new development in certain areas (i.e. a HPA) and others impose additional assessment criteria or limits via a wild river declaration and this code.
In regards to our possible requirements regarding the extraction of water from either surface or ground water supplies Part 3 – Environmentally Relevant Activities (ERAs) has some significance.

Part 3 states: "*The purpose of this part of the code is to ensure that new ERAs (other than mining and petroleum activities) within a wild river area are located and carried out in a way that preserves the wild river's natural values".*

It further states that: "*Under the IPA, making a material change of use of premises for new ERAs (other than mining and petroleum) in a wild river area is assessable development."* Examples of ERAs include chemical storage, manufacturing plant and waste disposal.

High Preservation Areas

Most new ERAs are prohibited in a HPA. Section 73AA of the Environmental Protection Act deems an application for such development to be invalid. The assessment manager must refuse to receive the application. However, those ERAs that are assessable development and for which a development application can be made are:

- ERA 15 (sewage treatment) and **ERA 16 (municipal water treatment plant)**

Code Assessment

There is no reference to the size or capacity of this type of plant; however an application to construct such a plant would require the approval of the E P A as Assessment Agency.

When determining whether an application meets the required outcome, the assessment manager must take a precautionary approach, that is, not use the lack of full scientific certainty as a reason for not imposing requirements or conditions to minimise potential adverse affects on the natural values. **The onus lies with the applicant to demonstrate that a proposed development or activity meets the required outcomes of the code**.
Each part of the code contains a 'purpose' and a series of required outcomes or performance requirements a development or activity must meet. These outcomes are broadly linked to preserving one or more of the wild river natural values. An application must demonstrate how the intended development or activity will achieve the outcomes. In some cases the code specifies mandatory requirements.

An application that complies fully with the probable solution/s will satisfy the required outcome. If an application does not comply with the probable solution/s or if no probable solution has been provided, it must demonstrate how it will still meet the required outcome.

An application for development or activity to which this code applies **must comply** with this code and the assessing agency's decision must comply with the applicable code mentioned in the wild river declaration.

Fraser Wild River Declaration 2007
This wild river declaration for the Fraser Wild River Area may be cited as the *Fraser Wild River Declaration 2007* and commenced on assent of the *Wild Rivers and Other Legislation Amendment Act 2007 (February).*

Areas to which the declaration applies
Wild River Features

1. The wild rivers for the wild river area are:-

    - Wanggoolba Creek
    - Bogimabah Creek
    - Woonggang Creek
    - Tumbowah (Yankee jack) Creek
    - Eli Creek
    - Yidney Creek
    - Coongul Creek
    - Yeerall Creek
    - Gerrowea Creek
    - Bowarrady Creek
    - Boon Boon Creek
    - Dundonga Creek
    - Bennett Creek, and
    - Ungowa Creek

2. There are no major tributaries for the wild river area
3. The special features of the wild river area are:

    - The Fraser Island Lake System
    - Coastal Wetlands Complex, and
    - The Peat swamps of Moon Point, Towoi and Wathumba

These features have strong hydrologic connections to the river system and play a major role in maintaining the natural values. These features are shown in the map (Schedule 1) above, and further details are available from the Dept. of Environment & Resource Management (DERM).

Areas

The Wild river area contains the following areas;

(a) High Preservation Area (HPA)
(b) Preservation Area (PA)
(c) Sub artesian Management Area (SMA)
(d) Designated Urban Area (DUA)

The location of the boundaries of the wild river area is shown indicatively on the following map (Schedule 2). Detailed data in digital electronic form is held by the Departments (DERM) Spatial Information Resource which may be inspected at one of their offices.

There is no floodplain management area or nominated waterway in the wild river area.

Resource Extraction

Sections 7 – 10 of the declaration describe requirements that must be considered before allowing the extraction of certain natural resources from the wild river areas. These sections deal specifically with the allocation of resources rather than the actual physical taking of the resource which is regulated by Part 4.

Division 1 – Taking of Water

1. This division applies to the following water in the wild river area:

   (a) Water in a water course or lake, or water in a spring, and
   (b) sub artesian water

2. Total volume of water to be allocated:

   (a) This does not apply to authorisation to take sub artesian water for stock purposes
   (b) The total amount of the annual volumetric limit for all water entitlements to take water at any time must not exceed 720 mega litres
   (c) From the above, the amount of water that can be allocated any time for purposes other than eco-tourism and town water supply must not exceed 220 ML/year

3. Granting, reserving and dealing with unallocated water:

   (a) For this section, unallocated water is that volume of water mentioned in subsection 8(2) less the total volumetric amount of granted water entitlements at any time.
   (b) Under section 212 of the Water Act 2000, an authority to take unallocated water in the wild river area can only be granted –

      - Using the process in Schedule 3 (Water Act 2000); or
      - To the Environmental Protection Agency, following the commencement of this declaration, in accordance with Schedule 4, table 1

Regulating Activities

Sections 12 to 26 of the declaration describe the wild river matters that must be considered in deciding whether to allow the carrying out of an activity in the wild river area.

Division 1 - Carrying out water works
Taking or interfering with water in a watercourse, lake or spring

1. Section 62 (a) of the Water Regulation 2002 is an applicable code for the operational works that allows the taking of water from, or interfering with water in a watercourse or lake, or water in a spring that is self assessable development under the Integrated Planning Act 1997, schedule 8, part 2, table 4 item 1(a).

There is no applicable code for wild river matters for the operational works, not covered by the above, that is assessable development under the Integrated Planning Act 1997, schedule 8, part 1, table 4, and item 3(a)

Division 2 – In stream works and activities
Destroy vegetation, excavate or place fill in a water course, lake or spring

An application may be approved or refused under section 269 of the *Water Act 2000*; the CEO must consider Part 9 of the Wild Rivers Code as criteria under section 268 of the *Water Act 2000*.

Waterway Barriers

Part 8 of the Wild Rivers Code is applicable for operational works for the construction or raising of a waterway barrier and is assessable development under the *Integrated Planning Act 1997*, schedule 8, part 1, table 4, item 6.

Works in a declared fish habitat area

1. Part 4 of the Wild Rivers Code is applicable for an application to perform the following works in a fish habitat area:

    - Building work that is assessable development under the *Integrated Planning Act 1997*, schedule 8, part 1, table 1, item 2, and
    - Operational works that is assessable development under the *Integrated Planning Act 1997*, schedule 8, part 2, table 4, item 7.

2. There is no applicable code, for wild river matters for an application to perform the following works in a fish habitat area:

    - Building work that is self - assessable development under the *Integrated Planning Act 1997*, schedule 8, part 2, table 1, item 3, and
    - Operational works that is self - assessable development under the *Integrated Planning Act 1997*, schedule 8, part 2, table 4, item 3.

Division 4 – Other Activities
Native vegetation clearing

1. Part 12 of the Wild Rivers Code is applicable for an application for operational works to clear native vegetation and is assessable under the *Integrated Planning Act 199*7, schedule 8, part 1, table 1 items 1A to 1G;

2. For the above, the applicable setbacks and land slopes are listed in schedule 3 of the declaration.

Environmentally Relevant Activities (ERAs)

1. Assessable development, under the *Integrated Planning Act 1997*, in a wild river area is:

    (a) A material change of use of premises for an ERA (schedule 8, part1, table 2, item 1);
    (b) Various aspects of development for an ERA where a code of environmental compliance has been made under the *Environmental Protection Regulation 1998* (schedule 8, part 1, table 5, item 4).

2. For an application for the assessable development mentioned above (subsection 1) the applicable code is:

   (a) Part 10 of the Wild Rivers Code for ERAs, 19 and 20 for the purpose of riverine quarry material extraction;
   (b) Part 3 of the Wild Rivers Code for ERAs other than those mentioned in the above (a).

3. For the code mentioned above (subsection 2) the applicable setbacks and slopes are listed in schedule 3 of the declaration.

Schedule 4 – Releasing unallocated water
General Provisions

(a) This schedule sets out the process for releasing unallocated water in the wild river area.
(b) The method of release of unallocated water will be through:
    a. A tender as outlined in this schedule; or
    b. A fixed price as determined by the chief executive

(c) The results of a tender may be used to guide the chief executive in determining a fixed price and reassessment of the fixed price may be undertaken at their discretion.
(d) A tender or fixed price application will constitute a bid application for a water licence.
(e) There is no restriction on the volume of unallocated water that may be purchased by a single bidder.

Initiation of the process for making the water available

1. The process of releasing unallocated water will be initiated by an entity submitting an expression of interest on the approved form to the chief executive;

2. An expression of interest must be for a specific:

   - Volume of water
   - Purpose of use

3. Until an initial expression of interest is received the chief executive must not commence the release of unallocated water in the wild river area.
4. A tender process will be used for the first sale of water after the commencement of this declaration.
5. Following the first sale of water, whether a tender process or fixed price is used, the timing of these processes will be at the discretion of the chief executive.

Process to issue unallocated water

1. In addition to the requirements for tender specified in section 4 and fixed price allocations specified in section 6 of this schedule, the chief executive must consider whether the application is consistent with the purpose of the Wild Rivers Act 2005.
2. In assessing the application the chief executive must consider:

   (a) The impact that the proposed taking of water may have on the following natural values:

      i. Water quality
      ii. Movement of fish and other marine life
      iii. Natural movement of sediment

   (b) Maintaining stream flows to preserve the following:

      i. Longitudinal connectivity of low flow habitats throughout the river system
      ii. Natural seasonality of flows and zero flows
      iii. The replenishment of refuge pools that enable movement of instream biota
      iv. Contributions from aquifers to the flow of water in watercourses
      v. Lateral connectivity between the river and adjacent riverine environments, including flood plains

   (c) Contributions from aquifers to the flow of water in water courses and lakes

3. The above does not limit the matters that the chief executive may consider.

At the time of the publication of the Wild River Declaration 2007 the only agency granted water licence is the Environmental Protection Agency. This licence allows them to take 50 mega litres per annum for a period of 10 years from a water course or lake, water from a spring or sub- artesian aquifer within the Great Sandy National Park, Lot 21 on Plan NPW659 for the purpose of Eco- tourism. While this licence is current, the amount of **water allocation available is 670 mega litres per annum.**

The potential supply from Fraser Island was thoroughly investigated in the JWP 1994 strategy report. No further detailed investigation has been undertaken for the purposes of this study.

While the Fraser Island sand mass is undoubtedly a major freshwater resource (SKM, 1994), it does possess a number of characteristics which act to limit its viability:-

i. Extremely high environmental constraints (and likely social)
ii. Recent legislation (*Wild Rivers Act*) which prohibits water extraction in certain areas
iii. High initial capital cost requirements for any scheme
iv. Long lead time required for any pre -investigation work and to obtain approvals

The JWP 1994 strategy report considered the development of a water supply scheme for Fraser Island that was very similar to that developed on North Stradbroke Island for the then Redland Shire Council. That scheme provided for the extraction of up to 54.4 Ml/d from the Bogimbah Creek to Big Woody Island and then onto Urangan. Water would then be treated at a new treatment plant and then pumped to the Ghost Hill Reservoirs.

Estimated capital cost in 1994 was $34.5m which would equate to around $72.0m in 2009 dollar figures.

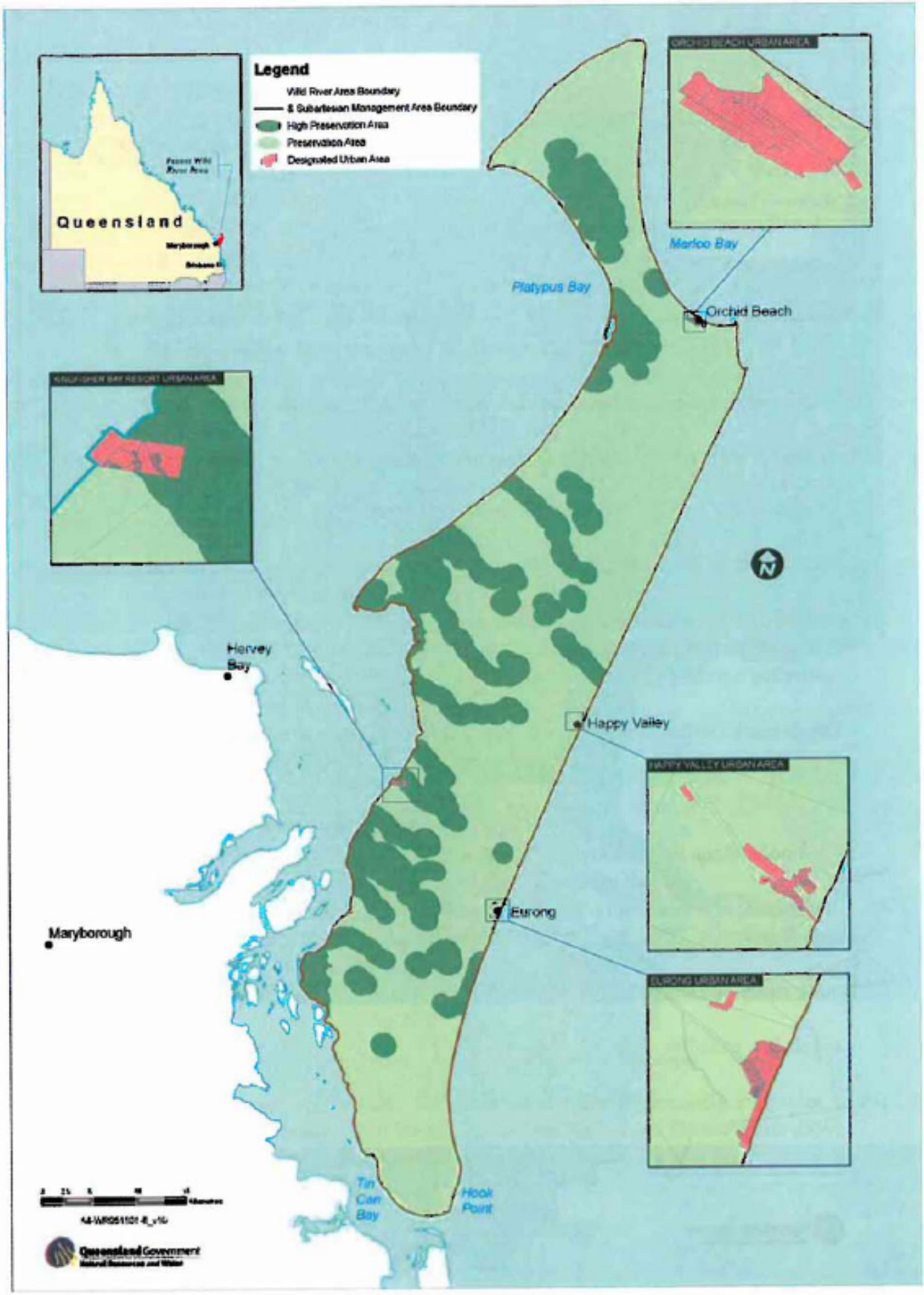
The JWP report focussed on extraction from the Bogimbah Creek as the primary supply, but since then WBWC has undertaken a review of groundwater supplies on Fraser Island to determine if alternatives are available. Data on existing bore sites on the island provided by the Department of Natural Resources indicates that groundwater levels are impacted very closely by rainfall in the area. All of the 14 sites reviewed by the Corporations Engineering Group indicate an abundance of water available with no long term reduction in supply and replenishment during periods of rainfall.

Subsequent to the above JWP report, the State Government has instigated the *Wild Rivers* legislation which provides severe restrictions on the development of community infrastructure on Fraser Island. The Corporation has previously taken this issue up with the government through the then local Member of Parliament to ensure that provision could still be made for development of a water supply on the island. Although this issue has not been pursued, the State government has repeatedly stressed that a source from Fraser Island was not an opportunity.

The recent Regional Water Supply Strategy made no provision for extraction from Fraser Island even though WBWC repeatedly asked for it to be included or, as a minimum, a detailed scientific evaluation be made to determine the source size and environmental impacts. Without a detailed investigation, no party can made an informative decision on the viability of Fraser Island as a raw water supply source for not only Hervey Bay, but also the region at large.

Schedule 1 – Wild river features

Schedule 2 –Areas



5.5 Groundwater

In 1997, GHD were engaged by Hervey Bay City Council to undertake a review of potential groundwater supplies to augment the existing potable water supplies to the region. The final report was produced in 1998 and concluded that 'any development of the groundwater resource by HBCC should be restricted to a maximum of 70 ML/yr to 270 Ml/yr.'

Further groundwater investigations were undertaken by the Engineering Consultancy Group in 2008 which included pumping of existing bores and evaluation of water quality.

As with the GHD investigation, there was little evidence to suggest that groundwater extraction was a viable option for expansion of the raw water supply source as potential yields were in the area of 0.5Ml/day at two separate sites investigated. Salinity levels were not as high as identified in the GHD report, but would still need to be addressed by additional treatment including provision for iron and manganese removal.

The GHD report of 1998 identified the cost of supplying treated water from a groundwater resource as being approximately four times the cost of supply from the Howard treatment plant.

No further evaluation has been undertaken for the benefit of this report.

5.6 Desalination

Desalination is the process of removing dissolved salts from saline or brackish water to make it fit for human consumption. Water desalination technology has been in use worldwide for decades and is rapidly advancing, in particular for potable water supplies. A number of desalination plants have been constructed in Australia in recent years with a number planned by various water service providers, predominantly in higher population areas such as Perth, Melbourne and SE Queensland.

There are two recognised desalination technologies utilised for potable supplies:

1. Thermal (evaporation)
2. Membrane filtration

Membrane filtration is the most common system utilised in Australia with membrane development and system operation improving at a rapid pace. Reverse Osmosis processes have recently been constructed in Queensland with the largest being on the Gold Coast (125 Ml/day) suppling the South East Queensland region.

WBWC Engineering Staff commenced a review of desalination options last year as a method of providing supply to our more remote communities (Burrum and River Heads) while reducing demand on our existing infrastructure. The following comments were provided in the review report:

Process:

Reverse Osmoses (RO) involves more than just a RO membrane, it requires feed water that is of very high quality so as not to deposit any particles or particulates within the membrane that would be impossible to remove at a later date. This involves passing the water through a very fine sand filter, or to achieve better water quality another membrane treatment system which will produce water of very high quality suitable for the RO plant. After the water has passed through the RO membrane the salt content will be reduced by 98 - 99% along with everything else leaving the water very pure but highly aggressive to pipes and fittings, not to mention humans. Bearing this in mind we need to add extra chemicals at the end of the process to provide additional alkalinity and some minerals to balance the water delivered to our customers.

Considerations:
Energy

Reverse Osmoses treatment plants traditionally use a large amount of power in order to reach the pressures required to remove the salts from the water. These costs are being reduced as the technology is improving. Currently costs are approximately $1.25 per m^3 of water produced. This break down encompasses, Power Cost = $ 0.82, Chemical Cost = $ 0.13, Membrane Replacement costs = $ 0.15, Maintenance costs = $ 0.15 (per m3 permeate).

Resource

Extraction would ideally be from a beach bore where the water is collected through the sand providing an initial barrier to particulates and organic material such as fish and weed. Further at low extraction rates there will be no risk of creating a depression in the water level as the recharge rates will greatly exceed the extraction rate. From initial consultation with the EPA with regard to the construction of a desalination plant, they have indicated that they will form a special team to decide on whether such a project is feasible from their point of view. Extraction of water from the waters around Hervey Bay and return of a concentrated brine may have some impact on the existing environmental conditions and indications are that DERM may be opposed to such a development.

Maintenance

An R.O. treatment plant does not require any more maintenance than a conventional plant; it has a far smaller footprint and has no issues associated with blowers and large mechanical works but it does have high pressure pumps and anti-scaling dosing facilities which ideally should not require any special maintenance. The design life of an R.O. plant is approximately 20 - 25 years, though the membranes (as with any membrane plant) will require replacement at 5-year intervals. The costs involved with maintenance have been integrated into the above costing numbers. All manufacturers offer a service contract with immediate response to ensure the integrity of the treatment systems. These contracts need to be negotiated during the contract period or at tendering.

Chemicals.

The following chemicals may be used in treatment processes in a desalination plant but their use will depend on trials and treatability studies.

Chemical	Issue	Measurement
Coagulant	Enhance flocculation in pretreatment filtration	Total Suspended Solids (TSS) Iron (mg/L)
Chlorine	Microbiological growth in pretreatment	Total Organic Carbon (TOC)
Sodium Metabisulfite	Remove chlorine prior to RO membranes	Total Chlorine – ppm Oxidation Reduction Potential (ORP) – mV
Antiscalant	Scale formation on membrane elements	Stiff-Davis Saturation Index (SDSI) Langelier Saturation Index (LSI)
Acid or Caustic	Feed pH – boron rejection, permeate pH	pH
Calcite Mineral	Product Water corrosion potential	Hardness (mg/L)

Cost

Reports developed by GHD in 2003 and by AWA in 2008 identify the cost of development and operation of seawater desalination plants. As with most water or wastewater treatment facilities, economies of scale come into effect as plants increase in size and development and operation costs go down. These reports identify the following as potential options for WBWC:

Option	Capacity (ML/d)	Capital Cost	Annual O&M Cost	O&M Cost per kL
Construct 2 x 1.0 Plants at Burrum and River Heads	2.0	$5.7m	$1.87m	$2.56
Construct 2 x 2.0 Plants at Burrum and River Heads	4.0	$10.2m	$2.53m	$1.73
Construct a single 20 ML/d Plant (Location to be determined)	20.0	$74.3m	$8.95m	$1.23

Notes:

- No additional treatment is needed at each site;
- The Burrum and River Heads plants can feed directly into the existing reticulation and supplement existing supplies;
- The 20 Ml/d plant will require a pipeline to existing reservoir storages;
- Potential sites include:
    - River Heads
    - Booral
    - Dundowran Beach
    - Burrum Heads

5.7 Indirect Potable Reuse

Recycled Water has been identified in the Regional Water Supply Strategy (RWSS) as a potential opportunity to reduce demand on potable water supplies in the event of an extreme drought. The RWSS defines Recycled Water as:

- Sewage or treated sewage
- Greywater, and
- Wastewater (Queensland Government 2008)

From July 2008, recycled water is regulated under the *Water Supply (Safety and Reliability) Act 2008.*
This act defines a regulatory framework for both recycled and drinking water in Queensland.

Recycled water is available in different quantities, reflecting source water and level of treatment. There are two broad categories defined under the Act:

1. Recycled water that is used for potable reuse (augmented drinking water supplies, also known as purified recycled water (PRW),
2. Recycled water for non potable reuse.

For the purpose of this report, we are dealing with treated recycled water through an IPR process to reduce demand on the existing potable supplies.

The recently constructed Nikenbah WWTP was designed to provide a high quality treated effluent and for that effluent to be piped to the Cassava Dams and then retreated to reduce demand on potable supplies from the Burrum River system. Additional State Government subsidies were forthcoming on that project for that purpose and it met State requirements current at that point in time.

Purified Recycled Water (PRW) is wastewater that has been treated to the highest standard through a seven-barrier process (*Water Supply (Safety and Reliability) Act 2008).*

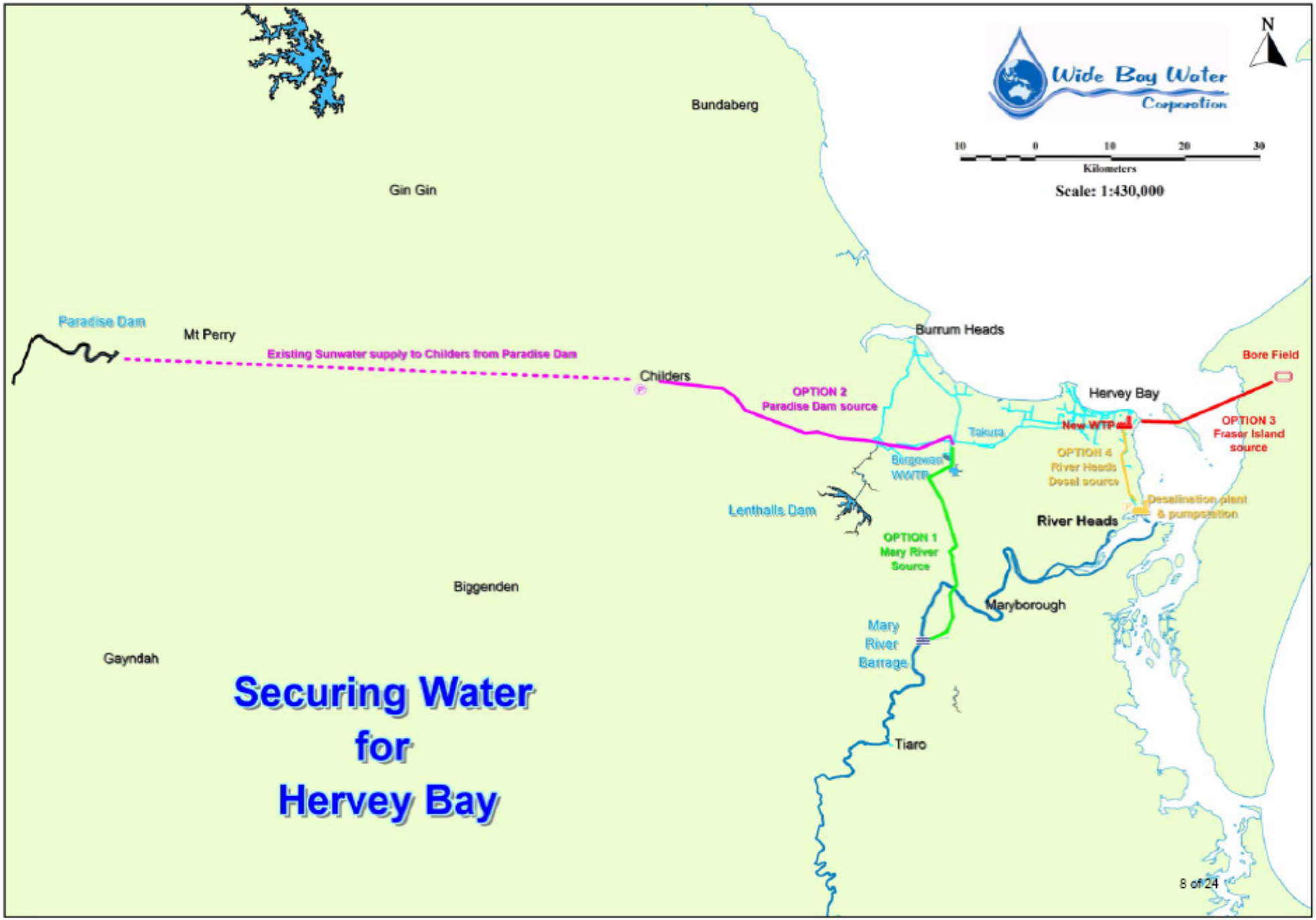
The seven barriers are:

1. Residential/ source control
2. Wastewater treatment plants
3. Microfiltration
4. Reverse osmosis
5. Advanced oxidation
6. Blending of water into a natural reservoir, such as a dam
7. Water treatment plant.

Once a transfer capability has been established from the Nikenbah WWTP to the Cassava dams, the only processes missing from the above seven are Reverse Osmosis and Advanced Oxidation (UV) as all others are covered within existing infrastructure at Nikenbah and Burgowan.

The existing Nikenbah WWTP has the capability of transferring up to 4.8 Ml/d of treated effluent to the Cassava Dams and thereby reducing demand on potable sources such as the Burrum River by a similar amount.

Public perception of such a scheme has not been determined although the Corporation has always been very clear in the potential use of treated effluent as a water supply source in the event of a major drought.


Wide Bay Water Corporation
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Gin Gin
Paradise Dam
Mt Perry
Existing Sunwater supply to Childers from Paradise Dam
Childers
OPTION 2
Paradise Dam source
Burrum Heads
Bore Field
Hervey Bay
Takura
New WTP
OPTION 3
Fraser Island
source
OPTION 4
River Heads
Dessal source
Burgowan
WWTP
Desalination plant
& pumpstation
Lenthalls Dam
River Heads
OPTION 1
Mary River
Source
Biggenden
Maryborough
Mary
River
Barrage
Gayndah
Tiaro
Securing Water
for
Hervey Bay
8 of 24

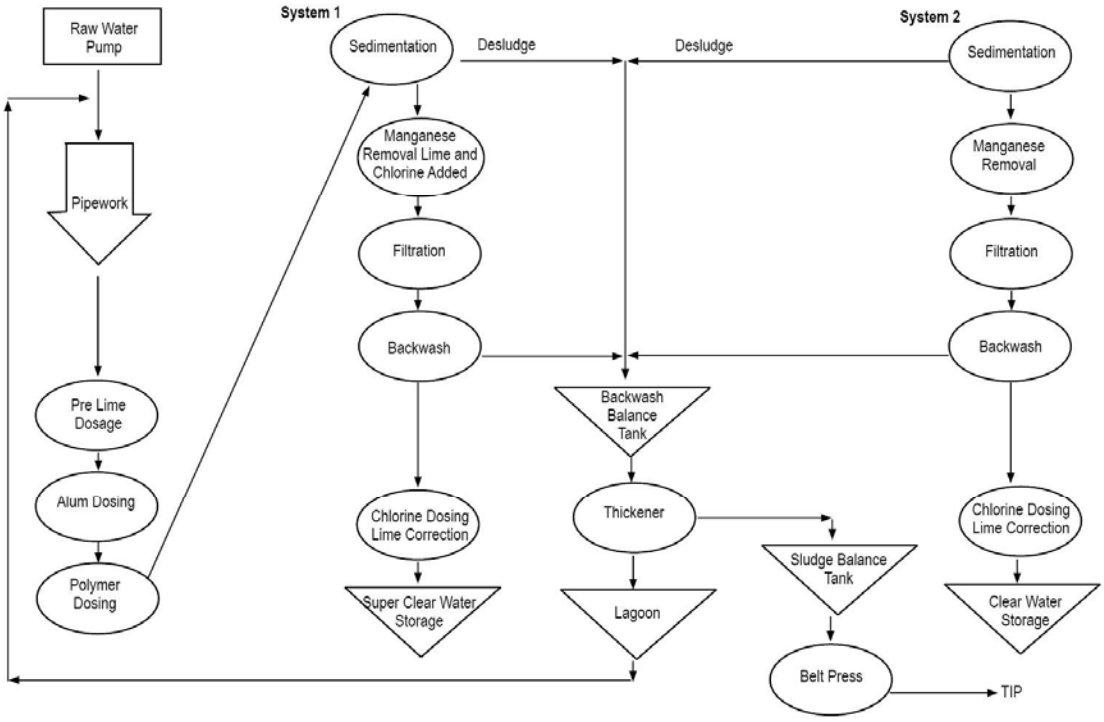
6.0 TREATMENT

6.1 Howard Water Treatment Plant

The water treatment plant at Howard is a conventional plant consisting of a chemical flash mixer, flocculation, reactivator clarifiers and dual media pressure filters. Disinfection is achieved by the addition of chlorine gas.

The plant was built and commissioned in 1964 with a capacity of 115 litres per second, approximately 10 ML/day. Plant capacity was increased in 1982 to a maximum hydraulic rate of 250 litres per second but the secure capacity was considered to be 18 ML/day. Note secure capacity is defined as the reliable plant performance treating average raw water quality and an allowance for loss of production due to down-time for backwashing, plant breakdowns and reduced raw water pumping efficiency.

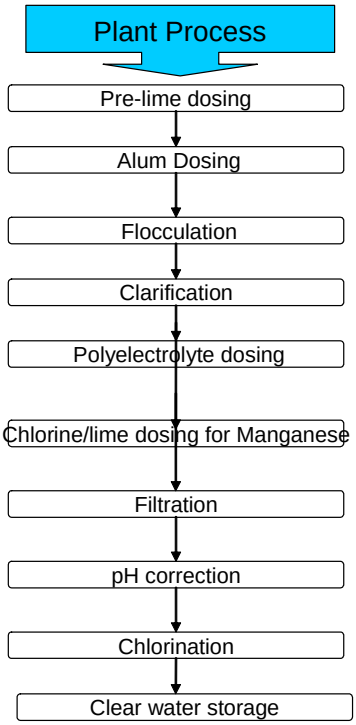
Howard Water Treatment Plant Flow Diagram

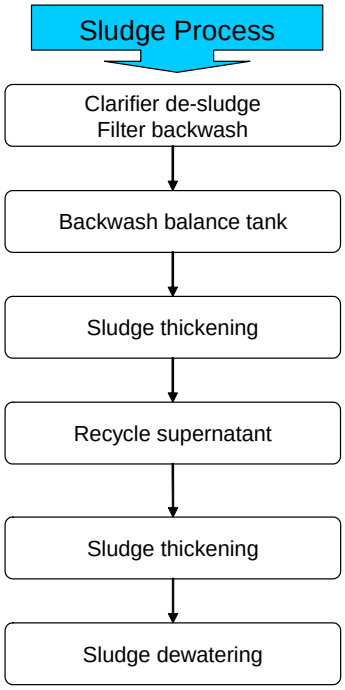


Further augmentations were undertaken between 1999 and 2003 to meet the new standards for drinking water quality, improve the plant reliability and increase plant capacity. This work comprised renovation of the filters, upgrading of the chemical dosing system and a new switch board. In 2004 additional raw water pumps were installed together with a variable frequency drive on No 1 clear water pump.

In addition, there is a need to restrict clear water pumping to 250 litres/sec because at higher pumping rates the 300mm diameter rising main bursts at a pressure of 360 kPa. This main has been isolated as it is uneconomical to maintain in service. The maximum rate of flow through the 450mm diameter rising main is 230 litre/sec.

Howard Process Treatment Chart





6.2 Burgowan

6.2.1 Dynasand Filtration Plant

A continuous backwashing Dynasand direct filtration plant was constructed and commissioned in 1991. With all 8 filter cells in operation the plant has a maximum hydraulic capacity of 12 ML/day.

The design filtration rate is 10.8 $m^3/m^2/h$ (10 ML/day). Backwash sludge is thickened by a Lamella separator and dried on sand beds. The plant can operate at variable flow rates of 45, 90 and 140 litres per second depending on demand and raw water quality. It cannot remove soluble manganese.

These filters have in general performed well but their capability is particularly affected by changes in raw water quality, especially colour. High raw water colour (greater than - 150 Pt Co units) requires an increase in the coagulant dose rate producing excess floc that the backwash process cannot handle. Under these conditions the plant flow rate has to be reduced to 45 litre/sec and if the colour exceeds 250 PtCo units the plant has to be shut down. In effect, the plant can only reliably treat water from the Cassava dams. Its "secure" capacity is therefore the safe Cassava dam yield which is estimated to be 1000 ML/annum plus low manganese and low coloured water pumped from the Burrum River.

Currently, the plant is in stand-by mode as water demand can be provided by other treatment facilities.

6.2.2 Ozone/BAC Plant

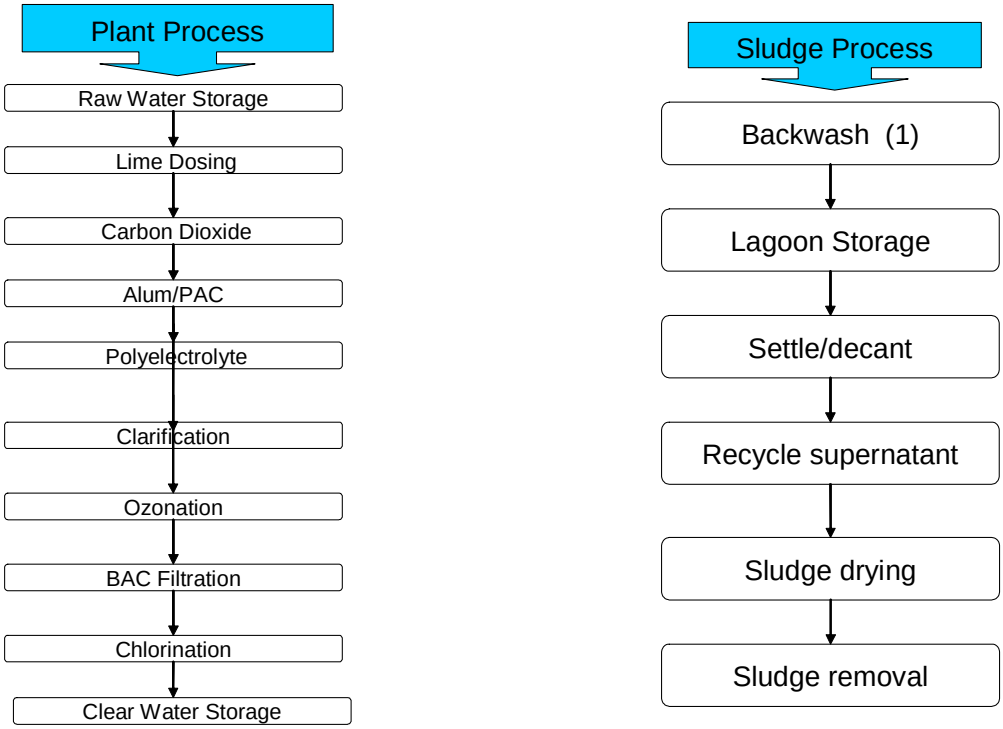
A new plant was built and commissioned at the Burgowan site in 2006. It has a nominal design capacity of 20 ML/day. The robust treatment process can treat raw water from different sources and variable quality characteristics, removing a wide range of contaminants.

The process train comprises:

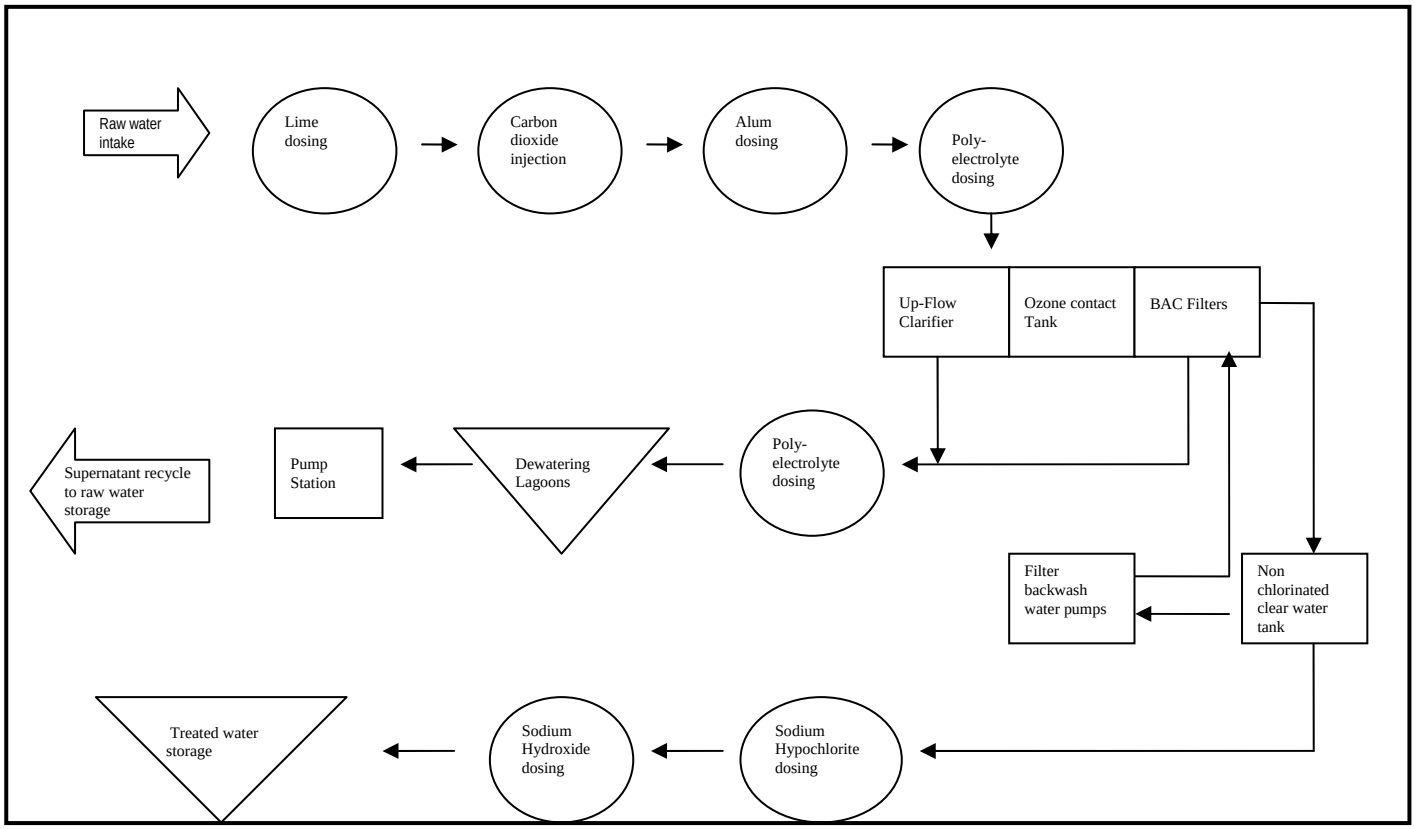
- The inlet works including raw water pipe manifold and valves and a compartmentalised mixing chamber where chemicals are added sequentially
- Up-flow packed bed clarifiers to remove flocs entraining colour and turbidity from the coagulated water
- Ozonation of the clarified water (turbidity < 0.3NTU) to remove dissolved organic matter, taste compounds and any alagal toxins
- Biological activated carbon filters to remove readily biodegradable bi-products and residual floc particles
- Disinfection and final water pH correction with sodium hypochlorite and sodium hydroxide respectively
- Sludge generated from clarifier and filter backwash is discharged into dewatering lagoons and the supernatant water is recycled back to the plant inlet.

Raw waters from the Burrum River and Cassava dams have low concentrations of alkalinity and hardness, typically < 20 mg/L. A feature of the plant is the pre-treatment process of lime and carbon dioxide to produce a non-corrosive product water with a target alkalinity of 40 mg/L.

Burgowan Process Treatment Chart



Burgowan Process Flow Diagram



Although the plant has a design capacity of 20 ML/day, the up-flow clarifiers require more frequent backwashing than originally anticipated. The amount of backwash flow is approximately 10% which means that if 20 ML/day comes in, only 18 ML/day enters the clear water tank. If the raw water colour is high, run times in the clarifier can fall to two hours increasing the amount of water lost in the backwash and therefore the secure plant capacity is considered to be 15 ML/day.

The high volumes of backwash water also impact on the capacity of the sludge lagoons. Based on the last 18 months operation, it is estimated that one lagoon is required for each 1800 ML of water treated. Therefore a lagoon will fill every 120 days and will need to dry out and be emptied within 4 months whilst the second lagoon is filling. This imposes a further constraint on plant throughput as drying time is typically 6 months.

7.0 TRUNK DISTRIBUTION

7.1 Pump Stations

Burrum No 1 Pump Station

Located on the Burrum River near Howard this pump station delivers raw water to the Water Treatment Plants at Howard and Burgowan. The pump station has been recently upgraded and has adequate capacity throughout the planning period. The pumps have the capacity to deliver 20 ML/day to The Howard Water Treatment Plant and 40 ML/day to Burgowan however extraction rates from the Burrum River under the IROL limit the amount of water that can be withdrawn from the River and Lenthalls Dam.

Howard Water Treatment Plant Clearwater Pumps

These pumps supply water to Takura Reservoir via a DN450 main. The DN300 main running in parallel has been decommissioned as it breaks whenever pressure from the pumps is applied. The Howard pumps used to pump into both mains which enabled them to meet the production capacity of the Howard Water Treatment Plant. The current operating point of these pumps is now different from their design value because they pump through only one of the mains to Takura. It is recommended that the current operating point of the pumps be investigated to ensure that the transfer capacity from the Clearwater storage at Howard through the 450 main to Takura Reservoir is not a restriction on the production capacity of the plant.

Burgowan Clear Water Pumps

The Clearwater pumps at Burgowan transfer water to the Takura Reservoir. There are 2 pumps at Burgowan but there is a limitation on the available power supply which restricts the operation to only one pump. Parallel operation of the pumps will be required by 2026 to meet projected demands. This will require a power supply upgrade to the Burgowan Water Treatment Plant and an upgrade to the switchboard at Burgowan which together are estimated to cost $400,000.

Urraween

The water supply system in Hervey Bay is currently reliant on pump stations to deliver water directly into the reticulation. Urraween pump station pumps directly into the reticulation at Nissan Street and also to Ghost Hill No 2 Reservoir. Peak hour demands are supplied from both the Urraween pumps and Ghost Hill No 2 Reservoir. The capacity of the 3 Urraween pumps operating in parallel is approximately 600 L/s compared with a projected max hour demand in 2031 of 1051 L/s. The three pumps are required to operate in parallel to meet projected demands and a standby pump should be provided in case of breakdown. There is also no provision for emergency power supply at Urraween Pump station. An emergency generator, standby pump and switchboard upgrade is estimated to cost $700,000

Ghost Hill No 2 (High Level)

The high level pump station at Ghost Hill services properties generally above approximately RL 35.0. There is a group of 5 small pumps at Ghost Hill No 2 which are regulated to switch on and off according to demand fluctuations throughout the day. These pumps should be sufficient to meet projected demands through to beyond 2021 when sequential replacement with larger capacity pumps will be required. The timing of these upgrades will be dependent upon the configuration of mains in Greenfield development sites in the Doolong Flats area and to the west along Christensen St where parts of new developments will be supplied from either Ghost Hill No1 or No 2 Reservoirs. The number of future properties in each DMA will be dependant to some extent upon the future layout of the road network.

Dundowran

Dundowran is supplied from Takura reservoir via the Purser Road pump station. This pump station currently has only one pump and operates 24 hours per day. There is no standby capacity in this pump station. The pump is VSD controlled and must meet peak hour demands at Craignish and Dundowran. It also delivers water to the Bayrise Reservoir. The VSD **controller on** the pump has recently been set to run the pump over-speed to meet current peak hour demands and a second pump has been ordered for immediate installation. Installation of the second pump will also require the installation of a new switchboard. With the mains upgrades recommended elsewhere in this report, the two pumps operating in parallel will meet projected demands to around 2021. In later planning period's problems arise in the more elevated areas particularly in Karaches Road and Apex Court. At this time the pumps will require a capacity upgrade in terms of both flow and pressure to meet peak hour demands and to maintain agreed level of service pressures in the more elevated areas . Both pumps should be fitted with VSD's to reduce power consumption by maintaining the operating range of the pumps close to their peak efficiency point. A new switchboard with VSD controller and an additional pump, estimated to cost $100,000, is required immediately. A further $150,000 has been included in the Capital Works Program for a further upgrade of the pump station in 2022 to meet increasing demands.

As the Craignish/Dundowran area is almost totally dependent upon the Purser Road Pump Station, consideration should be given to the provision of a standby pump and generator capacity to run the pump station in the event of power failure.

Modelling suggests that the Karasches Road area can be supplied from the Pursers Road pump station but the model assumes that the pipework and fittings are in reasonable condition. It is recommended that pressure monitoring be undertaken in Apex Court to determine the need for an in-line booster pump station in Karasches Road to maintain pressures in Apex Court. No provision has been made within the forward capital works program for a booster station in Karaches Rd.

River Heads

The high Level zone in River Heads is supplied from booster pumps at the River Heads Reservoir. There is a group of 3 small pumps at the Reservoir which are regulated to switch on and off according to demand fluctuations throughout the day. These pumps are insufficient to meet projected demands beyond 2021 and will require upgrading. Each pump delivers 5 L/s at its design operating point and this will need to be doubled to meet projected demands. Upgrades to these pumps are estimated to cost $30,000.

Booral Booster Station

The Booral booster pump station located on River Heads Road near Booral Road delivers water to the River Heads Reservoir It also supplies properties connected directly to the trunk main to River Heads and properties in the elevated area of East Booral. The pump station has a single pump which requires capacity augmentation beyond 2021. There is no standby capacity in this pump station and it is recommended that a second pump be installed as a backup. With both pumps operating in parallel, modelling suggests that service standards in the Booral East area will be maintained throughout the planning period. This assumes that the mains upgrade along Booral Road has occurred as recommended elsewhere in the report. Upgrading of the pump and switchboard is estimated at $50,000.

Toogoom Bush Pump Station

The Toogoom Bush Pump Station delivers water from Takura Reservoir to the Takura Heights Reservoir which supplies Toogoom. The pump station has adequate capacity for the projected demands throughout the planning period but there is only one pump. It is recommended that a standby pump be provided in this pump station. Installation of a second pump and upgrade to the switchboard is estimated to cost $50,000.

7.2 Reservoirs

Current System Operation:

Treated water from the Burgowan WTP is pumped to the Takura Reservoirs. Treated water from the Howard WTP is pumped to Takura Reservoirs and also to Burrum Heads and the elevated storage in Howard. When the Howard WTP is not operating both Howard and Burrum Heads can be supplied directly from Takura Reservoir.

Takura Reservoir distributes water to Urraween Reservoir through gravity trunk mains, and also to Takura Heights and Bayridge Heights reservoirs with assistance from booster pumps. Ghost Hill High and Ghost Hill Low are supplied by pumping from Urraween Reservoir. The pumps at Urraween Reservoir also supplement supply directly into the reticulation at Nissan Street and are required to meet the maximum hour demand from the Point Vernon, DCP2 and Lower Mountain Road DMA's. The River Heads Reservoir is supplied from the Ghost Hill High and/or Ghost Hill Low reservoirs and a pump on Booral Road boosts the supply to River Heads. There are also a number of properties supplied directly from the trunk mains although no further connections are permitted[1].

An analysis of the required reservoir capacities for the projected demands is summarised below:

	2006	**2011**	**2016**	**2021**	**2026**	**2031**	**2036**	**2041**	**2046**	**2051**	**2056**	**2061**	**Existing Capacity**
Bayrise Estate	0.26	0.26	0.27	0.28	0.28	0.29	0.29	0.30	0.31	0.32	0.32	0.33	**0.33**
Burrum Heads	0.92	1.03	1.14	1.25	1.30	1.41	1.51	1.62	1.73	1.83	1.92	2.00	
Dundowran	1.09	1.23	1.39	1.62	1.83	2.00	2.17	2.34	2.51	2.67	2.82	2.95	
Howard	0.60	0.67	0.75	0.85	0.93	1.02	1.11	1.20	1.28	1.37	1.44	1.51	**0.68**
River Heads	0.67	0.75	0.85	1.00	1.16	1.24	1.33	1.42	1.51	1.59	1.67	1.74	**1.0**
Takura	0.89	0.90	0.91	0.91	0.93	0.99	1.05	1.11	1.17	1.23	1.28	1.33	**10.0**
Takura Heights	0.76	0.90	1.05	1.17	1.21	1.31	1.40	1.50	1.59	1.68	1.77	1.84	**0.68**
Town Supply	13.8	15.8	18.1	20.5	23.0	25.6	28.2	30.9	33.5	35.9	38.2	40.3	**46.60**
Total Storage	**19.0**	**21.6**	**24.5**	**27.6**	**30.6**	**33.8**	**37.6**	**40.3**	**43.6**	**46.6**	**49.5**	**52.0**	**59.29**

Applying NRM standards for the sizing of service reservoirs, this table indicates that there are current deficiencies in storage provision in Takura Heights (supplying Toogoom) and Bayrise Estate Reservoirs.

For the purpose of this report, both Ghost Hill reservoirs and Urraween Reservoir have been considered as one entity. To enable this situation to continue beyond the present day, consideration needs to be given to the ability to transfer water from Urraween Reservoir to both Ghost Hill Reservoirs and then the ability to deliver that water from the reservoirs to the reticulation network. To enable the reticulation network to function under maximum demands, a permanent pumping arrangement will be required at Urraween which would entail a generator to be available in the extent of a failure of power supply.

In addition to the generator, a permanent large diameter supply out of Ghost Hill will be required. Ghost Hill No. 1 Reservoir does not have the capability of additional large diameter supplies from the reservoir and as such it would be prudent to develop a new larger capacity reservoir on the existing site and make provision for larger diameter inlet and outlets.

When the Howard WTP is operating Burrum Heads is supplied from pumps at the Howard WTP. When the Howard WTP is not operating Burrum Heads is supplied from Takura Reservoir via approximately 32km of trunk mains. A short term emergency supply is available from Toogoom via approximately 10.5 km of DN150 main although this is insufficient to meet other than short term supply interruptions. At the time of writing this report the population in Burrum Heads is approximately 2,600 with effectively no alternative means of supply. From a continuity of supply perspective there is an urgent need for a reservoir located near Burrum Heads to serve this community.

Dundowran is in a similar situation to Burrum Heads in that there is no dedicated storage for a community of approximately 3,500 people.

Proposed Developments:

Three areas have been identified as requiring development of additional reservoir storage, with other areas requiring improvements to water supply to those zones in lieu of storage capacity:

New Reservoirs

Burrum Heads WSD

As a result of current and projected development, significant growth is planned for the Burrum Heads WSD's. This increase in water demand corresponds to an increase in the water supply infrastructure required to service customers. Furthermore, as no storage capacity exists at Burrum Heads, some capacity will be required to address potential failure of the single pipe feed to the community in the immediate future.
The required infrastructure to supply the Burrum Heads and Burrum Heads 2 WSD's, at the desired SOS is detailed in the following table.

Table: Burrum Heads WSD Proposed Water Supply Infrastructure

Item	Description	Size	Unit Rate	Length/Size	Year Proposed	Capital Cost
1	Burrum Heads Reservoir	3.0 ML	-	-	2012	$1,100,000.00
2	Reservoir outlet main to service Burrum Heads WSD	450 mm	$ 489/m	3,800 m	2012	$1,858,000.00
3	Local MH Booster Pump Station	8 L/s	-	-	2020	$ 175,000.00
TOTAL						**$3,133,000.00**

Toogoom WSD

As with Burrum Heads WSD, significant development is occurring within the Toogoom WSD, over and above that previously planned for and to accommodate this growth will necessitate the construction of additional water supply infrastructure to service the area.

The required infrastructure to supply the Toogoom WSD, at the desired SOS is detailed in the following table.

Table: Toogoom WSD Proposed Water Supply Infrastructure

Item	Description	Size	Unit Rate	Length/Size	Year Proposed	Capital Cost
1	Toogoom Reservoir	3.0 ML	-	-	2014	$1,100,000.00
2	Reservoir outlet main to service Toogoom WSD	300 mm	$ 309/m	2,400 m	2010	$ 742,000.00
3	Toogoom Reservoir Pump Station Upgrade	35 L/s	-	-	2030	$ 185,000.00
4	Toogoom Reservoir Pump Station Suction/Discharge Mains	200 mm	$ 203/m	4,800 m	2030	$ 974,000.00
TOTAL						**$3,001,000.00**

Hervey Bay WSD's

The majority of existing development is around the City of Hervey Bay and this is predicted to remain the case in the future. There are a number of WSD's within the City and surrounding areas that are serviced from the Takura, Urraween and Ghost Hill reservoir complexes.

- Booral/River Heads LLZ
- Bayrise
- DCP2
- Dundowran PS
- Ghost Hill
- Hornes Road
- Kawungan
- Pialba
- Point Vernon
- Scarness
- Torquay
- Urangan
- Wondunna

Of the above WSD's, a number are predicted to have a significant increase in population as a result of new development (e.g. DCP2, Kawungan) or densification of the existing development (e.g. Pialba and the coastal strip). This additional demand, over and above that previously planned will necessitate upgrades to the network, in particular further reservoir storage, larger diameter trunk mains and bulk water pump station upgrades.

As noted previously, the actual development locations and sequencing will dictate the final supply strategy. For preliminary planning purposes it is proposed to provide additional reservoir storage in Hervey Bay, around Ghost Hill, to supply the central and eastern WSD's listed above and additional storage around Takura to supply the western WSD's.

The Takura reservoir complex is at an elevation of around AHD 95m. The current planning strategy will necessitate Pressure Reducing Valves (PRV's) to supply those properties to be supplied from the Takura reservoir. This will be required to protect consumers from receiving excessively high pressures, however, additionally serves as an effective demand management technique.

The current supply strategy of delivering bulk water to the Urraween Reservoir and pumping from this storage to the Ghost Hill reservoirs will continue in the future. This differs from the present use of the Urraween pumps where they also discharge into the reticulation network. Consistent with this supply strategy it is proposed to provide additional storage capacity at the Ghost Hill Reservoir No 1 complex.
The required infrastructure to supply the Hervey Bay WSD's, at the desired SOS is detailed in the following table.

Table: Hervey Bay WSD's Proposed Water Supply Infrastructure

Item	Description	Size	Unit Rate	Length/Size	Year Proposed	Capital Cost
1	Ghost Hill Reservoir Outlet supply main upgrades	750 mm	$ 919/m	500 m	2011	$ 460,000.00
2	Ghost Hill Reservoir Upgrade	20.0 ML	-	-	2015	$ 2,750,000.00
3	Takura Reservoir Upgrade	6.0 ML	-	-	2020	$ 1,500,000.00
4	Provide backup generator and switchboard upgrade at Urraween				2013	$ 700,000.00
TOTAL						**$ 5,410,000.00**

Booral and River Heads LLZ WSD's

The existing 150mm diameter main supplying the Booral and River Heads Low Level Zone (LLZ) WSD's is not adequate to accommodate the projected demands and an upgrade to this main is proposed, as detailed in the following table.

Table: Booral and River Heads LLS Proposed Water Supply Infrastructure

Item	Description	Size	Unit Rate	Length/Size	Year Proposed	Capital Cost
1	Main along Booral Road	200 mm	$ 203/m	8,600 m	2012	$ 1,746,000.00
TOTAL						**$ 1,746,000.00**

8.0 OPTIONS REVIEW

8.1 Raw Water Source

The following table was provided within Section 4 of this document as an indication of the estimated daily water consumption for the Hervey Bay community:

Year	Average Day (ML/D)	Mean Day Maximum Month (ML/D)	Peak Day (ML/D)
2006	17.5	22.7	27.9
2011	20.3	26.4	32.5
2016	23.4	30.4	37.5
2021	26.9	34.9	43.0
2026	30.3	39.4	48.5
2031 (ULT)	34.3	44.6	54.9

Annual treated water requirement is determined from the Average Day demand:

Year	Average Day (ML/D)	Annual Requirement (ML/A)
2006	17.5	6,490
2011	20.3	7,410
2016	23.4	8,541
2021	26.9	9,919
2026	30.3	11,060
2031 (ULT)	34.3	12,520

WBWC has an annual allocation from Lenthalls Dam of 14,425 ML of which 405 ML is available for irrigators, leaving an available resource of 14,020 Ml/annum. Although this allocation exceeds the 2031 requirement (12,520 ML/annum) and the life of this report, provision needs to be made for identification of the next supply source which is anticipated to be needed by 2035. Considering the time taken to obtain the approvals to raise Lenthall Dam by 2.0m (10 Years), it would be prudent to have an alternative source identified and approvals finalised by 2030. Given the potential delays, a start would need to be made on approvals by 2020 and an alternative developed before that date.

Section 5.0 of this report identified the raw water source options available to the Corporation:

1. Further raising of Lenthall's Dam
2. Supply from the Mary River
3. Supply from the Burnett River
4. Supply from Fraser Island
5. Supplemented or direct supply from desalination
6. Supplemented supply from groundwater
7. Supplemented supply from recycled water

With the exception of 1 and 4, all of the above options were considered within the Wide Bay Burnett Regional Water Supply Strategy with the following adopted within that document:

a. Two small desalination plants (Burrum and River Heads)- 1,460 ML/Annum
b. Purified Recycled Water – 2,920 ML/Annum
c. Pipeline from SunWater's water supply scheme in Childers - 5,400 ML/Annum

This additional 9,780 ML/ Annum would provide Hervey Bay for potentially the next 60 years and potentially beyond that limit.

The cost to develop such a scheme has been identified in Section 5 of this document:

a. $5.7m
b. $15.5m (includes pipeline from Nikenbah to Burgowan, first stage only)
c. $51.38m (includes pipeline to Burgowan and purchase of allocation)

Total Capital Cost would be $72.58m which could be developed over a number of years with the pipeline from Childers being the largest individual unit to be developed over a single year.

With the abandonment of the Traveston Dam, there may be provision to review the opportunity of extracting water from the Mary River scheme which would have the impact of reducing the above capital expenditure by $13.0m. There may be some political backlash over this issue, but once the public perception has cooled down, it could be worth discussing with the State Government.

The development of two small desalination units and an indirect potable reuse scheme would have a number of public perception and environmental constraints to hurdle, but these could be overcome with a constructive media campaign and discussion with relevant community groups.

Of the source options identified above, the following comments are made regarding their viability:

1. Raising Lenthall Dam by an additional 2 - 4 m is a viable but potentially expensive option with considerable environmental, social and political implications.
2. Supply from the Mary River has always been the preferred option for the Hervey Bay community and provides an economic solution although there may be the potential of environmental constraints following on from the Traveston Dam fiasco.
3. A supply from the Burnett has the lowest environmental constraints, but high capital cost and limited to 9 months of the year which means infrastructure development is larger to enable water transfer over a shorter timeframe.
4. At this point in time, there is no substantive information available to identify raw water source availability from Fraser Island. Existing environmental constraints are high and capital development costs would be high. It would be to the Corporations advantage to pursue the State Government to allow an in depth review of source options from Fraser Island.
5. A large scale desalination project (20 ML/day) would be very expensive to develop ($74.3m) and expensive to operate, but two smaller (1.0 ML/ day each) would be a viable option as a supplemented supply. However, the cost of developing and operating these plants needs to be weighed against the cost of alternative supplies to the two identified communities, and at this point in time, they hold little financial advantage.
6. A supplemented supply from groundwater has a minimal advantage to the Corporation due to the location of the sources, their production rate and the cost of additional treatment. They are not considered a viable option.
7. A supplemented supply from recycled water (indirect potable reuse) is a very viable option to the Corporation. Nikenbah will provide around 4.0 ML/ day of effluent with this figure to double after the next stage upgrade (approximately 8 – 10 years). Additional treatment will be required and a pipeline from Nikenbah to Cassava (Burgowan).

Source Options:

The following options have been identified for further consideration within this report:

i. Develop a recycled water scheme in two stages of 4.0 ML/day each (total 2,920 ML/annum) followed by a permanent supply from the Mary River (8,000 Ml/annum).
ii. Develop a recycled water scheme in two stages of 4.0 ML/ each day (total 2,920 ML/annum) followed by a permanent supply from the Burnett River (7,800 Ml/annum).

iii. Two small desalination units (1,460 ML/annum) and a recycled water scheme in two stages of 4.0 ML/ each day (total 2,920 ML/annum) followed by a permanent supply from the Mary River (8,000 Ml/annum).

iv. Two small desalination units (1,460 ML/annum) and a recycled water scheme in two stages of 4.0 ML/ each day (total 2,920 ML/annum) followed by a permanent supply from the Burnett River (7,800 Ml/annum).

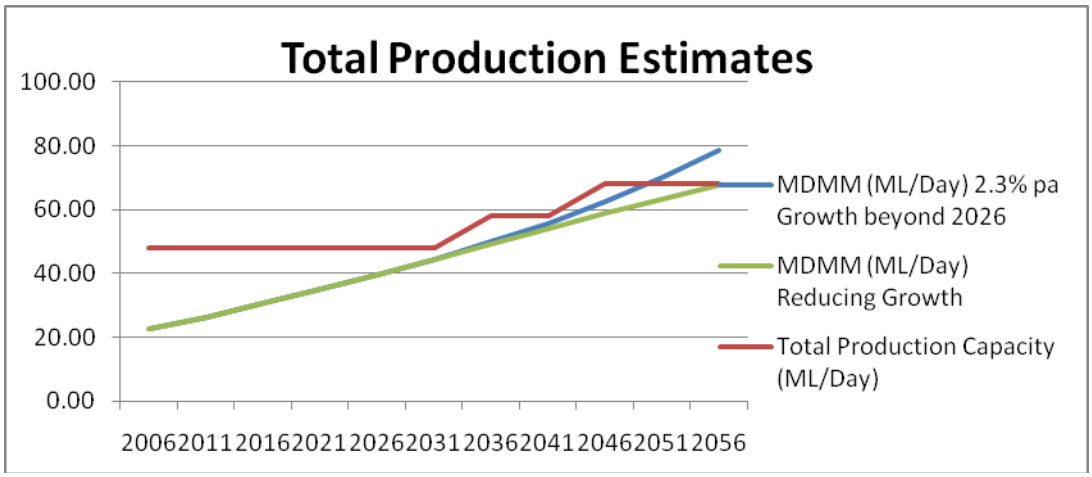
Option	Description	Capital Cost	Additional Resource(ML/annum)	Timing
i	Stage 1 - Construct pipeline and treatment to Burgowan	$15.5m	1,460	2015
	Stage 2 – Additional treatment capacity	$5.5m	1,460	2020
	Stage 3 – Construct pipeline from Mary to Burgowan	$38.35m **Total - $59.35m**	8,000 **10,920**	2040
ii	Stage 1 - Construct pipeline and treatment to Burgowan	$15.5m	1,460	2015
	Stage 2 – Additional treatment capacity	$5.5m	1,460	2020
	Stage 3 – Construct pipeline from Childers to Burgowan	$51.38m **Total - $72.38m**	7,800 **10,720**	2040
iii	Stage 1 - Construct 2 x 1.0 ML/d Desalination plants	$5.7m	730	2015
	Stage 2 - Construct pipeline and treatment to Burgowan	$15.5m	1,460	2018
	Stage 3 – Additional treatment capacity	$5.5m	1,460	2020
	Stage 4 – Construct pipeline from Mary to Burgowan	$51.38m **Total - $65.05m**	8,000 **11,650**	2045
iv	Stage 1 - Construct 2 x 1.0 ML/d Desalination plants	$5.7m	730	2015
	Stage 2 - Construct pipeline and treatment to Burgowan	$15.5m	1,460	2018
	Stage 3 – Additional treatment capacity	$5.5m	1,460	2020
	Stage 4 – Construct pipeline from Burnett to Burgowan	$51.38m **Total - $78.08m**	8,000 **11,450**	2045

Option (i) has the greatest advantage to the Corporation and although an alternative raw water source is not required for a number of years, there are some advantages to commencing the development of this resource in advance of its need. This may mean a purchase of an allocation from the Mary or Burnett supplies to secure that water for future use.

8.2 Treatment

The MDMM demand of the system in the year 2026 is estimated at 39.65 ML, and in 2031 it is forecast to rise to 44.42 Ml. The current treatment capacity of the combined Howard and Burgowan plants is around 48 ML/day. Whilst no capacity augmentations are foreshadowed over the next 20-25 years, upgrades to the Howard and Burgowan Tema treatment plants are likely to be required to maintain water quality standards.

Beyond 2031 an augmentation of the treated water scheme of around 20 ML/d will be required to meet projected demands through to 2056. The graph below demonstrates the likely timing of future augmentation requirements to meet projected demands. Should growth rates and/or consumption change significantly from those values assumed in the projections, these works will either need to be brought forward to meet increased demand, or deferred if the projections are not realised. Further demand management initiatives, compulsory fitting of rainwater tanks to all new residential buildings, pricing initiatives and on-going public education programs will also assist in deferring the need for future augmentations of treatment capacity.



Options for consideration in the provision of an additional 20 ML/day treatment capacity are closely linked with the source option adopted. There is little opportunity to develop the Howard WTP any further than its present capacity and as such, an expansion of the Burgowan WTP is the preferred option.
Burgowan was originally developed to enable a 20 ML/day augmentation in the future and it is this augmentation that is proposed in around 2033.

8.3 Trunk Distribution

Previous planning has assumed that the supply to Hervey Bay City would ultimately be from a large storage on Ghost Hill. Trunk mains supplying the new reservoir will need to deliver MDMM flows and flows from the reservoir will need to meet PH demands. PH demands are almost 3 times higher than MDMM demands.

The pumps at Urraween reservoir currently supply close to PH demands by delivering directly into the reticulation at Nissen Street. They are supplemented to a degree by the Ghost Hill Storages but they provide substantially higher flows than they would have had they been pumping to a storage at Ghost Hill. The pumps still pump against the head at Ghost Hill No 2 under either scenario but the pumping rate and hence the power supply requirements and infrastructure are substantially different.

Projections to 2056 require the provision of 37.5 ML of storage for Hervey Bay City. There is currently a total of 46.5 ML of storage within Hervey Bay City at the Urraween and Ghost Hill Reservoirs although the majority of this storage is in Urraween reservoir at the bottom of the hill. Ghost Hill No 2 Reservoir in Regency Avenue has a capacity of only 6.7 ML and there is insufficient site area upon which to provide up to an additional 30.8 Ml at this location. There is sufficient site area at Ghost Hill No 1 Reservoir if the existing 4.5 Ml Reservoir is replaced.

Construction of a large storage (20 ML) at the Ghost Hill No 1 site will enable the majority of Hervey Bay City to be supplied from this reservoir with only the high level zones (above about RL 35) being supplied from Ghost Hill No 2 reservoir. Pumping to the new 20ML storage at MDMM rates will require impellor changes to the existing pumps (downsizing from 440 mm to 405mm) at Urraween reservoir. No new pumps will be required to meet the duty to 2031. As demand continues to grow, larger pumps will be required.

Trunk mains to supply the 20 ML storage at Ghost Hill are the existing DN450 AC and DN500 DICL mains from Urraween Reservoir. The DN 750 main is included in the 2009-10 Capital Works Program and part of it will be constructed in conjunction with the reconstruction of Main Street. It will be necessary to construct a DN 600 main in Urraween Road from Main Street to Nissen Street so that the DN 450 and 500 mains can be used as dedicated pumping mains to the new Ghost Hill 30 ML storage.

Ghost Hill No 2 reservoir will then only service the high level zones and is more than adequate for this purpose. It will be necessary to pump from the 20 ML storage to Ghost Hill No 2 reservoir but this will be at MDMM pump rates.

An alternative to suppling Hervey Bay from a 20 ML storage at Ghost Hill No 1 is to supply from the much smaller Ghost Hill No 2 storage. This will still require the construction of the 30 ML storage but it will provide slightly higher pressures to the trunk mains. This will enable higher transfer rates and potentially (longer term) deferred upgrades

to some trunk mains infrastructure. The downside is the additional pumping costs associated with pumping to the higher elevation.

Conceptually this can be achieved by pumping from Urraween Reservoir to both the Ghost Hill Reservoirs at MDMM flow rates, and boosting the supply to Ghost Hill No 2 from Ghost Hill No 1 to meet the PD and PH demands The pumps at Ghost Hill No 1 will need to deliver up to 2 times MDMM to Ghost Hill No 2 to meet the PH demands on the reservoir.

Reservoir options have been discussed in Section 7.3 and need no further elaboration at this stage.

8.4 Reticulation

Hydraulic Network Models were developed for each 5 year increment from 2006 (base position) through to 2031 taking into account:

- Average Water demand of 590L/ED/day
- Population growth as defined in Section 4.0 of this document consistent with the recently adopted Fraser Coast Regional Council Planning Scheme Policy No 4 (PSP4). Population growth was allocated to each property in accordance with the projections contained within PSP4 resulting in differing growth rates for each water demand management area.
- Peaking factors and diurnal profiles as defined in section 4.0 of this document
- Existing network operating procedures (pump start/ stop, reservoir levels etc.)
- No failure scenario of 3 consecutive days of maximum day demand (i.e. Average day x 1.6)
- Residential Fire Flow allowance of 15 L/s at two thirds max. hour demand at each hydrant (residential area hydrants and hydrants located outside Hervey Bay. ie. Burrum Heads, Toogoom, Howard, Craignish, Dundowran and River Heads.)
- Commercial Fire Flow allowance of 30 L/s at two thirds max. hour demand at each hydrant located in Commercial, Industrial, or High and Medium Density Residential Zones as defined in the Hervey Bay City Planning Scheme.

Where a pipeline failed under the above scenarios during any 5 year time step, that pipeline was identified and an additional pipeline provided to that area. Failure of a pipeline was due either to excessively high velocities or head losses within the pipeline resulting in downstream levels of service not meeting those levels of service specified within the service agreement.

Where a pump station failed to meet the required demand or a reservoir ran out of water, additional pumping capacity or storage was provided.

Initial Modelling was conducted in three stages. Demands appropriate to the time step were applied to the reticulation network and the results of the model run were analysed to identify any level of service deficiencies. Pipes that failed were duplicated, and where necessary additional pump(s) were provided and reservoir capacities were increased. The model was then re-run to ensure that the required levels of service were achieved.

Residential and Commercial Fire Flow runs were then conducted and any additional deficiencies in system capacity were identified and rectified before moving on to the next time step.

During these first three stages many of the existing pressure reducing valves were found to be under capacity for the projected demands and required upgrading. Where pipes were duplicated additional pressure reducing valves (PRV's) were also required on the new mains.

Because of the unknowns associated with the increasing demands and the future sizing of PRV's it was decided to ensure that the reticulation could meet the projected demands without pressure reduction through the first three stages of modelling. Once this modelling was completed PRV's were then re-introduced and the models re-run with reticulation pressures controlled through the PRV's to maintain a minimum pressure of 25 metres at the CPP's within each DMA.

Existing PRV's operate under a range of controls which are designed to maintain required levels of service at the critical pressure point (CPP) within each DMA. Rather than monitoring pressures at remote CPP's and using telemetry to control the PRV's, PRV controls have been linked to downstream pressures close to the PRV for which a relationship has been developed with pressures experienced in the field at the CPP. This was not possible to duplicate within the model for future time steps due to the increasing demand over time. Instead, modelling of the PRV's was based on maintaining a minimum pressure of 25 metres at the CPP for three consecutive days of peak day demand. Fire flow analyses were also based on maintaining a minimum pressure of 25 metres at the CPP.

IT was assumed throughout the fire flow analyses that commercial fire flows (30 L/s) would only be provided within the Commercial, Industrial, High and Medium Residential Zones within the City of Hervey Bay. All other hydrants were tested for residential fire flows (15 L/s). Whilst there are a small number of hydrants that do not meet the desired standards, they are generally located on 100mm diameter or smaller dead end mains or in courts, or at DMA boundaries on 100mm diameter mains where flow is only available to the hydrant from one direction. Failure of a hydrant does not mean that water is not available from the hydrant, it simply means that the hydrant does not meet the standards and could fail to meet them by less than 1.0 L/s. No provision has been made within the capital works program to upgrade these mains because of the isolated nature of hydrant failures and the costs involved. It should be noted that there is no legal requirement for WBWC to provide water for fire fighting purposes nor does WBWC guarantee that water will be available from a hydrant that has been provided in a particular location.

The results of the analyses have been tabulated within the capital Works programme.

9.0 20 YEAR CAPITAL WORKS PROGRAM

Detailed below is the 20 year capital works program developed as a result of the hydraulic modelling works undertaken for this investigation. The program takes into account the adopted standards of service and the operation strategies discussed previously.

9.1 Unit Rates for Water Mains

Contain in Table 10.1 below are the water main unit rates adopted for calculating the capital costs of the proposed augmentations. The unit rates in the table below are based on an extensive analysis of tendered construction rates for projects in South East Queensland. They have been factored to include on-costs such as design, survey, construction supervision and Corporate overheads. The rates do not have an allowance for GST.

TABLE 10.1: Augmentation Unit Rates

Diameter (mm)	Unit Cost ($/m)
100	140
150	181
200	203
225	258
250	273
300	309
375	449
450	489
500	543
525	587
600	695
700	834
750	919

The rates above are based on sand in an urban area and have had appropriate multiplication factors applied to allow for different soil conditions and different locations i.e. rural, urban, CBD.

Level of Development	Soil Type	Pipe Size				
		<150mm	150mm - < 300mm	300mm - < 600mm	600mm - < 900mm	900mm - < 2100mm
RURAL	Sand	0.83	0.91	0.95	0.96	0.98
	Good Soil	1	1.03	1.06	1.09	1.13
	Poor Soil (High WT areas)	1.12	1.1	1.1	1.11	1.14
	ASS areas	1.2	1.15	1.14	1.15	1.18
	Soft Rock	1.21	1.2	1.22	1.25	1.35
	Hard Rock	1.77	1.63	1.62	1.69	1.94
URBAN	Sand	1	1	1	1	1
	Good Soil	1.16	1.13	1.12	1.13	1.15
	Poor Soil (High WT areas)	1.29	1.19	1.15	1.15	1.16
	ASS areas	1.36	1.24	1.19	1.19	1.2
	Soft Rock	1.37	1.29	1.27	1.29	1.37
	Hard Rock	1.94	1.72	1.67	1.73	1.96

HIGH DENSITY URBAN	**Sand**	1.34	1.18	1.1	1.07	1.04
	Good Soil	1.5	1.31	1.22	1.2	1.19
	Poor Soil (High WT areas)	1.63	1.38	1.25	1.22	1.2
	ASS areas	1.7	1.43	1.29	1.26	1.24
	Soft Rock	1.71	1.48	1.37	1.37	1.41
	Hard Rock	2.28	1.91	1.78	1.81	2
CBD	**Sand**	2.36	1.79	1.49	1.39	1.25
	Good Soil	2.52	1.92	1.61	1.51	1.41
	Poor Soil (High WT areas)	2.64	1.98	1.64	1.54	1.41
	ASS areas	2.72	2.03	1.68	1.57	1.46
	Soft Rock	2.73	2.08	1.76	1.68	1.63
	Hard Rock	3.29	2.51	2.17	2.12	2.22

9.2 Proposed Capital Works Programme

The proposed Capital Works Programme is detailed in Table 10.2. Whilst this programme is primarily targeted at the 20 year planning horizon significant cost infrastructure items pertaining to water source and treatment that are outside the 20 year planning horizon have been detailed.

The years that each of this items appears are the projected years in which the infrastructure is required and therefore will be influenced by deviations from the projected population as well as changes in the actual per unit consumption.

Furthermore, any capital works budgets derived from this strategy should make appropriate financial allowance prior to the year required to allow for the planning and design phases of the project which, for water source and treatment, can be lengthy. The estimate of infrastructure costs does include an allowance for planning and design.

The 20 year capital works program with regard to the water distribution network has been developed to satisfy the adopted Standards of Service. As with any strategic planning document detailed planning should be undertaken prior to construction of all new infrastructure to confirm need, sizing, route, and equipment used.

The Total Capital Cost for the 20 year Capital Works Programme is $41,097,609.00.

9.3 Table – Proposed Capital Works Hervey Bay

Water Capital Works Programme - 2010 - 2030
Hervey Bay Community

Activity	Capital Value	Year Required	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Water Resource																							
Stage 1 - Construct Pipeline to Burgowan and Recycled Water Treatment	15500000	2015						15500000															
Stage 2 - Additional Treatment Capacity of Recyled water	5500000	2020											5500000										
Stage 3 - Construct Raw Water Pipeline between Mary River & Burgowan WTP	38,350,000	2040																					
	59,350,000																						
Water Treatment																							
Upgrade Burgowan 1 to meet MDMM	100000	2023														100000							
20 ML/d Upgrade Burgowan	12000000	2033																					
	12,100,000																						
Reservoirs																							
3.0 ML Burrum Heads Reservoir	1100000	2012			1100000																		
3.0 ML Toogoom Reservoir	1100000	2014					1100000																
20.0 ML Ghost Hill Reservoir	2750000	2015						2750000															
6.0 ML Takura Reservoir	1500000	2020											1500000										
	6,450,000																						
Pumping Station																							
Toogoom Bush Pumpstation Standby Pump	50000	2010	50000																				
Urraween Clear Water Pumpstation Augmentation																							
(Backup Generator and Swichboard Upgrade)	700000	2013				700000																	
Burrum Heads Max Hour Booster Pumpstation	175000	2020											175000										
River Heads HLZ Booster Pumpstation Augmentation	30000	2021												30000									
Booral Booster Pumpstation Augmentation	50000	2021												50000									
Dundowran Booster Pumpstation Augmentation	100000	2026																	100000				
Burgowan Clear Water Pumpstation Augmentation	400000	2026																	400000				
Toogoom Bush Pumpstation Augmentation	185000	2030																					
	1,690,000																						
Trunk Distribution																							
Old Maryborough Rd (Tooth St to Beach Rd)																							
872m of 200mm oPVC	179173	2010	179173																				
Toogoom Heights Res to Toogoom Rd																							
2400m of 300mm DICL	742000	2010	742000																				
Carls Rd (Dundowran Pumping Station to Pedelty Ln)																							
1414m of 250mm DICL	352454	2011		352454																			
Regency Av (Ghost Hill Res No. 2 to Main St)																							
246m of 300mm oPVC	112925	2011		112925																			
Main St to Davis Dr (300/200 main through proposed Subdivision)																							
220m of 300mm oPVC and 193m of 200mm oPVC	100145	2011		100145																			
Ghost Hill Reservoir Outlet supply main upgrade																							
500m of 750mm DICL	525000	2011		525000																			
Burrum Heads Reservoir to Burrum Heads WSD																							
3800m of 450mm DICL	1858000	2012			1858000																		
Hughes Rd (Boundary Rd to Rosewood Ave)																							
585m of 200mm oPVC and 224m of 150mm oPVC	159505	2013				159505																	
Sempfs Rd (Anson's Rd to Vine Forest Dr)																							
742m of 200mm oPVC	137567	2014					137567																
Boundary Rd (Denman Camp Rd to Robert St)																							
1673m of 450mm DICL	818833	2016							818833														
Burrum River Crossing (Wieland Rd)																							
385m of 300mm HDPE under river bore)	550000	2016							550000														
Booral Rd/ River Heads Rd (Shore Rd West to Boral Booster Pump Station)																							
2434m of 200mm oPVC	495076	2016							495076														
Pantlins Ln/Conservation Dr (from Bayswater Dr to Satinwood Ave)																							
164m of 200mm oPVC and 410m of 150mm oPVC	114702	2016							114702														
Pialba/Burrum Heads Rd (Karrashs Rd to Petersens Rd)																							
1425m of 200mm oPVC	418095	2016							418095														
Sempfs Rd (Vine Forest Dr to Pandanus Dr)																							
401m of 200mm oPVC	74176	2016							74176														
Urangan St (Robert St to Zircon St)																							
(908m of 200mm oPVC)	184484	2016							184484														
Truro St, Ann St, & Dayman St (Robert St to Alexander St)																							
1313m of 200mm oPVC	267064	2016							267064														
Urraween Rd (Urraween Res to Scrub Hill Rd)																							
1950m of 375mm DICL	953979	2021												953979									
Robert St (Boundary Rd to Colyton St)																							
434m of 300mm DICL	134158	2021												134158									
Bengston Rd (Cove Blvd to Avolet Cres)																							
254m of 200mm oPVC	78638	2021												78638									
Denman Camp Rd (Boundary Rd to Capania Wy)																							
308m of 300mm oPVC	95209	2026																	95209				
Robert St (Colyton St to Exeter St)																							
440m of 250mm oPVC	139489	2026																	139489				
Ann St (Truro St to the Esplanade)																							
432m of 200mm oPVC	87869	2026																	87869				
Charlton Esp (North from Moolyir St)																							
214m of 200mm oPVC	38520	2026																	38520				
Charlton Esp (South from Boat Harbour Dr)																							
158m of 200mm oPVC	38440	2026																	38440				
Robert St (Boat Harbour Dr to Truro St)																							
454m of 250 oPVC	124151	2026																	124151				
Boundary Rd (Walkers Rd to Moolyyir St)																							
1978m of 300mm oPVC	651439	2026																	651439				

Toogoom Trunk Main (mains supplying Toogoom Reservoir)																							
4800m of 200mm DICL	974000	2030																					974000
	10,405,091																						
Reticulation																							
Burrum St (Burrum Heads Rd to Dudley St)																							
478m of 150mm oPVC	86422	2010	86422																				
O'Regan Creek Rd (west of Jepperson Rd)																							
290m of 150mm oPVC	52432	2010	52432																				
Beach Rd (Old Maryborough Rd towards Islander Rd)																							
105m of 150mm oPVC	18984	2011		18984																			
Colyton St (Honiton St to Caswell Ct)																							
128mm of 150 oPVC	23142	2011		23142																			
Colyton St (Honiton St to Cato Ct)																							
168m of 150mm oPVC	30374	2011		30374																			
Johnson Blvd (Romeck Crs to Julieanne St)																							
289m of 150mm oPVC	59650	2011		59650																			
Rosewood Ave (Milo St to Sandlewood Dr)																							
448m of 150mm oPVC	80998	2011		80998																			
Johnston Blvd (Main St to Romeck Ct)																							
666m of 150mm oPVC	137462	2013				137462																	
Boat Harbour Dr (Robert St to Bruce St)																							
906m of 150mm oPVC	163805	2015						163805															
Burrum St (Dudley St to Bushnell Rd)																							
477mm of 150mm oPVC	76320	2016							76320														
Gilston Rd (Boundary Rd to Carrick Wy)																							
1097m of 150mm oPVC	180786	2016							180786														
Ocean Outlook (Longview Dr to Cove Blvd)																							
947m of 150mm oPVC	246978	2016							246978														
O'Regan Creek Rd (East of Jepperson Rd)																							
481m of 150mm oPVC	76960	2016							76960														
Julie Anne St (Johnston Blvd to Queensbury Gve)																							
208m of 150mm oPVC	42931	2021												42931									
Proposed Main Street Subdivision (Westminster Ct to Davis Dr)																							
720m of 150mm oPVC	118656	2021												118656									
Exeter St/Honiton St (Robert St to Urangan St)																							
510m of 150mm oPVC	92208	2021												92208									
Boundary Rd (Hughes Rd to Senorita Ave)																							
342m of 150mm oPVC	61034	2021												61034									
Cecily Tce (Ferris Ave to Woolfe St)																							
124m of 100mm oPVC	29018	2026																	29018				
Dundee Dr (Doolong Rd to Cromdale Crt)																							
154m of 150 oPVC	27843	2026																	27843				
Bideford St (Colyton St to Woodland Cl)																							
119m of 150mm oPVC	31515	2026												31515									
	1,637,518		1,110,027	1,303,672	2,958,000	996,967	1,237,567	18,413,805	3,503,474	-	-	-	7,175,000	1,593,119	-	100,000	-	-	1,731,978	-	-	-	974,000

10.0 CONCLUSIONS AND RECOMMENDATIONS

10.1 Conclusions

The development of a Water Supply Strategy document for Wide Bay Water Corporation has provided the basis of a capital development programme covering the period to 2030 and also identifying major capital development projects through to 2050.

Due to a significant reduction on potable water consumption from 785 L/Ed/day in 2004 to 590 L/ED/day in 2009, the demand on Corporations infrastructure has reduced to match that demand. Population growth figures have not altered to the same extent, but the combined impact has the effect of reducing the financial impacts to the Corporation. WBWC has undergone a significant development programme over the last several years and the benefits of that work will be felt for many years to come.

A capital development programme valued at a little over $90m will be required over the next 30 years, with the majority of that expenditure (42%) taking place in the last two years of that period.

A number of assumptions have been made in developing this strategy document with the main ones being a static water demand per property and population growth rates that slowly reduce over time. Both of these issues will need to be reviewed over time as they are the key drivers for infrastructure development. WBWC has made major advances in water demand reduction over recent years and these advances need to be carried forward into future generations as they are instrumental in reducing the demand on water infrastructure and therefore the need for capital expenditure by the Corporation, which has a flow on impact on consumers.

10.2 Recommendations

The following recommendations are made with respect to the above report:

1. That the WBWC Board adopts the Hervey Bay Water Supply Strategy Report 2009 as the basis for development of a Capital Works Programme for the period to 2030 with major projects identified to 2040.

2. That this report is reviewed every two years to address changes to water demand and population growth.