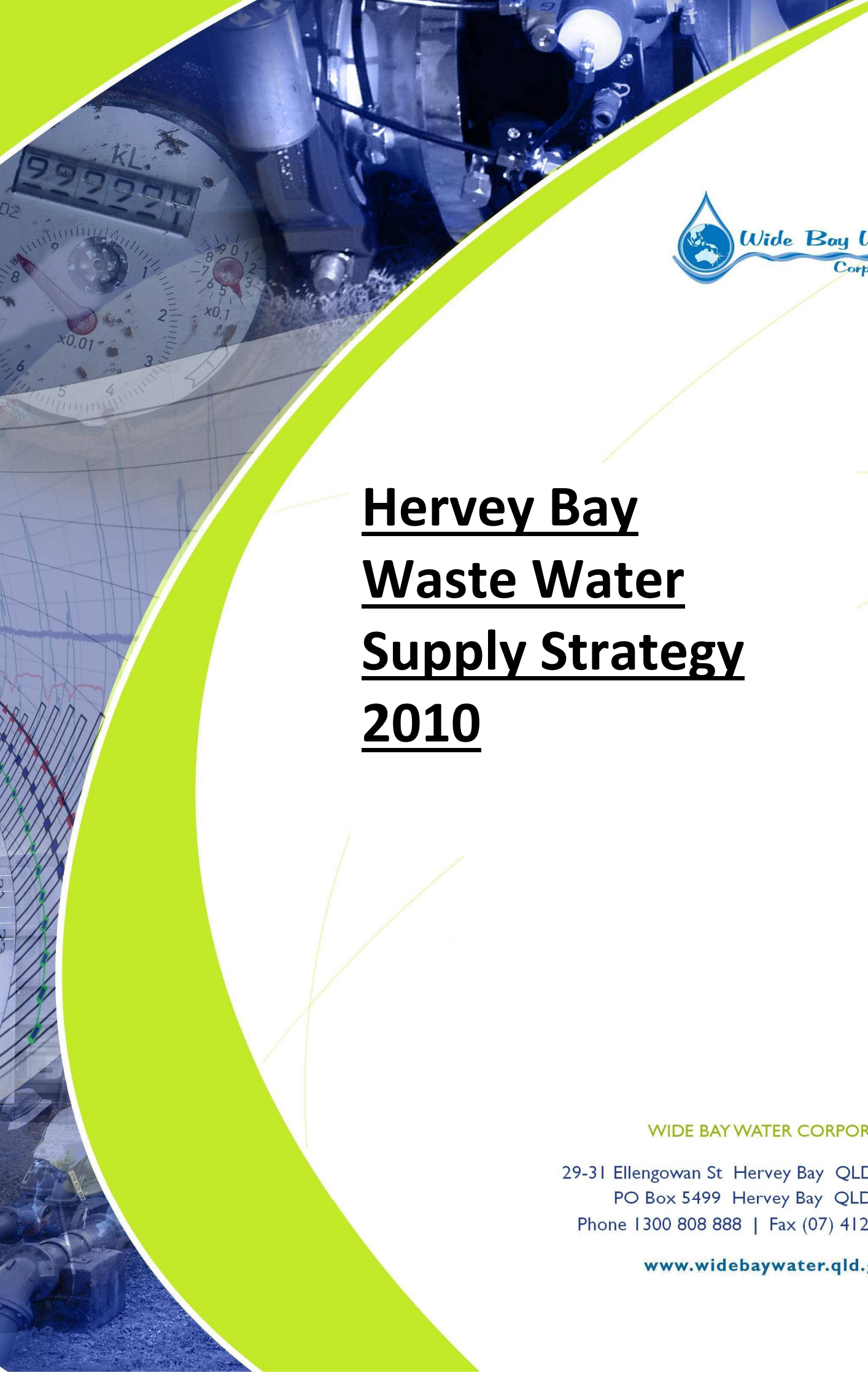



Wide Bay Water Corporation

# Hervey Bay Waste Water Supply Strategy 2010

WIDE BAY WATER CORPORATION

29-31 Ellengowan St Hervey Bay QLD 4655
PO Box 5499 Hervey Bay QLD 4655
Phone 1300 808 888 | Fax (07) 4125 5118

www.widebaywater.qld.gov.au

# WIDE BAY WATER CORPORATION - WASTEWATER STRATEGY 2009
# PROPOSED DOCUMENT CONTENTS

# Table of Contents

# 1.0 INTRODUCTION

Previous sewerage infrastructure planning for the Wide Bay network included reports prepared by Cardno MBK: in 2001 the *Wide Bay Water Wastewater Transportation System Study* and the *Wide Bay Water Hervey Bay Wastewater Collection, Treatment and Disposal Planning Report* in 2003. The *Water and Wastewater Planning Strategies March 2004 Addendum* was subsequently prepared by WBWC as a result of higher than expected population growth and development in the Hervey Bay region.

The Addendum's main recommendation was for the construction of a third wastewater treatment plant at Nikenbah adjacent to the existing 800ML effluent storage dam. Diversion of flows to the new WWTP from both Pulgul and Eli WWTP's would then provide for additional development within each of these catchments. The Nikenbah WWTP is currently under construction and is expected to be commissioned towards the end of 2009.

The main objective of this strategy review is to evaluate the capacity of the existing wastewater systems to meet projected population growth and to identify infrastructure requirements to satisfactorily manage these demands to the year 2030.

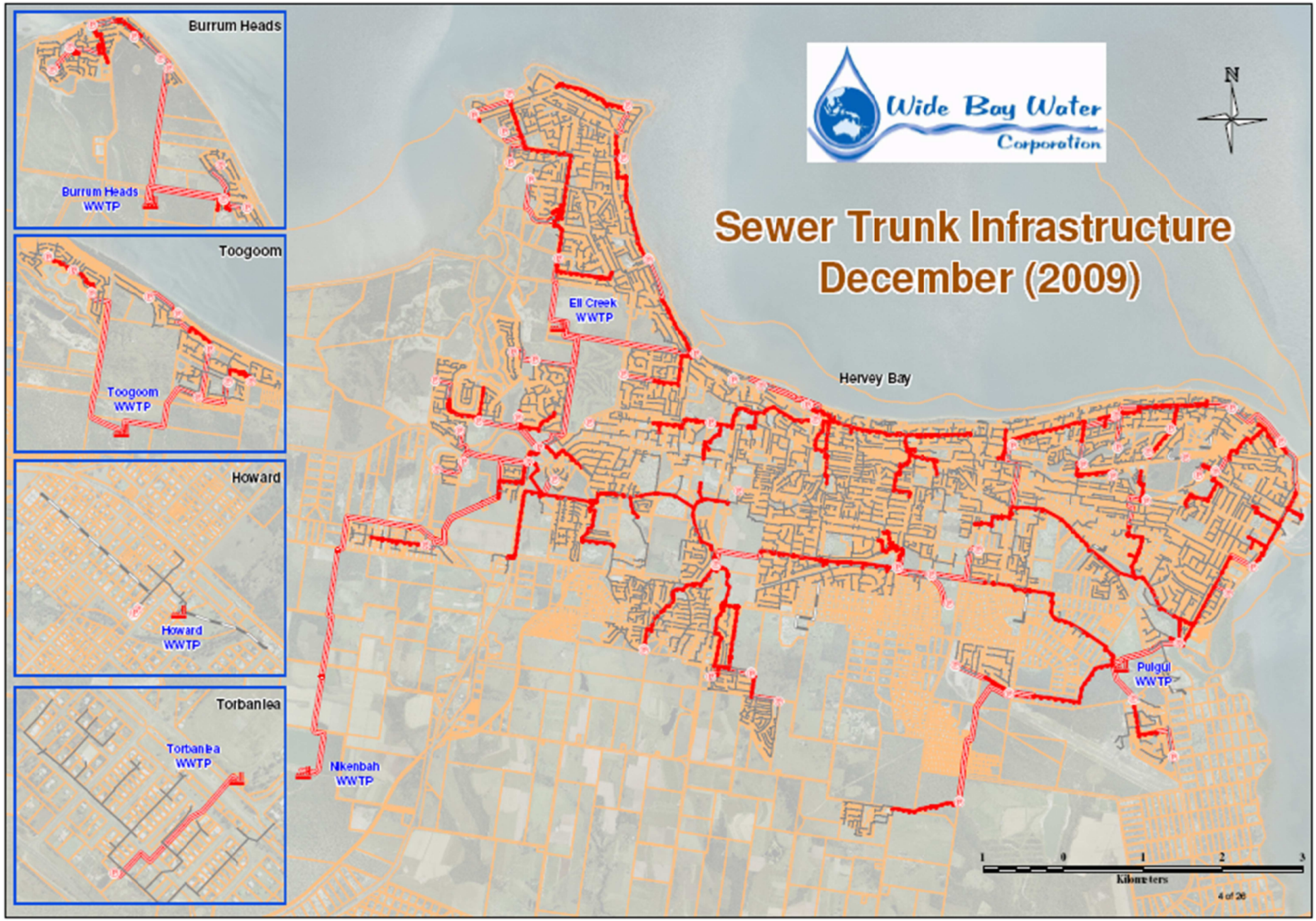
A major part of the investigation included the reassessment of demand forecasts resulting from sustained high growth rates in Hervey Bay, upward revisions of predicted future growth and changing patterns of water use resulting from demand management initiatives.

The primary objectives of this Report are to:

- Assess the existing wastewater loads based on recently recorded flow data;
- Assess the projected wastewater loads, 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 wastewater treatment plant requirements and determine the most appropriate method of augmentation to meet projected community growth;
- Evaluate the impacts that the revised population projections and development sequencing will have on the major wastewater transport infrastructure components (eg. trunk mains, pump stations, rising mains)
- Allocate the revised wastewater loads to the hydraulic model and identify where the system 'fails';
- Identify the additional wastewater infrastructure and the appropriate construction timing required to deliver the desired Standards of Service (SOS) to Wide Bay Water Corporation customers;
- Establish a preferred strategy for wastewater infrastructure planning up to 2031.

## *1.1 Study Area*

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


Burrum Heads
Burrum Heads WWTP
Toogoom
Toogoom WWTP
Howard
Howard WWTP
Torbanlea
Torbanlea WWTP
Wide Bay Water Corporation
Sewer Trunk Infrastructure
December (2009)
N
Ell Creek WWTP
Hervey Bay
Pulgul WWTP
Nikenbah WWTP
1 0 1 2 3
Kilometers
4 of 20

## 2.0 WASTEWATER

### *2.1 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:

- Total sewerage overflows per 100km/year: < 10;
- Odour complaints per 1,000 connections/year: < 10;
- Response/ reaction time to incidents: 1 Hour;
- Compliance with EPA Licence: 98%;
- Utilisation or disposal of Sewerage Sludge Biosolids: 100%

### *2.2 Sewerage Treatment Systems*

The Hervey Bay Sewerage system is serviced by seven treatment plants:

- Eli Creek WWTP – A conventional trickling filter plant commissioned in 1969. The current plant's design capacity is estimated to be 4.5 ML/d under Average Dry Weather Flow (ADWF).

- Pulgul WWTP – An Intermittently Decanted Extended Aeration plant and a modified oxidation treatment plant on the same site with a combined capacity around 7.4ML/d under ADWF.

- Nikenbah WWTP – Commissioned in 2010 and utilising Biological Nutrient Removal and membrane Bioreactor processes with a rated capacity of 4.8ML/d under ADWF.

- Torbanlea WWTP – An Intermittently Decanted Extended Aeration package plant commissioned in 1994. The plant's design capacity is 130 kL/d.

- Howard WWTP – An Enviroflow Trickling Filter package. The plant's design capacity is 24kL/d.

- Burrum Heads WWTP – Comprised of a 625kL/d Intermittently Decanted Extended Aeration wastewater treatment plant.

- Toogoom WWTP –The plant consists of a 375 kL/d Intermittently Decanted Extended Aeration wastewater treatment plant.

## 3.0 POPULATION PROJECTIONS AND SYSTEM DEMAND

To determine the sewage load on the existing wastewater system an infrastructure planning model (IPM) was prepared.

An Equivalent Dwelling (ED) has been used to date as the basis for infrastructure planning in Hervey Bay. An ED was defined in the Water *and Wastewater Planning Strategies March 2004 Addendum* as the average sewage load generated by a single residential dwelling on an allotment less than 1000 $m^2$. An ED also forms the basis for the calculation of Infrastructure Charges in the Fraser Coast Regional Council's Planning Scheme policy No 4 (PSP4) where it is referred to as an Equivalent Demand Unit (EDU). In PSP4 however, the ED refers to a single residential property between 400 and 1000 $m^2$ and this has been adopted in this report to maintain consistency with current Planning Scheme Controls and Policies.

Each property within the proposed sewered areas within PSP4 were assigned an ED rating for sewerage loading for the following planning horizons:-

- Existing (2006)[1]
- 2011
- 2016
- 2021
- 2026
- ED(Ult) – 2030

Notes:

1. The planning horizons were adopted to align with the Hervey Bay Population Model which formed the basis of demand forecasts in PSP4 and which was benchmarked against the most recent Census data in 2006.

### *3.1 Existing and Projected ED Demand*

Existing and projected Residential demands were taken from the Hervey Bay City Population Model which is benchmarked against the State Governments Population Information Forecasting Unit's (PIFU) Medium Series population projection. An allowance has been made within the Model for the City's tourist population which will create an additional demand for accommodation and associated infrastructure.

Existing and projected Non Residential demand was estimated from a consideration of the development potential under the current zoning provisions, site and building constraints under the Planning Scheme , Equivalent Dwelling Units (ED's or EDU's) from the schedules of Infrastructure Planning Demands in PSP 4, and current metered consumption. Where current metered demand exceeds projected ultimate demand from the above analysis, the current metered demand and hence the ED loading to the sewer has been assumed to remain constant throughout the planning period. Growth in Non-Residential demand was assumed to follow the estimated PIFU forecast growth in population.

The Residential and Non-Residential Ed's were then applied to existing sewered properties from the rates database to determine the existing (2006) ED sewerage loads in the Model. The results were then compared with records of major Sewer Pump Stations throughout Hervey Bay to ensure that the existing load in the Sewer Model was comparable with the performance of the current system.

Flow records for the WWTP's were analysed against Bureau of Meteorology rainfall data to determine a suitable period for estimation of Average Dry Weather Flow (ADWF) per ED. The analysis showed a significant difference in the ADWF/ED between the Eli and Pulgul WWTP catchments in Hervey Bay. Further investigation of individual pump station flows strongly indicates that this difference is largely due to infiltration. The analysis concluded that **450 L/ED/Day** was an appropriate estimate of ADWF and this has been adopted as the basis for future planning purposes throughout the report. This represents a 9% reduction since 2004.

**Table 3.1 2009 WWTP ED Loads**

| Wastewater Treatment Plant | Residential ED | Non-Residential ED | Total ED | Plant Capacity ED Hydraulic Load | Plant Capacity ED Biological Load |
|---|---|---|---|---|---|
| Burrum Heads | 730 | 155 | 885 | 1,389 | 1,100 |
| Eli Creek | 3,903 | 2,491 | 6,394 | 10,000 | |
| Howard | 15 | 32 | 47 | 47 | 42 |
| Pulgul | 7,002 | 2,510 | 9,511 | 16,444 | |
| Nikenbah | 5,222 | 1,001 | 6,223 | 10,666 | 10,000 |
| Toogoom | 520 | 6 | 526 | 833 | 650 |
| Torbanlea | 126 | 18 | 144 | 289 | 120 |
| **Total** | **17,518** | **6,212** | **23,730** | **39,668** | |

Hydraulic load is only one factor in the design of sewerage systems. It determines the capacity of assets such as pipes, pumps, rising mains, tanks and storages. Biological load also needs to be considered in the sizing of individual treatment plant processes.

The communities of Burrum Heads, Howard, Toogoom and Torbanlea are also serviced by local WWTP's. It should be noted that the projections in these communities are based on current Planning Scheme constraints which provide for no growth beyond land presently zoned for development effectively putting a ceiling on growth in the recent growth areas of Toogoom and Burrum Heads. This is driven by current State Government Policy with respect to further development within these communities.

Potential exists for further development within the land currently zoned for development at Howard and Torbanlea but there are no plans to extend the sewered areas.

## 4.0 HERVEY BAY COLLECTION AND TRANSPORTATION

Trunk mains modelling were carried out for Eli Creek, Pulgul and Nikenbah. This modelling was carried out by applying the population loadings per catchment at the designated pump station. The model illustrated where sewage was lost (or there was an overflow) at a point i.e. at a manhole or pump station well. The overflows were caused by lack of capacity of the gravity main, pump station or main. These models will enable an assessment for replacement/augmentation of the sewage infrastructure and form estimation for the Capital Works Program.

### *4.1 Methodology*

As the population data relies both on residential and non- residential, an average of each profile at each particular time step was calculated and applied to each catchment. This profile enables a proportion of flow per ED to be estimated per hour in a 24 hour period for all three models. The model catchments are based on the revised sewer catchment incorporating Eli Creek, Pulgul and Nikenbah WWTP.

The problems encountered manifested themselves as volume of sewage lost ($m^3$) upstream of a pump station either at the pump well or an upstream manhole. If additional capacity was not provided, the magnitude of overflows increased at the next iteration. New overflows also became apparent at each iteration. To resolve the overflow problems, overflows from each manhole and/or storage were allocated to the nearest downstream pump station. The logic was that the pump/rising main was unable to keep up with the upstream flows and thus needed to be upgraded/augmented. Please note that the model gives an indication of the locations and timing of future upgrades. The model can account for the effects of an ageing system but it cannot account for other system deficiencies. Works in addition to those identified in this report may be required due to a more rapid deterioration of system assets.

### *4.2 Results Summary*

#### *4.2.1 Eli Catchment*

The Eli Creek Wastewater catchment has been modelled while removing the catchments for Pump Station 30, 58 and 69 as they will become part of the Nikenbah catchment.

The model identified an overflow at Pump Station 5 (PS 05) in the 2016 model run in a Peak Wet Weather Flow (PWWF) scenario. The solution was to increase the capacity of the pumps and add a supplementary DN 450 mm rising main. In some cases upgrading the system has a flow on effect. The resulting additional flow caused capacity issues downstream at PS 04. To address this issue PS 04 pumps also needed to be upgraded together with a new DN 450 rising main to Eli Creek WWTP.

**Additional work**
An all mains model was created for the Eli Catchment due to concerns with the gravity main in Main Street and Torquay Road. The existing concrete sewer runs under several buildings in the commercial district and will not be able to sustain increased loads from the upstream catchment. This was confirmed after running the 2016 model whereby MH 11548 (located in Hunter Street) overflowed. Upgrading of this sewer had been previously identified in PSP4 to be funded by infrastructure charges and has been included in the capital works program.

#### *4.2.2 Pulgul Catchment*

Problems were identified in the Urangan Street Trunk Sewer with overflows during peak wet weather events. A number of options were available to address this problem:-

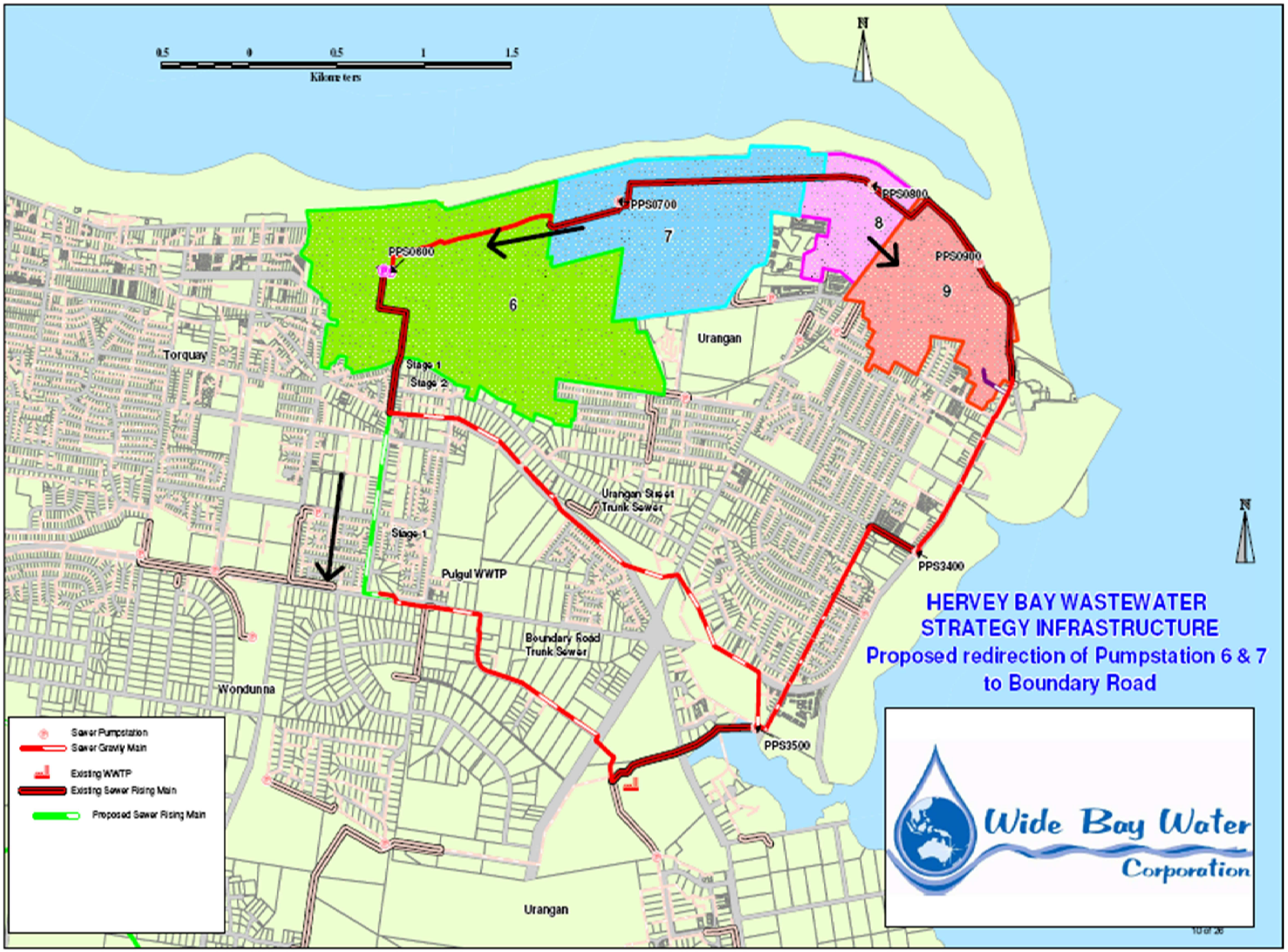
1. Duplicate the Urangan Street Trunk Sewer and upgrade PS 35 in 5 years;
2. Redirect PS 06 to the Boundary Rd Trunk Sewer as stage 1 (Urangan Street Trunk Sewer no longer requires duplication). Stage 2 being an upgrade to the capacity of PS 06 and duplication of the existing rising main as growth occurs in the catchment of PS 06. Stage 2 is required in 2016 followed by an upgrade of PS 35 in 2026.

1. Redirect both PS 6 and PS 07 to the Boundary Rd trunk sewer. This option removes any upgrade to PS 35 during the planning period.
2. As per 3 above, but PS 8 also transferred to PS 6.

The following identifies the capital cost of each option and NPV on capital cost.

| Option | Capital Cost | NPV (Capital Cost) at 4% | NPV (Capital Cost) at 6% | NPV (Capital Cost) at 10% |
|---|---|---|---|---|
| 1 | $1.243M | $1.100M | $1.039M | $0.933M |
| 2 | $1.118M | $0.835M | $0.737M | $0.592M |
| 3 | $1.074M | $0.907M | $0.839M | $0.725M |
| 4 | $1.280M | $1.064M | $0.976M | $0.830M |

Option 3 has the lowest capital cost and should provide the best operational improvement of the four options.


0.5 0 0.5 1 1.5
Kilometers
N
PPS0700
PPS0800
PPS0600
PPS0900
6
7
8
9
Torquay
Urangan
Stage 1
Stage 2
Urangan Street
Trunk Sewer
Stage 1
Pulgul WWTP
PPS3400
Boundary Road
Trunk Sewer
Wondunna
PPS3500
Urangan
Sewer Pumpstation
Sewer Gravity Main
Existing WWTP
Existing Sewer Rising Main
Proposed Sewer Rising Main
HERVEY BAY WASTEWATER
STRATEGY INFRASTRUCTURE
Proposed redirection of Pumpstation 6 & 7
to Boundary Road
Wide Bay Water
Corporation

### *4.2.3 Nikenbah Catchment*

The Nikenbah WWTP services the catchments and contributing sub-catchments of Pump Stations 30, 33 and 58 from Eli Creek and Pump Station 23 from Pulgul. The plant has a capacity of 10,000 ED with an ADWF of 4.8 ML per day. The WWTP has been designed so that it can be upgraded in stages to 30,000 ED. Pump Station 83 which supplies the Nikenbah WWTP has also been designed to allow an upgrade to 30,000 ED. A DN 450 rising main has been constructed and this will require augmentation with a DN 600 main around 2021 together with an upgrade of the pump capacity in PS83.

A trunk main model was created to analyse the Nikenbah catchment. This confirmed the staging for PS83 and the rising main(s) to Nikenbah.

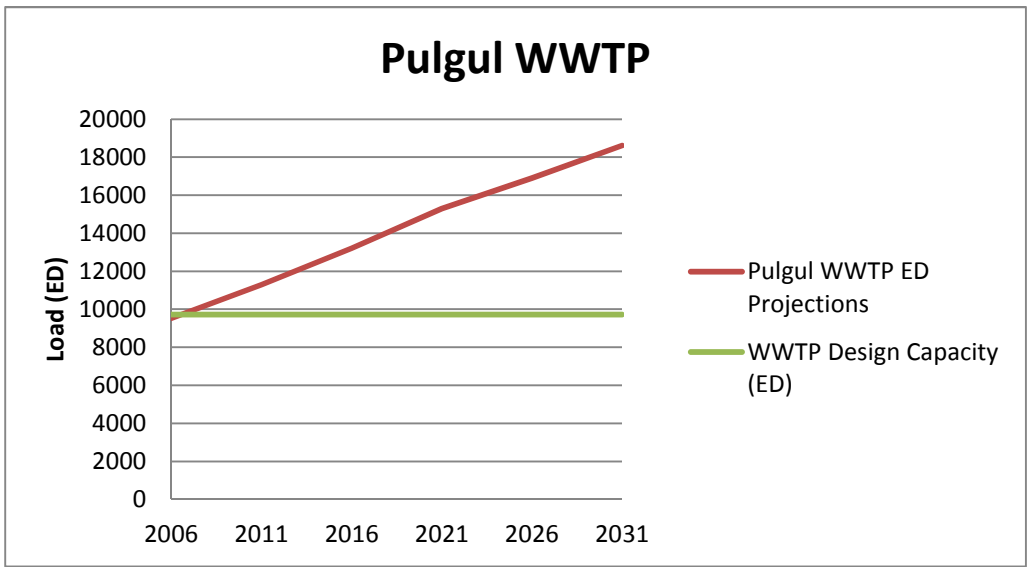
## 5.0 HERVEY BAY TREATMENT

### *5.1 Pulgul WWTP*

In 2005 the Pulgul WWTP was upgraded to 9,720 ED. There are two process trains at Pulgul, an oxidation ditch and an IDEA tank. In the oxidation ditch problems are being experienced with elevated ammonia levels and aeration systems running at peak capacity for most of the day. In addition, the capacity of downstream clarifiers severely restricts the hydraulic capacity of this process train. In the IDEA tank, short circuiting limits the hydraulic loading rate to less than half its design capacity.

Even with the load transfer of the PS23 catchment to Nikenbah, the Pulgul WWTP is at or nearing its capacity based on current ED loads entering the plant. The plant is hydraulically limited in its current configuration and modifications to the IDEA tank may be able to provide additional capacity in the short term. The graph below shows the projected loads on the plant and the urgency of a major augmentation to meet future demands. Commencement of planning for the next augmentation should commence as a matter of urgency. It is unlikely that commissioning would occur in less than 3 years.

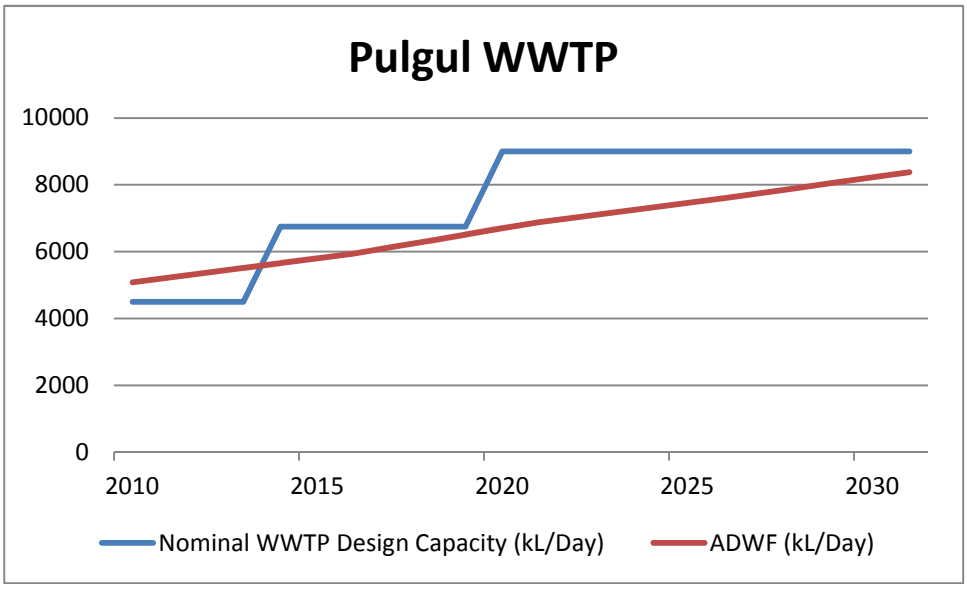
**Graph 5.1.1 Pulgul WWTP Capacity**




**An additional 10,000 ED upgrade of Pulgul will entail the construction of a complete new process train although some existing infrastructure such as the inlet works can be utilised within the new development.**

The upgrade could be undertaken as two 5,000 ED augmentations in 2013 and 2019 or a single 10,000 ED augmentation in 2013/14. At this stage it is proposed that a detailed review and financial analysis be undertaken as a separate activity to this document.

**Graph 5.1.2 Pulgul Augmentation**



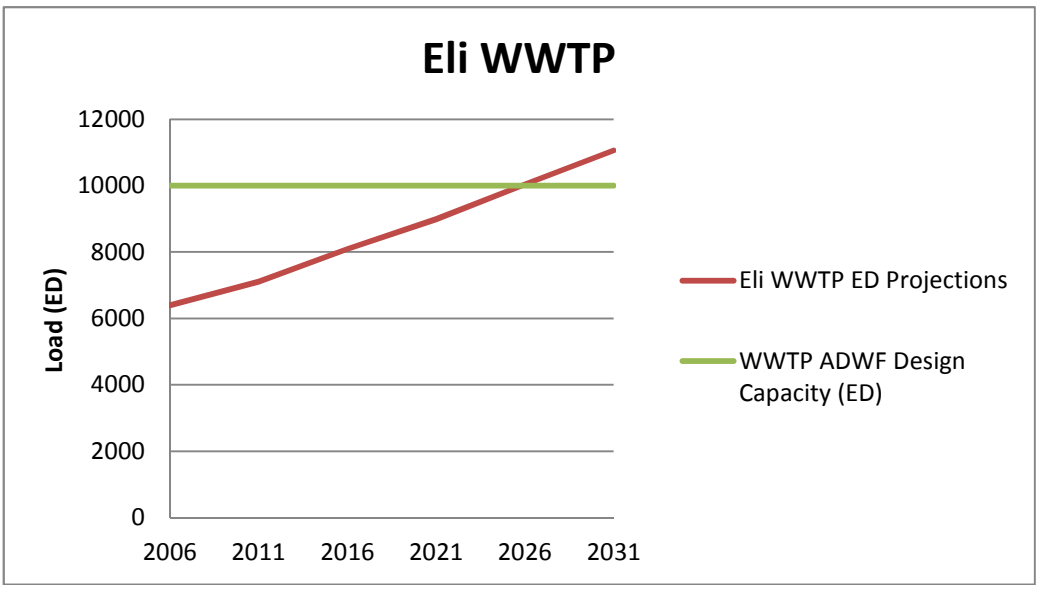

## *5.2 Eli WWTP*

The Eli Creek Wastewater Treatment Plant is a Trickling Filter/Solids Contact process with a capacity of (10,000 ED) although it has been operating above this capacity at up to 11,500-12,000 ED over recent years. Composite sampling conducted at PS4 (and PS33) in 2006/07 indicated high levels of trade waste entering the sewerage system, and this continues to be reflected in current ammonia concentrations in the effluent. Effective policing of trade waste entering the sewerage system is essential in the optimisation of effluent quality leaving the treatment plant.

Eli WWTP is currently overloaded, however following commissioning of the Nikenbah WWTP only PS4 will continue to discharge to Eli WWTP, the other pumping stations being progressively redirected to Nikenbah. The transfer of load to the Nikenbah WWTP will take the pressure off the Eli WWTP in the immediate future and provide some capacity for further development in the catchment of PS4.

The graph below shows the projected load on the Eli WWTP and plant capacity. It can be seen that the WWTP will again reach design capacity around 2026. Whilst licence limits are generally met, Eli WWTP does have hydraulic limitations during wet weather events and overflows from the plant do occur to Eli Creek during such events.

**Graph 5.2 Eli WWTP Capacity**



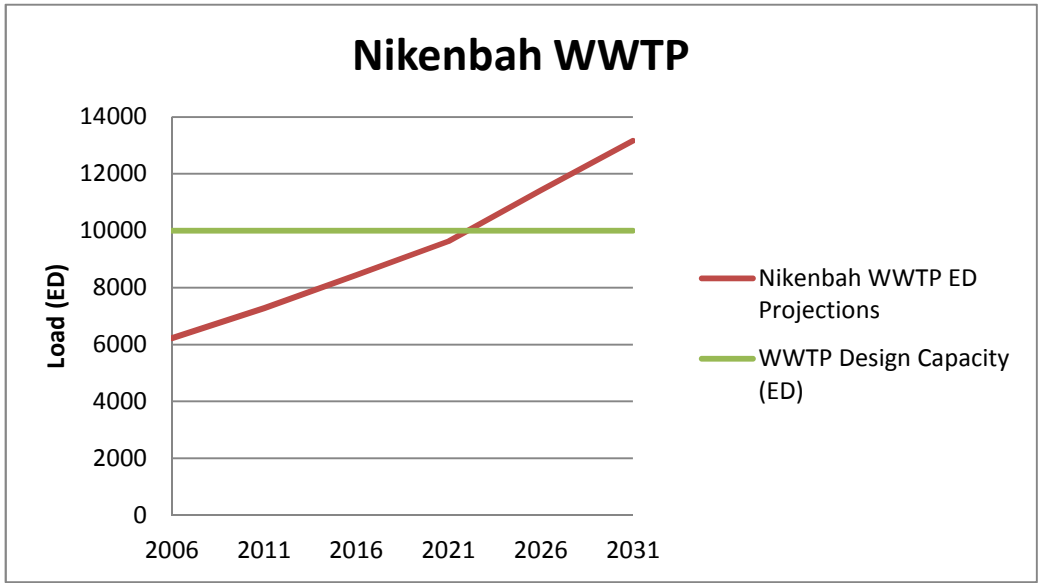
Given the proximity of the Eli WWTP to existing residential properties and the history of associated odour complaints, coupled with the fact that the odour buffer around the plant effectively sterilizes development of what could only be described as potentially prime residential land, provision of additional capacity at the site has not been considered appropriate and a capacity ceiling of 10,000 ED has been applied in the past. This philosophy has been carried forward in the options considered in this strategy review.

When Eli WWTP again reaches its design capacity in 2026, there will be a need to transfer loads from the Eli Catchment to an augmented Nikenbah WWTP. This can be achieved by development of a balance tank at Eli that will receive flows from PS4 and then transfer to Nikenbah.

### *5.3 Nikenbah WWTP*

The Nikenbah WWTP has a design capacity of 10,000 ED and will reach this milestone around 2020/21. This projection is consistent with previous design projections for the Nikenbah WWTP and the plant has been configured so that two additional treatment process trains can be added cost effectively. Two additional modules each of 10,000ED have been proposed at Nikenbah, the first being required by around 2021 based on current load projections.

**Graph 5.3 Nikenbah WWTP Capacity**



## 6.0 MINOR COMMUNITY TREATMENT

### *6.1 Burrum Heads WWTP*

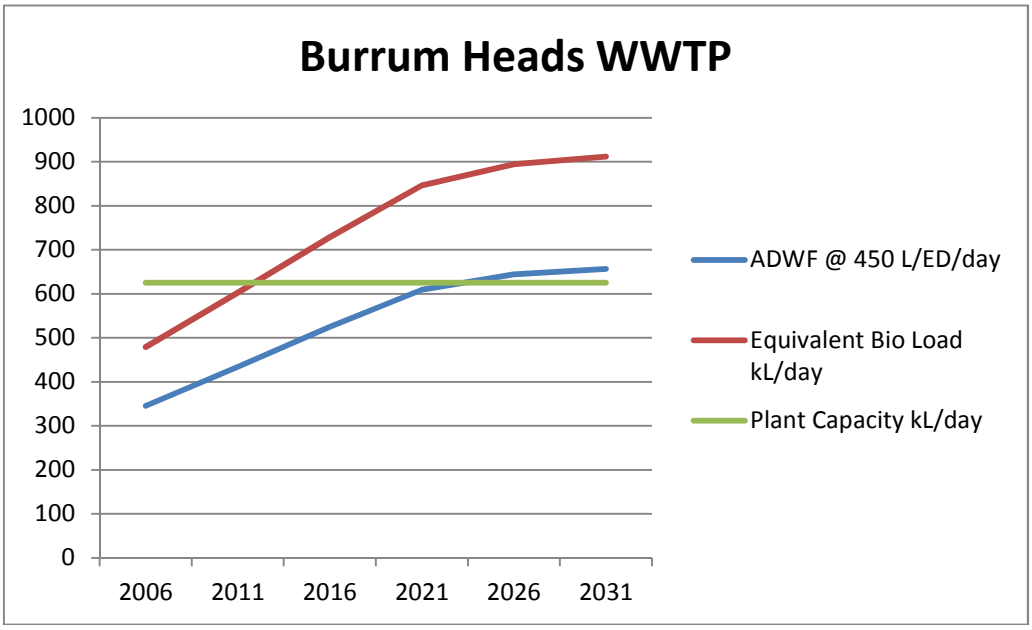
Burrum Heads WWTP has a nominal capacity of 1087 ED (Based on 2.3 EP/ED) and the design is a hybrid version of the Intermittently Decanted Extended Aeration (IDEA) treatment process.

The original design basis of 250 L/EP/day is equivalent to an ADWF of 625 kL/day. Records of recent inflow to the WWTP suggest that hydraulically there is adequate capacity at the plant for some considerable time to come and that recent work on inflow and infiltration is actually reducing inflows to the plant. However biologically this is unlikely to be the case.

There is no recent continuous influent quality monitoring data available for the WWTP but assuming that the biological load per ED has remained relatively constant whilst hydraulic load per ED has reduced, then the equivalent biological load on the WWTP is directly proportional to the number of ED's contributing to the plant.

From the Hervey Bay Population Model the estimated ED load on the Burrum Heads WWTP is 885 (2009) and it is forecast to rise beyond 1,000 ED (nominal Plant capacity) by 2012. There is an urgent need to determine the actual ED load on the plant through continuous influent quality monitoring to more accurately predict the timing (and hence capital requirements) of an augmentation at the WWTP. However, if hydraulic loads were determined to be the controlling factor, then an upgrade would not be required until around 2023, refer following graph.

**Graph 6.1 – Burrum Heads Treatment Capacity**




It should also be noted that the flow per ED in Burrum Heads appears to be considerably less than average flows per ED in Hervey Bay; although this could be associated with low occupancy rates (holiday houses). Noticeable flow peaks of around 25-30% of plant inflow coincide with the school holiday periods. This is likely to be associated with tourist loadings and the return of non-resident population to holiday houses during the holiday periods.

*Future Loads*

Load projections for the Burrum Heads WWTP indicate that they will increase from an estimated 885 ED (2009) to an ultimate load of 1459 ED in 2030. This is the ultimate development potential of land under the Planning Scheme and identified in the Priority Infrastructure Plan in Burrum Heads that is to be serviced by the WWTP.

*Capital Upgrades*

Marginal capacity increases may be available by changes in operation of the WWTP but in order to meet the projected demand in Burrum Heads, a significant increase in plant capacity will be required. It is proposed to duplicate the existing plant to provide for a total capacity of 2,000 ED ultimately, but to only provide for sufficient aeration capacity for an additional 600 ED as Stage 1.

This strategy was employed in the Toogoom plant enabling a relatively inexpensive short term capacity increase, and it is an appropriate strategy given the level of uncertainty surrounding the ultimate development potential at Burrum Heads.

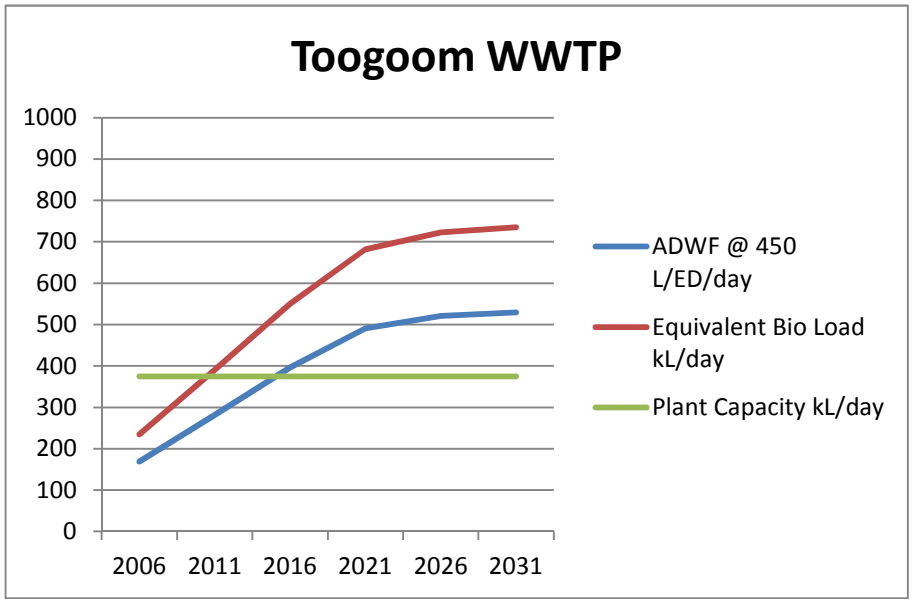
## *6.2 Toogoom WWTP*

Toogoom WWTP has a nominal capacity of 650 ED (Based on 2.3 EP/ED) and the design is a hybrid version of the Intermittently Decanted Extended Aeration (IDEA) treatment process.

The original design basis of 250 L/EP/day is equivalent to an ADWF of 375 kL/day. Records of recent inflow to the WWTP suggest that hydraulically there is adequate capacity at the plant for some considerable time to come and that recent work on inflow and infiltration is actually reducing inflows to the plant. However as with Burrum Heads, biologically this is unlikely to be the case.

From the Hervey Bay Population Model the estimated ED load on the Toogoom WWTP is 526 (2009) and it is forecast to rise beyond 600 ED (nominal Plant capacity) by 2011. There is an urgent need to determine the actual ED load on the plant through continuous influent quality monitoring to more accurately predict the timing (and hence capital requirements) of an augmentation at the WWTP. However, if hydraulic loads were determined to be the controlling factor, then an upgrade would not be required until around 2015, refer following graph.

**Table 6.2 – Toogoom WWTP Capacity**




The Toogoom WWTP was designed to be increased to a capacity of 2500 EP (1000 ED) without the need for additional treatment tanks.

It should be noted that flow monitoring at the plant suggests that recent works to repair damaged manholes, pipes and junctions throughout the reticulation has resulted in a dramatic reduction in the amount of inflow and infiltration entering the system during wet weather events, so much so that there are no significant spikes in inflow as a result of recorded rain events over the last 12 months.

It should also be noted that the flow per ED in Toogoom appears to be considerably less than average flows per ED in Hervey Bay, although this could be associated with low occupancy rates (holiday houses) in Toogoom. However, from recent inflow data there do not appear to be any noticeable increases in flows to the plant during school holiday periods.

*Future Loads*

The ED load for the Toogoom WWTP will increase from an estimated 526 ED (2009) to an ultimate load of 1176 ED in 2030. This is the ultimate development potential of land identified in the Priority Infrastructure Plan in Toogoom that is to be serviced by the Toogoom WWTP.

This makes no provision for existing unserviced properties along either side of Moreton St and the Esplanade in Toogoom. Servicing of these existing properties was specifically excluded from the Priority Infrastructure Plan by decision of Council. Backlog servicing of these properties has not been allowed for in the load projections.

*Capital Upgrades*

The Toogoom WWTP was designed to be increased to a capacity of 1,100 ED without the need for additional treatment tank capacity. This minor augmentation was designed to be achieved by increasing the aeration capacity of the plant.

Once the augmentation has been completed the plant will have capacity for the projected development in Toogoom until around 2020 at which stage a further capacity augmentation at the plant will be required. If it is assumed that growth at Toogoom will increase beyond what is provided for in the Planning Scheme then it is likely that a duplication of the plant in stages as per the existing plant design would be appropriate. An additional 600 ED plant (with provision to increase to 1000ED) has been included in the forward capital works program in 2020.

## *6.3 Torbanlea WWTP*

Torbanlea WWTP and Effluent Disposal System

The Torbanlea WWTP was constructed in 1994 and consists of a 120 EP capacity intermittently decanted extended aeration package plant, designed with provision for the plants subsequent upgrade to a capacity of 220 ED . Chlorinated effluent from the plant gravitates to a 6.3 ML wet weather storage lagoon located approximately 600 m north of the plant. Reclaimed water from this lagoon is reused for irrigation of a 6 ha grassed area within the Torbanlea Racecourse property.
The plant is at capacity and no additional connections are being considered. There is also no provision for additional capacity to be provided at the WWTP in the recently adopted PSP4 (Infrastructure Charges Policy). Unless a development application is lodged there is no mechanism to levy headworks charges to fund an expansion of the plant. Connection of existing dwellings will only add additional load to the plant but provide no mechanism to recover the costs associated with the provision of additional wastewater treatment capacity at the plant.

*Future Loads*

There is no forecast growth in Torbanlea contributing to the WWTP under the Hervey Bay population model and total growth at Torbanlea is generally forecast in decline in each planning period to 2021. Additional demand on the sewerage system will likely come from sewer extensions to existing houses by way of sewer extensions but no capacity exists at the plant without a capacity augmentation at the plant.

## *6.4 Howard WWTP*

The Howard WWTP is a small trickling filter plant which has the capability to remove organic matter from the wastewater. This type of treatment process does not remove nutrients (phosphorous) from the wastewater. The original plant had a capacity of 42 ED which is equivalent to a hydraulic load of 24 kL/day.

An additional trickling filter has been added as a side stream process which operates in series with the original filter. Whilst this may improve the BOD/COD in the final effluent it does not add to the hydraulic capacity of the plant.

Influent Flow records for July/August 2009, a period of little or no rainfall, indicated that the plant was receiving 19KL/day. This was equivalent to an ED loading rate of approximately 400 L/ED/day. In September 2009 the flow into the plant jumped to an average of 38 kL/day. Further investigation has found that the dramatic increase in hydraulic load at the plant is due to discharge from laboratory sinks at the Howard Water Treatment Plant where raw water quality is continuously monitored.
There is also a serious inflow/infiltration problem within the sewer system at Howard. A daily flow peak of 238 kL was recorded on 18th Feb 2009 with 208 Kl the following day, almost 10 times the nominal design capacity of the plant. These inflows occurred when only 146mm fell over a period of 8 days at Howard, the maximum daily fall being 71mm. This is by no means a “peak wet weather” event and demonstrates the impact of inflow and infiltration on the Howard sewerage system.

*Future Loads*

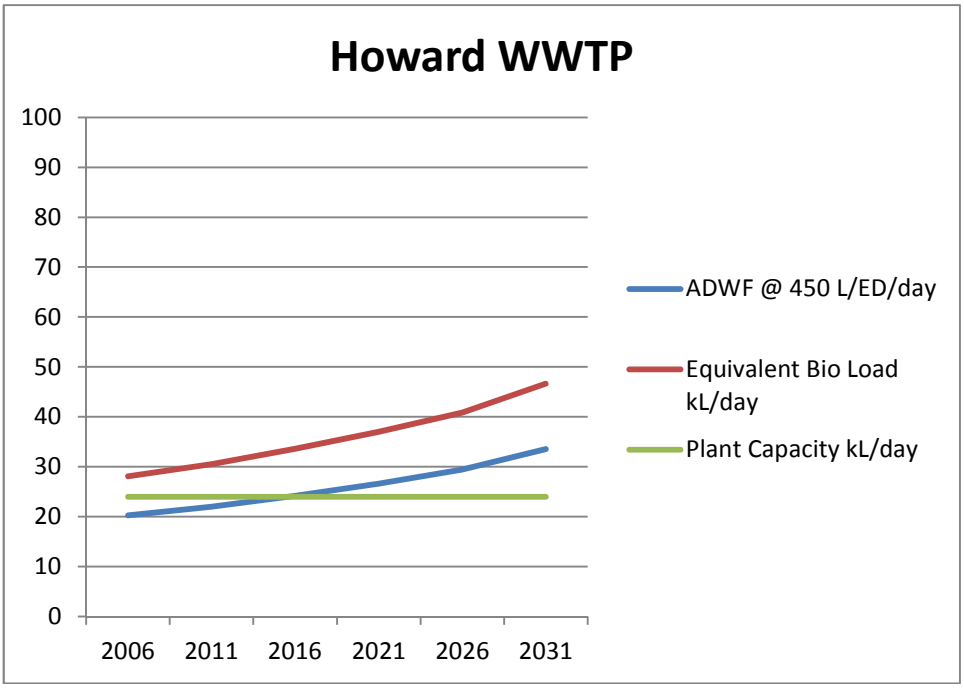
The current ED load is estimated at 47 ED compared with a design capacity of 42 ED. Redevelopment of existing sewered land in Howard has the potential to increase the load on the WWTP to 75 ED. Policy to date has been not to allow any additional connections to the Howard WWTP but it is unknown whether the same would be able to be applied to a redevelopment of existing sewered properties within the catchment. The Hervey Bay Population Model predicts that Howard is expected to grow from a population of 1502 in 2006 to an ultimate population of 3069 around 2031. With this population growth will come a demand for increased commercial services which will by their nature need to be connected to the WWTP.
There is no capacity available at the Howard WWTP for any additional connections.

*Capital Upgrades*

Financial assistance under the Small Communities Assistance Program has been sought towards the cost of sewering Howard but to date this has not been forthcoming. Withdrawal of subsidies in 2009 by the State Government would suggest that any form of financial assistance is unlikely, and efforts several years ago by WBWC to seek assistance from benefitting property owners towards the costs were not well received.

It is also unlikely that the EPA would approve a large capacity increase on or adjacent to the existing site at the rear of shops in the commercial centre of Howard. Were the sewering of Howard to occur it is most likely that a new site with appropriate buffer zones would need to be acquired remote to the township. For these reasons no allowance has been made for any capital upgrades at Howard, and no additional properties are being connected to the plant.

**Table 6.4 Howard WWTP**



## 7.0 HERVEY BAY DISPOSAL AND REUSE

### *7.1 Introduction*

Wide Bay Water Corporation (WBWC) has over the last decade maximised the reuse of effluent generated from the Hervey Bay Region becoming a national leader in the field. The Corporation provides effluent for irrigation to a variety of users including cane and turf farms, golf courses, sports fields and its own tree plantations.

With the expected continued high population growth in Hervey Bay, effluent production will increase and methods for its disposal that are both socially responsible and sustainable must be sought.

### *7.2 Current Strategy*

WBWC has made significant advances in it knowledge base, land acquisition program and its disposal method since the last Effluent Reuse Strategy was introduced in March, 2004.

The current strategy has as its main objective to focus on opportunities for beneficial reuse taking the following issues into consideration:

- Population growth and increasing volumes of recycled water
- Market demand for recycled water
- Community perception and support
- Sustainable irrigation application rates considering (i) Wet Weather and, (ii) Soil Sodicity and Salinity
- Acquisition of land by WBWC for further expansion
- Capital costs and return on investment

### *7.3 Wastewater Production*

The predicted total annual volumes of effluent produced by the seven waste water treatment plants owned by WBWC based on estimated ED Projection figures (Table 1)

**Available Re use volumes based on 9.4% total system loss** (Average previous 5 years)

**Table 7.3 Estimated ED Projections, Inflow and Volumes of Effluent Re- use Water**

| Plant | 2011 | | | 2016 | | | 2021 | | | 2026 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Load (ED) | Inflow (ML/a) | **Re use (ML/a)** | Load (ED) | Inflow (ML/a) | **Re Use (ML/a)** | Load (ED) | Inflow (ML/a) | **Re Use (ML/a)** | Load (ED) | Inflow (ML/a) | **Re Use (ML/a)** |
| **Eli Creek** | 7,108 | 1,168 | **1,058** | 8,087 | 1,328 | **1,203** | 8,984 | 1,476 | **1,337** | 10,040 | 1,649 | **1,494** |
| **Pulgul Creek** | 11,295 | 1,855 | **1,680** | 13,208 | 2,170 | **1,966** | 15,300 | 2,513 | **2,277** | 16,897 | 2,775 | **2,514** |
| **Nikenbah** | 6,223 | 1,022 | **926** | 8,437 | 1,386 | **1,255** | 9,634 | 1,582 | **1,433** | 11,415 | 1,875 | **1,699** |
| **Howard *** | 48 | 7.9 | **7.2** | 53 | 8.7 | **7.9** | 59 | 9.7 | **8.8** | 65 | 10.7 | **9.7** |
| **Toogoom** | 625 | 102.7 | **93.0** | 763 | 125.3 | **113.5** | 808 | 132.7 | **120.2** | 814 | 133.7 | **121.1** |
| **Burrum Heads** | 955 | 156.9 | **142.2** | 1155 | 189.7 | **171.9** | 1342 | 220.4 | **199.7** | 1419 | 233.1 | **211.2** |
| **Torbanlea** | 134 | 22.0 | **19.9** | 134 | 22.0 | **19.9** | 134 | 22.0 | **19.9** | 135 | 22.2 | **20.1** |
| **Total** | 26,388 | 4,334 | **3,927** | 31,837 | 5,229 | **4,737** | 36,261 | 5,956 | **5,396** | 40,785 | 6,699 | **6,069** |

- ED = 2.5 Equivalent People , ED load = 450 litres/day
- Howard WWTP receives up to an additional 10 ML/a from the Water Treatment Plant as part of the treatment process

The percentage of effluent or waste water collected and disposed of varies each year. In 2009, approximately 95% of the effluent produced in Hervey Bay was disposed of in a beneficial way, satisfying our EPA licence conditions.

## *7.4 Reuse*

Reuse Strategy Tenets:

(a) To achieve 100% beneficial reuse of all its treated effluent (recycled water)
(b) The first priority will be to distribute this recycled water on land or retain it in storages (No releases into the World Heritage Listed Great Sandy Straights, RAMSAR area)
(c) Any commercial use or enterprise that generates revenue and achieves the above two points should be encouraged.
(d) Social enterprises and/or socially responsible promotion of WBWC sustainability objectives that align with the above should be actively sought

Land and Storage Requirements:

Application rates are determined by soil type, climatic conditions, crop species and sustainability issues such as Salinity and leaching of soil nutrients.

Regardless of the type of land use, a maximum of 5 ML/Ha/annum is the recommended irrigation application rate to avoid soil degradation.

The current diversity in application, distribution and usage requires WBWC to hold storage capacity of approximately 6 months supply in any one year. Table 2 shows the predicted storage requirements for Hervey Bay Region under the current Water Reuse scheme. A detailed Water Balance Model is recommended for development as a priority to clearly identify the required water storage and land requirements for the developing community.

Table 7.4 Predicted Storage Requirements

| **Year** | **2011** | **2016** | **2021** | **2026** |
|---|---|---|---|---|
| **Production of Recycled Water (ML/day)*** | 10.76 | 12.98 | 14.75 | 16.63 |
| **Required Storage Capacity (ML)** | 1,960 | 2,370 | 2,690 | 3,030 |

*WBWC Cost Analysis Study*

It is important to have an understanding of the quantity of land needed and the best way that it can be utilised. WBWC has undertaken extensive trials on a number of crop types and tree species using reuse water, and has established set up and operational costs for each type. The strategy for the future is to maximise the economic return from the crop or crops grown by the corporation using the most efficient and secure methods.

*Land Use Recommendation*

The purchase of suitable land to develop well managed, effluent irrigated hardwood plantations incorporating carbon trading is recommended as it provides an excellent business opportunity for WBWC.

WBWC have developed a concept plan to convert the WBWC owned Hebblewhite Rd Farm into the Fraser Coast International Arboretum that will provide a recreational, educational and scientific asset to attract tourists to Hervey Bay.

A second proposal is to pipe recycled water from the new Nikenbah WWTP to what will be known as the Cassava Plantation Site. (Cassava Reuse Proposal 2007) The recycled water will be used in forest and wetlands and then introduced into the Cassava Dams.

*Other Potential Use of Recycled Water*

Other options for reuse include the expansion of current open space irrigation areas further investigation into economically viable crop species, horticulture, expansion of hardwood plantation products, and dual reticulation systems.

## *7.5 Small Community Schemes*

### *7.5.1 Howard*

At present the Howard treated effluent is used for the irrigation of the Burrum District Golf Course, with 100% reuse. As there are no plans to extend the sewered area of Howard in the immediate future, this disposal method will continue subject to the following conditions:

- The soil condition in the irrigation dispersal areas is tested at regular intervals to establish any soil management requirements, and commence a groundwater monitoring program to check the performance of the scheme.

### *7.5.2 Toogoom*

There is currently no reuse of the effluent being produced from the Toogoom WWTP, but WBWC has recently purchased land adjoining the WWTP for the development of a limited capacity re-use scheme. Effluent is discharged directly into polishing ponds to be exfiltrated into the ground water system.

### *7.5.3 Burrum Heads*

There is currently no reuse of the effluent being produced from the Burrum Heads WWTP. Effluent is discharged directly into polishing ponds to be exfiltrated into the ground water system. This effluent has high salinity levels and is not suitable for reuse.

To address this issue WBWC intends to augment the system to a scheme similar to Pulgul Creek and Eli Waters WWTP. In addition, in 2009 WBWC purchased a 175 Ha cane farm for beneficial reuse, of which around 80 Ha is suitable for hardwood plantation. This will allow 100% reuse of all the effluent generated from this plant and will be operational in 2010.

### *7.5.4 Torbanlea*

At present the Torbanlea treated effluent is used for the irrigation of the local racecourse and surrounding area. Based on current estimates it is likely that the racecourse will continue to receive 100% of the recycled water up until 2026.

## *7.6 Reuse and Disposal Conclusions*

The focus of the future WBWC Water Reuse program should be to continue with the move from a disposal operation to a profitable business. This will require sound management practices based on the development and expansion of its tree plantations.

WBWC will be in a position of strength to offer consultancy services to other Water Service Providers as it continues to develop its knowledge base and operational experience. These services may include:

- Advice on setting up a hardwood plantation program
- Technical expertise in engineering, agribusiness and operations
- Project management
- Possible profit sharing arrangements under the WBWC umbrella

Carbon trading has the potential to become a key component of the strategy, not only is it an opportunity to generate income, but it offers opportunities for partnering with large organisations. This could promote WBWC as an organisation that embraces social enterprise.

The final key element of the strategy will be to ensure that pricing of this valuable resource is both responsible and sustainable. Commercial buyers of effluent need to be paying fair market value if WBWC wants to shift from a disposal operation to a business.

## 8.0 INFLOW AND INFILTRATION

Gravity sewerage reticulation systems have historically (NRM Guidelines) been designed for a Peak Wet Weather Flow (PWWF) of 5 times the Average Dry Weather Flow (ADWF) entering the system.

The PWWF flow allows for unwanted inflows that are referred to inflow/infiltration or I/I. Groundwater infiltration and stormwater inflow are the sources of this additional flow. Inflow is apparent in flow data as it reflects an increase in sewage flows during a rain event. The stormwater enters through direct connections of rooves into the sewer, other illegal connections and broken manholes. In the case of Infiltration, the sewer system acts like an agricultural drain drawing down local groundwater levels. The recession curve continues for a much longer period of time after the rainfall event and is usually quite distinct. Infiltration into the sewer is related to the height of the water table and in coastal areas can be influenced by tidal ranges/intrusion. Infiltration enters the system due to infrastructure integrity and/or poor construction techniques.

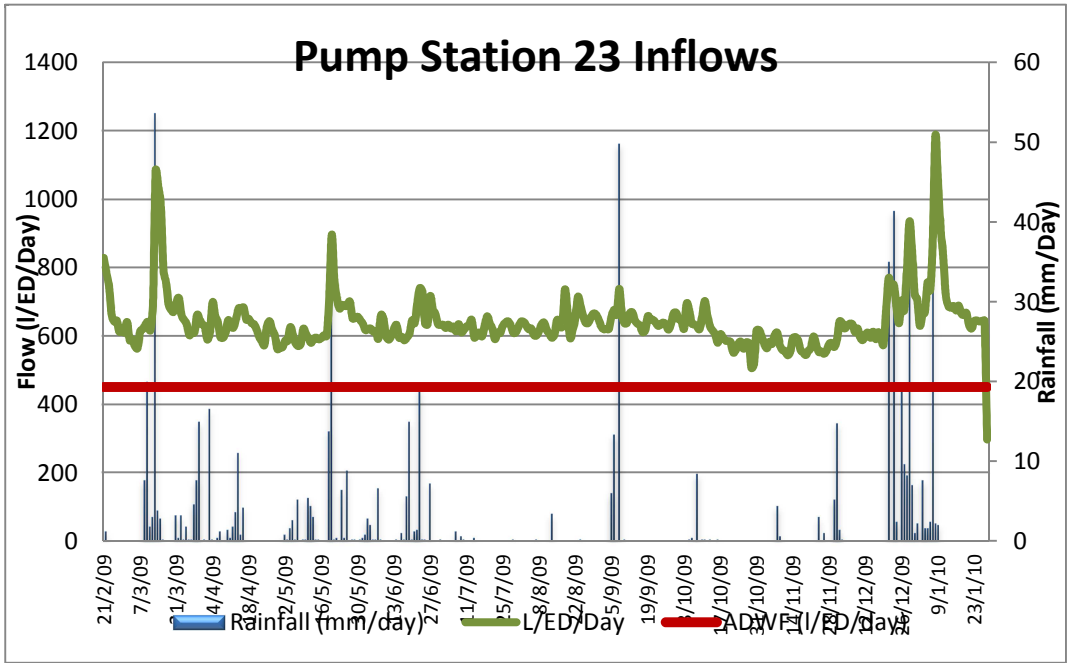
Over the last 12 month period, whilst there were some rain events, none of these were significant enough to approach a 'peak" wet weather event. Apart from the Toogoom WWTP, all other WWTP's show inflow and infiltration (I/I) to varying degrees in their systems. At the treatment plant level, capacity must be provided either for treatment or partial treatment, and provision made to capture and store flows for later reuse.

Flow records from several of the major pump stations were compared with the adopted 450 L/ED/day to better understand this phenomenon. Rainfall data was added to these records to enable comparison of sewage flows and the impact that rainfall has on the system. Definite sewage flow peaks during wet weather were easily identified as they correlated with the timing of the rain event. There are some spatial differences as rainfall can be varied across a large area. Although most pump stations were analysed in this way, the following pump stations have been identified as needing further investigation:

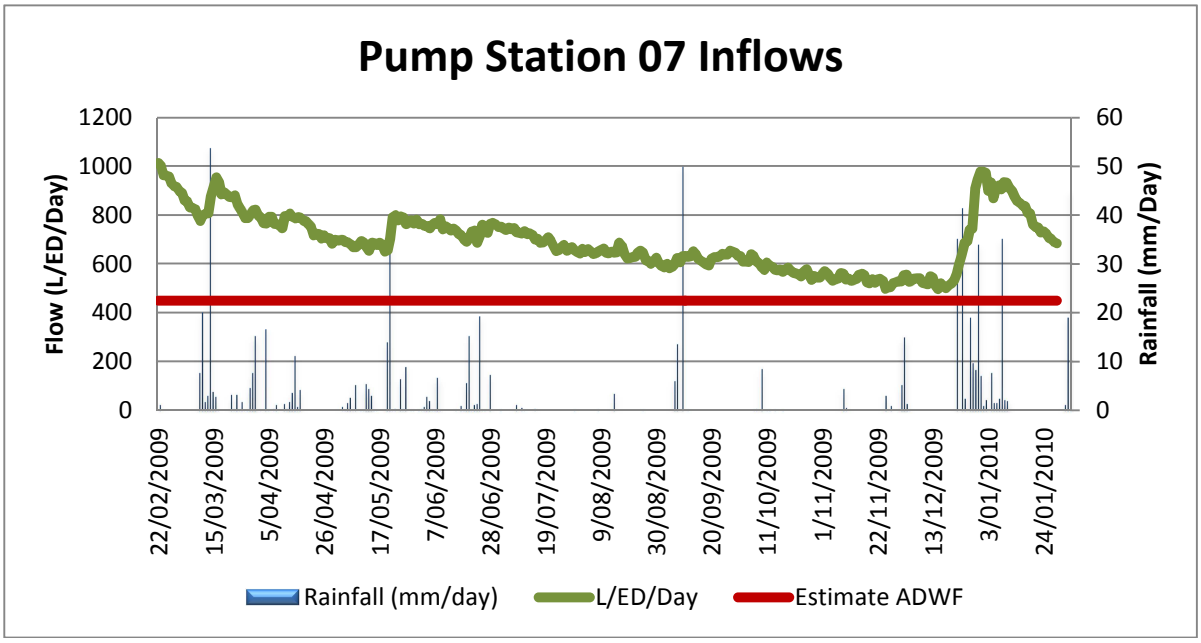
- Pump Station 23 - ADWF 650 l/ED/Day.
- Pump Station 7 – ADWF indeterminate due to groundwater infiltration

It is evident from this snapshot of Pump Station 23 daily flows (see figure below) that there are some significant I/I problems that are distorting the flow per ED. It is possible that the figure of 450 L/ED/day adopted throughout this report can be reduced to around 400 L/ED/day in the long term but this will be dependant upon the success or otherwise of a targeted I/I investigation and reduction program.

**Graph 8.1 Pump Station 23 Inflows**



**Graph 8.2 Pump Station 7 Inflows**



## 9.0 OPTIONS REVIEW

Load projections for the Hervey Bay WWTP's detailed earlier in this report indicate that the Pulgul WWTP is currently at or beyond its capacity. Given the lead times involved for such a project (3-4 years to commissioning) it is essential that planning for this project commence as a matter of urgency. The Capital Works program provides for a complete review of the Pulgul WWTP in 2010/11 including any short term options available to address the current deficiencies, and for detailed design of the next augmentation of the plant. The program further provides for two 5000 ED augmentations at the plant, the first to be funded over two financial years with commissioning in 2013 , and the second with similar funding arrangements to be commissioned around 2019. The Planning study of the plant will also address the option and economics of a single 10000 ED augmentation of the plant to be commissioned as soon as possible. These proposed augmentations will provide for development throughout the planning period.

The projections also indicate that subsequent to the transfer of load to Nikenbah, the Eli WWTP will have capacity for growth within the Eli catchment up to its nominal design capacity until around 2026. Given the proximity of the Eli WWTP to existing residential properties and the history of associated odour complaints, coupled with the fact that the odour buffer around the plant effectively sterilizes development of what could only be described as potentially prime residential land, provision of additional capacity at the site has not been considered appropriate and a capacity ceiling of 4.5ML/day (10000 ED @ 450 L/ED/day) has been applied in the past. This philosophy has been carried forward in the options considered in this strategy review. Any additional growth beyond 10000 ED has been transferred to Nikenbah.

This will involve the construction of a pump station and a combined 0.7ML balance tank adjacent to the Eli WWTP and 1.9 km of DN450 rising main to the DN750 trunk main near the old PS33 site which discharges to PS83 and Nikenbah. It is further proposed that PS 4 will discharge into this pump station and that lift pumps will limit the ADWF into the inlet works at Eli WWTP to 4.5 ML/day with wet weather flows limited to 3 x ADWF into Eli WWTP. These works have been proposed for 2026 when the ADWF going to Eli WWTP is forecast to reach 4.5 ML/day.

## 10.0 20 YEAR CAPITAL WORKS PROGRAMME