Total Water Cycle Management Strategy for Moreton Bay Regional Council

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Total Water Cycle Management Strategy for Moreton Bay Regional Council

Prepared For:	Moreton Bay Regional Council
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Title :	Total Water Cycle Management Strategy for Moreton Bay Regional Council
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Synopsis :	This document presents the results of a study investigating the drivers and issues influential in the development of a Total Water Cycle Management (TWCM) Plan for Moreton Bay Regional Council. It also assesses different solutions to address the identified catchment issues, and recommends a shortlist of potential solutions for further investigation in Phase 2, the detailed planning phase.

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TWCM Strategy Summary Report

This Total Water Cycle Management (TWCM) Strategy presents the results of a study involving the identification of water cycle management drivers and issues affecting the Moreton Bay Regional Council (MBRC) region, development of solutions to address the identified issues, and preliminary assessment of these solutions resulting in the selection of catchment solution sets recommended for further investigation in a detailed planning phase (development of the TWCM Plan).

The document has been divided into two parts:

Part 1: ***TWCM Strategy Summary Report*** – this provides an easy to read overview of the key findings and study results, and can be extracted as a stand alone document (this report)

Part 2: ***TWCM Strategy Technical Report*** – this provides the detailed findings and technical information associated with the study (follows on from this Summary Report)

This TWCM Strategy Summary Report (Part 1) presents an overview of the key study findings as follows:

- Background to TWCM planning and the project;
- Drivers of the TWCM planning process in the MBRC region;
- Current and future water cycle accounts for each catchment;
- Water cycle management issues identified;
- Solutions developed to address the issues; and
- Study conclusions.

Background 2

In 2009, the Ecosystem Health Monitoring Program (EHMP) reported a general decline in all receiving estuaries and waters in SEQ, with Moreton Bay declining from a B- to a D, the lowest ecosystem health rating in over a decade of monitoring. The recent 'Millennium Drought' experienced in South East Queensland (SEQ), which saw regional bulk water supplies drop below 20%, has also propelled the issue of water security to a high priority. These issues, combined with the increasing pressures of development and population growth, demonstrate that detailed planning with regard to the management of water resources within SEQ is essential. This planning will ensure that existing environmental, social and economic values in the region are maintained or improved.

In this context, the *Environmental Protection (Water) Policy 2009* (EPP Water) was revised and released in August 2009. This updated version of the EPP Water now prescribes that all Local Government Areas (LGAs) over a certain population must develop and implement a TWCM Plan specific to its local government area prior to 1 July 2012.

The EPP Water describes the matters that must be taken into account when an LGA is preparing a TWCM Plan. The primary intent of the EPP Water is to use TWCM Plans to enable equitable and informed decisions to be made about the use of water in a way that results in water quality improvements.

The SEQ Regional Plan 2009-2031 also supports the use of TWCM Plans as the preferred method for ensuring land use and infrastructure planning is environmentally sustainable, and to ensure reliable water supplies to cater for forecast population growth.

Moreton Bay Regional Council (MBRC) is one of the first LGAs in Queensland to commence the process of TWCM Planning. The TWCM Plan developed for MBRC will build on the findings of previous studies in the region investigating sustainable loads and integrated urban water management.

The project will be undertaken in two Phases:

Phase 1 – Preparation of a Total Water Cycle Management Plan Strategy

Phase 2 – Preparation of the Total Water Cycle Management Plan (Detailed Planning Phase)

This document forms the TWCM Strategy (Phase 1). The TWCM Plan (Phase 2) will identify how the Strategy will be implemented, including comprehensive predictions of the outcomes of implementation, the costs and benefits of application, and detailed infrastructure plans for TWCM that can be adopted into other strategic planning processes. The TWCM Plan is scheduled for completion by August 2011.

Concurrent to this project, Water By Design released a draft Guideline in September 2010 to outline a process to develop and implement a TWCM Plan that would ensure compliance with the legislative requirements of the EPP Water. This Strategy is consistent with general intention of these guidelines.

Study Area

Key catchments and features within the Moreton Bay Regional Council study area are shown in Figure 1.

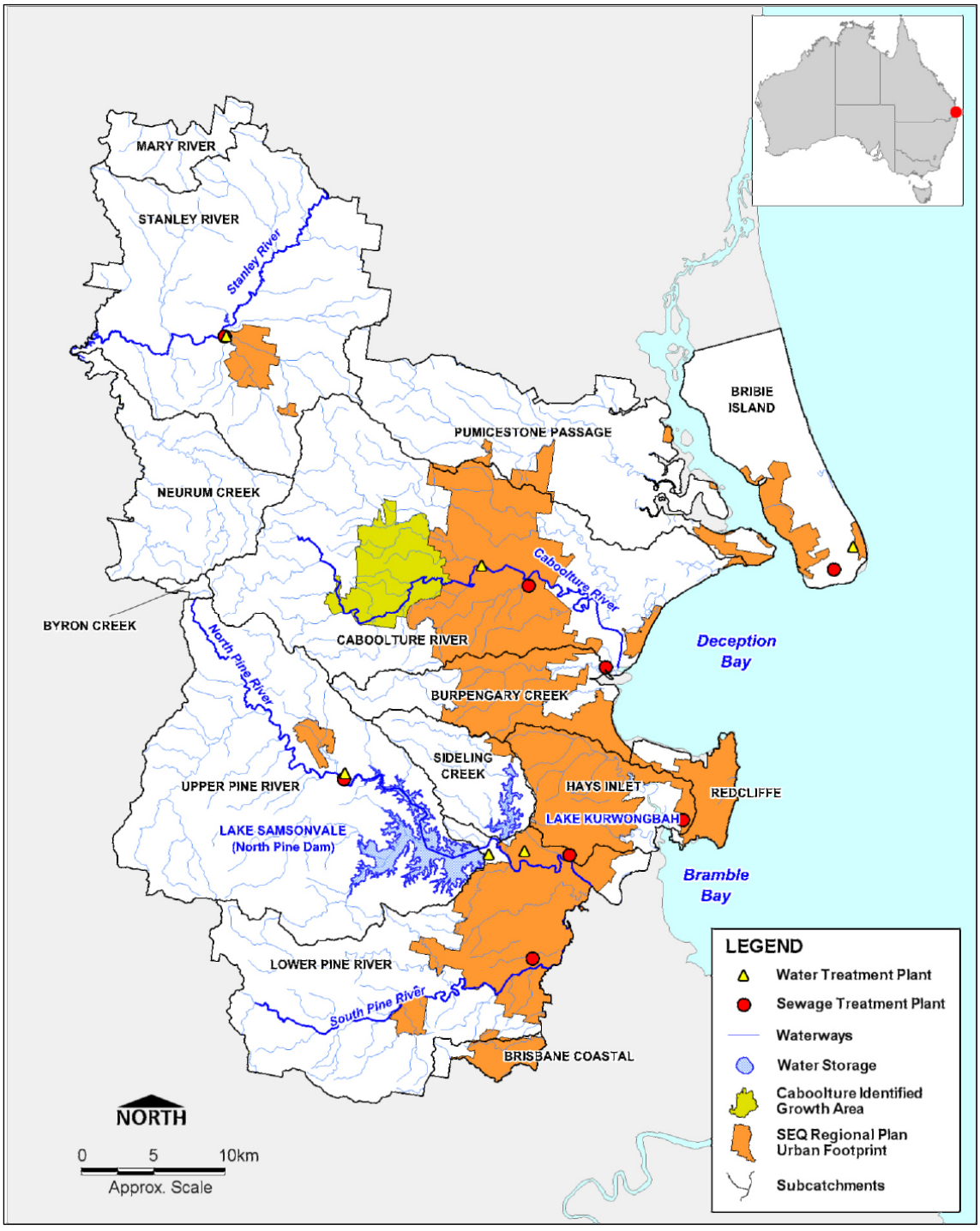


Figure 1 Study Area

Background 4

Purpose of this Strategy

The purpose of this strategy is to :

- Review and collate all relevant information and identify the key drivers for TWCM within MBRC;
- Describe current and future water accounts for all elements of the water cycle;
- Identify key catchment issues/pressures;
- Develop and undertake preliminary assessment of solutions using Multi Criteria Assessment; and
- Select solution sets for further investigation in Phase 2 (Detailed Planning) for each catchment, based on the specific water cycle issues identified.

Principles of Total Water Cycle Management

The key principles of Total Water Cycle Management as described in the SEQ Regional Plan 2009-2031 include:

- **Natural Cycles** - minimising the alteration to natural flow and water quality regimes;
- **Sustainable Limits** - ensuring that the volume of water extracted from a source is sustainable for the community and the environment;
- **Water Conservation** - minimising water use and losses by reducing demand and by maximising efficient use and reuse;
- **Diversity in New Supplies** - considering all potential sources of water when new supplies are needed, including reusing wastewater and stormwater;
- **Water Quality** - managing the water cycle at all phases to preserve water quality for the community and the environment; and
- **Water Quality 'Fit for Purpose'** - aiming for water supply quality to be no better than is required for the proposed use, i.e. not supplying potable water for uses that do not require potable quality.

Drivers For TWCM 5

The following presents a summary of the key drivers that will influence the TWCM planning process within Moreton Bay Regional Council (MBRC). While this specifically focuses on the drivers for TWCM within MBRC's boundaries, most of the drivers discussed also relate to the South East Queensland (SEQ) region generally (being driven by Queensland legislation and SEQ policy) and may also be of relevance to other Local Government Areas (LGAs) outside the region.

Water Supply

Despite the 'water supply guarantee' outlined in the SEQ Water Strategy, it is evident that security of water supply in the MBRC area is a driver of the TWCM planning process. When developing the TWCM Plan for MBRC, these water supply sources and their future security will need to be considered in line with 'fit for purpose' principles. It will also be important to investigate other potential sources of potable water in the region (such as recycled water and stormwater harvesting) so that reliance on the current, largely catchment runoff-based sources is diversified.

Environmental Flows

The *Water Resource (Moreton) Plan 2007* sets environmental flow objectives for the following waterways within MBRC:

- Pumicestone Creek at end of system;
- Caboolture River at end of system;
- Pine River at end of system;
- South Pine River at North Pine River confluence; and
- Stanley River at Woodford Weir inflow.

The consequence of having to maintain environmental flows in these waterways can potentially adversely impact on the available water supply and associated harvestable yield in the region. If water storages are required to release a certain amount of water to downstream reaches, this can reduce yields. Combine this with the potential impacts of climate change and increasing population on water supplies, and it is evident that the TWCM planning process will need to account for environmental flow requirements in any future water accounting scenarios to ensure that storage yields are appropriately determined.

Population Growth

Strong population growth is anticipated within MBRC, particularly within the following greenfield development areas:

- Caboolture Identified Growth Area (CIGA);
- Morayfield and Narangba Transport Precincts;
- Elimbah East; and
- The Northern Growth Corridor – including Dakabin, Griffin, Mango Hill and North Lakes.

To ensure sustainable development, this additional population growth will need to be considered in terms of additional resources and infrastructure requirements along with increasing pressures on environmental values.

Drivers For TWCM

Climate Change

It is estimated that climate change may impact on future water supplies within MBRC. This impact may potentially result in a 10% reduction in surface water supply/yield, and it is therefore essential that this impact is considered in any future scenarios from a water supply perspective. This also places emphasis on the need for the investigation of other sources of water which are less susceptible to climate change impacts, given the current reliance on surface water supplies in the region.

Water Conservation

Water savings targets set in the SEQ Regional Plan in order to reduce residential and non-residential water demand are expected to affect future water demand within MBRC. While the TWCM Plan may include solutions for additional water supplies, it is essential that water conservation maintains a continued focus in order to minimise inefficient water use. This may delay or eliminate the need for future water infrastructure upgrades, such as desalination plants, and also contributes to wastewater flow/load reduction targets.

Wastewater Management

The key driver in terms of wastewater management is the current need for STPs to comply with legislative requirements of the *Environmental Protection Act 1994* and the *Environmental Protection (Water) Policy 2009*, while also accommodating for future development and growth within MBRC.

In order to achieve this, sustainable pollutant loads for receiving waterways (i.e. the annual pollutant load that waterways can assimilate without exceeding concentration based Water Quality Objectives (WQOs)) will need to be determined and inputs from wastewater will need to be considered along with other inputs (i.e. diffuse loads) in the context of Total Water Cycle Management.

Additionally, Council's commitment to the SEQ Healthy Waterways Strategy 2007 - 2012, and specifically the Point Source Pollution Management Action Plan - which has a target to prevent 100% of nutrient point sources from entering Moreton Bay by 2026 - is another key driver.

Drivers For TWCM 7

Water Quality

The key water quality drivers for MBRC in terms of water quality are to:

• Satisfy regulatory requirements of the *Environmental Protection Act 1994* and *Environmental Protection (Water) Policy 2009*, which prescribe the development of a TWCM Plan to help achieve Water Quality Objectives and protect Environmental Values;

• Meet commitments of the SEQ Healthy Waterways Strategy 2007-2012, which aims to achieve waterways and catchments that are healthy ecosystems supporting the livelihoods and lifestyles of people in SEQ by 2026;

• Achieve targets set in the SEQ Natural Resources Management Plan that are aligned with desired regional outcomes and policies for Water Management in the SEQ Regional Plan; and

• Implement planning and management of urban stormwater to comply with the *Sustainable Planning Act (2009)* and *State Planning Policy for Healthy Waters* (effective 28 February 2011), as well as design objectives set out in the SEQ Regional Plan 2009-2031 *Implementation Guideline No. 7: Water Sensitive Urban Design.*

Considering the current condition of waterways, and the future population growth and development pressures in the region, existing water quality pressures on receiving waters in the region are likely to significantly increase. These are key challenges that will need to be addressed in the TWCM planning process.



Flooding

The TWCM planning process will need to consider flooding impacts when developing management solutions. There should be no increase in flooding risk from any of the solutions developed, and ideally the target should be to decrease the flooding risk in each catchment as well as downstream impacts, where possible. However, it should be noted that to resolve broader issues of floodplain management, MBRC is developing a Floodplain Management Plan as a companion document to the TWCM Plan.

Drivers For TWCM

Water Industry Institutional Arrangements

A recent water industry reform has resulted in the formation of a new water distribution and retail business serving the needs of both the Moreton Bay and Sunshine Coast communities. This new entity is called Unitywater and commenced operations on 1 July 2010. Any implications associated with the establishment of this new entity and the functional responsibility split between MBRC and Unitywater will need to be considered in the TWCM Plan. Unitywater will be the responsible organisation for delivering many of the water cycle solutions developed for the TWCM Plan and a foreshadowed amendment to the EPP Water will require MBRC to seek the endorsement of the TWCM Plan by Unitywater, for delivering TWCM solutions related to water supply and sewage.

Protection of Environmentally Sensitive Areas

A number of areas have been identified within MBRC which are environmentally sensitive and require protection from adverse environmental stressors. These areas are important environmental assets, on both a local and regional scale. One outcome from the TWCM planning process will be the development of measures which minimise existing and future environmental impacts on these areas.

Legislative and Policy Drivers

The various legislation and policy which are relevant in the context of TWCM planning within MBRC include the following:

- *Environmental Protection Act 1994*;
- *Water Act 2000*;
- *Water Supply (Safety and Reliability) Act 2008*;
- *Public Health Regulation 2008*;
- *Sustainable Planning Act 2009*
- *State Planning Policy for Healthy Waters* (SPP for Healthy Waters);
- *Implementation Guideline No. 7: Water Sensitive Urban Design*;
- *SEQ Regional Plan 2009-2031*;
- SEQ Water Strategy;
- SEQ Healthy Waterways Strategy;
- SEQ Natural Resource Management Plan;
- SEQ Regional Water Security Program; and
- Draft SEQ Climate Change Management Plan.

Drivers For TWCM

Infrastructure Timing and Cost Optimisation

The provision of sustainable and cost effective urban water and wastewater services is essential to meet growing population and environmental pressures in the Moreton Bay region. Effective infrastructure timing and cost optimisation is required to meet this need. The extensive investment in the upgrades to STPs, stormwater management and water supply source augmentation required over the next 5 to 10 years will place significant financial pressures upon the owners of that infrastructure. The TWCM Plan will assist with determining the most cost effective means of providing that infrastructure, through identification of alternative options (in a triple bottom line way) and determine anticipated timing of expenditure and look at options that may result in deferral or elimination of significant capital costs.

Areas and Standards of Service

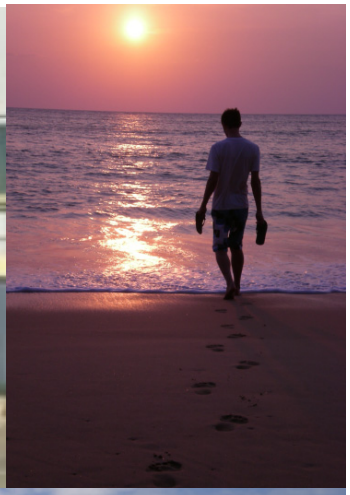
The need to increase recycling of water has been widely established, however the need to determine how much and where this is to occur and to make appropriate changes to planning provisions is required.

The drivers briefly discussed in previous pages summarise the key environmental, social, and economic factors which influence the need for TWCM planning within MBRC and provide the context in which the TWCM planning process is to be undertaken. A more detailed discussion of the individual drivers is included in Part 2 of this document (*TWCM Strategy Technical Report*).

Catchment Water Cycle Accounts 10

A description of the key characteristics of each catchment, along with a summary of the existing and future accounts for each element of the water cycle is presented in the following pages. These accounts also illustrate the key constraints specific to each catchment, and were used to assist in identifying the issues for TWCM within each catchment.

A detailed description of the methodology used in determining the existing and future water cycle accounts, as well as more detailed water cycle accounts for each catchment, is included in the *TWCM Strategy Technical Report*.



Overall MBRC Region

The overall MBRC Region encompasses 14 catchments, with a total area of approximately 202,543 ha. Future land use (i.e. 2031) in the MBRC region is expected to consist of approximately 17% urban, 27% agriculture and 56% conservation area / green space.

The urban population in the MBRC region is approximately 374,900 people currently, and is expected to increase to about 566,600 people in 2031. This is an increase of 191,700 people which represents a 51% increase. However, if the Caboolture Investigation Growth Area (CIGA) goes ahead, then this may potentially increase the population in the MBRC region (the Caboolture River catchment specifically) by an additional 60,000 people. This would bring the future predicted population up to 626,600.

Stormwater runoff is drained by a number of major waterways in the MBRC region including Stanley River, Caboolture River, Pumicestone Passage, and Pine River. These waterways discharge into Moreton Bay (Bramble Bay and Deception Bay). Based on 2010 EHMP scores, water quality in Stanley catchment is B-, Caboolture estuary is D, Pumicestone Passage is D+, and Pine estuary is C-. Bramble Bay and Deception Bay received a score of D+.

In regard to flooding issues, MBRC is developing a Floodplain Management Plan in parallel with the TWCM Plan, which will be a companion document to the TWCM Plan.

Potable water is sourced a number of surface water storages including North Pine Dam, Lake Kurwongbah, Woodford Weir, and the Caboolture Weir, and also groundwater storages including Bribie Island borefield and Dayboro borefield. Potable water is also imported from the Sunshine Coast via the Northern Pipeline Interconnector (NPI) and also exported to Brisbane.

Wastewater is treated at eight sewage treatment plants (STPs), including Bribie Island, Caboolture, Burpengary East, Woodford, Dayboro, Redcliffe, Murrumba Downs, and Brendale STPs.

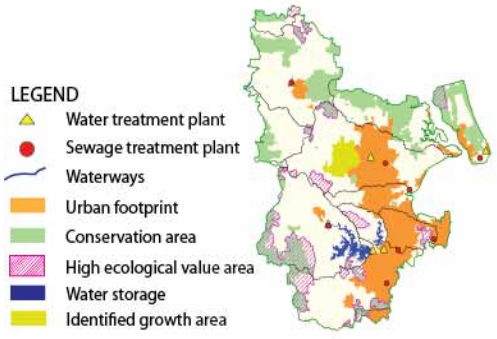
There are a number of key conservation areas in the MBRC region comprising national parks, state forests, conservation areas, reserves, wetlands and areas declared as High Ecological Value (HEV) areas as per the EPP Water.

The water account for the overall MBRC region, showing water movement and key issues, is summarised on the following page.

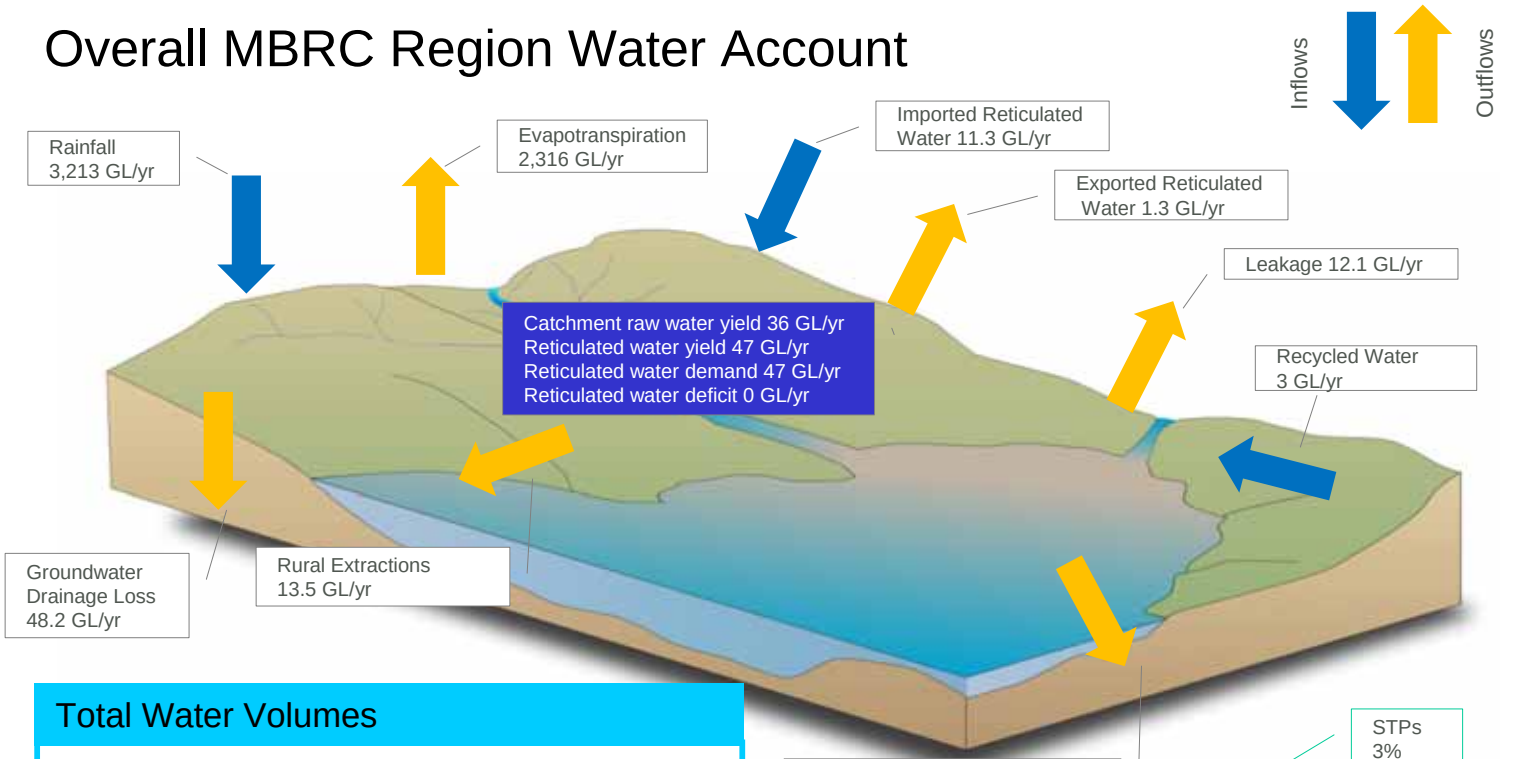
Catchment Facts

- **Area: 202,543 ha**
- **Current Population: 374,900**
- **Future Population: 566,600***
- **Future Pop. Growth: 51%***
- **Future Urban Land use: 17%**
- **Surface water storages include North Pine Dam, Lake Kurwongbah, Woodford and Caboolture Weirs**
- **Groundwater storages include Bribie Island and Dayboro borefields**
- **Wastewater treated at 8 STPs**
- **EHMP Score 2010:**
  - **Stanley: B-**
  - **Caboolture: D**
  - **Pumicestone: D+**
  - **Pine: C-**
  - **Bramble Bay: D+**
  - **Deception Bay: D+**

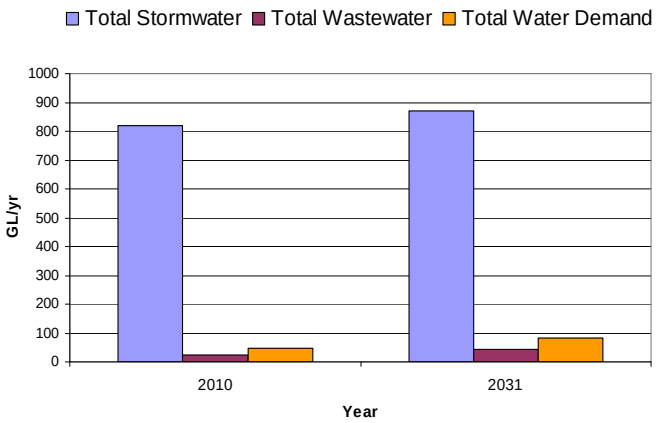
*** Does not include CIGA**



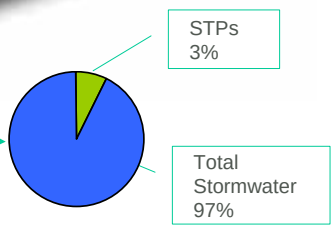
Overall MBRC Region Water Account



Total Water Volumes

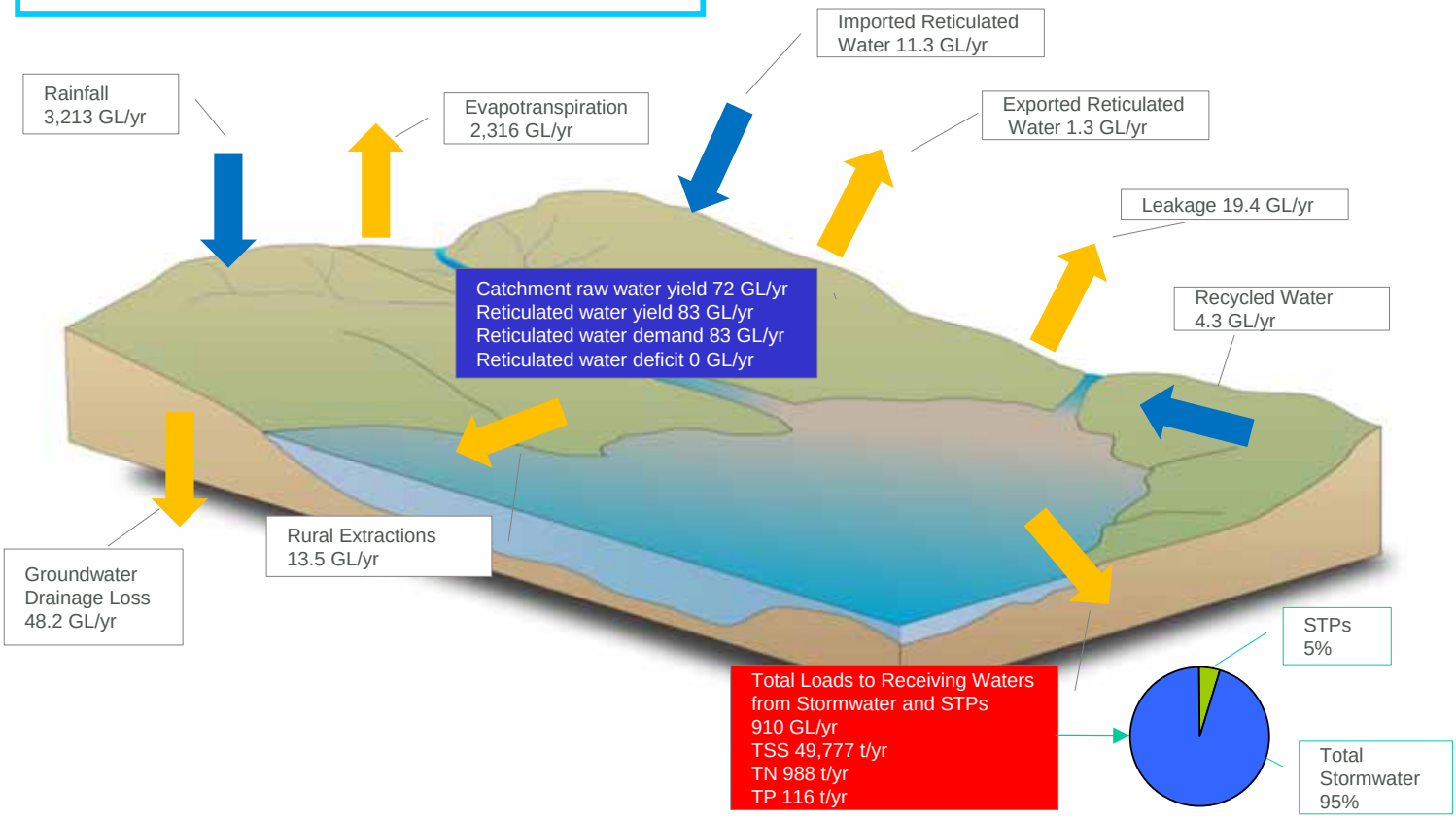


Total Loads to Receiving Waters
from Stormwater and STPs
842 GL/yr
TSS 41,701 t/yr
TN 803 t/yr
TP 87 t/yr



Population 374,900

2010



Total Loads to Receiving Waters
from Stormwater and STPs
910 GL/yr
TSS 49,777 t/yr
TN 988 t/yr
TP 116 t/yr

Population 566,600
(No CIGA)

2031

Stanley River Catchment

Stanley River catchment is 31,830 ha in size, with future land use consisting of approximately 2% urban, 39% agriculture and 59% conservation area / green space.

The urban population in Stanley River catchment, located in the townships of Woodford and D'Aguilar, is approximately 4,100 people currently, and is expected to increase to about 8,600 people in 2031. This is an increase of 4,500 people which represents a 110% increase.

Stormwater runoff in the catchment is drained by Stanley River, which is the major waterway in this catchment. This river conveys runoff from the catchment and flows south-west into Somerset Dam in the Somerset Regional Council area. Stanley catchment received an EHMP score of B- in 2010.

Potable water is sourced from within the catchment at the Woodford Weir, located on the Stanley River at Woodford, which has a storage yield of 1.1 GL/yr. Water from the weir is treated at the Woodford water treatment plant (WTP), which has a capacity of 1.5 GL/yr.

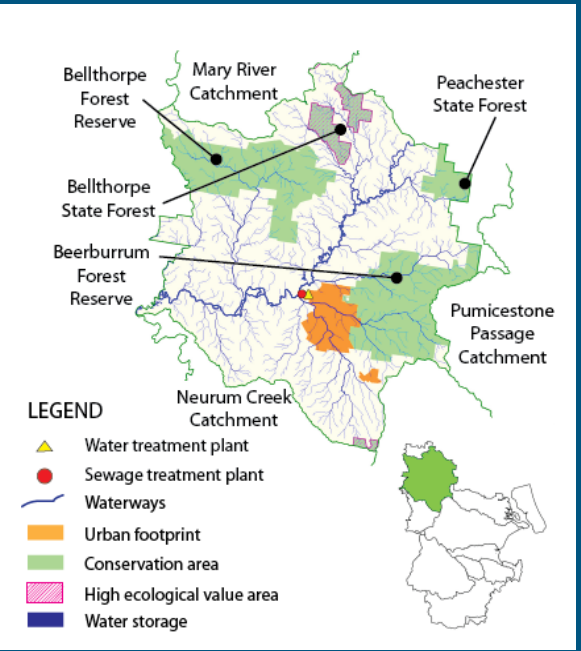
Wastewater from Stanley River catchment is treated within the catchment at the Woodford sewage treatment plant (STP), which discharges into the Stanley River. This STP has a design capacity of 2,000 EP and a licence capacity of <4,000 EP.

Key conservation areas in Stanley River catchment include Bellthorpe State Forest and Beerburrum State Forest.

The water account for Stanley River catchment, showing water movement and key issues, is summarised on the following page.

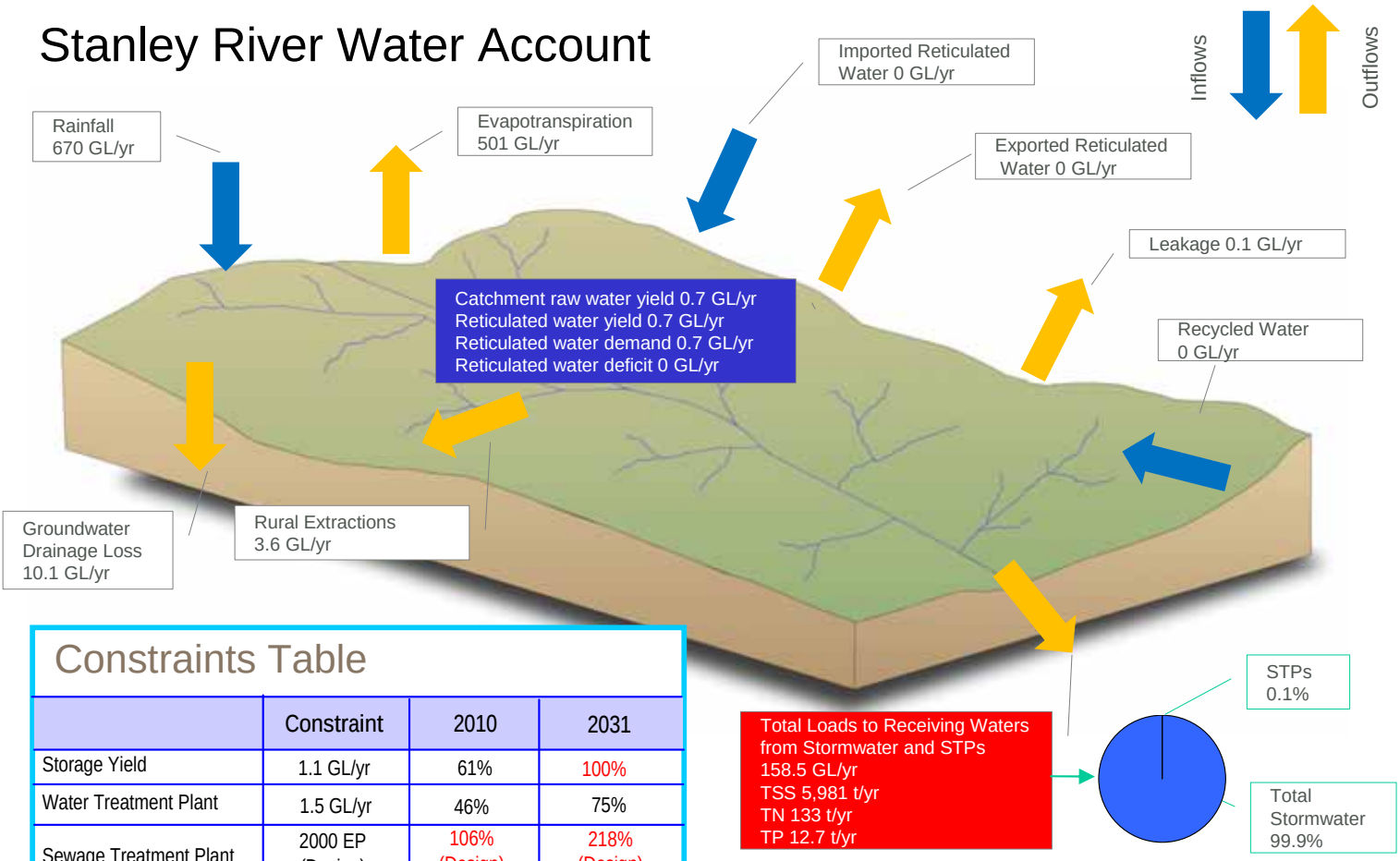
Catchment Facts

- **Area: 31,830 ha**
- **Current Population: 4,100**
- **Future Population: 8,600**
- **Future Pop. Growth: 110%**
- **Future Urban Land Use: 2%**
- **Potable water sourced from Woodford Weir**
- **Wastewater treated at Woodford STP**
- **EHMP Score (2010): B-**



BMT WBM

Stanley River Water Account

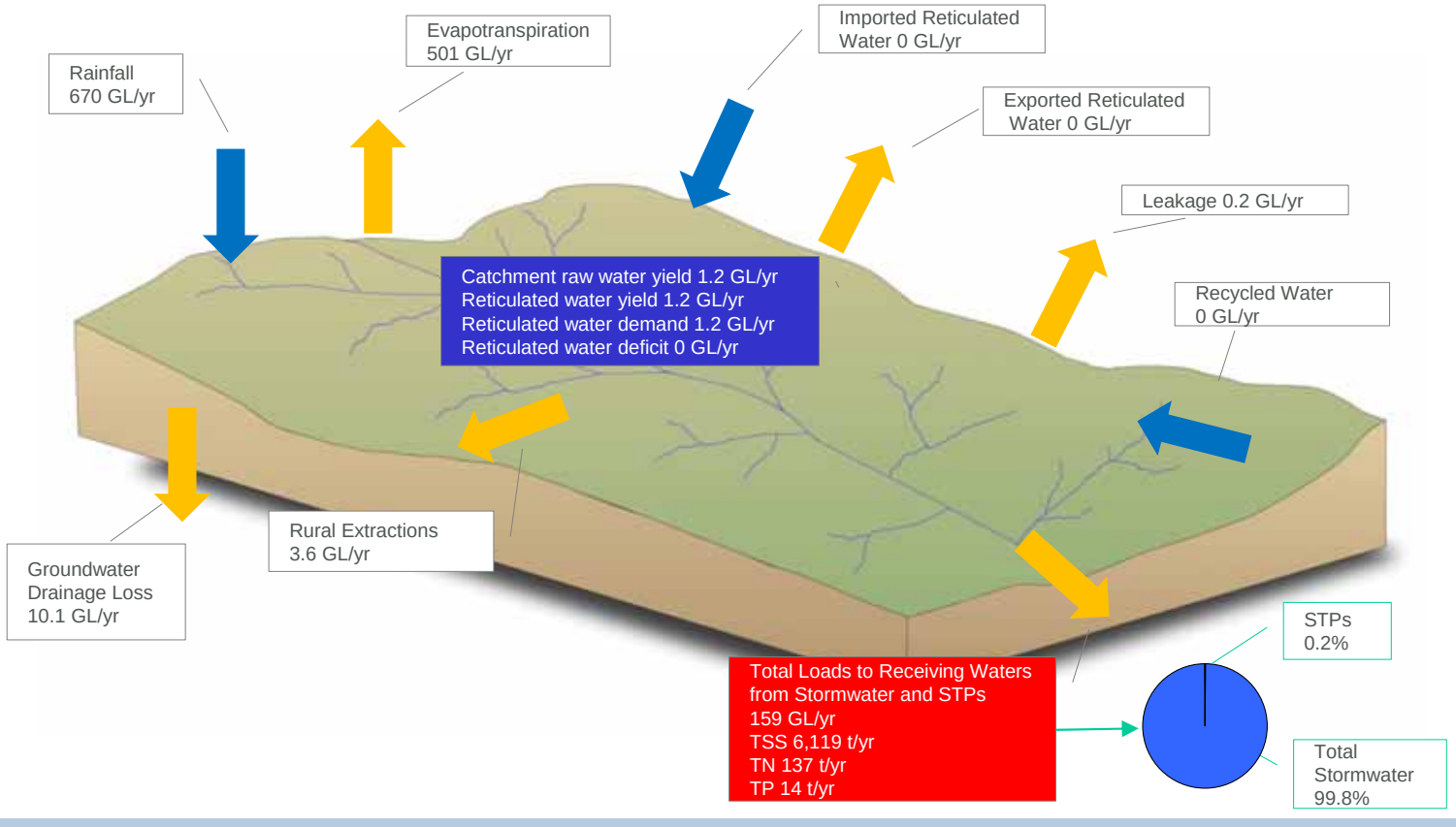


Constraints Table

	Constraint	2010	2031
Storage Yield	1.1 GL/yr	61%	100%
Water Treatment Plant	1.5 GL/yr	46%	75%
Sewage Treatment Plant (Woodford)	2000 EP (Design) <4000 EP (Licence)	106% (Design) 53% (Licence)	218% (Design) 109% (Licence)
Recycled Water Reuse	0.14 GL/yr	0%	0%
Sustainable Loads - TSS	?	5,981 t/yr	6,119 t/yr
Sustainable Loads – TN	?	133 t/yr	137 t/yr
Sustainable Loads - TP	?	12.7 t/yr	14 t/yr
Environmental Flow	>86 GL/yr	92%	93%

Population 4,100

2010



Population 8,600

2031

Pumicestone Passage Catchment

Pumicestone Passage catchment is 18,480 ha in size, with future land use consisting of approximately 15% urban, 27% agriculture and 58% conservation area / green space.

The urban population in Pumicestone Passage catchment is approximately 11,400 people currently, and is expected to increase to about 12,200 people in 2031. This is an increase of 800 people, which represents a 7% increase.

Pumicestone Passage catchment has been identified as the potential location for a future industrial development site, and also contains the future growth area of Elimbah East (as per the SEQ Regional Plan (2009-2031)).

There are no major waterways in Pumicestone Passage catchment, however stormwater runoff is drained by a number of minor waterways such as Elimbah and Ningi Creeks which discharge into Pumicestone Passage. Pumicestone Passage received an EHMP score of D+ in 2010.

Potable water is sourced from the reticulated water network with water coming from the adjacent Caboolture River catchment.

Wastewater from central Pumicestone Passage catchment is treated at the Caboolture sewage treatment plant (STP) located in the adjacent Caboolture River catchment. Wastewater from eastern Pumicestone Passage catchment is treated at Bribie Island STP.

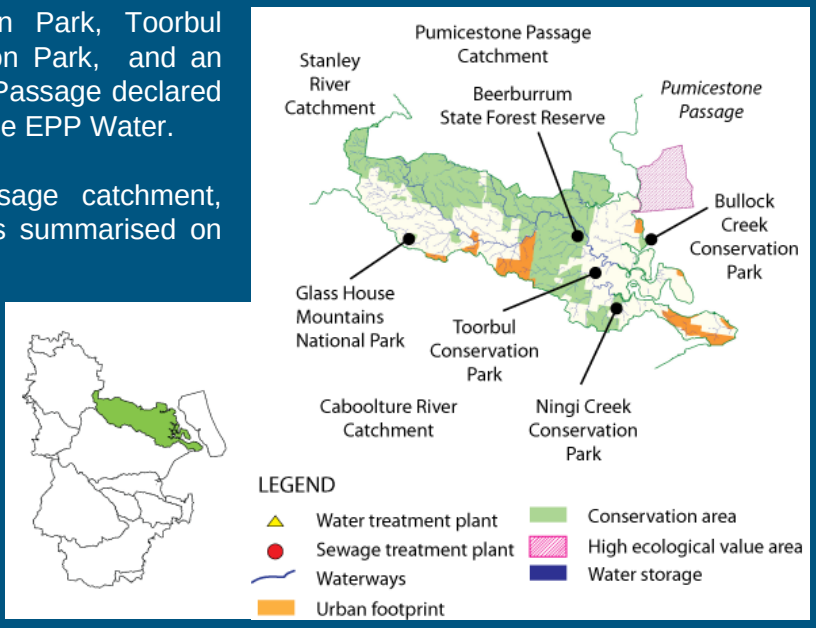
Key conservation areas in Pumicestone Passage catchment include Beerburrum State Forest, Glass House Mountains National Park, Bullock Creek Conservation Park, Toorbul Conservation Park, Ningi Creek Conservation Park, and an area in the northern section of Pumicestone Passage declared to be of High Ecological Value (HEV) as per the EPP Water.

The water account for Pumicestone Passage catchment, showing water movement and key issues, is summarised on the following page.

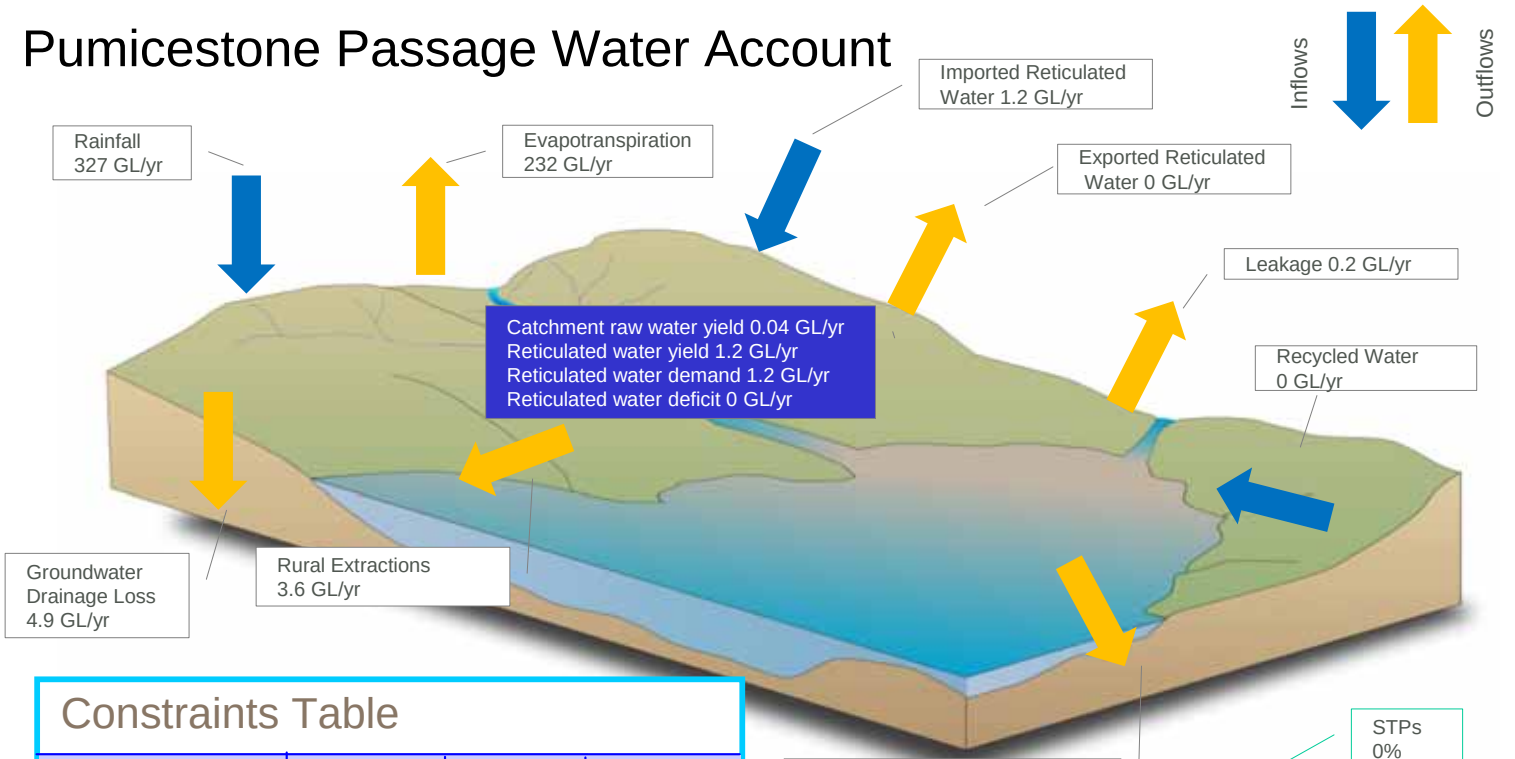
Catchment Facts

- **Area: 18,480 ha**
- **Current Population: 11,400**
- **Future Population: 12,200**
- **Future Pop. Growth: 7%**
- **Future Urban Land Use: 15%**
- **Potable water sourced from Caboolture catchment**
- **Wastewater from central catchment treated at Caboolture STP**
- **Wastewater from eastern catchment treated at Bribie Island STP**
- **EHMP Score 2010:**

  D+ (Estuary)

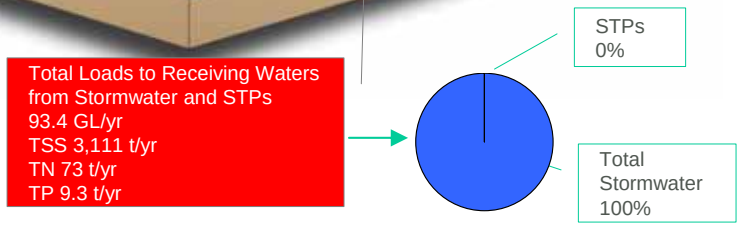


Pumicestone Passage Water Account

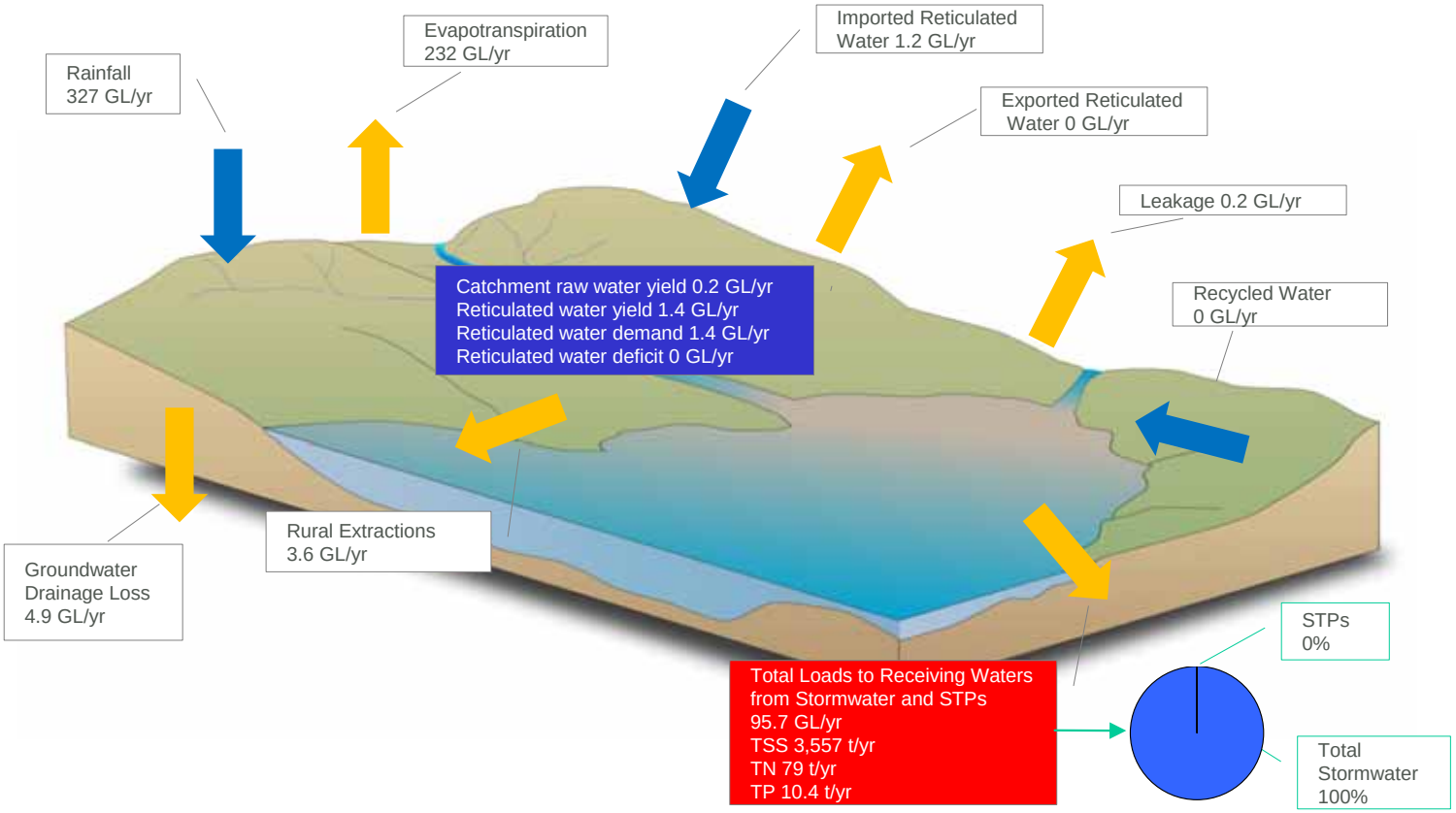


Constraints Table

	Constraint	2010	2031
Storage Yield	N/A	N/A	N/A
Water Treatment Plant	N/A	N/A	N/A
Sewage Treatment Plant	N/A	N/A	N/A
Recycled Water Reuse	N/A	N/A	N/A
Sustainable Loads - TSS	?	3,111 t/yr	3,557 t/yr
Sustainable Loads – TN	?	73 t/yr	79 t/yr
Sustainable Loads - TP	?	9.3 t/yr	10.4 t/yr
Environmental Flow	>82 GL/yr	114%	117%



Population 11,400 **2010**



Population 12,200 **2031**

Bribie Island Catchment

Bribie Island catchment is 10,700 ha in size, with future land use consisting of approximately 10% urban, 0.3% agriculture and 89.7% conservation area / green space.

The current urban population in Bribie Island catchment is approximately 17,100 people, and is expected to increase to about 21,800 people by 2031. This is an increase of 4,700 people which represents a 27% increase.

There are no major waterways in the Bribie Island catchment, however stormwater runoff discharges into Pumicestone Passage and Deception Bay, which have areas of High Ecological Value (HEV). Both Pumicestone Passage and Deception Bay received an EHMP score of D+ in 2010.

Potable water is currently sourced from the northern groundwater aquifer within Bribie Island, which has a sustainable storage yield of approximately 1.6 GL/yr (4.32 ML/day). Water is treated and distributed by the Banksia Beach water treatment plant (WTP), which has a capacity of 1.3 GL/yr. A southern aquifer exists, however the WTP associated with this aquifer (Woorim WTP) is not currently operational. Furthermore, the sustainable yield of this southern aquifer has not been determined. Additional water is supplemented by the reticulated water network linked to the Caboolture River catchment.

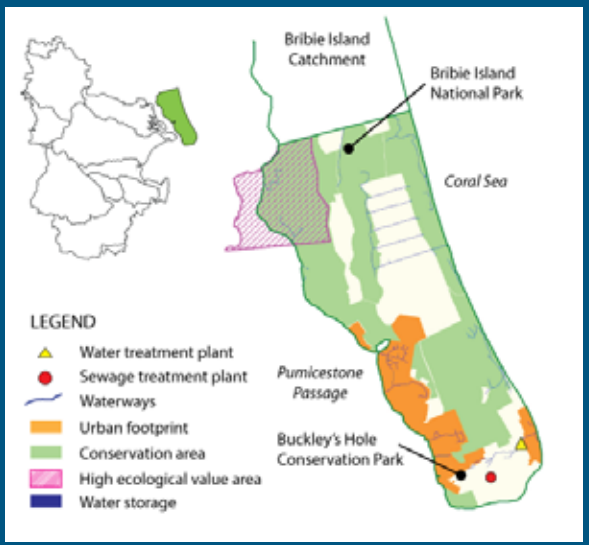
Wastewater is treated within the catchment at the Bribie Island sewage treatment plant (STP), which discharges all treated wastewater to groundwater with the use of infiltration trenches. This STP has a design capacity of 38,000 EP and a licence capacity of <50,000 EP.

Key conservation areas on Bribie Island include Bribie Island National Park, and Buckleys Hole Conservation Park.

The water account for Bribie Island catchment, showing water movement and key issues, is summarised on the following page.

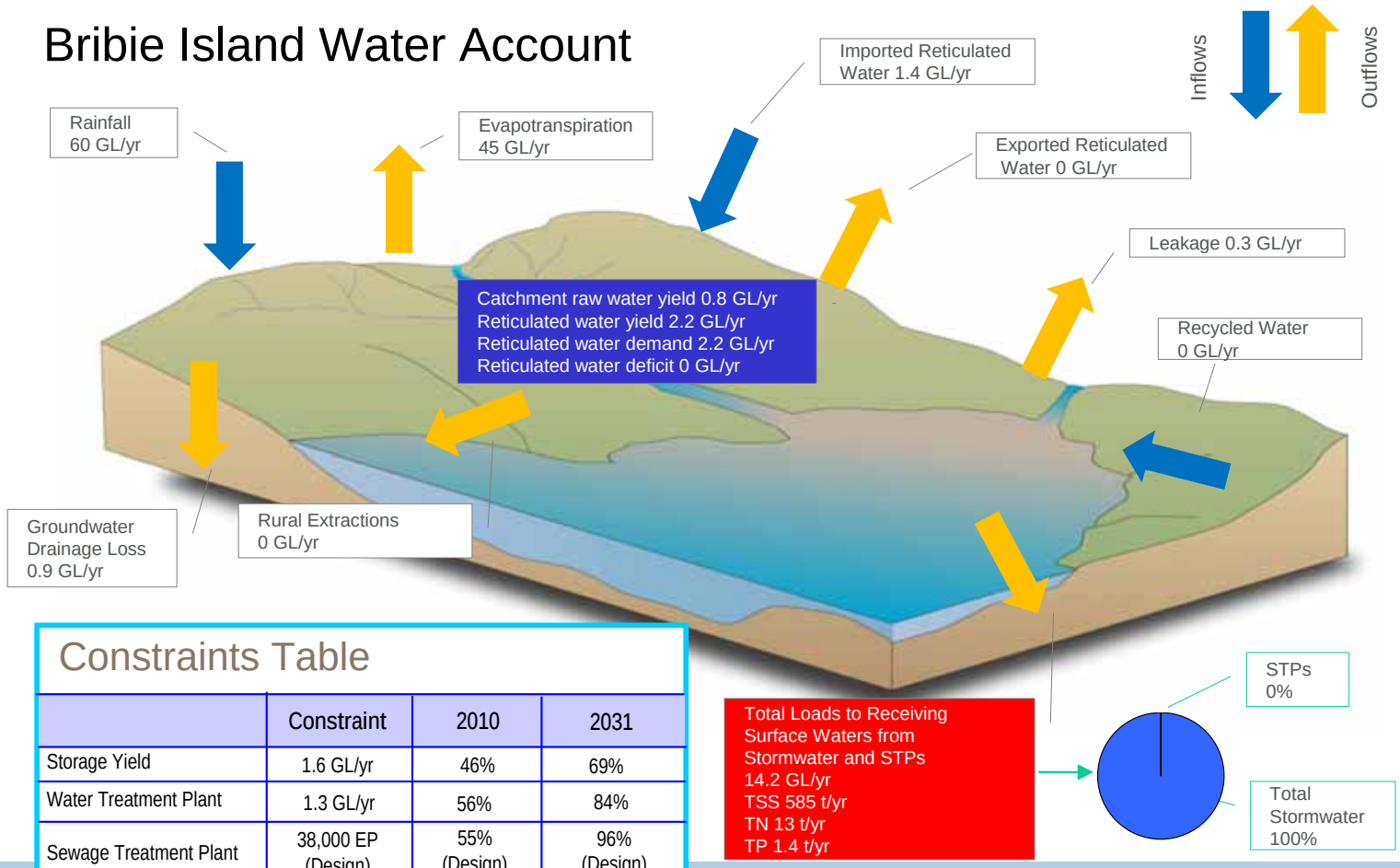
Catchment Facts

- **Area: 10,700 ha**
- **Current Population: 17,100**
- **Future Population: 21,800**
- **Future Pop. Growth: 27%**
- **Future Urban Land Use: 10%**
- **Potable water sourced from groundwater aquifer and supplemented by reticulated water network**
- **Bribie Island STP discharges to groundwater**
- **EHMP Score 2010: D+ (Pumicestone Passage & Deception Bay)**



BMT WBM

Bribie Island Water Account

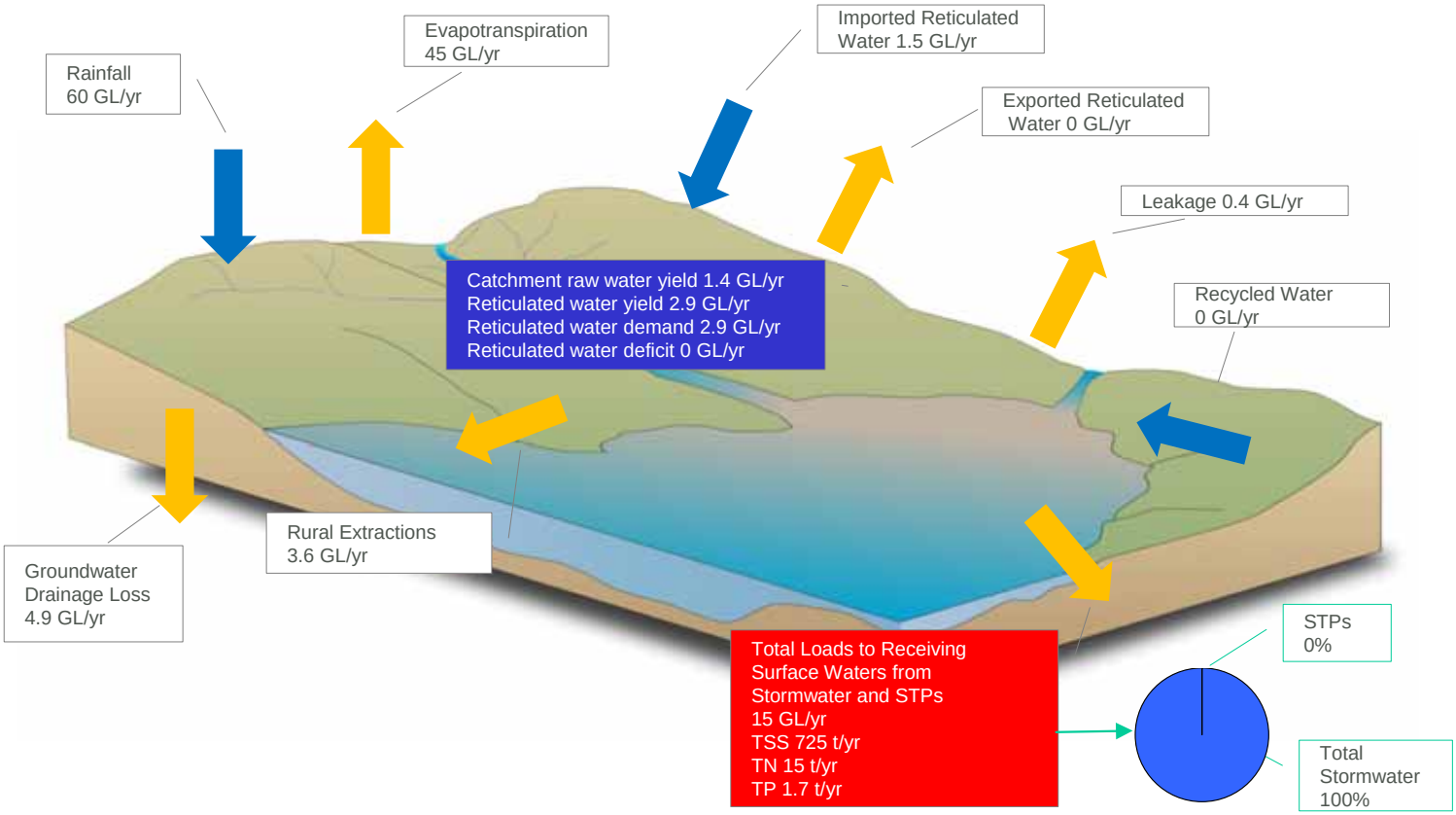


Constraints Table

	Constraint	2010	2031
Storage Yield	1.6 GL/yr	46%	69%
Water Treatment Plant	1.3 GL/yr	56%	84%
Sewage Treatment Plant (Bribie Island)	38,000 EP (Design) <50,000 EP (Licence)	55% (Design) 42% (Licence)	96% (Design) 73% (Licence)
Recycled Water Reuse	2 GL/yr	0%	0%
Sustainable Loads - TSS	?	585 t/yr	725 t/yr
Sustainable Loads – TN	?	13 t/yr	15 t/yr
Sustainable Loads - TP	?	1.4 t/yr	1.7 t/yr
Environmental Flow	N/A	14.2 GL/yr	15 GL/yr

Total Loads to Receiving Surface Waters from Stormwater and STPs
14.2 GL/yr
TSS 585 t/yr
TN 13 t/yr
TP 1.4 t/yr

Population 17,100 **2010**



Total Loads to Receiving Surface Waters from Stormwater and STPs
15 GL/yr
TSS 725 t/yr
TN 15 t/yr
TP 1.7 t/yr

Population 21,800 **2031**

Caboolture River Catchment

Caboolture River catchment is 38,440 ha in size, with future land use consisting of approximately 33% urban, 34% agriculture and 33 % conservation area / green space.

The urban population in Caboolture River catchment is approximately 69,500 people currently, and is expected to increase to about 112,200 people in 2031. This is an increase of 42,700 people which represents a 61% increase. It is noted that this does not account for predicted population growth as a result of the Caboolture Identified Growth Area (CIGA).

Stormwater runoff drains to the Caboolture River, which is the major waterway in this catchment. This river flows from the upper catchment areas through Caboolture township and eventually discharges into Deception Bay. Burpengary Creek flows into Caboolture River in the lower reaches of the estuary. Caboolture catchment (freshwater) received an EHMP score of C+ in 2010, while Caboolture estuary received a score of D.

Potable water is sourced from the Caboolture Weir, located on the Caboolture River, and has a storage yield of 3.6 GL/yr. Water from this weir is treated at the Caboolture water treatment plant (WTP), which has a capacity of 5.2 GL/yr. This water is supplemented by water from the reticulated water network, with supply from the Northern Pipeline Interconnector (NPI) and North Pine Dam.

Wastewater is treated within the catchment at the South Caboolture sewage treatment plant (STP), which discharges into the Caboolture River upper estuary. South Caboolture STP has a design capacity of 40,000 EP and a licence capacity of 100,000 EP.

Treated wastewater from the Burpengary East STP (from adjoining Burpengary Creek catchment) is also discharged into the Caboolture River lower estuary. This STP has a design capacity of 49,500 EP and a licence capacity of <50,000 EP.

Key conservation areas in Caboolture River catchment include Sheep Station Creek Conservation Park, Charlie Moorhead Nature Refuge, Beerburrum State Forest, Wararba Creek Conservation Park, Beachmere Conservation Park, and Godwin Beach Environmental Reserve. There are also some areas in the upper catchment and Deception Bay declared as High Ecological Value (HEV) areas as per the EPP Water.

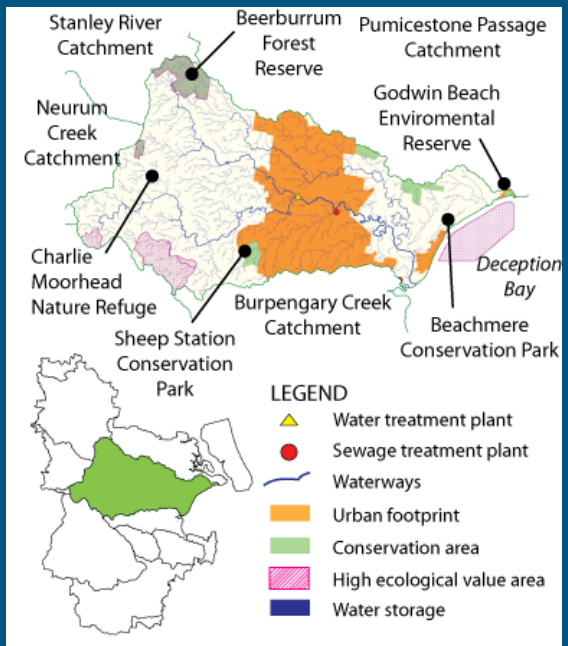
The water account for Caboolture River catchment, showing water movement and key issues, is summarised on the following page.

Catchment Facts

- **Area: 38,440 ha**
- **Current Population: 69,500**
- **Future Population: 112,200***
- **Urban Pop. Growth: 61%**
- **Future Urban Land Use: 33%**
- **Potable water sourced from Caboolture Weir, NPI and North Pine Dam**
- **Wastewater treated within catchment at South Caboolture STP and discharged into Caboolture River upper estuary**
- **Burpengary East STP discharges into Caboolture River lower estuary**
- **EHMP Score 2010:**

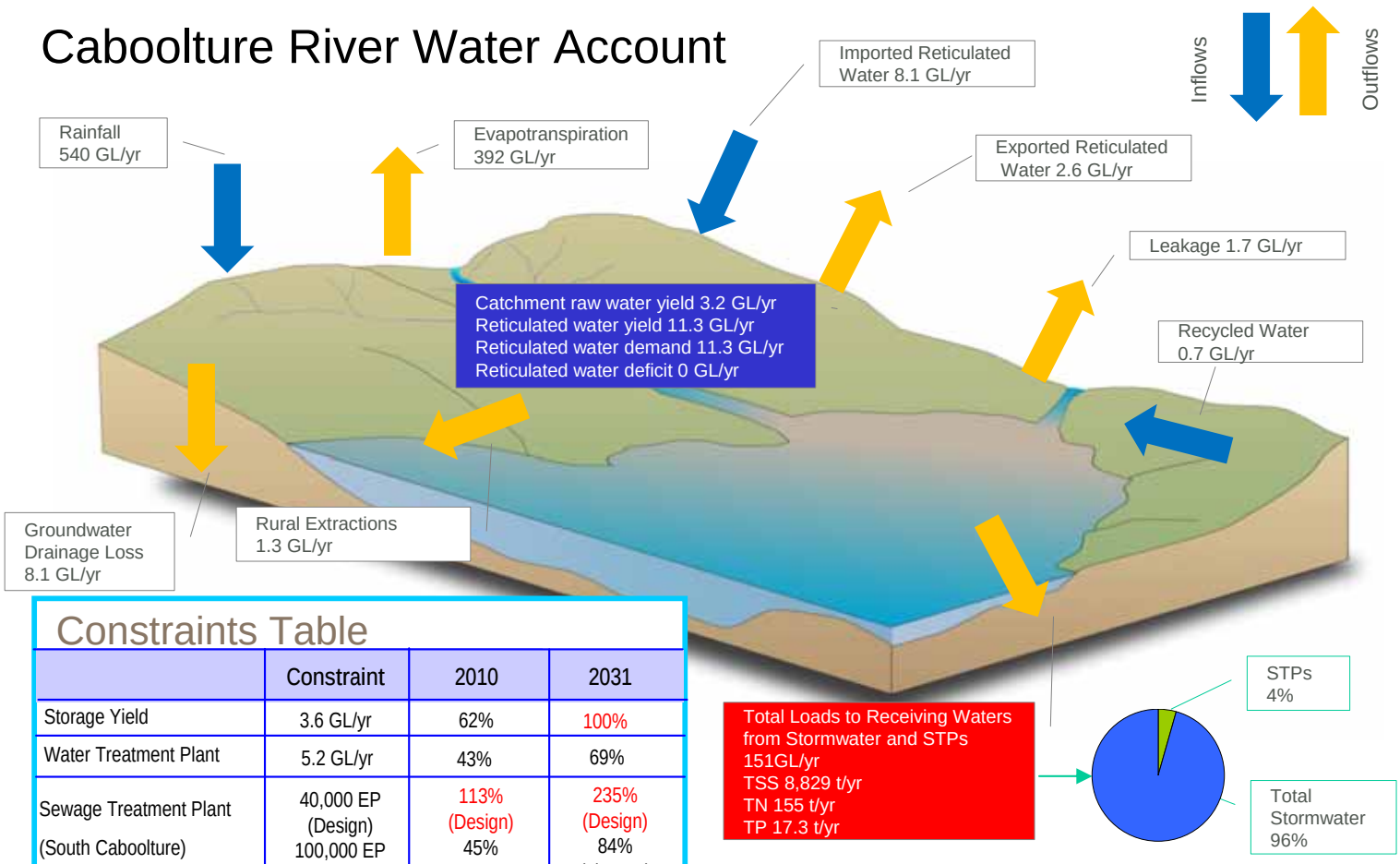
C+ (Fresh) D (Estuarine)

*** Does not include CIGA**



BMT WBM

Caboolture River Water Account

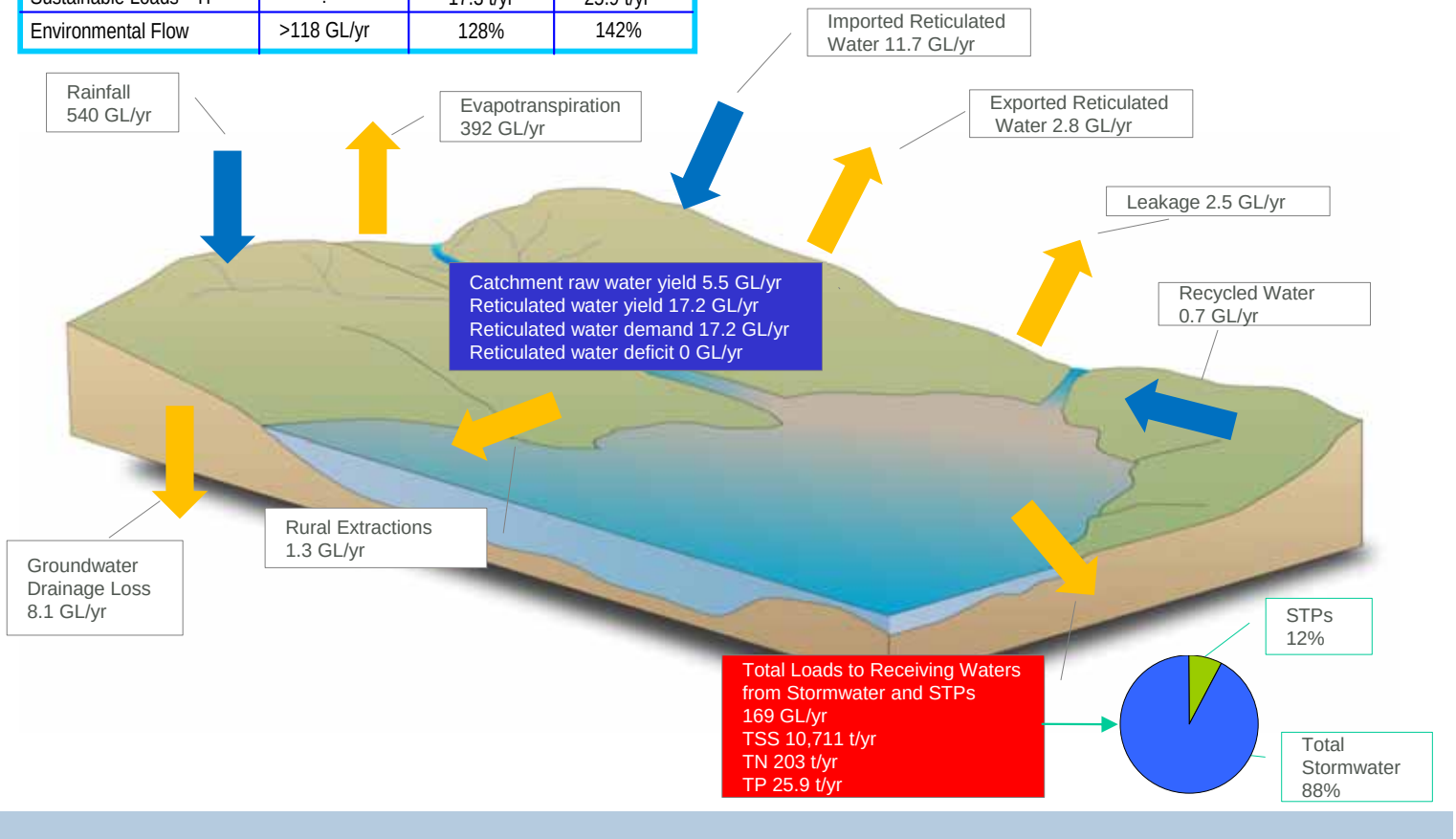


Constraints Table

	Constraint	2010	2031
Storage Yield	3.6 GL/yr	62%	100%
Water Treatment Plant	5.2 GL/yr	43%	69%
Sewage Treatment Plant (South Caboolture)	40,000 EP (Design) 100,000 EP (Licence)	113% (Design) 45% (Licence)	235% (Design) 84% (Licence)
Sewage Treatment Plant (Burpengary East)	49,500 EP (Design) <50,000 EP (Licence)	88% (Design) 87% (Licence)	120% (Design) 94% (Licence)
Recycled Water Reuse	3.7 GL/yr	19%	19%
Sustainable Loads - TSS	?	8,829 t/yr	10,711 t/yr
Sustainable Loads – TN	27 t/yr	574%	752%
Sustainable Loads - TP	?	17.3 t/yr	25.9 t/yr
Environmental Flow	>118 GL/yr	128%	142%

Population 69,500

2010



Population 112,200
(No CIGA)

2031

Caboolture River (with CIGA) Catchment

This catchment is the description of the Caboolture River catchment with the Caboolture Investigation Growth Area (CIGA) included. The CIGA is an area approximately 4,160 ha in size to the west of Caboolture which has been identified for future residential development. The CIGA could potentially accommodate a population of approximately 60,000 people.

Caboolture River (with CIGA) catchment is 38,440 ha in size, with future land use consisting of approximately 44% urban, 27% agriculture and 29 % conservation area / green space.

The urban population in Caboolture River catchment is approximately 69,500 people currently, and is expected to increase to about 172,200 people in 2031 with development of the CIGA. This is an increase of 102,700 people which represents a 148% increase.

Stormwater runoff is drained by Caboolture River, which is the major waterway in this catchment. This river flows from the upper catchment areas through Caboolture township and eventually discharges into Deception Bay. Burpengary Creek flows into Caboolture River in the lower reaches of the estuary. Caboolture catchment (freshwater) received an EHMP score of C+ in 2010, while Caboolture estuary received a score of D.

Potable water is sourced from the Caboolture Weir, located on the Caboolture River. This water is supplemented by water from the reticulated water network, with supply from the Northern Pipeline Interconnector (NPI) and North Pine Dam. It should be noted that the increase in population relating to CIGA will be above the Caboolture Weir, therefore potentially impacting on its viability as a water source.

Wastewater is treated within the catchment at the Caboolture sewage treatment plant (STP), which discharges into the Caboolture River upper estuary. Treated wastewater from the Burpengary East STP (from adjoining Burpengary Creek catchment) is also discharged into the Caboolture River lower estuary.

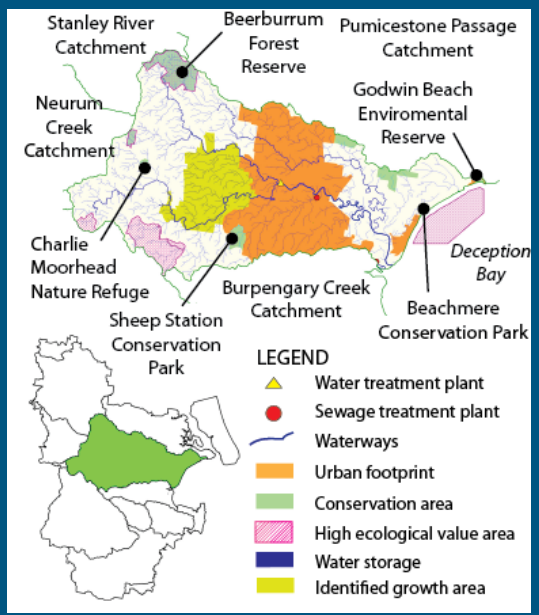
Key conservation areas in Caboolture River catchment include Sheep Station Creek Conservation Park, Charlie Moorhead Nature Refuge, Beerburrum State Forest, Wararba Creek Conservation Park, Beachmere Conservation Park, and Godwin Beach Environmental Reserve. There are also some areas in the upper catchment and Deception Bay declared as High Ecological Value (HEV) areas as per the EPP Water.

The water account for Caboolture River (with CIGA) catchment, showing water movement and key issues, is summarised on the following page.

Catchment Facts

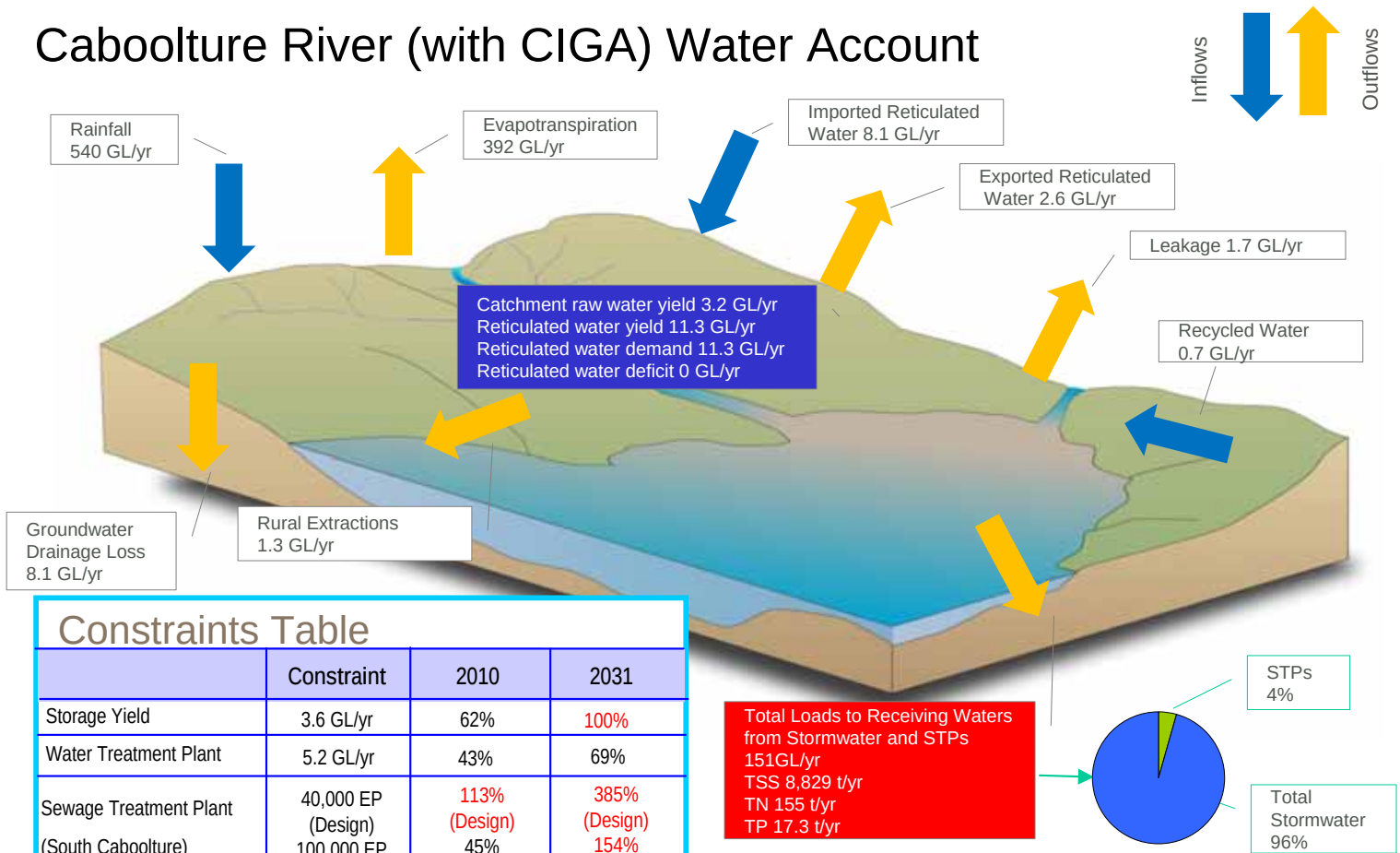
- **Area: 38,440 ha**
- **Current Population: 69,500**
- **Future Population: 172,200**
- **Future Pop. Growth: 148%**
- **Future Urban Land Use: 44%**
- **Potable water sourced from Caboolture Weir, NPI and North Pine Dam**
- **Wastewater treated within catchment at Caboolture STP and discharged into Caboolture River upper estuary**
- **Burpengary East STP discharges into Caboolture River lower estuary**
- **EHMP Score 2010:**

C+ (Fresh) D (Estuarine)



BMT WBM

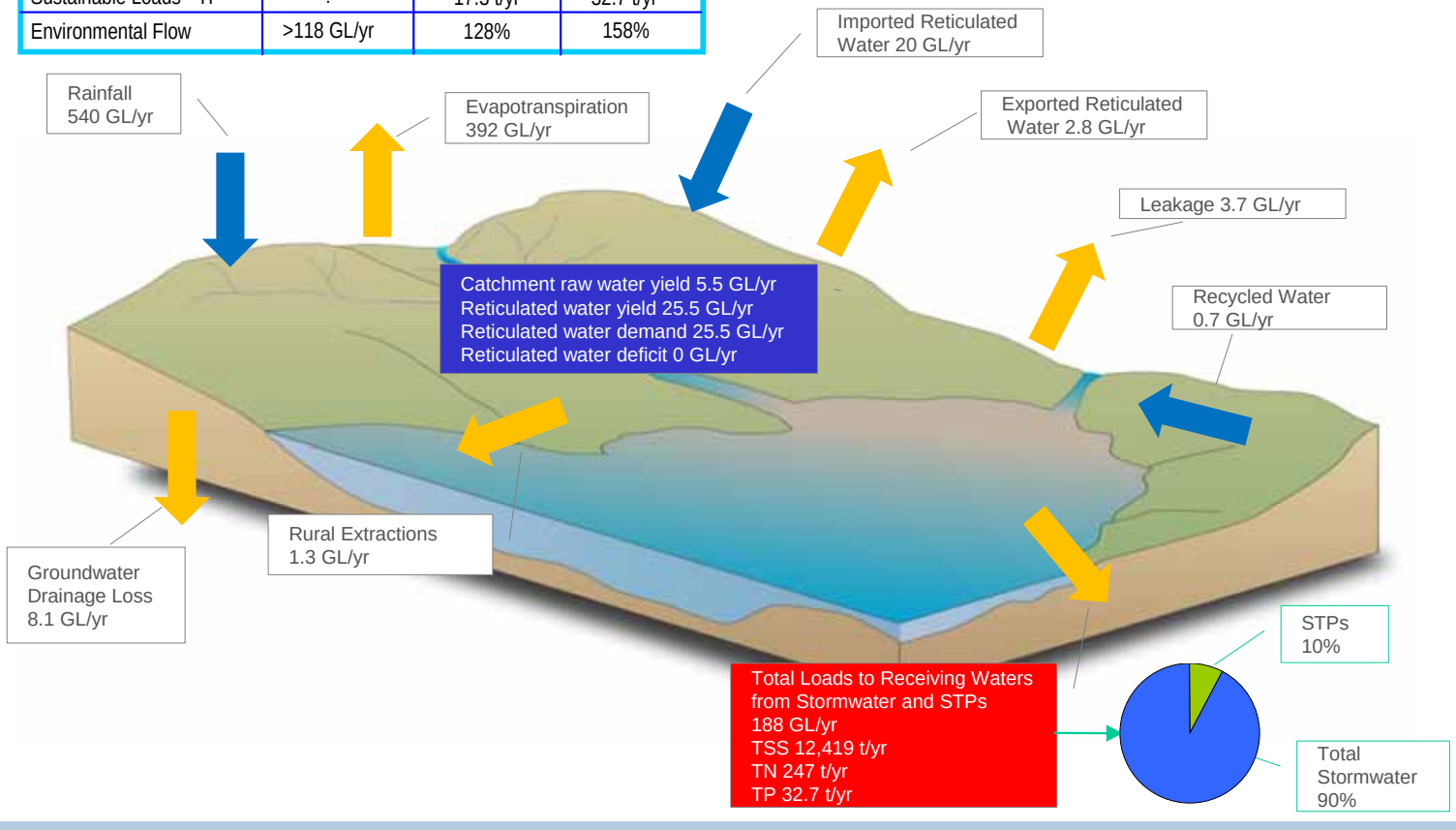
Caboolture River (with CIGA) Water Account



Constraints Table

	Constraint	2010	2031
Storage Yield	3.6 GL/yr	62%	100%
Water Treatment Plant	5.2 GL/yr	43%	69%
Sewage Treatment Plant (South Caboolture)	40,000 EP (Design) 100,000 EP (Licence)	113% (Design) 45% (Licence)	385% (Design) 154% (Licence)
Sewage Treatment Plant (Burpengary East)	49,500 EP (Design) <50,000 EP (Licence)	88% (Design) 87% (Licence)	156% (Design) 155% (Licence)
Recycled Water Reuse	3.7 GL/yr	19%	19%
Sustainable Loads - TSS	?	8,829 t/yr	12,419 t/yr
Sustainable Loads – TN	27 t/yr	574%	915%
Sustainable Loads - TP	?	17.3 t/yr	32.7 t/yr
Environmental Flow	>118 GL/yr	128%	158%

Population 69,500 **2010**



Population 172,200 **2031**

Burpengary Creek Catchment

Burpengary Creek catchment is 8,435 ha in size, with future land use consisting of approximately 25% urban, 14% agriculture and 61% conservation area / green space.

The urban population in Burpengary Creek catchment is approximately 42,800 people currently, and is expected to increase to about 64,400 people in 2031. This is an increase of 21,600 people which represents a 51% increase.

Stormwater runoff is drained by Burpengary Creek, which is the major waterway in this catchment. This waterway drains into Caboolture River near the coastline, which eventually discharges into Deception Bay. The receiving waters of Deception Bay received an EHMP score of D+ in 2010.

Potable water is sourced from the reticulated water network, with water coming from the Northern Pipeline Interconnector (NPI) and North Pine Dam.

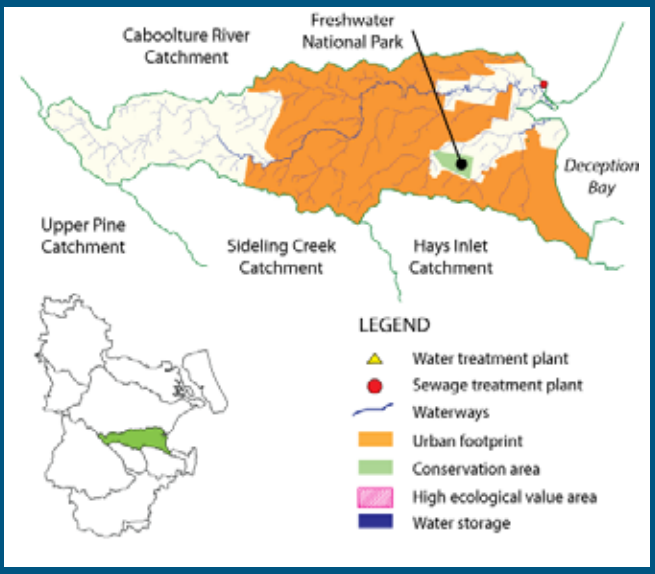
Wastewater is treated at the Burpengary East sewage treatment plant (STP) which is located on the northern catchment border and included in the Caboolture River catchment summary. Wastewater from adjacent Sideling Creek and Hays Inlet catchments is also treated at this STP. All treated wastewater is discharged into the Caboolture River lower estuary.

Freshwater National Park is a key conservation area in the catchment.

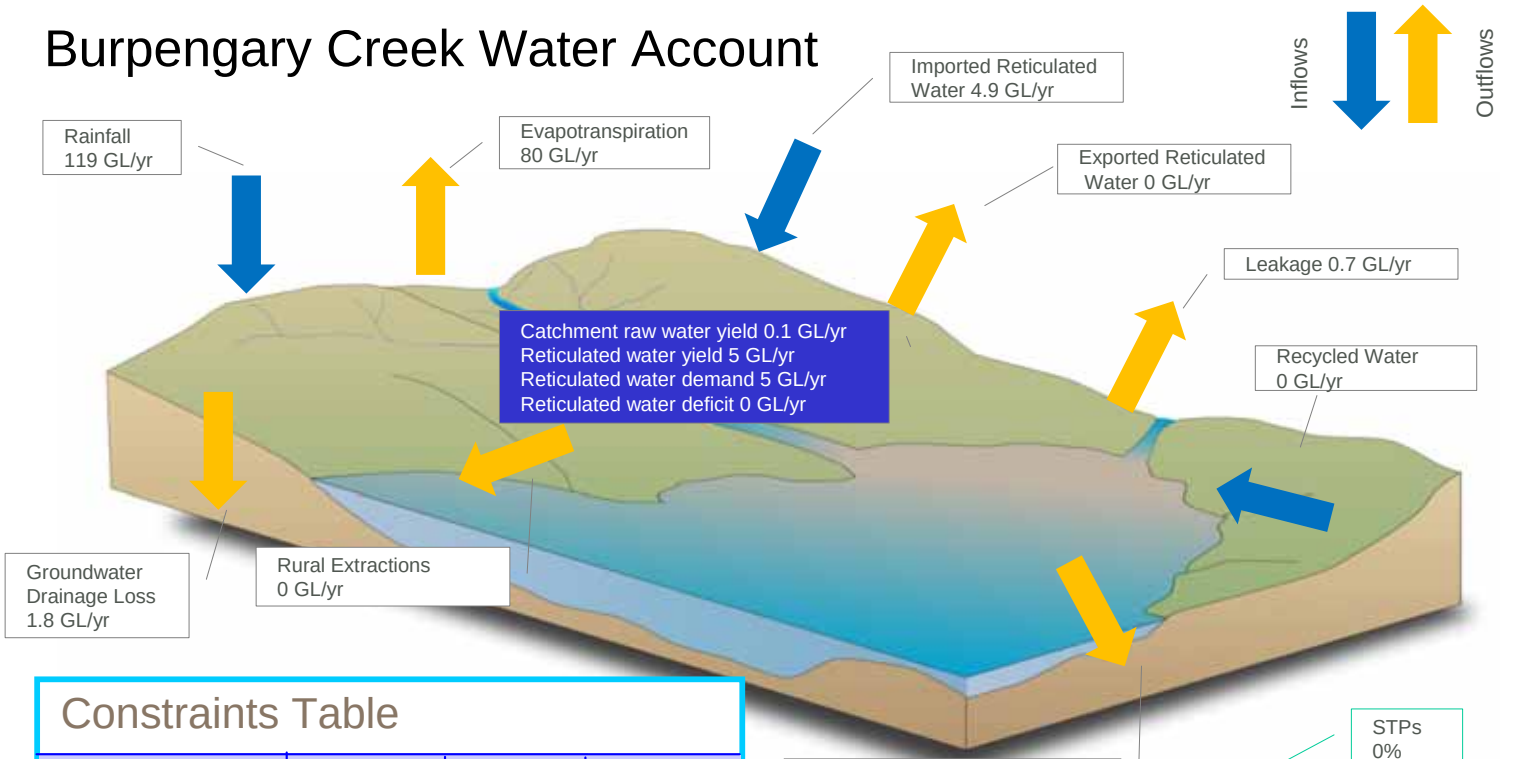
The water account for Burpengary Creek catchment, showing water movement and key issues, is summarised on the following page.

Catchment Facts

- **Area: 8,435 ha**
- **Current Population: 42,800**
- **Future Population: 64,400**
- **Future Pop. Growth: 51%**
- **Future Urban Land Use: 25%**
- **Potable water sourced from NPI and North Pine Dam**
- **Wastewater treated at Burpengary East STP and discharged into Caboolture River lower estuary**
- **EHMP Score 2010: D+ (Deception Bay)**

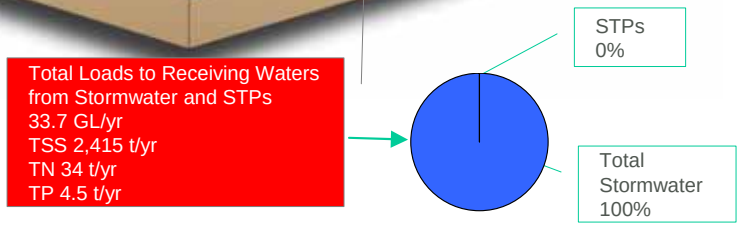


Burpengary Creek Water Account

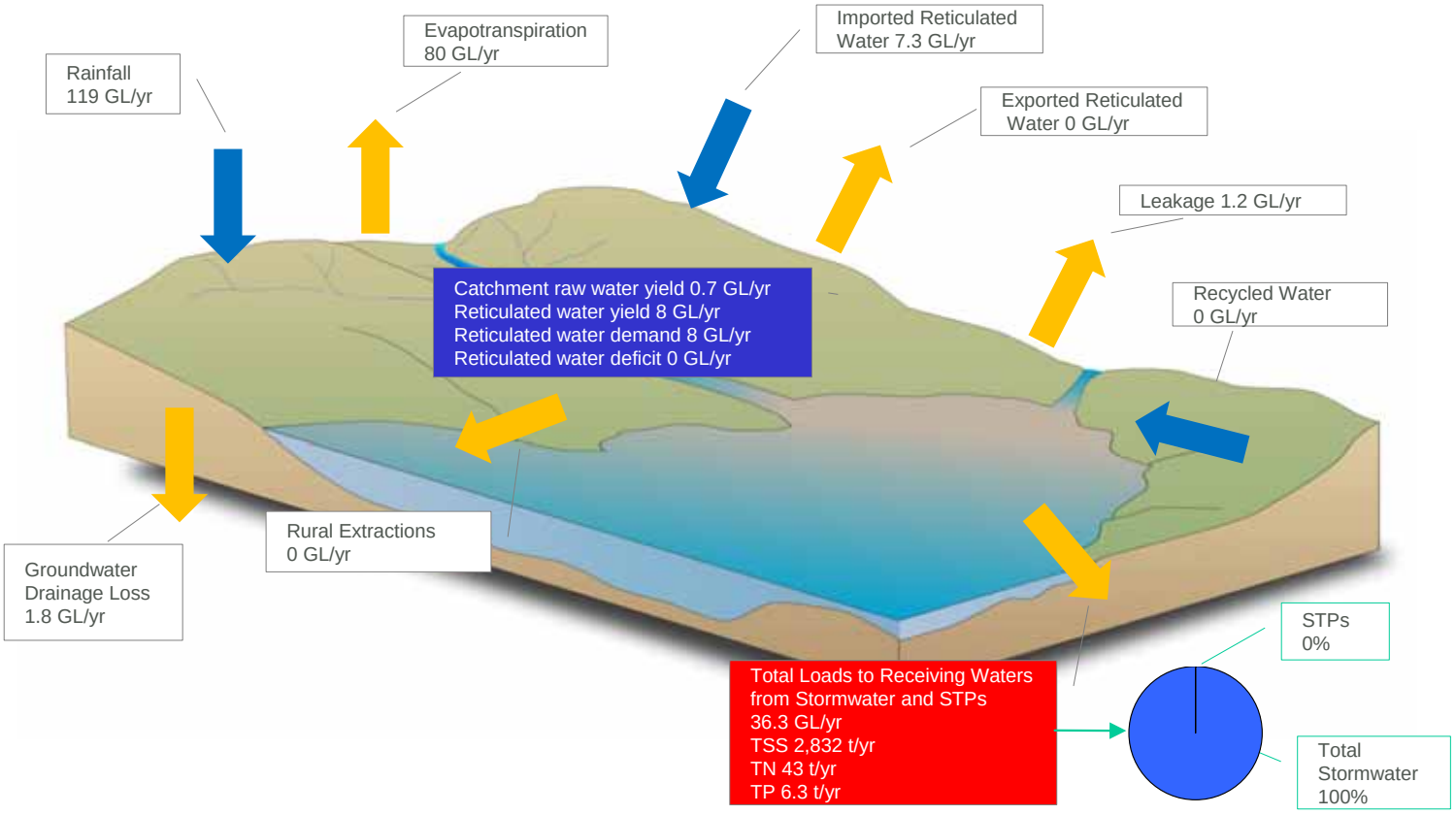


Constraints Table

	Constraint	2010	2031
Storage Yield	N/A	N/A	N/A
Water Treatment Plant	N/A	N/A	N/A
Sewage Treatment Plant	N/A	N/A	N/A
Recycled Water Reuse	N/A	N/A	N/A
Sustainable Loads - TSS	?	2,415 t/yr	2,832 t/yr
Sustainable Loads – TN	?	34 t/yr	43 t/yr
Sustainable Loads - TP	?	4.5 t/yr	6.3 t/yr
Environmental Flow	N/A	33.7 GL/yr	36.3 GL/yr



Population 42,800 **2010**



Population 64,400 **2031**

Upper Pine River Catchment

Upper Pine River catchment is 34,890 ha in size, with future land use consisting of approximately 2% urban, 16% agriculture and 82% conservation area / green space / surface water storage.

The urban population in Upper Pine River catchment, located in the township of Dayboro, is currently approximately 2,000 people. This is expected to increase to about 3,200 people in 2031, which represents a 60% increase.

Stormwater runoff is drained by North Pine River, which is the major waterway in this catchment, which discharges into Bramble Bay. The Pine catchment (freshwater) and Pine estuary both received an EHMP score of C- in 2010.

A dam constructed on North Pine River provides a regionally significant potable water storage in the form of North Pine Dam (Lake Samsonvale), which has a storage yield of 59 GL/yr. Potable water from North Pine Dam is treated at North Pine water treatment plant (WTP), which has a capacity of 91.3 GL/yr. Water from this WTP is distributed to most other catchments within the MBRC region, along with supplying the Brisbane City Council region via the Aspley reservoir.

Potable water in Dayboro is sourced from a groundwater borefield, which has a storage yield of 0.25 GL/yr. This water is treated by the Dayboro WTP, which has a capacity of 0.4 GL/yr.

Wastewater from Upper Pine River catchment is treated within the catchment at the Dayboro sewage treatment plant (STP), which irrigates treated wastewater onto Council farmland. This STP has a design capacity of 2,000 EP and a licence capacity of <1,500 EP.

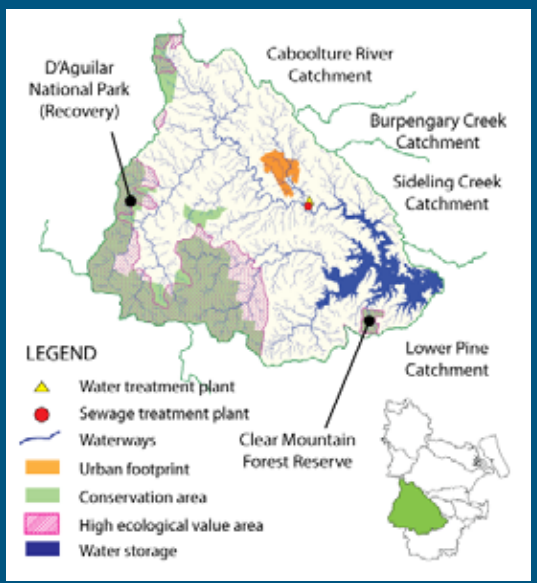
Key conservation areas in Upper Pine River catchment include D'Aguilar National Park, Clear Mountain Forest Reserve, and large areas in the upper catchment declared High Ecological Value (HEV) areas as per the EPP Water.

The water account for Upper Pine River catchment, showing water movement and key issues, is summarised on the following page.

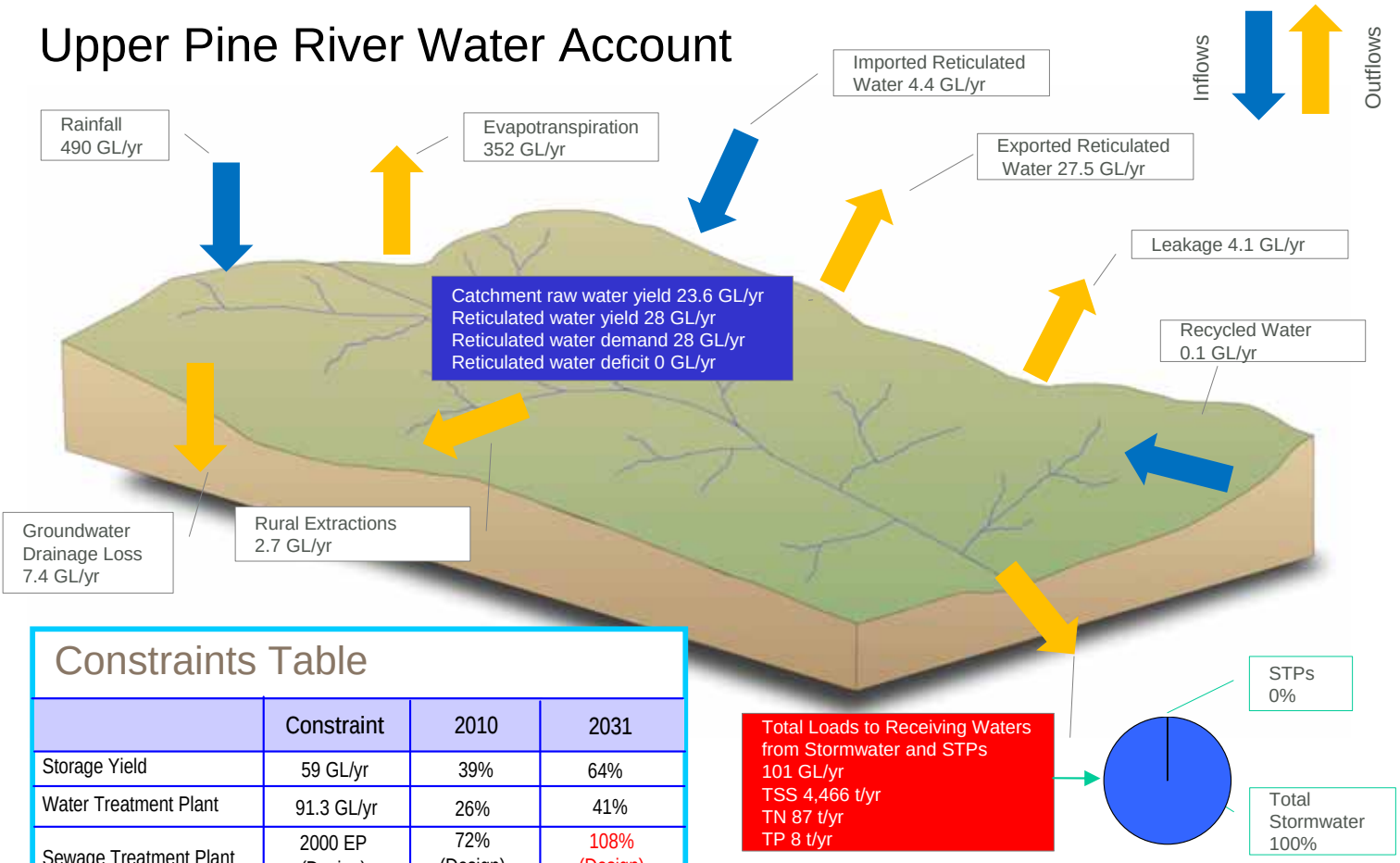
Catchment Facts

- **Area: 34,890 ha**
- **Current Population: 2,000**
- **Future Population: 3,200**
- **Future Pop. Growth: 60%**
- **Future Urban Land Use: 2%**
- **Potable water from North Pine Dam is distributed to other catchments and Brisbane**
- **Potable water in Dayboro sourced from groundwater borefield**
- **Wastewater treated at Dayboro STP**
- **Treated wastewater irrigated to land**
- **EHMP Score 2010:**

  C- (Freshwater)



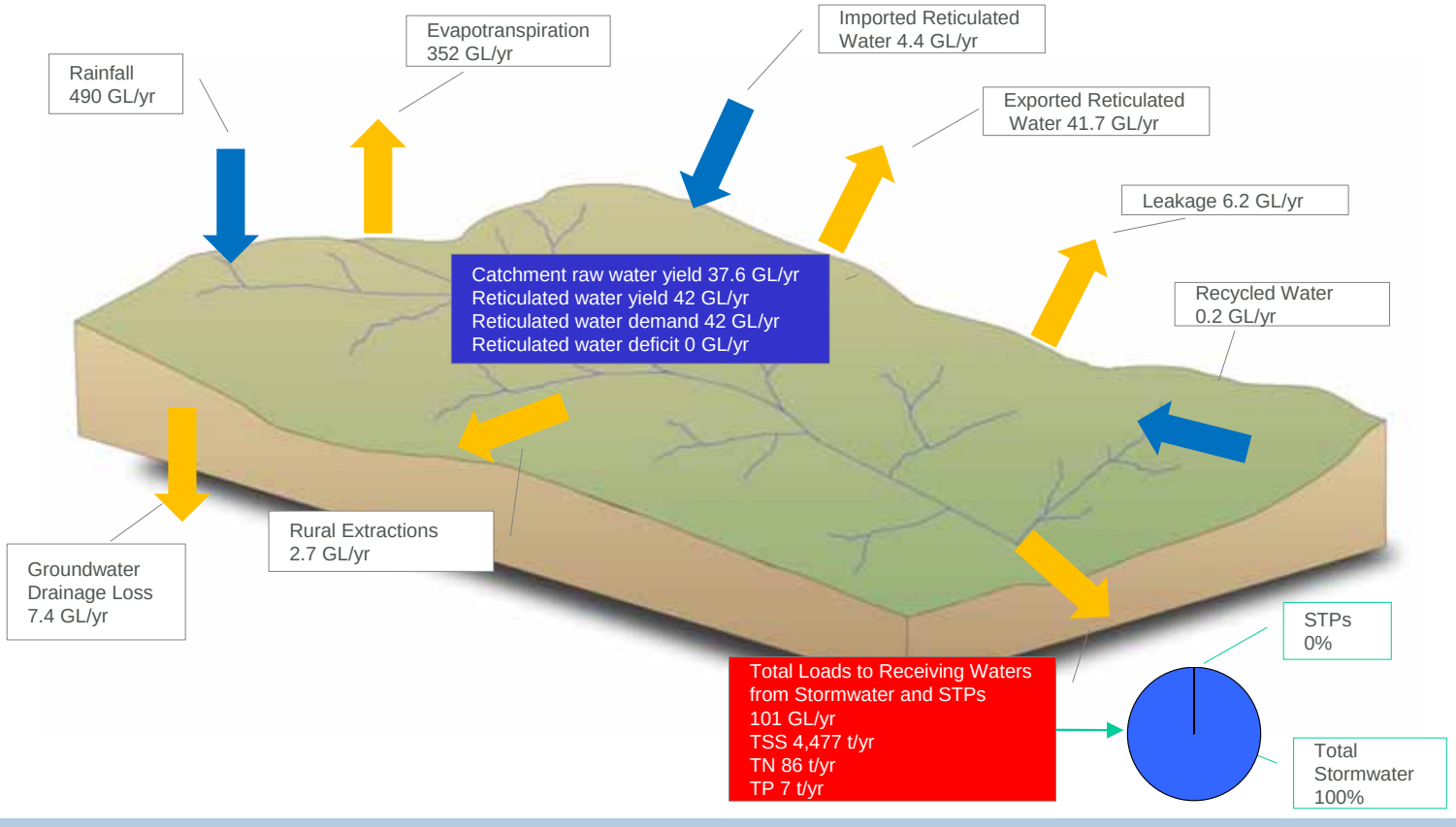
Upper Pine River Water Account



Constraints Table

	Constraint	2010	2031
Storage Yield	59 GL/yr	39%	64%
Water Treatment Plant	91.3 GL/yr	26%	41%
Sewage Treatment Plant (Dayboro)	2000 EP (Design) <1500 EP (Licence)	72% (Design) 96% (Licence)	108% (Design) 144% (Licence)
Recycled Water Reuse	0.1–0.2 GL/yr	100%	100%
Sustainable Loads - TSS	2,781 t/yr	161%	161%
Sustainable Loads – TN	62 t/yr	140%	139%
Sustainable Loads - TP	8.4 t/yr	95% t/yr	83%
Environmental Flow	N/A	101 GL/yr	101 GL/yr

Population 2,000 **2010**



Population 3,200 **2031**

Lower Pine River Catchment

Lower Pine River catchment is 28,280 ha in size, with future land use consisting of approximately 11% urban, 4% agriculture and 85% conservation area / green space.

The urban population in Lower Pine River catchment is approximately 90,700 people currently, and is expected to increase to about 133,000 people in 2031. This is an increase of 42,300 people which represents a 47% increase.

Stormwater runoff is drained by South Pine River, which is the major waterway in this catchment. This river converges with North Pine River and eventually discharges into Bramble Bay. The Pine catchment (freshwater) and Pine estuary both received an EHMP score of C- in 2010.

Potable water is sourced from the reticulated water network with water coming from both North Pine Dam and Lake Kurwongbah.

Wastewater from the northern portion of Lower Pine River catchment is treated at the Murrumba Downs sewage treatment plant (STP), which discharges into the Pine River upper estuary. Wastewater from the southern portion of the catchment is treated by the Brendale STP which discharges into the South Pine River. Murrumba Downs STP has a design capacity of 150,000 EP and pollutant load licence conditions. Brendale STP has a design capacity of 40,000 EP and a licence capacity of <50,000 EP.

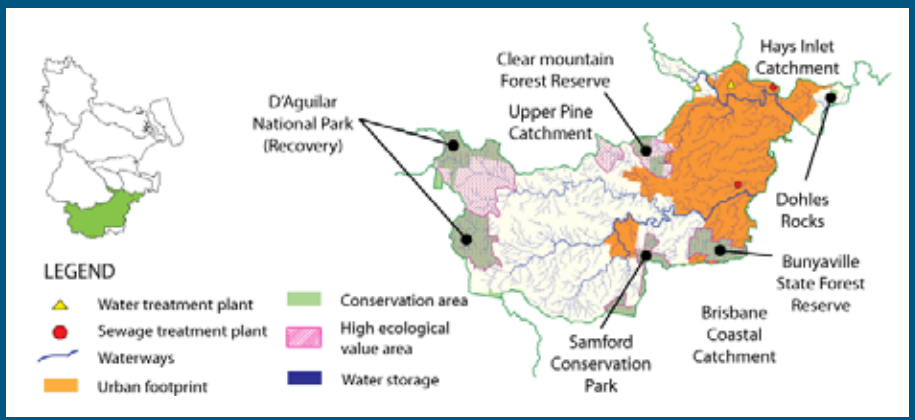
Key conservation areas in Lower Pine catchment include Dohles Rocks Reserve, Bunyaville Forest Reserve, Samford Conservation Park, Clear Mountain Forest Reserve, and D'Aguilar National Park. There are also some areas in the upper catchment declared as High Ecological Value (HEV) areas as per the EPP Water.

The water account for Lower Pine River catchment, showing water movement and key issues, is summarised on the following page.

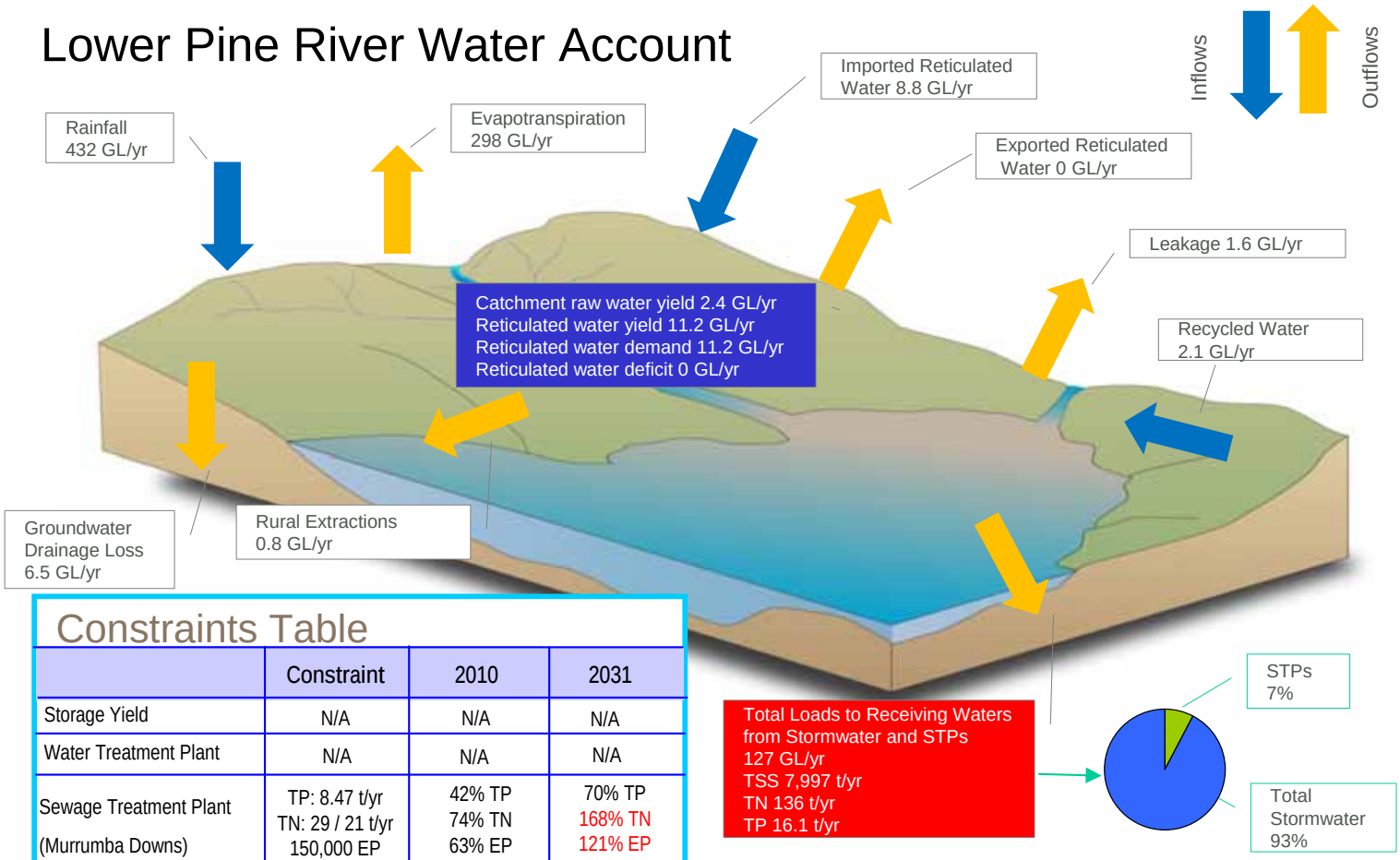
Catchment Facts

- **Area: 28,280 ha**
- **Current Population: 90,700**
- **Future Population: 133,000**
- **Future Pop. Growth: 47%**
- **Future Urban Land Use: 11%**
- **Potable water sourced from North Pine Dam and Lake Kurwongbah**
- **Wastewater treated at Murrumba Downs and Brendale STPs**
- **EHMP Score 2010:**

C- (Fresh) C- (Estuarine)



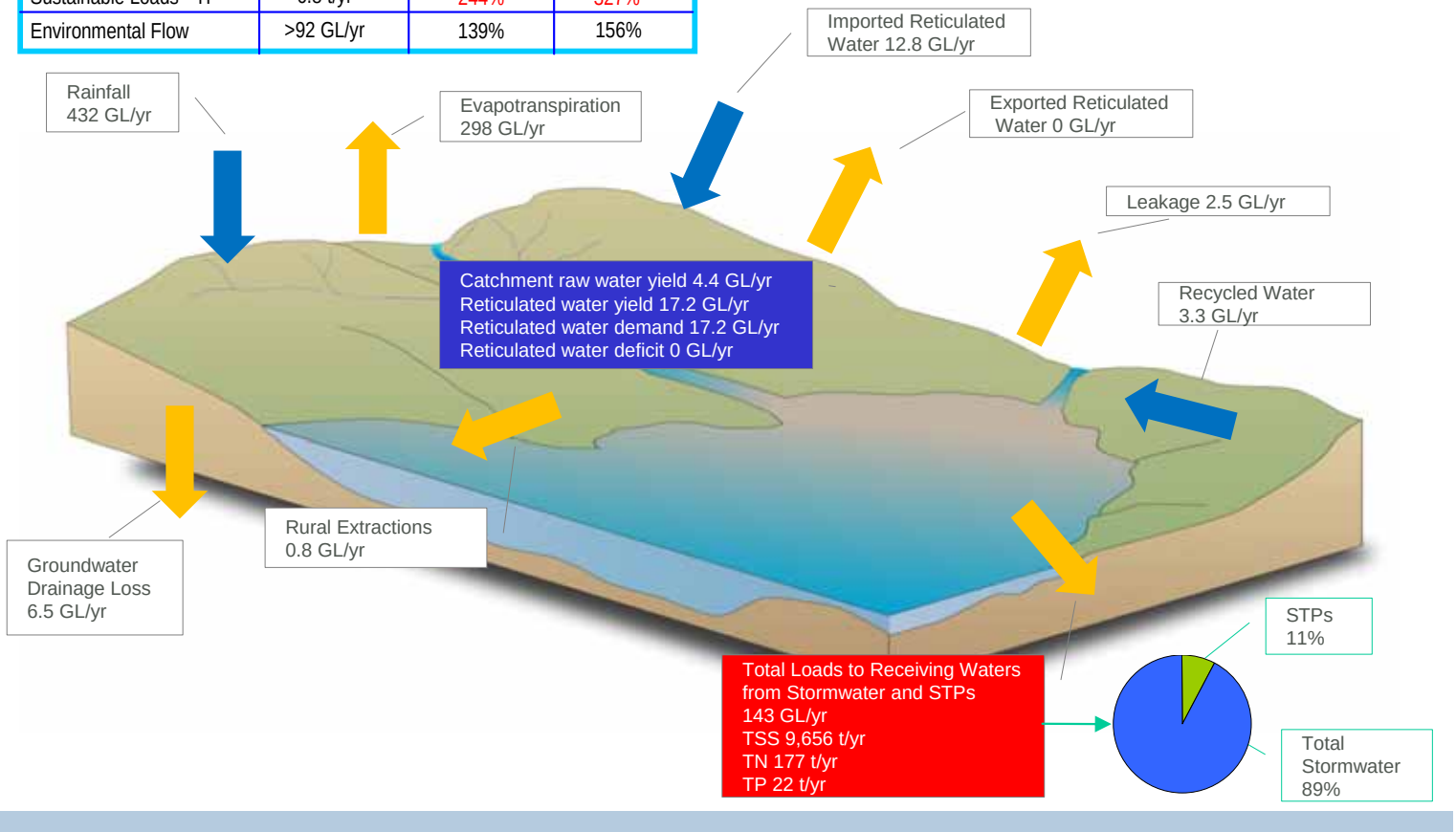
Lower Pine River Water Account



Constraints Table

	Constraint	2010	2031
Storage Yield	N/A	N/A	N/A
Water Treatment Plant	N/A	N/A	N/A
Sewage Treatment Plant (Murrumba Downs)	TP: 8.47 t/yr TN: 29 / 21 t/yr 150,000 EP (Design)	42% TP 74% TN 63% EP (Design)	70% TP 168% TN 121% EP (Design)
Sewage Treatment Plant (Brendale)	40,000 EP (Design) <50,000 EP (Licence)	100% (Design) 80% (Licence)	183% (Design) 146% (Licence)
Recycled Water Reuse	10.5 GL/yr	20%	31%
Sustainable Loads - TSS	2,254 t/yr	355%	428%
Sustainable Loads – TN	50 t/yr	277%	353%
Sustainable Loads - TP	6.8 t/yr	244%	327%
Environmental Flow	>92 GL/yr	139%	156%

Population 90,700 **2010**



Population 133,000 **2031**

Sideling Creek Catchment

Sideling Creek catchment is 5,267 ha in size, with future land use consisting of approximately 18% urban, 18% agriculture and 64% conservation area / green space / surface water storage.

The urban population in Sideling Creek catchment is approximately 1,400 people currently, and is expected to increase to about 2,600 people in 2031. This is an increase of 1,200 people which represents an 87% increase.

Stormwater runoff is drained by Sideling Creek, which is the main waterway in this catchment, which converges with North Pine River which eventually discharges to Bramble Bay.

A dam constructed on Sideling Creek just prior to the confluence with the North Pine River provides potable water storage in the form of Lake Kurwongbah, which has a storage yield of 7 GL/yr. Potable water from Lake Kurwongbah is treated at the Petrie water treatment plant (WTP), which has a capacity of 16.4 GL/yr. Water from this WTP is distributed to other catchments within the MBRC region, including Hays Inlet, Redcliffe and Lower Pine River catchments.

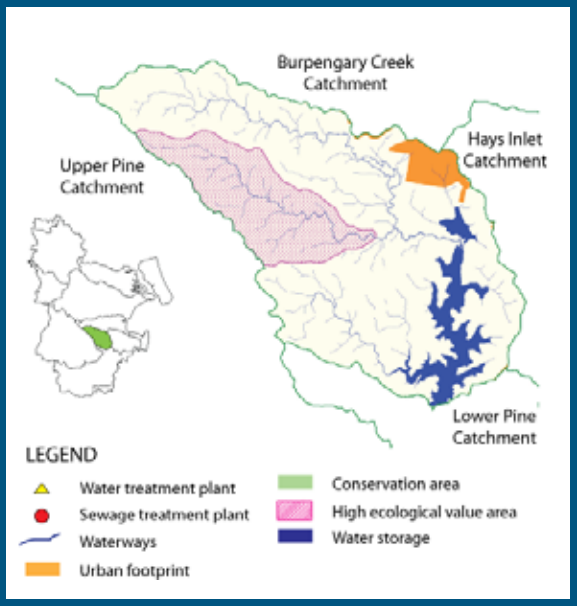
Wastewater from Sideling Creek catchment is treated at the Burpengary East sewage treatment plant (STP) located in Burpengary Creek catchment. Treated wastewater from this STP discharges into the Caboolture River lower estuary.

A key area of conservation exists in the upper reaches of the catchment around Mosquito Creek. This is declared as a High Ecological Value (HEV) area in the EPP Water.

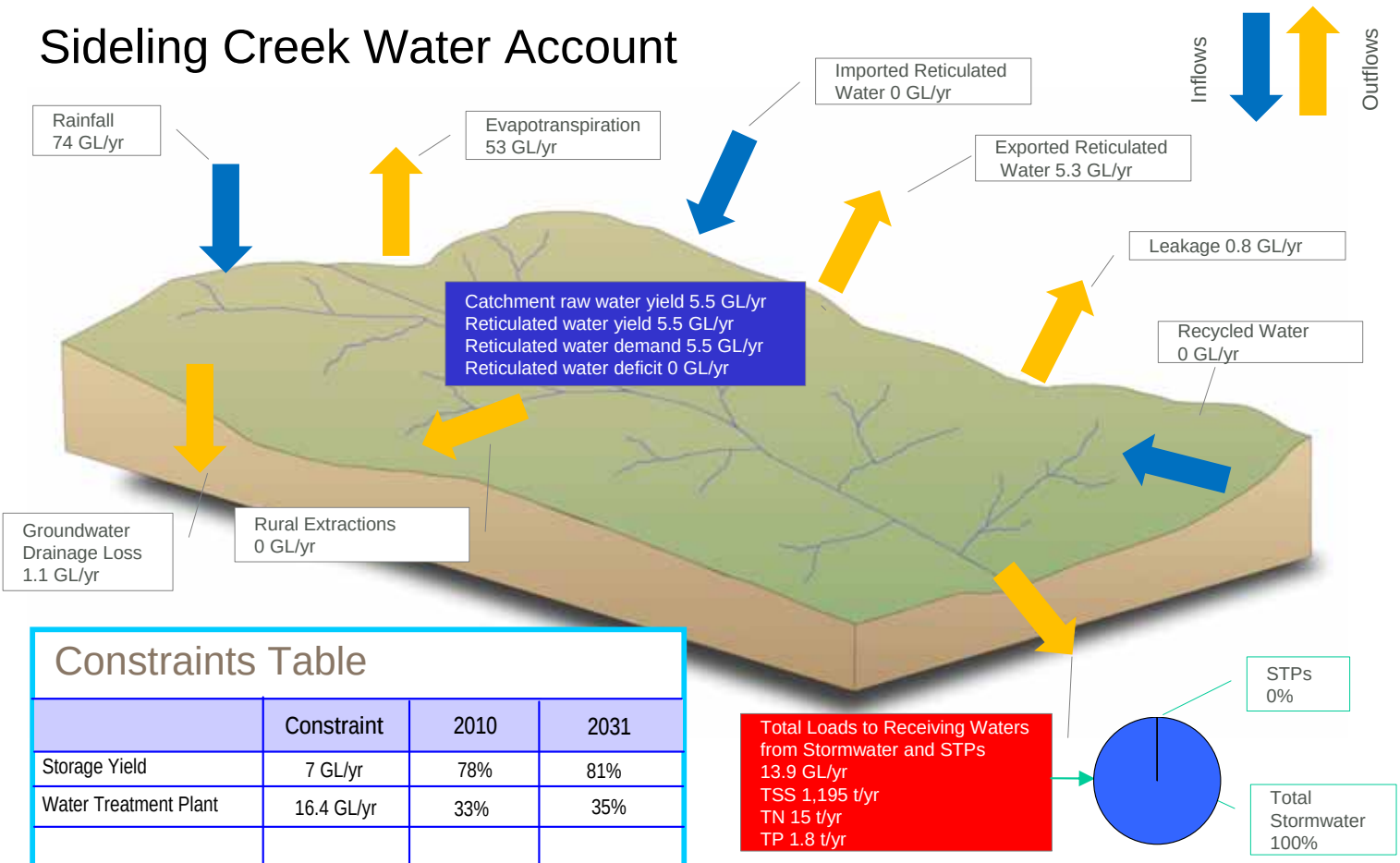
The water account for Sideling Creek catchment, showing water movement and key issues, is summarised on the following page.

Catchment Facts

- **Area: 5,267 ha**
- **Current Population: 1,400**
- **Future Population: 2,600**
- **Future Pop. Growth: 87%**
- **Future Urban Land Use: 18%**
- **Potable water from Lake Kurwongbah is distributed to adjacent catchments**
- **Wastewater treated at Burpengary East STP in Burpengary Creek catchment**



Sideling Creek Water Account

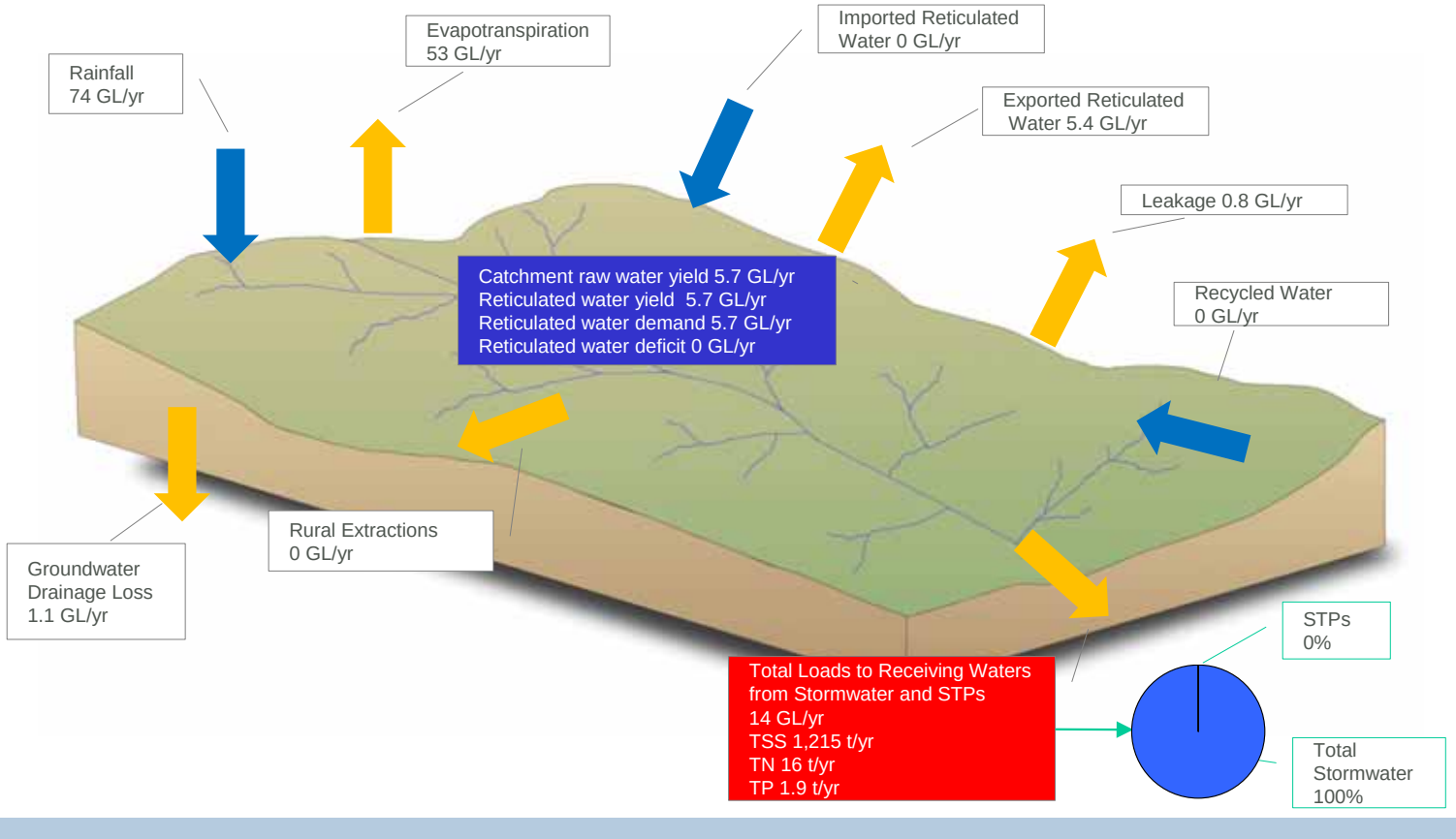


Constraints Table

	Constraint	2010	2031
Storage Yield	7 GL/yr	78%	81%
Water Treatment Plant	16.4 GL/yr	33%	35%
Sewage Treatment Plant	N/A	N/A	N/A
Recycled Water Reuse	N/A	N/A	N/A
Sustainable Loads - TSS	420 t/yr	285%	289%
Sustainable Loads – TN	9 t/yr	160%	171%
Sustainable Loads - TP	1.3 t/yr	142%	150%
Environmental Flow	N/A	13.9 GL/yr	14 GL/yr

Population 1,400

2010



Population 2,600

2031

Hays Inlet Catchment

Hays Inlet catchment is 7,599 ha in size, with future land use consisting of approximately 33% urban, 5% agriculture and 62% conservation area / green space.

The urban population in Hays Inlet catchment is approximately 63,600 people currently, and is expected to increase to about 111,600 people in 2031. This is an increase of 48,000 people which represents a 76% increase.

Hays Inlet catchment contains the future growth areas of Dakabin, Griffin, Mango Hill and North Lakes - collectively known as the 'Northern Growth Corridor' – which can accommodate an additional 40,000 people by 2031.

There are no major waterways in Hays Inlet catchment, however stormwater runoff is drained by a number of minor waterways such as Freshwater Creek which drain into Hays Inlet Conservation Park and into Bramble Bay. Bramble Bay received an EHMP score of D+ in 2010.

Potable water is sourced from the reticulated water network with water coming from both North Pine Dam and Lake Kurwongbah.

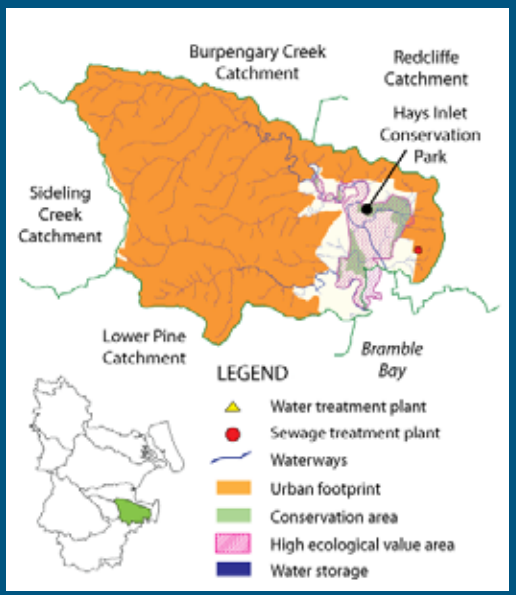
Wastewater from the southern portion of Hays Inlet catchment is treated at the Murrumba Downs sewage treatment plant (STP), which discharges into the Pine River upper estuary. Wastewater from the northern portion of the catchment is treated at Burpengary East STP, which discharges into Caboolture River lower estuary. Wastewater from the adjacent Redcliffe catchment is treated at the Redcliffe STP and is discharged into Hays Inlet. This STP has a design capacity of 70,000 EP and a licence capacity of <100,000 EP.

Key conservation areas in Hays Inlet catchment include Hays Inlet Conservation Park, which is also a RAMSAR wetland and a High Ecological Value (HEV) area as per the EPP Water.

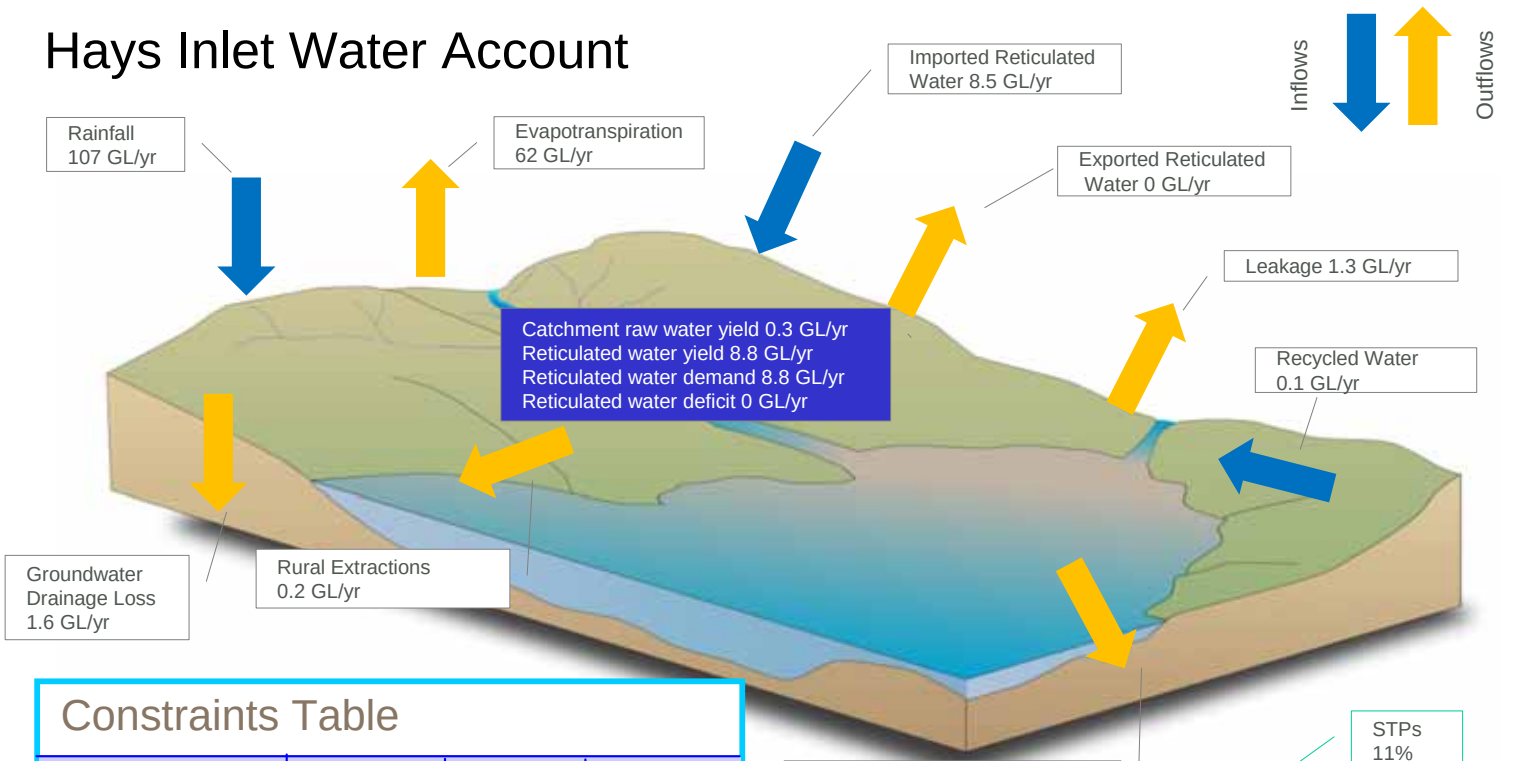
The water account for Hays Inlet catchment, showing water movement and key issues, is summarised on the following page.

Catchment Facts

- **Area: 7,599 ha**
- **Current Population: 63,600**
- **Future Population: 111,600**
- **Future Pop. Growth: 76%**
- **Future Urban Land Use: 33%**
- **Potable water sourced from North Pine Dam and Lake Kurwongbah**
- **Wastewater from southern catchment is treated at Murrumba Downs STP**
- **Wastewater from northern catchment is treated at Burpengary East STP**
- **Redcliffe STP discharges wastewater from Redcliffe into Hays Inlet**
- **EHMP Score 2010: D+ (Bramble Bay)**

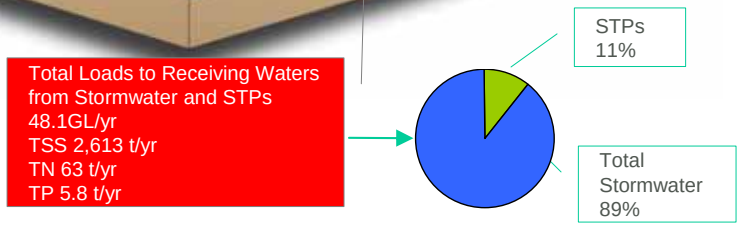


Hays Inlet Water Account

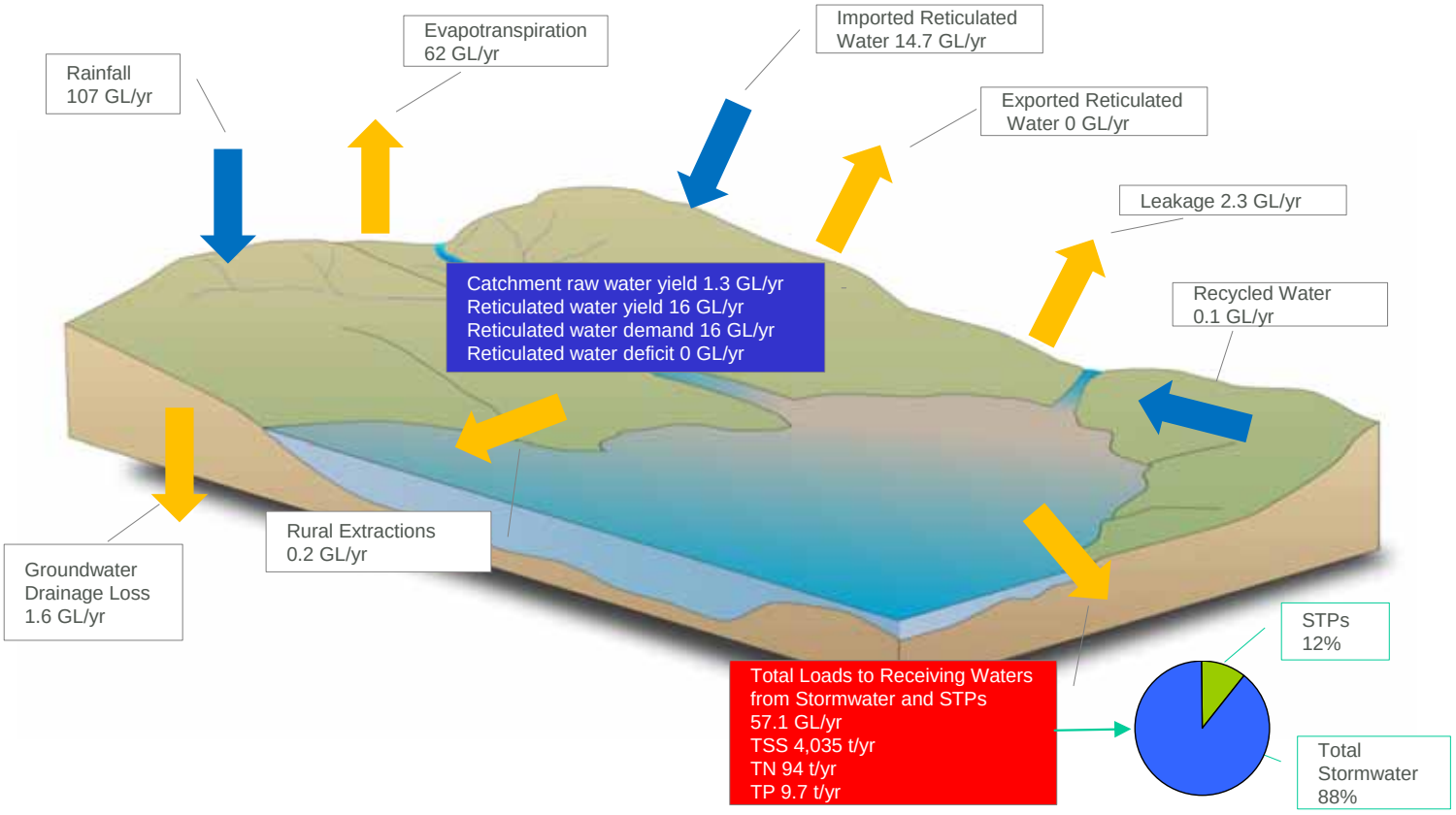


Constraints Table

	Constraint	2010	2031
Storage Yield	N/A	N/A	N/A
Water Treatment Plant	N/A	N/A	N/A
Sewage Treatment Plant (Redcliffe)	70,000 EP (Design) <100,000 EP (Licence)	94% (Design) 66% (Licence)	120% (Design) 84% (Licence)
Recycled Water Reuse	5.3 GL/yr	2%	2%
Sustainable Loads - TSS	606 GL/yr	431%	666%
Sustainable Loads – TN	13 t/yr	467%	697%
Sustainable Loads - TP	1.8 t/yr	317%	530%
Environmental Flow	N/A	48.1 GL/yr	57.1 GL/yr



Population 63,600 **2010**



Population 111,600 **2031**

Redcliffe Catchment

Redcliffe catchment is 2,662 ha in size, with future land use consisting of approximately 56% urban, 1% agriculture and 43% conservation area / green space.

The urban population in Redcliffe catchment is approximately 49,600 people currently, and is expected to increase to about 72,900 people in 2031. This is an increase of 23,300 people which represents a 47% increase.

There are no major waterways in Redcliffe catchment, and the majority of stormwater runoff is drained via small drainage lines and minor waterways into surrounding waters of Bramble Bay and Deception Bay. Both these bays received an EHMP score of D+ in 2010.

Potable water is sourced from the reticulated water network, with water coming from both North Pine Dam and Lake Kurwongbah.

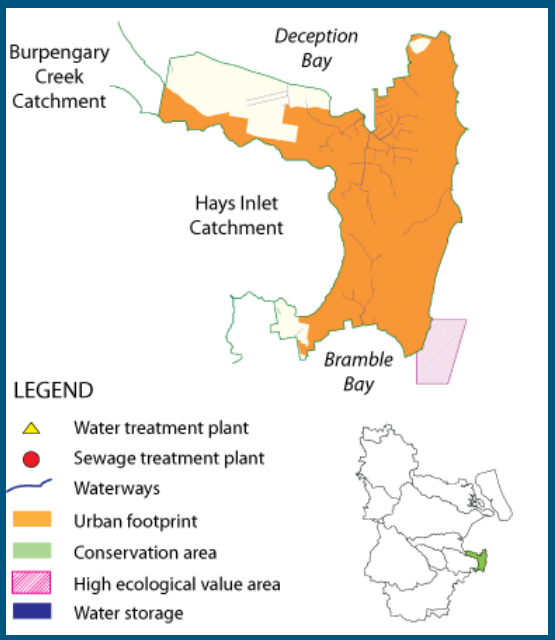
Wastewater from Redcliffe catchment is treated at the Redcliffe sewage treatment plant (STP) located in the adjacent Hays Inlet catchment. Treated wastewater from this STP discharges into Hays Inlet.

While there are no key conservation areas within Redcliffe catchment, directly adjacent is the Hays Inlet Conservation Park, which is also a RAMSAR wetland and a High Ecological Value (HEV) area as per the EPP Water. There is also a HEV area adjoining the south-eastern side of Redcliffe catchment.

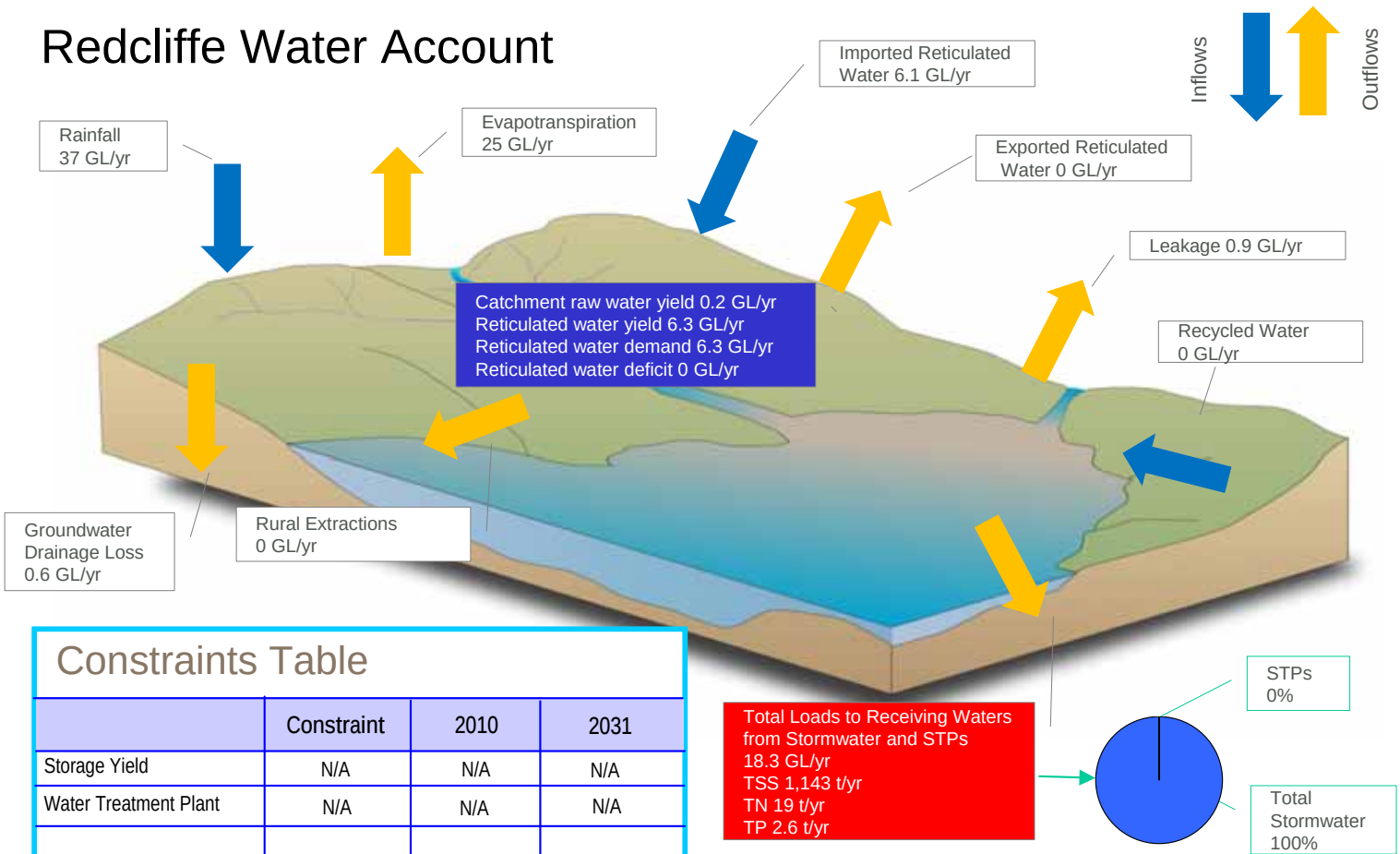
The water account for Redcliffe catchment, showing water movement and key issues, is summarised on the following page.

Catchment Facts

- **Area: 2,662 ha**
- **Current Population: 49,600**
- **Future Population: 72,900**
- **Future Pop. Growth: 47%**
- **Future Urban Land Use: 56%**
- **Potable water sourced from North Pine Dam and Lake Kurwongbah**
- **Wastewater treated at Redcliffe STP in Hays Inlet catchment**
- **EHMP Score 2010: D+ (Bramble & Deception Bays)**



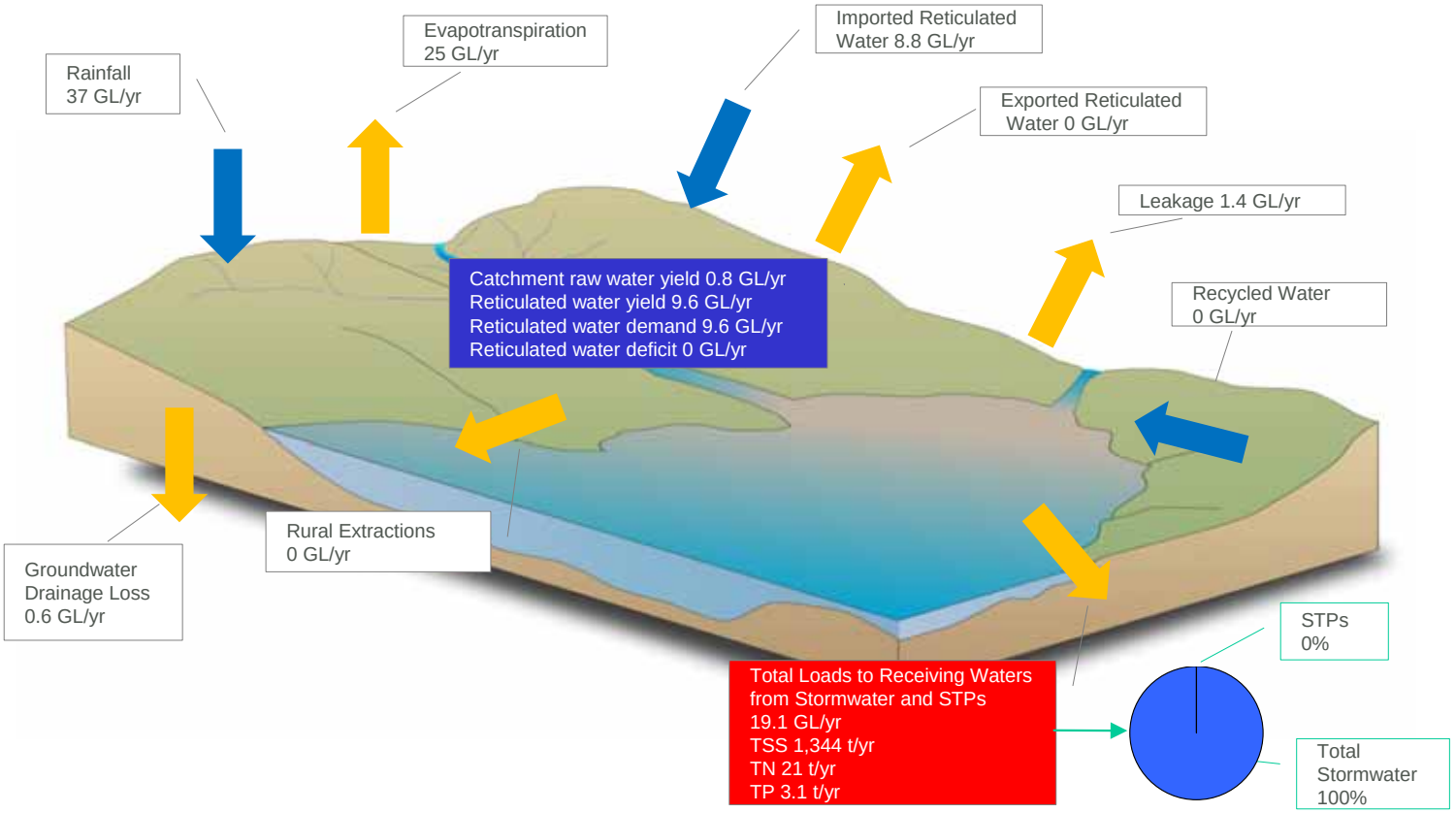
Redcliffe Water Account



Constraints Table

	Constraint	2010	2031
Storage Yield	N/A	N/A	N/A
Water Treatment Plant	N/A	N/A	N/A
Sewage Treatment Plant	N/A	N/A	N/A
Recycled Water Reuse	N/A	N/A	N/A
Sustainable Loads - TSS	205	558%	1,735%
Sustainable Loads – TN	5	380%	1,580%
Sustainable Loads - TP	0.6	433%	1,733%
Environmental Flow	N/A	18.3 GL/yr	19.1 GL/yr

Population 49,600 **2010**



Population 72,900 **2031**

Brisbane Coastal Catchment

Brisbane Coastal catchment is 1,530 ha in size, with future land use consisting of approximately 78% urban and 22% conservation area / green space.

The urban population in Brisbane Coastal catchment is approximately 22,600 people currently, and is expected to increase to about 24,100 people in 2031. This is an increase of 1,500 people which represents a 6% increase.

There are no major waterways in the Brisbane Coastal catchment, however stormwater runoff from the northern portion of the catchment drains to Cabbage Tree Creek, while the southern portion drains into Kedron Brook (Lower Brisbane Catchment) in the Brisbane City Council Region. The Lower Brisbane Catchment received an EHMP score of F in 2010.

Potable water is sourced from the reticulated water network, with water predominately coming from the North Pine water treatment plant (WTP) at North Pine Dam.

Wastewater from the northern part of the catchment is treated in the adjacent Lower Pine River catchment at the Brendale sewage treatment plant (STP), which discharges into the South Pine River. Wastewater from the southern part of the catchment (that drains towards Kedron Brook) is treated at Luggage Point STP in Brisbane.

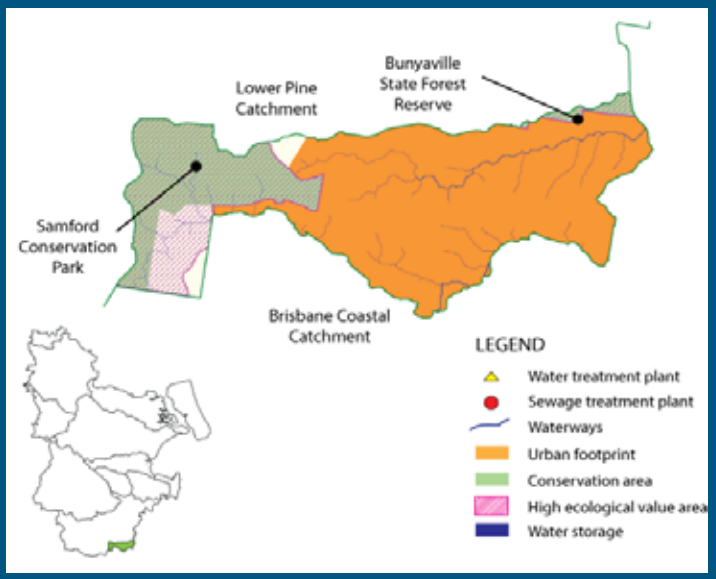
Key conservation areas in Brisbane Coastal catchment include Samford Conservation Park.

The water account for Brisbane Coastal catchment, showing water movement and key issues, is summarised on the following page.

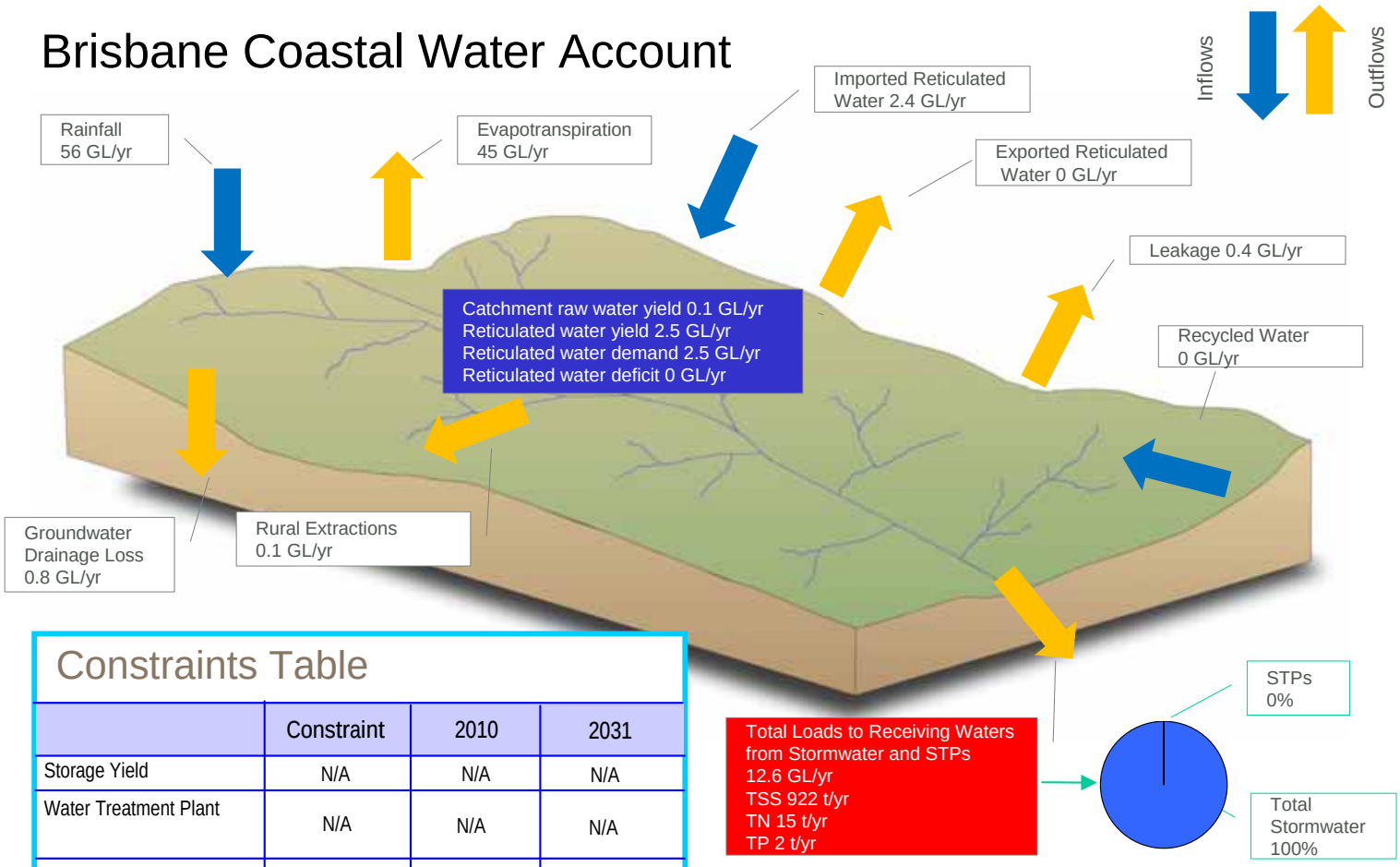
Catchment Facts

- **Area: 1,530 ha**
- **Current Population: 22,600**
- **Future Population: 24,100**
- **Future Pop. Growth: 6%**
- **Future Urban Land Use: 78%**
- **Potable water sourced from North Pine Dam**
- **Wastewater from northern catchment is treated at Brendale STP in adjacent Lower Pine River catchment**
- **Wastewater from southern catchment is treated at Luggage Point STP in Brisbane**
- **EHMP Score 2010: F**

(Lower Brisbane Catchment)



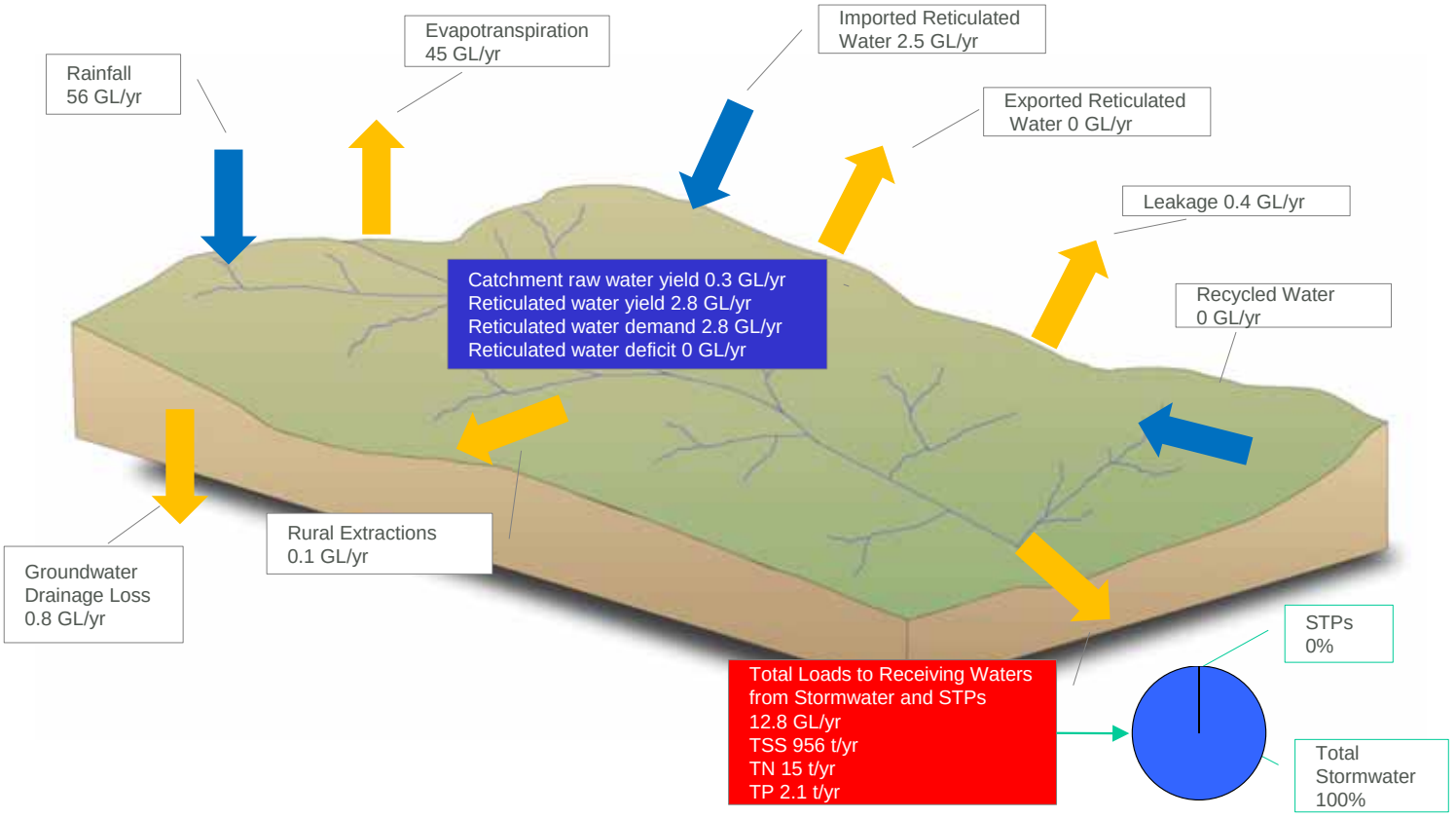
Brisbane Coastal Water Account



Constraints Table

	Constraint	2010	2031
Storage Yield	N/A	N/A	N/A
Water Treatment Plant	N/A	N/A	N/A
Sewage Treatment Plant	N/A	N/A	N/A
Recycled Water Reuse	N/A	N/A	N/A
Sustainable Loads - TSS	?	922 t/yr	956 t/yr
Sustainable Loads – TN	?	15 t/yr	15 t/yr
Sustainable Loads - TP	?	2 t/yr	2.1 t/yr
Environmental Flow	N/A	12.6 GL/yr	12.8 GL/yr

Population 22,600 **2010**



Population 24,100 **2031**

Mary River Catchment

Mary River catchment is 3,541 ha in size, with future land use consisting of approximately 3% urban, 53% agriculture and 44% conservation area / green space.

The urban population in Mary River catchment is currently nil, based on number of people connected to the reticulated water network.

There are no major waterways in Mary River catchment, however stormwater runoff flows north into the Mary River in the Sunshine Coast Regional Council area.

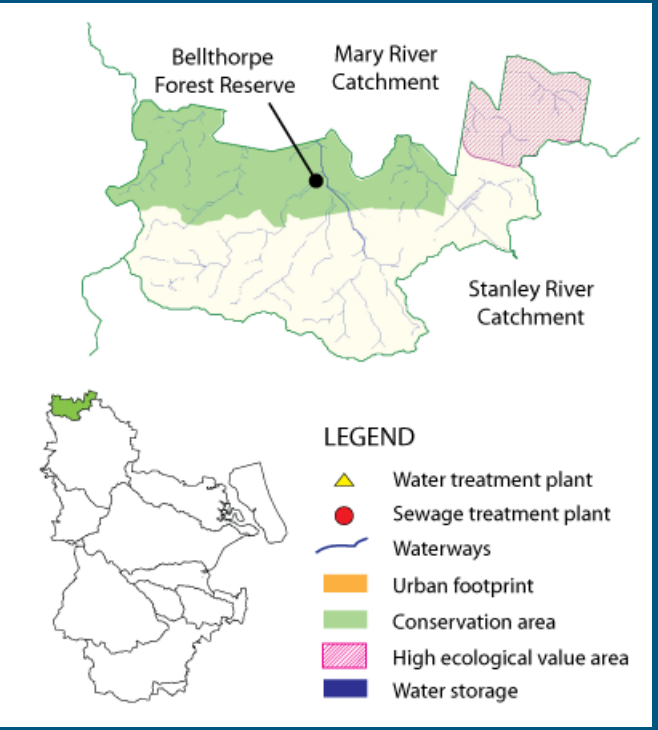
There is no reticulated water or wastewater infrastructure in this catchment due to the limited population.

Key conservation areas in Mary River catchment include Bellthorpe State Forest, along with an area declared as a High Ecological Value (HEV) area as per the EPP Water.

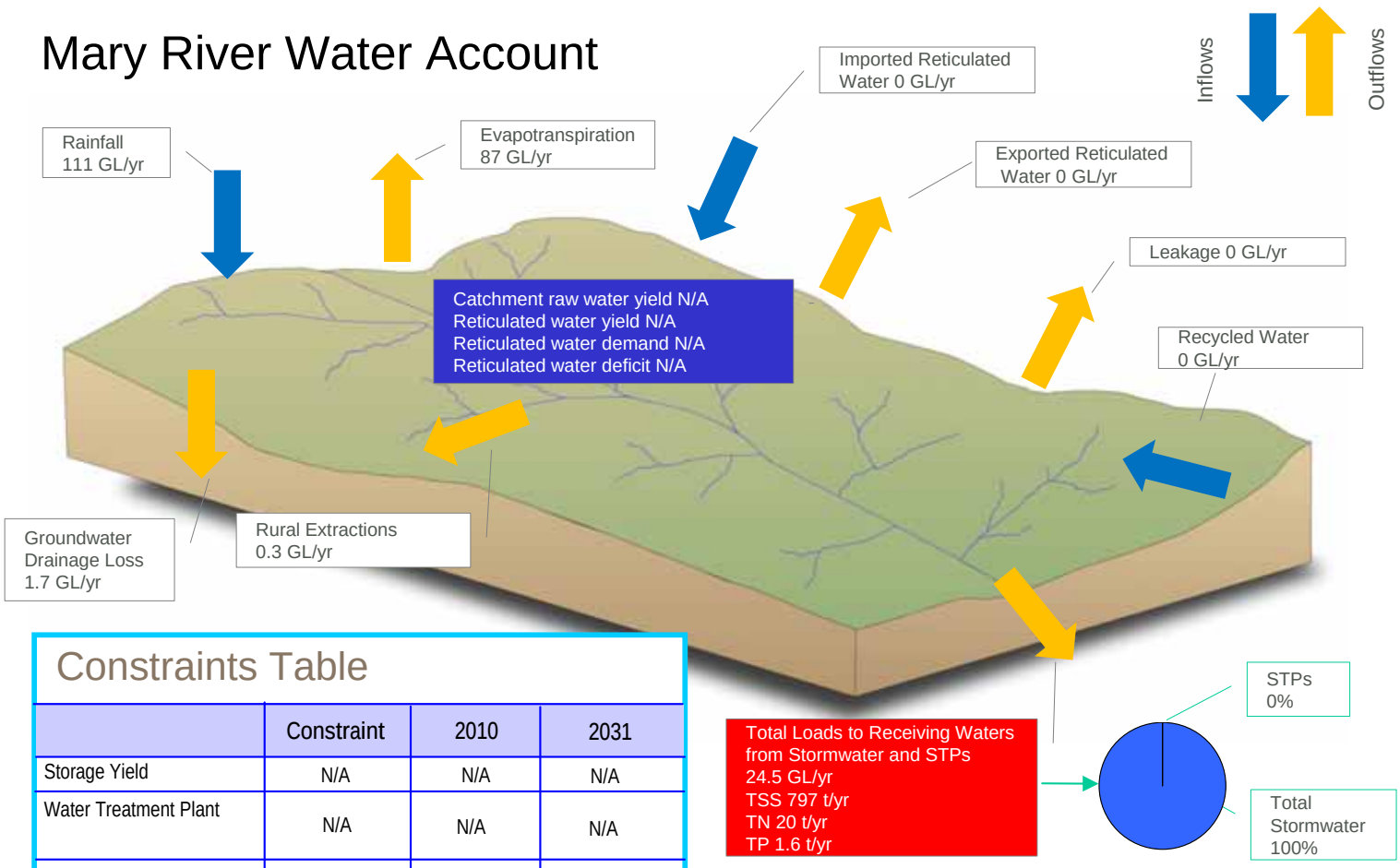
The water account for Mary River catchment, showing water movement and key issues, is summarised on the following page.

Catchment Facts

- **Area: 3,541 ha**
- **Current Population: 0**
- **Future Population: 0**
- **Future Urban Land Use: 3%**
- **No reticulated water or wastewater infrastructure**



Mary River Water Account

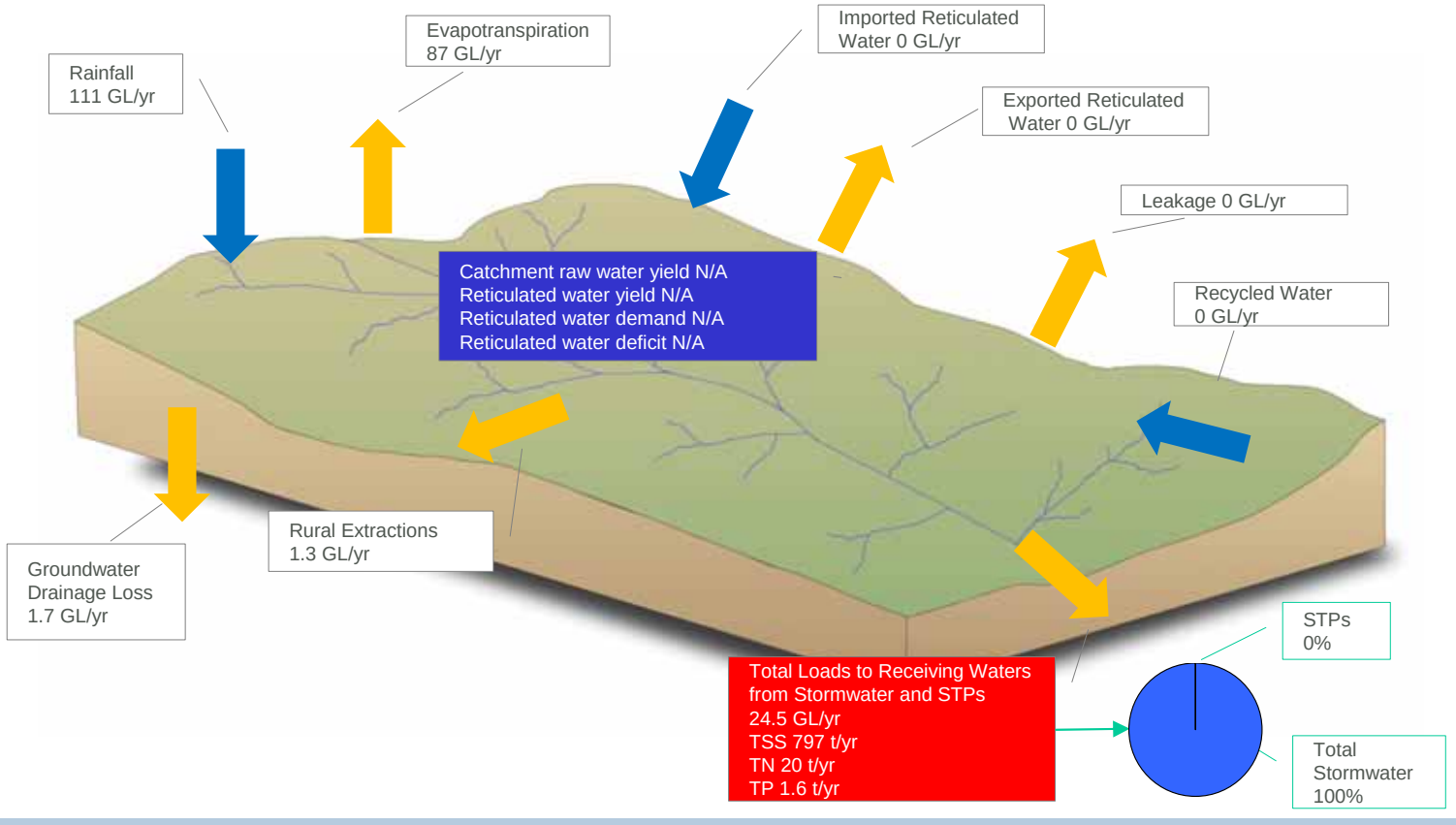


Constraints Table

	Constraint	2010	2031
Storage Yield	N/A	N/A	N/A
Water Treatment Plant	N/A	N/A	N/A
Sewage Treatment Plant	N/A	N/A	N/A
Recycled Water Reuse	N/A	N/A	N/A
Sustainable Loads - TSS	?	797 t/yr	797 t/yr
Sustainable Loads – TN	?	20 t/yr	20 t/yr
Sustainable Loads - TP	?	1.6 t/yr	1.6 t/yr
Environmental Flow	N/A	24.5 GL/yr	24.5 GL/yr

Population 0

2010



Population 0

2031

Byron Creek Catchment

Byron Creek catchment is 369 ha in size, with future land use consisting of 100% conservation area / green space.

There is currently no urban population in Byron Creek catchment due to the lack of urban land zoning.

No major waterways are located in the Byron Creek catchment, however stormwater runoff flows into Byron Creek in the Somerset Regional Council area, which eventually flows into the Brisbane River (upstream of Wivenhoe Dam).

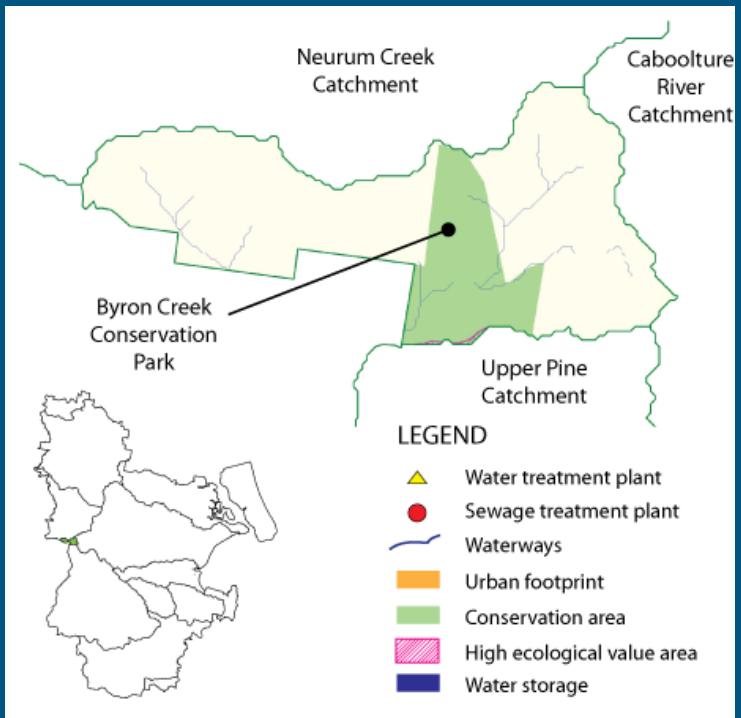
There is no reticulated water or wastewater infrastructure in this catchment due to the lack of urban population.

Byron Creek Conservation Park constitutes the key area of conservation within the catchment .

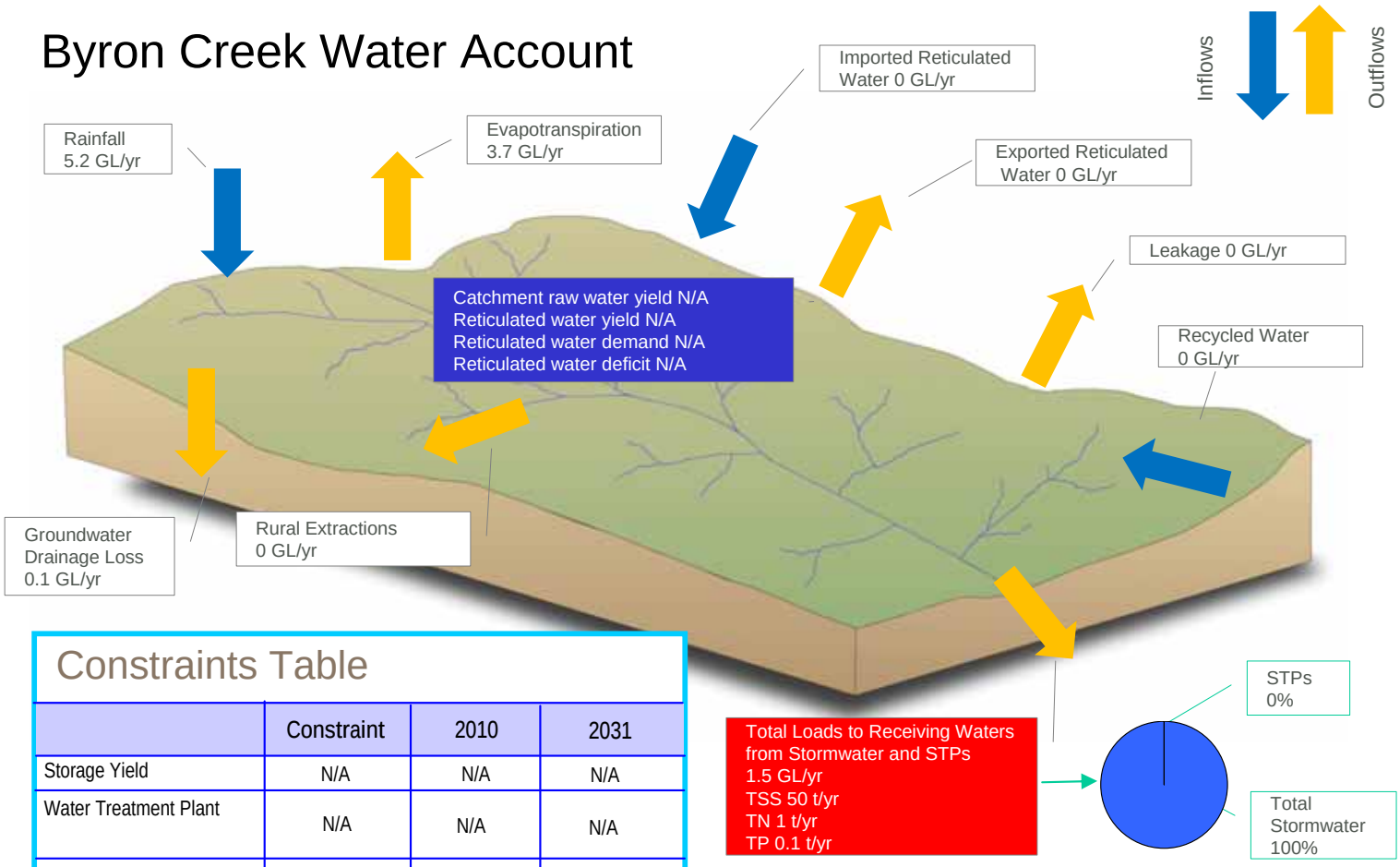
The water account for Byron Creek catchment, showing water movement and key issues, is summarised on the following page.

Catchment Facts

- **Area: 369 ha**
- **Current Population: 0**
- **Future Population: 0**
- **Future Urban Land Use: 0%**
- **No reticulated water or wastewater infrastructure in catchment**



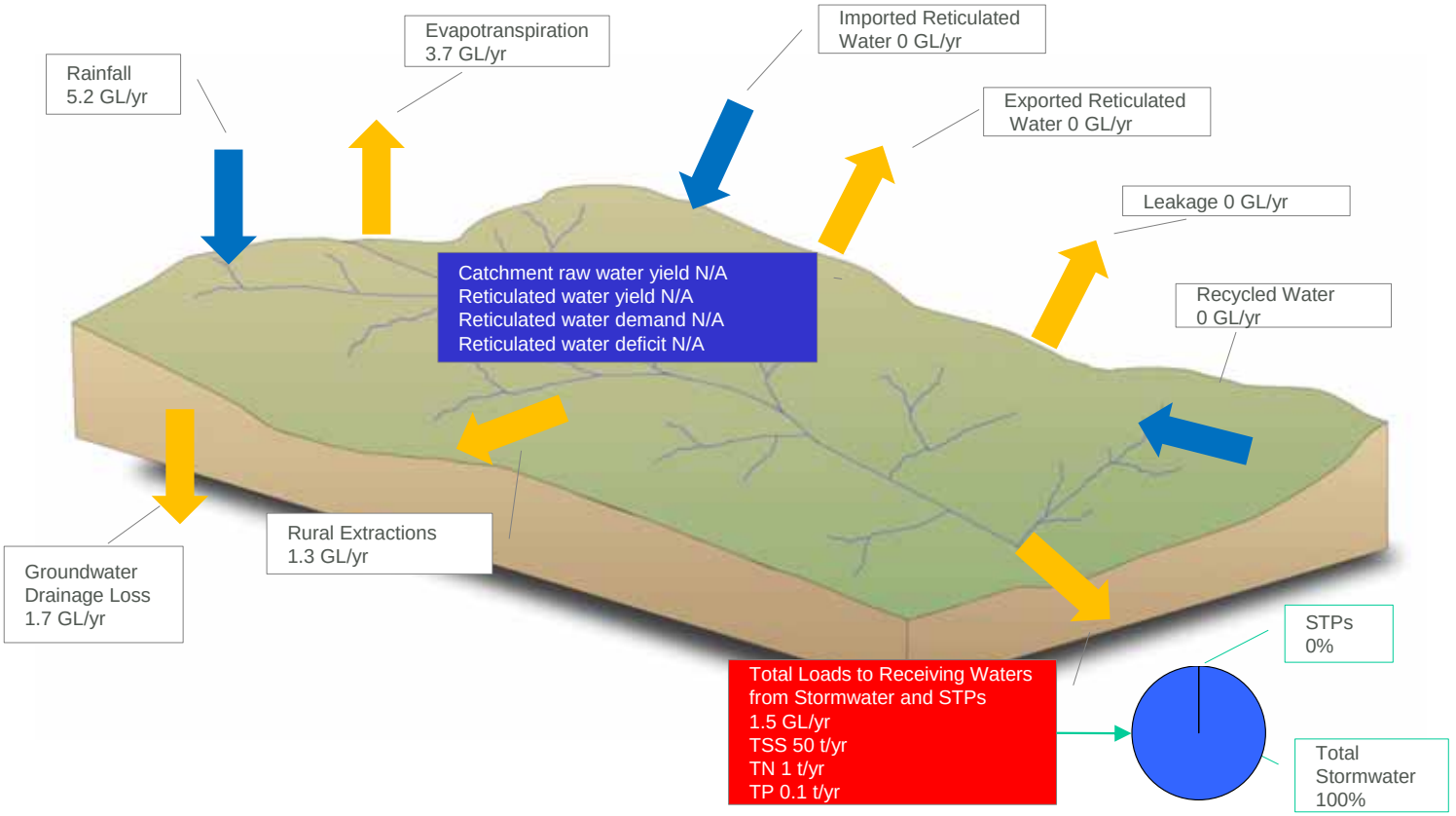
Byron Creek Water Account



Constraints Table

	Constraint	2010	2031
Storage Yield	N/A	N/A	N/A
Water Treatment Plant	N/A	N/A	N/A
Sewage Treatment Plant	N/A	N/A	N/A
Recycled Water Reuse	N/A	N/A	N/A
Sustainable Loads - TSS	?	50 t/yr	50 t/yr
Sustainable Loads – TN	?	1 t/yr	1 t/yr
Sustainable Loads - TP	?	0.1 t/yr	0.1 t/yr
Environmental Flow	N/A	1.5 GL/yr	1.5 GL/yr

Population 0 **2010**



Population 0 **2031**

Neurum Creek Catchment

Neurum Creek catchment is 10,510 ha in size, with future land use consisting of approximately 0.1% urban, 50% agriculture and 49.9% conservation area / green space.

There is currently no urban population in Neurum Creek due to the lack of urban land zoning.

Stormwater runoff is drained by Neurum Creek, which is the main waterway in this catchment. Neurum Creek flows in a westerly direction out of the MBRC region and discharges into Somerset Dam in the Somerset Regional Council area. This catchment is part of the greater Stanley River catchment, which received an EHMP score of B- in 2010.

There is no reticulated water or wastewater infrastructure in this catchment due to the limited population.

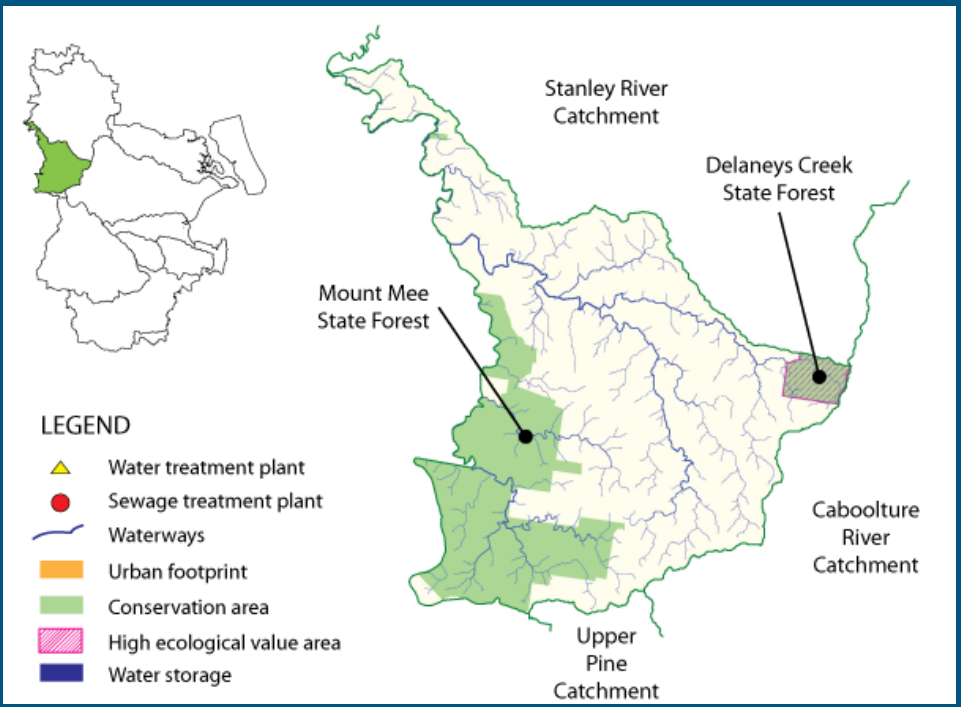
Key conservation areas in Neurum Creek catchment include Neurum Creek Conservation Park, Delaneys Creek State Forest, Mount Mee State Forest, and an area declared as High Ecological Value (HEV) as per the EPP Water.

The water account for Neurum Creek catchment, showing water movement and key issues, is summarised on the following page.

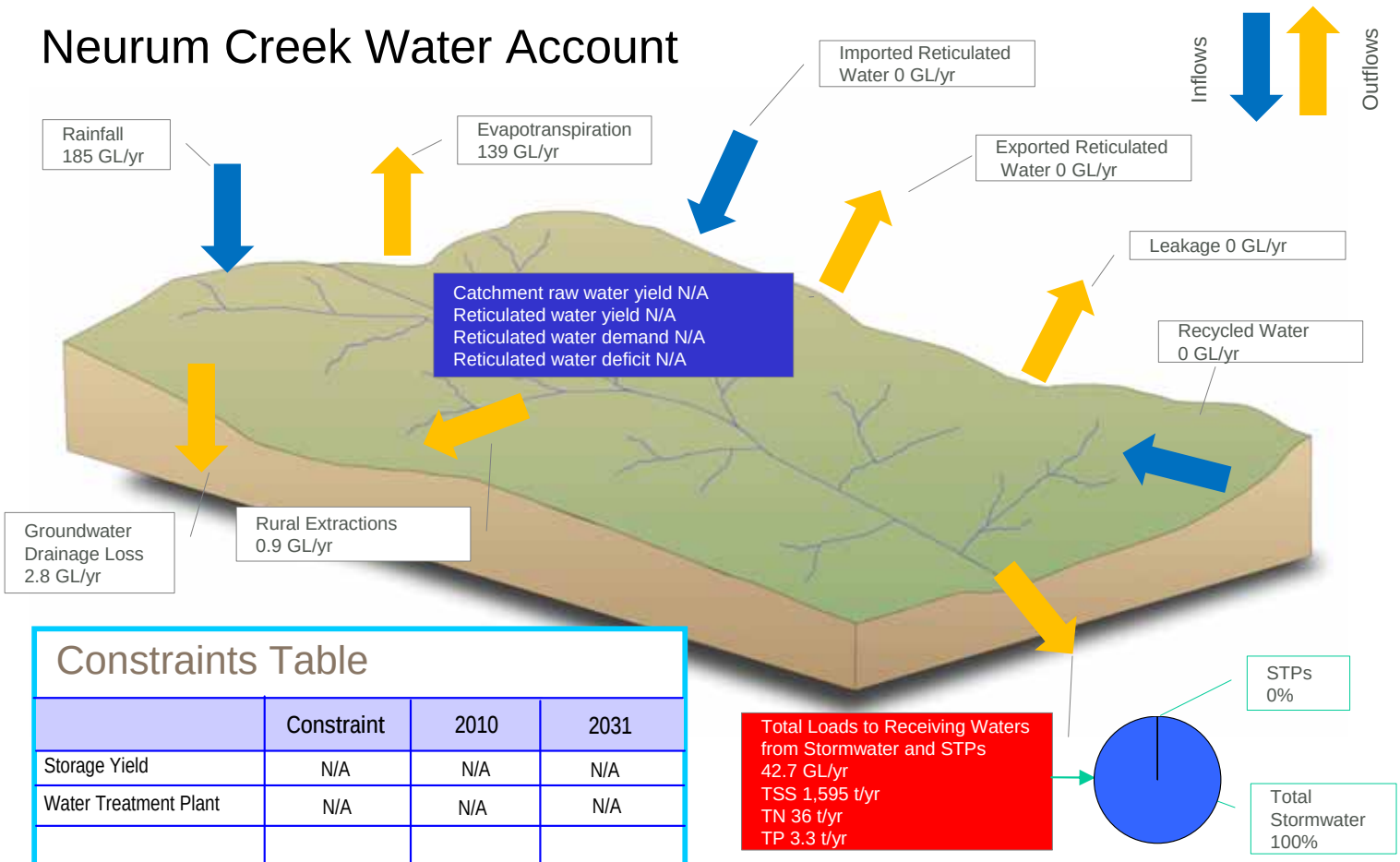
Catchment Facts

- **Area: 10,510 ha**
- **Current Population: 0**
- **Future Population: 0**
- **Future Urban Land Use: 0.1%**
- **No reticulated water or wastewater infrastructure**
- **EHMP Score 2010: B-**

(Stanley River Catchment)



Neurum Creek Water Account

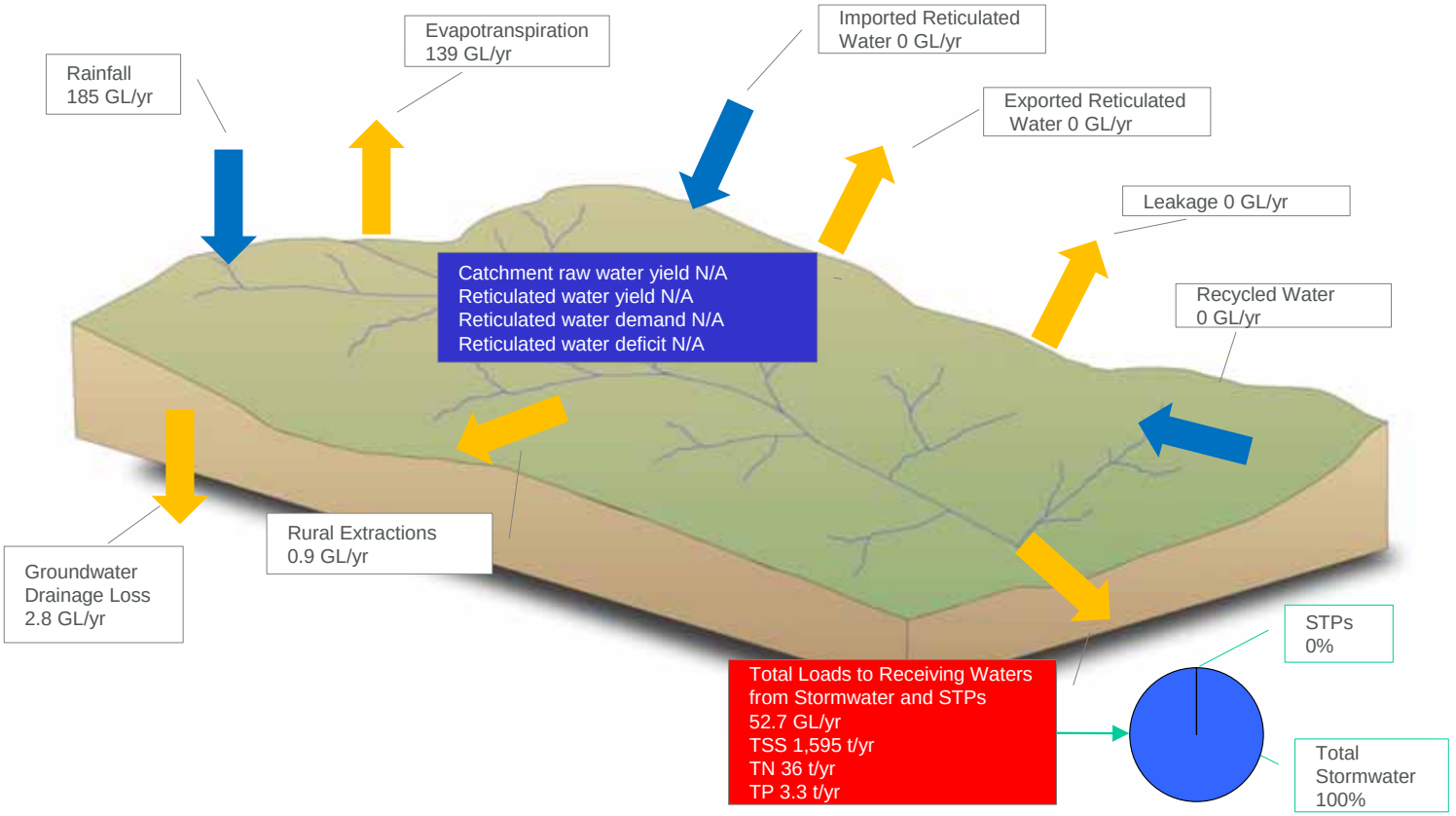


Constraints Table

	Constraint	2010	2031
Storage Yield	N/A	N/A	N/A
Water Treatment Plant	N/A	N/A	N/A
Sewage Treatment Plant	N/A	N/A	N/A
Recycled Water Reuse	N/A	N/A	N/A
Sustainable Loads - TSS	?	1,595 t/yr	1,595 t/yr
Sustainable Loads – TN	?	36 t/yr	36 t/yr
Sustainable Loads - TP	?	3.3 t/yr	3.3 t/yr
Environmental Flow	N/A	N/A	N/A

Population 0

2010



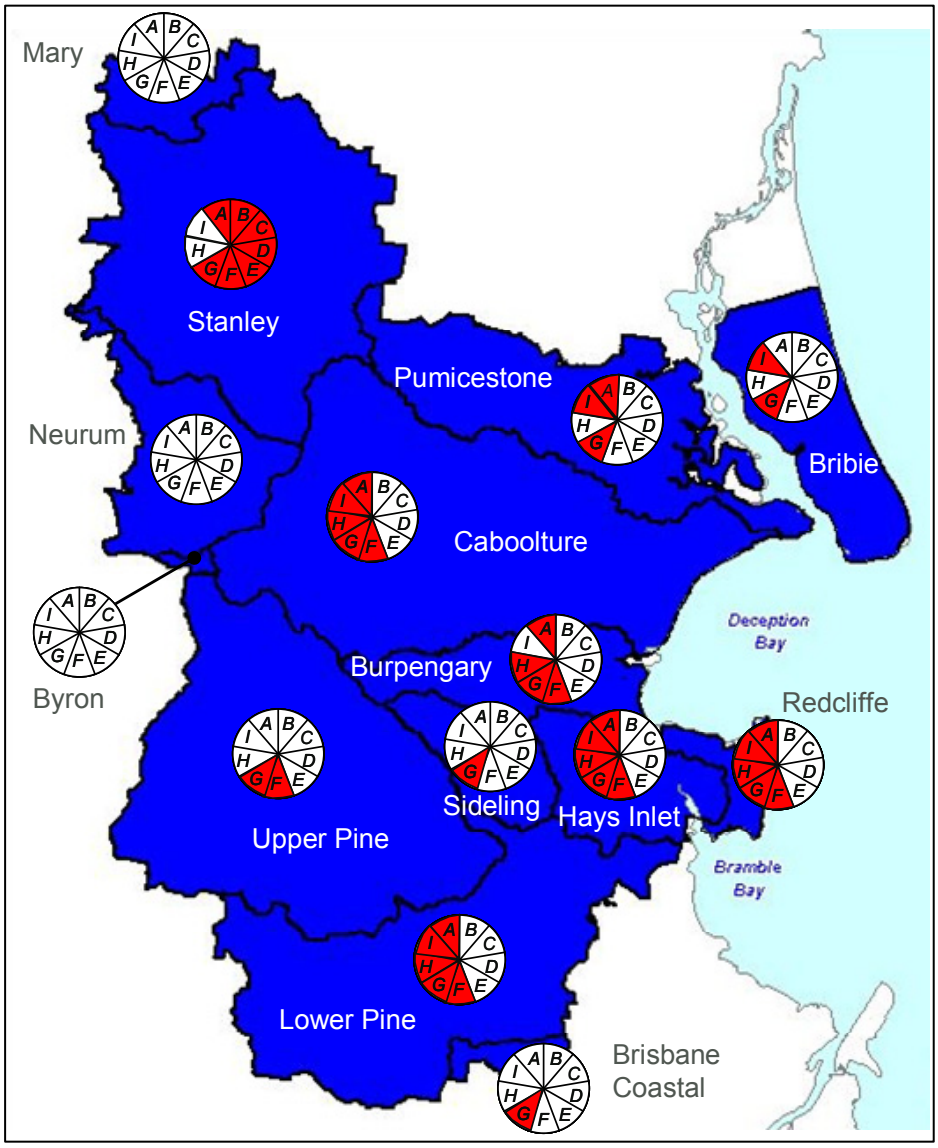
Population 0

2031

Existing and future water accounts and key catchment constraints (such as STP licence capacity, water supply storage yield, environmental flow objectives) were used to identify the key water cycle management issues within each catchment. Figure 2 illustrates the key water cycle management issues identified for each catchment within Moreton Bay Regional Council.

The issues identified in Figure 2 also relate back to some of the key drivers identified for TWCM. Further information on how these issues were identified can be found in the *TWCM Strategy Technical Report.*

It is noted that further detailed investigations will be required to identify the extent of flooding issues and verify other key issues dependent upon constraints such as sustainable loads and environmental flows. It is noted that detailed flooding investigations are currently underway and will be addressed in a Floodplain Management Plan, that will serve as a companion document to the TWCM Plan.



Key Catchment Issues:	
A	Population Growth
B	Water Supply
C	Environmental Flow
D	Climate Change
E	Water Conservation
F	STP Capacity
G	Water Quality
H	Water Quantity (Flooding)
I	Environmentally Sensitive Areas

Figure 2 Key Water Cycle Management Issues Within MBRC Catchments

Developing Solutions to Address Key Catchment Issues

A number of potential management responses or 'solutions' have been identified to address the key issues identified within each catchment. All possible solutions were identified at a conceptual level without regard to practicality or costs to ensure that all possible options were sufficiently considered.

In developing solutions, it is recognised that each solution may address a number of issues, rather than just one. For example, stormwater harvesting addresses both water supply and water quality issues. Additionally, it is likely that a number of solutions (a 'solution set') may be required for each catchment, depending on the specific issues identified within each individual sub catchment. A range of solutions were developed to ensure a wide variety of options were put forward for review in each catchment, ranging from centralised to decentralised solutions, and incorporating conventional to innovative ideas.

Assessing Solutions Using Multi Criteria Analysis

To assist in the selection of solutions to be further investigated during the detailed planning stage, Multi Criteria Analysis (MCA) was used.

Criteria with which to assess the performance of each solution were developed around Triple Bottom Line (TBL) principles that address the Environmental, Social and Economic objectives of MBRC. Each solution was scored against 16 individual criteria reflecting TBL objectives. Although each criteria was assigned a weighting according to the importance placed on that criteria, an even weighting distribution between Environmental, Social and Economic criteria was adopted since sensitivity analyses indicated that changing the weighting of Environmental, Social and Economic criteria did not significantly affect the preferred (i.e. highest scoring) solutions for each catchment.

Solutions were scored over 3 half day workshops by an Options Analysis Team that was nominated by MBRC and approved by Councillors. Workshop participants invited to attend included:

- Councillors;
- Council's existing Strategic Coordination Advisory Group (SCAG);
- MBRC representatives; and
- Unitywater representatives.

During the workshops, each solution was scored by the Options Analysis Team for all relevant catchments. Scoring of the outcomes generated by each solution against each individual assessment criteria was undertaken using a qualitative scoring system (i.e. from very much better to very much worse) due to project resource and time constraints. The overall score of each solution was then determined by adding together the weighted scores for each of the 16 criteria. An overall weighted score was then determined to represent the performance of all relevant solutions in each catchment.

Each solution was then ranked from highest to lowest in each catchment to assist in the selection of solutions to address the key issues identified in each catchment.

Selecting Solutions for Further Detailed Investigations

Using results of the MCA process, the top ranking solutions in each catchment were chosen as a 'solution set' for further investigation in the detailed planning phase. The solution sets for each catchment were chosen to ensure that the key issues identified in each catchment, as shown in Figure 2, would be sufficiently addressed.

A summary of the catchment solutions recommended for further investigation in the detailed planning phase are shown in Table 1. Solution descriptions are included in Appendix F of the *TWCM Strategy Technical Report*. An indication of the key mechanism for implementing each solution has been indicated using a colour key (i.e. Council Policy, Council Infrastructure, Unitywater Infrastructure).

It is noted that as no key issues were identified in the Mary River, Byron Creek and Neurum Creek catchments, solution sets for these catchments were not deemed necessary.

The detailed planning phase will further investigate in detail the solutions identified in Table 1, taking into account the findings of previous key studies on sustainable loads and integrated water management within the catchment.

Table 1 Catchment Solution Sets

Solution Implementation Key: Council Policy / Council Infrastructure / Unitywater	Catchment											
	Stanley	Pumicestone	Bribie	Caboolture	Caboolture CIGA	Burpengary	Upper Pine	Lower Pine	Sideling	Hays	Redcliffe	Brisbane Coastal
S5: Recycled Water Supplied to Urban Users				X	X	X		X		X	X	
S6: Recycled Water Supplied to Agricultural Users	X			X	X							
S7: Sewer Mining - Small Community Based Plants to Treat and Reuse Sewage	X			X	X	X	X	X		X	X	
S8: Indirect Potable Reuse of Purified Recycled Water (PRW)				X	X			X				
S9: Rainwater Tanks Retrofitted for Non-Potable Uses		X	X	X	X	X		X		X	X	
S10: Stormwater Harvesting for Non-Potable Uses	X		X	X	X	X		X		X	X	X
S14: Pressure Reduction on Trunk Water Supply Infrastructure	X											
S16: Education & /or Capacity Building and Investment in Incentive Schemes	X	X	X	X	X	X	X	X	X	X	X	X
S23: Upgrade STP Infrastructure	X			X	X		X	X		X		
S25: Diversion of Sewage to STPs with Capacity				X	X			X				
S26: Smart Sewers (Reduced Infiltration/Inflows)	X		X	X	X	X	X	X		X	X	
S27: Prevention of Illegal Stormwater Inflow Connections to Sewer	X			X	X	X	X			X	X	
S29: Waterway Rehabilitation - Riparian Zones (3/4 Order Streams)	X	X		X	X	X	X	X	X	X	X	X
S30: Increased Implementation of Erosion & Sediment Control on Development Sites	X	X	X	X	X	X	X	X	X	X	X	X
S31: Existing Water Sensitive Urban Design (WSUD) Retrofit		X	X	X	X	X	X	X	X	X	X	X
S32: Future Development WSUD Measures Achieve No Worsening	X	X	X	X	X	X	X	X	X	X	X	X
S33: Rural Best Management Practices (e.g. Limiting Erosion etc)	X	X		X	X	X	X	X	X			
S35: Cap at current Population Without Any Other Solutions Implemented	X	X				X	X					

Conclusions

By undertaking Phase 1 of the TWCM planning process, the following outcomes were achieved:

- Identification of the drivers of the TWCM process specific to the MBRC area;
- Description of the existing and future water cycle issues through preliminary water accounting;
- Identification of key water cycle management issues in each relevant catchment in the MBRC region;
- Development and preliminary assessment of solutions to address these issues using a Multi Criteria Analysis (MCA) approach; and
- Selection of potential solution sets specific to each catchment for further detailed assessment.

This TWCM Strategy has been instrumental in identifying the specific water cycle management issues within each catchment and the potential solutions to address these issues. The shortlist of potential solutions will need to be assessed in further detail in Phase 2 of the TWCM planning process (development of the TWCM Plan), for which this Strategy provides a basis.

In carrying out phase 2, it is noted that essential data gaps (such as sustainable loads) will also need to be addressed. Further information on the detailed findings, assumptions and technical information associated with the TWCM Strategy is included in the *TWCM Strategy Technical Report*.

TWCM STRATEGY TECHNICAL REPORT

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1 INTRODUCTION

This Total Water Cycle Management Strategy presents the results of a study investigating the drivers and issues influential in the development of a Total Water Cycle Management (TWCM) Plan for Moreton Bay Regional Council. This document represents the first phase in a two phase process, as follows:

- **Phase 1** - the preparation of a TWCM Strategy document, which involves the identification of water cycle management drivers and issues in the MBRC region, development of solutions to address the identified issues, and preliminary assessment of these solutions resulting in a short list of solutions for further detailed analysis in Phase 2.; and
- **Phase 2** - the preparation of the final TWCM Plan, which will involve a comprehensive assessment of the costs and benefits of total water cycle management options (i.e. solutions).

Concurrent to this project, Water By Design released a draft Guideline in September 2010 to outline a process to develop and implement a TWCMP that would ensure compliance with the legislative requirements of the EPP (Water) 2009. This document is consistent with general intention of these guidelines.

1.1 Background

With the recent 'Millennium Drought' experienced in SEQ, which saw regional bulk water supplies drop below 20%, the issue of water security has become a high priority. This, combined with the high population growth currently being experienced (and forecast to continue) in the region, demonstrates that detailed planning in regard to the utilisation of water resources in the SEQ region is essential. This planning will ensure that existing environmental, social and economic values in the region are maintained or improved.

In this context, the *Environmental Protection (Water) Policy 2009* (EPP Water) was revised and released in August 2009 and has replaced the original policy which was first released in 1997, in addition to subsequent amendments. This updated version of the EPP Water now prescribes that all Local Government Areas (LGAs) that contain over a certain population must develop and implement a TWCM Plan specific to its local government area (DERM, 2009a).

The EPP Water describes the matters that must be taken into account when an LGA is preparing a TWCM Plan (refer to Section 2.11 for details). The primary intent of the EPP Water is to use TWCM Plans to enable equitable and informed decisions to be made about the use of water in a way that results in water quality improvements.

The SEQ Regional Plan 2009-2031 (Chapter 11, DIP, 2009b) also supports the use of TWCM Plans as the preferred method for ensuring land use and infrastructure planning is environmentally sustainable, and to ensure reliable water supplies to cater for forecast population growth.

Moreton Bay Regional Council (MBRC) is one of the first LGAs in Queensland to commence the process of TWCM Planning. Previous water cycle management plans have been developed in recent years for the Pine Rivers area. These studies include:

- Pine Rivers Integrated Urban Water Cycle Management Concept Study (MWH, 2005);
- Northern Growth Corridor (NGC) Integrated Urban Water Management Study (MWH, 2006); and
- Moreton Bay Regional Council Pine Rivers Area Integrated Urban Water Cycle Management Strategy (MWH, 2009).

The TWCM Plan for MBRC will build on the findings of these previous studies, along with other studies undertaken in the area such as sustainable load studies for a number of major waterways in the region.

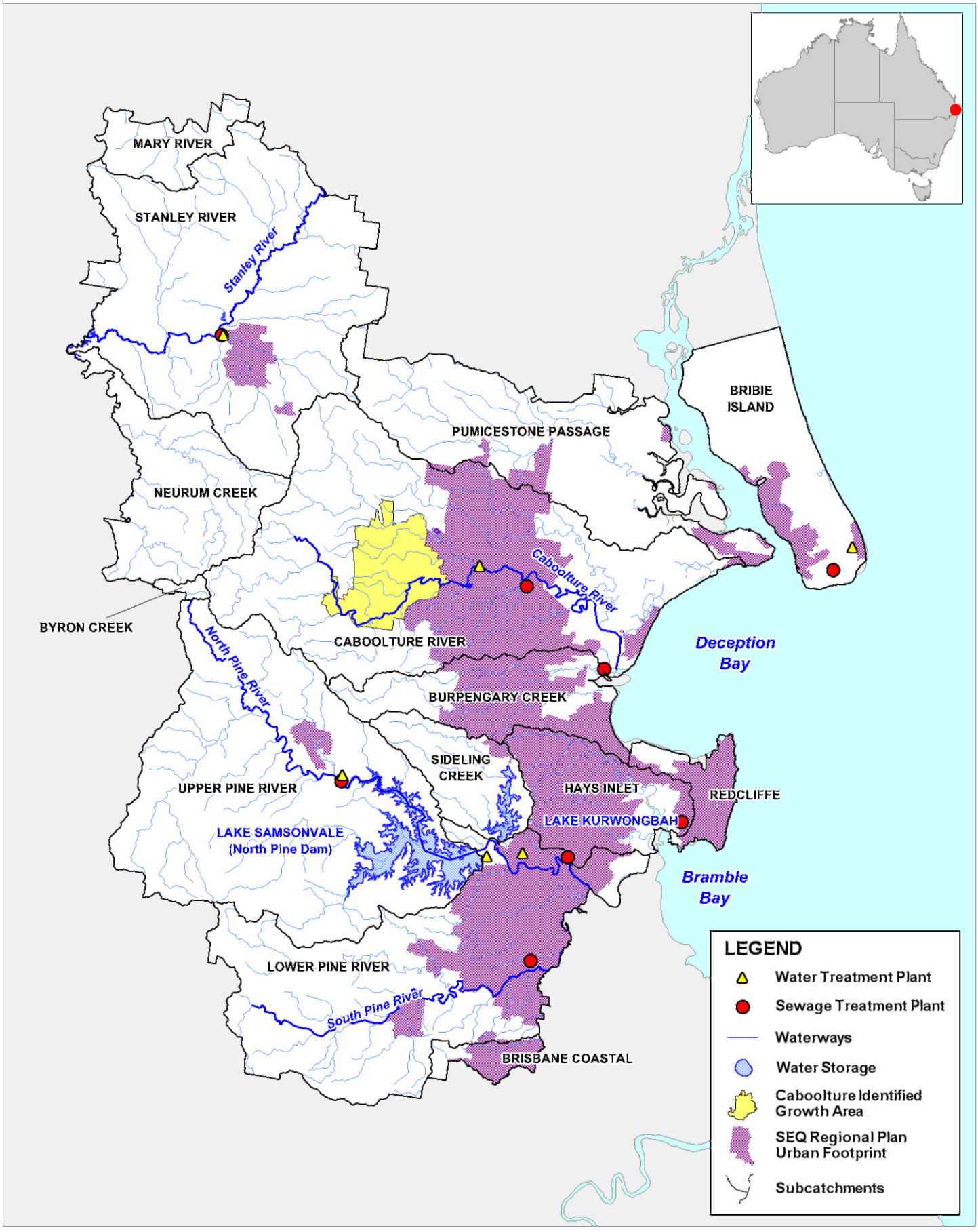
Concurrent to the TWCM planning activities being undertaken by MBRC and other LGAs, the Queensland Water Commission (QWC) is also required to develop sub-regional TWCM Plans in areas identified in the South East Queensland Regional Plan 2009-2031 (SEQ Regional Plan), as areas where large scale development and significant infrastructure is to occur. The focus of sub-regional TWCM Plans is on water supply values in key development areas. In this context, within MBRC region, along with a local TWCM Plan, a sub-regional TWCM Plan also needs to be prepared for an area west of Caboolture - the Caboolture Identified Growth Area (CIGA) - identified as a significant growth area within the SEQ Regional Plan.

For a general overview of the Moreton Bay Regional Council area, refer to Figure 1-1.

1.2 Definition of Total Water Cycle Management

The concept of total water cycle management is outlined in the latest SEQ Regional Plan 2009-2031 (DIP, 2009b), and indicates that TWCM recognises the interrelationships between the human uses of water and its role in the environment. Key principles of TWCM include:

- Natural cycles - minimising the alteration to natural flow and water quality regimes;
- Sustainable limits - ensuring that the volume of water extracted from a source is sustainable for the community and the environment;
- Water conservation - minimising water use and losses by reducing demand and by maximising efficient use and reuse;
- Diversity in new supplies - considering all potential sources of water when new supplies are needed, including reusing water and stormwater;
- Water quality - managing the water cycle at all phases to preserve water quality for the community and the environment; and
- Water quality 'fit for purpose' - aiming for water supply quality to be no better than is required for the proposed use, i.e. not supplying potable water for uses that do not require potable quality.



Title:

Moreton Bay Regional Council Area

Figure: 1-1

Rev: A

BMT WBM endeavours to ensure that the information provided in this map is correct at the time of publication. BMT WBM does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.

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Approx. Scale

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2 TWCM DRIVERS AND ISSUES

The purpose of this section is to briefly present and discuss some of the drivers and issues which influence the TWCM planning process. While this specifically focuses on the area within Moreton Bay Regional Council's (MBRC's) boundaries, most of the drivers discussed relate to the South East Queensland (SEQ) region generally and may also be of relevance to other Local Government Authorities (LGAs) outside the region.

The drivers discussed in this section include the environmental, social, and economic factors which influence the need for TWCM planning and also provide the context in which the planning process is to be undertaken. These drivers can also be considered as water cycle management 'issues of concern' which play a vital role in water cycle management in the region.

2.1 Population Growth

Population in the SEQ region has grown from around 1.5 million people 25 years ago to more than 2.5 million people currently. This historic population growth in SEQ, coupled with our economic profile, suggests the region's population will continue to grow at a rapid rate for at least the next 50 years (DIP, 2009b).

The Planning Information and Forecasting Unit (PIFU) of the Office of Economic and Statistical Research (OESR) provides population growth figures for SEQ based on low, medium and high growth scenarios. The SEQ Water Security Strategy was prepared on the basis that future population growth in SEQ will trend between the medium and high series projections. Based on a high series projection, the population of SEQ could surpass six million people by 2056.

For the MBRC area, Table 2-1 includes projected population growth figures based on low, medium and high growth scenarios. These figures indicate that by 2031 the projected population is expected to reach approximately 585,000 in the MBRC area based on a high growth scenario, a 58% increase from the current population (approximately 370,000). This additional population growth will put pressure on existing infrastructure and increase detrimental impacts on the environment, unless appropriately managed. Suitable planning is required so that adequate water supply and wastewater treatment/reuse infrastructure is in place to ensure that this additional population growth can be accommodated, and adverse impacts on the region's waterways are minimised.

Table 2-1 Population Growth Forecast in Moreton Bay Regional Council Area

Year	Population Growth Scenarios		
	Low	Medium	High
2011	369,224	376,949	385,726
2016	404,156	422,146	442,424
2021	435,987	464,155	497,416
2026	459,107	498,194	545,334
2031	473,107	523,037	585,895

Source: PIFU, 2009

To accommodate this additional population growth, certain areas within MBRC have been nominated as 'future growth areas'. These growth areas are largely greenfield sites with no existing infrastructure and are typically located outside of Council water supply and sewerage headworks zones. These areas have been nominated due to the limited amount of infill development sites within Moreton Bay region that are capable of accommodating predicted population growth.

The future growth areas, as per the SEQ Regional Plan (DIP, 2009b), include the following:

- Caboolture Investigation Growth Area (CIGA) (potentially supporting an additional 60,000 people);
- Morayfield and Narangba Transport Precincts (supporting an additional 33,500 people by 2031);
- Elimbah East; and
- The Northern Growth Corridor – including Dakabin, Griffin, Mango Hill and North Lakes (expected to support an additional 40,000 people by 2031).

As part of the TWCM planning process, this additional population growth will need to be considered in terms of additional resources and infrastructure required along with additional pressures on environmental values. Future scenarios will require detailed analysis of where the population growth will occur, how it will occur (i.e. population densities), and the additional inputs and outputs into the water accounting equation.

2.2 Water Supply

Security of water supply is a driver of TWCM planning in the region. With the impacts of population growth and climate impacts placing pressure on water supplies, adequate planning is required to ensure water resources are used efficiently and are able to supply the future population.

With the recent drought, the issue of water security was highlighted in SEQ. As a result, the SEQ Regional Plan includes targets and objectives to ensure water is efficiently managed in the SEQ region. This Plan states that "the principle of water supply planning is to supply sufficient water to support a comfortable, sustainable and prosperous lifestyle, while meeting the needs of urban, industrial and rural growth, and the environment" (DIP, 2009b).

To achieve the water supply objectives stated in the SEQ Regional Plan, the SEQ Water Strategy was developed. This document includes specific measures to ensure an adequate supply of water is maintained in SEQ, including a 'water supply guarantee'. This water supply guarantee is more of a vision statement and, as per the SEQ Water Strategy (QWC, 2010), includes the following:

Known as the Water Supply Guarantee, this water security vision will be achieved by:

- Balancing community expectations of water security, quality and cost;
- Embedding water efficiency throughout the water supply and demand chain;
- Managing water security through diversified and integrated water supplies and drought preparedness; and
- Improving environmental outcomes, including healthier waterways, through integrated strategic planning and catchment management.

This 'water supply guarantee' will be achieved through Level of Service (LOS) objectives. As per the SEQ Water Strategy (QWC, 2010), these LOS objectives are as follows:

- During normal operations sufficient water from the SEQ Water Grid will be available to meet an average total urban demand of 375 litres per person per day (including residential, non-residential and system losses), of which 230 litres per person per day is attributed to residential demand;
- Sufficient investment will also occur in the water supply system with the objectives of ensuring that:
  - Medium Level Restrictions will not occur more than once every 25 years, on average;
  - Medium Level Restrictions need only achieve a targeted reduction in consumption of 15% below the total consumption volume in normal operations;
  - The frequency of triggering drought response infrastructure will be not more than once every 100 years, on average;
  - The frequency that combined regional storage reserves decline to 10% of capacity will be not more than once every 1000 years, on average;
  - Regional water storages must not be permitted to reach 5% of combined storage capacity; and
  - Wivenhoe, Hinze and Baroon Pocket dams must not be permitted to reach minimum operating levels.
- It is expected that Medium Level Restrictions will last longer than six months no more than once every 50 years, on average.

In response to the 'Millennium Drought', the SEQ Water Grid has recently been developed. Currently, most infrastructure projects related to this Water Grid have been constructed, while other projects are still in the construction or pre-construction stages. Prior to the SEQ Water Grid, SEQ was supplied from eight largely discrete water supply zones, with differing levels of reliability and, until recently, different owners and operators.

The section of the SEQ Water Grid relevant to the MBRC area comprises the Northern Pipeline Interconnector. Stage 1 of this pipeline has been constructed and connects Landers Shute Water Treatment Plant near Eudlo on the Sunshine Coast (using water from Baroon Pocket Dam) to the Morayfield reservoirs, where it links with the Caboolture and Brisbane water networks. It is able to transfer up to 65 megalitres of water per day. Stage 2 of the pipeline, yet to be constructed, will provide a two-way connection within the Sunshine Coast area and reverse flow capacity will also be installed onto the Stage 1 Interconnector (DIP, 2010) so that water can be transferred towards the Sunshine Coast from the North Pine Dam.

In terms of other water supply sources being contemplated, the SEQ Water Strategy indicates that desalination facilities will underpin future water security (QWC, 2010). Four potential sites for desalination plants have been identified in the SEQ region, with one located within MBRC. These sites are to be included in planning schemes so that they may be utilised in the future if desalination is required to supplement potable water supplies. Desalination sites have been identified at:

- Lytton;
- Marcoola;
- Tugun (next to existing); and
- Bribie Island (MBRC).

Existing potable water supply sources in the MBRC region currently include the following:

- Lake Samsonvale (North Pine Dam);
- Lake Kurwongbah;
- Caboolture River (Caboolture Weir);
- Stanley River (Woodford Weir);
- Bribie Island Borefields (groundwater);
- Dayboro Borefields (groundwater); and
- Northern Pipeline Interconnector (from Baroon Pocket Dam on Sunshine Coast).

While assessments have been undertaken which quantify annual yields from these water supply sources (refer to the SEQ Regional Water Security Program - DNRM&E, 2006), to date there is no information available in regard to their *sustainable* yields. Determination of sustainable yields would require issues such as environmental flow objectives and conjunctive use arrangements to be taken into account. The SEQ Water Strategy (QWC, 2010) indicates that the sustainable yield of the Brisbane groundwater aquifers, including Bribie Island and Dayboro borefields, is currently being determined. Also, the *Water Resource (Moreton) Plan 2007* includes environmental flow objectives (see Section 2.3 for further details) which could be used in determining sustainable yields.

Despite this lack of information, further investigation into other alternative water supply sources, such as stormwater harvesting, rainwater harvesting, and recycled water will need to be considered to ensure sustainable yields on existing potable water sources is maximised.

As discussed in Section 2.5, The Queensland Development Code (MP4.2 and 4.3) requires that new low/medium density residential and new commercial development achieves minimum potable water savings using an alternative water source. The alternative source could include rainwater harvesting, stormwater harvesting, wastewater recycling or greywater use. This requirement sets a legislative basis for including decentralised water sources in water supply planning.

Rainwater harvesting for non-potable uses is well established in new development at an individual household scale. In addition, a number of projects are currently being developed that aim to harvest roofwater at a community scale for both potable and non-potable substitution.

Interest in stormwater harvesting has increased in SEQ in recent years and a number of significant urban harvesting projects are currently in development or proposed. Stormwater runoff is seen by many as a wasted resource and as a potentially significant supplementary water supply source. In addition, the frequent flow rules addressed in the State Planning Policy for Healthy Waters and in the Implementation Guideline No.7 under the SEQ Regional Plan, are likely to encourage stormwater harvesting as part of an integrated strategy to protect waterway health for new developments with relatively un-degraded waterways.

Wastewater recycling is a potential source of water supply and an important component of any strategy to reduce the environmental impacts of wastewater discharges to receiving waters. Reuse could include non-potable residential, industrial, open space or agricultural uses. It could also potentially be potable use through a new Purified Recycled Water (PRW) scheme similar to the recently completed Western Corridor Pipeline scheme. In the Moreton Bay Region a PRW scheme would most probably supply water into the North Pine Dam impoundment, and the potential yield from such a scheme was evaluated for earlier versions of the SEQ Water Strategy.

Despite the 'water supply guarantee' outlined in the SEQ Water Strategy, it is evident that security of water supply in the MBRC area is a driver of the TWCM planning process. When developing the TWCM Plan for MBRC, these water supply sources and their future security will need to be considered. It will also be important to investigate other potential sources of potable water in the region (such as recycled water and stormwater harvesting) so that reliance on the current, largely catchment runoff-based sources is diversified.

2.3 Environmental Flows

Environmental flow can be defined as the flow regime required in a waterway to maintain the health of aquatic ecosystems. This flow regime correlates not only to the baseflow experienced during periods of low rainfall in a catchment, but also the extent of the hydrologic regime necessary to ensure that the requirements of the aquatic ecosystem are maintained, such as flushing flows, dry weather spells, rates of flow change and degrees of bed stress.

Currently in the SEQ region, the majority of our water supply is sourced from surface waters in the form of dams, weirs and direct extraction from rivers and creeks. The process of extracting these surface waters for water supply purposes can significantly alter natural flow regimes and affect downstream environmental flows.

Currently within MBRC and the rest of SEQ there is no provision for the release of flow from dams, such as North Pine Dam, to ensure downstream flows are maintained (MWH, 2005). Releases of water from these storages typically only happen in times of high rainfall in the catchment when surplus water is allowed to overflow dam walls into downstream reaches, usually to maintain dam safety requirements. As a consequence, during periods of low rainfall, downstream reaches of waterways such as the Pine River experience reduced flows which potentially impacts on the health of aquatic ecosystems.

To address the issue of environmental flows in the major waterways of SEQ, environmental flow objectives have been included in the various Water Resource Plans developed under the *Water Act 2000*. The Plan relevant to MBRC is the *Water Resource (Moreton) Plan 2007*, which includes environmental flow objectives for a number of locations within MBRC, including:

- Pumicestone Creeks at end of system (AMTD 0.0km);
- Caboolture River at end of system (AMTD 0.0km);
- Pine River at end of system (AMTD 0.0km);
- South Pine River at North Pine River confluence (AMTD 7.5km); and
- Stanley River at Woodford Weir inflow (AMTD 64.0km).

The environmental flow objectives specified in the *Water Resource (Moreton) Plan 2007* for these locations include a range of flow requirements that need to be achieved under low, medium and high flow scenarios, based on historical flow records. Wherever possible, these environmental flow objectives attempt to mimic the natural flow regime of a catchment system.

Environmental flows are also addressed in the SEQ Natural Resource Management Plan 2009–2031 (SEQ NRM Plan) (DERM, 2009b). This Plan includes targets and objectives in regard to the protection of SEQ's natural resources which aim to meet outcomes specified in the SEQ Regional Plan. In terms of environmental flows in waterways of SEQ, the SEQ NRM Plan includes the following targets:

- By 2031, environmental flows will meet aquatic ecosystem health and ecological process requirements;
- By 2017, water resource plans will determine environmental flow targets to meet ecosystem requirements;
- By 2017, the impacts on aquatic ecosystem health and ecological processes caused by interaction between surface and groundwater will be assessed; and
- By 2017, the impact of peak flows on aquatic ecosystem health and ecological processes will be assessed.

In terms of TWCM planning, the consequence of having to maintain these environmental flow objectives in the waterways of MBRC can potentially adversely impact on available water supply and associated harvestable yield in the region. If water storages are required to release a certain amount of water to downstream reaches, this can reduce yields. Combine this with the potential impacts of climate change (see Section 2.4) and increasing population on water supplies, and it is evident that the TWCM planning process will need to account for environmental flow requirements in any future water accounting scenarios to ensure that storage yields are properly determined.

2.4 Climate Change

In terms of water supply in the region, climate change may potentially have an impact on the yields of surface water storages. This is mainly due to the predicted increase of hotter days and lower rainfall impacting on inflows into the storages and also losses from these storages from increased evapotranspiration.

The SEQ Water Strategy (QWC, 2010) makes reference to climate change, stating that "climate change may have a dramatic impact on the supply from our dams. The majority of climate modelling done to date indicates that SEQ is likely to become hotter and drier, reducing inflows to dams and increasing demand for water. A mid-range estimate of a 10% reduction in the yield of dams and weirs has been used for scenario analysis. This estimate is based on modelling of climate, rainfall and inflow projections for SEQ".

The Draft SEQ Climate Change Management Plan (DIP, 2009a) has recently been developed which includes actions to implement the climate change policies included in the SEQ Regional Plan. The aim of these actions is to reduce greenhouse gas emissions in SEQ (mitigation) and to undertake measures which mitigate the effects of climate change (adaptation).

To predict the impacts that climate change may have on weather systems, global climate change models have been developed. These models attempt to predict the climate system's response to human-induced impacts such as the production of greenhouse gases. They simulate oceanic and atmospheric processes and the important connections between land, oceans and the atmosphere. However, these global models typically have a grid resolution of between 150 and 300 km, which increases the uncertainty of climate change predictions on a regional scale (DIP, 2009a).

To address the uncertainty which is inherent in these course global scale models, regional scale models are currently being developed which aim to increase the resolution of the SEQ region. These models should provide more reliable climate change predictions for the region by downscaling the global model simulations from a grid resolution of 150 to 300 km to a resolution of 14 to 20 km for SEQ (DIP, 2009a).

The SEQ Water Strategy (QWC, 2010) states that the majority of climate-catchment modelling results for SEQ catchments indicate the region is likely to become drier and suggests climate change may dramatically impact on regional water supplies. This means less water is likely to be available from water catchments and dams. These changes are expected to occur over the medium to long-term, linked to increases in average temperature. The SEQ Water Strategy also includes results from case studies which indicate that by 2031 the annual streamflow for the Brisbane River downstream of Mt Crosby Weir could be reduced by up to 28% in a 'dry' scenario or increased by up to 14% in a 'wet' scenario (QWC, 2010).

While it is expected that climate change will impact on future weather patterns to some degree, there is still a considerable degree of uncertainty in these predictions. More work is required to improve our understanding of climate change impacts, and such work is currently being conducted by the Queensland Government Climate Change Centre of Excellence and the SEQ Urban Water Security Research Alliance. Until this work is complete, the SEQ Water Strategy has adopted a mid-range climate change scenario of a 10% reduction in surface water supply/yield by 2030.

In terms of the TWCM planning process, it is essential that this 10% reduction in surface water supply/yield is considered in any future water supply scenarios. This also places emphasis on the need for investigation of other sources of water (such as recycled water and stormwater harvesting) which are less susceptible to climate change impacts, given the current reliance on surface water supplies in the region.

2.5 Water Conservation

Water conservation is an essential component of TWCM planning and plays a key role in water supply security and wastewater discharge minimisation. Since the recent drought, water conservation has been a focus area in SEQ with the imposition of significant water restrictions, and the introduction of a broad range of water saving initiatives.

Water restrictions have been instrumental in reducing per capita water consumption. However, with the breaking of the drought and water supplies returning to near capacity, it is expected that over time these lower levels of water consumption may drift back towards pre-drought levels.

A number of initiatives and measures have been implemented in order to assist with long term water conservation and to encourage the population to reduce its water consumption. These include the

setting of water use targets, along with statutory requirements to install water savings fixtures and devices in new buildings and a range of measures to encourage and subsidise the installation of water saving systems, such as rainwater tanks, pool covers, shower heads and tap fittings.

The SEQ Regional Plan specifies a residential water use target of 230L/person/day. Demand management measures significantly reduced water consumption during the 'Millennium Drought' from an average of 296 L/person/day before restrictions were introduced, to 129 L/person/day for the year to end July 2008 (DIP, 2009b). While these water restrictions have been relaxed and water consumption has probably increased, the target of 230 L/person/day is considered realistic in the long term. Therefore, this should be the water demand figure utilised for future scenario analysis in the TWCM planning process.

The installation of water savings fixtures and devices in certain new buildings is now a statutory requirement. The Queensland Development Code requires that every new detached house in SEQ must meet water savings targets by supplying 70,000 litres of non-grid water per year, while each new townhouse must supply 42,000 litres (DIP, 2009b). This requirement can be achieved through rainwater tanks, local recycled water schemes, stormwater harvesting or alternative measures.

Additionally, all businesses must use water efficiently. Non-residential activities that use more than 10 million litres per year must complete a water efficiency management plan that demonstrates how they are achieving, or will achieve, best practice water use. Businesses using more than one million litres of water per year must install water-efficient appliances such as low-flow taps, trigger sprays, showerheads, urinals and cooling towers (DIP, 2009b).

In terms of rural water use, the SEQ Regional Plan includes provisions to investigate opportunities to provide recycled water for rural irrigation, and to improve the efficiency of rural water use, particularly irrigation systems, through information and incentives.

While the TWCM Plan may include solutions for additional water supplies, it is essential that water conservation maintains a continued focus in order to minimise inefficient water use. This may delay or eliminate the need for future water infrastructure upgrades, such as desalination plants, and also contribute to wastewater flow/load reduction targets.

2.6 Wastewater Management

Eight Sewage Treatment Plants (STPs) are located within MBRC:

- Woodford (discharges to Stanley River);
- Bribie Island (discharges to groundwater);
- Burpengary East (discharges to Caboolture River);
- South Caboolture (discharges to Caboolture River);
- Dayboro (irrigated to land);
- Murrumba Downs (discharges to lower North Pine River);
- Brendale (discharges to South Pine River); and
- Redcliffe (discharges to Hays Inlet).

Of the above STPs, South Caboolture and Murrumba Downs both operate Advanced Water Treatment Plants that treat a portion of water from these STPs to A+ Class recycled water. This water is supplied to users in the Caboolture district (from South Caboolture) and to AMCOR in the Lower Pine River Catchment (from Murrumba Downs).

Each STP operated under DERM development permits with approval conditions which constrain the discharge of treated water to receiving waters. The existing development permits all include concentration based discharge limits with a limit to daily discharge volume. Specific nutrient loads are not conditioned, apart from Murrumba Downs, which has mass load limits in addition to concentration based limits in its new licence conditions. It is also noted that negotiations are currently being undertaken to transfer the Caboolture and Burpengary STP licences to mass load limits. Copies of current STP licences are contained in Appendix A for reference.

In 2007, concentration-based water quality objectives (WQOs) for waterways in SEQ were introduced under the *Environmental Protection Act 1994* (EP Act), specifically through Schedule 1 of the *Environmental Protection (Water) Policy 2009* (EPP Water). Section 14.2 of the EPP Water stipulates that wastewater discharged from a proposed development must meet the target WQOs, and where discharge from a STP cannot immediately meet these WQOs, then future capacity upgrades must result in a practical reduction in the total amount of pollutants released so that receiving waters are improved. Section 20 of the EPP Water also stipulates that a local government's TWCM Plan must include provisions for effluent management, waste water recycling, sewerage system overflows and biosolids management. It is noted that Unitywater is currently reviewing its biosolids management strategy.

Section 22 of the EPP (Water) 2009 also specifies that a local government or sewerage service provider should develop and implement an Environmental Plan about Trade Waste Management to control trade waste entering its sewerage services. This plan must be included in its TWCM Plan. MBRC currently has Trade Waste Policies/Environmental Plans for each of its former LGAs (Pine, Caboolture and Redcliffe). Unitywater intends to develop a common Trade Waste Policy for all areas within the next two years that will satisfy this requirement. Apart from the development of a common policy for the amalgamated MBRC LGA, no significant trade waste issues are identified within Moreton Bay Regional Council. Currently trade waste within MBRC is low relative to STPs in other areas and is primarily from low risk activities (e.g. shopping centres). South Caboolture, Murrumba Downs, Bribie Island, Redcliffe, Dayboro and Woodford all have trade waste flows of 3 to 4% of total flow.

Trade waste generated at Burpengary East and Brendale constitute between 4 and 5% of total flow. These two plants have a slightly higher risk profile due to the Narangba Industrial Area and the Brendale (light) industrial area, however there have been no incidents which have threatened the biological processes at these plants. There are some small scale metal finishing and plating industries which have the potential to release quantities of heavy metals that could pose a risk to the STPs or the environment, however these are closely monitored with strict controls in place.

The setting of specific water quality objectives for receiving waters (under the EPP Water) has significant implications on wastewater discharges from STPs. A number of the STPs within MBRC are currently nearing their approved capacity, and will require upgrades to meet future increased flows from new development and expected population growth. These upgrades would be subject to development approval and be required to meet WQOs and provisions of the EPP Water. The

approval process under the *Sustainable Planning Act 2009* (SPA) will also reinforce the need to comply with the EPP Water and associated WQOs.

As receiving waters at present are generally in poor condition (refer Table 2-2), it is not expected that any increase in current discharge limits will be allowed, and future studies quantifying sustainable loads may in fact require significant decreases to current licence limits. Therefore STPs will be required to improve treatment technologies, reduce discharge (through reduced water use/infiltration etc) and/or increase reuse to comply with the EP Act and EPP Water.

Forecasts by Unitywater indicate the following timeframes for STPs to exceed current DERM licence conditions, assuming business as usual:

- Brendale: 2016 with no diversion of flows to BCC or 2021 with BCC diversion (>9.4 ML/d Q);
- Murrumba Downs: 2016 (>58 kg/d TN);
- Burpengary East STP: 2014 no diversion, 2019 with temporary diversion of 70,000 EP to Murrumba Downs (>50,000 EP);
- Redcliffe STP: potentially 2011 – 2015 (TN concentration > 5mg/L); and
- South Caboolture STP: 2025 (ADWF >16.3 ML/day);

Furthermore, sustainable load limits for the Caboolture River identified by the EPA in 1998 for Total Nitrogen (75 kg/day) will be exceeded by discharge from the South Caboolture and Burpengary STPs around 2021. It is, however, noted that additional investigation of sustainable loads is required to establish the accuracy of this figure.

Figure 2-1 to Figure 2-4 (sourced from Unitywater) illustrate some of the above forecast timeframes.

Figure 2-5 shows the current DERM licenced capacity of each STP, in comparison to the current design capacity and the current loads received for treatment at each STP.

Figure 2-5 illustrates the need for upgrades of design capacities at most STPS, however it is anticipated that these upgrades will not trigger the need for development approval, as they are likely to remain within licenced capacities. Future upgrades are planned for Woodford (prior 2011), Brendale (prior 2015), South Caboolture (prior 2016), Burpengary East (prior 2016) and Redcliffe (prior 2017).

To ensure compliance with current and future legislation, a combination of improved treatment technologies, reduced discharge (through reduced water use/infiltration etc) and increased reuse will be required. Current best practice treatment technologies in conventional STPs produce effluent nutrient concentrations that are still an order of magnitude greater than receiving waterway WQOs. Therefore it is evident that treatment technologies alone will not fulfil legislative requirements to enable effectively unlimited discharges from STPs.

The use of treatment technologies to improve water quality also has the following key financial and environmental impacts to be considered:

- High capital costs and associated increases in contributions to sewerage infrastructure charges, which in turn affects housing affordability;

- Significant increases to greenhouse gas emissions due to the high energy consumption by the treatment technology used to achieve very low concentrations of nitrogen; and
- High chemical costs for reducing phosphorus to low concentrations.

Considering the financial and environmental impacts of treatment technologies alone, the potential to reuse effluent to meet agricultural, residential, commercial and industrial demands may potentially provide a more sustainable and cost effective solution for STPs to achieve WQOs and legislative discharge requirements. However, it is noted that reuse of effluent may also have similar financial and environmental impacts that will also need to be investigated and considered as part of the TWCMP process.

If sustainable solutions cannot be delivered, there would be a need to cap the volume of wastewater or nutrient loads discharged in order to comply with legislative requirements and thereby protect the environmental values of receiving waters. This may necessitate a cap on further development in the catchment which would have significant social and economic impacts. This prospect has already been raised by the former Moreton Bay Water to Councillors and key staff in MBRC for development in the Caboolture River Catchment in 2021 (when it is estimated that sustainable TN loads from STPs will be exceeded) (MBRC 2009a).

In summary, from a wastewater perspective, the key drivers of TWCM will be the need to comply with legislative requirements of the Environmental Protection Act 1994 and the EPP Water while accommodating future development and growth within MBRC.

In order to achieve this, sustainable pollutant loads for receiving waterways (i.e. the annual pollutant load that waterways can assimilate without exceeding concentration based WQOs) will need to be determined and inputs from wastewater will need to be considered along with other inputs (i.e. diffuse loads) in the context of Total Water Cycle Management.

An additional driver is Council's commitment to the SEQ Healthy Waterways Strategy 2007 - 2012, and specifically the Point Source Pollution Management Action Plan, which has a target of 100% reuse of dry weather flows from STPs.

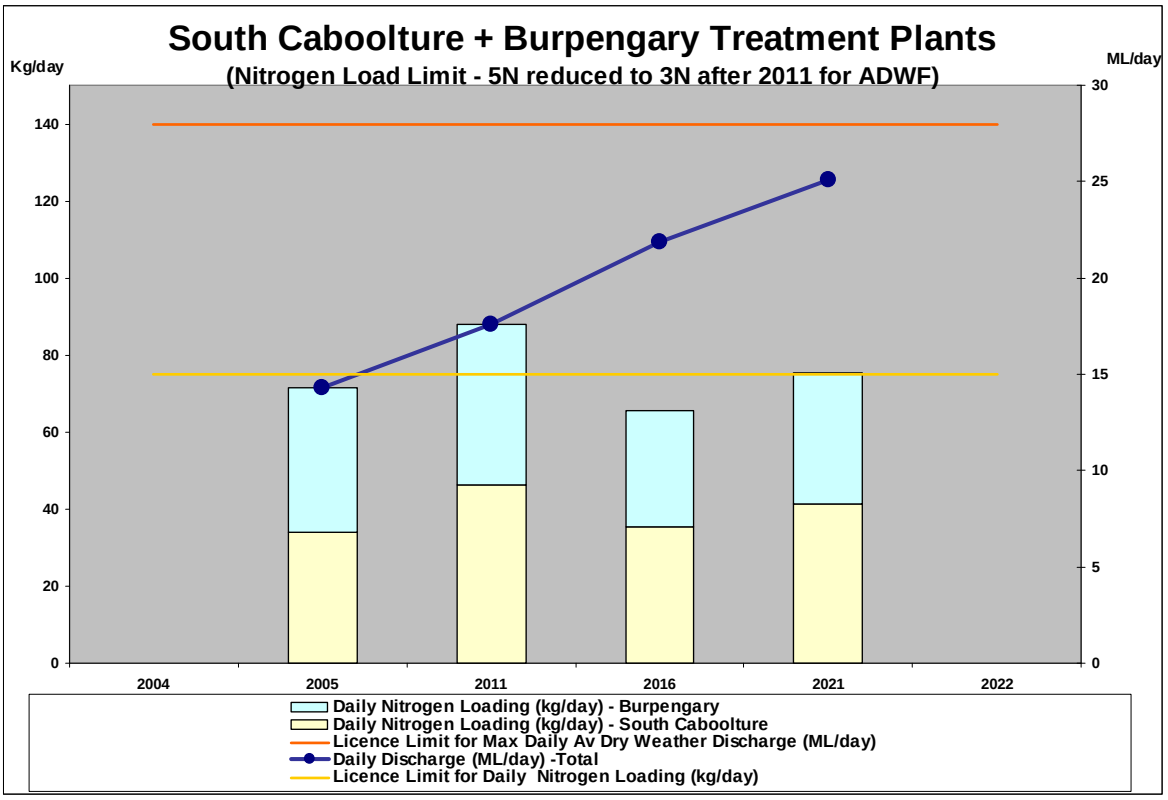


Figure 2-1 Sustainable Loads for TN in Caboolture River Predicted to be Exceeded by 2021

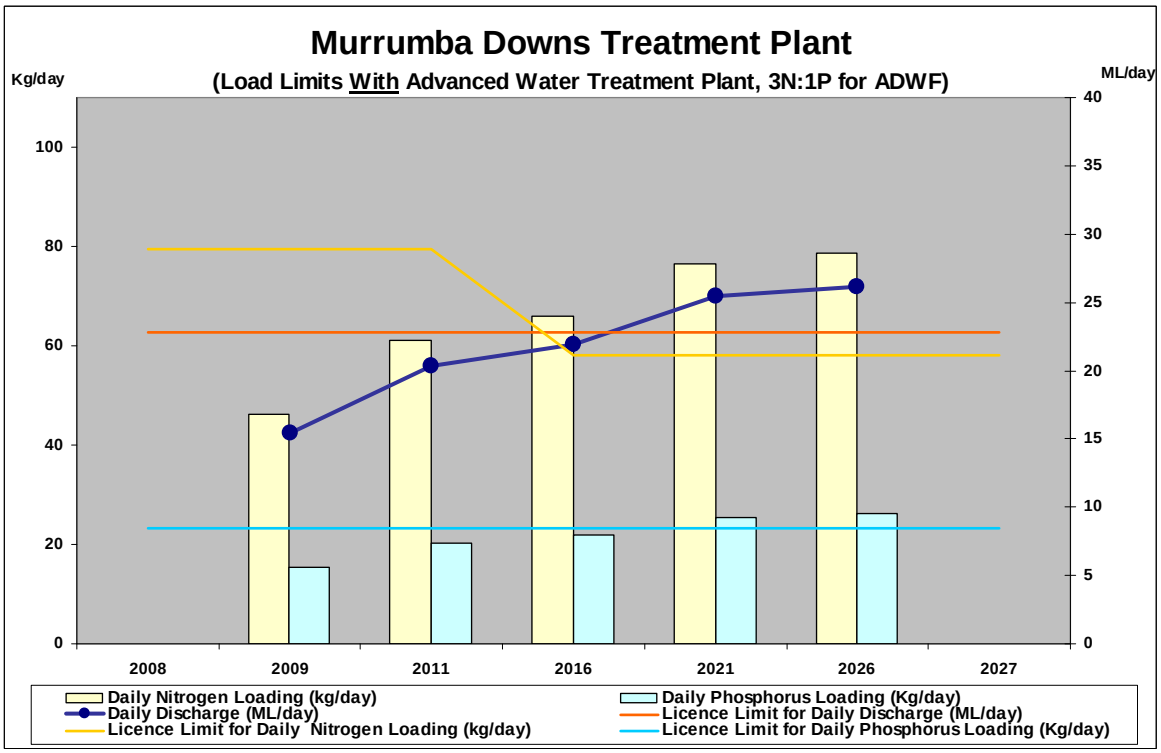


Figure 2-2 Approval Conditions for TN Predicted to be Exceeded by 2016 at Murrumba Downs STP (discharge to lower North Pine River)

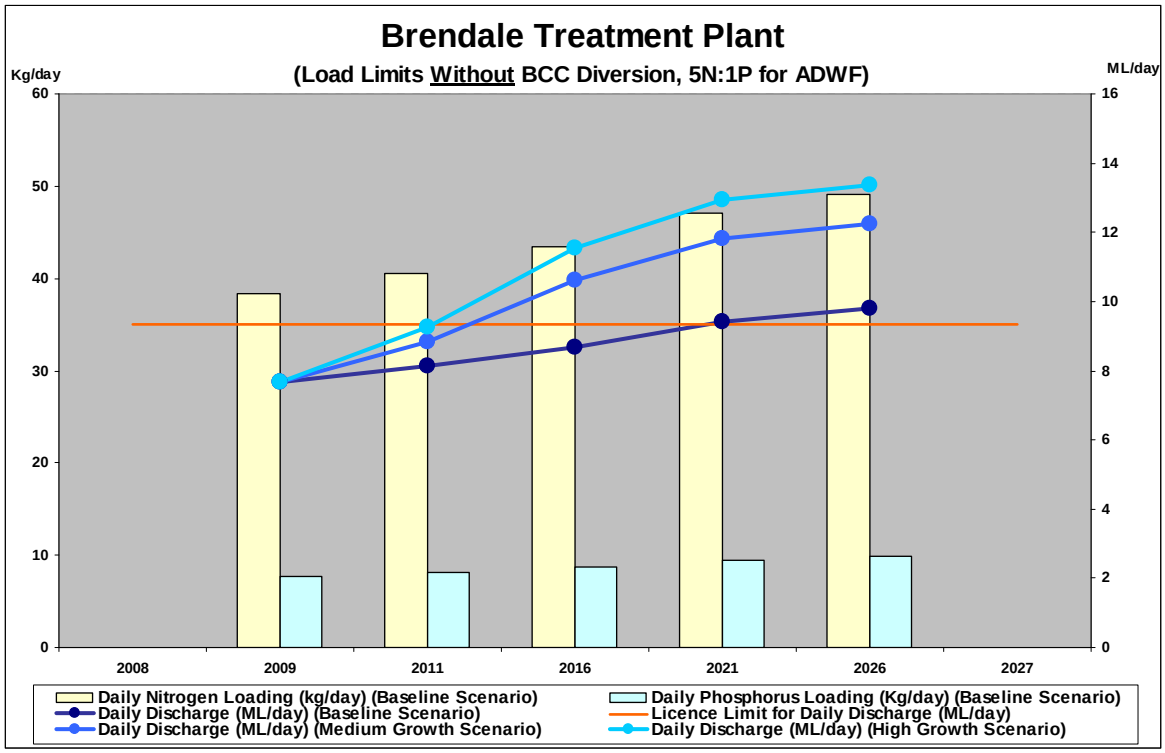


Figure 2-3 Approval Conditions for Daily Discharge Predicted to be Exceeded by 2016 at Brendale STP (discharge to South Pine River) for Medium Growth Scenario and Assuming No Diversion of Flows to BCC

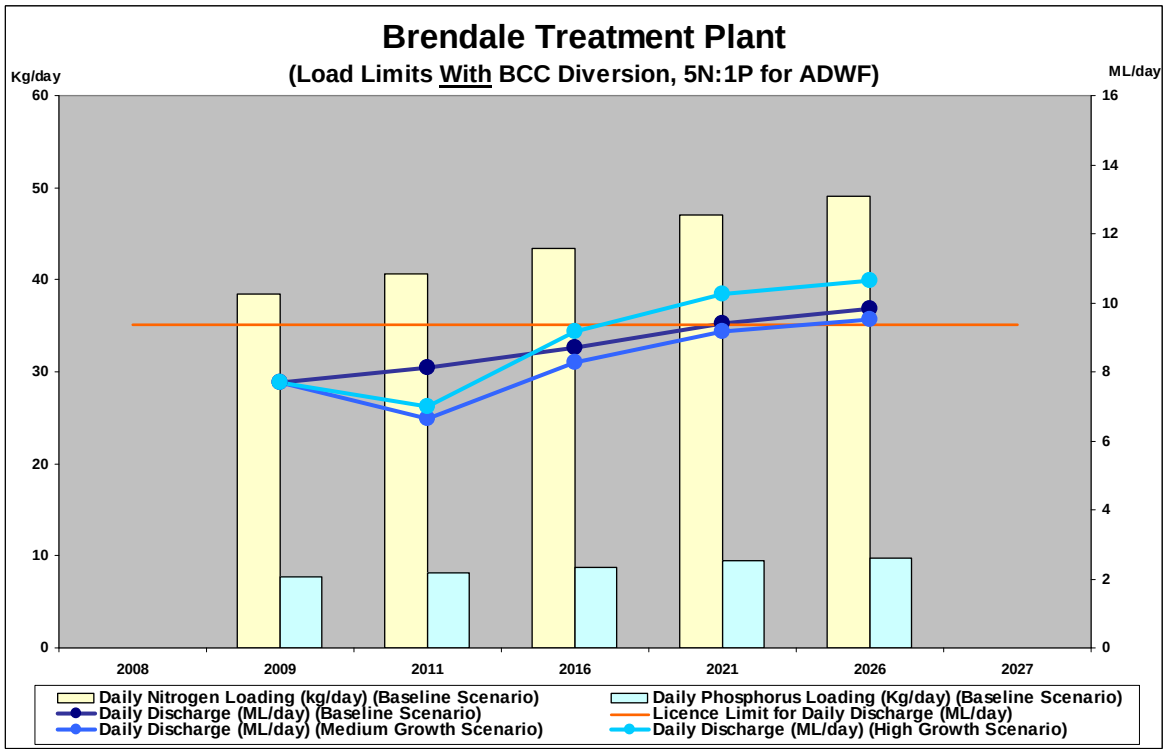


Figure 2-4 Approval Conditions for Daily Discharge Predicted to be Exceeded by 2021 at Brendale STP (discharge to South Pine River) for Medium Growth Scenario and Assuming Diversion of Flows to BCC

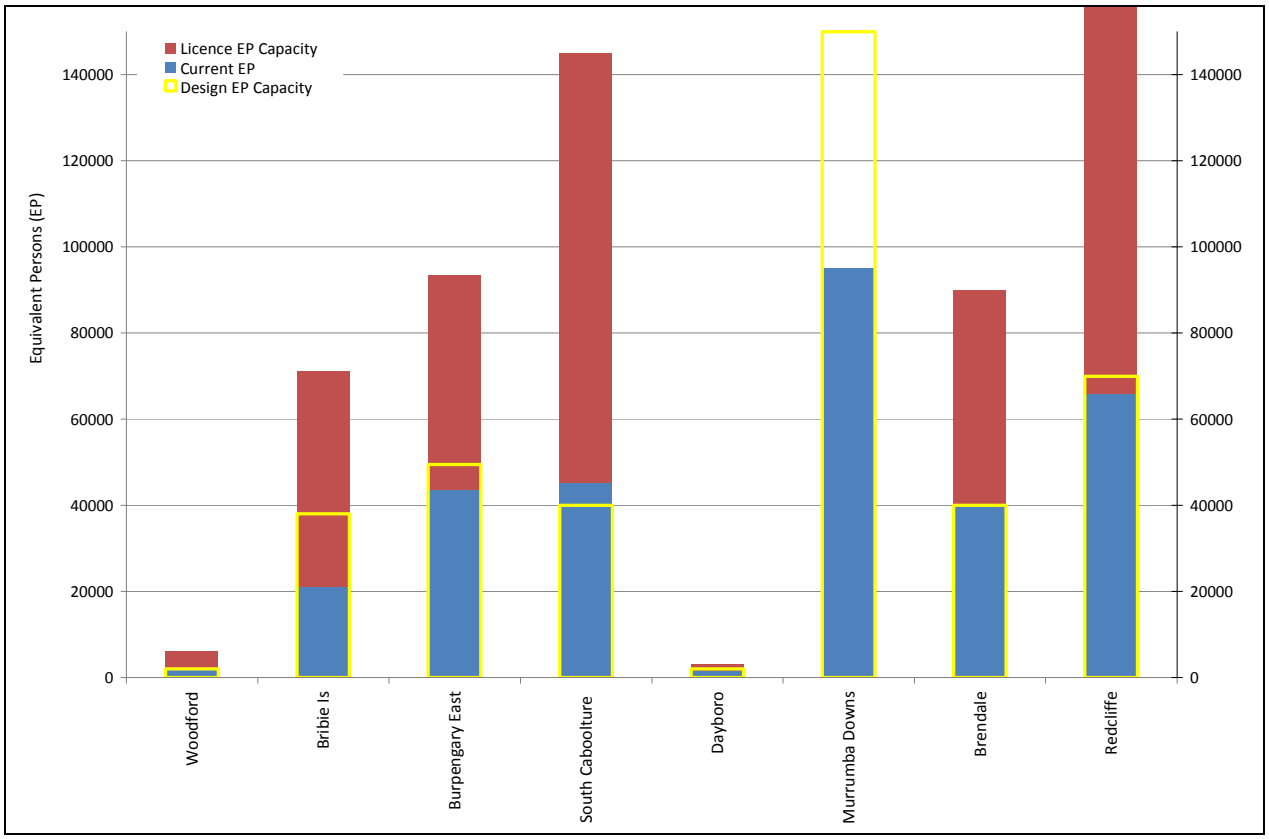


Figure 2-5 STP Licence Capacity, Design Capacity and Current EP

2.7 Water Quality

The Ecosystem Health Monitoring Program (EHMP), coordinated by the SEQ Healthy Waterways Partnership, provides regional assessments of the ambient ecosystem health for each of SEQ's 19 major catchments, 18 river estuaries, and Moreton Bay, highlighting where the health of SEQ's waterways is getting better or worse. The program commenced in 2000, however a snapshot of the most recent EHMP Report Card grades for catchments that largely fall within MBRC and ultimately its receiving waters (estuaries and bays) is presented in Table 2-2. Where report card grades have declined from the previous year, grades are highlighted in red text. Improvements are highlighted in blue text.

Table 2-2 EHMP Grades for Catchments within MBRC and Receiving Waters

Catchment	Freshwater		Estuary/Marine	
	2009	2010	2009	2010
Stanley River Catchment[1]	B	B-		
Pumicestone Passage Catchment & Estuary[1]	B	C-	C+	D+
Caboolture River Catchment & Estuary	C	C+	D-	D
Pine Rivers Catchment & Estuary	C-	C-	D+	C-
Deception Bay			D-	D+
Bramble Bay			F	D+
Overall Moreton Bay			D	C

Report Card Ratings: A = Excellent B = Good C = Fair D = Poor F = Fail

[1] Catchment and monitoring sites also extend into other SEQ Council jurisdictions

As demonstrated in Table 2-2, only freshwaters in the Stanley River and the Pumicestone Passage (2009) catchments received an Ecosystem Health rating of 'good' in 2009, and while freshwaters

within Caboolture and Pine River catchments rated 'sound', receiving estuaries in these catchments were rated as 'poor'. Furthermore, the health of the Bays that ultimately receive all waters were rated from 'poor' to 'fail'.

The EHMP results in Table 2-2 generally show a slight improvement in estuary health since the previous year, except for Pumicestone Passage which has declined in 2010. A summary of all EHMP results recorded for catchments and receiving waters within MBRC between 2000 and 2010 is presented in Figure 2-6 (freshwater) and Figure 2-7 (estuary and bays).

Figure 2-7 indicates that there was a general decline in all receiving estuaries and waters in SEQ in 2009 due to significant rainfall over the year causing high diffuse loads of sediment and nutrients. This had a significant impact on receiving waters of Moreton Bay which declined from a B- in 2008 to a D in 2009, the lowest ecosystem health rating in over a decade of monitoring. However, in 2010 the EHMP results indicate that the estuaries are improving in water quality, with Moreton Bay improving to a C.

The results show that a key challenge to maintaining waterway health in SEQ is managing diffuse stormwater pollutant loads in both urban and non-urban areas. This is likely to be a key pressure within MBRC catchments due to future predicted increases in population and development in the region. Important measures to manage diffuse stormwater pollutant loads include riparian restoration, channel stabilisation and water sensitive urban design (in new and existing urban areas).

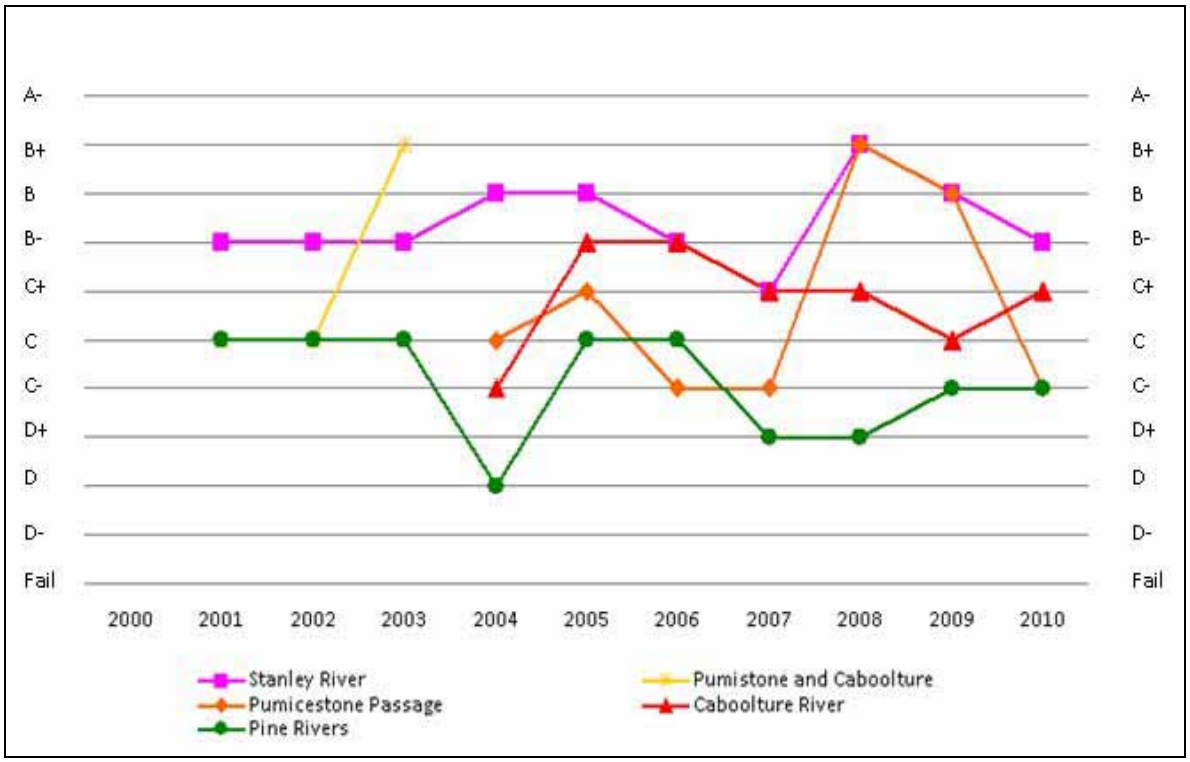


Figure 2-6 Freshwater EHMP Grades 2000 - 2009

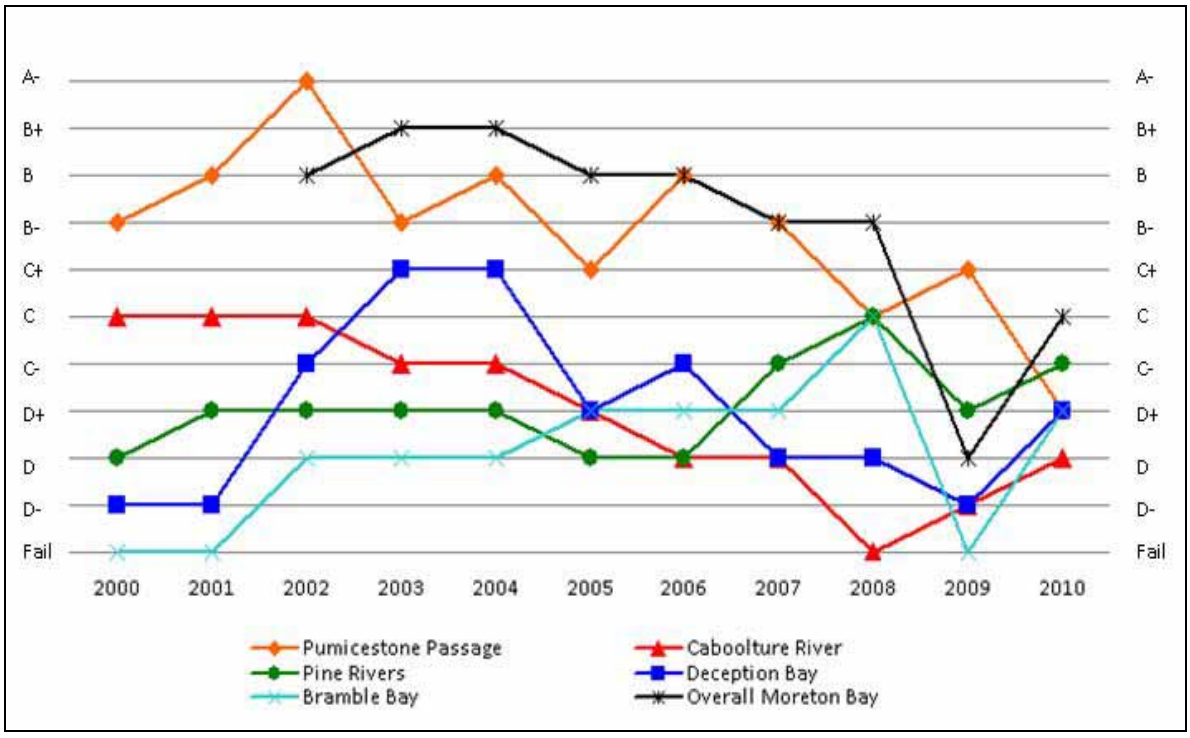


Figure 2-7 Estuary and Bay EHMP Grades 2000 - 2009

The SEQ Healthy Waterways Strategy 2007-2012 (HWP, 2007) has developed issue based Action Plans for WSUD, Protection and Conservation, Non-Urban Diffuse Source Pollution, and Coastal Algae Blooms which assist to contribute to the maintenance and improvement of waterways in SEQ through the management of diffuse pollutant loads. It also has a specific action plan developed to address Point Source Pollution, and an Area Based Action Plan for Moreton Bay. Table 2-3 summarises the overarching management target of each of the aforementioned Healthy Waterways Action Plans that are applicable within MBRC. These Action Plans are also supported by the Desired Regional Outcome for Water Management in the SEQ Regional Plan.

Table 2-3 Healthy Waterways Strategy Action Plans Applicable to MBRC (HWP 2007)

Action Plan	Target
Water Sensitive Urban Design	By 2026, all developed urban land in SEQ will meet consistent regional standards for Water Sensitive Urban Design
Protection and Conservation	By 2026, SEQ waterways and wetlands, and vegetated areas making important contributions to water quality and waterway health, are protected and conserved.
Non-Urban Diffuse Source Pollution	By 2026, non-urban diffuse source pollutant loads entering receiving waters will be reduced by 50 percent of the loads in 2006 and in-stream ecosystem health will improve in targeted catchments.
Coastal Algae Blooms	By 2026, the intensity, frequency and extent of existing Coastal Algal Blooms have been reduced in all SEQ estuarine and marine waterways, with their impacts minimised and no new bloom events occurring.
Point Source Pollution Management	By 2026, 100 percent of nutrient loads originating from point sources are prevented from entering receiving waterways and Moreton Bay.
Moreton Bay	By 2026, the Environmental Values and Water Quality Objectives of Moreton Bay are achieved with critical habitats and species protected and key ecological processes maintained.

Key actions that MBRC have committed to undertake to improve water quality as part of the SEQ Healthy Waterways Strategy are further detailed in Appendix B.

The SEQ Natural Resource Management Plan (DERM, 2009b) also articulates measurable targets for receiving waters and water resources that are aligned with desired regional outcomes (DRO) and policies in the SEQ Regional Plan. A number of targets in the Plan are aligned with the DRO for Water Management, which includes the principles of TWCM and the protection and enhancement of waterway health. Examples of specific targets include the maintenance of High Environmental Value (HEV) waterways; restoration of ecosystem health and ecological processes for waterways that are currently classified as slightly to moderately disturbed and/or highly disturbed; and the maintenance and enhancement of waterways to achieve or exceed scheduled WQOs (under the EPP Water). HEV Waterways, EVs and WQOs have been scheduled under the EPP Water (2009) for the following catchments and receiving waters within MBRC:

- Basin No.141 (part) Waters of the Stanley River Freshwater Catchment (draft only, no EVs and WQOs scheduled);

- Basin No. 141 (part): Pumicestone Passage;
- Basin No. 142 (part): Caboolture River;
- Basin No. 142 (part): Pine Rivers and Redcliffe Creeks;
- Basin No. 142 (part): Brisbane Creeks – Bramble Bay; and
- Basins No. 144 and adjacent to basins 141 to 143, 145 and 146: Moreton Bay, North Stradbroke, South Stradbroke, Moreton and Moreton Bay Islands.

As discussed previously, in 2007 Environmental Values (EVs) and concentration-based WQOs for receiving waterways in SEQ were introduced under the *Environmental Protection Act 1994*, specifically through Schedule 1 of the EPP Water (2009). These WQOs have been set to protect and enhance the Environmental Values of SEQ waterways. While Council is committed to protecting these Environmental Values for the good of the local community and future generations, under the EPP Water MBRC is also required to develop a TWCM Plan that addresses urban stormwater quality management to improve the quality and flow of stormwater. To date, this has been undertaken for the Pine Rivers Catchment only (MWH, 2009). This was undertaken as an Integrated Urban Water Cycle Management (IUWCM) Strategy to fulfil commitments made by the former PRSC in the SEQ Healthy Waterways Strategy WSUD Action Plan.

In order to develop management strategies to protect EVs, sustainable loads to receiving waterways need to be quantified. Sustainable loads can be defined as the annual pollutant load that waterways can assimilate without exceeding concentration based WQOs (as set by the EPP Water). To date, sustainable loads targets have been quantified for the Pine River and Caboolture River Catchments only. However, it is noted that a study is currently being undertaken to review sustainable loads to the Caboolture River. Sustainable loads for all receiving waters within MBRC need to be quantified in order to develop appropriate management options to satisfy the EPP Water and protect the health of receiving waterways.

Findings of both the Pine Rivers Area Integrated Urban Water Cycle Management Strategy (MWH, 2009) and the Pine River Sustainable Pollutant Load Study (BMT WBM, 2008) indicated that the following management actions are necessary to assist in achieving sustainable loads and WQOs that protect the EVs of the waterways within the Pine Rivers Catchment:

- Maximising reuse and minimising discharge of wastewater;
- Implementing best practice WSUD (80/60/45% load reductions of TSS/TP/TN) for all Greenfield urban developments;
- Progressive retrofit of WSUD in existing urban areas as opportunities arise (e.g. during road resurfacing and urban drainage improvement works);
- Revision of existing catchment and stormwater management planning documents, processes and capital works programs to include WSUD practices; and
- Management actions to reduce non-urban diffuse loads.

It is evident from the above that WSUD is a key management action for improving water quality and should be considered in any TWCMP. As mentioned previously, the SEQ Regional Plan DRO for Water Management adopts TWCM as a key principle and framework for managing urban water quality in SEQ. As part of this approach, the SEQ Regional Plan endorses the adoption of water

sensitive urban design (WSUD), with Policy 11.1.2 specifying that planning and management of urban stormwater should comply with the design objectives as set out in the *SEQ Regional Plan 2009-2031 Implementation Guideline No. 7: Water Sensitive Urban Design.* This document sets stormwater management design objectives for water quality, waterway stability and waterway frequent flow management. The design objectives in this document are consistent with design objectives for best practice urban stormwater management developed by the Healthy Waterways Partnership and documented in the SEQ Healthy Waterways WSUD Action Plan. The key purpose of the Implementation Guideline is to set design objectives as a consistent standard for all new assessable urban development within SEQ. It is noted that the SEQ urban stormwater management design objectives advocated in this Implementation Guideline are also strengthened by the *State Planning Policy for Healthy Waters (effective February 2010)*. The purpose of this policy is to ensure that any development for urban purposes under the *SPA 2009*, including community infrastructure, is planned, designed, constructed and operated to manage stormwater and wastewater to a lesser extent) in ways that protect the environmental values prescribed in the *Environmental Protection (Water) Policy 2009.*

In summary the key water quality drivers for TWCM within MBRC will be to:

- *Meet the regulatory requirements of the EP Act 1994 and EPP Water (2009) which prescribes the development of a TWCM Plan and to achieve WQOs to protect Environmental Values;*
- *Meet commitments of the SEQ Healthy Waterways Strategy 2007-2012, which aims to achieve waterways and catchments that are healthy ecosystems supporting the livelihoods and lifestyles of people in SEQ by 2026;*
- *Meet targets in the SEQ Natural Resources Management Plan that are aligned with Desired Regional Outcomes and policies for Water Management in the SEQ Regional Plan; and*
- *Implement planning and management of urban stormwater and wastewater to comply with the Sustainable Planning Act (2009) and SPP for Healthy Waters (effective 28 February 2011), as well as the design objectives set out for stormwater in the SEQ Regional Plan 2009-2031 Implementation Guideline No. 7: Water Sensitive Urban Design. This Guideline is aligned with principles and policies for Total Water Cycle Management and Desired Regional Outcomes for Water Management in the SEQ Regional Plan.*

Considering the current condition of waterways, and the future population growth and development pressures in the region, existing water quality pressures on receiving waters in the region are likely to significantly increase. These are key challenges that will need to be addressed in the TWCM planning process.

2.8 Water Quantity (Flooding)

Changes in natural overland flow regimes can result from land use changes associated with urbanisation. This is mostly a consequence of vegetation clearing and an increase in impervious areas, resulting in an increase in runoff volumes entering downstream waterways. This increase in runoff volume can also result in an increase in the extent of flood impacted areas, with associated risk and safety issues. Harvesting or interference with overland flows as part of agricultural activities can also alter natural overland flow regimes.

The SEQ Regional Plan stipulates that areas of flood risk should be identified, including the projected effects of climate change, and programs undertaken to mitigate this risk. Natural flow and inundation patterns should be restored in flood hazard areas, including connectivity between rivers and floodplains and beneficial flooding of agricultural areas. This will also minimise the concentration of flows and downstream flooding. The flood hazard area should be determined based on a defined flood event, taking into account the effects of climate change on rainfall and storm surges (DIP, 2009b).

In urban areas, one way to assist in managing these flow alterations is by using water sensitive urban design (WSUD) wherever possible. However, it should be noted that WSUD alone will not alleviate flooding risks entirely. All developments should be assessed to ensure flow alterations are acceptable in relation to flood risk and environmental flows.

The TWCM planning process will need to consider flooding impacts when developing management solutions. There should be no increase in flooding risk from any of the solutions developed, and ideally the target should be to decrease the flooding risk in each catchment as well as downstream impacts, where possible. Council is currently developing a flood plain management plan as a companion document to the TWCM Plan, that will identify flood risks and appropriate management measures.

2.9 Water Industry Institutional Arrangements

With the development of the SEQ Water Grid, the Queensland Government has taken the first steps in implementing water industry institutional reform. This reform aims to ensure effective operation and management of the Water Grid and the efficient use of the range of water supplies in SEQ.

The SEQ Water Strategy (QWC, 2010) indicates that the reform is to be implemented in stages, with the first stage completed in July 2008 comprising the establishment of four new entities that own and operate the SEQ Water Grid, including:

- Queensland Bulk Water Supply Authority, trading as Seqwater, which owns all dams, groundwater infrastructure and water treatment plants in SEQ;
- Queensland Manufactured Water Authority, trading as WaterSecure, which owns the desalination plant at the Gold Coast and the Western Corridor Recycled Water Project;
- Queensland Bulk Water Transport Authority, trading as Linkwater, which owns all major pipelines in SEQ; and
- SEQ Water Grid Manager.

The second stage of the reform commenced on 1 July 2010, and involved the establishment of three combined distribution/retail entities that own the water and sewerage infrastructure and sell water supply and sewage disposal services to customers. The service areas of the entities are the following Council groups:

- Brisbane, Scenic Rim, Ipswich, Somerset, Lockyer Valley – trading as Queensland Urban Utilities;
- Gold Coast, Logan, Redlands – trading as Allconnex Water; and
- Sunshine Coast, Moreton Bay – trading as Unitywater.

This water industry reform involves a restructuring of functional responsibilities for LGAs and water businesses. MBRC is responsible for stormwater, town planning, growth management, development control, and environmental management, while Unitywater is responsible for water and recycled water supply, wastewater treatment, and trade waste. Refer to Figure 2-8 for a description of water industry entities relevant to the Moreton Bay region and associated functional responsibilities.

For the MBRC area, Unitywater is the new water distribution and retail business serving the needs of the Moreton Bay and Sunshine Coast communities. Any implications associated with the establishment of this new entity and the functional responsibility split between MBRC and Unitywater will need to be considered in the TWCM Plan. Unitywater will be the responsible organisation for delivering many of the water cycle solutions developed for the TWCM Plan and a foreshadowed amendment to the EPP Water will require MBRC to seek the endorsement of the TWCM Plan by the local Water Distribution Retailer. At the same time, The TWCM Plan must have sufficient information to inform Unitywater's Netserv Plan, due to be completed by 2013.

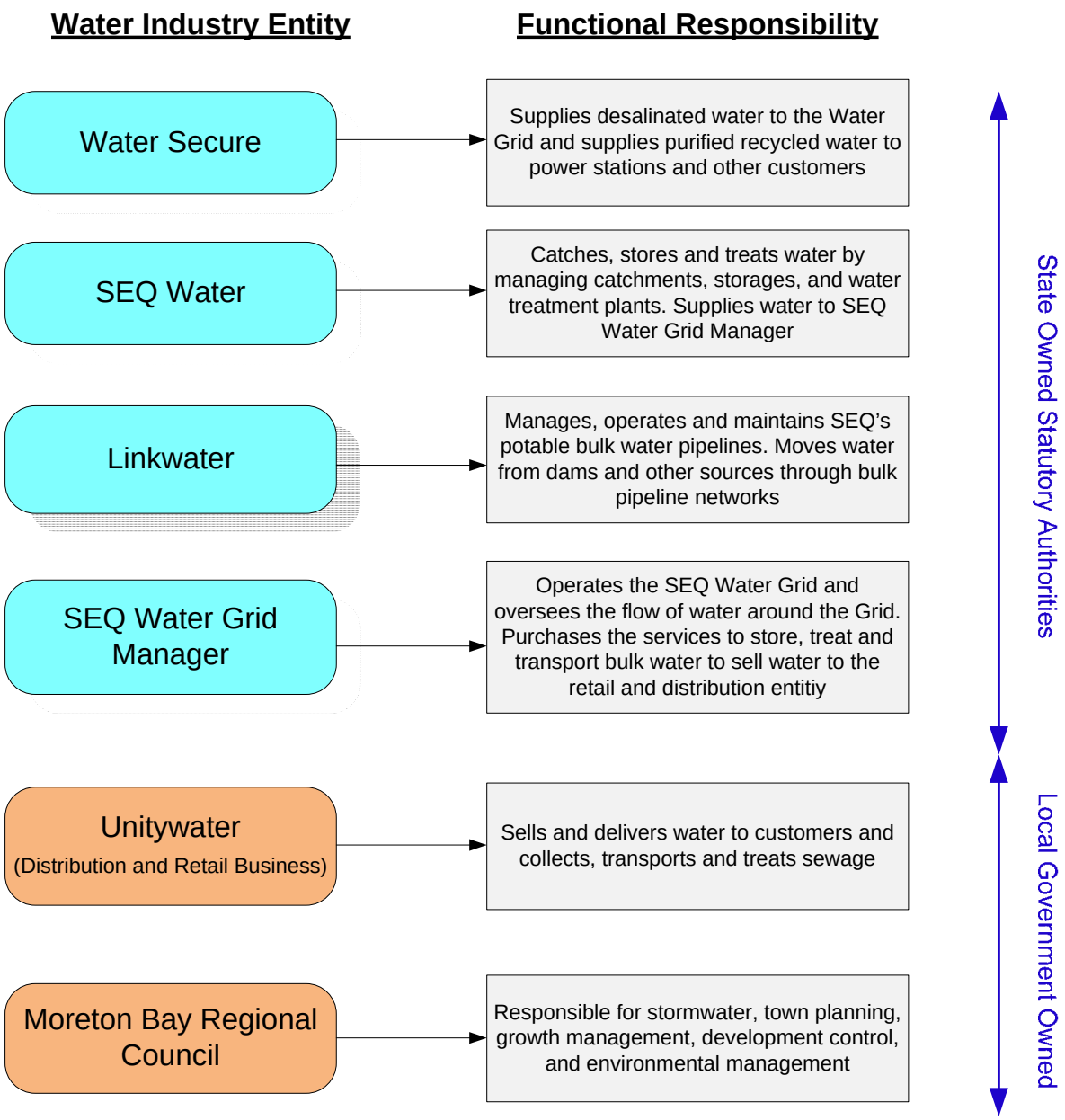


Figure 2-8 Water Industry Entities in Moreton Bay Region and Functional Responsibilities

2.10 Protection of Environmentally Sensitive Areas

Within the MBRC region, there exist a number of environmentally sensitive areas comprising national parks, state forests, conservation areas, reserves, wetlands and High Ecological Value (HEV) areas. These areas are important for several reasons including species richness and diversity, habitat quality, and aesthetic values. The environmental values associated with these areas require protection, and in this regard the TWCM planning process needs to consider existing environmental stressors on these areas along with potential impacts from future development.

Examples of areas which are environmentally important in the MBRC region include the following:

- **High Ecological Value (HEV) areas** – these areas, as per Schedule 1 of the EPP Water, have been identified as being of high ecological importance. In these areas, water quality is required to either be maintained (no worsening) or certain water quality standards achieved;
- **Hays Inlet** - this area is a saltwater inlet off Bramble Bay. The slender inlet borders the suburb of Clontarf to the east and the suburbs of Mango Hill and Griffin to the west. Hays Inlet is a declared fish habitat and is recognised as an internationally significant migratory wader bird habitat under the Ramsar Convention. It provides important habitat and breeding grounds for the Black-winged Stilt, Bar-tailed Godwit and other wader birds that migrate here every year. In the past, green algae blooms have developed in Hays Inlet due to high nutrient concentrations (PRCA, 2010). Hays Inlet is also classified as a HEV area;
- **Pumicestone Passage** – this passage is a narrow, shallow estuary with a meandering system of channels, sand banks and islands. It is located between Bribie Island and the mainland, extending from Caloundra in the north to Deception Bay in the south. The passage has a diversity of environmental values, with many significant species such as turtles, dugongs and migratory birds making their homes amongst the mangroves, mud flats, coastal dunes and seagrass meadows. For this reason the passage is recognised on a local, regional, national and international scale (SCRC, 2010). Also, the northern part of Pumicestone Passage is classified as a HEV area;
- **D'Aguilar Range National Park** – this national park (formerly Brisbane Forest Park) is located on the western border of MBRC and totals approximately 35,000ha. This park protects the core of vast bushland area in the D'Aguilar Range The town of Dayboro is situated on the lower foothills midway along the range and Woodford lies at the northern most point of the range. Some areas within this National Park are identified as HEV areas;
- Other environmentally sensitive areas in the MBRC region include the following:
  - **Bribie Island National Park** – located in Bribie Island catchment;
  - **Beerburrum State Forest** – located in Pumicestone Passage, Stanley River and Caboolture River catchments;
  - **Charlie Moorhead Nature Refuge -** located in Caboolture River catchment;
  - **Dohles Rocks Reserve** – located in the Lower Pine catchment;
  - **Godwin Beach Reserve** – located in the Caboolture River catchment
  - **Glasshouse Mountains National Park** – located in Pumicestone Passage catchment;

- **Bellthorpe Forest** – located in Mary River and Stanley River catchments;
- **Peachester Forest** – located in Stanley River catchment;
- **Delaneys Creek State Forest** – located in Neurum Creek catchment;
- **Wararba Creek Conservation Park** – located at western extent of Caboolture River catchment;
- **Clear Mountain Forest Reserve** - located at the border of Upper Pine and Lower Pine catchments;
- **Buckleys Hole Conservation Park** – located on Bribie Island;
- **Byron Creek Conservation Park** – located in Byron Creek catchment;
- **Bunyaville Forest Reserve** – located in Lower Pine catchment;
- **Samford Conservation Park** - located in Lower Pine and Brisbane Coastal catchments;
- **Freshwater National Park** – located in Burpengary Creek catchment;
- **Sheep Station Creek Conservation Park** – located in Caboolture River catchment; and
- **Beachmere Conservation Park** – located on the coastline of the Caboolture River catchment.

Refer to Figure 3-1 in Section 3.1 for locations of these environmentally sensitive areas within the MBRC region.

These areas are important environmental assets, on both a local and regional scale. One outcome from the TWCM planning process will be the development of measures which minimise existing and future environmental impacts on these areas.

2.11 Legislative and Policy Drivers

A brief description of the legislative and policy drivers which play a significant role in the above mentioned drivers is included here to provide an indication of their relevance in the context of TWCM planning process. Legislative and policy drivers include the following:

- ***Sustainable Planning Act 2009* (SPA) -** The *Sustainable Planning Act 2009* (SPA), which replaced the *Integrated Planning Act 1997* (IPA) in 2009, is Queensland's principal planning legislation. It provides a framework for integrated and coordinated assessment of new development through the Integrated Development Assessment System (IDAS);
- ***Environmental Protection Act 1994*** - provides a regulatory framework for protection of the environment and promotes an environmental stewardship approach. The Act also gives force and effect to the recently revised *Environmental Protection (Water) Policy 2009* (EPP Water), which specifies environmental values and water quality objectives for waterways in Queensland. The EPP Water also prescribes the requirement for development of total water cycle management plans for LGAs (section 19 of EPP Water). Along with the requirements of these Plans set out in section 19, these TWCM Plans must include provisions for sewage management (section 20), urban stormwater quality (section 21), and trade waste management (section 22);

- ***Water Act 2000*** - establishes a system for the planning, allocation and use of water. Sustainable management under the Act requires that water be allocated for the wellbeing of the people of Queensland and the protection of the biological diversity and health of natural ecosystems, within limits that can be sustained indefinitely. Under the Act, a number of catchment-based water resource plans have been developed which take into account surface water, groundwater and overland flow, and provide for environmental needs as well as human uses by providing secure water entitlements with a specified probability of supply. For the MBRC area, the relevant water resource plan is the *Water Resource (Moreton) Plan 2007*. The Water Act provides authority to the Queensland Water Commission (QWC) to impose water restrictions;
- ***Water Supply (Safety and Reliability) Act 2008*** - includes provisions dealing with drinking water that aim to protect public health by requiring drinking water service providers to undertake monitoring and reporting on drinking water quality, and to develop and implement a Drinking Water Quality Management Plan. Catchment management is a core element of managing the quality of drinking water, and is achieved by managing existing uses, planning new development to manage risks, and rehabilitating catchments. Local Government planning schemes must identify drinking water catchment areas and include appropriate development controls. Planning studies in these areas must consider how to avoid future types or scales of development that would pose an unacceptable risk to water quality. Where development is permitted, strict controls may be required to protect the natural water cycle. Infrastructure should also be located and designed with regard to water quality risks. The Act also addresses the treatment and supply of recycled water for potable and non-potable uses, including the requirement to develop a Recycled Water Management Plan (RWMP). A key driver for the Act was to provide a regulatory basis for the development of the Western Corridor Purified Recycled Water project;
- ***Public Health Regulation 2008*** - provides minimum water quality requirements for water recycling for both potable and non-potable uses;
- **State Planning Policy for Healthy Waters (SPP for Healthy Waters)** - this State Planning Policy was approved by government in October 2010 and becomes effective on 28 February 2011. It aims to ensure that any development under the *Sustainable Planning Act 2009* (SPA), including community infrastructure, is planned, designed, constructed, and operated to manage stormwater and wastewater in ways that protect the environmental values specified in the EPP Water (2009). In other words, this would require developers to demonstrate how they have adopted water sensitive urban design principles in their development applications. The SPP for Healthy Waters applies to:
  - The stormwater water quality management of development proposals that comprise at least six lots or dwellings;
  - Development for urban purposes with wastewater for discharge to a waterway; and
  - Planning at all scales including new green field urban areas as well as infilling and redevelopment of existing built-up areas.

  The Policy does not apply to development associated with single detached dwellings. This policy has been developed under *IPA 1997* and the *SPA 2009* and applies to the whole of Queensland.
- **Implementation Guideline No. 7: Water Sensitive Urban Design** - this guideline forms part of the SEQ Regional Plan 2009 -2031. It includes Water Sensitive Urban Design Objectives for

Urban Stormwater Management, and applies to the SEQ region only. The three key design objectives in the Guideline for managing urban stormwater are intended to:

- Manage urban stormwater quality;
- Improve waterway stability; and
- Manage the frequency of flows.

The guideline applies to:

- A previously developed site (redevelopment);
- An undeveloped site in a developed area (infill development); and
- An undeveloped site in an undeveloped area (greenfield development).

The new SPP for Healthy Waters advocates the use of the stormwater management objectives in these guidelines for applicable development within SEQ.

- **SEQ Regional Plan 2009-2031** (DIP, 2009b) - The SEQ Regional Plan is the overarching planning document for the SEQ region. The purpose of the Plan is to manage regional growth and change in the most sustainable way to protect and enhance quality of life in the region. The State Government recently reviewed the previous version of the SEQ Regional Plan (2005-2026) to address emerging regional growth management issues, and refined and modified the strategic directions, principles and policies of the SEQ Regional Plan 2005-2026 to respond to emerging issues;
- **SEQ Water Strategy** (QWC, 2009) - this plan sets out the means to ensure a secure water supply over the next 50 years and beyond, to support our lifestyles and provide for our water use needs as well as those of the environment. The Strategy includes a water supply guarantee which is to be met by a range of supply infrastructure, such as dams, desalination, purified recycled water and a grid linking them up, as well as an ongoing demand management program;
- **SEQ Healthy Waterways Strategy** (HWP, 2007) - is an integrated set of Action Plans which aim to maintain and improve the health of the waterways and catchments of SEQ. The Strategy addresses aquatic ecosystem health and water quality issues in SEQ, and provides measures to avoid or ameliorate the impacts of human activities on waterways under an adaptive management framework. This Strategy has been developed with the understanding that to manage water sustainably, it is necessary to address the total water cycle. This includes managing water resources, land use, waterways, and water quality, to protect the significant aquatic environmental values that underpin the economy, lifestyle and wellbeing of the region's residents;
- **SEQ Natural Resource Management Plan** (DERM, 2009b) - includes targets in regard to the protection of SEQ's natural resources. This Plan is the pre-eminent, non-statutory environment and natural resource management plan for the region. It articulates measurable targets for the condition and extent of environment and SEQ Regional Plan 2009–2031, and has been prepared to provide baseline data and spatial information to complement and inform preparation and review of the South East Queensland State of the Region Report;
- **SEQ Regional Water Security Program** (DNRM&E, 2006) - the legislative and policy framework for water management in SEQ includes specification of a number of required (and enforceable) programs and plans. The Regional Water Security Program is one of these. The

SEQ Regional Water Security Program is made by the Minister for Natural Resources, Mines & Energy. It specifies, at a high level, how regional water security is to be achieved. A Regional Water Security Program for SEQ was adopted on 13 November 2006, providing for the construction of significant infrastructure; and

- **Draft SEQ Climate Change Management Plan** (DIP, 2009a) - includes draft actions to implement the climate change policies of the SEQ Regional Plan. The proposed actions will help to make future development, infrastructure and communities in SEQ more resilient to the possible impacts of climate change and help reduce regional greenhouse gas emissions to support international, national and Queensland Government mitigation policies.

The relationship that these planning documents have to each other in the water planning context is presented in Figure 2-9.

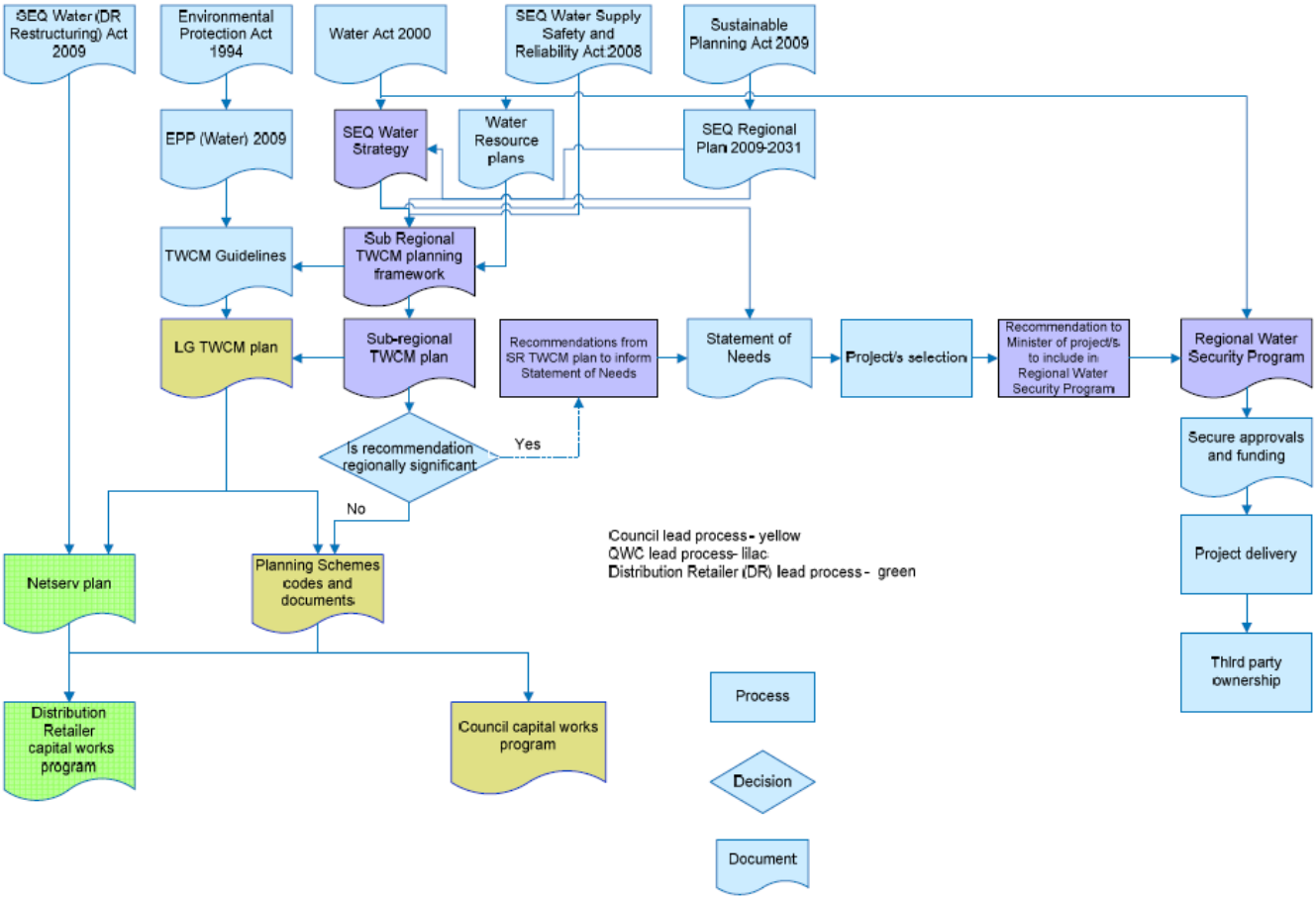


Figure 2-9 Policy and Planning Framework for Total Water Cycle Management in SEQ (Source: QWC Sub-regional TWCM Framework)

2.12 Summary of Drivers

In summary, the drivers which have been identified as being influential in terms of TWCM planning in MBRC can be summarised as follows:

Population growth – it is estimated that population growth will remain strong in SEQ and in certain parts of MBRC in particular (e.g. Northern Growth Corridor). This additional population growth will need to be considered in terms of additional resources and infrastructure required along with additional pressures on environmental values. Future scenarios will require detailed analysis of where the population growth will occur, how it will occur (i.e. population densities), and the additional inputs and outputs into the water accounting equation;

Water supply – despite the 'water supply guarantee' outlined in the SEQ Water Strategy, it is evident that security of water supply in the MBRC area is a driver of the TWCM planning process. When developing the TWCM Plan for MBRC, these water supply sources and their future security will need to be considered. It will also be important to investigate other potential sources of potable water in the region (such as recycled water and stormwater harvesting) so that reliance on the current, largely catchment runoff-based sources is diversified;

Environmental flows – environmental flow objectives for a number of waterways in MBRC are contained in the *Water Resource (Moreton) Plan 2007.* The consequence of having to maintain environmental flow objectives in these waterways can potentially adversely impact on the available water supply and associated harvestable yield in the region. If water storages are required to release a certain amount of water to downstream reaches, this can reduce yields. Combine this with the potential impacts of climate change and increasing population on water supplies, and it is evident that the TWCM planning process will need to account for environmental flow requirements in any future water accounting scenarios to ensure that storage yields are properly determined;

Climate change – in SEQ, it is estimated that climate change may impact on future water supplies. This impact may potentially result in a 10% reduction in surface water supply/yield, and it is therefore essential that this impact is considered in any future scenarios from a water supply perspective. This also places emphasis on the need for the investigation of other sources of water which are less susceptible to climate change impacts, given the current reliance on surface water supplies in the region;

Water conservation – water savings targets have been set in the SEQ Regional Plan in order to reduce residential and non-residential water demand. While the TWCM Plan may include solutions for additional water supplies, it is essential that water conservation maintains a continued focus in order to minimise inefficient water use. This may delay or eliminate the need for future water infrastructure upgrades, such as desalination plants, and also contributes to wastewater flow/load reduction targets;

Wastewater management – the key driver in terms of wastewater management is the current need for STPs to comply with legislative requirements of the *Environmental Protection Act 1994* and the EPP Water while also accommodating for future development and growth within MBRC. In order to achieve this, sustainable pollutant loads for receiving waterways (i.e. the annual pollutant load that waterways can assimilate without exceeding concentration based WQOs) will need to be quantified

and inputs from wastewater will need to be considered along with other inputs (i.e. diffuse loads) in the context of Total Water Cycle Management.

Additionally, Council's commitment to the SEQ Healthy Waterways Strategy 2007 - 2012, and specifically the Point Source Pollution Management Action Plan - which has a target to prevent 100% of nutrient point sources from entering Moreton Bay by 2026 - is another key driver;

Water quality - the key water quality drivers in terms of water quality are: to meet regulatory requirements of the *EP Act 1994* and EPP Water 2009 which prescribe the development of a TWCM Plan and to achieve WQOs to protect Environmental Values; to meet commitments of the SEQ Healthy Waterways Strategy 2007-2012, which aims to achieve waterways and catchments that are healthy ecosystems supporting the livelihoods and lifestyles of people in SEQ by 2026; meet targets set in the SEQ Natural Resources Management Plan that are aligned with desired regional outcomes and policies for Water Management in the SEQ Regional Plan; and to implement planning and management of urban stormwater to comply with the design objectives as set out in the *SEQ Regional Plan 2009-2031 Implementation Guideline No. 7: Water Sensitive Urban Design,* as well as management of urban stormwater and waste water to comply with the *SPA (2009)* and State Planning Policy for Healthy Waters (effective 28 February 2011).

Considering the current condition of waterways, and the future population growth and development pressures in the region, existing water quality pressures on receiving waters in the region are likely to significantly increase. These are key challenges that will need to be addressed in the TWCM planning process.

Water quantity (flooding) - the TWCM planning process will need to consider flooding impacts when developing management solutions. There should be no increase in flooding risk from any of the solutions developed, and ideally the target should be to decrease the flooding risk in each catchment as well as downstream impacts, where possible;

Water industry institutional arrangements - a recent water industry reform has resulted in the formation of a new water distribution and retail business serving the needs of both the Moreton Bay and Sunshine Coast communities. This new entity is called Unitywater and commenced operations on 1 July 2010. Any implications associated with the establishment of this new entity and the functional responsibility split between MBRC and Unitywater will need to be considered in the TWCM Plan. Unitywater will be the responsible organisation for delivering many of the water cycle solutions developed for the TWCM Plan and a foreshadowed amendment to the EPP Water will require MBRC to seek the endorsement of the TWCM Plan by the local Water Distribution Retailer; and

Protection of environmentally sensitive areas - a number of areas have been identified within MBRC which are environmentally sensitive and require protection from adverse environmental stressors. These areas are important environmental assets, on both a local and regional scale. One outcome from the TWCM planning process will be the development of measures which minimise existing and future environmental impacts on these areas.

Legislative and Policy Drivers - the various legislation and policy which are relevant in the context of TWCM planning include the following:

- *Sustainable Planning Act 2009;*

- *Environmental Protection Act 1994;*
- *Water Act 2000;*
- *Water Supply (Safety and Reliability) Act 2008;*
- *Public Health Regulation 2008;*
- State Planning Policy for Healthy Waters (SPP for Healthy Waters, effective 28 February 2011);
- SEQ Regional Plan 2009-20031 Implementation Guideline No. 7: Water Sensitive Urban Design;
- SEQ Regional Plan 2009-2031;
- SEQ Water Strategy;
- SEQ Healthy Waterways Strategy;
- SEQ Natural Resource Management Plan;
- SEQ Regional Water Security Program; and
- Draft SEQ Climate Change Management Plan.

2.12.1 Additional Considerations

In addition to the key drivers discussed in the previous section, the following drivers are also important and will be an integral part of the detailed phase of the TWCM planning process:

Infrastructure Timing and Cost Optimisation - the extensive investment in the upgrades to STPs, stormwater management and water supply source augmentation required over the next 5 to 10 years will place significant financial pressures upon the owners of that infrastructure. The TWCM Plan will assist with determining the most cost effective means of providing that infrastructure (in a triple bottom line way) and determine anticipated timing of expenditure and look at options that may result in deferral or elimination of significant capital costs.

Areas and Standards of Service - the need to increase recycling of water has been established, however the need to determine how much and where this is to occur and to make appropriate changes to planning provisions is required.

3 WATER ACCOUNTING

A key step in the TWCM planning process is to develop water accounts for a defined area. These water accounts attempt to quantify, as much as practical, the inputs and outputs of water in the water cycle, and to identify where water related issues, such as water shortages and water quality impacts, may exist currently and in the future (i.e. 2031).

Figures representing the existing and future water accounting results for each catchment are included in Appendix C (existing) and Appendix D (future).

3.1 Catchment Summary

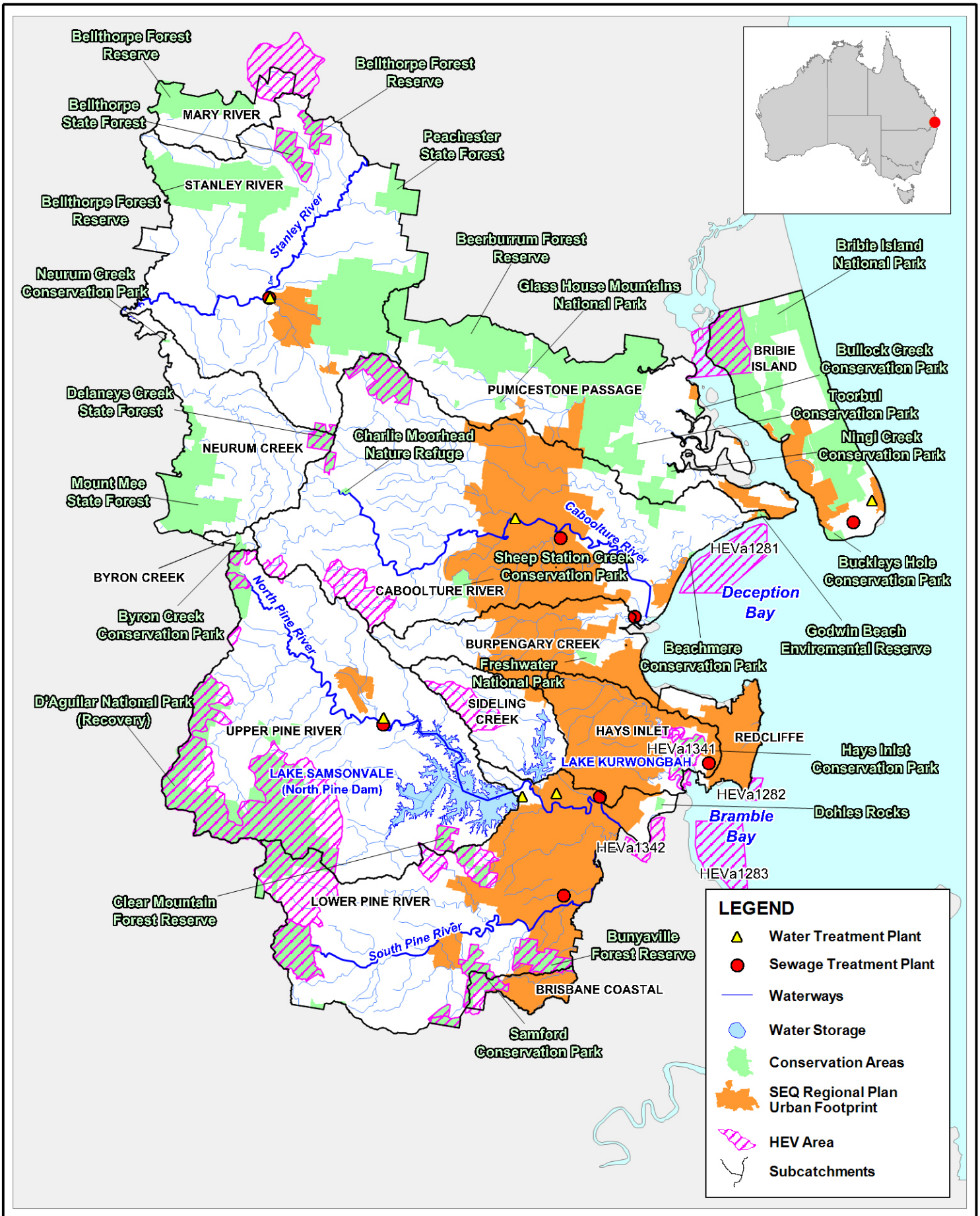
For water accounting purposes, the MBRC region was split into 14 catchments. These catchments were delineated based on major drainage basins to be consistent with catchment delineation as per the MBRC Regional Floodplain Database, and also to be consistent with catchment modelling undertaken concurrently for MBRC.

Key characteristics of each of the 14 catchments is summarised in Table 3-1. These key characteristics, including environmentally sensitive areas, are also presented in Figure 3-1.

Table 3-1 Summary of Key Catchment Characteristics

Catchment	Area	Population		Land Use [2]		Water Treatment Plant	Sewage Treatment Plant	Potable Water Storage
	(Ha)	2010	2031	Urban	Rural			
Bribie Island	10,710	17,133	21,830	10%	90%	Banksia Beach WTP	Bribie Island STP	Bribie Island Borefields
Pumicestone Passage	18,480	11,415	12,183	15%	85%	-	-	-
Redcliffe	2,662	49,638	72,858	56%	44%	-	-	-
Mary River	3,541	0	0	3%	97%	-	-	-
Caboolture River [1]	10,710	69,546	112,227	33%	67%	Caboolture WTP	South Caboolture and Burpengary East STPs	Caboolture Weir
Burpengary Creek	8,435	42,766	64,396	25%	75%	-	-	-
Hays Inlet	7,599	63,613	111,641	33%	67%	-	Redcliffe STP	-
Brisbane Coastal	1,530	22,601	24,058	78%	22%	-	-	-
Byron Creek	369	0	0	0%	100%	-	-	-
Neurum Creek	10,510	0	0	0.1%	99.9%	-	-	-
Sideling Creek	5,267	1,397	2,609	18%	82%	Petrie WTP	-	Lake Kurwongbah
Lower Pine River	28,280	90,695	132,974	11%	89%	-	Murrumba Downs and Brendale STPs	-
Upper Pine River	34,890	2,014	3,223	2%	98%	North Pine and Dayboro WTPs	Dayboro STP	North Pine Dam, Dayboro Borefields
Stanley River	31,830	4,073	8,642	2%	98%	Woodford WTP	Woodford STP	Woodford Weir
Total	**202,543**	**374,890**	**566,642**					

Notes:
[1] Future population figure does not include the Caboolture Investigation Growth Area (CIGA) – estimated to be an additional 60,000 people
[2] Land use based on 2031



Title:

Key Catchment Characteristics

Figure: 3-1

Rev: A

BMT WBM endeavours to ensure that the information provided in this map is correct at the time of publication. BMT WBM does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.

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Approx. Scale

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3.2 Current Water Accounts

This section presents the methodology used to develop the current water accounts (i.e. 2010).

3.2.1 Water Accounting Methodology

For each of the 14 catchments, water cycle accounting was undertaken by quantifying each of the following elements:

- **Rainfall** – accounts for all rainfall on the catchment, based on catchment area and average annual rainfall;
- **Evapotranspiration** – volume of water evaporating from the ground and surface waters, along with transpiration losses from vegetation;
- **Groundwater drainage loss** – volume of water lost out of the system in the form of groundwater infiltration. This water does not flow back into surface waters;
- **Rural extractions** – volume of water extracted from both surface water and groundwater for irrigation and stock watering purposes;
- **Reticulated water yield** – volume of potable water available in each catchment from surface water and groundwater storages, and also from the SEQ Water Grid;
- **Reticulated water demand** – residential and non-residential reticulated water demand within reticulated water network catchments.
- **Exported reticulated water** – volume of reticulated water exported out of the catchment in trunk water infrastructure (i.e. SEQ Grid);
- **Imported reticulated water** – volume of reticulated water imported into the catchment;
- **Reticulated network leakage** (non-revenue water) – volume of water lost from reticulated network infrastructure due to leakage;
- **Stormwater discharges** – surface runoff and groundwater (baseflow) entering receiving waters;
- **Wastewater discharges** – volume of wastewater discharged from STPs into receiving waters; and
- **Recycled water** – wastewater treated at STPs and recycled back into the water network (e.g. through third pipe systems) as a substitute for potable water in some uses.

The methodology for calculating each of the above elements is included in the following sections.

3.2.1.1 Rainfall

Rainfall volume was calculated for each catchment using catchment area multiplied by the average annual rainfall for the MBRC region sourced from gridded SILO data (DNRW, 2009), for the period January 1980 to October 2009. Annual rainfall totals from the SILO data are depicted in Figure 3-2. Average annual rainfall for the MBRC region is 1,405 mm/year.

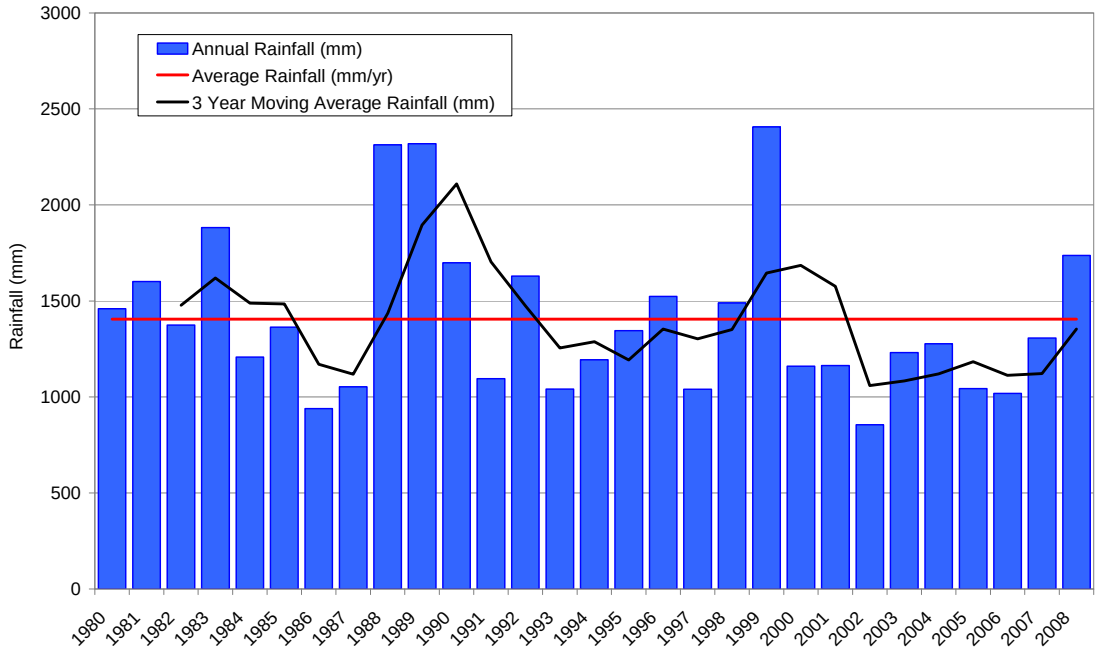


Figure 3-2 SILO Rainfall Data and Trend

Pollutant concentrations for rainfall were sourced from studies conducted in regard to pollutants in road runoff and rainfall (WBM, 2003), which were also used as inputs into a catchment model developed concurrently for MBRC (BMT WBM, 2010). These pollutant concentrations for rainfall are 0.4 mg/L for total nitrogen and 0.006 mg/L for total phosphorus.

Assumptions:

- That each catchment experiences the same average annual rainfall per year; and
- Rainfall volumes for 2010 are similar to the average annual rainfall for the period 1980 – 2009.

3.2.1.2 Evapotranspiration

To calculate the volume of water lost out of each catchment through evapotranspiration, initially potential evapotranspiration (PET) data was sourced from gridded SILO data (DNRW, 2009), for the period January 1980 to October 2009. Annual PET totals from the SILO data are depicted in Figure 3-3. This gives an annual average PET for the MBRC region of 1,490 mm/yr.

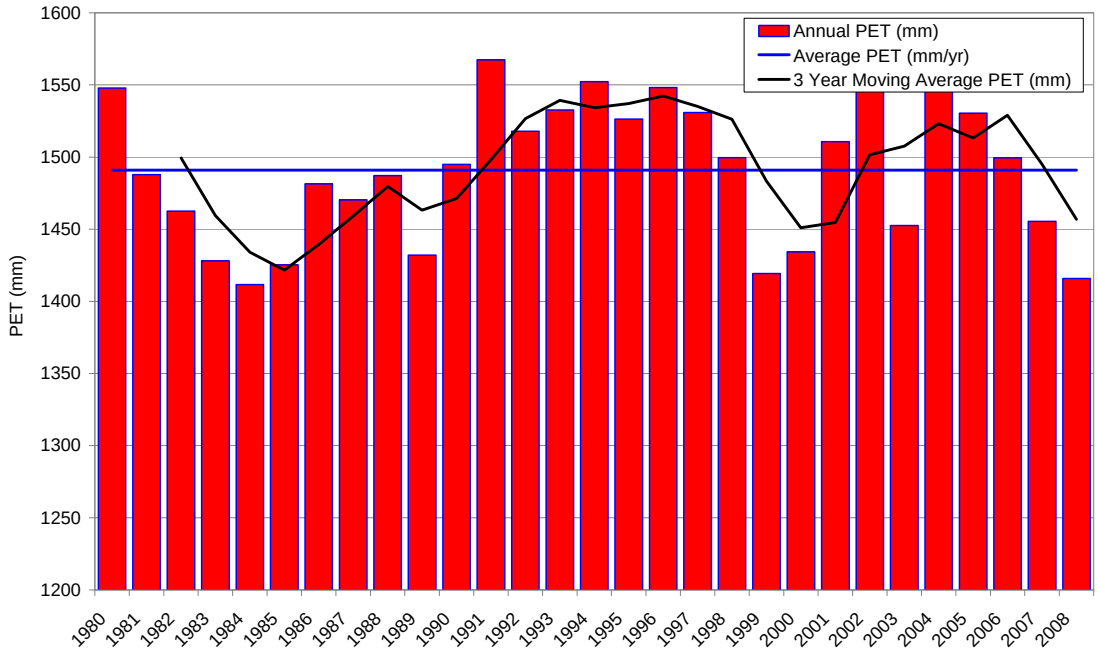


Figure 3-3 SILO PET Data and Trend

As can be seen, the average annual PET (1,490 mm/yr) is higher than the average annual rainfall (1,405 mm/yr). This is due to PET relating to the *potential* of the atmosphere to remove water from the catchment assuming no control on water supply. Therefore, for each catchment, the *actual* evapotranspiration (i.e. the quantity of water actually removed from the catchment due to evaporation and transpiration) was estimated.

To achieve this, the input into each catchment from rainfall was balanced with outputs such as runoff and groundwater drainage loss, to give an estimation of actual evapotranspiration. This resulted in an actual evapotranspiration volume below the average annual PET and which varied in each catchment between 810 mm/yr and 1,130 mm/yr.

3.2.1.3 Groundwater Drainage Loss

Water lost out of each catchment through groundwater infiltration and drainage loss was calculated as being the equivalent to 1.5% of annual rainfall. This figure was based on modelling studies undertaken in Australia which modelled deep drainage of groundwater (i.e. water moving to below the root zone). The studies concluded that groundwater deep drainage coefficients (i.e. modelled average annual deep drainage as a percentage of average annual rainfall) range between 1.5% and 1.8% (National Water Commission, 2010). The lower figure of 1.5% was utilised for water accounting purposes in each catchment.

Assumptions:

- It is assumed that the groundwater drainage loss (1.5% of annual rainfall) includes the component of groundwater infiltration that drains into aquifers as groundwater recharge, and is effectively lost to the system. Groundwater that eventually flows into surface waters is included in the stormwater discharges component of the water cycle account; and

- The deep drainage coefficient assumes that soil types and drainage characteristics are consistent throughout all catchments in the MBRC region, and also consistent with other areas along the eastern seaboard of Australia.

3.2.1.4 Rural Extractions

To determine approximate volumes of water extracted from groundwater and surface water sources for rural applications in each catchment, water licence data was sourced from the Department of Environment and Resource Management (DERM).

The water licence data contains details regarding the location of rural water extraction points and the irrigation area in hectares. Based on data from recent surveys of water use on Queensland farms (ABS, 2010), an average irrigation application rate of 4.0 ML/ha was used to calculate the approximate volume of water extracted for rural applications in each catchment.

Using this methodology, the volume of water currently extracted and used in rural applications is presented in Table 3-2.

Table 3-2 Rural Water Extraction per Catchment

Catchment	Rural Water Extraction (GL/yr)
Bribie Island	0
Pumicestone Passage	3.6
Redcliffe	0.0
Mary River	0.3
Caboolture River	1.3
Burpengary Creek	0.0
Hays Inlet	0.2
Brisbane Coastal	0.1
Byron Creek	0.0
Neurum Creek	0.9
Sideling Creek	0.0
Lower Pine River	0.8
Upper Pine River	2.7
Stanley River	3.6

Assumptions:

- The application rate of 4.0 ML/ha assumes that all water extracted for rural purposes is used predominantly for irrigation.

3.2.1.5 Reticulated water yield

The reticulated water yield was calculated for each catchment, which includes in-catchment raw water yield from surface water storages, groundwater storages, recycled water from STPs, and rainwater tanks, along with imported reticulated water. While rainwater tanks are not part of the reticulated water network, they supplement water from the reticulated water network so were factored into the calculations.

To calculate raw water yield from surface water and groundwater storages, production data for water treatment plants (WTPs) in the MBRC region was provided by Unitywater. This included daily production data for the previous 12 month period, with the average daily production volume being utilised in the water yield calculations.

Water supply data for the Northern Pipeline Interconnector (NPI), which is part of the SEQ Water Grid and supplies water from Barron Pocket Dam on the Sunshine Coast to the MBRC region, was provided by Linkwater and the SEQ Grid Manager. The NPI supplies water to the Caboolture catchment via the Elimbah and Morayfield reservoirs, the Burpengary catchment via the Narangba reservoir, and also gets distributed to other catchments via inflow into the North Pine Dam water treatment plant.

Rainwater tank yields were estimated by first determining the number of people in each catchment using a GIS demand model. This model, developed by Unitywater, contains the population in equivalent persons (EP) allocated to each lot in the MBRC region from 2010 through to 2031 (Unitywater, 2009 and 2010).

To determine the volume of water used in rainwater tanks, a number of general assumptions were used in the calculations as follows:

- The uptake of rainwater tanks currently in the MBRC region is assumed to be approximately 25% (based on pers. comm. A Sloan, 26 July 2010);
- 2% of these tanks are plumbed internally, the remainder are used for outdoor gardening only (based on pers. comm. A Sloan, 26 July 2010);
- An average of 2.5 EP per household;
- Indoor reticulated water savings for internally plumbed tanks is 76 L/day (based on Water by Design, 2009); and
- Outdoor reticulated water savings is 95 L/day (based on Water by Design, 2009).

Table 3-3Table 3-3 presents a summary of the catchment raw water yield, imported water, and overall reticulated water yield for each catchment.

Table 3-3 Reticulated Water Yield per Catchment

Catchment	Reticulated Water Yield (GL/yr)					
	Catchment Raw Water Yield				*Imported Water*	
	Surface Water	Ground-water	Rainwater Tanks	Recycled Water	From other catchments	NPI
Bribie Island	0	0.74	0.06	0	1.4	0
Pumicestone Passage	0	0	0.04	0	1.2	0
Redcliffe	0	0	0.17	0	6.1	0
Mary River	0	0	0	0	0	0
Caboolture River	2.23	0	0.25	0.73	4.5	3.6
Burpengary Creek	0	0	0.15	0	1.7	3.2
Hays Inlet	0	0	0.22	0.11	8.5	0

Catchment	Reticulated Water Yield (GL/yr)					
	Catchment Raw Water Yield				*Imported Water*	
	Surface Water	Ground-water	Rainwater Tanks	Recycled Water	From other catchments	NPI
Brisbane Coastal	0	0	0.08	0	2.4	0
Byron Creek	0	0	0	0	0	0
Neurum Creek	0	0	0	0	0	0
Sideling Creek	5.46	0	0	0	0	0
Lower Pine River	0	0	0.32	1.01	9.8	0
Upper Pine River	23.3	0.14	0.01	0	0	4.4
Stanley River	0.67	0	0.01	0	0	0

Assumptions:

- All WTPs are assumed to be operational and producing water at a constant volume based on average daily production figures derived from previous 12 months of data. It should be noted that Woodford WTP was out of operation for a number of months and was sourcing water from the Caboolture catchment (*pers comm*. Greg Marriot, Unitywater), however this was not accounted for in the current accounts; and
- All water not used within MBRC is assumed to be exported to Brisbane via the Aspley reservoir.

3.2.1.6 Reticulated water demand

Similar to rainwater tank yield estimations (section 3.2.1.5 above), reticulated water demand was calculated in each catchment through the use of a GIS demand model developed by Unitywater. This model provides an estimation of the population in equivalent persons (EP) allocated to each lot in the MBRC region from 2010 through to 2031 (Unitywater, 2009 and 2010).

The base unit of demand allocation is an equivalent person (EP). For residential A, residential B and rural residential demand allocation, one EP is considered equal to one person. For non-residential demand allocation, one EP is defined as a person using the same amount of water as a person living in an equivalent tenement (ET) which has an area between 500 to 1,000 m2 (Unitywater, 2010).

Using the estimates of EP in each catchment derived from the GIS demand model, water demand figures were initially calculated using an assumed water usage of 375 L/EP/day (which includes residential use, non-residential use and system losses). This water usage is based on planning assumptions included in the SEQ Regional Plan and the SEQ Water Strategy. The SEQ Water Strategy includes a planning assumption for residential water demand only of 230 L/person/day, with 375 L/person/day for total urban water demand from the grid (QWC, 2010).

However, when these water demand figures were compared to the actual water production data for the previous 12 months in the MBRC region, it was discovered that the water demand figures were over-estimating water usage. To rectify this, the assumed water usage (i.e. 375 L/EP/day) was modified so that water demand figures better matched water production data. This was achieved by assuming that water demand management in the MBRC region (including water savings devices, behavioural change, improved industrial water efficiency, etc) results in a reduction in water usage of approximately 90 L/EP/day, giving a current water usage of 285 L/EP/day.

Assumptions:

- Water use per EP is assumed to be 285 L/EP/day. This is based on the SEQ Regional Plan planning assumption of 375 L/EP/day minus the water demand management adjustment (90 L/EP/day). This water usage includes residential, non residential and system losses;
- The unknown variable in the water balance calculations is the volume of water exported to Brisbane. Therefore, the balance of water production data to water demand estimates assumes that water exported to Brisbane accounts for 0.75% (250 ML/yr) of total water production from North Pine Dam and Lake Kurwongbah; and
- Water demand figures are derived from the GIS demand model with associated assumptions including, for example: population growth rates (slightly higher than medium series PIFU projections); occupancy rates for residential dwellings; adopted demand for proposed greenfield development sites; and demand assumptions for non-residential users. For further details refer to Unitywater (2009 and 2010).

3.2.1.7 Exported reticulated water

With reticulated water trunk infrastructure (including the SEQ Water Grid infrastructure) forming a network across the catchments, potable water is allowed to flow between catchments depending on where the water demand is.

This flow of water was quantified by examining where the water is supplied from, combined with where the water demand is across all catchments with a reticulated water network. Water supply data and water demand figures, as discussed in Sections 3.2.1.5 and 3.2.1.6 above, were used in this process.

The volume of reticulated water exported out of each catchment was determined in catchments where the reticulated water yield was greater than the reticulated water demand (e.g. Upper Pine and Sideling Creek - comprising North Pine Dam and Lake Kurwongbah respectively). Furthermore, catchments which supply adjacent catchments with reticulated water (e.g. Caboolture catchment supplying Pumicestone and Bribie catchments) were identified and volumes of exported water quantified accordingly.

Assumptions:

- The water balance of reticulated water throughout the MBRC region assumes that water exported to Brisbane accounts for 4% (1.3 GL/yr) of total water production from North Pine Dam and Lake Kurwongbah. This figure corresponds to the volume of water remaining once water demand in each catchment is accounted for.

3.2.1.8 Imported potable water

The volume of reticulated water imported into each catchment was calculated using water demand figures (from GIS demand model) and water production data. Where there was a deficit in water supply in a catchment after all in-catchment sources (i.e. surface and groundwater storages, rainwater tanks, and recycled water) were accounted for, this deficit was balanced out with imported water from adjacent catchments and the SEQ water grid.

Most catchments in the MBRC region import reticulated water from North Pine Dam and Lake Kurwongbah in the Upper Pine and Sideling Creek catchments respectively. A significant proportion also gets imported from the SEQ water grid, specifically the Northern Pipeline Interconnector (NPI). This pipeline, which supplies water from Baroon Pocket Dam on the Sunshine Coast to the MBRC region, has a capacity of 65 ML/day. However, based on current data supplied by Linkwater and the SEQ Grid Manager, this pipeline is currently supplying approximately 30 ML/day on average to the MBRC region via reservoirs in the Caboolture and Burpengary catchments and directly into North Pine Dam.

To determine where water is imported from in catchments with reticulated water supply deficits, reticulated water trunk infrastructure mapping was examined. This provided an indication of the extent of the reticulated water network, and water flow pathways. For example, this showed that the Caboolture catchment was a supply hub for Pumicestone and Bribie catchments. Accordingly, the Caboolture catchment requires more reticulated water imported from North Pine Dam and the SEQ water grid to accommodate the additional demand from these adjacent catchments.

Once these reticulated water network linkages had been examined, the volume of bulk water produced from North Pine Dam, Lake Kurwongbah and the NPI was distributed throughout the catchments with a reticulated water deficit. Based on current production data, this resulted in an approximate volume of 33 GL/yr being distributed, with some water being exported to Brisbane.

Assumptions:

- As in section 3.2.1.7, the water balance of reticulated water throughout the MBRC region assumes that water exported to Brisbane accounts for 4% (1.3 GL/yr) of total water production from North Pine Dam and Lake Kurwongbah. This figure corresponds to the volume of water remaining once water demand in each catchment is accounted for.

3.2.1.9 Reticulated network leakage

Reticulated network leakage, or non-revenue water, refers to water which leaks out of reticulated water infrastructure. It is sometimes referred to as non-revenue water as the water does not reach the consumer and therefore the consumer cannot be charged for its use.

In the water accounts, this water is assumed to be lost out of the system. Previous studies in the Pine Rivers area have analysed non-revenue water data and determined that average non-revenue water loss is 13% of total water production (MWH, 2009). Therefore, this figure of 13% was added to the water demand figures (which already accounted for system losses) to derive a total water production figure for each catchment. Using this total water production figure, reticulated network leakage was then calculated as 13% of this number.

Assumptions:

- That reticulated network leakage across the entire MBRC region is consistent with previous studies in the Pine Rivers area, which found non-revenue water loss at 13% of total water production; and
- For the purposes of water accounting, it is assumed that all reticulated network leakage is lost out of the system, and does not flow to groundwater or surface waters.

3.2.1.10 Stormwater discharges

Stormwater discharges relate to surface runoff after rainfall events as well as groundwater flow (i.e. baseflow) from both urban and rural land uses in each catchment. In the water accounts, these stormwater discharges are represented by average annual flow volume and associated pollutant loads into receiving waterways at the bottom of each catchment (e.g. the mouth of the Caboolture River).

To quantify stormwater discharges, results of recent catchment modelling studies undertaken for the MBRC region were utilised. This involved the use of a 'Source Catchments' model developed for MBRC (BMT WBM, 2010), which also used a similar catchment delineation (i.e. 14 catchments). This catchment model was calibrated to existing flow and water quality data sourced from the Department of Environment and Resource Management (DERM) gauging stations.

In the catchment model, the modelled stormwater discharges also included wastewater discharges from sewage treatment plants (STPs), although these wastewater discharges were separated out in the water accounts, and are discussed further in section 3.2.1.11.

The volume of water extracted from surface water storages (e.g. North Pine Dam) was also incorporated into the catchment model. Consequently, modelled stormwater discharge is the stormwater runoff after accounting for water harvested from large surface water storages.

Pollutants modelled in the 'Source Catchments' model include total suspended solids (TSS), total nitrogen (TN), and total phosphorus (TP). As inputs into the system, pollutant concentrations for rainfall were sourced from previous studies which found that typical concentrations of TN and TP in rainfall are 0.4 mg/L and 0.006 mg/L respectively (WBM, 2003).

Flows and pollutant loads for each catchment are presented in Table 3-4.

Table 3-4 Stormwater Discharges per Catchment

Catchment	Stormwater Discharges (without STP loads)			
	Flow (GL/yr)	TSS (t/yr)	TN (t/yr)	TP (t/yr)
Bribie Island	14.2	585	13	1.4
Pumicestone Passage	93.4	3,111	73	9.3
Redcliffe	18.3	1,143	19	2.6
Mary River	24.5	797	20	1.6
Caboolture River	145	8,816	136	16.3
Burpengary Creek	33.7	2,415	34	4.5
Hays Inlet	42.9	2,603	42	5.3
Brisbane Coastal	12.6	922	15	2
Byron Creek	1.5	50	1	0.1
Neurum Creek	42.7	1,595	36	3.3
Sideling Creek	13.9	1,195	15	1.8
Lower Pine River	118.6	7,980	109	12.6
Upper Pine River	101.3	4,466	87	8
Stanley River	158.4	5,981	133	12.7

3.2.1.11 Wastewater Discharges

Wastewater generated by each Sewage Treatment Plant within Moreton Bay Regional Council was estimated using data provided by UnityWater. Where available, data recorded during 2009 was used to estimate the current annual wastewater discharged from each STP. Where this data was unavailable, wastewater discharge from each STP was estimated using predicted 2010 EPs (Equivalent Persons) provided by UnityWater and typical wastewater generation assumptions outlined below. A summary of current wastewater discharges for each STP is detailed in Table 3-5.

Table 3-5 Current STP Discharge to Receiving Waters

Catchment	STP	Equivalent Persons (EP)	Discharge (ML/yr)
Stanley	Woodford	2,115	136
Bribie	Bribie Is	21,000	1,975
Caboolture	Burpengary East	43,500	3,563
	South Caboolture	45,000	2,956
Upper Pine	Dayboro	1,438	0
Lower Pine	Murrumba Downs	95,000	7,121
	Brendale	40,000	2,340
Hays	Redcliffe	66,000	5,184
Total Wastewater Discharge			*23,275*

Note: Bribie Island STP discharges to groundwater, establishing a groundwater divide that prevents saltwater intrusion to the waters used for the WTP.

Existing 2009 data on the quality of wastewater effluent discharged from each STP was also used to estimate current pollutant loads discharged to receiving waters (based on wet and dry weather flows). Where no records of existing water quality were available, existing concentrations were based on

design performance standards of the STP. Pollutant loads for Total Nitrogen (TN), Total Phosphorus (TP) and Total Suspended Solids (TSS) were estimated using the following method:

Annual Pollutant Load = Annual Wastewater Discharge x Median Pollutant Concentration

The adopted effluent concentrations for each STP, based on existing data or alternatively design treatment standards (where no data exists) is summarised in Table 3-6, and the resulting pollutant loads discharged by each STP is summarised in Table 3-7.

Table 3-6 Current 2010 Median STP Effluent Concentrations

Catchment	STP	Median Concentration (mg/L)		
		Total Suspended Solids	Total Nitrogen	Total Phosphorus
Stanley	Woodford	2	3.1	0.22
Bribie	Bribie Is	2	1.5	0.18
Caboolture	Burpengary East	2	3.9	0.12
	South Caboolture	2	1.6	0.20
Upper Pine	Dayboro	5	10.6	8.49
Lower Pine	Murrumba Downs	2	3.0	0.50
	Brendale	2	3.8	0.20
Hays	Redcliffe	2	4	0.10

Table 3-7 Current 2010 Pollutant Loads Discharged to Waters (after reuse)

Catchment	STP	Annual Loads (kg/yr)		
		Total Suspended Solids	Total Nitrogen	Total Phosphorus
Stanley	Woodford	271	421	30
Bribie	Bribie Is	3,949	2,962	355
Caboolture	Burpengary East	7,126	13,895	428
	South Caboolture	5,912	4,729	591
Upper Pine	Dayboro	0	0	0
Lower Pine	Murrumba Downs	14,242	21,363	3,561
	Brendale	4,681	8,894	468
Hays	Redcliffe	10,369	20,738	518

In estimating the annual pollutant loads and flows discharged to receiving waters from each STP, reuse of effluent was also accounted for. The quantities of wastewater reused (i.e. recycled water) were based on estimates provided in the project brief and are discussed further in Section 3.2.1.12.

It should be noted that although wastewater will be generated in each catchment, for the purposes of establishing the current water balance and quantifying pollutant loads to receiving waters in each catchment, wastewater has been accounted for in the particular catchment that effluent is discharged within. Where more than one STP exists in a catchment, the sum of the flows and pollutant loads for each STP has been calculated for that catchment (i.e. Caboolture South and Burpengary East STPs

both discharge to the Caboolture River in the Caboolture River Catchment, therefore the existing catchment account for Caboolture reflects flows and pollutant loads for both STPs.)

Assumptions:

- Wastewater generation: Average Dry Weather Flow (ADWF) = 187 L/EP/day; and wastewater discharge = 1.2 x ADWF;
- South Caboolture effluent discharge concentrations based on combined effluent from STP and Advanced Water Treatment Plant;
- Wet weather overflows are not accounted for due to their highly variable nature and the difficulty in accurately quantifying such flows and pollutant loads. However wet weather pollutant loads, while locally significant, are not expected to significantly affect catchment pollutant loads, as they make up a small proportion of total STP flows/pollutant loads; and
- Although Household Sewage Treatment Plants (HSTPs) and septic systems may have significant localised impacts, pollutant loads are estimated to constitute a small proportion of total catchment pollutant loads. Calculations demonstrating this are detailed in Appendix E. Although estimates have been undertaken to quantify these pollutant loads, they are considered conservative and have not been included in the catchment accounts due to the difficulty in accurately estimating pollutants discharged to receiving waters.

3.2.1.12 Recycled water

Volumes of recycled water (i.e. reused wastewater) currently used at each STP have been accounted for in each catchment based on estimated quantities provided in the project brief. These reuse figures are presented in Table 3-8 below.

Pollutant loads have been estimated assuming the concentrations in Table 3-8 applied to the volumes of recycled water used. As per wastewater discharges, the water account for flow volumes and pollutant loads of recycled water have been assigned to those catchments that the STP would normally discharge to. Recycled water flows and pollutant loads have been subtracted from STP discharges to waterways as previously discussed (refer Section 3.2.1.11).

Table 3-8 Current 2010 Recycled Water Use

Catchment	STP	Recycled Water Use (ML/yr)
Stanley	Woodford	0
Bribie	Bribie Is	0
Caboolture	Burpengary East	0
	South Caboolture	730
Upper Pine	Dayboro	88
Lower Pine	Murrumba Downs	1,755
	Brendale	350
Hays	Redcliffe	108
Total Current Recycled Water Use		*3,031*

Assumptions:

- Recycled water use based on quantities provided by Council / UnityWater;
- AWTP reuse from Murrumba Downs includes 3 ML/day (1,095 ML/yr) reuse to supply AMCOR (current AWTP capacity 4 ML/day), plus an additional 1.8 ML/day (660 ML/yr) used for irrigating golf courses;
- No discharge of effluent to surface waterways from Dayboro STP (100% land irrigation); and
- Approximately 108 ML/yr recycled water from Redcliffe STP used for irrigating golf course.

3.2.2 Catchment Constraints

In the water accounting process, various constraints in the management of the water cycle in each catchment were identified. These include:

- *Storage yields* – the annual yield of surface water and groundwater storages in each catchment, which places an upper limit on the volume of water available for potable water supply;
- *Water treatment plant capacity* – the ability of infrastructure to treat and distribute potable water from storages, which also places an upper limit on potable water supply in each catchment;
- *Environmental flow targets* – one component of these targets sets minimum average annual flow volumes for a number of major waterways in the MBRC region which potentially limits the volume of water that can be extracted from these waterways;
- *Sustainable loads* – these targets limit the pollutant loads that can sustainably be discharged into receiving waters while meeting water quality objectives; and
- *Sewage treatment plant (STP) capacity* – the design and licence capacities of STPs place a limit on the discharges from STPs, and consequently limits the population able to be serviced by each STP.

3.2.2.1 Storage yield

While assessments have been undertaken which quantify annual yields from water supply storages (refer to the SEQ Regional Water Security Program - DNRM&E, 2006), to date there is no information available in regard to their *sustainable* yields. Determination of sustainable yields would require issues such as environmental flow objectives and conjunctive use arrangements to be taken into account. The SEQ Water Strategy (QWC, 2010) indicates that the sustainable yield of the Brisbane groundwater aquifers, including Bribie Island and Dayboro borefields, are currently being determined.

It should be noted that potable water on Bribie Island is currently sourced from the northern groundwater aquifer. Information sourced from the SEQ Grid Manager indicates that a sustainable yield of 1.6 GL/yr has been estimated for this aquifer, with water being treated by the Banksia Beach WTP. A southern aquifer exists, however the WTP associated with this aquifer (Woorim WTP) is not currently operational. If both borefields were operational, Bribie Island would be a net exporter of potable water. However, due to the Woorim WTP being shut down, Bribie Island currently requires additional water imported from the Caboolture catchment.

yields were based on water allocation figures included in Resource Operations Plans and presented in the SEQ Water Strategy (QWC, 2010). These figures were also confirmed by the SEQ Water Grid Manager.

Storage yields for surface water and groundwater storages in the MBRC are presented in Table 3-9.

Table 3-9 Annual Storage Yields

Storages	Annual Storage Yield (GL/yr)
North Pine Dam	59
Lake Kurwongbah	7
Woodford Weir	1.1
Caboolture Weir	3.6
Bribie Island Borefield	1.6
Dayboro Borefield	0.25

Assumptions:

- Annual storage yields are assumed to be the same as the water allocation figures (i.e. volumetric water entitlement) included in the SEQ Water Strategy (QWC, 2010); and
- The Bribie Island annual storage yield is based on a sustainable yield from Banksia Beach Borefields of 1,576 ML/annum.

3.2.2.2 Water Treatment Plant Capacity

Water treatment plant (WTP) capacity figures were derived from a number of sources, including SEQWater, Unitywater, and the SEQ Water Grid Manager, and are presented in Table 3-10.

Table 3-10 Water Treatment Plant Capacities

Water Treatment Plant	WTP Capacity (GL/yr)
North Pine treatment plant (North Pine Dam)	91.3
Petrie treatment plant (Lake Kurwongbah)	16.4
Caboolture treatment plant (Caboolture Weir)	5.22
Woodford treatment plant (Woodford Weir)	1.46
Dayboro treatment plant (Dayboro borefields)	0.40
Banksia Beach treatment plant (Bribie Island borefields)	1.31

It should be noted that the WTP capacity is a nominal capacity. Treatment plant capacity at any given time is dependent on a number of factors, such as raw water quality, scheduled maintenance and SEQWater rostering.

Assumptions:

- That WTP capacity is constant throughout the year, at the nominal capacity rate.

3.2.2.3 Environmental Flows

Environmental flow objectives are set in the *Water Resource (Moreton) Plan 2007*. While these objectives are expressed as low flow, medium and high flow objectives, for the purposes of water

accounting the mean annual flow objectives were used. These objectives are expressed as a percentage of the mean annual flow for the pre-development flow volume. Pre-development flows are defined as flows modelled as if there were no dams or other water infrastructure, and no water was extracted under water authorisations. Mean annual flow must be *at least* the following percentage of pre-development flow at the following specified nodes:

- Caboolture River at river mouth – 84% of pre-development flows;
- Stanley River at Woodford Weir – 95% of pre-development flows;
- Pumicestone Passage at end of system – 96% of pre-development flows;
- Pine River at mouth – 66% of pre-development flows; and
- South Pine River at confluence with North Pine River – 81% of pre-development flows.

Pre-development flows are typically quantified using DERM's Integrated Quantity and Quality Modelling (IQQM) computer program. However, for the purpose of water accounting, pre-development flows were estimated using the Model for Urban Stormwater Improvement Conceptualisation (MUSIC).

By using the mean annual environmental flow objectives and the estimated pre-development flows, an environmental flow constraint was identified in each relevant catchment. Peak flow environmental flow targets were not considered in this phase of the study, however they play an important role in the management of waterway health and should be investigated further as part of phase 2 (detailed planning).

Environmental flows and modelled pre-development and stormwater flows are discussed further in section 4.3 and presented in Table 4-4.

Assumptions:

- In determining pre-development flows using MUSIC, catchment areas were modelled using forested nodes, which assumes that pre-development not only relates to no water infrastructure in place, but also no urban development in the catchment; and
- Environmental flow objectives have been based on mean annual environmental flow targets. While it is noted that low flow and high flow objectives have been set and are important to quantify, it was beyond the scope of this phase of the study to determine these objectives.

3.2.2.4 Sustainable Loads

Review of existing information indicates that limited studies have been undertaken to date to quantify sustainable loads for receiving waters. Current estimates of sustainable loads in the catchment are detailed in Table 3-11.

Table 3-11 Sustainable Load Estimates

Receiving Waters	Sustainable Load Estimate (t/yr)		
	Total Suspended Solids	Total Nitrogen	Total Phosphorus
Caboolture River Estuary [1]	-	27	-
Pine River Estuary [2]	6060 t/yr	135	18.3

[1] Source DERM (1998) [2] Source BMT WBM (2008)

The sustainable load target of 75 kg/day (27 t/yr) is believed to have been set in 1998 by DERM, however the original source of this study cannot be located. Therefore the reliability and assumptions around this figure cannot be appropriately assessed. It is noted that a receiving water quality model (RWQM) exists for the Caboolture River Estuary that was previously used to investigate management strategies targeting point sources (BMT WBM, 2007). Although scenarios investigated in this study did not meet water quality objectives (and hence sustainable loads), this model can be used as a basis to quantify sustainable load targets for the Caboolture River Estuary in the next stage of this study (detailed planning phase).

The sustainable load estimates for the Pine River Estuary (BMT WBM, 2008) are based on pollutant load modelling from an area approximating the Upper Pine, Lower Pine, Sideling Creek and Hays Inlet catchments in the current study. In order to estimate the sustainable load targets for each catchment separately, the sustainable load estimate for the Pine River Estuary has been proportioned among the catchments based on the total land area. The resulting sustainable load targets for these catchments using this methodology are summarised in Table 3-12. It should be noted that these targets are indicative only, and further investigation to verify sustainable load targets will be required in the detailed planning phase (Phase 2) of this study.

Table 3-12 Sustainable Load Target Estimates for Catchments Draining to Pine River Estuary

Catchment	Area (ha)	% of Study Area[1]	Approximate Sustainable Load Target (t/yr)		
			TSS	TN	TP
Upper Pine	34,890	46%	2781	62	8.4
Lower Pine	28,280	37%	2254	50	6.8
Sideling	5,267	7%	420	9	1.3
Hays	7,599	10%	606	13	1.8
Total	*76,036*	*100%*	*6060*	*135*	*18.3*

[1] Refers to the approximate proportion of catchment area modelled in the sustainable loads study for the Pine River Estuary (BMT WBM, 2008). This has been used to estimate the proportion of sustainable loads from each catchment.

3.2.2.5 STP Design Capacity

The current design capacity for each STP (in Equivalent Persons (EP)) has been sourced from information provided by UnityWater. The design capacity indicates the current treatment capacity of

the plant, which may not be the same as the STP's licenced capacity. The Design capacity is an important constraint to consider as it can be used to give an indication of the likely timing and extent of works (and hence expenditure) required for STP infrastructure upgrades to accommodate future population growth.

The existing design capacity of each STP is summarised in Table 3-13.

Table 3-13 Current Sewage Treatment Plant (STP) Design Capacity

Catchment	STP	Design Capacity (EP)
Stanley	Woodford	2,000
Bribie	Bribie Is	38,000
Caboolture	Burpengary East	49,500
	South Caboolture	40,000
Upper Pine	Dayboro	2,000
Lower Pine	Murrumba Downs	150,000
	Brendale	40,000
Hays	Redcliffe	70,000

Assumptions:

- For Bribie Island STP, the design EP has been estimated using information on the design treatment flow, and using wastewater generation assumptions (as detailed below); and
- Wastewater generation: ADWF = 187 L/EP/day; and wastewater discharge = 1.2 x ADWF.

3.2.2.6 STP Licence Capacity

The current licence capacity for STPs within Moreton Bay Regional Council is summarised in Table 3-14. The existing licence capacity is important as new development approvals will be required for works that require STPs to upgrade above the licenced capacity. Due to anticipated stringent future environmental requirements, these upgrades may be cost prohibitive.

All STP licences, apart from Murrumba Downs, are licenced based around Equivalent Persons. Murrumba Downs, however, has licence conditions based on pollutant loads. Therefore the licence conditions for Murrumba Downs has been summarised separately in Table 3-15.

Table 3-14 Sewage Treatment Plant (STP) Licence Capacity

Catchment	STP	Licence Capacity (EP)
Stanley	Woodford	<4,000
Bribie	Bribie Is	<50,000
Caboolture	Burpengary East	<50,000
	South Caboolture	<100,000
Upper Pine	Dayboro	<1,500
Lower Pine	Murrumba Downs	>100,000
	Brendale	<50,000
Hays	Redcliffe	<100,000

Table 3-15 Licence STP Pollutant Loads Limits

STP	Annual Licence Limits (based on ADWF)		
	Discharge (ML/yr)	TP (kg/yr)	TN (kg/yr)
Murrumba Downs	11,907	8,470	29,000[1] 21,175[2]
South Caboolture[3]		5,004	25,020

[1] Current target licence conditions
[2] Target licence conditions from 2013
[3] Conditions in negotiation with DERM, and are yet to be licenced

Future STP licences issued by DERM are anticipated to be based around annual load limits in addition to volumetric discharges. It is noted that Unitywater is currently considering an offer by DERM to convert the STP licence for South Caboolture to a load limit approach as well. The current DERM offer is included in Table 3-15, however it should be noted that these conditions have not yet been licenced.

Copies of the licences for each STP are included in Appendix A.

3.3 Future Accounts

This section presents the methodology used to develop the future water accounts. These future water accounts represent a 2031 future scenario and were developed assuming that development and water cycle management practices would follow a 'business as usual' (i.e. current practices) path. This allowed water cycle issues to be identified (refer to Section 4) and management options to be developed (refer to Section 5).

The water accounting elements for the future accounts are the same as the current accounts (Section 3.2), and the methodology used to quantify most of these elements is also the same. The elements which differ from the current account are those that are impacted by increased development as a result of population growth (e.g. wastewater discharges, water demand, etc). Other elements, such as rainfall and evapotranspiration, are assumed to be consistent with current accounts.

The future water accounts also included assessment of potential growth associated with the Caboolture Identified Growth Area (CIGA) in the Caboolture catchment. Therefore, to accommodate this option, the future water accounts contain the 'Caboolture catchment' and the 'Caboolture catchment with CIGA'.

3.3.1 Future Water Accounting Methodology

The following sections outline the methodology used to develop the future accounts (i.e. 2031).

3.3.1.1 Rainfall

Average annual rainfall volumes in 2031 were assumed to be the same as current accounts. Although climate change predictions suggest that rainfall may be impacted by 2031, with the

uncertainty of the predictions it was assumed that rainfall volumes would remain relatively unchanged.

Assumptions:

- Annual rainfall volumes in 2031 remain similar to current accounts, which are based on average annual rainfall for the 29 years preceding 2010.

3.3.1.2 Evapotranspiration

Water lost out of the system due to evapotranspiration was assumed to remain unchanged from current accounts. As with rainfall, climate change may potentially impact on potential evapotranspiration rates, however with no firm data to base it on it was decided that evapotranspiration would remain unchanged in the future accounts.

Assumptions:

- Annual average evapotranspiration rates in 2031 remain similar to current accounts.

3.3.1.3 Groundwater Drainage Loss

Groundwater drainage loss remained unchanged from current accounts due to it being a function of rainfall which remains the same.

Assumptions:

- Groundwater drainage loss remaining constant though to 2031 assumes that increased development in some catchments would not impact to any significant level on groundwater drainage loss. While this may not be the case, due to increased impervious areas, for the water accounting exercise it was considered appropriate to simplify this element by making this assumption.

3.3.1.4 Rural Extractions

Volume of water extracted for rural applications was assumed to remain unchanged in 2031. This is due to the rural land use remaining relatively unchanged, hence the volume of rural water extractions remaining constant.

Assumptions:

- Rural management practices, including irrigation rates, remain unchanged from current levels; and
- In line with the 'business as usual' approach to future water accounting, no rural water is supplemented by other sources such as recycled water.

3.3.1.5 Reticulated Water Yield

For future accounts, reticulated water yield remained consistent with current accounts for the most part. This assumed that surface and groundwater storages remained the same, while water imported into the MBRC region via the NPI also remained the same as current accounts.

The only varying factors in the reticulated water yield calculations were rainwater tanks and recycled water use at Murrumba Downs. Future recycled water use from Murrumba Downs STP was assumed to increase to 8 ML/day as per required licenced reuse conditions.

Due to an increase in urban development as part of the future scenario, rainwater tank yields increased based on an increased population and using the following assumptions:

- 55% uptake of rainwater tanks by 2031, which includes existing dwellings plus all new dwellings as per requirements in the building code;
- 50% of tanks are plumbed internally, while 50% are only used for outdoor gardening requirements; and
- All other rainwater tank assumptions, such as reticulated water savings, remained the same as current accounts.

Table 3-16 presents the estimated rainwater tank yields for existing scenario (2010) and future scenario (2031) based on the assumptions used.

Table 3-16 Current and Future Estimated Rainwater Tank Yields

Catchment	Rainwater Tank Yield (GL/yr)	
	2010	2031
Bribie Island	0.06	0.23
Pumicestone Passage	0.04	0.13
Redcliffe	0.17	0.78
Mary River	0	0.00
Caboolture River	0.25	1.20
Burpengary Creek	0.15	0.69
Hays Inlet	0.22	1.19
Brisbane Coastal	0.08	0.26
Byron Creek	0	0.00
Neurum Creek	0	0.00
Sideling Creek	0	0.03
Lower Pine River	0.32	1.42
Upper Pine River	0.01	0.03
Stanley River	0.01	0.09
Total	**1.32**	**6.05**

Assumptions:

- That climate change does not significantly impact on storage yields. Although it has been suggested that storage yields will decrease by 10%, with no definitive data it was deemed appropriate to keep the storage yields consistent with current accounts. At any rate, the future water accounts indicate that reducing surface water yields by 10% does not impact on the ability to meet future water demand (refer to section 4.2 for further details); and
- Recycled water usage remains constant apart from Murrumba Downs (8 ML/day reuse as per licence conditions) which is consistent with the 'business as usual' approach.

3.3.1.6 Reticulated Water Demand

Reticulated water demand for future accounts was calculated in a similar manner as current accounts, i.e. by using a GIS demand model developed by Unitywater. This model provides an estimation of the population in equivalent persons (EP) allocated to each lot in the MBRC region in 2031.

Using the modelled future population estimates derived from the GIS demand model, water demand was calculated using a water usage figure of 285 L/EP/day, consistent with current accounts. Existing and future water demand is discussed further in section 4.2 and modelled water demand figures for each catchment are presented in Table 4-2.

Assumptions:

- Water use per EP, assumed to be 285 L/EP/day, remains constant through to 2031.This assumes that water restrictions and water conservation measures remain the same and do not affect average water usage in the future.

3.3.1.7 Exported reticulated water

The methodology used to calculate exported reticulated water for future accounts was similar to that used in the current accounts. The volume of exported water changed in response to increasing water demand in each catchment.

Assumptions:

- This assumes that water exported to Brisbane remains the same as current accounts, i.e. 4% (1.3 GL/yr) of total water production from North Pine Dam and Lake Kurwongbah. While Brisbane will no doubt require more water due to increased population, it is assumed that reticulated water there will be sourced internally or from other areas of the SEQ water grid.

3.3.1.8 Imported reticulated water

The methodology used to calculate imported reticulated water for future accounts was similar to that used in the current accounts. The volume of imported water changed in response to increasing water demand in each catchment.

Assumptions:

- The increased volume of imported reticulated water assumes that trunk infrastructure has the required capacity to cope with the additional volume;
- It is assumed that imported water from the Sunshine Coast via the NPI remains constant. While there is extra capacity in this pipeline, it is assumed that growth in the Sunshine Coast region would utilise this extra capacity; and
- It is assumed that all additional reticulated water required in the future accounts was sourced from North Pine Dam and Lake Kurwongbah.

3.3.1.9 Reticulated network leakage

Reticulated network leakage was consistent with the methodology used in the current accounts, i.e. derived by calculating 13% of the total water production in each catchment.

Assumptions:

- As reticulated network leakage in future accounts is consistent with current accounts, it is assumed that network infrastructure is neither improved nor deteriorates, but is maintained at a current state.

3.3.1.10 Stormwater discharges

Stormwater discharges for future accounts were quantified with the use of a Source Catchments model. This model, developed for MBRC and utilised in the current accounts, was used to determine stormwater flows and pollutant loads based on a 2031 future land use.

The modelled stormwater discharges also included a predicted increase in wastewater discharges from sewage treatment plants (STPs) in 2031 (assuming a 'business as usual' approach). Similar to current accounts, these wastewater discharges were separated out in the water accounts.

Table 3-17 presents the modelled stormwater discharges for the future scenario (2031).

Table 3-17 Future (2031) Modelled Stormwater Discharges per Catchment

Catchment	Stormwater Discharges (without STP loads)			
	Flow (GL/yr)	TSS (t/yr)	TN (t/yr)	TP (t/yr)
Bribie Island	15	725	15	1.7
Pumicestone Passage	95.7	3,557	79	10.4
Redcliffe	19.1	1,344	21	3.1
Mary River	24.5	797	20	1.6
Caboolture River	155.7	10,684	167	21.9
Caboolture with CIGA	169.7	12,382	199	27.2
Burpengary Creek	36.3	2,832	43	6.3
Hays Inlet	50.3	4,021	60	9
Brisbane Coastal	12.8	956	15	2.1
Byron Creek	1.5	50	1	0.1
Neurum Creek	42.7	1,595	36	3.3
Sideling Creek	14	1,215	16	1.9
Lower Pine River	127.5	9,625	132	17.4
Upper Pine River	101.2	4,477	86	7
Stanley River	158.9	6,118	135	13.2

Assumptions:

- Note stormwater modelling did not include 80% / 60% / 45% pollutant load removal for TSS, TN and TP respectively for future development.

3.3.1.11 Wastewater discharges

Future (2031) wastewater generated by each STP within Moreton Bay Regional Council was estimated using future EP predictions provided by UnityWater's demand model. Assumptions on typical wastewater generated by each EP are outlined below (refer assumptions). A summary of predicted future 2031 wastewater discharges (and EP) calculated for each STP using the below assumptions is detailed in Table 3-18. Table 3-18 includes a scenario for the Caboolture Catchment that includes the Caboolture Identified Growth Area (CIGA).

Table 3-18 Predicted Future (2031) STP Discharge to Receiving Waters

Catchment	STP	EP	Discharge (ML/yr)
Stanley	Woodford	4,373	358
Bribie	Bribie Is	36,361	2,978
Caboolture	Burpengary East	77,410	6,340
	South Caboolture	94,034	6,972
	South Caboolture (includes CIGA)	154,034	11,886
Upper Pine	Dayboro	2,157	0
Lower Pine	Murrumba Downs	181,023	11,907
	Brendale	73,000	5,629
Hays	Redcliffe	84,080	6,779

Notes:
Bribie Island STP discharges to groundwater, establishing a groundwater divide that prevents saltwater intrusion to the waters used for the WTP.
Discharge does not include wastewater that is reused (recycled water)
CIGA – Caboolture Identified Growth Area

Future predicted design treatment performance of STPs (incorporating upgrades in some instances) and existing data on the quality of wastewater effluent (as per existing scenario) were used to estimate future pollutant loads discharged to receiving waters. Pollutant loads for Total Nitrogen (TN), Total Phosphorus (TP) and Total Suspended Solids (TSS) were estimated using the following method:

Annual Pollutant Load = Annual Wastewater Discharge x Median Pollutant Concentration

The adopted effluent concentrations for each STP is summarised in Table 3-19, and the resulting pollutant loads discharged by each STP is summarised in Table 3-20.

Table 3-19 Predicted Future (2031) Median STP Effluent Concentrations

Catchment	STP	Median Concentration (mg/L)		
		Total Suspended Solids	Total Nitrogen	Total Phosphorus
Stanley	Woodford	2	5.0	1.00
Bribie	Bribie Is	2	1.5	1.00
Caboolture	Burpengary East	2	3.0	0.30
	South Caboolture	2	2.5	0.30
Upper Pine	Dayboro	5	10.6	8.49
Lower Pine	Murrumba Downs	2	3.0	0.50
	Brendale[1]	2	2.5	0.50
Hays	Redcliffe	2	5	0.1

[1] Assumes plant upgrade

Table 3-20 Predicted 2031 Annual Pollutant Loads Discharged to Waters (after reuse)

Catchment	STP	Annual Loads (kg/yr)		
		Total Suspended Solids	Total Nitrogen	Total Phosphorus
Stanley	Woodford	716	1,791	358
Bribie	Bribie Is	5,956	4,467	2,978
Caboolture	Burpengary East	12,681	19,021	1,902
	South Caboolture	13,944	17,430	2,092
	South Caboolture (Includes CIGA)	23,773	29,716	3,566
Upper Pine	Dayboro	0	0	0
Lower Pine	Murrumba Downs	23,814	35,721	5,953
	Brendale	11,258	14,073	2,815
Hays	Redcliffe	13,557	33,893	678

In estimating the annual pollutant loads and flows discharged to receiving waters from each STP, reuse of effluent was also accounted for. The quantities of wastewater reused (i.e. recycled water) were based on estimates provided in the project brief and are discussed further in Section 3.3.1.12.

It should be noted that although wastewater will be generated in each catchment, for the purposes of establishing the future water accounts and quantifying pollutant loads to receiving waters in each catchment, wastewater has been accounted for in the particular catchment that effluent is discharged within. Where more than one STP exists in a catchment, the sum of the flows and pollutant loads for each STP has been calculated for that catchment.

Assumptions:

- Wastewater generation: ADWF = 187 L/EP/day; and wastewater discharge = 1.2 x ADWF;

- Zero discharge to surface waters at Dayboro STP. Existing wet weather storage dam and irrigation areas have spare capacity to service current headworks area growth;
- Brendale STP loads assume expansion outside of headworks area and includes CSR land, Strathpine Transport Oriented Development (TOD) and Albany Creek Redevelopment;
- Effluent concentrations are based on future treatment design standards where available (likely to be conservative) or existing performance data;
- Wet weather overflows are not accounted for due to their highly variable nature and the difficulty in accurately quantifying such flows and pollutant loads. However wet weather pollutant loads, while locally significant, are not expected to significantly affect catchment pollutant loads, as they make up a small proportion of total STP flows/pollutant loads; and
- Although Household Sewage Treatment Plants (HSTPs) and septic systems may have significant localised impacts, pollutant loads are estimated to constitute a small proportion of total catchment pollutant loads. Calculations demonstrating this are detailed in Appendix E. Although estimates have been undertaken to quantify these pollutant loads, they have not been included in the catchment accounts due to the difficulty in accurately estimating pollutants discharged to receiving waters.

3.3.1.12 Recycled water

Volumes of future recycled water (i.e. reused wastewater) used at each STP have generally been assumed to remain the same as existing quantities. The exception to this is Dayboro and Murrumba Downs, where increased reuse has been assumed to satisfy licence conditions.

Pollutant loads have been estimated assuming the concentrations in Table 3-19 applied to the volumes of recycled water used. As per wastewater discharges, the water account for flow volumes and pollutant loads of recycled water have been assigned to those catchments that the STP would normally discharge to. Recycled water flows and pollutant loads have been subtracted from STP discharges to waterways as previously discussed (refer Section 3.2.1.11).

Table 3-21 Future (2031) Recycled Water Use

Catchment	STP	Recycled Water Use (ML/yr)
Stanley	Woodford	0
Bribie	Bribie Is	0
Caboolture	Burpengary East	0
	South Caboolture	730
Upper Pine	Dayboro	177
Lower Pine	Murrumba Downs	2,920
	Brendale	350
Hays	Redcliffe	108
Total Current Recycled Water Use		*1,936*

Assumptions:

- Future recycled water use assumed to be the same as existing (based on quantities provided by Council / UnityWater) apart from Dayboro, which is assumed to irrigate 100% of effluent;
- 8 ML/day recycled water use from Murrumba Downs to meet licence conditions (Water 19 & Water 20, refer to Appendix A);
- No discharge of effluent to surface waterways from Dayboro STP (100% land irrigation to meet licence conditions); and
- Approximately 296 kL/day recycled water from Redcliffe STP used for irrigating golf course.

3.3.2 Future Catchment Constraints

Catchment constraints in the future accounts are consistent with current accounts. This assumes that the following catchments constraints remain unchanged:

- Storage yields;
- Water treatment plant capacities;
- Sewage treatment plant capacities;
- Environmental flow targets; and
- Sustainable load targets.

3.4 Data Gaps

During the water accounting process, a number of data gaps were identified which impacted on the ability to accurately identify and quantify some water cycle issues in the catchments. Ideally, during detailed planning (Phase 2) of the TWCM planning process, these data gaps will need to be addressed in order to effectively assess recommended solution sets. These data gaps are discussed briefly in the following sections.

3.4.1 Sustainable Load Targets

Sustainable loads can be defined as the pollutant loads generated by a catchment (i.e. nutrients and sediment) that a waterway can assimilate while maintaining good ecosystem health. It is important to quantify sustainable load targets for catchments so that appropriate catchment management strategies can be identified and assessed using these targets.

As identified in Section 3.2.2.4, limited information currently exists to reliably quantify sustainable load targets for the catchments delineated within MBRC. Sustainable load targets derived from existing studies are outlined in Table 3-11and Table 3-12. As noted previously, the sustainable load estimates used for the current investigation are indicative only, and it is recognised that further modelling and assessment is required to more accurately quantify sustainable pollutant loads.

Review of available information has indicated that receiving water quality models have been developed for receiving estuaries and bays within the study region. These models, however, would ideally need to be recalibrated to include wet weather events, and remodelled to specifically quantify the sustainable pollutant loads generated from each contributing subcatchment. This would then be used to assist in targeting management strategies at a catchment level.

Furthermore, it is noted that the existing receiving water quality models do not extend to freshwater reaches of the catchments (hence sustainable loads in freshwater reaches have not been estimated in the current study). Significant resources would be required to develop receiving water quality models in freshwater reaches of the catchment to identify sustainable load targets in these waters.

3.4.2 Environmental Flows

While environmental flow targets have been set in the *Water Resource (Moreton) Plan 2007,* most of these targets are set at the end of systems (i.e. river mouths) and are modelled flows. To better understand and assess environmental flows in the major waterways in the MBRC region, it would be beneficial to set additional targets higher up in the catchments. This would enable flow monitoring data to be collected using flow gauging equipment, providing actual flow data as opposed to modelled flow data.

Environmental flow analysis studies which assessed the flow regime required in each waterway in order to maintain ecological health would also be beneficial.

With little in the way of environmental flow criteria, for the water accounting process undertaken in this study, environmental flows were crudely assessed using MUSIC to determine pre-developed flows in each relevant catchment. This was then compared to modelled catchment flows from a 'Source Catchments' model. While this provided some sort of preliminary indication as to where each

waterway was in terms of meeting environmental flow targets at the end of systems, further studies and environmental flow data would provide a better indication of the health of waterways in the MBRC region currently and in the future.

3.4.3 Flood Studies

During the current investigation, there was limited information readily available to identify existing / future flooding pressures within the catchments. Therefore, in order to identify where flooding issues may occur, it was decided that catchments with large areas of urban development were more likely to have potential flooding issues.

However, it should be noted that while TWCM Planning can be beneficial for flooding it may not resolve broader issues of floodplain management. To address this, MBRC is developing a Floodplain Management Plan in parallel with the TWCM Plan. This will be a companion document to the TWCM Plan, and will include:

- Estimates of damage associated with flooding in the Moreton Bay region, based on Regional Floodplain Database, Storm Tide Hazard Study and other investigations;
- Condition of the existing infrastructure and determination of future infrastructure needs in order to manage flooding and to inform capital works program;
- Other non-structural measures such as planning controls; and
- Evacuation plans for high risk areas including vulnerable communities, and at-risk infrastructure such as hospitals, schools, aged care facilities, etc.

It is envisaged that Phase 2 of the TWCM Plan (detailed planning phase) should be undertaken in close consultation with the Floodplain Management Plan study to identify any opportunities to integrate solutions as part of a total water cycle management approach. For example, opportunities to investigate stormwater harvesting where there are flooding issues, or implement WSUD /water quality treatment measures where inundated land may need to be reclaimed.

3.4.4 Water Sensitive Urban Design

Water sensitive urban design (WSUD) devices were not accounted for in the water accounts due to a lack of existing information on these devices. While MBRC has mapping data with the location and type of some WSUD devices in the region, further information was not readily accessible in regard to attributes such as size of device, upstream catchment area, and other design details.

Therefore, impacts of existing WSUD devices on water quality were not considered in the water accounts. Nevertheless, when compared to the magnitude of other elements in the water accounts (e.g. stormwater discharges), the impact of WSUD could be considered negligible due to the limited number of WSUD devices in the MBRC region at present.

3.4.5 Water / Wastewater Network Capacity

The capacity of wastewater and reticulated water trunk infrastructure was not considered in the water accounting process. While it is assumed that this data exists, the complexity of assessing the capacity of these networks was beyond the scope of work for this phase of the TWCM planning

process. The detailed planning phase will require a thorough assessment of network capacity to determine whether certain solutions are feasible and whether upgrades are required.

Therefore, for the preliminary assessment of issues in the future water accounts, a major assumption made was that wastewater and reticulated water infrastructure could cope with the additional volumes resulting from population growth.

3.5 Water Account Figures

Figures representing existing and future water cycle accounts developed using the above methodology are included in Appendix C (existing water accounts) and Appendix D (future water accounts).

4 KEY WATER CYCLE MANAGEMENT ISSUES

Once the current and future water accounts were developed, this enabled the identification of relevant water cycle management issues which may potentially be experienced in the future (2031) in each catchment. These issues relate back to some of the drivers for the TWCM process in the MBRC region (refer to section 2), and the following sections outline the key issues in each catchment and the process by which they were identified.

4.1 Population Growth Issues

Population growth predictions were derived from the GIS demand model (Unitywater, 2009 and 2010), which includes the population within reticulated water network catchments. Hence, these population growth estimates predominantly relate to the urban population as rural areas are generally not connected to the reticulated water network. Nevertheless, in line with the SEQ Regional Plan 2009-2031 (DIP, 2009b), most of the population growth is planned to be within a defined urban footprint, so the urban population growth predictions developed using the GIS demand model compare well to population growth predictions developed by the Planning Information and Forecasting Unit (PIFU) for the MBRC region. This is demonstrated in Table 4-1, which includes the population predictions for 2031 from the GIS demand model along with those from PIFU. This shows that the GIS demand model predictions lie somewhere between the medium and high growth scenario PIFU predictions.

Table 4-1 2031 Population Predictions

PIFU Medium Growth Scenario	GIS Demand Model	PIFU High Growth Scenario
523,037	566,642	585,895

In determining whether population growth was an issue in each catchment, the urban population growth predictions were used as an initial indicator. In catchments where the urban population was expected to increase by more than 20,000 people, population growth was flagged as an issue in that catchment.

Additionally, if a catchment's predicted growth was below 20,000 people but the percentage increase was greater than 100% (i.e. doubling of population), then population growth was flagged as an issue. The only catchment where this was relevant was the Stanley catchment, which includes the towns of Woodford and D'Aguilar. This doubling of population in these towns would place significant pressures on water cycle management, therefore by flagging this catchment as having a population growth issue, solutions could be developed and assessed.

During solution assessment workshops (refer to section 5), it was decided that Pumicestone catchment, despite not meeting the above criteria, should also be flagged as potentially having a population growth issue. This is due to a proposed large industrial development planned for the catchment which may place pressures on water cycle management.

Figure 4-1 provides an indication of population numbers in each catchment for 2010, 2031, and the increase in population. Rural catchments - such as Mary River, Neurum Creek, and Byron Creek –

are not included as they contain limited urban population and the rural population is not expected to increase by any significant extent.

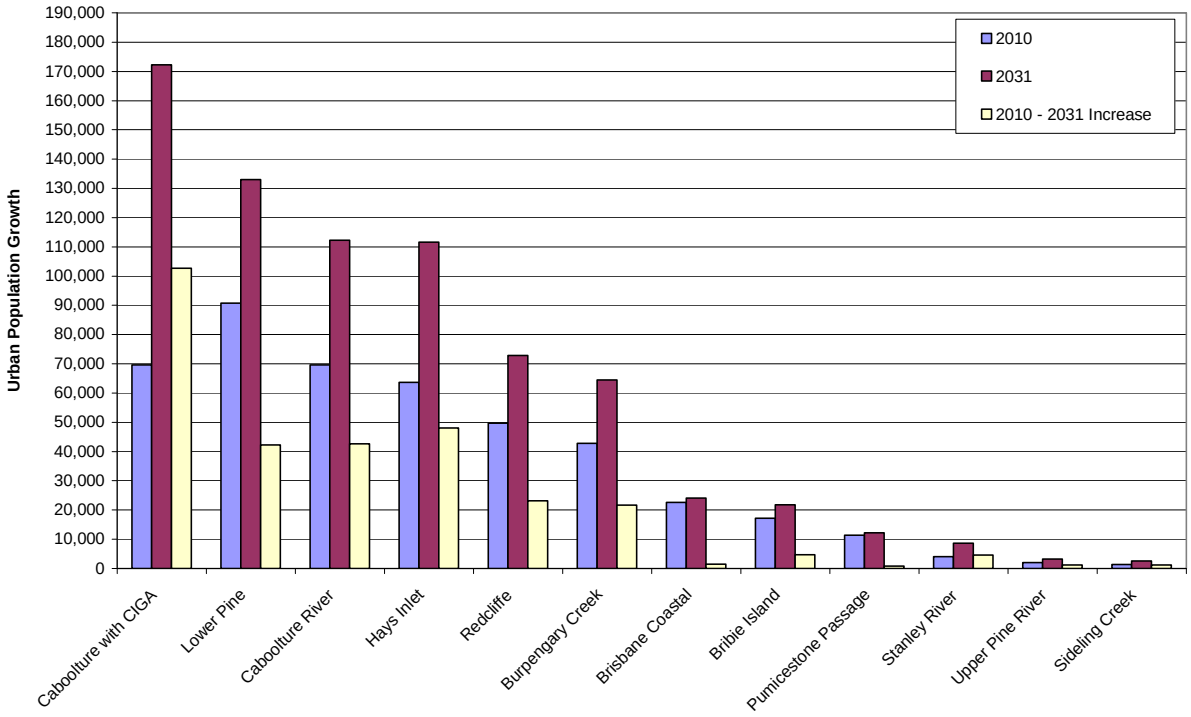


Figure 4-1 Urban Population Growth per Catchment

Therefore, using the above rationale, the following catchments were flagged as having population growth issues:

- Caboolture
- Lower Pine
- Burpengary
- Hays Inlet
- Redcliffe
- Stanley
- Pumicestone

4.2 Water Supply Issues

Water supply was considered an issue in catchments if future reticulated water demand could not be met by existing water supplies. Through the water accounting process it was discovered that, even though water demand significantly increases in the region, there is sufficient capacity in the existing storages to accommodate this increase in demand.

To illustrate this, Table 4-2 provides a summary of reticulated water demand per catchment in 2010 and in 2031, based on GIS demand model results. This indicates that current demand is approximately 47 GL/yr, and in 2031 this demand will be approximately 83 GL/yr (including CIGA) – an increase of 36 GL/yr.

Table 4-2 Modelled Existing and Future Water Demand per Catchment

Catchment	Reticulated Water Demand (GL/yr)		
	2010	2031	Increase
Caboolture with CIGA	8.7	22.7	14
Lower Pine	11.2	17.2	6
Hays Inlet	8.8	16.0	7.2
Redcliffe	6.3	9.6	3.3
Burpengary Creek	5.0	8.0	3
Brisbane Coastal	2.5	2.8	0.3
Bribie Island	2.2	2.9	0.7
Pumicestone Passage	1.2	1.4	0.2
Stanley River	0.7	1.2	0.5
Upper Pine River	0.3	0.5	0.2
Sideling Creek	0.2	0.4	0.2
Mary River	0.0	0.0	0
Neurum Creek	0.0	0.0	0
Byron Creek	0.0	0.0	0
Total	**47.1**	**82.7**	**35.6**

When compared to water storage data (current production, storage yields and WTP capacities) in Table 4-3, it can be seen that there is potentially an extra ***59 GL/yr*** of capacity which could easily be used to accommodate the predicted increase in water demand in 2031 of ***36 GL/yr***. Furthermore, even when a 10% reduction in surface water yields due to potential climate change impacts is factored in, there is sufficient capacity to accommodate this increased future water demand.

Table 4-3 Reticulated Water Production Data and WTP Capacities

Water Supply	Average Current Production (GL/yr)	Storage Yield (GL/yr)	WTP Capacity (GL/yr)	Extra Capacity (GL/yr)
North Pine Dam	23.30	59	91.3	35.70
Lake Kurwongbah (Petrie)	5.46	7	16.4	1.54
Woodford Weir	0.67	1.1	1.46	0.43
Caboolture Weir	2.23	3.6	5.22	1.37
Bribie Island Borefields	0.74	1.6	1.31	0.57
Dayboro Borefields	0.14	0.25	0.40	0.11
NPI	11.24	23.7	n/a	19.26
Rainwater tanks	1.32	n/a	n/a	n/a
Recycled Water	1.83	n/a	n/a	n/a
Total	**46.9**	**96.2**	**116.1**	**59.0**

It should be noted that this assumes that WTPs are able to realistically increase production up to their nominated capacities and the associated trunk infrastructure can accommodate the increase in

volume. This also assumes that demand for water from other areas, such as Brisbane, does not increase.

While this indicates that water supply is not an issue, the Stanley catchment was identified as potentially having water supply issues. This is due to Woodford and D'Aguilar being relatively isolated and the water accounting process indicating that the Woodford Weir will be at or near capacity by 2031. While Woodford and D'Aguilar are potentially able to source water from Caboolture, it was deemed prudent to flag this as an issue in this catchment to ensure these towns maintain a level of self-sufficiency in terms of reticulated water into the future.

On a rudimentary basis, this indicates that water supply will not be an issue in the MBRC region (notwithstanding the Stanley catchment). When the 'water supply guarantee' - as per the SEQ Water Strategy (QWC, 2010) - is also taken into consideration, then it would seem appropriate to focus on other higher priority water cycle management issues in the MBRC region.

4.3 Environmental Flow Issues

Based on the pre-development mean annual flows modelled in MUSIC, environmental flows were flagged as an issue in each relevant catchment when modelled catchment flows exceeded the mean annual flow criteria set out in the *Water Resource (Moreton) Plan 2007.*

Table 4-4 includes a summary of environmental flow criteria locations, along with modelled minimum flows (derived from MUSIC) and future modelled flows (derived from Source Catchments).

Table 4-4 Environmental Flow Criteria and Modelled Flows

Criteria Location	Environmental Flow Criteria [1]	Modelled Minimum Flow Required (GL/yr) [2]	Future (2031) Modelled Flows (GL/yr) [3]
Caboolture River at mouth	At least 84% of mean annual flow	118	168 187 (with CIGA)
Stanley River at Woodford Weir	At least 95% of mean annual flow	86	80
Pumicestone Passage at end of system	At least 96% of mean annual flow	82	96
Pine River at mouth	At least 66% of mean annual flow	172	243 [4]
South Pine River at confluence with North Pine	At least 81% of mean annual flow	92	145

1 - Percentage of *pre-development* Mean Annual Flow
2 - Modelled *pre-development* flow using MUSIC multiplied by environmental flow criteria
3 - Modelled flows for 2031 using Source Catchments
4 - Combination of flows from Lower Pine, Upper Pine and Sideling Creek catchments

As indicated in Table 4-4, the only catchment with potential environmental flow issues is the Stanley Catchment. All other catchments comply with the mean annual flow criteria, based on modelled mean annual flow volumes.

It should be noted that the environmental flow criteria assessed only relate to mean annual flow volumes, and do not consider environmental flow targets relating to peak flows.

4.4 Climate Change Issues

Climate change may potentially impact on a range of water cycle elements. This not only includes the impact on water supply due to a decrease in rainfall and increase in evapotranspiration, but also the potential impact on infrastructure from increased storm surges and sea level rise.

For the purposes of the TWCM Strategy however, assessment of climate change impacts on water cycle management was limited to impacts on water supply. This is due to the vulnerability of regional surface water storages to potential climate change impacts. Risk to infrastructure from storm surges and sea level rise should be considered separately in other planning studies conducted by MBRC.

Therefore, climate change was only considered an issue in a catchment if there were potential issues with water supply in the future. In this regard, the Stanley catchment was the only catchment with a potential water supply issue and was thus the only catchment identified as having an issue related to climate change. However, diversification of water supply should be an outcome of the TWCM planning process for all catchments, in order to address any potential climate change impacts.

4.5 Water Conservation Issues

Water conservation was considered an issue in a catchment if there were also issues identified with water supply. While water conservation measures are industry standard practice (being prescribed in the building code), additional measures that go beyond standard practice could be implemented in a catchment where potable water was predicted to be in short supply.

However, as mentioned previously, the only catchment with an identified issue with water supply was the Stanley catchment, and hence is the only catchment identified as having a water conservation issue. However, similar to climate change, water conservation is considered an important issue to be addressed by the TWCM Plan for all catchments.

4.6 Sewage Treatment Plant Capacity Issues

Sewage Treatment Plant (STP) capacity was identified as an issue in catchments where either the design capacity or the licence capacity (in EP) were predicted to be exceeded.

A summary of the current loading status of STPs, the predicted future load treatment requirements due to population growth and existing licence and design constraints of STPs (in EP) within MBRC is detailed in Table 4-5. Instances where existing or future capacity is likely to be exceeded have been highlighted in bold for ease of reference.

Table 4-5 Current and Future STP Capacity Issues

Catchment	STP	Current EP	Future EP	Design Capacity (EP)	Licence Capacity (EP)
Stanley	Woodford	**2,115**	**4,373**	2,000	<4,000
Bribie	Bribie Is	21,000	36,361	38,000	<50,000
Caboolture	Burpengary East	43,500	**77,410**	49,500	<50,000
	South Caboolture	**45,000**	**94,034**	40,000	<100,000
	South Caboolture (includes CIGA)	N/A	**154,034**	40,000	<100,000
Upper Pine	Dayboro	1,438	**2,157**	2,000	<1,500
Lower Pine	Murrumba Downs	95,000	**181,023**	150,000	>100,000[2]
	Brendale	**40,000**	**73,000**[1]	40,000	<50,000
Hays	Redcliffe	66,000	**84,080**	70,000	<100,000

[1] Assumes future development includes expansion outside of headworks area and includes CSR land, Strathpine TOD and Albany Creek Redevelopment

[2]Recent upgrades to Murrumba Downs are licenced through volumetric discharge and load limits (currently met)

Figure 4-2 illustrates the current loading of STPs with respect to current design and licence capacity constraints.

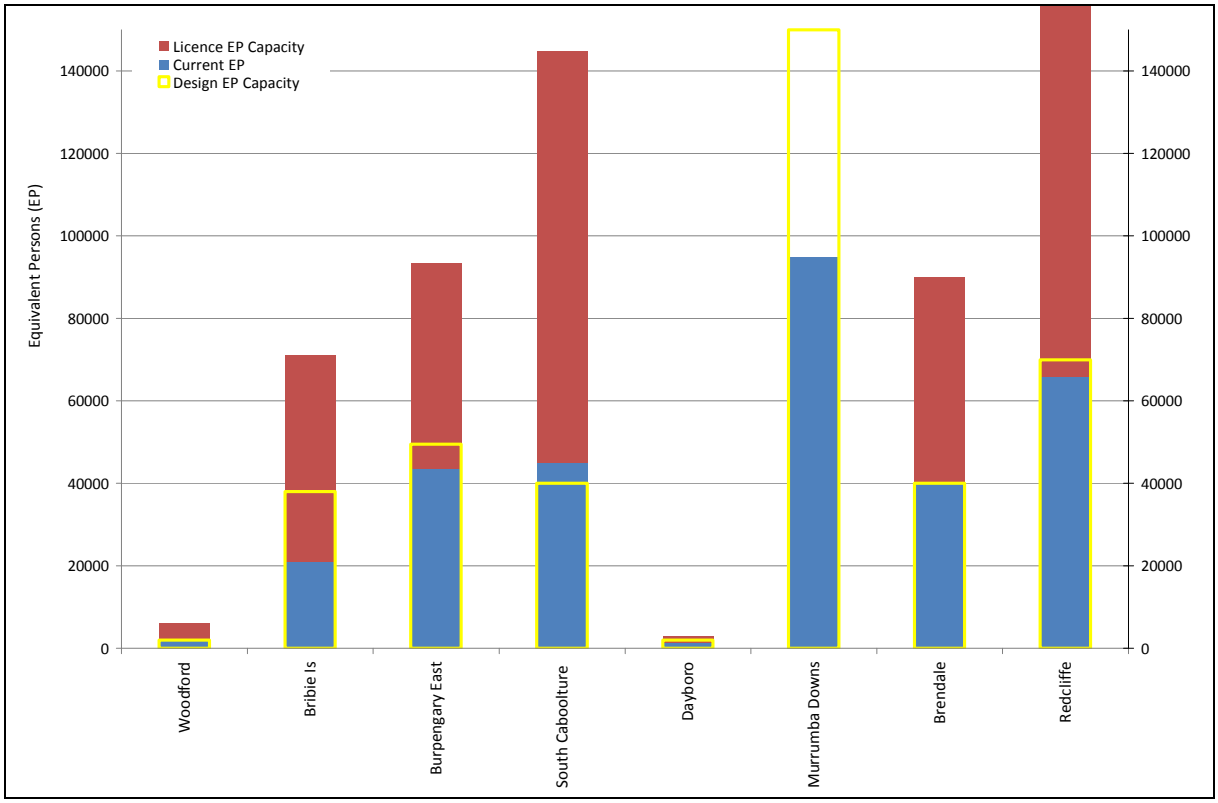


Figure 4-2 Current STP Capacity

Figure 4-2 and Table 4-5 indicate the following STPs with design capacity issues within MBRC catchments:

- Stanley River Catchment - Woodford STP currently exceeds design capacity;
- Caboolture River Catchment - Caboolture South STP currently exceeds design capacity; and
- Lower Pine River Catchment – Brendale STP is currently at design capacity.

Stanley and Caboolture South STPs are both scheduled for capacity upgrades prior to 2011 and 2018 respectively, while it is proposed that sewage from Brendale STP will be diverted to Luggage Point STP (Kedron Brook Transfer Scheme) to defer upgrades until approximately 2016.

With regards to key future (2031) STP capacity management issues within MBRC, Figure 4-3 and Figure 4-4 illustrate the predicted future loading of STPs with respect to current design and licence capacity constraints. The STPs have been arranged in order of design/licence exceedance for ease of reference. In both cases, the Caboolture CIGA scenario is expected to place the greatest pressures on existing design capacity and licence requirements.

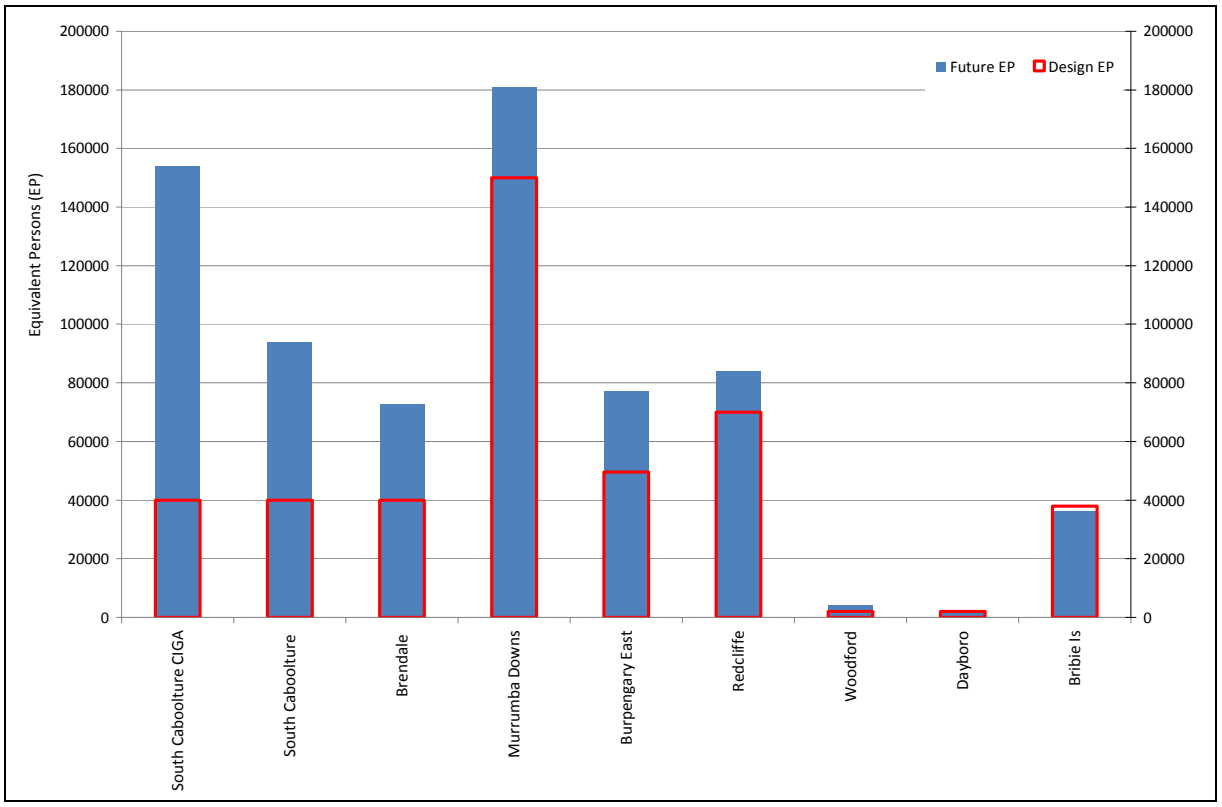


Figure 4-3 Future (2031) EP and Design Capacity Constraints

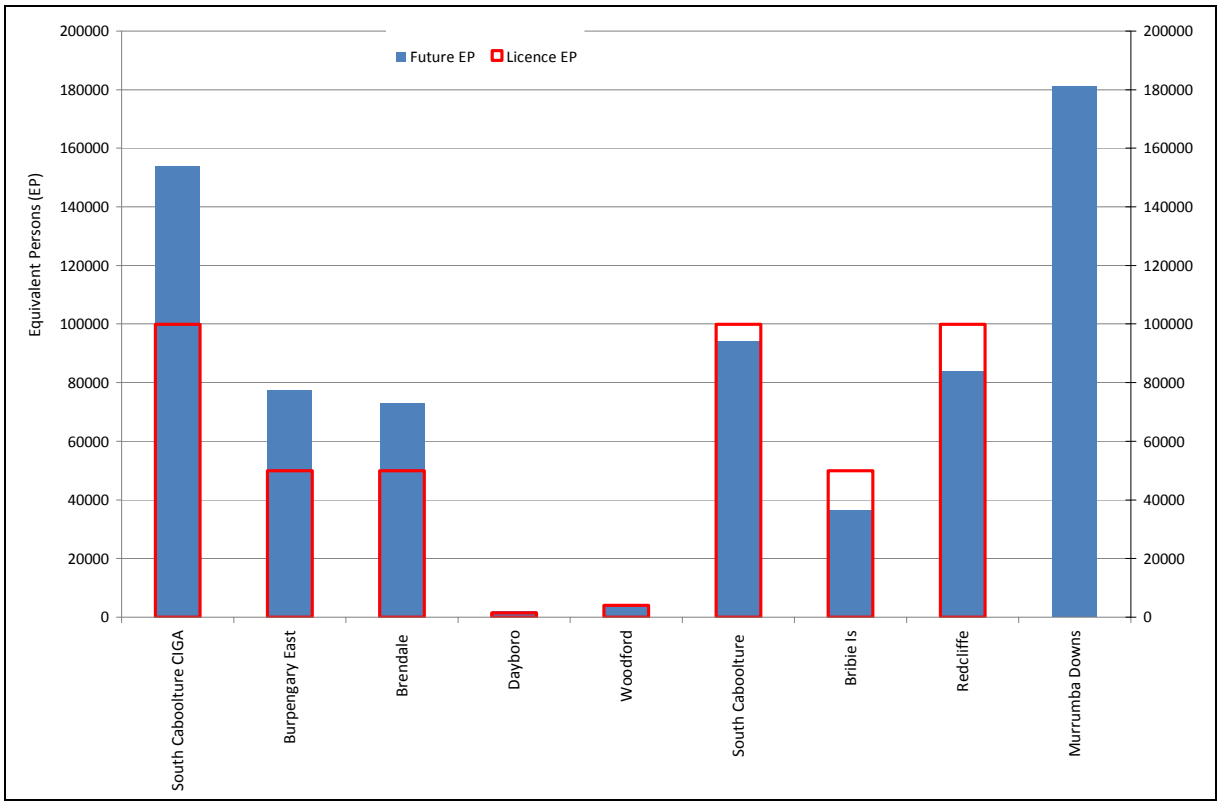


Figure 4-4 Future (2031) EP and Licence Capacity Constraints

It should be noted that the recently upgraded Murrumba Downs STP has had nutrient loads limits imposed in its licence conditions in addition to volumetric flow constraints. Table 4-6 indicates the future (2031) predicted discharge at the Murrumba Downs STP with respect to key licenced discharge constraints. Future discharges predicted to exceeded licence limits are highlighted in bold.

Table 4-6 Murrumba Downs Future Licence Constraints

Licence Parameter	2031 Predicted Discharge[1]	Licence Constraint
Volumetric Discharge (ML/yr)	**11,907**	8,322[2]
TP Annual Dry Weather Load (kg/yr)	5,953	8,470
TN Annual Dry Weather Load (kg/yr)	**35,721**	21,175[3]

[1] Predicted discharge takes into account 8 ML/day reuse as per licence conditions
[2] Derived from licence condition of 22.8 ML/day ADWF discharge (excluding 8 ML/day reuse)
[3] TN Target set from 1 January 2013

From the above information, the following key future STPs capacity issues have been identified within MBRC catchments:

- Caboolture River Catchment: South Caboolture and Burpengary East STPs predicted to exceed both design and licence capacities;
- Lower Pine River Catchment: Brendale STP predicted to exceed both design and licence capacities; Murrumba Downs STP predicted to exceed design capacity and licence limits for volumetric discharge and Total Nitrogen;
- Stanley River Catchment: Woodford STP predicted to exceed both design and licence capacities;

- Upper Pine River Catchment: Dayboro STP predicted to exceed both design and licence capacities; and
- Hays Inlet Catchment: Redcliffe STP predicted to exceed design capacity.

Those STPs predicted to exceed licence capacities present key management issues as development approvals will be required to proceed with upgrades. Future development approvals and STP licences are likely to licence nutrient load limits in addition to volumetric discharges (as done for Murrumba Downs STP) in order to satisfy the intent of legislative requirements (EPP Water). To gain these approvals, it is likely that significant treatment and/or reuse will be required. Council have also committed to the SEQ Healthy Waterways Strategy 2007 - 2012, and specifically the Point Source Pollution Management Action Plan - which has a target to prevent 100% of nutrient point sources from entering Moreton Bay by 2026. The reuse of future predicted increases in STP discharge will therefore be a key future management issue to be addressed.

Furthermore, the future increase in pollutant loads from STPs is significant and will place additional pressures on the ecological health of receiving waters (should loads be discharged rather than reused/treated), which are already under pressure as demonstrated by EHMP report card scores.

4.7 Water Quality Issues

To determine whether water quality would be a potential issue in a catchment in the future, existing water quality was assessed in each catchment along with likely potential future pressures. To achieve this, a number of water quality related aspects were assessed concurrently, including:

- The existing water quality in the catchment and/or receiving bay, based on EHMP report card scores;
- The existing and future pollutant loads from stormwater and STP discharges into receiving waters;
- The MBRC water quality monitoring data, which provided an indication of water quality hotspots which do not meet water quality objectives; and
- Whether the catchment contains or drains into a potable surface water storage.

The EHMP report card scores, as presented in Table 4-7, were used to assess the general water quality of a catchment. A catchment was initially flagged with water quality issues if the existing score did not meet a ‘C’ rating (fair) in receiving waters.

Diffuse (stormwater) and point source (STP) pollutant loads for each catchment were then examined to determine the magnitude of pollutants being discharged into receiving waters both currently and in the future. Stormwater pollutant loads were derived using the ‘Source Catchment’ modelling program. Point source pollutant loads from STPs were derived for each catchment using anticipated STP volumetric discharges and concentrations (detailed in Section 3.2.1.11 and 0). .Figure 4-5, Figure 4-6, and Figure 4-7 present the pollutant loads generated in each catchment in regard to TSS, TN and TP respectively. The figures are presented in order of the predicted magnitude of future pollutant loads.

Table 4-7 EHMP Scores

Catchment	Freshwater		Estuary/Marine	
	2009	2010	2009	2010
Stanley River Catchment[1]	B	B-		
Pumicestone Passage Catchment & Estuary[1]	B	C-	C+	D+
Caboolture River Catchment & Estuary	C	C+	D-	D
Pine Rivers Catchment & Estuary	C-	C-	D+	C-
Deception Bay			D-	D+
Bramble Bay			F	D+
Overall Moreton Bay			D	C

Report Card Ratings: A = Excellent B = Good C = Fair D = Poor F = Fail

[1] Catchment and monitoring sites also extend into other SEQ Council jurisdictions

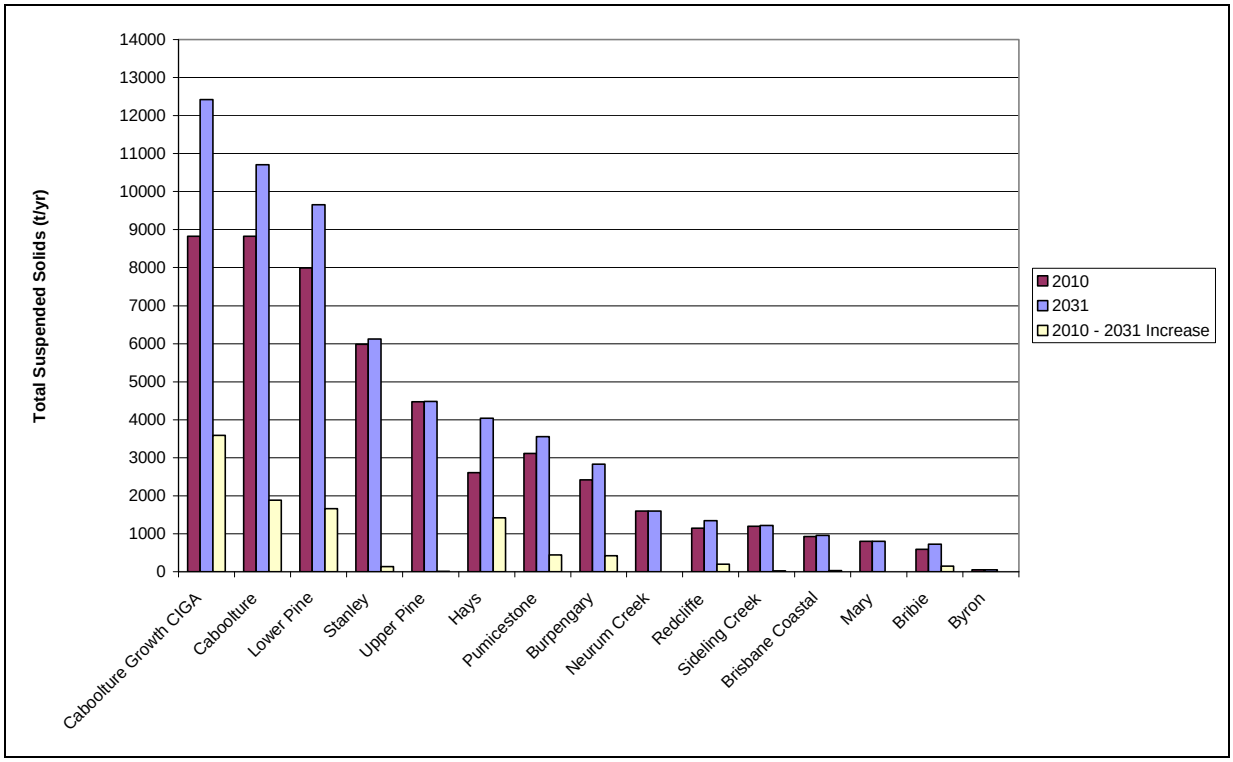


Figure 4-5 TSS Catchment Loads (Point & Diffuse Sources)

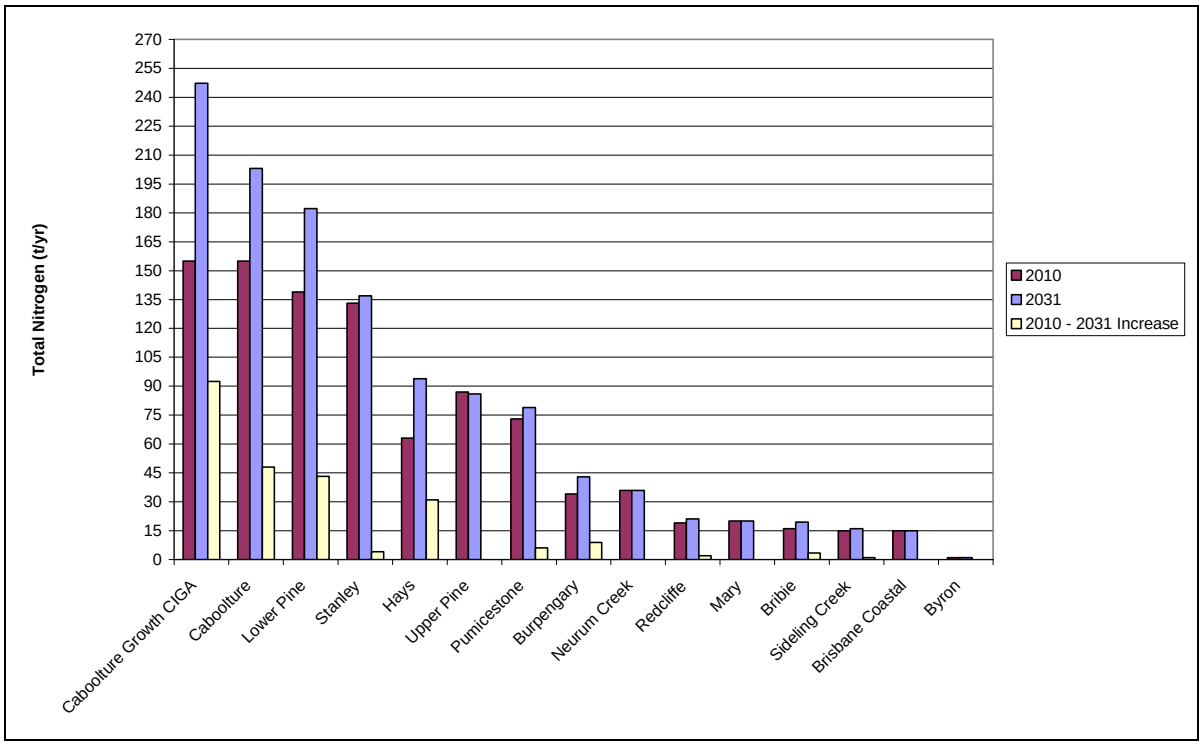


Figure 4-6 TN Catchment Loads (Point & Diffuse Sources)

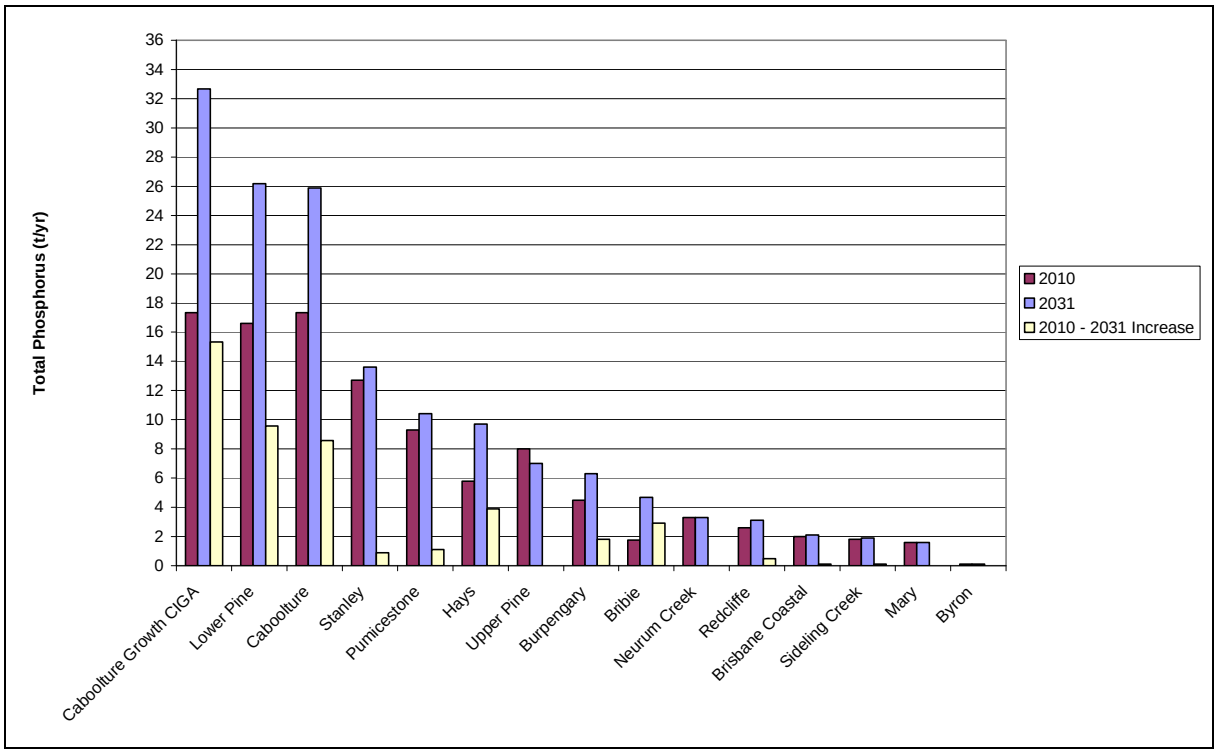


Figure 4-7 TP Catchment Loads (Point & Diffuse Sources)

Figure 4-5 to Figure 4-7 demonstrate that the greatest pollutant loads are likely to be generated from the Caboolture catchment (with and without the CIGA), Lower Pine and Stanley River catchments. Apart from the Stanley, these catchments also generally had the largest expected increases in future pollutant loads (from existing loads). Management of stormwater pollutant loads from future

development pressures in these catchments and others is likely to be key future management issued to be addressed, particularly where EHMP scores (refer Table 4-7) indicate receiving waters are in poor ecological health.

Catchments with fair to poor EHMP report card scores, and those with large pollutant loads being discharged into receiving waters, particularly in instances where they exceed sustainable load estimates (where available), have therefore been identified as having a water quality issue.

Additionally, catchments were also flagged if Council's water quality monitoring data suggested that there were water quality hot spots in the catchment. These results were generally aligned with EHMP report card scores, however enabled a more localised assessment of water quality within catchments where the EHMP presents a combined report card score. Catchments identified as containing sample locations where ecological health was slightly to heavily impacted (QWQG/ANZECC) include Hays Inlet, Redcliffe, Upper Pine, Lower Pine, and Sideling Creek.

Finally, catchments were identified as having potential water quality issues in 2031 if they contained development pressures and drained into potable surface water storages (i.e. drinking water Environmental Values). These catchments include the Stanley (draining into Somerset and Wivenhoe Dams), Upper Pine (containing North Pine Dam), Sideling Creek (containing Lake Kurwongbah) and potentially groundwater aquifers on Bribie Island.

Therefore, using the above rationale, the following catchments were flagged as having water quality issues:

- Stanley
- Bribie
- Burpengary
- Sideling Creek
- Redcliffe
- Brisbane Coastal
- Pumicestone
- Caboolture
- Upper Pine
- Hays Inlet
- Lower Pine

4.8 Water Quantity Issues

As mentioned previously, there was limited information readily available to identify existing / future flooding pressures within the catchments. Therefore, in order to identify where flooding issues may occur, it was decided that catchments with large areas of urban development were more likely to have potential flooding issues, and were flagged as potentially having water quantity (flooding) issues.

4.9 Environmentally Sensitive Area Issues

There are a number of environmentally sensitive areas in the MBRC region, comprising national parks, state forests, conservation areas, reserves, wetlands and High Ecological Value (HEV) areas. Refer to section 2.10 and Figure 3-1 for further details in regard to these environmentally sensitive areas.

To determine whether environmentally sensitive areas may potentially be impacted by various elements of water cycle management in a catchment, a preliminary assessment was conducted. This assessment consisted of identifying where development is likely to occur in a catchment (based on the SEQ Regional Plan urban footprint) and whether this development would impact directly on any of these areas. For example, if future development potentially impacts on habitat values or wildlife movement corridors associated with environmentally sensitive areas in a catchment, then it was flagged.

Additionally, if it was identified that pollutant loads from a catchment discharge to an area identified as being a HEV area, then it was flagged. This includes catchments such as Hays Inlet and Lower Pine which discharge into a HEV area and a RAMSAR wetland.

Therefore, using the above rationale, the following catchments were flagged as having potential issues in relation to environmentally sensitive areas:

- Pumicestone
- Bribie
- Redcliffe
- Hays Inlet
- Lower Pine
- Caboolture

4.10 Summary of Issues

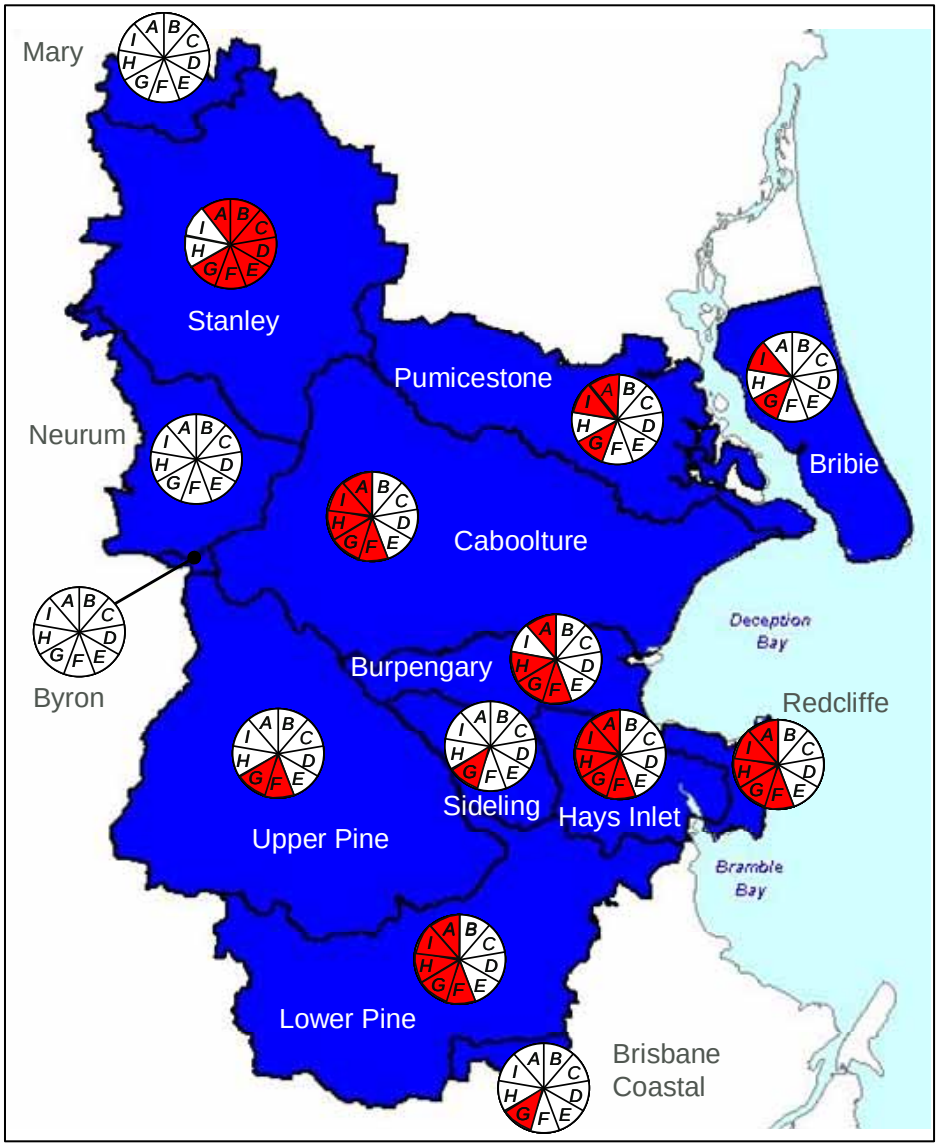
As a result of identifying potential future water cycle management issues in each catchment using the methodology outlined in the sections above, the relevant issues per catchment are summarised and presented in Table 4-8.

Table 4-8 Summary of Issues per Catchment

Catchment	Issue								
	Population Growth	Water Supply	Environmental Flows	Climate Change	Water Conservation	STP Capacity	Water Quality	Water Quantity (flooding)	Environmentally Sensitive Areas
Mary									
Stanley	X	X	X	X	X	X	X		
Pumicestone	X						X		X
Bribie							X		X
Caboolture	X					X	X	X	X
Burpengary	X					X	X	X	
Byron									
Redcliffe	X					X	X	X	X
Hays Inlet	X					X	X	X	X
Upper Pine						X	X		
Sideling							X		
Lower Pine	X					X	X	X	X
Brisbane Coastal							X		
Neurum Creek									

The identified issues per catchment are also presented graphically using 'issue wheels' in Figure 4-8. The 'issue wheels' provide an indication of which issues have been identified in each catchment.

With the water cycle issues identified in each catchment, appropriate solutions can then be developed to address these issues. The process of developing and assessing these solutions is discussed in Section 5.



Issues:	
A	Population Growth
B	Water Supply
C	Environmental Flow
D	Climate Change
E	Water Conservation
F	STP Capacity
G	Water Quality
H	Water Quantity (Flooding)
I	Environmentally Sensitive Areas

Figure 4-8 Water Cycle Management Issues per Catchment

5 SOLUTIONS

5.1 Development of Solutions

A number of potential management responses have been identified to address the issues identified within each catchment. These management responses are referred to as 'solutions' herein. All possible solutions were identified at a conceptual level without regard to practicality or costs to ensure that all possible options were sufficiently considered.

In developing solutions, it is recognised that each solution may address a number of issues, rather than just one. For example, stormwater harvesting addresses both water supply and water quality issues. Additionally, it is likely that a number of solutions (a 'solution set') may be required for each catchment, depending on the specific issues identified within each individual sub catchment. The primary issues addressed by each solution were documented to assist in identifying which solutions were applicable to consider within each catchment. A range of solutions were developed to ensure a wide variety of options were put forward for review in each catchment, ranging from centralised to decentralised solutions, and incorporating conventional to innovative ideas. A summary of the solutions assessed for each catchment (depending on the specific issues identified within each catchment) is shown in Table 5-1. A further detailed list of all the solutions including their descriptions is provided in Appendix F.

It is noted that some of the solutions initially developed in Table 5-1 were not scored. A brief description of why workshop participants decided that these solutions were not applicable to score is provided below:

- Solution 1 (S1): Build New Surface Water Storages – further investigation of this solution was not considered to be feasible within the MBRC area;
- Solution 4 (S4): Upgrade and/or construct new water supply infrastructure - this is considered to be necessary and will be defined by Council's Desired Standards of Service;
- Solution 13 (S13): Water efficient appliances and fittings – this is already being implemented within the MBRC area;
- Solution 15 (S15): Implementation of water restrictions – this was not considered further as it is the States responsibility and not an option that Council can drive; and
- Solution 34 (S34): Implement floodplain risk management measures – this was not assessed as it is largely dependent on concurrent studies underway and hence requirements will be assessed as part of these studies (Floodplain Management Plan).

Table 5-1 Solutions Assessed for Each Catchment

Solution	Stanley	Pumicestone	Bribie	Caboolture	CIGA	Burpengary	Upper Pine	Lower Pine	Sideling	Hays Inlet	Redcliffe	Brisbane Coastal
S1: Build new regional surface water storages and associated infrastructure	Not Assessed											
S2: Upgrade Water Treatment Plants to provide additional capacity/ improve water quality	■		■	■	■		■		■			
S3: Rely on Water Supply Guarantee in the SEQ Water Strategy	■				■							
S4: Upgrade and/or construct new trunk water supply infrastructure to boost capacity	Not Assessed											
S5: Recycled water supplied to urban users	■			■	■	■		■		■	■	
S6: Recycled water supplied to agricultural users	■			■	■							
S7: Sewer mining - small community based plants to treat and reuse sewage				■	■	■		■		■	■	
S8: Indirect Potable Reuse of Purified Recycled Water (PRW)				■	■	■		■		■	■	
S9: Rainwater tanks retrofitted for non-potable uses	■	■	■	■	■	■	■	■	■	■	■	■
S10: Stormwater harvesting for non-potable reuse	■		■	■	■	■		■		■	■	■
S11:Stormwater harvesting for potable reuse	■		■	■	■	■		■		■	■	■
S12: Mandatory lot-scale greywater reuse	■	■	■	■	■	■	■	■	■	■	■	■
S13: Water efficient appliances and fittings	Not Assessed											
S14: Pressure reduction on trunk water supply infrastructure	■	■	■	■	■	■		■	■	■	■	
S15: Implementation of water restrictions	Not Assessed											
S16: Education & /or Capacity Building and investment in incentive schemes	■	■	■	■	■	■	■	■	■	■	■	■
S17: Xeriscaping - landscaping using drought tolerant plant species	■	■	■	■	■	■	■	■	■	■	■	■
S18: Increase price of water to minimise water wastage	■	■	■	■	■	■	■	■	■	■	■	■
S19: Limit rural water extraction and supplement with other sources	■			■	■			■				
S20: Implement WSUD for hydrologic management	■	■		■	■	■		■		■	■	■

Solution	Stanley	Pumicestone	Bribie	Caboolture	CIGA	Burpengary	Upper Pine	Lower Pine	Sideling	Hays Inlet	Redcliffe	Brisbane Coastal
S21: Strategic release of water from dams to maintain environmental flows downstream												
S22: Recycled water pumped to downstream side of dams and weirs (Environmental Flows)												
S23: Upgrade STP Infrastructure												
S24: Storage of excess inflows during storm events												
S25: Diversion of sewage to STPs with capacity												
S26: Smart sewers (reduced infiltration/inflows)												
S27: Prevention of illegal stormwater inflow connections to sewer												
S28: Ocean outfall from STPs instead of discharge into rivers and creeks												
S29: Waterway Rehabilitation - Riparian Zones - 3/4 order streams												
S30: Increased implementation of Erosion & Sediment Control on development sites												
S31: Existing WSUD Retrofit												
S32: Future development WSUD measures achieve no worsening												
S33: Rural Best Management Practices (e.g. limiting erosion, application of fertilisers and pesticides at minimal rates, etc)												
S34: Implement floodplain risk management measures (property/response/flood modification measures) (Flooding)	Not Assessed											
S35: Cap at current Population without any other solutions implemented												

Indicates Solution Assessed Using MCA

5.2 Assessment of Solutions using MCA

To assist in the selection of solutions to be further investigated during the detailed planning stage, Multi Criteria Analysis (MCA) was used.

Multi Criteria Analysis is a management tool that allows the incorporation of monetary and non-monetary data of various options by assigning scores and weights to criteria used to assess the various options. The weights express the importance of each criteria effect to the decision-maker or stakeholders. A key feature of MCA is the emphasis on the judgment of the decision-making team. This judgment needs to be exercised in establishing objectives and criteria, estimating the relative importance (weights) of criteria and in judging the contribution of each option to each performance criterion (scoring).

In this case, the MCA process has been undertaken through workshops with key stakeholders and experts, and in consultation with local Councillors.

The key steps undertaken in the MCA process included:

1. Develop and agree on the list of criteria for evaluating the solutions;
2. Determine the relative importance and weighting of the assessment criteria;
3. Score the impact of the solutions with respect to each criteria;
4. Combine the scores for each criteria with the criteria weighting to provide an overall score for each solution; and
5. Select the preferred solution set for each catchment.

These steps are discussed in more detail in the following sections.

5.2.1 Development of Criteria for Evaluating Solutions

Criteria with which to assess the performance of each solution were developed around Triple Bottom Line (TBL) principles and include the following three criteria categories:

- Environment;
- Social; and
- Economic.

The individual criteria within each of these categories have been developed based on previous work undertaken for the *Northern Growth Corridor Integrated Urban Water Cycle Management Strategy* (MWH, 2006) and through consultation with Councillors (21 October 2010), representatives from MBRC and UnityWater and an Expert Panel.

In developing criteria, the following objectives were set:

Environmental Objectives:

- Protect and enhance the environmental values of receiving waters (including those relating to aquatic ecosystem and human use; ensuring sustainable flows & loads; minimising alteration of natural flow and water quality regimes); and
- Reduce greenhouse gas emissions, ensuring solutions have minimal impact on energy consumption and carbon emissions contributing to climate change.

Social Objectives:

- Ensure the security of future water supplies (including water conservation strategies, diversification of water supply sources and consideration of alternate water sources to achieve 'fit for use' (rainwater, stormwater, recycled water));
- Protect community health and well being; and
- Ensure urbanisation does not increase the risk of flooding.

Economic Objectives:

- Delay/avoid the need for expensive infrastructure upgrades; and
- Ensure the economic sustainability of the region.

Another objective set was to meet legislative and policy drivers, including:

- Queensland Development Code (Schedule 1 of the *Building Act 1975*);
- *Water Act 2000*;
- *Water Supply (Safety & Reliability) Act 2008*;
- SEQ Healthy Waterways Strategy;
- SEQ Natural Resource Management Plan;
- SEQ Regional Water Security Program; and
- Draft SEQ Climate Change Management Plan.

The adopted criteria for the MCA process are outlined in Table 5-2.

Table 5-2 Adopted MCA Criteria

Environmental Criteria
Changes in water quality in inland water systems, as well as changes to biodiversity, and bed and bank integrity
Changes in hydrology
Changes to water quality and biodiversity in estuaries and Moreton Bay
Changes in water quality and flow and biodiversity of groundwater systems
Changes in emissions of greenhouse gases
Impact on environmentally sensitive values
Social Criteria
Impacts on water supply
Impacts on human health
Impacts on public amenity/recreation
Impacts on flooding hazard
Level of community understanding, engagement and ownership
Public acceptability
Economic Criteria
Financial impacts on MBRC/ Unitywater – Outlays, capital and operating expenditure and revenue
Financial impacts including costs and cost savings on consumers (e.g. infrastructure charges) and other organisations
Impacts on local industries that rely on the environment (Fisheries, tourism)
Employment plus local economic sustainability

A more detailed description of the criteria is provided in Appendix G.

5.2.2 Weighting the Criteria

The relative importance of each criteria category (environmental, social and economic) and individual criteria within each criteria category was assigned using the input of expert panel and workshop participants. Sensitivity tests were undertaken to assess how changing the weighting for criteria categories affected the preferred solution sets. Results of the sensitivity analyses indicated that although the ranking of preferred solutions changed, overall the top solutions remained the same and therefore adopted 'solution sets' were not significantly affected. Therefore it was decided that an even weighting distribution between environmental, social and economic criteria categories be adopted.

The adopted criteria weighting and results of the sensitivity analysis were presented to Councillors on 10 November 2010 for review and approval. The adopted weighting of criteria is shown in Table 5-3 below.

Table 5-3 Adopted Criteria Weighting

Criteria Category & Weighting	Criteria	Criteria Weighting
Environmental Weighting = 33.3%	Changes in water quality in inland water systems, as well as changes to biodiversity, and bed and bank integrity	10%
	Changes in hydrology	10%
	Changes to water quality and biodiversity in estuaries and Moreton Bay	30%
	Changes in water quality and flow and biodiversity of groundwater systems	5%
	Changes in emissions of greenhouse gases	15%
	Impact on environmentally sensitive values	30%
	Total Environmental Criteria Weighting	*100%*
Social Weighting = 33.3%	Impacts on water supply	20%
	Impacts on human health	20%
	Impacts on public amenity/recreation	20%
	Impacts on flooding hazard	10%
	Level of community understanding, engagement and ownership	10%
	Public acceptability	20%
	Total Social Criteria Weighting	*100%*
Economic Weighting = 33.3%	Financial impacts on MBRC – Outlays, capital and operating expenditure and revenue	30%
	Financial impacts including costs and cost savings on consumers (e.g. infrastructure charges) and other organisations	30%
	Impacts on local industries that rely on the environment (Fisheries, tourism)	15%
	Employment plus local economic sustainability	25%
	Total Economic Criteria Weighting	*100%*

5.2.3 Scoring the Options

The scoring of solutions identified in Section 5.1 was undertaken by an Options Analysis Team nominated by MBRC and approved by Councillors on 21 October 2010. Workshop participants invited to attend included:

- Councillors;
- Strategic Coordination Advisory Group (SCAG);
- MBRC representatives; and
- UnityWater representatives.

Expert advisors involved in the project study were also invited to attend. A list of attending workshop participants is included in Appendix H.

The scoring was facilitated at Caboolture Councill Chambers over three half day workshops, undertaken on the following dates:

- Friday 29 October 2010;
- Monday 1 November 2010; and
- Wednesday 3 November 2010.

The scoring was undertaken on a solution/option basis for each catchment i.e. each solution was scored for all relevant catchments before moving on to the next solution. The scoring was undertaken using a consensus method. That is, each solution was discussed and debated in terms of how it satisfied each individual criteria (refer Appendix G), and was scored by the workshop facilitator with the consensus of workshop participants.

Due to project time and resource constraints, a semi-quantitative/qualitative scoring system was used. Where appropriate, solution scores in catchments were adjusted to reflect the potential scale of pressures from development of that particular catchment in comparison to the whole MBRC Region. Scoring of the outcomes generated by each solution against each individual assessment criteria was undertaken using the scoring system detailed in Table 5-4. The scoring was undertaken by comparison of the proposed solution scenario against the future base case of 2031 with 'business as usual' (i.e. with no mitigation measures/solutions implemented).

Table 5-4 MCA Scoring System

Qualitative Description	Score
Very much better	+4
Much better	+3
Moderately better	+2
Little better	+1
No change (same as base case)	0
Little worse	-1
Moderately worse	-2
Much worse	-3
Very much worse	-4

5.2.4 Calculation of Overall Weighted Scores

Once the initial scoring (as described in Section 5.2.3) was completed, the weighted score was calculated for each criteria score (for all solutions and all catchments). The weighted score adjusts the scoring for each criteria based on the relative importance of the individual criteria and the criteria category (which was assumed to be equal for environment, social and economic categories).

For example, assuming the original performance score for Solution X against the Criteria "Impacts to Human Water Supply" was 3 ('much better'), the weighted criteria score of "Impacts to Human Water Supply" was calculated using the following method:

Weighted Criteria Score = Original Score x Criteria Category Weighting x Individual Criteria Weighting

= 3 x 33.3% x 20%

= 0.2

The overall weighted score of each solution was then estimated by applying the following calculation:

Overall Weighted Score of Solution X = Sum of the Weighted Scores of Criteria 1 to Criteria n of Solution X.

The above calculation was undertaken to estimate the performance of each solution in each catchment, using triple bottom line principles.

As previously discussed, a sensitivity analysis was undertaken of the criteria category weighting. The results of the sensitivity analysis are shown in Table 5-5. Table 5-5 indicates that despite the difference in criteria category weightings, the highest ranking solutions are generally quite similar.

Table 5-5 Results of MCA Sensitivity Analysis

	Even Weighting	Sensitvity 1	Sensitivity 2	Sensitivity 3
Environmental Weighting	33.3%	30%	40%	20%
Social Weighting	33.3%	30%	40%	30%
Economic Weighting	33.3%	40%	20%	50%
S6: Recycled Water (Agricultural Use)	2.34	2.28	2.46	2.32
S29: Waterway Rehabilitation	2.21	2.04	2.55	1.93
S33: Rural Best Management Practices	2.14	1.98	2.46	1.85
S16: Education & Capacity Building	1.84	1.70	2.11	1.58
S32: WSUD No Worsening	1.48	1.30	1.82	1.17
S7: Sewer Mining	1.37	1.20	1.71	1.12
S10: Stormwater Harvesting (Non-potable Use)	1.33	1.13	1.73	0.92
S5: Recycled Water (Urban Use)	1.31	1.08	1.77	0.81
S30: Erosion & Sediment Control	1.23	1.14	1.43	1.04
S31: WSUD Retrofit	1.08	0.88	1.47	0.69
S9: Rainwater Tanks (Non-potable Uses)	0.97	0.84	1.25	0.69
S3: Rely on Water Supply Guarantee in the SEQ Water Strategy	0.82	0.76	0.94	0.79
S8: Indirect Potable Reuse of Purified Recycled Water (PRW)	0.80	0.68	1.05	0.47
S26: Smart Sewers	0.71	0.70	0.73	0.64
S35: Cap on Population	0.66	0.69	0.59	0.84
S21: Strategic Release of Water from Dams	0.60	0.51	0.78	0.35
S27: Prevention of Illegal Stormwater Connections to Sewer	0.49	0.53	0.41	0.55
S11:Stormwater Harvesting (Potable Use)	0.40	0.24	0.73	0.00
S14: Pressure Reduction (Trunk Water Supply)	0.26	0.26	0.26	0.27
S28: STP Ocean outfall	0.25	0.13	0.50	-0.11
S20: WSUD for Hydrologic Management	0.24	0.19	0.35	0.05
S17: Xeriscaping	0.06	0.06	0.08	0.06
S25: Diversion of Sewage to STPs with Capacity	0.02	-0.05	0.14	-0.13
S12: Mandatory Lot-Scale Greywater Reuse	-0.06	-0.14	0.10	-0.33
S2: Upgrade WTPs	-0.08	-0.06	-0.14	0.02
S23: Upgrade STP Infrastructure	-0.15	-0.32	0.24	-0.60
S24: Storage of Excess Sewage Inflows During Rainfall	-0.36	-0.56	0.05	-0.82
S19: Limit Rural Water Extraction	-0.50	-0.60	-0.31	-0.76
S18: Increase Price of Water	-0.56	-0.62	-0.46	-0.77
S22: Recycled Water to Maintain Environmental Flows	-1.77	-1.77	-1.76	-1.76

High Ranking Solution (Score >1)
Medium Ranking Solution (Score 0.5 - 1)
Low Ranking Solution (Score 0.01 - 0.5)
Zero / Negative Ranking Solution

5.2.5 Selection of Preferred 'Solution Sets' for Detailed Investigation

Using the overall weighted solution scores, solutions were ranked from highest to lowest for each catchment. The top ranking solutions were then selected for each catchment until it was satisfied that a group of solutions or 'solution set' had been selected that sufficiently addressed all issues identified within the catchment of interest. This process allowed all options to be initially screened and the best options (i.e. solution set) to be selected for further investigation and refinement in the detailed planning phase. The solution sets selected for each catchment are detailed in Section 5.3. It should be noted that as no key issues were identified in the Mary River, Byron Creek and Neurum Creek catchments, solution sets for these catchments were not deemed necessary.

The average scores of solutions for all catchments were also calculated to give an indication of the preferred solutions over the entire MBRC area, i.e. those solutions that scored positively (>0). The catchments were also further separated and grouped into those that consist of predominantly urban areas, and those that consist of predominantly rural land uses. The average solution scores were then assessed using these 'urban' and 'rural' catchment groupings to give an indication of the most viable options for these areas. Average MCA scores for solutions that scored positively on a whole of region, urban and rural catchment scale are presented in Figure 5-1.

The average scores from the MCA presented in Figure 5-1 indicate that on a whole of region and urban catchment scale, recycled water for agricultural land use rated as the highest (i.e. best option), while rural best management practices rated the highest for rural catchments. Although the orders were slightly different, the top 5 ranking solutions for whole of region, urban and rural catchments were the same and included:

- Recycled water for agricultural land uses;
- Riparian revegetation;
- Rural best management practices;
- Education and capacity building; and
- Water Sensitive Urban Design that achieves no worsening objectives.

It is noted that a combination of solutions are likely to be required to address specific issues identified in each catchment, and some solutions that did not rate highly (i.e. upgrade of STP capacity) may still be required to adequately address issues. The recommended selection of solution sets for further investigation in the detailed planning stage (in order of ranked preference from MCA) to satisfy issues specific to each catchment is further detailed in Section 5.3.

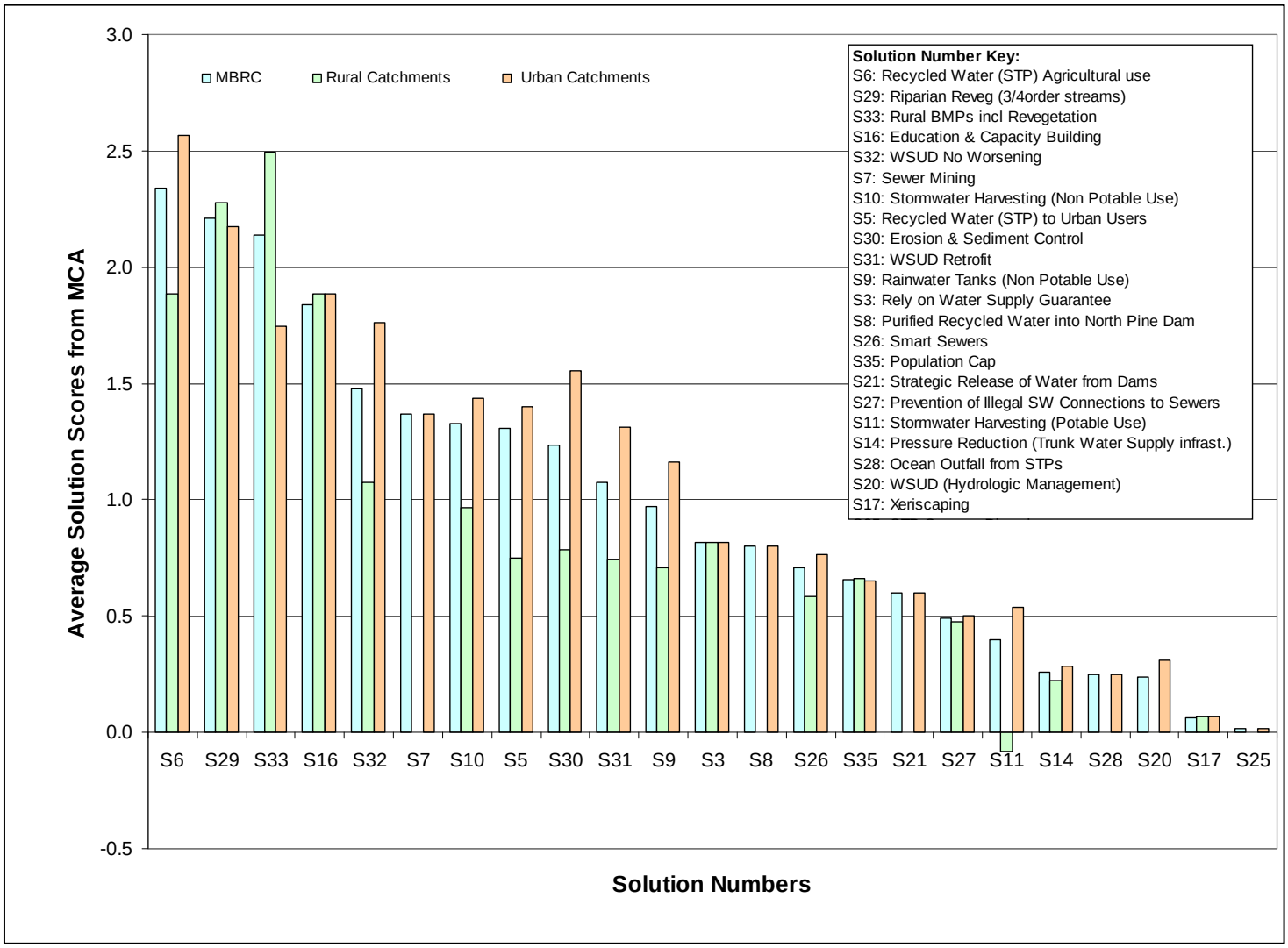


Figure 5-1 MCA Solution Results for Whole of Region (MBRC), Rural and Urban Catchments

5.3 Recommended Solution Sets

Recommended solutions sets identified for each catchment for further investigation as a result of the Multi Criteria Analysis are detailed in the Table 5-6 to Table 5-17 below. These tables also indicate the future issues specific to each catchment (as identified in Section 4.10) and the solutions selected to target each key issue. Although the responsibility for implementing the solutions is likely to be shared, an indication of the key mechanism for implementing each solution has been colour coded for ease of reference (i.e. Council Policy, Council Infrastructure, Unitywater Infrastructure).

Table 5-6 Stanley River Catchment Solution Set

Implementation Key:

Unitywater
Council Policy
Council Infrastructure

Stanley River Catchment Solution Set Description	A Population Growth	B Water Supply	C Environmental Flows	D Climate Change	E Water Conservation	F STP Capacity	G Water Quality	H Water Quantity (flooding)	I Environmentally Sensitive Areas
S33: Rural Best Management Practices (e.g. limiting erosion etc)		x					x		
S29: Waterway Rehabilitation - Riparian Zones - 3/4 order streams							x		
S6: Recycled water supplied to agricultural users		x	x	x			x		
S16: Education & /or Capacity Building and investment in incentive schemes		x	x	x	x	x	x		
S10: Stormwater harvesting for non-potable reuse		x					x		
S35: Cap at current Population without any other solutions implemented	x	x				x			
S32: Future development WSUD measures achieve no worsening	x	x					x		
S30: Increased implementation of Erosion & Sediment Control on development sites	x								
S26: Smart sewers (reduced infiltration/inflows)	x					x			
S27: Prevention of illegal stormwater inflow connections to sewer						x			
S14: Pressure reduction on trunk water supply infrastructure					x	x			
S7: Sewer mining - small community based plants to treat and reuse sewage	x					x			
S23: Upgrade STP Infrastructure	x					x			

Table 5-7 Pumicestone Creek Catchment Solution Set

Implementation Key:

Unitywater
Council Policy
Council Infrastructure

Pumistone Creek Catchment Solution Set Description	A Population Growth	B Water Supply	C Environmental Flows	D Climate Change	E Water Conservation	F STP Capacity	G Water Quality	H Water Quantity (flooding)	I Environmentally Sensitive Areas
S33: Rural Best Management Practices (e.g. limiting erosion etc)							x		x
S29: Waterway Rehabilitation - Riparian Zones - 3/4 order streams							x		x
S16: Education & /or Capacity Building and investment in incentive schemes							x		x
S32: Future development WSUD measures achieve no worsening	x						x		x
S31: Existing WSUD Retrofit							x		x
S9: Rainwater tanks retrofitted for non-potable uses							x		x
S30: Increased implementation of Erosion & Sediment Control on development sites	x						x		x
S35: Cap at current Population without any other solutions implemented	x								

Table 5-8 Bribie Island Catchment Solution Set

Implementation Key:

Unitywater
Council Policy
Council Infrastructure

Bribie Island Catchment Solution Set Description	A Population Growth	B Water Supply	C Environmental Flows	D Climate Change	E Water Conservation	F STP Capacity	G Water Quality	H Water Quantity (flooding)	I Environmentally Sensitive Areas
S16: Education & /or Capacity Building and investment in incentive schemes							x		x
S32: Future development WSUD measures achieve no worsening							x		x
S10: Stormwater harvesting for non-potable reuse							x		x
S31: Existing WSUD Retrofit							x		x
S9: Rainwater tanks retrofitted for non-potable uses							x		x
S30: Increased implementation of Erosion & Sediment Control on development sites							x		x
S26: Smart sewers (reduced infiltration/inflows)							x		x

Table 5-9 Burpengary Creek Catchment Solution Set

Implementation Key:

Unitywater
Council Policy
Council Infrastructure

Burpengary Creek Catchment Solution Set Description	A Population Growth	B Water Supply	C Environmental Flows	D Climate Change	E Water Conservation	F STP Capacity	G Water Quality	H Water Quantity (flooding)	I Environmentally Sensitive Areas
S29: Waterway Rehabilitation - Riparian Zones - 3/4 order streams							x		
S16: Education & /or Capacity Building and investment in incentive schemes						x	x		
S32: Future development WSUD measures achieve no worsening	x						x	x	
S33: Rural Best Management Practices (e.g. limiting erosion etc)							x		
S10: Stormwater harvesting for non-potable reuse							x		
S31: Existing WSUD Retrofit							x		
S7: Sewer mining - small community based plants to treat and reuse sewage						x			
S5: Recycled water supplied to urban users							x		
S30: Increased implementation of Erosion & Sediment Control on development sites	x						x		
S9: Rainwater tanks retrofitted for non-potable uses							x		
S26: Smart sewers (reduced infiltration/inflows)						x			
S35: Cap at current Population without any other solutions implemented						x			
S27: Prevention of illegal stormwater inflow connections to sewer						x			

Table 5-10 Caboolture River Catchment Solution Set

Implementation Key:

Unitywater
Council Policy
Council Infrastructure

Caboolture River Catchment Solution Set Description	A Population Growth	B Water Supply	C Environmental Flows	D Climate Change	E Water Conservation	F STP Capacity	G Water Quality	H Water Quantity (flooding)	I Environmentally Sensitive Areas
S6: Recycled water supplied to agricultural users							X		X
S29: Waterway Rehabilitation - Riparian Zones - 3/4 order streams							X		X
S33: Rural Best Management Practices (e.g. limiting erosion etc)							X		X
S30: Increased implementation of Erosion & Sediment Control on development sites	X						X		X
S32: Future development WSUD measures achieve no worsening	X						X	X	X
S16: Education & /or Capacity Building and investment in incentive schemes	X					X	X		X
S7: Sewer mining - small community based plants to treat and reuse sewage						X			
S5: Recycled water supplied to urban users							X		X
S10: Stormwater harvesting for non-potable reuse	X						X		X
S31: Existing WSUD Retrofit							X		X
S27: Prevention of illegal stormwater inflow connections to sewer						X			
S9: Rainwater tanks retrofitted for non-potable uses							X		X
S8: Indirect Potable Reuse of Purified Recycled Water (PRW)							X		X
S26: Smart sewers (reduced infiltration/inflows)						X			
S25: Diversion of sewage to STPs with capacity	X					X			
S23: Upgrade STP Infrastructure	X					X			

Table 5-11 Caboolture River Catchment with CIGA Solution Set

Implementation Key:

Unitywater
Council Policy
Council Infrastructure

Caboolture River Catchment with Caboolture Identified Growth Area (CIGA) Solution Set Description	A Population Growth	B Water Supply	C Environmental Flows	D Climate Change	E Water Conservation	F STP Capacity	G Water Quality	H Water Quantity (flooding)	I Environmentally Sensitive Areas
S6: Recycled water supplied to agricultural users		X		X			X		X
S29: Waterway Rehabilitation - Riparian Zones - 3/4 order streams							X		X
S33: Rural Best Management Practices (e.g. limiting erosion etc)					X		X		X
S30: Increased implementation of Erosion & Sediment Control on development sites	X						X		X
S32: Future development WSUD measures achieve no worsening	X						X		X
S16: Education & /or Capacity Building and investment in incentive schemes	X	X		X	X		X		X
S10: Stormwater harvesting for non-potable reuse		X					X		X
S5: Recycled water supplied to urban users		X		X			X		X
S7: Sewer mining - small community based plants to treat and reuse sewage	X	X		X		X			
S8: Indirect Potable Reuse of Purified Recycled Water (PRW)							X		X
S9: Rainwater tanks retrofitted for non-potable uses		X					X		X
S31: Existing WSUD Retrofit							X		X
S26: Smart sewers (reduced infiltration/inflows)	X					X			
S27: Prevention of illegal stormwater inflow connections to sewer						X			
S25: Diversion of sewage to STPs with capacity	X					X			
S23: Upgrade STP Infrastructure	X					X			

Table 5-12 Upper Pine River Catchment Solution Set

Implementation Key:

Unitywater

Council Policy

Council Infrastructure

Upper Pine River Catchment Solution Set Description	A Population Growth	B Water Supply	C Environmental Flows	D Climate Change	E Water Conservation	F STP Capacity	G Water Quality	H Water Quantity (flooding)	I Environmentally Sensitive Areas
S29: Waterway Rehabilitation - Riparian Zones - 3/4 order streams							x		
S16: Education & /or Capacity Building and investment in incentive schemes							x		
S33: Rural Best Management Practices (e.g. limiting erosion etc)							x		
S32: Future development WSUD measures achieve no worsening							x		
S30: Increased implementation of Erosion & Sediment Control on development sites							x		
S31: Existing WSUD Retrofit							x		
S35: Cap at current Population without any other solutions implemented						x			
S26: Smart sewers (reduced infiltration/inflows)						x			
S27: Prevention of illegal stormwater inflow connections to sewer						x			
S7: Sewer mining - small community based plants to treat and reuse sewage						x			
S23: Upgrade STP Infrastructure						x			

Table 5-13 Lower Pine River Catchment Solution Set

Implementation Key:

Unitywater
Council Policy
Council Infrastructure

Lower Pine River Catchment Solution Set Description	A Population Growth	B Water Supply	C Environmental Flows	D Climate Change	E Water Conservation	F STP Capacity	G Water Quality	H Water Quantity (flooding)	I Environmentally Sensitive Areas
S32: Future development WSUD measures achieve no worsening	X						X	X	X
S29: Waterway Rehabilitation - Riparian Zones - 3/4 order streams							X		X
S16: Education & /or Capacity Building and investment in incentive schemes							X		X
S31: Existing WSUD Retrofit							X		X
S10: Stormwater harvesting for non-potable reuse							X		X
S30: Increased implementation of Erosion & Sediment Control on development sites	X						X		X
S33: Rural Best Management Practices (e.g. limiting erosion etc)							X		X
S7: Sewer mining - small community based plants to treat and reuse sewage	X					X			
S9: Rainwater tanks retrofitted for non-potable uses							X		X
S5: Recycled water supplied to urban users							X		X
S8: Indirect Potable Reuse of Purified Recycled Water (PRW)							X		X
S26: Smart sewers (reduced infiltration/inflows)	X					X			
S25: Diversion of sewage to STPs with capacity	X					X			
S23: Upgrade STP Infrastructure	X					X			

Table 5-14 Sideling Creek Catchment Solution Set

Implementation Key:

Unitywater
Council Policy
Council Infrastructure

Sideling Creek Catchment Solution Set Description	A Population Growth	B Water Supply	C Environmental Flows	D Climate Change	E Water Conservation	F STP Capacity	G Water Quality	H Water Quantity (flooding)	I Environmentally Sensitive Areas
S29: Waterway Rehabilitation - Riparian Zones - 3/4 order streams							X		
S16: Education & /or Capacity Building and investment in incentive schemes							X		
S33: Rural Best Management Practices (e.g. limiting erosion etc)							X		
S32: Future development WSUD measures achieve no worsening							X		
S30: Increased implementation of Erosion & Sediment Control on development sites							X		
S31: Existing WSUD Retrofit							X		

Table 5-15 Hays Creek Catchment Solution Set

Implementation Key:

Unitywater
Council Policy
Council Infrastructure

Hays Inlet Catchment Solution Set Description	A Population Growth	B Water Supply	C Environmental Flows	D Climate Change	E Water Conservation	F STP Capacity	G Water Quality	H Water Quantity (flooding)	I Environmentally Sensitive Areas
S29: Waterway Rehabilitation - Riparian Zones - 3/4 order streams							X		X
S32: Future development WSUD measures achieve no worsening	X						X	X	X
S16: Education & /or Capacity Building and investment in incentive schemes							X		X
S30: Increased implementation of Erosion & Sediment Control on development sites	X						X		X
S7: Sewer mining - small community based plants to treat and reuse sewage	X					X			
S5: Recycled water supplied to urban users							X		X
S10: Stormwater harvesting for non-potable reuse							X		X
S31: Existing WSUD Retrofit							X		X
S9: Rainwater tanks retrofitted for non-potable uses							X		X
S26: Smart sewers (reduced infiltration/inflows)	X					X			
S27: Prevention of illegal stormwater inflow connections to sewer						X			
S23: Upgrade STP Infrastructure	X					X			

Table 5-16 Redcliffe Catchment Solution Set

Implementation Key:

Unitywater
Council Policy
Council Infrastructure

Redcliffe Catchment Solution Set Description	A Population Growth	B Water Supply	C Environmental Flows	D Climate Change	E Water Conservation	F STP Capacity	G Water Quality	H Water Quantity (flooding)	I Environmentally Sensitive Areas
S29: Waterway Rehabilitation - Riparian Zones - 3/4 order streams							x		x
S16: Education & /or Capacity Building and investment in incentive schemes	x					x	x		x
S32: Future development WSUD measures achieve no worsening	x						x	x	x
S10: Stormwater harvesting for non-potable reuse							x		x
S31: Existing WSUD Retrofit							x		x
S7: Sewer mining - small community based plants to treat and reuse sewage	x					x			
S5: Recycled water supplied to urban users							x		x
S30: Increased implementation of Erosion & Sediment Control on development sites	x						x		x
S9: Rainwater tanks retrofitted for non-potable uses							x		
S26: Smart sewers (reduced infiltration/inflows)	x					x			
S27: Prevention of illegal stormwater inflow connections to sewer						x			

Table 5-17 Brisbane Coastal Creeks Catchment Solution Set

Implementation Key:

Unitywater
Council Policy
Council Infrastructure

Brisbane Coastal Creeks Catchment Solution Set Description	A Population Growth	B Water Supply	C Environmental Flows	D Climate Change	E Water Conservation	F STP Capacity	G Water Quality	H Water Quantity (flooding)	I Environmentally Sensitive Areas
S29: Waterway Rehabilitation - Riparian Zones - 3/4 order streams							x		
S16: Education & /or Capacity Building and investment in incentive schemes							x		
S32: Future development WSUD measures achieve no worsening							x		
S10: Stormwater harvesting for non-potable reuse							x		
S31: Existing WSUD Retrofit							x		
S30: Increased implementation of Erosion & Sediment Control on development sites							x		

6 STUDY CONCLUSIONS

The outcomes of undertaking Phase 1 of the TWCM planning process have been presented in this TWCM Strategy document, and include the following:

- Identification of the drivers of the TWCM process specific to the MBRC area;
- Description of the existing and future water cycle issues through preliminary water accounting;
- Identification of key water cycle management issues in each relevant catchment in the MBRC region;
- Development and preliminary assessment of solutions using a Multi Criteria Assessment (MCA) approach; and
- Selection of potential solution sets for further detailed assessment.

The findings included in this TWCM Strategy should be utilised in the subsequent phase of the TWCM planning process (Phase 2), which involves detailed assessment of the recommended solution sets. Objectives of Phase 2 include the following:

- To utilise, assess and refine the recommendations developed in Phase 1 of the TWCM planning process and presented in this TWCM Strategy document;
- To identify and prioritise areas within the Moreton Bay Regional Council (MBRC) domain where detailed planning will be undertaken;
- To undertake detailed assessments of the efficacy/efficiency of those potential or shortlisted solutions identified in Phase 1 of the TWCM Planning Process (i.e. TWCM Strategy);
- To derive estimates of the likely ranges of capital and operational costs of each potential solution, including the range of infrastructure required to deliver each solution;
- To undertake consultation throughout the detailed planning phase with key stakeholders such as MBRC, Unitywater, QWC and other State Government agencies; and
- To prepare a detailed TWCM planning and implementation report which will summarise all study analyses and present a robust and defensible argument to MBRC and key stakeholders supporting the recommended TWCM options and most importantly presenting short, medium and long term actions which will see the objectives of the TWCM process (i.e. sustainable and cost effective urban water service provision together with commensurate protection and restoration of water quality levels/environmental values in the waterways of the MBRC) being achieved.

Detailed planning should make use of previous studies and reports, including Water Cycle Management Plans prepared for Pine Rivers Shire Council (MWH, 2005, 2006, and 2009) and sustainable loads studies (BMT WBM, 2008 and 2009), along with any other relevant studies.

An example of the scope of works required for the detailed planning phase (Phase 2) is included in Appendix I.

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APPENDIX A: STP LICENCES

Queensland Government
Environmental Protection Agency
Queensland Parks and Wildlife Service

Southern Regional Office (Brisbane)
PO Box 2771 Brisbane QLD 4001
Phone: (07) 3224 5641 Fax: (07) 3225 8723
www.env.qld.gov.au ABN: 87221158786

Notice of decision to grant licence (without development approval)

Section 93(2)(a) *Environmental Protection Act 1994*

This statutory notice is issued by the administering authority pursuant to section 92(2)(a) of the Environmental Protection Act 1994, *to advise you of a decision or action.*

Enquires to : Ahmad Rahman
Telephone : (07) 3225 1051
Your reference :
Our reference : STH1024

Caboolture Shire Council
Administration Centre
Cnr Hasking Street and Beerburrum Road
CABOOLTURE QLD 4510

Attention: Senthi Nathan,

Re: **Application for an environmental authority (without development approval) by Caboolture Shire Council to carry out Environmentally Relevant Activity (ERA) ERA 15 Sewage treatment located at Canando Street, Woodford, First Avenue, Bribie Island, Uhlmann Road, Burpengary and Weier Road, Morayfield**

Your application for an environmental authority (without development approval) received by this office on 13 September 2000 has been granted.

The administering authority has classified the activity to which the application relates as a level 1 ERA and accordingly you have been granted a licence without development approval.

A copy of Licence No.SR1750 which includes the schedule of conditions, is attached.

This licence takes effect from 20 February 2001.

You may apply to the administering authority for a review of this decision within 14 days after receiving this notice.

You may also appeal against this decision to the Planning and Environment Court.

Information outlining the review and appeal processes under the *Environmental Protection Act 1994* is included with this notice. This information is intended as a guide only You may have other legal rights and obligations.

Signed

Date

R T Anderson
Manager Licensing
Delegate of Administering Authority
Environmental Protection Act 1994

Extracts from the Act Regarding Reviews and Appeals

Procedure for review

521.

(1) A dissatisfied person may apply for a review of an original decision.

(2) The application must-
  (a) be made in the approved form to the administering authority within-
    (i) 14 days after the day on which the person receives notice of the original decision or the administering authority is taken to have made the decision (the "review date"); or
    (ii) the longer period the authority in special circumstances allows not later than the review date; and
  (b) be supported by enough information to enable the authority to decide the application.

(3) On or before making the application, the applicant must send the following documents to the other persons who were given notice of the original decision-
  (a) notice of the application (the "review notice");
  (b) a copy of the application and supporting documents.

(4) The review notice must inform the recipient that submission on the application may be made to the administering authority within 7 days after the application is made to the authority.

(5) If the administering authority is satisfied the applicant has complied with subsection (2) and (3), the authority must, within 14 days after receiving the application-
  (a) review the original decision;
  (b) consider any submissions properly made by a recipient of the review notice; and
  (c) make a decision (the "review decision") to-
    (i) confirm or revoke the original decision; or
    (ii) vary the original decision in a way the administering authority considers appropriate.

(6) The application does not stay the original decision.

(7) The application must not be dealt with by-
  (a) the person who made the original decision; or
  (b) a person in a less senior office than the person who made the original decision.

(8) Within 14 days after making the decision, the administering authority must give written notice of the decision to the applicant and persons who were given notice of the original decision.

(9) The notice must-
  (a) include the reasons for the review decision; and
  (b) inform the person of their right of appeal against the decision.

(10) If the administering authority does not comply with subsections (5) or (8), the authority is taken to have made a decision confirming the original decision.

(11) Subsection (7) applies despite section *Acts Interpretation Act 1954*, section 27A.

(12) This section does not apply to an original decision made by-
  (a) for a matter, the administration and enforcement of which has been devolved to a local government, the local government itself or the chief executive officer of the local government personally; or
  (b) for another matter-the chief executive personally.

Stay of operation of original decisions

522.

(1) If an application is made for review of an original decision, the applicant may immediately apply for a stay of the decision to-
  (a) for an original decision mentioned in schedule 1, part 1 - the tribunal; or
  (b) for an original decision mentioned in schedule 1, part 2 - the Court.

(2) The tribunal or Court may stay the decision to secure the effectiveness of the review and any later appeal to the tribunal or Court.

(3) A stay may be given on conditions the tribunal or Court considers appropriate and has effect for the period stated by the tribunal or Court.
(4) The period of a stay must not extend past the time when the administering authority reviews the decision and any later period the tribunal or Court allows the applicant to appeal against the review decision.

Who may appeal

531.
(1) A dissatisfied person who is dissatisfied with a review decision, other than a review decision to which subdivision 1 applies, may appeal against the decision to the Court.
(2) The chief executive may appeal against another administering authority 's decision (whether an original or review decision) to the Court.
(3) A dissatisfied person who is dissatisfied with an original decision to which section 521 does not apply may appeal against the decision to the Court.

COPY

Environmental Protection Act 1994

Licence No. SR1750

Section 93(2)

Under the provisions of the *Environmental Protection Act 1994* this environmental authority is issued:

To: Caboolture Shire Council

Address: Administration Centre
Cnr Hasking Street and Beerburrum Road
CABOOLTURE QLD 4510

in respect of carrying out the environmentally relevant activities (ERA's) at the following places:

LICENSED PLACE	ERA TYPE	ERA SITE	PROPERTY DESCRIPTION OF LICENSED PLACE
Woodford STP	15(c)	Woodford Sewage Treatment Plant	Lot 506 CG 4859, Parish of Durundur, County of Canning and the lands associated with all sewage pump stations and other ancillary works connected to the Woodford Sewage Treatment Works
Bribie Island STP	15(e)	Bribie Island Sewage Treatment Plant	Lot 64 SL 34290, Parish of Woorim, County of Canning and the lands associated with all sewage pump stations and other ancillary works connected to the Bribie Island Sewage Treatment Works
Burpengary East STP	15(e)	Burpengary East Sewage Treatment Plant	Lot 185 on plan SL11907, Parish of Burpengary, County of Stanley, and the lands associated with all sewage pump stations and other ancillary works connected to the Caboolture Regional Sewage Treatment Works and sewage network
South Caboolture STP	15(f)	Caboolture South Sewage Treatment Plant	Lots 1-3, RP158171, Parish of Caboolture, County of Stanley and the lands associated with all sewage pump stations and other ancillary works connected to the Caboolture South Sewage Treatment Works

located at:

ERA SITE	ADDRESS OF LICENSED PLACE[1]
Woodford Sewage Treatment Plant	Canando Street, Woodford, Qld 45[illegible]
Bribie Island Sewage Treatment Plant	First Avenue, Bribie Island, Qld 45[illegible]
Burpengary East Sewage Treatment Plant	Uhlmann Road, Burpengary East, Qld 4505
Caboolture South Sewage Treatment Plant	Weier Road, Morayfield, Qld 4506
Note 1: Includes all sewage pump stations and ancillary equipment associated with the respective sewage treatment plants and sewage network and other ancillary works.	

This environmental authority is issued subject to the conditions set out in the schedules attached to this environmental authority.

This licence takes effect from 20 February 2001.

signed .....

R T Anderson
Manager Licensing
Delegate of Administering Authority
Environmental Protection Act (1994)

date 20/2/01.

The definitions of the Environmentally Relevant Activity (ERA) Categories are as follows:

ERA 15(c) - Sewage treatment - operating a standard sewage treatment works having a peak design capacity to treat sewage of 1 500 or more equivalent persons but less than 4 000 equivalent persons.

ERA 15(e) - Sewage treatment - operating a standard sewage treatment works having a peak design capacity to treat sewage of 10 000 or more equivalent persons but less than 50 000 equivalent persons.

ERA 15(f) - Sewage treatment - operating a standard sewage treatment works having a peak design capacity to treat sewage of 50 000 or more equivalent persons but less than 100 000 equivalent persons.

The Schedules of the various parts of the environmental authority are as follows:

Schedule A	-	General Conditions
Schedule B	-	Air
Schedule C	-	Water
Schedule D	-	Stormwater Management
Schedule E	-	Land
Schedule F	-	Noise
Schedule G	-	Waste Management
Schedule H	-	Monitoring and Reporting
Schedule I	-	Definitions

SCHEDULE A - GENERAL CONDITIONS

(All conditions are relevant to each site, unless otherwise stated.)

Display of Environmental Authority

(A1) A copy of all parts of this environmental authority relevant to the carrying out the environmentally relevant activities must be kept in a location readily accessible to the personnel that are carrying out those environmentally relevant activities.

Records

(A2) Any records or documents that are required to be kept by a condition of this environmental authority must be kept where practicable to do so at the licensed places where the activities are carried out and at the offices of Caboolture Shire Council, except as otherwise provided, a period of at least five (5) years and be available for examination by an authorised person. The record retention requirements of this condition will be satisfied if any daily and weekly records are kept for a period of at least three (3) years and these records are then kept in the form of annual summaries after that period.

For the purpose of this condition, records may be held in electronic format at the sites and at the administration centre.

Alterations

(A3) No change, replacement or operation of any plant, infrastructure or equipment is permitted if the change, replacement or operation of the plant or equipment increases, or is likely to substantially increase, the risk of environmental harm above that expressly provided by this environmental authority.

An example of a substantial increase in the risk of environmental harm is an increase of ten percent (10%) or more in the quantity of the contaminant to be released into the environment.

Calibration

(A4) All instruments and devices used for the measurement or monitoring of any parameter under any condition of this environmental authority must be calibrated, and appropriately operated and maintained.

Integrated Environmental Management System (IEMS)

(A5) The holder of this environmental authority must implement the Integrated Environmental Management System (IEMS) submitted with the application dated 12 September 2000 and ensure that when implemented the IEMS provides for the effective and appropriate management by the holder of this environmental authority of the actual and potential environmental impacts resulting from the carrying out of the environmentally relevant activities.

(A6) The holder of this environmental authority must not implement an IEMS or amend the IEMS where such implementation or amendment would result in a contravention of any condition of this environmental authority.

(A7) An up to date copy of the IEMS must be kept at the office of Caboolture Shire Council, and where practicable to do so, at the licensed places at that the activities are carried out.

Site Based Management Plans

(A8) The holder of this environmental authority must implement the Site Based Management Plans (SBMP) for the respective ERA sites submitted with the application dated 12 September 2000. .

(A9) The holder of this environmental authority must not implement a SBMP or amend the SBMP where such implementation or amendment would result in a contravention of any condition of this environmental authority.

(A10) An up to date copy of the relevant SBMP must be kept at the office of Caboolture Shire Council and at the licensed places to that that plan relates, or if such is not practicable, at a place readily accessible to personnel that are carrying out the environmentally relevant activity, and be available for examination by an authorised person on request.

Trained Operators

(A11) All persons engaged in the conduct of the activity, including but not limited to employees and contract staff, must be:

(i) trained in the procedures and practices necessary to:

(a) comply with the conditions of this environmental authority, and
(b) prevent environmental harm during normal operation and emergencies; or

(ii) under the close supervision of such a trained person.

Maintenance of Plant, Equipment and Measures

(A12) The holder of this environmental authority must:

(i) install all plant, equipment and measures necessary to ensure compliance with the conditions of this environmental authority;
(ii) maintain all plant, equipment and measures in a proper and efficient condition; and
(iii) operate all plant, equipment and measures in a proper and efficient manner.

In this condition, "plant, equipment and measures" includes:

(a) any plant, equipment and measures used to prevent and/or minimise the likelihood of environmental harm being caused;
(b) any devices and structures to contain foreseeable escapes of contaminants and waste;
(c) any vehicles used to transport waste;
(d) any device or structure used to store, handle, treat or dispose of waste;
(e) any sediment and erosion control measures;
(f) any monitoring equipment and associated alarms; and
(g) any backup systems that act in the event of failure of a primary system.

Nuisance

(A13) Notwithstanding any other condition of this environmental authority, this environmental authority does not authorise any release of contaminants which causes or is likely to cause an environmental nuisance beyond the boundaries of the licensed places.

End of Conditions for Schedule A

SCHEDULE B - AIR

Release of Contaminants to the Atmosphere

(B1) The environmentally relevant activities must be carried out by such practicable means necessary to prevent the release or likelihood of release of contaminants to the atmosphere.

(B2) Where it is not practicable to prevent the release of contaminants to the atmosphere as required by condition (B1), the environmentally relevant activity must be carried out by such practicable means necessary to minimise the release or likelihood of any such release of contaminants to the atmosphere.

Noxious or Offensive Odour

(B3) Notwithstanding any other condition of this environmental authority, no release of contaminants from the licensed places is to cause a noxious or offensive odour beyond the boundaries of the licensed places.

End of Conditions for Schedule B

SCHEDULE C - WATER

Release of Contaminants to Waters

(C1) Contaminants must not be directly or indirectly released from the licensed places to any waters or the bed and banks of any waters except as permitted under the water schedule or the stormwater management schedule.

(C2) The only contaminants permitted to be released from the licensed places at the release point W1 are sewage treatment effluents from the sewage treatment plant.

Release Points

(C3) Contaminants must not be directly or indirectly released from any source on the licensed places to any waters at any location other than the contaminants and sources at the locations listed below:

Schedule C Table 1 - Release Points for Respective Sites

Licensed Place	Release Points	
Woodford STP	Release Point W1	Sewage wastes from the treatment plant via an outfall pipe to waters described as the Stanley River at 64.0 km AMTD
	Other Release Point	Sewage wastes from the sewage pump station overflow as provided for in this environmental authority
Bribie Island STP	Release Point W1	Sewage wastes from the treatment plant outfall pipe discharged to groundwater via the 4 rapid sand infiltration ponds, located approximately 1 km south east of the treatment plant and old effluent sewage disposal areas
	Other Release Points	Sewage wastes from the sewage pump station overflows as provided for in this environmental authority
Burpengary East STP	Release Point W1	Sewage wastes from the sewage treatment plant via an outfall pipe to waters described as the Caboolture River at approximately AMTD 1.2 km.
	Other Release Points	Sewage wastes from the sewage pump station overflows as provided for in this environmental authority.
South Caboolture STP	Release Point W1	Sewage wastes from the treatment plant via an outfall pipe to waters described as the Caboolture River at 19.0 km AMTD.
	Other Release Points	Sewage wastes from the sewage pump station overflows as provided for in this environmental authority.

Release Point Details

(C4) Release point number W1 at Woodford STP as shown in Schedule C Table 1 must be submerged at all times.

(C5) Release point number W1 at Burpengary East STP as shown in Schedule C Table 1 must be submerged with diffusers such that the top of the outfall pipe is at least 1.2 metres below Low Water Datum in the Brisbane River.

(C6) Release point number W1 at South Caboolture STP as shown in Schedule C Table 1 must be submerged such that the top of the outfall pipe is at least 0.14 metres below Low Water Datum in the Caboolture River.

Times of Discharge

(C7) The discharge of contaminants from release point W1 at Burpengary East STP as shown in Schedule C Table 1 must only occur four and a half (4.5) hours on either side of high tide.

(C9) The holder of this environmental authority must keep an accurate record of the times of effluent release.

Quantity of Contaminants Released

(C10) The quantity of release of treated effluent from each ERA sites must not exceed those limits as shown in Schedule C Table 2 - Quantity of Contaminants Released.

Schedule C Table 2 - Quantity of Contaminants Released

Licensed Place	Dry Weather Day (cubic metres per day)	Wet Weather Day (cubic metres per day)
Woodford STP	649	1475
Bribie Island STP	11535	32040
Burpengary East STP	11664	32400
South Caboolture STP	16300	48000

Quality Characteristics of Release to Waters

(C11) The release of contaminants to waters must comply, at the sampling and in-situ measurement points specified in Schedule H, with each of the limits specified in Schedule C Table 3 for each quality characteristic.

SCHEDULE C TABLE 3 - RELEASE QUALITY CHARACTERISTIC LIMITS

QUALITY CHARACTERISTICS	RELEASE LIMIT [1]	RELEASE LIMIT [2]	RELEASE LIMIT [3]	LIMIT TYPE
5-day Biochemical Oxygen Demand (uninhibited)	10 mg/L	10 mg/L	20 mg/L	long term 80 percentile compliance
5-day Biochemical Oxygen Demand (uninhibited)	15 mg/L	15 mg/L	30 mg/L	short term 80 percentile compliance
5-day Biochemical Oxygen Demand (uninhibited)	20 mg/L	30 mg/L	40 mg/L	maximum
Suspended Solids	15 mg/L	15 mg/L	30 mg/L	long term 80 percentile compliance
Suspended Solids	20 mg/L	20 mg/L	45 mg/L	short term 80 percentile compliance
Suspended Solids	30 mg/L	45 mg/L	60 mg/L	maximum
Total Nitrogen (as Nitrogen)	10	5 mg/L	10	long term 50 percentile compliance
Total Nitrogen (as Nitrogen)	12.5	7.5 mg/L	12.5	short term 50 percentile compliance
Total Nitrogen (as Nitrogen)	20	15 mg/L	20	maximum
Total Phosphorus (as Phophorus)	2	1 mg/L	2	long term 50 percentile compliance
Total Phosphorus (as Phophorus)	3	1.5 mg/L	3	short term 50 percentile compliance
Total Phosphorus (as Phophorus)	5	3 mg/L	5	maximum
Dissolved Oxygen	2.0 mg/L	2.0 mg/L	2.0 mg/L	minimum
pH	6.5 to 8.5	6.5 to 8.5	6.5 to 8.5	range
Free Chlorine Residual	0.7 mg/L	0.7 mg/L	-	maximum
Faecal Coliforms [4]	1000 organisms per 100 mL as a median value (minimum of 5 samples taken at not less than half-hourly intervals in any one day, with 4 out of the 5 samples containing less than 4000 organisms per 100 mL)		Notes 1. Applicable to Woodford STP 2. Applicable to Burpengary East STP and South Caboolture STP 3. Applicable to Bribie Island STP	

(C12) Notwithstanding the quality characteristic limits specified in Schedule C Table 3, the release of contaminants to waters where authorised under this environmental authority must comply with the following qualitative characteristics:

(i) The release must not have any properties nor contain any organisms or other contaminants which are capable of causing environmental harm.

(ii) The release must not produce any slick or other visible evidence of oil or grease, nor contain visible floating oil, grease, scum, litter or other objectionable matter.

Pump Station and Overflow Structure

(C13) The only pump station/s permitted to release contaminants to waters are listed below and may only release at the corresponding discharge overflow locations:

Schedule C Table 4 - Pump Station and Overflow

Licensed Place	Pump Station	Street Location	Discharge Location
Woodford STP	WF 02	Archer Street	One Mile Creek
Bribie Island STP	BI 01	Kangaroo Av and Goodwin Drive	Pumicestone Passage
	BI 11	Verdoni Street Bongaree	Dux Creek
	BI 29	Solander Esplanade Public Toilet	*Approx 6 m from high water mark*
Burpengary East STP	DB01	Webster Road, Deception Bay	Deception Bay foreshore
	DB02	Wallin Avenue, Burpengary	Deception Bay foreshore
	DB03	Captain Cook Parade, Burpengary	Deception Bay foreshore
	BG01	Springfield Drive, Burpengary	Burpengary Creek
South Caboolture STP	MF01	Weir Road, Caboolture	Caboolture River
	MF06	Masters Court, Caboolture	Gympie Creek
	CT04	Railway Parade, Caboolture	Lagoon Creek
	CT05	Dux Street, Caboolture	Caboolture River
	CT07 Effluent Tank at Old North Caboolture STP	Martin Street, Caboolture Lower King Street Caboolture	Lagoon Creek Caboolture River

(C14) Pump stations whose failure will result in a direct or indirect release of contaminants to waters must be fitted with stand-by pumps and pump-failure alarms. Pump failure alarms must be able to operate without mains power.

(C15) No release of contaminants from pump stations or other ancillary works must occur except as a result of power failure, excessive rainfall, accidental damage or other emergency.

Emergency/Contingency Plan

(C16) The holder of this environmental authority must implement the Emergency Response/Contingency Plans as described in the Site Based Management Plans.

(C17) Notwithstanding condition number (C16) the holder of this environmental authority must not implement the Emergency Response/Contingency Plans or amend the Waste Management Plans where such implementation or amendment would result in a contravention of any condition of this environmental authority.

Minimise Sewer Infiltration

(C18) The holder of this environmental authority must take all reasonable and practicable measures to minimise infiltration.

(C19) For the purpose of demonstrating compliance with condition (C17), the holder of this environmental authority must periodically report to the administering authority on the following matters:

(i) the estimated level of infiltration; and
(ii) the reasonable and practicable measures intended to be implemented to minimise infiltration; and
(iii) the actions taken to minimise infiltration; and
(iv) periodic re-estimations of the level of infiltration and, by comparison with previous infiltration estimates and connected population, an assessment of the effectiveness of the actions taken to minimise infiltration.

(C20) The reports required by condition (C19) must be lodged with the administering authority with each annual return.

End of Conditions for Schedule C

SCHEDULE D - STORMWATER MANAGEMENT

Contaminant Releases Caused by Rainfall

(D1) The environmentally relevant activities must be carried out by such practicable means necessary to prevent the contact of incident rainfall and stormwater runoff with wastes or other contaminants.

(D2) Where it is not practicable to prevent contact as required by condition D1 above, the environmentally relevant activity must be carried out by such practicable means necessary to minimise any such contact.

Release of Contaminated Stormwater Runoff

(D3) Except as otherwise provided by the conditions of the stormwater management schedule and the water schedule of this environmental authority, the environmentally relevant activity must be carried out by such practicable means necessary to prevent the release or likelihood of release of contaminated runoff from the licensed places to any stormwater drain or waters or the bed or banks of any such waters.

(D4) Where it is not practicable to prevent any release of contaminated runoff as required by condition D3, the environmentally relevant activities must be carried out by such practicable means necessary to minimise any such release or the likelihood of any such release.

Stormwater Management Plan

(D5) The holder of this environmental authority must implement the Stormwater Management Plans as described in the Site Based Management Plans.

(D6) Notwithstanding condition number (D5) the holder of this environmental authority must not implement the Stormwater Management Plans or amend the Waste Management Plans where such implementation or amendment would result in a contravention of any condition of this environmental authority.

Maintenance and Cleanup

(D7) The maintenance and cleaning of vehicles and any other equipment or plant must be carried out in areas from where contaminants cannot be released into any waters, roadside gutter or stormwater drainage system.

(D8) Any spillage of wastes, contaminants or other materials must be cleaned up as quickly as practicable. Such spillages must not be cleaned up by hosing, sweeping or otherwise releasing such wastes, contaminants or material to any stormwater drainage system, roadside gutter or waters.

Acid Sulphate Soils

(D9) Any acid sulphate soils or potential acid sulphate soils disturbed, extracted or unearthed as a result of carrying out the environmentally relevant activity or activities must be stored and/or treated and/or disposed of so as not to cause environmental harm to surface waters and/or groundwaters.

Bunding

(D10) All chemical tank storages must be bunded so that the capacity of the bund is sufficient to contain at least one hundred percent (100%) of the largest storage tank plus ten percent (10%) of the second largest tank within the bund.

(D11) All chemical drum storages must be bunded so that the capacity of the bund is sufficient to contain at least twenty five percent (25%) of the maximum design storage volume within the bund.

(D12) All tanker loading/unloading areas must be bunded so that the capacity of the bund is sufficient to contain one hundred percent (100%) of the largest compartment of any tanker using the area.

(D13) All bunding must be constructed of materials which are impervious to the materials stored.

(D14) The base and walls of all bunded areas must be maintained free from gaps or cracks.

(D15) All bunding must be roofed where practicable.

(D16) Where it is impractical to completely roof a bunded area the holder of this environmental authority must ensure that any stormwater captured within the bund is free from contaminants or wastes prior to any release.

(D17) All empty drums must be stored with their closures in place.

Dry Chemicals Storage

(D18) All dry chemicals must be stored in weather proof enclosures.

Pond conditions

(D19) All ponds used for the storage or treatment of contaminants or wastes must be constructed and maintained to ensure the stability of the ponds' construction.

(D20) Suitable banks and/or diversion drains must be installed and maintained to exclude stormwater runoff from any ponds or other structures used for the storage or treatment of contaminants or wastes.

End of Conditions for Schedule D

SCHEDULE E - LAND APPLICATION

Release of Contaminants to Land

(E1) Except as otherwise provided by the conditions of the land schedule of this environmental authority, the environmentally relevant activities must be carried out by such practicable means necessary to prevent the release or likelihood of release of contaminants to land.

(E2) Where it is not practicable to prevent any release of contaminants to land as required by condition (E1), the environmentally relevant activities must be carried out by such practicable means necessary to minimise the release or likelihood of release of any such contaminants to land.

Description of Contaminants

(E3) The only contaminants allowed to be released to land are sewage treatment effluents from the sewage treatment plant.

Contaminant Release Location

(E4) The defined contaminant release areas are described as landscaped areas of the licensed places.

Contaminant Release Quality

(E5) Treated sewage effluent used for irrigation purposes must comply with quality characteristics specified for respective sites in Schedule C Table 3.

Contaminant Release Precautions

(E6) The contaminant release areas must not be used for grazing, recreational activities or as a traffic thoroughfare.

(E7) The release of contaminants to land must not be carried out if soil moisture conditions are such that surface runoff or ponding is likely to occur.

(E8) Spray from any release of contaminants to land must not drift beyond the boundaries of the licensed places.

(E9) Public access to any contaminant release area must be denied during the release of contaminants to land and until the release area has dried.

(E10) Pipelines and fittings for the release of contaminants to land must be clearly identified. Standard water taps, hoses and cocks must not be fitted to contaminant release pipelines, and the contaminant release system must not be connected to other service pipelines. Lockable valves or removable handles must be fitted to the contaminant release pipelines where there is public access to the contaminant release areas.

Provision of Treated Effluent to other Person(s)

(E11) The quality of treated sewage effluent given to another person for irrigation purposes must comply, at the sampling and in-situ measurement point specified in Schedule H of the self monitoring and reporting schedule, with each of the release limits specified in Schedule C Table 3 for each quality characteristic.

(E12) If the holder of this environmental authority gives or transfers ownership of the treated sewage effluent to another person(s), the holder of this environmental authority must:

(i) prior to giving such effluent or transferring ownership of such effluent to that person(s), obtain from that person details of how that person intends to comply with the general environmental duty provided for by Section 36 of the Act in respect of the use and disposal of such effluent, particularly in relation to the environmental sustainability of any effluent disposal, protection of public health and protection of environmental values of waters; and

(ii) only give or transfer ownership of such effluent in accordance with a written agreement between the holder of this environmental authority and that person(s); and

(iii) upon becoming aware that the person is not or is not likely to comply with the general environmental duty provided by Section 36 of the Act, cease the giving and transferring ownership of such effluent, as the case may be.

End of Conditions of Schedule E

SCHEDULE F - NOISE

Emission of Noise

(F1) In the event of a complaint about noise that constitutes intrusive noise being made to the administering authority, that the administering authority considers is not frivolous or vexatious, then the emission of noise from the premises to which this development approval relates must not result in levels greater than those specified in Schedule F - Table 1.

SCHEDULE F - TABLE 1

NOISE LIMITS AT A NOISE SENSITIVE PLACE	
Period	Noise Level at a Noise Sensitive Place Measured as the Adjusted Maximum Sound Pressure Level ($L_{Amax\ adj,\ T}$)
7 am - 6 pm	Background noise level plus 5 dB(A)
6 pm - 10 pm	Background noise level plus 5 dB(A)
10 pm - 7 am	Background noise level plus 3 dB(A)
NOISE LIMITS AT A COMMERCIAL PLACE	
Period	Noise Level at a Commercial Place measured as the Adjusted Maximum Sound Pressure Level ($L_{Amax\ adj,\ T}$)
7 am - 6 pm	Background noise level plus 10 dB(A)
6 pm - 10 pm	Background noise level plus 10 dB(A)
10 pm - 7 am	Background noise level plus 8 dB(A)

End of Conditions for Schedule F

SCHEDULE G - WASTE MANAGEMENT

General

(G1) Waste must not be released to the environment, stored, transferred or disposed of contrary to any condition of this environmental authority.

(G2) The holder of this environmental authority must not:

(i) burn waste (apart from off-gases from the anaerobic digesters) at or on the licensed places; nor
(ii) allow waste to burn or be burned at or on the licensed places; nor
(iii) remove waste from the licensed places and burn such waste elsewhere.

Waste Management Plan

(G3) The holder of this environmental authority must implement the Waste Management Plans as described in the Site Based Management Plans.

(G4) Notwithstanding condition number (G3) the holder of this environmental authority must not implement the Waste Management Plans or amend the Waste Management Plans where such implementation or amendment would result in a contravention of any condition of this environmental authority.

Off Site Movement

(G5) Where regulated waste is removed from any of the licensed places (other than by a release as permitted under another schedule of this environmental authority), the holder of this environmental authority must monitor and record the following:

(i) the date, quantity and type of waste removed; and
(ii) name of the waste transporter and/or disposal operator that removed the waste; and
(iii) the intended treatment/disposal destination of the waste.

(NOTE: Records of documents maintained in compliance with a waste tracking system established under the *Environmental Protection Act 1994* or any other law for regulated waste will be deemed to satisfy this condition).

(G6) Regulated waste must not be sent for disposal at any facility without the written approval of the person operating that facility.

Records

(G7) Records must be maintained for a period of five (5) years for all wastes mentioned in this schedule

Notification of Improper Disposal Of Regulated Waste

(G8) If the holder of this environmental authority becomes aware that a person has removed regulated waste from any of the licensed places and disposed of the regulated waste in a manner which is not authorised by this environmental authority or is improper or unlawful, then the holder of this environmental authority must, as soon as practicable, notify the administering authority of all relevant facts, matters and circumstances known concerning the disposal.

Spillage and Cleanup

(G9) The holder of this environmental authority must ensure that a facility or equipment is available for the containment and recovery of any spillages at the loading point.

End of Conditions for Schedule G

SCHEDULE H - MONITORING AND REPORTING

Complaint Recording

(H1) All complaints received by the holder of this environmental authority relating to operations at the licensed places must be recorded in a logbook with the following details:

(i) nature, time and date of complaint;
(ii) type of communication (telephone, letter, personal etc.);
(iii) name, contact address and contact telephone number of complainant (Note: if the complainant does not wish to be identified then "not identified" is to be recorded);
(iv) response and investigation undertaken as a result of the complaint;
(v) name of person responsible for investigating complaint; and
(vi) action taken as a result of the complaint investigation and signature of responsible person.

(H2) The complaints record required by condition (H1) must be maintained for a period of not less than five (5) years.

Incident Recording

(H3) A record must be maintained of events including but not limited to:

(i) the time, date and duration of equipment (including sewage pump stations) malfunctions, that may affect the environmental performance of the licensed places; and
(ii) any shut-downs of equipment upon which the environmental performance of the licensed places depends.

(H4) The record required by condition H3 must be maintained for a period of not less than five (5) years.

Notification of Emergencies and Incidents

(H5) As soon as practicable after becoming aware of any emergency or incident which results in the release of contaminants not in accordance, or reasonably expected to be not in accordance with the conditions of this environmental authority, the holder of this environmental authority must notify the administering authority of the release by telephone or facsimile. email ?

(H6) The notification of emergencies or incidents as required by condition (H5) must include but not be limited to the following:

(i) The holder of the environmental authority;
(ii) the location of the emergency or incident;
(iii) the number of the environmental authority;
(iv) the name and telephone number of the designated contact person;
(v) the time of the release;
(vi) the time the holder of the environmental authority became aware of the release;
(vii) the suspected cause of the release;
(viii) the environmental harm caused, threatened, or suspected to be caused by the release; and
(ix) actions taken to prevent further any release and mitigate any environmental harm caused by the release.

(H7) Not more than fourteen (14) days following the initial notification of an emergency or incident, the holder of the environmental authority must provide written advice of the information supplied in accordance with condition H6 in addition to:

(i) proposed actions to prevent a recurrence of the emergency or incident; and
(ii) outcomes of actions taken at the time to prevent or minimise environmental harm.

(H8) As soon as practicable, but not more than six (6) weeks following the conduct of any environmental monitoring performed in relation to the emergency or incident, which results in the release of contaminants not in accordance, or reasonably expected to be not in accordance with the conditions of this environmental authority, the holder of the environmental authority must provide written advice of the results of any such monitoring performed to the administering authority.

Monitoring of Contaminant Releases to Waters

(H9) The holder of this environmental authority is responsible for the making of determinations of the quality of the contaminants released for the release points, quality characteristics, and at the frequency specified in Schedule H Table 1:

Schedule H - Table 1

Quality Characteristic	Units	Frequency
5-day Biochemical Oxygen Demand	mg/L	Weekly
Suspended Solids	mg/L	Weekly
pH	pH scale	Weekly
Dissolved Oxygen	mg/L	Weekly
Free Chlorine Residual	mg/L	Weekly
Faecal Coliforms	org/100 mL	Weekly
Total Nitrogen (as Nitrogen)	mg/L	Weekly
Total Phosphorus (as Phosphorus)	mg/L	Weekly

Sampling and In-situ Monitoring Point Details

(H10) Determinations of the quality of contaminants released to waters to check conformity with the release quality characteristics specified in Schedule C of this environmental authority must be undertaken at the sampling and in-situ measurement point described below in Schedule H Table 3 for respective sites.

Schedule H Table 3 - Sampling and In-situ Monitoring Point Details

Licensed Place	Sampling and In-situ Monitoring Point Details
Woodford STP	The outlet from the chlorine detention tank, apart from the determination of dissolved oxygen, which shall be undertaken at the outlet from the energy dissipation flume.
Bribie Island STP	The first manhole downstream of the secondary sedimentation tank, except for the determination of either free chlorine residual or microbiological quality, which shall be performed at the outlet from the chlorine detention tank.
Burpengary East STP	Prior to chlorination except for those measurements of microbiological activity and free residual chlorine which shall be sampled at a point described as after chlorination but before release.
South Caboolture STP	Prior to chlorination, apart from the determinations of Free Chlorine Residual and microbiological quality, which shall be performed after disinfection.

Quality Determinations

(H11) All determinations of the quality of contaminants released to waters must be made in accordance with methods prescribed in the Department of Environment Water Quality Sampling Manual, 3rd Edition, February 1999, or more recent additions or supplements to that document as such become available, or as specifically approved by the administering authority.

(H12) All determinations of the quality of contaminants released must be performed by a person or body possessing appropriate experience and qualifications to perform the required measurements.

(H13) Records must be kept of the results of all determinations of the quality of contaminants released to waters for a period of at least five (5) years.

Monitoring Of Volume of Release

(H14) The daily quantity of contaminants released must be determined or estimated by an appropriate method, for example, a flow meter.

(H15) Records must be kept of the results of all determinations of the daily quantity of contaminants released to waters for a period of at least five (5) years.

Noise Monitoring

(H16) For the purposes of investigating any complaint made about noise annoyance and also for checking compliance with condition F3 in Schedule F, monitoring and recording the noise levels from the environmentally relevant activity must be undertaken for at least the following descriptors, characteristics and conditions:

(i) $L_{Amax,\ Adj\ T}$
(ii) $L_{Abg,\ T}$ (or $L_{A90,\ T}$);
(iii) $L_{AN,\ T}$ (where N equals statistical levels of 1, 10, 50, 90 and 99);
(iv) Max $L_{pA\ T}$;
(v) $L_{Aeq,\ T}$.
(vi) the level and frequency of occurrence of impulsive or tonal noise;
(vii) atmospheric conditions including temperature, relative humidity and wind speed and direction; and
(viii) effects due to extraneous factors such as traffic noise.

(H17) In conjunction with the measurement and recording of the noise, the following parameters and conditions must be recorded

(i) location, date and time of recording

(H18) Monitoring must also be undertaken to investigate any complaint of noise annoyance upon receipt of a written request from the administering authority to carry out such monitoring.

(H19) The method of measurement and reporting of noise levels must comply with the Environmental Protection Agency Noise Measurement Manual, third edition, March 2000, or more recent additions or supplements to that document as become available.

(H20) The measurement and reporting of noise levels must be undertaken by a person or body possessing appropriate experience and qualifications to perform the required measurements.

(H21) Records must be kept of the results of all monitoring of noise levels and other information required to be recorded in conjunction with such monitoring for a period of at least five (5) years.

Exception Reporting

(H22) The holder of this environmental authority must notify the administering authority in writing of any monitoring result which indicates an exceedance of any licence limit within twenty eight (28) days of completion of the analysis.

(H23) The written notification required by condition H22 above must include:

(i) The full analysis results, and
(ii) Details of investigation or corrective actions taken, and
(iii) Any subsequent analysis.

Monitoring Reporting

(H24) Any monitoring data compiled, collected or recorded as required by conditions of this environmental authority shall be supplied to the administering authority with the annual return.

Receiving Environment Monitoring Program

(H25) The holder of this environmental authority must develop and implement a Receiving Environment Monitoring Program to monitor the effects of the release of contaminants on the "receiving environment" to effectively determine whether environmental values are being protected.

"Receiving environment" for the purpose of the Receiving Environment Monitoring Program means the receiving environment detailed for relevant ERA site in Schedule H Table 4.

Schedule H Table 4 - Receiving environments relevant to each ERA Site

ERA Site	Receiving environment for that ERA Site
Woodford STP	(i) Stanley River; and (ii) Moreton Bay
Burpengary East STP	(i) Caboolture River; and (ii) Moreton Bay
South Caboolture STP	(i) Caboolture River; and (ii) Moreton Bay

(H26) In developing The Receiving Environment Monitoring Program, the holder of this environmental authority must:

(i) submit a proposal for the Receiving Environment Monitoring Program to the administering authority for its review and comment:

(a) in the case of the holder of this environmental authority not becoming a "participating member" as defined in condition number (H26), 90 days from the date this environmental authority takes effect; or

(b) in the case of the holder of this environmental authority ceasing to be a "participating member" as defined in condition number (H26), 60 days from the date the holder of this environmental authority ceases to be a "participating member"; and

(ii) ensure the proposed program describes and addresses at least the following:

(a) description of potentially affected environment including key communities and ambient water quality;

(b) description of water quality objectives and biological objectives to be achieved;

(c) description of selected physico-chemical and biological indicators and reasons for their inclusion;

(d) the proposed monitoring locations including control locations and reasons for their selection;

(e) the proposed sampling depths;

(f) the frequency of sampling and analysis;

(g) any historical data sets to be relied upon; and

(h) description of the statistical basis on which conclusions are drawn; and

(iii) have due regard to the comments of the administering authority in the finalisation of the Receiving Environment Monitoring Program.

(H27) In evaluating the effect of the release on environmental values of receiving environment, consideration must be given to at least the following:

(i) water quality criteria specified in the Australian & New Zealand Environment & Conservation Council's "Australian Water Quality Guidelines for Fresh and Marine Waters", November 1992; and

(ii) any Environmental Protection Policies enacted under Queensland's Environmental Protection Act 1994 concerning water quality and ecosystems; and

(iii) any relevant reports produced with respect to the Environmental Protection Agency's Water Quality Monitoring Programs if applicable; and

(iv) any relevant reports produced by the Brisbane River and Moreton Bay Wastewater Management Study.

(H28) Within 30 days of the date of receipt of written comment from the administering authority as per condition number (H26), or such other period as advised in writing by the administering authority, the applicant must commence carrying out the Receiving Environment Monitoring Program.

(H29) The holder of this environmental authority must submit a report of the results of the Receiving Environment Monitoring Program including an assessment of the impact of the release of contaminants upon the receiving environment with each Annual Return. The assessment must address whether environmental values are being protected with reference to water quality data and any other monitoring data obtained and state the basis on which the conclusions are drawn.

Option to become a 'participating member' in an equivalent Receiving Environment Monitoring Program carried out by other persons and/or agencies.

(H30) As an alternative to developing and implementing a Receiving Environment Monitoring Program for North Pine River and Moreton Bay, the holder of this environmental authority may become and remain a "participating member" in a study carried out by other persons or agencies that meets the requirements of condition numbers (H25) to (H29) inclusive (the equivalent study), such as, the Southeast Queensland Regional Water Quality Management Study and the Ecological Health Monitoring Program proposed to be carried out under the Study.

A "participating member" for the purposes of condition number (H26) and the condition numbers (H30) to (H32) inclusive means that the holder of this environmental authority actively participates in the equivalent study and any monitoring program resulting from such study.

(H31) The holder of this environmental authority will be deemed to comply with condition numbers (H25) to (H29) in so far as they relate to Stanley and Caboolture Rivers and Moreton Bay, so long as the holder of this environmental authority continues to be a "participating member" in an equivalent study. In the event that the holder of this environmental authority ceases to be a "participating member" in an equivalent study, then the holder of this environmental authority must within sixty (60) days submit a proposal for a Receiving Environment Monitoring Program in accordance with condition number (H26).

(H32) If the holder of this environmental authority ceases to be to be a participating member in an equivalent study, then the holder of this environmental authority must within fourteen (14) days notify the administering authority in writing that they are no longer a "participating member".

Monitoring of Groundwater Quality (applicable to Bribie Island STP only)

(H33) The holder of this environmental authority must conduct an on-going Groundwater Monitoring Program as recommended in the "Bribie Island Groundwater Investigation Draft Report by John Wilson and Partners dated March 2000" to monitor the quality of groundwater affected, or likely to be affected, by the indirect discharge of treated wastes to the groundwater via the sand infiltration ponds.

(H34) The Groundwater Monitoring Program must include but not be limited to the following:

(i) validation of the plume flow direction as per groundwater modelling referred to in condition number (H33);

(ii) measurement of standing water levels in bores on each occasion that samples are obtained for groundwater monitoring;

(iii) collecting samples of groundwater from each of the 17 groundwater bores except when any of the bores are dry or inaccessible once in every month and analysing the samples for at least the following indicators:

- (a) total nitrogen;
- (b) nitrate;
- (c) total Kjeldahl nitrogen;
- (d) total phosphorus;
- (e) chloride;
- (f) conductivity;
- (g) pH;
- (h) total coliforms;
- (i) faecal coliforms; and
- (j) enteroviruses;

(iv) determining changes in vegetation by aerial photography and ground observation.

(H35) Each groundwater monitoring bore must be fitted with a locked cap at all times other than at the time of sampling.

(H36) The holder of this environmental authority must submit a report of the results of the Groundwater Monitoring Program including an assessment of the impact of the discharge upon the receiving environment with respect to water quality criteria with each Annual Return. This report shall include an interpretation of the results and conclusions by an expert in the field of groundwater monitoring as to whether there is any contamination and if so, the level of environmental harm caused as a result of such contamination.

End of Conditions for Schedule H

SCHEDULE I - DEFINITIONS

(I1) For the purposes of this environmental authority any term not otherwise defined in the Act and any subordinate legislation made pursuant to the Act or in the Definitions Schedule of this Environmental Authority has the meaning conferred to that term in its common usage.

(I2) In the event of any inconsistency arising between the meaning of any term provided in the Definitions Schedule of this Environmental Authority and any common usage of that term, the meaning conferred in the Definitions Schedule of this environmental authority prevails.

For the purposes of this environmental authority the following definitions apply:

(I3) "Act" means the Environmental Protection Act 1994.

(I4) "administering authority" means the Environmental Protection Agency or its successor.

(I5) "AMTD" means Adopted Middle Thread Distance as per the Queensland Water Resources Commission publication entitled "Atlas of AMTD Maps, January 1984."

(I6) "authorised person" means a person holding office as an authorised person under an appointment under the Environmental Protection Act 1994 by the chief executive or chief executive officer of a local government.

(I7) "land" in the Land Application Schedule, means land excluding waters and the atmosphere.

(I8) "mg/L" means milligrams per litre.

(I9) "dry weather day" refers to a day during which no rainfall is recorded at any rainfall measuring station recognised by the Commonwealth Bureau of Meteorology within the sewered area connected to the sewage treatment plant, or if no such measuring station exists, at the nearest such station to the sewage treatment plant. The term also excludes days during which recorded rainfall over the three preceding days exceeds 100 mm.

(I10) "long term 80 percentile compliance" means that not more than ten (10) of the measured values of the quality characteristic are to exceed the stated release limit for any fifty (50) consecutive samples where:

(i) the consecutive samples are taken over a one year period;
(ii) the consecutive samples are taken at approximately equal periods; and
(iii) the time interval between the taking of each consecutive sample is not less than six (6) days.

(I11) "short term 80 percentile compliance" means that not more than one (1) of the measured values of the quality characteristic are to exceed the stated release limit for any five (5) consecutive samples where:

(i) the consecutive samples are taken over a five (5) week period;
(ii) the consecutive samples are taken at approximately equal periods; and
(iii) the time interval between the taking of each consecutive sample is not less than six (6) days.

(I12) "median" means the middle value, where half the data are smaller, and half the data are larger. If the number of samples is even, the median is the arithmetic average of the two middle values.

(I13) "maximum" means that the measured value of the quality characteristic or contaminant must not be greater than the release limit stated.

(I14) "minimum" means that the measured value of the quality characteristic or contaminant must not be less than the release limit stated.

(I15) "range" means that the measured value of the quality characteristic or contaminant must not be greater than the higher release limit stated nor less than the lower release limit stated.

(I16) "$L_{Amax\ adj,\ T}$" means the average maximum A-weighted sound pressure level, adjusted for noise character and measured over a time period of not less than fifteen (15) minutes, using Fast response.

(I17) "background noise level" means either:

$L_{A90,\ T}$ being the A-weighted sound pressure level exceeded for 90 percent (90%) of the time period not less than fifteen (15) minutes, using Fast response, or

$L_{Abg,\ T}$ being the arithmetic average of the minimum readings measured in the absence of the noise under investigation during a representative time period of not less than fifteen (15) minutes, using Fast response.

(I18) "Max$L_{pA\ T}$" means the maximum A-weighted sound pressure level measured over a time period of not less than fifteen (15) minutes, using Fast response.

(I19) "total Nitrogen" means the sum of Organic Nitrogen, Ammonia, Nitrite plus Nitrate, as mg/L of Nitrogen.

(I20) "total Phosphorus" means the sum of the reactive phosphorus, acid-hydrolysable phosphorus and organic phosphorus, as mg/L of Phosphorus. This includes both the inorganic and organic fraction of phosphorus.

(I21) "commercial place" means a place used as an office or for business or commercial purposes.

(I22) "noise sensitive place" means-

(i) a dwelling, mobile home or caravan park, residential marina or other residential premises; or
(ii) a motel, hotel or hostel; or
(iii) a kindergarten, school, university or other educational institution; or
(iv) a medical centre or hospital; or
(v) a protected area; or
(vi) a park or gardens.

(I23) "regulated waste" means non-domestic waste mentioned in Schedule 7 of the Environmental Protection Regulation 1998

End of Conditions for Schedule I

Department of Environment
and Resource Management

Notice

Change to a development approval

This notice is issued by the Department of Environment and Resource Management pursuant to section 376 of the Sustainable Planning Act 2009 ("the Act").

Unitywater
20/27 South Pine Road
BRENDALE QLD 4510

Attention: Scott Lowe

cc. Moreton Bay Regional Council
Pine Rivers District Office
PO Box 5070
STRATHPINE QLD 4500

Our reference: 351093 / BNT128

Re: Request to change a development approval

1. The Chief Executive, Department of Environment and Resource Management (DERM) as concurrence agency received a request to change a development approval on 24 June 2010.

2. **Details of the development approval for the original application**

Assessment Manager ref.: SR1248 – Environmental Authority

Aspect(s) of development:

Material change of use - Environmentally relevant activities	*Sustainable Planning Regulation 2009* - Schedule 7, table 2, item 1

Property/Location description:

Lot 2 Plan 808643
Strong Road, DAYBORO

Department of Environment and Resource Management
www.derm.qld.gov.au ABN 46 640 294 485

Queensland Government

Date of decision for the original application and development approval:

DERM original decision date 7 March 2001

Replacement development approval issued - ENDC00419105

3. The decision for the request to change a development approval made on 24 June 2010 is to approve the request.

4. Attached is a copy of the amended development approval. Please note that the permit reference number has changed from ENDC00419105 to SPCE00766110.

5. The application requested:

- Amend reference to Pine Rivers Shire Council to Moreton Bay Regional Council.
- Amend condition A10 to replace reference to Pine Rivers Shire Council Chambers.
- Amend condition A15 to replace reference to Pine Rivers Shire Council Chambers.
- Amend condition D3 to remove method of cleaning up spillages.
- Replace condition E1 with three conditions to bring approval in line with Queensland Water Recycling Guidelines.
- Amend conditions E12, H16 and H18 from faecal coliforms to *e.coli* to bring approval in line with Queensland Water Recycling Guidelines.
- Amend condition H17 to reflect the actual microbiological sampling point.
- Add an existing pump station that triggers the threshold for 63(1)(b).

The actual changes made to the approval, after agreement, are as follows:

- Unitywater's details have been added to the front of the approval.
- Condition A10 has been deleted.
- Condition A15 has been amended to remove reference to the Pine Rivers Shire Council Chambers.
- Condition E1 has been replaced with requested conditions.
- Conditions E12, H16, H18 and H17 have been amended as requested.
- The pump station listed has been added to the approval.
- The definition and number for environmentally relevant activity – sewage treatment has been updated in line with the *Environmental Protection Regulation 2008*.
- Any reference to the Environmental Protection Agency has been replaced with the Department of Environment and Resource Management.

6. If this notice is given to the person who made the request, or to an entity that gave DERM as the responsible entity a notice under section 373 of the Act or a pre-request response notice, or if this notice is given by DERM as a concurrence agency and the concurrence agency's decision is to refuse the request or approve the request on conditions, such person or entity may appeal against the decision and the attached extract from the Act states how the person or entity may appeal.

Deena Murray
Delegate
Department of Environment and Resource Management
4 August 2010

Enquiries:
Department of Environment and Resource Management
PO Box 168, 29 The Esplanade
COTTON TREE QLD 4558
Phone: 07 5459 6121
Fax: 07 5443 9927
Email: deena.murray@derm.qld.gov.au

Attachments

- Information Sheet – Appeals – Sustainable Planning Act 2009 (extract from the Sustainable Planning Act 2009)
- Copy of the amended development approval.

ecoaccess
environmental licences and permits

Replacement Development Approval
Section 621(4) *Environmental Protection Act 1994*

DERM development approval number:	SPCE00766110
Replacing:	ENDC00419105
Relevant Laws and Policies:	*Environmental Protection Act 1994* and subordinate legislation

Under the provisions of the *Environmental Protection Act 1994* this development approval is issued to:

Unitywater
33 King Street
CABOOLTURE QLD 4510

Development Description:

Carrying out of Environmentally Relevant Activity (ERA):
63 Threshold 2 (b) – Sewage treatment – operating sewage treatment works, other than no release works, with a total daily peak design capacity of more than 100 equivalent persons but less than 1 500 equivalent persons.

at the following place:
Lot 2 Plan808643, County of Stanley, Parish of Whiteside.

located at:
Dayboro Sewage Treatment Plant
Strong Road
DAYBORO QLD 4521

The pump stations listed in the following table are covered by this development approval:

Pump Station	Location	Lot on Plan Description
PS402	Railway Street, Dayboro	N/A

The environmentally relevant activity must be constructed, operated and maintained in accordance with the conditions as set out in the attached schedule of conditions.

Further development permits required
Nil

[1] Permit includes licences, approvals, permits, authorisations, certificates, sanctions or equivalent/similar as required by legislation administered by the Department of Environment and Resource Management

Additional information for applicants

This approval pursuant to the *Environmental Protection Act 1994* does not remove the need to obtain any further approval for this development which might be required by other State and/or Commonwealth legislation. Applicants are advised to check with all relevant statutory authorities. Applicants also should comply with all relevant legislation.

It is a requirement of the *Environmental Protection Act 1994* that if the owner or occupier of this site becomes aware a Notifiable Activity (as defined under schedule 3 of the *Environmental Protection Act 1994*) is being carried out on this land or that the land has been affected by a hazardous contaminant, they must, within 22 business days after becoming aware the activity is being carried out, give notice to the Administering Authority. A list of Notifiable Activities is provided within Schedule 3 of the *Environmental Protection Act 1994*.

Appeal

This development approval is issued pursuant to section 621 of the *Environmental Protection Act 1994*. The rights of review and appeal are attached to this notice.

This development approval takes effect 10 Business days after you receive this notice, or if there is an appeal from the day the appeal is finally decided or is otherwise ended.

Signed

4 August 2010
Date

Deena Murray
Manager (Moreton Bay)
Environmental Services North
South East Region, DERM
Delegate of Administering Authority
Environmental Protection Act 1994

[1] Permit includes licences, approvals, permits, authorisations, certificates, sanctions or equivalent/similar as required by legislation administered by the Department of Environment and Resource Management

SCHEDULE A - GENERAL CONDITIONS

Maintenance of Plant and Equipment

(A1) The holder of this development approval must:

(a) maintain all plant and equipment in a proper and efficient condition; and
(b) operate all plant and equipment in a proper and efficient manner.

In this condition, "plant and equipment" includes:

(i) any plant and equipment used to prevent and/or minimise the likelihood of environmental harm being caused;
(ii) any devices and structures to contain foreseeable escapes of contaminants and waste;
(iii) any vehicles used to transport waste;
(iv) any device or structure used to store, handle, treat or dispose of waste;
(v) any monitoring equipment and associated alarms; and
(vi) any backup systems that act in the event of failure of a primary system.

Display of Development approval

(A2) A copy of all parts of this development approval relevant to the carrying out the environmentally relevant activities must be kept in a location readily accessible to the personnel that are carrying out those environmentally relevant activities.

Records

(A3) Any records or documents are required to be kept by a condition of this development approval must be kept where practicable to do so at the approved place at which the activities are carried out and at the Pine River Shire Council Chambers for, except as otherwise provided, a period of at least five (5) years and be available for examination by an authorised person. The record retention requirements of this condition will be satisfied if any daily and weekly records are kept for a period of at least three (3) years and these records are then kept in the form of annual summaries after that period.

Alterations

(A4) No change, replacement or operation of any plant or equipment is permitted if the change, replacement or operation of the plant or equipment increases, or is likely to substantially increase, the risk of environmental harm above that expressly provided by this development approval.

An example of a substantial increase in the risk of environmental harm is an increase of 10% or more in the quantity of the contaminant to be released into the environment.

Calibration

(A5) All instruments and devices used for the measurement or monitoring of any parameter under any condition of this development approval must be calibrated, and appropriately operated and maintained.

[1] Permit includes licences, approvals, permits, authorisations, certificates, sanctions or equivalent/similar as required by legislation administered by the Department of Environment and Resource Management

Trained Operators

(A6) All persons engaged in the conduct of the activity, including but not limited to employees and contract staff, must be:

(i) trained in the procedures and practices necessary to:

(a) comply with the conditions of this development approval; and
(b) prevent environmental harm during normal operation and emergencies; or

(ii) under the close supervision of such a trained person.

Nuisance

(A7) Notwithstanding any other condition of this development approval, this development approval does not authorise any release of contaminants which causes or is likely to cause an environmental nuisance beyond the boundaries of the approved place.

Inspections by Authorised Persons

(A8) At all reasonable times, and to the satisfaction of an authorised person, the following must be provided to enable an authorised person to check compliance with the conditions of this development approval:

(i) monitoring facilities, and
(ii) access to such facilities, and
(iii) any reasonable assistance which the authorised person deems necessary.

Integrated Environmental Management System (IEMS)

(A9) The holder of this development approval must implement the Integrated Environmental Management System (IEMS) submitted with the application for development approval and ensure that the implemented Integrated Environmental Management System provides for the effective and appropriate management by the holder of this development approval of the actual and potential environmental impacts resulting from the carrying out of the environmentally relevant activities.

(A10) The holder of this development approval must not implement an Integrated Environmental Management System or amend the Integrated Environmental Management System where such implementation or amendment would result in a contravention of any condition of this development approval.

(A11) The holder of this development approval must submit details of any amendment to the Integrated Environmental Management System annually to the administering authority with the Annual Return which immediately follows the enactment of any such amendment.

[1] Permit includes licences, approvals, permits, authorisations, certificates, sanctions or equivalent/similar as required by legislation administered by the Department of Environment and Resource Management

Site-Based Environmental Management Plan

(A12) The IEMS must provide for the development and implementation of a Site-Based Environmental Management Plan which address the management of the actual and potential environmental impacts resulting from the carrying out of the environmentally relevant activities (including any issue/site-specific environmental management plans required to be developed and implemented under the conditions of this development approval) at the approved premise.

(A13) The Site-based Management Plan must address at least the following matters:

(i) routine operating procedures to prevent or minimise environmental harm, however occasioned or caused during normal operations;
(ii) maintenance practices and procedures;
(iii) contingency plans and emergency procedures to deal with foreseeable risks and hazards including corrective responses to prevent and mitigate environmental harm (including any necessary site rehabilitation);
(iv) monitoring of the release of contaminants into the environment including procedures, methods, record keeping and notification of results;
(v) assessment of the environmental impact of any releases of contaminants into the environment including procedures, methods, record keeping and notification of results;
(vi) handling of environmental complaints;
(vii) keeping and production of environmental records and reports;
(viii) lines and methods of communication to be utilised for communication of procedures, plans, incidents, potential environmental problems and results, including a feedback mechanism to ensure that management is made aware of potential environmental problems and any failure of procedures adopted; and
(ix) staff training and awareness of environmental issues related to the operation of the environmentally relevant activities, including responsibilities under the *Environmental Protection Act 1994.*

(A14) An up to date copy of the relevant Site-Based Environmental Management Plan (including any issue/site-specific environmental management plans required to be developed and implemented under the conditions of this development approval) must be kept at the approved place to which that plan relates, or if such is not practicable, at a place readily accessible to personnel that are carrying out the environmentally relevant activity, and be available for examination by an authorised person on request.

End of Conditions for Schedule A

SCHEDULE B - AIR

Release of Contaminants to the Atmosphere

(B1) Except as otherwise provided by the conditions of the air schedule, the environmentally relevant activity must be carried out by such practicable means necessary to prevent the release or likelihood of release of contaminants to the atmosphere.

(B2) Where it is not practicable to prevent the release of contaminants to the atmosphere as required by condition B1, the environmentally relevant activity must be carried out by such practicable means necessary to minimise the release or likelihood of any such release of contaminants to the atmosphere.

[1] Permit includes licences, approvals, permits, authorisations, certificates, sanctions or equivalent/similar as required by legislation administered by the Department of Environment and Resource Management

Noxious or Offensive Odour

(B3) Notwithstanding any other condition of this development approval, no release of contaminants from the approved place is to cause a noxious or offensive odour beyond the boundaries of the approved place.

End of Conditions for Schedule B

SCHEDULE C - WATER

Emergency Response/Contingency Plan

(C1) The holder of this development approval must develop and implement an effective and appropriate Emergency Response/Contingency Plan to manage the environmental impacts of any release of contaminants from pump station and other ancillary equipment.

(C2) The Emergency Response/Contingency Plan address at least the following matters:

(i) the location of the pump station and overflow;
(ii) procedures to be implemented to reduce the likelihood of any pump station failure and likelihood of any release of contaminants;
(iii) response procedures to prevent any further release, or if such is not practicable, minimise the extent and duration of any release to the greatest practicable extent;
(iv) the practices and procedures to be employed to restore the environment, or if such is not practicable, mitigate any environmental impacts of the release (including in both dry and wet conditions);
(v) a description of the resources to be used in response to a release;
(vi) the training of staff that will be called upon to respond to a release;
(vii) procedures to investigate the cause of any release, and where necessary, implement remedial actions to reduce the likelihood of recurrence of a similar event;
(viii) the provision and availability of documented procedures to staff attending any release to enable them to effectively respond;
(ix) timely and accurate reporting of the circumstances and nature of release events to the administering authority;
(x) periodic estimation of the catchment population serviced by the pump station and hence daily dry weather flow to minimise any likelihood of the design capacity of the pump station being exceeded; and
(xi) the need to install screens be investigated and screens installed where appropriate and beneficial.

(C3) A copy of the Emergency Response/Contingency Plan and any subsequent amendment of the Emergency Response/Contingency Plan must be kept at the approved place and be available for examination by an authorised person on request.

(C4) An updated list of all pump stations connected to the sewage treatment plant must be forwarded to the administering authority with each Annual Return.

[1] Permit includes licences, approvals, permits, authorisations, certificates, sanctions or equivalent/similar as required by legislation administered by the Department of Environment and Resource Management

Release of Contaminants to Waters

(C5) Contaminants must not be directly or indirectly released from any approved place to any waters or the bed and banks of any waters except:

(i) as permitted under any water schedule in this development approval; or
(ii) as permitted under any stormwater schedule in this development approval; or
(iii) to a sewer as permitted or otherwise agreed from time to time by the relevant Local Government.

(C6) Contaminated wastewater generated from washing and/or degreasing of any vehicles, any plant and any equipment must be collected and:

(i) treated and disposed of to sewer with the approval of the relevant Local Government in accordance with a tradewaste permit; or
(ii) transported for disposal, recycled, reprocessed or treated at a facility that can lawfully accept such waste.

End of Conditions for Schedule C

SCHEDULE D - STORMWATER MANAGEMENT

Contaminant Releases Caused by Rainfall

(D1) Except as otherwise provided by the conditions of the stormwater management schedule and the water schedule of this development approval, the environmentally relevant activity must be carried out by such practicable means necessary to prevent and/or minimise the release or likelihood of release of contaminated runoff from the approved place to any stormwater drain or waters or the bed or banks of any such waters. "Contaminated runoff" for the purposes of this condition means stormwater and/or stormwater runoff that contains contaminants that may cause environmental harm.

Cleaning and Spillages

(D2) The maintenance and cleaning of any vehicles, other equipment or plant must be carried out in areas where contaminants cannot be released into any waters, roadside gutter or stormwater drain.

(D3) Any spillage of waste, contaminants or other materials must be cleaned up as quickly as practicable to prevent the release of contaminants to Queensland waters (including groundwater).

Acid Sulphate Soils

(D4) Any acid sulphate soils or potential acid sulphate soils disturbed, extracted or unearthed as a result of carrying out the environmentally relevant activity or activities must be stored and/or treated and/or disposed of so as not to cause environmental harm to surface waters and/or groundwaters.

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Bunding

(D5) All chemical tank storages must be bunded so that the capacity of the bund is sufficient to contain at least 100% of the largest storage tank plus 10% of the second largest tank within the bund.

(D6) All chemical drum storages must be bunded so that the capacity of the bund is sufficient to contain at least 25% of the maximum design storage volume within the bund.

(D7) All bunding must be constructed of materials which are impervious to the materials stored.

(D8) The base and walls of all bunded areas must be maintained free from gaps or cracks.

(D9) All bunding must be roofed where practicable.

(D10) Where it is impractical to completely roof a bunded area the holder of this development approval must ensure that any stormwater captured within the bund is free from contaminants or wastes prior to any release.

(D11) All empty drums must be stored with their closures in place.

Minimise Sewer Infiltration

(D12) The holder of this development approval must take all reasonable and practicable measures to minimise infiltration.

(D13) For the purposes of demonstrating compliance with condition D12, the holder of this development approval must periodically report to the administering authority on the following matters:

(i) the estimated level of infiltration;
(ii) the reasonable and practicable measures intended to minimise infiltration;
(iii) the actions taken to minimise infiltration; and
(iv) periodic re-estimations of the level of infiltration and, by comparison with previous infiltration estimates and connected population, an assessment of the effectiveness of the actions taken to minimise infiltration.

(D14) The initial report must be lodged with the administering authority by 1 July 1998 with subsequent reports to be lodged with the annual return in 2000 and at least once every two (2) years thereafter.

End of Conditions for Schedule D

SCHEDULE E – LAND APPLICATION

Contaminant Release Precautions at the Approved Place

(E1) Treated sewage may be used for irrigation purposes on land managed by the registered operator. The quality of treated sewage reused must comply with Queensland Water Recycling Guidelines 2005 or more recent editions or replacements of this document and the conditions of this approval.

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(E2) The quality of treated sewage effluent used for irrigations purposes, or supplied to another party for irrigation purposes by the registered operator must be monitored as a minimum in accordance with the Queensland Water Recycling Guidelines 2005 or more recent editions or replacements of this document and the conditions of this approval.

(E3) The registered operator of the activity to which this development approval relates must, when reusing the water, do so in a manner in which release of the treated effluent to water is not likely.

(E4) The release of contaminants to land must not be carried out within 50 metres of any watercourse.

(E5) The release of contaminants to land must not be carried out if soil moisture conditions are such that surface runoff or ponding is likely to occur.

(E6) Spray from any release of contaminants to land must not drift beyond the boundaries of the approved place.

(E7) Public access to any contaminant release area must be denied during the release of contaminants to land and until the release area has dried.

(E8) Pipelines and fittings for the release of contaminants to land must be clearly identified. Standard water taps, hoses and cocks must not be fitted to contaminant release pipelines, and the contaminant release system must not be connected to other service pipelines. Lockable valves or removable handles must be fitted to the contaminant release pipelines where there is public access to the contaminant release areas.

Release of Contaminants to Land

(E9) The only contaminants to be released to land are treated sewage effluents from the Wet Weather Storage Dam.

Contaminant Release Location

(E10) The defined contaminant release areas are described as irrigation areas No. 1, No. 2 and No. 3 as marked on Pine Rivers Map A1 contained in "Process Description and Calculations" submitted with the application for development approval.

(E11) A minimum of nine (9) hectares of land must be provided for the contaminant release area.

Quantity of Contaminants Released to Land

(E12) The quantity of contaminants released to the release area during any day must not exceed 650 cubic metres.

(E13) The rate of application of contaminants to the release area must not exceed 18 litres per second.

Quality of Contaminants Released from the Sewage Treatment Plant

(E14) The contaminants released from the sewage treatment plant to the Wet Weather Storage Dam must comply, at the sampling and in-situ measurement point/s specified in schedule H, with each of the release limits specified in schedule E - Table 1 for each quality characteristic.

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SCHEDULE E - TABLE 1 RELEASE QUALITY CHARACTERISTIC LIMITS

QUALITY CHARACTERISTICS	RELEASE LIMIT	LIMIT TYPE
5-day Biochemical Oxygen Demand (inhibited)	20 mg/L	80 percentile compliance
5-day Biochemical Oxygen Demand (inhibited)	60 mg/L	maximum
Suspended Solids	30 mg/L	80 percentile compliance
Suspended Solids	90 mg/L	maximum
Ammonia (as Nitrogen)	2.0 mg/L	50 percentile compliance
Ammonia (as Nitrogen)	6.0 mg/L	maximum
pH	6.5 to 8.5	range
Dissolved Oxygen	2.0 mg/L	minimum
e.coli	1000 cfu per 100 mL as a median value (minimum of 5 samples taken at not less than half-hourly intervals in any one day, with 4 out of the 5 samples containing less than 4000 organisms per 100 mL)	

(E15) Notwithstanding the quality characteristic limits specified in Table 1 of the land application schedule the contaminants released must also comply with the following qualitative characteristics:

(i) the release must not have any properties nor contain any organisms or contaminants in concentrations or which are capable of causing environmental harm.

Wet Weather Storage

(E16) When weather conditions or soil conditions preclude the release of contaminants, the contaminants must be directed to a wet weather storage.

(E17) The wet weather storage must be designed to hold a volume equivalent to approximately 110 days storage based on 340 cubic metres per day average wastewater generation rate.

(E18) The wet weather storage must be designed and operated to have a total excess capacity of at least thirty-four (34) megalitres at all times, except in the period after wet weather and provided all reasonable and practicable measures are taken to dispose of the excess effluent by irrigation.

Effluent Irrigation Management Plan

(E19) The holder of this development approval must develop and implement an Irrigation Management Plan which details how the holder of this development approval will effectively and appropriately manage the effluent irrigation process so as to sustainably comply with all conditions of this development approval.

(E20) The Irrigation Management Plan must detail how irrigation is to be managed and scheduled having regard to at least the following:

(i) soil moisture results;
(ii) weather forecasts and climate monitoring results;
(iii) irrigation records for each effluent disposal area;
(iv) characteristics and quantity of contaminants which are applied, including biochemical oxygen demand, suspended solids, total nitrogen, total phosphorus, conductivity, dissolved oxygen, pH, total dissolved salts, sodium, calcium, magnesium, potassium, chloride, sulphate, alkalinity, boron, heavy metals;

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(v) characteristics of the soil in the contaminated release area, including pH, salinity, total dissolved salts, total nitrogen, total phosphorus, total potassium, sodium, calcium, magnesium , calculated Sodium Absorption Ratio, exchangeable cations, heavy metals;
(vi) type of vegetation intended to be grown in the contaminant release area;
(vii) effluent quality results;
(viii) soil quality results for the effluent disposal area(s);
(ix) groundwater level results;
(x) cropping practice for each effluent disposal area;
(xi) sustainable hydraulic loadings for the contaminant release area;
(xii) sustainable biological oxygen demand loadings for the contaminant release area;
(xiii) sustainable nitrogen loadings for the contaminant release area;
(xiv) sustainable phosphorus loadings for the contaminant release area;
(xv) sustainable salt loadings for the contaminant release area; and
(xvi) production of appropriate records and reporting of results and environmental issues.

(E21) A copy of the Irrigation Management Plan must be kept at the approved place.

(E22) The holder of this development approval must not implement an Irrigation Management Plan or amend an Irrigation Management Plan where such implementation or amendment would result in a contravention of any condition of this development approval.

(E23) The holder of this development approval must submit details of any amendment to the Irrigation Management Plan to the administering authority with the annual return which immediately follows the enactment of any such amendment.

End of Conditions for Schedule E

SCHEDULE F - NOISE

Emission of Noise

(F1) In the event of a complaint about noise that constitutes intrusive noise being made to the administering authority, that the administering authority considers is not frivolous or vexatious, then the emission of noise from the approved place must not result in levels greater than those specified in Schedule F - Table 1.

SCHEDULE F - TABLE 1

NOISE LIMITS AT A NOISE SENSITIVE PLACE	
Period	***Noise Level at a Noise Sensitive Place Measured as the Adjusted Maximum Sound Pressure Level*** $L_{Amax\ adj,\ T}$
7 am - 6 pm	Background noise level plus 5 dB(A)
6 pm - 10 pm	Background noise level plus 5 dB(A)
10 pm - 7 am	Background noise level plus 3 dB(A)

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NOISE LIMITS AT A COMMERCIAL PLACE	
Period	***Noise Level at a Commercial Place measured as the Adjusted Maximum Sound Pressure Level*** $L_{Amax\ adj,\ T}$
7 am - 6 pm	Background noise level plus 10 dB(A)
6 pm - 10 pm	Background noise level plus 10 dB(A)
10 pm - 7 am	Background noise level plus 8 dB(A)

End of Condition for Schedule F

SCHEDULE G - WASTE MANAGEMENT

General

(G1) Waste must not be released to the environment, stored, transferred or disposed of contrary to any condition of this development approval.

(G2) The holder of this development approval

(i) allow waste to burn or be burnt at or on the approved place excepting as permitted in a condition of this development approval; nor
(ii) remove waste from the approved place and burn such waste elsewhere.

Off Site Movement

(G3) Where regulated waste is removed from the approved place (other than by a release as permitted under another schedule of this development approval), the holder of this development approval must monitor and keep records of the following:

(a) the date, quantity and type of waste removed; and
(b) name of the waste transporter and/or disposal operator that removed the waste; and
(c) the intended treatment/disposal destination of the waste.

(NOTE: Records of documents maintained in compliance with a waste tracking system established under the *Environmental Protection Act 1994* or any other law for regulated waste will be deemed to satisfy this condition.)

(G4) Regulated waste must not be released to the environment, stored, transferred or disposed of contrary to any condition of this development approval.

Notification of Improper Disposal Of Regulated Waste

(G5) If the holder of this development approval becomes aware that a person has removed regulated waste from the approved place and disposed of the regulated waste in a manner which is not authorised by this development approval or is improper or unlawful, then the holder of this development approval must, as soon as practicable, notify the administering authority of all relevant facts, matters and circumstances known concerning the disposal.

End of Conditions for Schedule G

[1] Permit includes licences, approvals, permits, authorisations, certificates, sanctions or equivalent/similar as required by legislation administered by the Department of Environment and Resource Management

SCHEDULE H - MONITORING AND REPORTING

Complaint Recording

(H1) All complaints received by the holder of this development approval relating to releases of contaminants from operations at the approved place must be recorded and kept in a log with the following details:

(i) time, date and nature of complaint;
(ii) type of communication (telephone, letter, personal etc.);
(iii) name, contact address and contact telephone number of complainant (Note: if the complainant does not wish to be identified then "Not identified" is to be recorded);
(iv) response and investigation undertaken as a result of the complaint;
(v) name of person responsible for investigating complaint; and
(vi) action taken as a result of the complaint investigation and signature of responsible person.

Notification of Emergencies and Incidents

(H2) As soon as practicable after becoming aware of any emergency or incident which results in the release of contaminants not in accordance, or reasonably expected to be not in accordance with the conditions of this development approval, the holder of this development approval must notify the administering authority of the release by telephone or facsimile.

(H3) The notification of emergencies or incidents as required by condition H2 must include but not be limited to the following:

(i) the name of the holder of the development approval;
(ii) the location of the emergency or incident;
(iii) the number of the development approval;
(iv) the name and telephone number of the designated contact person;
(v) the time of the release;
(vi) the time the holder of the development approval became aware of the release;
(vii) the suspected cause of the release;
(viii) the environmental harm caused, threatened, or suspected to be caused by the release; and
(ix) actions taken to prevent further any release and mitigate any environmental harm caused by the release.

(H4) Not more than 14 days following the initial notification of an emergency or incident, the holder of the development approval must provide written advice of the information supplied in accordance with condition H3 in addition to:

(i) proposed actions to prevent a recurrence of the emergency or incident; and
(ii) outcomes of actions taken at the time to prevent or minimise environmental harm.

(H5) As soon as practicable, but not more than six weeks following the conduct of any environmental monitoring performed in relation to the emergency or incident, which results in the release of contaminants not in accordance, or reasonably expected to be not in accordance with the conditions of this development approval, the holder of the development approval must provide written advice of the results of any such monitoring performed to the administering authority.

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Water Quality Determinations

(H6) All determinations of the quality of contaminants released to waters must be made in accordance with methods prescribed in the Water Quality Sampling Manual, 3rd Edition, December 1999, or more recent additions or supplements to that document as such become available.

(H7) All determinations of the quality of contaminants released must be performed by a person or body possessing appropriate experience and qualifications to perform the required measurements.

Noise Monitoring

(H8) For the purposes of checking compliance with condition F1 and investigating any complaint of noise annoyance, monitoring and recording of the noise levels from the activity/activities must be undertaken for the following descriptors, characteristics and conditions:

(i) $L_{Amax, adj\ T}$;
(ii) $L_{Abg, T}$ or $L_{A90, T}$;
(iii) $L_{AN, T}$ (where N equals statistical levels of 1, 10, 50, 90 and 99);
(iv) $L_{pA\ T}$;
(v) $L_{Aeq, T}$;
(vi) the level and frequency of occurrence of impulsive or tonal noise;
(vii) atmospheric conditions including temperature, relative humidity and wind speed and direction; and
(viii) effects due to extraneous factors such as traffic noise.

(H9) In conjunction with the measurement and recording of noise, the following parameters and conditions must be recorded:

(i) location, date and time of recording.

(H10) Monitoring must also be undertaken to investigate any complaint of unreasonable and intrusive noise upon receipt of a written request from the administering authority to carry out such monitoring.

(H11) The method of measurement and reporting of noise levels must comply with the Noise Measurement Manual, 3rd edition, March 2000, or more recent additions or supplements to that document as become available.

(H12) The measurement and reporting of noise levels must be undertaken by a person or body possessing appropriate experience and qualifications to perform the required measurements.

Incident Recording

(H13) A record must be maintained of at least the following events:

(i) the time, date and duration of equipment malfunctions where the failure of the equipment resulted in the release of contaminants reasonably likely to cause environmental harm;
(ii) any uncontrolled release of contaminants reasonably likely to cause environmental harm; and
(iii) any emergency involving the release of contaminants reasonably likely to cause material or serious environmental harm requiring the use of fire fighting equipment.

Exception Reporting

(H14) The holder of this development approval must notify the administering authority in writing of any monitoring result that indicates an exceedance of or non-compliance with any approval limit within 28 days of completion of analysis.

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(H15) The written notification required by condition number H14 above must include:
(i) the full analysis results; and
(ii) details of investigation or corrective actions taken; and
(iii) any subsequent analysis.

Monitoring of Contaminant Releases from the Sewage Treatment Plant to the Wet Weather Storage Dam

(H16) The holder of this development approval is responsible for the making of determinations and keeping of records of the quality of the contaminants released from the sewage treatment plant for the quality characteristics and at the frequency specified in Schedule H - Table 1:

SCHEDULE H - TABLE 1

QUALITY CHARACTERISTICS	UNITS	MONITORING FREQUENCY
5-day Biochemical Oxygen Demand	mg/L	Monthly
Suspended Solids	mg/L	Monthly
Ammonia (as Nitrogen)	mg/L	Monthly
PH	pH scale	Monthly
Dissolved Oxygen	mg/L	Monthly
Total Nitrogen (as Nitrogen)	mg/L	Monthly
Total Phosphorus (as Phosphorus)	mg/L	Monthly
e.coli	cfu/100 mL	Monthly

Sampling and In-situ Monitoring Points Details

(H17) Determinations of the quality of contaminants released to check conformity with the release quality characteristics specified in Schedule E - Table 1 of this development approval must be undertaken at the sampling and in-situ measurement point described as at the outlet of the sewage treatment plant prior to discharge to the wet weather storage dam, apart from the determination of microbiological quality, which shall be performed at the point that irrigation water is drawn from the wet weather storage dam.

Monitoring of Contaminants Released to Land from the Wet Weather Storage Dam

(H18) The holder of this development approval is responsible for the making of determinations and keeping of records of the quality of the contaminants released from the Wet Weather Storage Dam for the quality characteristics, and at the frequency specified in Schedule H - Table 2:

SCHEDULE H - TABLE 2

QUALITY CHARACTERISTICS	UNITS	MONITORING FREQUENCY
5-day Biochemical Oxygen Demand	mg/L	Six monthly
Suspended Solids	mg/L	Six monthly
PH	pH scale	Six monthly
e.coli (geometric mean[log])	cfu/100 mL	Six monthly
Total Nitrogen (as Nitrogen)	mg/L	Six monthly
Total Phosphorus (as Phosphorus)	mg/L	Six monthly
Sodium Adsorption Ratio	calculated	Six monthly
Dissolved Solids	mg/L	Six monthly
Total Dissolved Salts (calculated)	mg/L	Six monthly
Specific Conductance or electrical conductivity	µS/cm	Six monthly

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Exchangeable cations	mg/L	Six monthly
Total Aluminium	mg/L	Six monthly
Total Arsenic	mg/L	Six monthly
Total Barium	mg/L	Six monthly
Total Beryllium	mg/L	Six monthly
Boron	mg/L	Six monthly
Total Cadmium	mg/L	Six monthly
Total Chromium	mg/L	Six monthly
Hexavalent Chromium	mg/L	Six monthly
Total Cobalt	mg/L	Six monthly
Total Copper	mg/L	Six monthly
Total Iron	mg/L	Six monthly
Total Lead	mg/L	Six monthly
Total Lithium	mg/L	Six monthly
Total Manganese	mg/L	Six monthly
Mercury	mg/L	Six monthly
Total Molybdenum	mg/L	Six monthly
Total Nickel	mg/L	Six monthly
Potassium	mg/L	Six monthly
Total Selenium	mg/L	Six monthly
Total Silver	mg/L	Six monthly
Total Strontium	mg/L	Six monthly
Total Vanadium	mg/L	Six monthly
Total Zinc	mg/L	Six monthly
Total Calcium	mg/L	Six monthly
Total Chloride	mg/L	Six monthly
Total Magnesium	mg/L	Six monthly
Total Sodium	mg/L	Six monthly
Total Sulphate	mg/L	Six monthly

Sampling and In-situ Monitoring Points Details

(H19) Determinations of the quality of contaminants released for the release quality characteristics specified in the Schedule H - Table 2 of this development approval must be undertaken at the sampling and in-situ measurement point described as at the outlet of the irrigation pump.

Quality Determinations

(H20) All determinations of the quality of contaminants released to land must be made in accordance with methods prescribed in the Water Quality Sampling Manual, 3rd Edition, December 1999, or more recent additions or supplements to that document as such become available.

(H21) All determinations of the quality of contaminants released must be performed by a person or body possessing appropriate experience and qualifications to perform the required measurements.

Monitoring Of Volume of Release

(H22) The daily quantity of contaminants released must be determined or estimated by an appropriate method, for example, a flow meter.

(H23) The holder of this development approval must keep records of the volume, date, time of commencement and duration of each occasion on which any release of contaminants is made to the contaminant release area.

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Contaminant Release Area Monitoring Program

(H24) The holder of this development approval must develop and implement a Contaminant Release Area Monitoring Program to effectively monitor the condition of the land to which contaminants are released.

(H25) Monitoring required by Condition H24 shall include the taking of top soil and sub-soil samples from at least thirty (30) representative sites for the quality characteristics and at the frequency specified in Schedule H - Table 3.

SCHEDULE H - TABLE 3

QUALITY CHARACTERISTICS	UNITS	FREQUENCY
PH	pH scale	Every 2 years
Sodium Adsorption Ratio (1:5 Soil/water mix)	calculated	Every 2 years
Calcium/Magnesium Ratio (1:5 Soil/water mix)	calculated	Every 2 years
Exchangeable Cations	mg/L	Every 2 years
Total Cations	mg/L	Every 2 years
Specific Conductance or electrical conductivity	µS/cm	Every 2 years
Total Aluminium	mg/L	Every 2 years
Total Arsenic	mg/L	Every 2 years
Total Barium	mg/L	Every 2 years
Boron	mg/L	Every 2 years
Total Cadmium	mg/L	Every 2 years
Total Chromium	mg/L	Every 2 years
Hexavalent Chromium	mg/L	Every 2 years
Total Cobalt	mg/L	Every 2 years
Total Copper	mg/L	Every 2 years
Total Iron	mg/L	Every 2 years
Total Lead	mg/L	Every 2 years
Total Lithium	mg/L	Every 2 years
Total Manganese	mg/L	Every 2 years
Total Molybdenum	mg/L	Every 2 years
Total Nickel	mg/L	Every 2 years
Total Nitrogen	mg/L	Every 2 years
Phosphorus (extractable)	mg/L	Every 2 years
Potassium (available)	mg/L	Every 2 years
Potassium (extractable)	mg/L	Every 2 years
Total Silver	mg/L	Every 2 years
Total Strontium	mg/L	Every 2 years
Total Zinc	mg/L	Every 2 years
Total Calcium (exchangeable)	mg/L	Every 2 years
Total Chloride	mg/L	Every 2 years
Total Magnesium (exchangeable)	mg/L	Every 2 years
Total Sodium (exchangeable)	mg/L	Every 2 years

(H26) The Contaminant Release Area Monitoring Program must include but not be limited to the following:

(i) the locations of monitoring stations including soil types and depths; and
(ii) the proposed vegetation characteristics to be monitored.

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(H27) The holder of this development approval must submit with each annual return a report on the Contaminant Release Area Monitoring Program including an assessment of the impact and sustainability of the application of treated sewage wastes to the contaminant release area. This report shall include an interpretation of the results and conclusions by an expert in the field of effluent land disposal.

(H28) All determinations of the condition of the contaminant release area must be made by a person or body registered by the National Association of Testing Authorities (NATA) for the required determinations.

(H29) Records must be kept of the results of all monitoring carried out under the Contaminant Release Area Monitoring Program for a period of at least five (5) years.

End of Conditions for Schedule H

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SCHEDULE I - DEFINITIONS

For the purposes of this development approval the following definitions apply:

General Definitions

(I1) ***"Act"*** means the *Environmental Protection Act 1994.*

(I2) ***"administering authority"*** means the Department of Environment and Resource Management or its successor.

(I3) ***"AMTD"*** means Adopted Middle Thread Distance as per the Queensland Water Resources Commission publication entitled "Atlas of AMTD Maps, January 1984".

(I4) ***"authorised person"*** means a person holding office as an authorised person under an appointment under the *Environmental Protection Act 1994* by the chief executive or chief executive officer of a local government.

(I5) ***"background noise level"*** means either:

$L_{A90,\,T}$ being the A-weighted sound pressure level exceeded for 90 percent of the time period not less than 15 minutes, using Fast response, or

$L_{Abg,\,T}$ being the arithmetic average of the minimum readings measured in the absence of the noise under investigation during a representative time period of not less than 15 minutes, using Fast response.

(I6) ***"cfu"*** means colony forming units.

(I7) ***"commercial place"*** means a place used as an office or for business or commercial purposes.

(I8) ***"dewatered"*** means the material does not yield free liquid and "free liquid" means liquid which readily separates from the solid portion of a waste under ambient temperature and pressure as determined by Method 9095 (Paint Filter Liquids Test) described in "U.S. EPA: Free Liquids (Paint Filter)" Federal Register, Vol. 50, No. 83, page 18370, April 30, 1985.

(I9) ***"drum"*** means any individual container for holding a chemical and having a capacity of not more that 250 litres.

(I10) ***"dry weather day"*** refers to a day during which no rainfall is recorded at any rainfall measuring station recognised by the Commonwealth Bureau of Meteorology within the sewered area connected to the sewage treatment plant, or if no such measuring station exists, at the nearest such station to the sewage treatment plant. The term also excludes days during which recorded rainfall over the three preceding days exceeds 100 mm.

(I11) ***"dry weather flow"*** refers to a day during which no rain falls within the catchment of the sewage treatment plant for the commencement of measurement for that day. The term also excludes days during which measurement is made which occur within three days following cumulative rainfall of 100 mm over the three preceding days.

(I12) ***"dwelling"*** as mentioned in Schedule 5 of the Environmental Protection (Noise) Policy 1997 means any of the following structures or vehicles that is principally used as a residence:

(a) a house, unit, motel, nursing home or other building or part of a building;

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(b) a caravan, mobile home or other vehicle or structure on land; or
(c) a watercraft in a marina.

(I13) ***"groundwater monitoring system"*** means a system of groundwater monitoring devices, such as monitoring bores, used to provide data in respect to the level and quality of groundwater in the uppermost aquifer where the location of the groundwater monitoring devices is such that comparisons of groundwater quality and groundwater level can be made between groundwater flowing from beneath the site (down-gradient flow) of the activity and groundwater flowing towards the site of the activity (up-gradient flow).

(I14) ***"infiltration"*** means all flows entering a sewage reticulation system other than those flows that are legally permitted to enter the sewage reticulation system. Infiltration may be from:

(i) stormwater/groundwater inflows; or
(ii) illegal connections.

(I15) "***intrusive noise***" - means noise that, because of its frequency, duration, level, tonal characteristics, impulsiveness or vibration -

(a) is clearly audible to, or can be felt by, an individual; and
(b) annoys the individual.

In determining whether a noise annoys an individual and is unreasonably intrusive, regard must be had to Australian Standard 1055.2 - 1989 Acoustics - Description and Measurement of Environmental Noise Part 2 - Application to Specific Situations.

(I16) ***"$L_{Amax\ adj,\ T}$ "*** means the average maximum A-weighted sound pressure level, adjusted for noise character and measured over a time period of not less than 15 minutes, using Fast response.

(I17) ***"land"*** in any Land Application Schedule, means land excluding waters and the atmosphere.

(I18) ***"landfill facility"*** means land and structures at the licensed place used for the disposal of solid waste.

(I19) ***"leachate"*** means a liquid that has passed through or emerged from, or is likely to have passed through or emerged from, a material stored, processed or disposed of at the licensed place that contains soluble, suspended or miscible contaminants likely to have been derived from the said material.

(I20) ***"limited regulated waste"*** means any of the following regulated wastes - asbestos, infectious substances or quarantine waste that has been rendered non-infectious, contaminated soil, fish processing waste, food processing waste, poultry processing waste, tyres or treatment tank sludge or residue produced in sewage treatment or water treatment plants.

(I21) ***"long term 50 percentile compliance"*** means that the median value of the measured values in ranked order of the quality characteristic is not to exceed the stated release limit for any fifty (50) consecutive samples where:

(i) the consecutive samples are taken over a one year period;
(ii) the consecutive samples are taken at approximately equal periods; and
(iii) the time interval between the taking of each consecutive sample is not less than six days.

(I22) ***"long term 80 percentile compliance"*** means that not more than ten (10) of the measured values of the quality characteristic are to exceed the stated release limit for any fifty (50) consecutive samples where:

(i) the consecutive samples are taken over a one year period;

[1] Permit includes licences, approvals, permits, authorisations, certificates, sanctions or equivalent/similar as required by legislation administered by the Department of Environment and Resource Management

(ii) the consecutive samples are taken at approximately equal periods; and
(iii) the time interval between the taking of each consecutive sample is not less than six days.

(I23) ***"maximum"*** means that the measured value of the quality characteristic or contaminant must not be greater than the release limit stated.

(I24) ***"MaxL$_{pA\ T}$"*** means the maximum A-weighted sound pressure level measured over a time period of not less than 15 minutes, using Fast response.

(I25) ***"median"*** means the middle value, where half the data are smaller, and half the data are larger. If the number of samples is even, the median is the arithmetic average of the two middle values.

(I26) ***"mg/L"*** means milligrams per litre.

(I27) ***"minimum"*** means that the measured value of the quality characteristic or contaminant must not be less than the release limit stated.

(I28) ***"noise sensitive place"*** as mentioned in Schedule 5 of the *Environmental Protection (Noise) Policy 1997* means any of the following places:

(a) a dwelling;
(b) a library, childcare centre, kindergarten, school, college, university or other educational institution;
(c) a hospital, surgery or other medical institution;
(d) a protected area, or an area identified under a conversation plan as a critical habitat or an area of major interest, under the Nature Conservation Act 1992;
(e) a marine park under the Marine Parks Act 1982; or
(f) a park or garden that is open to the public (whether or not on payment of money) for use other than for sport or organised entertainment.

(I29) ***"noxious"*** means harmful or injurious to health or physical well-being.

(I30) ***"offensive"*** means causing offence or displeasure; is disagreeable to the senses; disgusting, nauseous or repulsive.

(I31) ***"range"*** means that the measured value of the quality characteristic or contaminant must not be greater than the higher release limit stated nor less than the lower release limit stated.

(I32) ***"regulated waste"*** means non-domestic waste mentioned in Schedule 7 of the *Environmental Protection Regulation 2008* whether or not it has been treated or immobilised and includes -

(i) for an element - any chemical containing the element; and
(ii) anything that has contained a regulated waste.

(I33) ***"short term 50 percentile compliance"*** means that the median value of the measured values in ranked order of the quality characteristic is not to exceed the stated release limit for any five (5) consecutive samples where:

(i) the consecutive samples are taken over a five week period;
(ii) the consecutive samples are taken at approximately equal periods; and
(iii) the time interval between the taking of each consecutive sample is not less than six days.

(I34) ***"short term 80 percentile compliance"*** means that not more than one (1) of the measured values of the quality characteristic are to exceed the stated release limit for any five (5) consecutive samples where:

(i) the consecutive samples are taken over a five week period;

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(ii) the consecutive samples are taken at approximately equal periods; and
(iii) the time interval between the taking of each consecutive sample is not less than six days.

(I35) ***"STP"*** means Sewage Treatment Plant.

(I36) ***"tank"*** means any individual container for holding a chemical and having a capacity of more that 250 litres.

(I37) ***"total Nitrogen"*** means the sum of Organic Nitrogen, Ammonia, Nitrite plus Nitrate, as mg/L of Nitrogen.

(I38) ***"total Phosphorus"*** means the sum of the reactive phosphorus, acid-hydrolysable phosphorus and organic phosphorus, as mg/L of Phosphorus. This includes both the inorganic and organic fraction of phosphorus.

(I39) ***"uppermost aquifer"*** means the geologic formation nearest to the natural ground surface that is an aquifer. The term includes any aquifers that are likely to be hydraulically interconnected with this aquifer within the landfill facility property boundary.

End of Definitions for Schedule I

[1] Permit includes licences, approvals, permits, authorisations, certificates, sanctions or equivalent/similar as required by legislation administered by the Department of Environment and Resource Management

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Notice

Amended Concurrence Agency Response

This notice is issued by the Environmental Protection Agency pursuant to Sections 3.3.17 and 3.3.18 of the Integrated Planning Act 1997 to advise of a decision or action.

Moreton Bay Regional Council
Pine Rivers District Office
PO Box 5070
STRATHPINE QLD 4500

CC: Pine Water
C/- Ian Buchanan Town Planning
PO Box 501
KALLANGUR QLD 4503

Our reference: 240838

Dear Sir/Madam

Re: Referral for Concurrence Agency Response

The Environmental Protection Agency (EPA), wishes to advise that on 18 September 2008, a decision was made to issue an amended concurrence agency response. This amended concurrence agency response replaces the concurrence agency response previously issued and dated 28 August 2008.

1. Property/Location:

Street address - Bickle Road MURRUMBA DOWNS QLD 4503
Lot/Plan - Lot 12 Plan SL10529, Lot 2 Plan RP113846, Lot 4 Plan RP127767

2. Details of the recommendation

Aspect of Development	Recommendation	EPA Ref Number
- Concurrence Response for a MCU involving an ERA - ERA 15(g) Sewage treatment - operating a standard sewage treatment works having a peak design capacity to treat sewage of 100 000 equivalent persons or more.	Approved subject to conditions	IPCE00674007

Currency period

Environmental Protection Agency
www.epa.qld.gov.au ABN 87 221 158 786

This approval will lapse unless substantially started within the standard currency periods stated in section 3.5.21 of the Integrated Planning Act 1997 applying to each aspect of development in this approval.

3. Codes for self-assessable development

Any self-assessable development for an environmentally relevant activity conducted in conjunction with this approval, must comply with the relevant code of environmental compliance.

4. Assessment Manager Responsibilities

Please note that it is a requirement under Sections 3.5.15 and 3.5.17 of the Integrated Planning Act 1997 that a copy of the final Decision Notice (which includes the EPA's concurrence response) for this application issued by the EPA, be forwarded to each referral agency. Therefore could you please send a signed hardcopy to the EPA's Ecoaccess Customer Service Unit, PO Box 15155 CITY EAST 4002 and an electronic copy to eco.access@epa.qld.gov.au.

In addition, the State's Native Title Work Procedures indicate that responsibility for assessment of native title issues for an IDAS application rest with the Assessment Manager. Therefore in this instance, the EPA has not provided a notification to native title parties.

If you require more information, please contact Leonie Clough, the Project Manager, on the telephone number listed below.

5. Codes for self-assessable development

Any self-assessable development for an environmentally relevant activity conducted in conjunction with this approval, must comply with the relevant code of environmental compliance.

Yours sincerely

R. Kent

Rod Kent
Delegate
Environmental Protection Agency
19-SEP-2008

Enquiries:
Leonie Clough
ES - Reg Serv - Bne North - Bne
GPO Box 2771
BRISBANE QLD 4001
Phone: (07) 3227 7984
Fax: (07) 3225 8725

ecoaccess
environmental licences and permits

Section 3.3.17 and 3.3.18 *Integrated Planning Act 1997*

EPA Permit[1] number: IPCE00674007

This document replaces the document issued on 28 August 2008

EPA Permit[1] number:	IPCE00674007
Assessment Manager reference:	
Date application received by EPA:	13-JUN-2007
Permit[1] Type:	Concurrence Response for a MCU involving an ERA
Date of Decision:	18 September 2008
Decision:	Approved subject to conditions
Relevant Laws and Policies:	*Environmental Protection Act 1994* and any subordinate legislation
Jurisdiction:	Item 1 in Table 2 of Schedule 2 of the *Integrated Planning Regulation 1998*

Development Description

Property	Lot/Plan	Aspect of Development
Bickle Road,MURRUMBA DOWNS QLD 4503	Lot 12 Plan SL10529, Lot 2 Plan RP113846, Lot 4 Plan RP127767	ERA 15(g) Sewage treatment - operating a standard sewage treatment works having a peak design capacity to treat sewage of 100 000 equivalent persons or more.

Reasons for inclusion of development conditions

In accordance with section 3.3.18(8) of the Integrated Planning Act 1997 and section 27B of the Acts Interpretation Act 1954, the reasons for the inclusion of development conditions are:

1) The Environmental Protection Agency is a concurrence agency under the Integrated Planning

[1] Permit includes licences, approvals, permits, authorisations, certificates, sanctions or equivalent/similar as required by legislation administered by the Environmental Protection Agency and the Queensland Parks and Wildlife Service

Environmental Protection Agency
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Queensland Government
Environmental Protection Agency
Queensland Parks and Wildlife Service

Regulation 1998 for the purposes of the Environmental Protection Act 1994.
2) Any development conditions placed on this permit1 for an environmentally relevant activity are in accordance with section 73B of the Environmental Protection Act 1994.

Additional comments or advice about the application

<Insert additional comments or advice about the application>

Additional information for applicants

Contaminated Land

It is a requirement of the *Environmental Protection Act 1994* that if an owner or occupier of land becomes aware a Notifiable Activity (as defined by Schedule 2 of the *Environmental Protection Act 1994*) is being carried out on the land or that the land has been affected by a hazardous contaminant, they must, within 30 days after becoming so aware, give notice to the Environmental Protection Agency.

Environmentally Relevant Activities

The aforementioned description of any environmentally relevant activity (ERA) for which this permit is issued is simply a restatement of the ERA as prescribed in the legislation at the time of issuing this permit. Where there is any conflict between the abovementioned description of the ERA for which this permit is issued and the conditions specified herein as to the scale, intensity or manner of carrying out of the ERA, then such conditions prevail to the extent of the inconsistency.

This permit authorises the ERA. It does not authorise environmental harm unless a condition within this permit explicitly authorises that harm. Where there is no such condition, or the permit is silent on a matter, the lack of a condition or silence shall not be construed as authorising harm.

In addition to this permit, the person to carry out the ERA must be a registered operator under the Environmental Protection Act 1994. For the person to become a registered operator, they must apply for a registration certificate under section 73F of the Environmental Protection Act 1994.

R. Kent

Rod Kent
Delegate
Environmental Protection Agency
19-SEP-2008

Conditions of Approval

Agency Interest: General

General 1: **Approved plant capacity**

The plant and equipment comprising the approved expansion of the Murrumba Downs Wastewater Treatment Plant are:

- Inlet works Upgrade;
- Flow Load Attenuation Tanks (I and II);
- Bioreactor No 2;
- Clarifiers (x2);
- Cloth media process units;
- Open Channel UV Disinfection;
- New chemical storage area;
- Odour management works; and
- AWTP2 (and its associated process train).

as described in Section 16.1 of the WWTP Planning Report - Volume 1- November 2007 submitted to the EPA on 27 November 2007 in support of the application.

General 2: The Murrumba Downs Wastewater Treatment Plant expansion described in General 1 above must be located on the approved place in accordance with Figure 1 - Murrumba Downs Wastewater Treatment Plant Site Layout within the Q100 zone, dated March 2008.

General 3: This development approval authorises the carrying out of environmentally relevant activity (ERA) 15(g), sewage treatment, using plant and equipment with capacity to treat a maximum of 49 Megalitres of sewage influent per day, under average dry weather flow conditions (based on a average dry weather flow of 31 ML per day with a 1.6 peaking factor).

General 4: **Application of development permit**

The conditions specified herein apply to the Murrumba Downs Wastewater Treatment Plant and replace any conditions previously issued for the Murrumba Downs Wastewater Treatment Plant.

General 5: **Prevent and/or minimise likelihood of environmental harm**

In carrying out an ERA to which this approval relates, all reasonable and practicable measures must be taken to prevent and/or to minimise the likelihood of environmental harm being caused.

General 6: **Maintenance of Measures, Plant and Equipment**

The registered operator of the activity to which this development approval relates must:

1. install all measures, plant and equipment necessary to ensure compliance with the conditions of this approval; and
2. maintain such measures, plant and equipment (including for example odour collection and odour treatment devices, dosing equipment, monitoring equipment, flocculation equipment, filtration equipment, bunding, stormwater management systems, remote performance monitoring and alarm systems and associated response measures) in a proper and efficient condition; and
3. operate such measures, plant and equipment (including for example odour collection and odour treatment devices, dosing equipment, monitoring equipment, flocculation equipment, filtration equipment, bunding, stormwater management systems, the diffuser) in a proper and efficient manner.

General 7: **Alterations**

No change, replacement or operation of any plant or equipment is permitted if the change, replacement or operation of the plant or equipment increases, or is likely to substantially increase, the risk of environmental harm above that expressly provided for by this development approval.

General 8: **Records**

The registered operator of the activity to which this development approval relates must record, compile and keep all monitoring results and reports required by this development approval and present any monitoring results or reports to the administering authority when requested.

General 9: All records required by this development approval must be kept for at least five (5) years.

General 10: **Annual Monitoring Report**

An annual monitoring report must be prepared each year and be provided to the administering authority with the annual return. The annual monitoring report must include, but not be limited to:

1. A summary of the previous twelve (12) months monitoring results obtained in accordance with any of the monitoring requirements of this development approval and, in graphical form showing relevant limits, a comparison of the previous twelve (12) months monitoring results to both the limits specified in this development approval and to relevant prior results; and
2. An evaluation/explanation of the data from any monitoring programs; and
3. A summary of any record of quantities of releases required to be kept under this development approval; and
4. An outline of actions taken or proposed to minimise the environmental risk from any deficiency identified by the monitoring or recording programs; and
5. A summary of any trade waste and recycled water agreements entered into or amended during the year, including the nature of the industry.

Note: To remove any doubt, monitoring data that has been submitted electronically to the EPA Point Source Data Base in accordance with a written agreement with the EPA does not need to be resubmitted in an annual monitoring report.

General 11: **Environmental Management System (EMS)**
The registered operator of the activity to which this development approval relates must implement an Environmental Management System (EMS) and ensure that the implemented EMS provides for the effective and appropriate management by the registered operator of the actual and potential environmental impacts resulting from the carrying out of the ERA.

General 12: An up to date copy of the EMS must be kept at Moreton Bay Regional Council Chambers and, where practicable to do so, at the approved place at which the ERA is carried out.

General 13: The registered operator of the activity to which this development approval relates must not implement an EMS or amend the EMS where such implementation or amendment would result in a contravention of any condition of this development approval.

General 14: The registered operator of the activity to which this development approval relates must submit details of any amendment to the EMS annually to the administering authority with the Annual Return which immediately follows the enactment of any such amendment.

General 15: **Site-Based Environmental Management Plan**

The EMS must provide for the development and implementation of a Site-Based Environmental Management Plan which address the management of the actual and potential environmental impacts resulting from the carrying out of the ERA (including any issue/site-specific environmental management plans required to be developed and implemented under the conditions of this development approval) at the approved premise.

General 16: The Site-Based Management Plan must address at least the following matters:

1. routine operating procedures to prevent or minimise environmental harm, however occasioned or caused during normal operations;
2. maintenance practices and procedures;
3. contingency plans and emergency procedures to deal with foreseeable risks and hazards including corrective responses to prevent and mitigate environmental harm (including any necessary site rehabilitation);
4. monitoring of the release of contaminants into the environment including procedures, methods, record keeping and notification of results;
5. assessment of the environmental impact of any releases of contaminants into the environment including procedures, methods, record keeping and notification of results;
6. handling of environmental complaints;
7. keeping and production of environmental records and reports;
8. lines and methods of communication to be utilised for communication of procedures, plans, incidents, potential environmental problems and results, including a feedback mechanism to ensure that management is made aware of potential environmental problems and any failure of procedures adopted; and
9. staff training and awareness of environmental issues related to the operation of the environmentally relevant activities, including responsibilities under the *Environmental Protection Act 1994.*

General 17: An up to date copy of the relevant Site-Based Environmental Management Plan (including any issue/site-specific environmental management plans required to be developed and implemented under the conditions of this development approval) must be kept at the Moreton Bay Regional Council Chambers and at the approved place to which that plan relates, or if such is not practicable, at a place readily accessible to personnel that are carrying out the ERA, and be available for examination by an authorised person on request.

General 18: **Notification**

The registered operator of an activity to which this development approval relates must notify the administering authority as soon as practicable after becoming aware of any equipment malfunctions, other incident or release of contaminants that occurs otherwise than in accordance with the conditions of this development approval, or any event where environmental harm is caused or threatened.

Please Note: The Pollution Hotline (1300 130 372) is the most appropriate contact for pollution incidents.

General 19: Written advice detailing the following information must be provided to the administering authority within fourteen (14) days following any notification in accordance with condition General 18:

1. The name of the registered operator of the activity to which this development approval relates, including the development approval number; and
2. The name and telephone number of a designated contact person; and
3. The location of the release/event; and
4. The time of the release/event; and
5. The time the registered operator became aware of the release/event; and
6. The suspected cause of the release/event; and
7. A description of the resulting effects of the release/event; and
8. The results of any sampling performed in relation to the release/event; and
9. Actions taken to mitigate any environmental harm (including environmental nuisance) caused by the release/event; and
10. Proposed actions to prevent a recurrence of the release/event.

General 20: Records of all incidents notified under condition General 18 must be maintained for a minimum of five (5) years

General 21: **Monitoring**

A competent person(s) must conduct any monitoring required by this development approval.

General 22: **Equipment calibration**

All instruments, equipment and measuring devices used for measuring or monitoring in accordance with any condition of this development approval must be calibrated, and appropriately operated and maintained.

General 23: **Sample Analysis**

All analyses and tests required to be conducted under this development approval must be carried out by a laboratory that has NATA certification for such analyses and tests, except as otherwise authorised by the administering authority.

General 24: **Trained/Experienced Operator(s)**

The operation of the Murrumba Downs Waste Water Treatment Plant and associated pollution control equipment must be carried out by a person with appropriate experience and/or qualifications to ensure the effective operation of the plant and equipment.

Agency Interest: Social

General 25: **Complaint Response.**

The registered operator must record the following details for all complaints received and provide this information to the administering authority on request:

a. time, date, name and contact details of the complainant;

b. reasons for the complaint;

c. investigations undertaken by the registered operator;

d. conclusions formed; and

e. actions taken to resolve the cause of the complaint.

Agency Interest: Air

Air 1: **Nuisance**

Notwithstanding any other condition of this approval, the release of noxious or offensive odour(s) or any other noxious or offensive airborne contaminant(s) resulting from the activity must not cause any environmental nuisance at any odour sensitive place.

Air 2: **Odour Collection and Control**

The inlet pump stations, inlet manholes and vent, inlet works, grit screening and handling, flow splitter, flow/load attenuation tank, the anaerobic tanks, bioreactor anoxic zones, the biosolids unloading bay, biosolids hopper and conveyors and any other odour sources capable of causing an environmental nuisance at any odour sensitive place must be:

a) efficiently covered/enclosed so as to enable extraction of odourous gases and vapours from these sources;

b) kept under negative pressure to prevent release of fugitive odour; and

c) served by extraction systems (hereinafter called the "gas extraction systems) to convey the odourous gases and vapours to odour treatment plant and equipment.

Air 3: The management of aerobic zones in the treatment plant must be in accordance with a risk based approach that relies on measuring specific odour emission rates from the upgraded bioreactor and clarifiers in accordance with the sampling survey specified in Table Air 1 Aerobic Zone Odour Sampling and Measurement Program. Results of the survey must be used to calculate the likely odour emission rate from bioreactor and clarifier surfaces (calculated as the product of the surface areas of the bioreactor and clarifier treatment units and their respective 80^{th} percentile measured specific odour emission rates to check if this exceeds the action trigger level of 1832 odour units per second.

Air 4: If the aerobic zones show measured emissions exceeding the action trigger in Air 3 or are likely, in combination with other odourous emissions from the activity, to cause an environmental nuisance at any odour sensitive place, then the aerobic zones, to the extent necessary to prevent such nuisance, must be managed in accordance with condition Air 2.

Air 5: The ducting and extraction systems that transfer odourous gases and vapours from one location to another must be constructed, operated and maintained to minimise any release of odourous gases and vapours to the atmosphere occurs from these sources.

Air 6: Gases and vapours collected by the gas extraction systems must be effectively treated in the Odour Control Facility (OCF) to minimise the concentration of noxious and/or offensive gases and odours prior to any release to the atmosphere.

Air 7: The Odour Control Facility must incorporate a two stage wet chemical scrubber utilizing reagents effective in treating the odourous gases and vapours associated with carrying out the activity and a standby odour treatment plant as a contingency measure.

Air 8: **Wet Scrubber**

Equivalent duty back-up pumps must be provided and maintained on site for the recirculation of scrubbing liquor to and from the scrubber.

Air 9: The scrubber must be fitted with a device to monitor the flow rate of liquid through the unit and to indicate by both visual and audible alarm functions if liquid flow failure through the unit should occur.

Air 10: The scrubber must be fitted with a device to monitor the quality of the scrubbing liquor to ensure likely effectiveness of the reagents in treating odourous gases and vapours in the unit and to indicate by both visual and audible alarm functions if replacement of the scrubbing liquor should occur e.g. an alarm to the site SCADA system.

Air 11: **Standby Odour treatment**

A standby odour treatment system capable of effectively treating odours and gases must be maintained and effectively operated during any failure in treatment efficiency of the primary scrubbing system (wet chemical scrubber).

Air 12: Monitoring and keeping of records of parameters that indicate effective operation of the emission control equipment must be undertaken. Records must be marked to show the true calendar date and time of day

Air 13: **Biosolids Handling Building**

All external doors of the biosolids handling building must be kept fully closed when processing or storage of sewage sludges is occurring, except when necessarily being used for access. The building shall be ventilated at a rate of at least 20 building air changes per hour to Air release point RP2.

Air 14: **Sewerage System Management**

Management measures shall be implemented to minimise septicity of sewage received at the plant and hence reduce risks of odour generation at the Murrumba Downs WWTP.

Air 15: **Specified Releases of Contaminants to the Atmosphere**

Contaminants resulting from the operation of the sources described in Table Air 2-Contaminant releases to air in Attachment – Tables must only be released to the atmosphere from those release points specified in Table Air 2 Contaminant releases to air.

Air 16: Contaminants released from each release point specified in Table Air 2-Contaminant releases to air must be directed vertically upwards without any impedance or hindrance.

Air 17: Contaminants must be released to the atmosphere from a release point at a height not less than the corresponding height stated for that release point in Table Air 2-Contaminant releases to air.

Air 18: Contaminants must be released to the atmosphere from a release point at a velocity not less than the corresponding velocity stated for that release point in Table Air 2-Contaminant releases to air.

Air 19: Contaminants must not be released to the atmosphere from a release point at a mass emission rate/concentration, as measured at a monitoring point, in excess of that stated in Table Air 2- Contaminant releases to air and must be monitored not less frequently than in Table Air 2- Contaminant releases to air.

Air 20: Monitoring of any releases to the atmosphere required by a condition of this approval must be carried out in accordance with the following requirements:

a) Monitoring provisions for the release and monitoring points listed in Table Air 2 - Contaminant release limits to air must comply with the Australian Standard AS 4323.1 - 1995 'Stationary source emissions Method 1: Selection of sampling positions' (or more recent editions).

b) Odour stack monitoring must be conducted in accordance with Australian and New Zealand Standard AS/NZS 4323.3:2001, Stationary source emissions - Determination of odour concentration by dynamic olfactometry; (or more recent editions).

c) The following tests must be performed for each required determination specified in Table 1 - Contaminant release limits to air:

i. gas velocity and volume flow rate;

d) Where practicable, samples must be taken when emissions are expected to be at maximum rates.

e) During the sampling period the following additional information must be gathered:

i. wastewater treatment rate at the time of sampling; i.e. diurnal peak
ii. any atypical factors that may influence odour emissions;
iii. the odour treatment system operating, system status and rate; and
iv. reference to the actual test methods and accuracy of the methods

Air 21: In the event of a complaint about noxious or offensive odour from an odour sensitive place, to the administering authority that the administering authority considers is not frivolous or vexatious, the registered operator of the activity to which this development approval relates must undertake monitoring to investigate any complaint of odour nuisance upon receipt of a written request from the administering authority to carry out such monitoring.

Air 22: When requested by the administering authority, monitoring must be undertaken to investigate any complaint of environmental nuisance caused by a release to the atmosphere from a release point at the site, and the results thereof notified to the administering authority within 14 days following completion of monitoring.

Air 23: The monitoring referred to in condition Air 21 above must include but is not limited to any specific relevant monitoring included in the request and evaluation of the performance of the odour sources from the plant operations. The evaluation should include an inspection of potential odour sources and associated emission control systems, and a review of monitoring data.

Air 24: If the administering authority requests monitoring to determine contaminant releases to the atmosphere, all monitoring must be performed by an independent person or body possessing appropriate experience and qualifications to perform the required measurements. Odour stack monitoring must be conducted in accordance with Australian and New Zealand Standard AS/NZS 4323.3:2001, Stationary source emissions - Determination of odour concentration by dynamic olfactometry; and for any other odourant gases, a method as approved by Queensland, New South Wales or Victorian EPAs.

Air 25: If monitoring indicates that environmental nuisance is caused or threatened by odour release from the activities, then the registered operator must:

(a) advise the administering authority of planned odour abatement measures; and

(b) as soon as practicable implement odour abatement measures such that the release of odour from the activity will not result in further environmental nuisance.

Agency Interest: Land

Land 1: Contaminants must not be released to land with the exception of recycled water irrigated in accordance with the conditions of this permit.

Land 2: **Bunding**

Where it is impractical to completely roof a bunded area ensure that any stormwater captured within the bund is free from contaminants or wastes prior to any release.

Land 3: All empty drums must be stored on a concrete hardstand area with their closures in place.

Land 4 Contaminants such as fuels, liquid waste and chemicals must be:

(a) contained within an on-site containment system; and

(b) controlled in a manner that prevents environmental harm; and

(c) managed in accordance with the Australian Standards (as amended from time to time) AS4326 – 1996 The storage and handling of oxidizing agents; and AS1940 – 2004 The storage and handling of flammable and combustible liquids; and AS3780 – 2008 The storage and handling of corrosive substances.

Agency Interest: Noise

Noise 1: All noise from operation of the Murrumba Downs wastewater treatment plant must not exceed the levels specified in Table 1 – Noise Limits in the Attachment – Tables at any nuisance sensitive or commercial place.

Noise 2: **Noise Nuisance**

Notwithstanding condition – Noise 1, noise from the operation of the Murrumba Downs Wastewater Treatment Plant must not cause an environmental nuisance at any nuisance sensitive place or commercial place.

Noise 3: **Noise Monitoring**

When requested by the administering authority, noise monitoring must be undertaken to investigate any complaint of noise nuisance, and the results notified within fourteen (14) days. Monitoring must include:

1. $L_{A\ Max\ adj,T}$
2. Background Noise
3. the level and frequency of occurrence of impulsive or tonal noise;
4. atmospheric conditions including wind speed and direction;
5. effects due to extraneous factors such as traffic noise; and
6. location, date and time of recording.

Noise 4: The method of measurement and reporting of noise levels must comply with the latest edition of the *Environmental Protection Agency's Noise Measurement Manual.*

Agency Interest: Waste

Waste 1: The registered operator must not:

(i) allow waste to burn or be burnt at or on the authorised place; nor

(ii) remove waste from the authorised place and burn such waste elsewhere other than as permitted by another condition.

Waste 2: **Waste Handling**

All reasonable and practicable measures must be implemented to prevent the release of contaminants to surface waters and/or groundwaters from the temporary storage, conditioning, treatment and disposal of screenings, grit, biosolids and sludge.

Waste 3: Waste generated in the carrying out of the activities must be stored, handled and transferred in a proper and efficient manner.

Waste 4: **Off-site movement of waste**

Waste must not be released to the environment, stored, transferred or disposed contrary to any condition of this development permit.

Waste 5: All regulated waste removed from the site must be removed by a person who holds a current approval to transport such waste under the provisions of the *Environmental Protection Act 1994*.

Waste 6: Where regulated waste is removed from the site (other than by a release as permitted under another condition of this development permit), the registered operator must monitor and keep records of the following:

a. the date, quantity and type of waste removed; and

b. name of the waste transporter and/or disposal operator that removed the waste; and

c. the intended treatment/disposal /destination of the waste.

Waste 7: **Notification of Improper Disposal of Regulated Waste**

If a person removes regulated waste associated with activities at the approved place and disposes of such waste in a manner which is not authorised or is improper or unlawful then, the registered operator must, as soon as practicable, notify the administering authority of all relevant facts, matters and circumstances known concerning the disposal.

Waste 8: **Sludge storage and disposal**

Sludge generated by the sewage treatment process must not be:

a. disposed of on site; or

b. stored on site for any period of time longer than that necessary to dewater the sludge and prepare it for transport to and disposal at a proper and appropriate approved waste disposal/incineration/treatment facility that can lawfully accept such waste or to a facility that can lawfully and appropriately reuse, recycle or reprocess such waste.

Agency Interest: Water Specific

Water 1: **Permitted contaminant release and discharge point(s)**

The only contaminant(s) permitted to be released directly or indirectly to any waters from the Murrumba Downs WWTP are the following releases to the North Pine River:

1. RP1 - Treated sewage effluent including Reverse Osmosis Concentrate (ROC) from AWTP1, clean in place wash waters and filtrate residues from sewage recycling carried out at the AWTP1 via the outfall located at approximately 10.2 AMTD, [refer plan titled Murrumba Alliance Waste Water Treatment Works Development Approval Location of Release Point Drawing 5-35103 Rev 0 attached to this approval].

Water 2: The releases of contaminants directly or indirectly to waters must not:

1. produce any visible discolouration of receiving waters; nor
2. produce any slick or other visible or odorous evidence of oil, grease or petrochemicals nor contain visible floating oil, grease, scum, offensive odour, litter or other contaminants in quantities or concentration that may cause environmental harm; nor
3. be undertaken in a way in that causes bank erosion or risks public health through contact with the release.

Water 3: **Acceptance and Monitoring of Reverse Osmosis Concentrates**

The acceptance of reverse osmosis concentrate (ROC) must only occur in compliance with the following conditions:

1. the volume of ROC accepted on any one day must not exceed 1.6 megalitres;
2. the net load in kilograms of total nitrogen and total phosphorus released from AWTP1 into the Murrumba Downs WWTP, must be monitored and measured in accordance with the requirements of condition Water 5 of this development approval;
3. the discharge load in kilograms of total nitrogen and total phosphorus accepted into the Murrumba Downs WWTP from AWTP1, monitored and measured in accordance with the requirements of condition water 5 of this development approval, must not exceed the ROC Load Acceptance Limits in Table 1 - Water- Mass Acceptance Limits for Reverse Osmosis Concentrate.
4. the ROC must be introduced from a flow balance tank(s) managed so as to maximise dilution at all times, but in no case be introduced in a proportion less than (1) one part ROC to (3.5) three and one half parts treated sewage effluent following the BNR and disinfection treatment processes;
5. Concentrations of dissolved oxygen, total chlorine and ammonia nitrogen (as nitrogen) in ROC must be monitored and managed to ensure release limits for the composite wastewater release are complied with; and
6. ROC must be de-chlorinated, for example by sodium metabisulphate dosing, prior to acceptance at the WWTP and subsequent discharge into the North Pine River.

Water 4 The daily volume of treated sewage recycled via AWTP1 and the daily volume of ROC accepted from AWTP1 into the Murrumba Downs WWTP must be determined or estimated by an appropriate method with an accuracy of +/- 5%, (e.g. a calibrated flow meter) for each point, and records kept of such determinations. Rainfall records relevant to the sewered area served by the plant must be obtained from the Commonwealth Bureau of Meteorology and kept to determine and record whether each day is a dry weather day or a wet weather day as defined in this development approval.

Water 5: For the purposes of checking condition water 3(subclause 3), the daily load (in kilograms) of the contaminants total nitrogen and total phosphorus accepted into the Murrumba Downs WWTP from the AWTP1 [at Monitoring Point S3] and in the intake feed water sent to the AWTP1 each day [at Monitoring Point S4] shall be determined or calculated and records kept of such determinations or calculations. The intake, release and net ROC loads shall be calculated for each day according to the following formulae:

i. Daily Release Load (kg) = ROC Release Conc. X Dis. Vol.

ii. Daily Intake Load (kg) = Intake Conc. X Intake Vol.

iii. Net Daily ROC Load. = Daily Release Load minus Daily Intake Load.

Where:

- ROC Release Conc. = AWTP1 ROC release wastewater contaminant concentration (in milligrams per litre, mg/L) measured that day or on the most recent sampling occasion if not measured that day.
- Intake Conc. = AWTP1 intake water concentration (in mg/L) measured that day or on the most recent sampling occasion if not measured that day.
- Dis. Vol. = the volume (in megalitres, ML) of wastewater discharged that day.
- Intake Vol. = the volume (in megalitres, ML) of water intake that day.

Water 6 The flow rates of:

(1) treated sewage ex the BNR process and disinfection, after off-take of feedwater to AWTP1 and any other reuse off-takes, but prior to introduction of the ROC from AWTP1 [at Monitoring Point S2]; and

(2) ROC from AWTP introduced into the flow mentioned in clause 1 above [at Monitoring Point S3];

must be determined or estimated by an appropriate method with an accuracy of +/- 5%, (e.g. a calibrated flow meter) for each point, and records kept of such determinations. From this data, the ratios of respective flows [ROC Flow: Pre ROC Flow] must be calculated and records kept to check compliance with condition water 3 (clause 4).

Water 7: **Treated sewage effluent including ROC – Release concentration limits**

The treated sewage effluent (including ROC) released must not exceed the release limits specified in Tables 2 and 3 Water - Release Quality Limits when measured at the composite effluent monitoring point S1 [refer plan titled Murrumba Alliance Waste Water Treatment Works Development Approval Location of Monitoring Points Drawing 5-35102 Rev 1 attached to this approval].

Water 8: **Treated sewage effluent excluding ROC – Release concentration limits**

The treated sewage effluent (excluding ROC) released must not exceed the release limits specified in Table 2 and 3 Water - Release Quality Limits when measured at the monitoring point S2 described as sewage effluent monitoring point prior to introduction of ROC as shown on [refer plan titled Murrumba Alliance Waste Water Treatment Works Development Approval Location of Monitoring Points Drawing 5-35102 Rev 1 attached to this approval].

Water 9: **Treated sewage effluent including ROC - Toxic Substances (Acute and Chronic)**

Notwithstanding any other condition of this development approval, there must be no release of any contaminants to any waters in any amount or concentration that are likely to cause acute toxicological effects to biota in the receiving environment.

Water 10: There must be no release of any contaminants to any waters where the NOEC for chronic toxicity tests to any test organisms in direct toxicity assessment (DTA) is observed at a 50% dilution i.e. the lowest observed effect concentration (LOEC) must only be observed at a dilution greater than 1:1.

Water 11: **Treated sewage effluent including ROC - Mass Load Limits**

The total quantity of contaminants released directly or indirectly into the North Pine River from the Murrumba Downs WWTP during any day must not exceed any of the limits for each contaminants specified in Table 4 Water - Release to North Pine River - Mass Load Limits when measured at each of the monitoring points S2 (load prior to ROC entry) and S3 (ROC load) described as in Table 4 and calculated in accordance with conditions water 12 and Water 13.

Water 12: The daily load (in kilograms) of the contaminants biochemical oxygen demand (BOD, measured as 5-day BOD), total nitrogen, total phosphorus and ammonia (as N) released to waters per day shall be determined or calculated and records kept of such determinations or calculations. The loads shall be calculated for each day according to the following formulae:

iv. Daily Release Load[#] (kg) = Release Conc. X Dis. Vol.

Where:

- Release Conc. = release wastewater contaminant concentration (in milligrams per litre) measured that day or on the most recent sampling occasion if not measured that day.
- Dis. Vol. = the volume (in megalitres) of wastewater released that day.

[#] Note: If more than one wastewater stream is discharged that day, the formula shall be applied to each discharge viz. at S2 and S3 and the sum of the all discharge loads calculated to give a total discharge load.

Water 13: The registered operator of the activity to which this development approval relates must determine the monthly and annual mass loads of biochemical oxygen demand, ammonia, total nitrogen and total phosphorus released to waters throughout the operation of the Murrumba Downs WWTP. Mass loads are to be calculated as below and by applying the formulae for load calculation prescribed in these development approval conditions and be included in the Annual Monitoring Report available to the administering authority.

Monthly Mass Load:	Sum of total daily loads for each month during which a release occurs. [Reporting requirement]
Total Annual Mass Load:	Sum of total daily loads for each calendar year during which a release occurs. [Reporting requirement]
Annual Dry Weather Load:	(A) – The arithmetic average of all the total daily waste water release volumes in megalitres (ML/day) [i.e. daily total of treated sewage plus any reverse osmosis concentrate discharges], measured on dry weather days, as defined in this development approval, and over the previous twelve months period MULTIPLIED BY (B) - The arithmetic average concentration in milligrams per litre of the relevant water quality characteristic, also measured over the same twelve month period MULTIPLIED BY (C) - 365.

Water 14: **Treated sewage effluent including ROC – Release volume limits**

The volume of treated sewage effluent (including ROC) released must not exceed include volume limits in Table 5 – Water - Volumetric release limits.

Water 15: **Oxygen Demanding Substances**

The holder must:

(a) monitor and manage loads of oxygen demanding substances released to waters from the activity so to not cause any lowering of the 1 July 2007 to 30 June 2008 minimum and median dissolved oxygen concentrations measured in the North Pine River at approximately 10.5 kilometres AMTD, for the period during which the oxygen demand study (described in condition water 54) is underway and during the implementation of any remedial actions or works arising from that study; and

(b) thereafter, implement and maintain effective remedial measures, commensurate with the holder's dry weather load contribution of oxygen demanding substances, that contribute to the dissolved oxygen water quality objectives scheduled for the North Pine River under the *Environmental Protection Policy 1997* being met.

Water 16: Notwithstanding the load limits for Total Nitrogen prescribed in Table 4 Water - Release to North Pine River - Mass Load Limits, the holder must, in addition, undertake all reasonable and practicable measures to further reduce total nitrogen loads released to waters. The measures shall include:

(a) treatment of reverse osmosis concentrates (ROC) accepted to reduce the mass of total nitrogen loads in ROC prior to any release to waters; and
(b) optimising biological nitrogen removal processes, including any supplementary readily biodegradable carbon additions and aeration (excluding, for the aeration system, a major structural alteration of the plant and any redundancy of existing aeration equipment that is aerating effectively) as necessary to enhance removal processes;
(c) implementation of any additional reasonable and practicable waste water reuse opportunities that arise for which the treated effluent is suitable; and
(d) other practicable measures identified by the holder and advised to the administering authority, in particular:
    (1) incorporating investigations of how to minimise nitrogen release to waters and outcomes of these investigations into all studies for future plant upgrades and improvements;
    (2) ensuring that whenever operational changes or technology changes are made to the treatment plant, that minimisation of nitrogen loads released to waters is of the highest priority, but recognising that that this must be balanced against the overall performance of the treatment plant in complying with its release limits and what is the best outcome for meeting the water quality objectives prescribed for the receiving waters; and
    (3) where available, implementing any reasonable and practicable nitrogen offset in the event that a State Government Policy provides for consideration of nutrient offsets for releases to waters.

Water 17: The target for the further total nitrogen load reduction measures shall be a median daily load of 58 kg/day and an annual load of 21,170 kg by 31 December 2012, measured in accordance with the requirements of this development approval. The holder must undertake all reasonable and practicable measures to achieve this target.

Water 18 Progress in implementing these measures and achieving these load reductions shall be monitored and reported to the administering authority at least annually.

Water 19: **Treated sewage effluent – Minimum Volumes Diverted to Reuse**

A minimum of 4 megalitres (ML) (based on treating 5.4 ML of sewage effluent and producing 1.4 ML of reverse osmosis concentrate return) must be treated to standards fit for industrial or equivalent third party reuse and reused rather than being released directly or indirectly to waters. This condition is subject to a reasonable demand for the treated water existing, and the holder making treated water available for such reuse to the greatest extent practicable.

Water 20: In addition to the volume mentioned in water 19, the additional volumes of sewage per day# prescribed in the table below must be treated to standards fit for reuse and reused rather than being released directly or indirectly to waters, in accordance with the timing requirements stated therein.

Timing Requirements – Must be implemented by:	Minimum Reuse Volume for this condition (ML)
From commencement	0.5
By 2012	2.0
When Annual Flow* reaches 28.75 ML/day	3.0
When Annual Flow* reaches 29.75 ML/day	4.0

*Annual flow means the average daily inflow in megalitres (ML) over the dry weather days, as defined in this development approval, and over the preceding twelve month period.

Taken to be the average daily volume of reused treated sewage over the preceding twelve month period.

Water 21: Determinations must be made of volumes of treated effluent reused and records kept of such determinations. The effluent reused must be further categorised between effluent reuse that results in nutrients being returned back into the plant and other forms of reuse where this does not occur e.g. irrigation.

Water 22: **Treated sewage effluent including ROC – Outfall Submergence and Minimum Dilution**

Contaminants must only be released to waters via an outfall that is fully submerged at all times and that achieves a minimum 1:1.8 (one : one point eight) dilution within two metres under all tidal conditions.

Monitoring

Water 23: Monitoring of contaminants released directly and indirectly to the North Pine River must be undertaken for the quality characteristics and parameters, at the monitoring point(s), and at the frequencies specified in Tables 2 and 3 Water - Release Quality Limits.

Water 24: All determinations of the quality of releases must be made on samples that are representative of the releases.

Water 25: All determinations of the quality of contaminants released must be made in accordance with the methods prescribed in the latest edition of the *Environmental Protection Agency Water Quality Sampling Manual*, and be carried out on samples that are representative of the discharge.

Water 26: **Routine Direct Toxicity Assessment (DTA)**

The registered operator of the activity to which this development approval relates must routinely undertake a DTA to quantify the toxicity of the effluent release. The Routine DTAs must be undertaken in accordance with the following minimum requirements:

1. During the first 12 months following the commencement of discharge of ROC to the North Pine River and during the first twelve months following commissioning of the upgraded waste water treatment plant, a DTA must be carried out on a twice yearly basis (with approximately 6 months between each Routine DTA). These are termed "confirmation DTAs".
2. After the first 12 months of operation in each case in Water 26 (1) and subject to consecutive twice yearly DTA results showing compliance with the release limits, the minimum frequency of Routine DTA shall be once every two years, except as provided by Waste 26 (3) of this condition.
3. If any DTA result demonstrates non-compliance with conditions Water 9 and/or Water 10 of this development approval, then action is required as per Water 34, and monitoring must recommence on a six monthly basis as in Water 26 (1) unless the registered operator can demonstrate with data and information (see note below) to the administering authority that the cause of the non-complaint DTA result has been rectified and it is unlikely to recur.
4. The DTA must be undertaken on the combined contaminant release i.e. post introduction of ROC with the WWTP effluent with the activity's minimum ratio of ROC to the disinfected WWTP effluent used.

Note: Failure to comply in a DTA should typically initiate a Toxicity Management Plan, whereby the holder must investigate the cause of the toxicity and implement operational changes or plant modifications or other measures so that the cause of the observed toxicity is addressed. The final outcome of the TPM is that the observed toxicity is no longer present as demonstrated by a repeat DTA.

Water 27: **Treatment Train Critical Assessment**

The registered operator of the activity to which this development approval relates must undertake an Treatment Train Critical Assessment (TTCA) to determine the potential toxicity of the released effluent (at the minimum 1:3.5 dilution) when any factor in the AWTP1 treatment process or influent water quality change may result in an increased toxicological effect to aquatic organisms in the receiving environment. [An example would be use of a new water treatment chemical that has product information or chemical formulation showing a toxicological effect to aquatic organisms].

Water 28: Where the TTCA determines that an increased toxicological effect may occur, a confirmation DTA must be undertaken utilising indicator organism(s) appropriate to the change and the results reported to the administering authority. [An example would be a change is planned in treatment processes and material toxicity to Crustaceans is indicated by reference material. A DTA using a Crustacean(s) or related indicator organism(s) must be carried out].

Water 29: The DTA procedure followed must address the following:

1. All specific methods and protocols to determine whether concentrations of toxicants are neither acutely toxic outside the approved acute toxicity zone nor chronically toxic outside the approved chronic toxicity zone to the test biota, including:

   (a) Specific test organisms to be utilised for DTA testing, in accordance with Section 8.3.6.8 of the ANZECC 2000 Guidelines, to provide an accurate indication of actual & chronic toxic effects in the receiving waters, taking into consideration locally occurring species and the nature of any change being investigated; and

   (b) The selection and characterisation of environmental waters for dilution of the combined contaminant waste stream;

   (c) Characterisation of the combined contaminant waste stream, including potential toxicants present;

   (d) The nature of the contaminant(s);

   (e) Acute and chronic DTA testing conducted on end-of-pipe combined contaminant discharged;

   (f) Test/biological end points;

   (g) DTA end-points (including NOEC and LOEC);

   (h) Quality assurance/quality control;

   (i) Applicable Toxicity Identification Evaluation (TIE) procedures to be followed should the administering authority require such an evaluation; and

   (j) Reporting of DTA procedure results promptly to the administering authority, which must include but not be limited to:

      (i) NOEC for all bioassay results;

      (ii) LOEC for all bioassay results;

      (iii) All relevant sample collection information for the combined contaminant test sample and receiving environment dilution water;

      (iv) Timing of combined contaminant test sample collection in relation to process performance;

      (v) Details of any manipulation of the combined contaminant test sample or receiving environment dilution water;

      (vi) combined contaminant Test sample and receiving environment dilution water delivery details;

      (vii) Results of the chemical analysis of the ROC, sewage effluent prior to blending with ROC, blended ROC/sewage effluent test water, and receiving environment dilution water for known toxicants of concern (i.e. all toxicants in Tables 6 are a minimum requirement in additional to parameters indicative of any suspected change). Chemical analysis is not required for every dilution water in every organism/effect tested, but may be required for test water in some dilutions where linear the relationship between the contaminant and the dilution is not linear. The procedure must include a consultation step with the EPA to ascertain what tests are desirable on test water for each of the individual dilutions;

      (viii) Time between test sample collection and commencement of the DTA, and

      (ix) Interpretation of results.

2. Reporting of the progress and/or results of DTA testing to the administering authority no more than 20 business days following the initial results of the toxicity assessment.

Water 30: A written DTA procedure that effectively measures toxicity of the effluent must be developed by the registered operator to which this development approval relates, and be submitted to the administering authority within 3 months of issue of this development approval.

Water 31: The registered operator of the activity to which this development approval relates must have due regard to the administering authority's comments in the finalisation and any review of the DTA procedure.

Water 32: The finalised DTA procedure must not be changed without the prior written consent of the administering authority.

Water 33: The DTA must be designed and performed by a suitably qualified person.

Water 34: **Minimum Responses to any Non Compliant Toxicity in combined contaminant Effluent**

Where a DTA has demonstrated observable toxicological effects for related tests at or greater dilutions than defined in the approved chronic toxicity limits, the registered operator of the activity to which this development approval relates must:

1. Immediately advise the administering authority; and
2. Promptly investigate the toxicity result by:
   (a) Identifying any trend or excessive presence in any contaminant likely to cause or contribute to the observed toxicity, and
   (b) Undertake an additional DTA or an appropriate single-species Toxicity Bioassay (TB) (following consultation with and as agreed with the administering authority) to investigate whether the non-compliant toxicity is still present; and
3. If following results of the investigations in either Water 34 2(a) or 2(b) compliance with the toxicity release limits is not demonstrated, immediately advise the administering authority of the results and within 10 business days prepare and submit to the administering authority a Toxicity Management Plan (TMP) that has the following objectives:
   (a) Identify the causative agent(s) responsible for the observed increase in toxicity;
   (b) Assess the risk posed to the environment by the non-compliant toxicity, and
   (c) Reduction of toxicity to the approved chronic toxicity limit specified by this development approval forthwith, for example by providing additional treatment for the contaminant(s) eliciting the toxicity, source reduction, additional dilution or equivalent.

Water 35: The TMP must, at a minimum, present the tasks and timeframes for corrective actions directed at identifying and eliminating the observed toxicological effect(s) out side of the approved toxicity zone.

Note: A Toxicological Identification Evaluation (TIE) maybe required as part of this TMP to determine the toxicant(s) responsible for the observed toxicological effect(s).

Water 36: A Confirmation DTA must be undertaken as soon as practicable after completion of the corrective action(s) required by the TMP/condition Water 34 to verify that the actions taken have been effective in eliminating the observed toxicological effects out side of the approved toxicity limits.

Note: This is an additional assessment other than normally required by the conditions of this development approval.

Water 37: **Receiving Environment Monitoring Program (REMP)**

A REMP, focussing on near-field and more distant potential impacts, must be implemented, based on the outcomes of a background environmental investigation, pertaining to the receiving waters (i.e. North Pine River) that addresses at least the following:

1. Description of potentially affected receiving waters including key communities and background water quality characteristics based on accurate and reliable monitoring data that takes into consideration any temporal variation (e.g. seasonality); and
2. Description of applicable environmental values and water quality objectives to be achieved (i.e. as scheduled pursuant to the *Environmental Protection (Water) Policy 1997*); and
3. Any relevant reports prepared by other governmental or professional research organisations that relate to the receiving environment within which the REMP is proposed; and
4. Water quality targets within the receiving environment to be achieved, and clarification of contaminant concentrations or levels indicating adverse environmental impacts during the REMP.

Water 38: **Near-field Monitoring Program (NFMP)**

A NFMP must be implemented to monitor and record the effects of the release of contaminants on the near-field receiving environment whilst contaminants are being discharged from the operation of the Murrumba Downs WWTP, with the aims of identifying and describing the extent of any adverse impacts to local environmental values, particularly from depression of dissolved oxygen, effects on recreational values and potentially toxic contaminants and monitoring to ensure adequate mixing and dilution in accordance with condition Water 22.

For the purposes of the NFMP, the receiving environment is the waters of the North Pine River and connected waterways within 200 metres upstream and downstream of the outfall.

Water 39: The NFMP proposal must address (but not necessarily be limited to) the following:

1. Monitoring for any potential adverse environmental impacts caused by the release, particularly in terms of potentially toxic contaminants that may be present in the intake water;
2. Monitoring of dissolved oxygen levels;
3. Monitoring of relevant recreational indicators including Enterococci;
4. Sampling to determine the extent of the near field mixing zone around the outfall structure at various tidal phases (including the vertical profile) to validate performance of the discharge structure in meeting the performance requirements of this development approval;
5. Monitoring of selected toxicants (including ammonia nitrogen, total and free chlorine, dissolved metals and metalloids likely to be present in intake water) to assess the extent

of the compliance of concentrations with water quality objectives and the extent of the toxicity zone,

6. Monitoring of selected physical chemical parameters (including turbidity, pH, dissolved oxygen saturation, conductivity, temperature) that would assist in quantifying the mixing and dilution.
7. The locations of monitoring points including monitoring transects away from the outfall of the designated release point as well as control locations;
8. The proposed sampling depths;
9. The frequency or scheduling of sampling and analysis;
10. Any historical datasets to be relied upon;
11. Description of the statistical basis on which conclusions are drawn, and
12. Any spatial and temporal controls to exclude potential confounding factors.

Water 40: The NFMP must be prepared and submitted in writing to the administering authority not more than 20 business days form the issue of this development approval (i.e. reverse osmosis concentrate) for the designated Murrumba Downs WWTP release point to the North Pine River.

Water 41: **Mid-field Monitoring Program (MFMP)**

A MFMP must be implemented to monitor and record the effects of the release for any potential adverse environmental impacts to recreational values and due to ammonia loads from the release, with the aims of identifying and describing the extent of any adverse impacts to local environmental values.

For the purposes of the MFMP, the receiving environment is the waters of the North Pine River and connected waterways:

For ammonia - within 1 kilometres upstream and downstream of the outfall; and

For assessing impacts on recreational values, from the Bruce Highway Bridge crossing downstream to North Pine River at the Gympie Road bridge crossing Petrie upstream.

Note: If regional water quality studies address this monitoring, such monitoring, to the extent of any overlap, is taken to satisfy these MFMP monitoring requirements, provided that monitoring is carried out in an integrated manner.

Water 42 The MFMP proposal must address (but not necessarily be limited to) the following:

1. Monitoring of indicators related to ammonia discharge including at least dissolved oxygen (including depth profiles), ammonia nitrogen, total nitrogen and chlorophyll 'a', and selected indicators of suitability for recreational use, but including at least faecal coliforms and *Enterococci*;
2. The locations of monitoring points (where practicable utilise Pine Rivers Shire Council historic river monitoring points);
3. The proposed sampling depths;
4. The frequency or scheduling of sampling and analysis;
5. Any historical datasets and water quality objectives/guidelines to be relied upon;
6. Description of the statistical basis or approaches on which conclusions are drawn, and
7. Any spatial and temporal controls to exclude potential confounding factors.

Water 43: The MFMP must be prepared and submitted in writing to the administering authority not more than 3 months from the issue of this development approval for the Murrumba Downs WWTP release to the North Pine River.

Water 44: **Far-field Monitoring Program (FFMP)**

A FFMP must be implemented to monitor the effects of the release of contaminants on the receiving environment outside the near field and mid-field whilst contaminants are being discharged from Murrumba Downs WWTP, with the aims of identifying and describing the extent of any adverse impacts to local environmental values.

For the purposes of the FFMP, the receiving environment is the waters of the North Pine River and connected waterways.

Water 45: The FFMP proposal must address (but not necessarily be limited to) the following:

1. Monitoring for any potential adverse environmental impacts caused by the release;
2. Monitoring of selected physicochemical parameters (including total nitrogen, total phosphorus, ammonia nitrogen, NOx, FRP, chlorophyll 'a', turbidity, pH, dissolved oxygen saturation, conductivity, temperature, and total suspended solids);
3. Monitoring of biological indicators that detect the extent of influence of the discharge on the far-field environment and ensure that environmental values are protected (including nutrient processing, processed nitrogen tracking such as del N, and seagrass and coral monitoring).
4. The locations of monitoring points including monitoring transects away from the outfall of the designated release point as well as control locations;
5. The proposed sampling depths;
6. The frequency or scheduling of sampling and analysis;
7. Any historical datasets or water quality objectives/guidelines to be relied upon;
8. Description of the statistical basis or approaches on which conclusions are drawn, and
9. Any spatial and temporal controls to exclude potential confounding factors.

Water 46: The FFMP must be prepared and submitted in writing to the administering authority by the 31 December 2008.

Water 47: **Involvement in Regional Monitoring Studies (i.e. Far-field Monitoring Program FFMP)**

As an alternative to carrying out the FFMP specified in Water 44-46, the registered operator of the activity to which this development approval relates may become and remain a "participating member" in the following regional water quality and ecosystem health monitoring studies, or any equivalent program:

1. the Southeast Queensland Regional Water quality Management Strategy; and
2. the Ecosystem Health Monitoring Program.

For the purposes of regional (far-field) monitoring studies, the receiving environment is the North Pine River, Moreton Bay and connected waterways.

Water 48: For the purposes of condition Water 47, the registered operator of the activity to which this development approval relates will be deemed by the administering authority to be a "participating member" in regional studies in the following situations.

1. The operator is a "contributing member", to the regional studies of water quality and ecosystem health; and
2. The operator is identified as a "contributing member" in a written statement to the administering authority from the authority carrying out the regional studies; and
3. The registered operator continues to be a "contributing member", of such regional studies.

Water 49: For the purposes of condition Water 48, the registered operator of the activity to which this development approval relates will be deemed by the administering authority to be a "contributing member" until such time as:

1. the authority carrying out the regional studies notifies the administering authority in writing that the holder is no longer a "contributing member"; and
2. the administering authority has undertaken reasonable steps to confirm this with the registered operator and the authority carrying out the regional studies; and
3. the registered operator notifies the administering authority in writing that they are no longer a "contributing member".

Water 50: **Protection of Riparian Vegetation**

All activities associated with the environmentally relevant activity, including the release of contaminants to waters, must be undertaken in a manner which prevents any adverse impacts to riparian vegetation located in or adjacent to any waters (excepting any necessary disturbance involved in constructing and maintaining outfall RP1).

Water 51: **Contaminant and Release Reduction Strategy**

The registered operator of the activity to which this development approval relates must implement studies to investigate additional water treatment and additional treated water reuse measures to further reduce releases of contaminants to the North Pine River from the Murrumba Downs WWTP. The studies shall inform a Contaminant and Release Reduction Strategy that must have the following objectives:

1. To reduce accepted ROC and sewage effluent contaminant concentrations and loads in general.
2. To identify ways to progress towards and meet the South East Queensland Healthy Waterways Strategy requirement for point sources to remove 100% of the nutrient loads from discharges to Moreton Bay and tributary streams including the Pine Rivers by 2026.
3. To demonstrate "No Chronic Observed Toxicological Effect", at zero dilutions, from the wastewater discharge.
4. To provide a regular review of emerging technologies or reuse options that may achieve significant load reductions, or zero loads of nutrients and other contaminants including oxygen-demanding substances.
5. To identify additional treatment measures such as dosing to reduce phosphorus provide a regular review of emerging technologies that may reduce toxic effects of the Reverse Osmosis Concentrate.
6. To develop five year programs of implementation of any feasible measures consistent with best practice environmental management for the relevant contaminant.

Water 52 The Contaminant and Release Reduction Studies and Strategy, required by condition Water 51, must include, as a minimum, the following:

1. An investigation of the feasibility of alternative options, practices and procedures to avoid or further minimise the volume and concentration of contaminants (treated sewage and reverse osmosis concentrate) released to waters including (but not limited to) avoiding discharge, improving the quality of the influent, best practice re-use and recycling alternatives, segregation of waste streams and source reduction and the use of treatment technologies for the treatment of ROC prior to discharge and chemical dosing of treated sewage to reduce phosphorus concentrations); and
2. Incorporating any relevant Healthy Waterway's action items for point source reductions in future Healthy Waterways Strategies viz. future strategies following on from the *South East Queensland Healthy Waterways Strategy 2007-2012 – Point Source Pollution Management Action Plan December 2007*; and
3. The Management Goals and Water Quality Objectives in the *Environmental Protection Policy (Water) 1997 or any more recent environmental protection policy under the Environmental Protection Act 1994 applying to the Pine River and Moreton Bay* ; and
4. Where alternative options, practices and procedures are not considered feasible, the provision of a report providing justification to support that determination.
5. Acknowledgement in weighing the costs and benefits of various implementation options, that the relevant Regulatory Impact Statement for the affected waters found there are large and damaging economic/social impacts associated with further declines in water quality of affected waters; and therefore, there is a strong case for intervention that seeks the improvement in water quality to protect environmental values. See Regulatory Impact Statement for SL 2006 No. 30 made under the *Environmental Protection Act 1994.*

Water 53 The initial Contaminant and Release Reduction report must be submitted to the administering authority by 30 June 2010 with further reporting, in accordance with conditions Water 51 & 52, every five years. The report(s) must, as a minimum, link with the objectives and include the following:

1. Details of the specific options, practices and procedures investigated; and
2. Where alternative options, practices and procedures are not considered feasible, the provision of justification to support that determination; and
3. Details of the option(s) to be implemented by the registered operator of the activity to which this development approval relates, including the timeframes for implementation, and justification for the chosen option/s.

Water 54: **Evaluation of Source and Effects of Oxygen Demanding Substances**

The holder must participate in a Sustainable Oxygen Demand Load Assessment coordinated by and as required by the administering authority that shall be undertaken by 31 August 2010 or a later date as agreed in writing by the administering authority following the issuing of this approval for the objectives of:

1. Assessing the contribution of organic carbon and ammonia nitrogen loads from the activity to changes in dissolved oxygen concentrations (including spatial extent) of the upper North Pine River estuary and any adjoining waterways. The contributions must consider at least current recorded maximum daily loads (from 12 months previous operation), potential future maximum daily loads and maximum daily organic carbon loads allowed under this permit for the activity.
2. In collaboration with the administering authority and the Healthy Waterways Partnership, determine a sustainable daily load of oxygen demand due to organic carbon and ammonia to the Upper North Pine estuary and any other waters potentially affected by the

discharge that does not cause non-compliance with the water quality objectives for the Upper North Pine River scheduled under the *Environmental Protection (Water) Policy 1997* (based on a statistically average rainfall periods).

3. In addition the assessment shall also incorporate the following investigations:

a. Measurement of mass loads of oxygen demanding substances (5 day biochemical oxygen demand) and nutrients (ammonia nitrogen, total nitrogen, total phosphorus) by measurement of discharge volume and waste waster quality, and consequent quantification of the mass loads of oxygen demanding substances and nutrients released to waters from the activity. The quantification must encompass potential variability in load discharges such as due to weather conditions to achieve a reliable estimate of loads. [Notes: Composite sampling may also be employed, provided sample preservation protocols in the administering authority's water sampling quality manual are complied with. Chemical oxygen demand may also be measured if it is considered that this would enhance the assessment]

b. Measurement of the redox potential and sediment oxygen demand in the receiving waters potentially influenced by the wastewater discharge. Characterisation techniques for organic carbon include sterol biomarkers shall be used to identify, if practicable, any influence of the activity on sediment oxygen demand;

c. Evaluate the relative contributions of heterotrophic and autotrophic energetic pathways to carbon cycling in receiving water ecosystems and make comparisons to research findings for other waterways, where practicable;

d. Characterisation of organic carbon content of the wastewater discharge to enable, as far as practicable, distinguishment of its organic carbon character, from other potential sources. The characterisation must include techniques of fluorescence spectrometry, carbon stable isotopic signature and sterol biomarkers.

e. Characterisation of organic carbon content of the receiving waters and any inflows from any tributary streams to identify, as far as practicable, distinguishable sources of organic carbon. The characterisation must include techniques of fluorescence spectrometry, carbon stable isotopic signature and sterol biomarkers.

f. Estimation of extent to which the wastewater discharge materially influences water quality in the River. The assessment must use a recognised technique such as nitrogen stable isotopic ratios to estimate the likely zone of influence of the sewage discharge on the Pine River. Any historic data may be utilised for this purpose.

g. Measurement of dissolved oxygen concentrations and saturation in receiving waters. The assessment must include and assess measurements of dissolved oxygen concentrations and saturation in receiving waters potentially influenced by the waste water discharge, as well as physical and biological parameters that influence or illustrate processes influencing dissolved oxygen concentrations. These include temperature, salinity and chlorophyll 'a'. Dissolved oxygen measurements must include surface and subsurface measurements e.g. measurements at 0.2 m, 2 metre depth intervals and the stream bottom.

h. Investigations of potential relationships between the dissolved oxygen measurements, discharge loads, catchment rainfall records and physical and biological parameters mentioned in clause 3(g) should be evaluated.

i. Development of an organic carbon and oxygen budget for the receiving waters including for dry and wet weather periods.

j. Seeking and obtaining an independent scientific review of the Assessment (as it relates specifically to the carrying out of the activity) from the Healthy Waterways Scientific Expert Panel and incorporate any comments provided into the conduct and findings of the Assessment.

k. Proposing suitable indicators for monitoring loads end-of pipe, for example Biochemical Oxygen Demand, Chemical Oxygen Demand and/or Total Organic Carbon and limits and load reduction targets for these indicators to reflect current and future operations for the activity to minimise likelihood of environmental harm and further achievement of the dissolved oxygen water quality objectives scheduled for the Pine River in the *Environmental Protection Water Policy 1997*.

l. Where it is shown that sustainable oxygen demand loads to upper North Pine River estuary and adjoining waterways are not currently being achieved or will not be achieved in the future and where contributions of organic carbon and or ammonia loads from the activity are found to be significant {e.g. greater than 5 percent of the estuary's source of organic carbon or 5 percent of the sustainable oxygen demand defined in 2 or causing a sag in dissolved oxygen concentrations in the North Pine River below the dissolved water quality objective scheduled for the River in the *Environmental Protection Water Policy 1997* in the near to mid field, (described as within two kilometres upstream and downstream of the outfall)}, develop options and strategies to reduce organic and or ammonia loads from the activity to sustainable levels for the relevant discharge location.

For the purposes of this permit, the upper North Pine River estuary for investigation is defined as from the upper tidal point on the North Pine River to the confluence of the South Pine and North Pine Rivers. Adjoining waterways includes the South Pine River, the lower North Pine Estuary (confluence of the South Pine River to mouth of the North Pine River) and Moreton Bay. [Note: Studies of organic carbon cycling and identification in the Bremer River may be used as a guide.]

Note: Holder of this Development Approval's specific role in the assessment shall be further specified in a separate notice under the *Environmental Protection Act 1994*.

Water 55: A draft program for the Load Assessment must be developed by the registered operator to which this development approval relates, and be submitted to the administering authority 6 months of the issue of this development approval or such later period agreed to with the administering authority.

Water 56: The registered operator of the activity to which this development approval relates must have due regard to the administering authority's comments in the finalisation and any review of the Load Assessment.

Water 57: The finalised Load Assessment program must not be changed without the prior written consent of the administering authority.

Water 58: The Load Assessment program must be designed and performed by a suitably qualified person. Records must be kept of results of all monitoring

Water 59: Records must be kept of results of all monitoring carried out under the Load Assessment program.

Water 60: The registered operator of the activity to which this development approval relates must provide to the administering authority a Sustainable Oxygen Demand Load Assessment Report, within a two year period (or such later period as approved by the administering authority) following the issuing of this approval. The report must include the outcome of the assessment including the methodology, findings and recommendations and cover points listed in condition Water 54.

Water 61: The registered operator of the activity to which this development approval relates must have due regard to comments, provided by the administering authority in regards to content and recommendations of the Sustainable Organic Load Assessment Report.

Water 62: **Monitoring to Investigate Potential Impacts on Environmental Values Health**

In the event of a concern by the administering authority about effects of a release of contaminants (for example a sewage spill) from the environmentally relevant activity upon environmental and recreational values of waters and public health and a request in writing by the authority to investigate risks, then the registered operator of the activity to which this development approval relates must undertake monitoring for relevant water quality indicators in the relevant receiving waters to investigate the extent and environmental risks. Relevant water quality indicators include:

- Ammonia nitrogen;
- Dissolved oxygen;
- Biochemical oxygen demand or total organic carbon;
- E Coli and Total coliforms by Colilert;
- Faecal coliforms;
- Enterococci;
- Coliphage (In situations with a higher than average potential risk to public health such as primary contact recreation areas, oyster growing areas, potable water supply storages and waters frequented by children. Use of this indicator is subject to consultation with the holder on the value of including this indicator in assessing public health risks of the particular incident.); and
- Human sterols (In situations following wet weather events or other situations where it is desirable to distinguish between sewage and other sources of contamination such as stormwater. Use of this indicator is subject to consultation with the holder on the value of including this indicator in evaluating relative contributions of different sources for a particular incident).

Results of such monitoring must be kept and provided promptly to the administering upon receipt of results.

Water prevention and minimisation.

Water 63: **Stormwater management**

Except as otherwise provided by the conditions of this permit, the environmentally relevant activity must be carried out by such reasonable and practicable means necessary to prevent the contact of rainfall and stormwater runoff with waste or other contaminants.

Water 64: Reasonable and practicable measures must be implemented to prevent the release of stormwater runoff that has been in contact with any contaminants at the site to any waters

Water 65: Any spillage of wastes, contaminants or other materials must be cleaned up as quickly as practicable. Such spillages must not be cleaned up by hosing, sweeping or otherwise releasing such wastes, contaminants or material to any stormwater drainage system, roadside gutter or waters.

Note: To eliminate doubt, Condition Water 64 does not apply to a purpose designed and built area for spill control, nor to temporary works undertaken for spillage control and/or cleanup provided that such area or works effectively contains all contaminants within the authorised place.

Water 66: **Minimise infiltration to sewer**

All reasonable and practicable measures must be taken to minimise the infiltration of stormwater and / or groundwater to sewer.

Water 67: For the purposes of demonstrating compliance with condition Water 67, the registered operator must establish and maintain a system which addresses the following matters:

a. the measured or estimated level of infiltration;

b. reasonable and practicable measures intended to minimise infiltration;

c. the actions taken to minimise infiltration;

d. periodic re-estimations of the level of infiltration and, by comparison with previous infiltration estimates and connected population, an assessment of the effectiveness of the actions taken to minimise infiltration; and

e. where infiltration has been identified as a cause for overflows from sewerage infrastructure, the remedial actions performed and an assessment of the effectiveness of such actions.

Water 68: Details of the system required by condition Water 67 must be provided to the administering authority upon request

Water 69: **Wastewater Spillage Abatement Strategy**

The registered operator must operate and maintain a strategy that effectively minimises spills and overflows from wastewater infrastructure associated with the Murrumba Downs Wastewater Treatment Plant.

Water 70: There must be sufficient on-site backup or alternative power feed available to operate essential units of sewage treatment plant and any instrumentation associated with the sewage treatment plant and disinfection process.

Contaminant and Sewage Pump Stations and Overflow Structures

[Note: Overflow locations for any new sewage pump station installed by the registered operator must be selected based on the results of a risk assessment that include consideration of public health and environmental issues. Consideration must also be given to overflow control structures where practicable, such as the installation of basins to isolate and contain sewage pump station overflows and for return back into the sewage treatment system or devices to remove gross pollutants.]

Water 71: Sewage pump stations must be fitted with stand-by pumps and pump-failure alarms and/or telemetry, as well as high-level alarms to warn of imminent pump station overflow.

Water 72: All alarms and telemetry systems referred to in condition Water 71 must be able to raise an alarm should mains power failure occur at the pump station. When triggered the alarm must be reported to the appropriate person to respond to the failure.

Water 73: The registered operator must maintain an updated list of all sewage pump stations and overflow structures connected to the Murrumba Downs Wastewater Treatment Plant. This list must contain at least the following information:

a. sewage pump station identification, e.g., sewage pump station number by which the sewage pump station is uniquely identified;

b. address/location of the sewage pump station including name of street and suburb in which the sewage pumping station is located; and

c. identification of the part of environment to which an overflow/discharge may occur (e.g. for waterbody, a description of where sewage may enter the particular waterbody);

Water 74: The registered operator must forward an updated list of the information required by condition Water 68 to the administering authority with each annual return.

[Note: if the details required by condition Water 73 have not changed since the last annual return the following statement should be included in the annual return "There has been no change to the locations or details of the sewage pumping stations connected to the Murrumba Downs Wastewater Treatment Plant since the last annual return"].

Water 75: **Recycling Treated Effluents**

Treated sewage effluent may be used for irrigation purposes on land managed by the registered operator, or supplied to another party for irrigation purposes or other reuse purpose (excluding release of the effluent into any water). The quality of treated sewage effluent reused must comply with the Queensland Water Recycling Guidelines December 2005 published by the Environmental protection Agency (or more recent editions or replacements of that document).

Water 76: The quality of the treated sewage effluent used for irrigation purposes, or supplied to another party for irrigation purposes or other reuse must be monitored as a minimum in accordance with the Queensland Water Recycling Guidelines December 2005 published by the Environmental protection Agency (or more recent editions or replacements of that document). Records must be kept of results of such monitoring.

Water 77: The registered operator of the activity to which this development approval relates must, when irrigating or otherwise reusing treated effluent, take all reasonable and practicable measures to ensure that persons and stock are not exposed to pathogens in treated sewage effluent, by such means including -

(a) selection of irrigator equipment with an appropriately low exposure risk; and
(b) appropriate timing of irrigation;
(c) restriction of public access to areas either being irrigated or that are freshly irrigated; and
(d) monitoring relevant groundwater quality indicators if any potentially affected bores exist near reuse sites;
(e) use of appropriate withholding periods for livestock grazing if livestock may be affected;
(f) notices prominently displayed on areas undergoing wastewater irrigation, warning the public that the area is irrigated with treated waste water and not to use or drink the waste water;
(g) fitting lockable valves or removable handles to all treated wastewater release pipes situated in public access areas; and
(h) ensuring pipelines and fittings for the transfer of treated sewage effluent must be clearly identified and that standard water taps, hoses and cocks must not be fitted to pipelines carrying treated sewage effluent and that such pipelines must not be connected to other service pipelines.

Water 78: The registered operator of the activity to which this development approval relates must, when reusing the water, do so in a manner in which release of the treated effluent to waters is not likely.

Provision of recycled water to other persons

Water 79: If the registered operator supplies recycled water to another person or organisation ("third party"), other than to a residential dwelling by means of dual reticulation, a recycled water agreement must be entered into, in accordance with the provisions of the EPA's *Queensland Water Recycling Guidelines (2005)*. Any recycled water agreement must, at the very least, include:

(a) a clear description of the respective obligations and responsibilities with respect to the supply and use of recycled water; and

(b) disclosure by the registered operator of relevant information about recycled water quality to enable the third party to make an informed decision about the suitability of using the recycled water for the intended uses, and to ensure that environmental risks are appropriately managed; and

(c) a commitment from the third party utilising the recycled water to use the recycled water in such a way as to prevent environmental harm, and must specifically make the third party aware of the general environmental duty as provided in section 319 of the *Environmental Protection Act 1994*, the environmental sustainability of their recycled water use and any storage and their obligation to protect public health and the environmental values of potentially impacted waters, as provided in the *Environmental Protection (Water) Policy 1997.*

[NOTE: The EPA document, *Manual for recycled water use agreements in Queensland*, should be referred to when preparing recycled water use agreements.]

Water 80: **Prohibition of release to groundwater**

There must be no release of contaminants to groundwater.

DEFINITIONS

Words and phrases used throughout this permit[1] are defined below. Where a definition for a term used in this permit[1] is sought and the term is not defined within this permit[1] the definitions provided in the relevant legislation shall be used.

"administering authority" means the Environmental Protection Agency or its successor.

"ADWF" means average dry weather flow.

"annual return" means the return required by the annual notice (under section 316 of the *Environment Protection Act 1994*) for the section 73F registration certificate that applies to the development permit.

"approval" means 'notice of development application decision' or 'notice of concurrence agency response' under the *Integrated Planning Act 1997.*

"Australian Water Quality Guidelines" means the *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* as revised or amended from time-to-time.

"Authorised Person" refers to a person holding office as an Authorised Person under an appointment of the *Environmental Protection Act 1994* by the Chief Executive of the Environmental Protection Agency.

"authorised place" means the place authorised under this development permit for the carrying out of the specified environmentally relevant activities.

"AWTP1" means the advanced water treatment plant as outlined in AWTP Planning Report Pages 25-26 dated September 2007, designed to receive 5.4 megalitres of treated sewage effluent for recycling.

"commercial place" means a place used as an office or for business or commercial purposes.

"dry weather day" means a day during which less than 1 mm of rainfall is recorded at any rainfall measuring station recognised by the Commonwealth Bureau of Meteorology within the sewered area connected to the sewage treatment plant, or if no such measuring station exists, at the nearest such station to the sewage treatment plant. The term also excludes days during which recorded rainfall over the four preceding days exceeds 100 mm.

"dry weather flow" means flow which occurs from the sewage treatment plant to the designated receiving water during a dry weather day.

"dwelling" means any of the following structures or vehicles that is principally used as a residence –

- a house, unit, motel, nursing home or other building or part of a building;
- a caravan, mobile home or other vehicle or structure on land;
- a water craft in a marina.

"Environmental Protection Agency" means the department or agency (whatever called) administering the *Coastal Protection and Management Act 1995* or the *Environmental Protection Act 1994.*

"intrusive noise" means noise that, because of its frequency, duration, level, tonal characteristics, impulsiveness or vibration –

- is clearly audible to, or can be felt by, an individual; and
- annoys the individual.
- In determining whether a noise annoys an individual and is unreasonably intrusive, regard must be given to Australian Standard 1055.2 – 1997 Acoustics – Description and Measurement of Environmental Noise Part 2 – Application to Specific Situations.

"$L_{A\ 10,\ adj,\ 10\ mins}$" means the A-weighted sound pressure level, (adjusted for tonal character and impulsiveness of the sound) exceeded for 10% of any 10 minute measurement period, using Fast response.

"$L_{A\ 1,\ adj,\ 10\ mins}$" means the A-weighted sound pressure level, (adjusted for tonal character and impulsiveness of the sound) exceeded for 1% of any 10 minute measurement period, using Fast response.

"$L_{A,\ max\ adj,\ T}$" means the average maximum A-weighted sound pressure level, adjusted for noise character and measured over any 10 minute period, using Fast response.

"land" in the "land schedule" of this document means land excluding waters and the atmosphere.

"long term 50th percentile" means the median value of the measured values in ranked order or the quality characteristic is not to exceed the stated release limit for any fifty-two (52) consecutive samples where:

(i) the consecutive samples are taking over a one year period;
(ii) the consecutive samples are taken at approximately equal periods; and
(iii) the time interval between the taking of each consecutive sample is not less than three (3) days or greater than eleven (11) days.

"long term 90th percentile" means that not more than five (5) of the measured values of the quality characteristic are to exceed the stated release limit for any fifty-two (52) consecutive samples where:

(i) the consecutive samples are taking over a one (1) year period;
(ii) the consecutive samples are taken at approximately equal periods; and
(iii) the time interval between the taking of each consecutive sample is not less than three (3) days or greater than eleven (11) days.

"mg/L" means milligrams per litre.

"**Murrumba Downs WWTP**" means all components of the wastewater treatment train including primary treatment, secondary treatment, disinfection, and advanced water treatment for recycling sewage for various end uses. The term also includes ancillary works such as chemical storage and sludge handling, the sewerage network conveying sewage to the plant and associated pump stations.

"No Observed Effect Concentration" means the highest concentration of an effluent tested, which does not exhibit a toxic effect.

"noxious" means harmful or injurious to health or physical well being.

"noise sensitive place" means –

- a dwelling, residential allotment, mobile home or caravan park, residential marina or other residential premises; or
- a motel, hotel or hostel; or
- a kindergarten, school, university or other educational institution; or
- a medical centre or hospital; or
- a protected area under the *Nature Conservation Act 1992*, the *Marine Parks Act 1992* or a World Heritage Area; or
- a park or garden;

and includes the curtilage of such place.

"NTU" means nephelometric turbidity units.

"odour sensitive place" includes –

- a dwelling, residential allotment, mobile home or caravan park, residential marina or other residential premises; or
- a motel, hotel or hostel; or
- a kindergarten, school, university or other educational institution; or
- a medical centre or hospital; or
- a protected area under the *Nature Conservation Act 1992*, the *Marine Parks Act 1992* or a World Heritage Area; or
- a public thoroughfare, park or gardens; or
- a place used as a workplace, an office or for business or commercial purposes;

and includes a place within the curtilage of such a place reasonably used by persons at that place.

"**Odour Unit (ou)**" means that concentration of odorant(s) at standard conditions that elicits a physiological response from a panel (detection threshold) equivalent to that elicited by one Reference Odour Mass (ROM), evaporated in one cubic metre of neutral gas at standard conditions as measured under AS/NZS-4323.3:2001 - Australian and New Zealand Standard, Stationary source emissions - Determination of odour concentration by dynamic olfactometry.

"**Odour emission rate**" ("ou.m^3/s") means the arithmetic product of the odour concentration of the release of contaminants and the volume rate of discharge (in wet cubic metres per second referred to a temperature of zero degrees Celsius and a pressure of 101.3 kilopascals.

"offensive" means causing offence or displeasure; is disagreeable to the sense; disgusting, nauseous or repulsive.

"participating member" means, for the purposes of an equivalent REMP, being an actively participating member in a study which is the equivalent of the REMP and any monitoring program resulting from such study.

"protected area" means –

- a protected area under the *Nature Conservation Act 1992*; or
- a marine park under the *Marine Parks Act 1992*; or
- a World Heritage Area.

"**Reference Odour Mass (ROM)**" means the acceptable reference value for the odour unit, equal to a defined mass of a certified reference material. One ROM is equivalent to 132 μg n-butanol which evaporated in 1 cubic metre of neutral gas at standard conditions produces a concentration of 40 ppb (μmol/mol).

"REMP" means the Receiving Environmental Monitoring Program.

"regulated waste" means non-domestic waste mentioned in Schedule 7 of the *Environmental Protection Regulation 1998* (whether or not it has been treated or immobilised), and includes -

- for an element - any chemical compound containing the element; and
- anything that has contained the waste.

"**Relevant Regulatory Impact Statement**" means the Regulatory Impact Statement for Subordinate Legislation No. 30 of 2006 made under the *Environmental Protection Act 1994.*

"reverse osmosis concentrate" means the concentrated waste stream generated during operation of the advanced water treatment plant utilising reverse osmosis processes.

"short term 50th percentile" means that the median value of the measured values in ranked order of the quality characteristic is not to exceed the stated release limit for any five (5) consecutive samples where:

(i) the consecutive samples are taking over a five (5) week period;
(ii) the consecutive samples are taken at approximately equal periods; and
(iii) the time interval between the taken of each consecutive sample is not less than three (3) days or greater than eleven (11) days.

"short term 80th percentile" means that not more than one (1) of the measured values of the quality characteristic are to exceed the stated release limit for any five (5) consecutive samples where:

(i) the consecutive samples are taking over a five week period;
(ii) the consecutive samples are taken at approximately equal periods; and
(iii) the time interval between the taking of each consecutive sample is not less than three (3) days or greater than eleven (11) days.

"total Nitrogen" means the sum of Organic Nitrogen, Ammonia, Nitrite plus Nitrate, as mg/L of Nitrogen.

"total Phosphorus" means the sum of the reactive phosphorus, acid-hydrolysable phosphorus and organic phosphorus, as mg/L of Phosphorus. This includes both the inorganic and organic fraction of phosphorus.

"watercourse" means a river, creek or stream in which water flows permanently or intermittently-

- in a natural channel, whether artificially improved or not; or
- in an artificial channel that has changed the course of the watercourse.

"Water EPP" means the *Environment Protection (Water) Policy* as revised or amended from time-to-time.

"waters" includes river, stream, lake, lagoon, pond, swamp, wetland, unconfined surface water, unconfined water natural or artificial watercourse, bed and bank of any waters, dams, non-tidal or tidal waters (including the sea), stormwater channel, stormwater drain, roadside gutter, stormwater run-off, and groundwater and any part-thereof.

"wet weather day" means a day which is not a dry weather day.

"works" or "operation" means the development approved under this development permit.

"50th percentile" means not more than three (3) of the measured values of the quality characteristic are to exceed the stated release limit for any six (6) consecutive samples for a release/monitoring point at any time during the environmental activity(ies) works.

"80th percentile" means not more than one (1) of the measured values of the quality characteristic is to exceed the stated release limit for any five (5) consecutive samples for a sampling point at any time during the environmental activity(ies) works

END OF CONDITIONS

Attachment – Tables

Table Air 1 Aerobic Zone Odour Sampling and Measurement Program (See also notes to Table)

Unit	Sample Location	Stage 1 Survey		Stage 2 Survey	
		Samples per day	Total Samples	Samples per day	Total Samples
Bioreactor 2 Aerobic Zones 1-3	A point of the liquid surface, from alternating cells each day	1	5	1	5
Bioreactor 2 Aerobic Zones 4-5	A point of the liquid surface, from alternating cells each day	1	5	1	5
Bioreactor 2 De-aeration Zone 1	A point on the liquid surface, from alternating cells each day.	1	5	1	5
Bioreactor 2 Re-aeration Zone and Outlet Weirs	A point on the liquid surface	1	5	1	5
Final Clarifier 3	A point on the liquid surface halfway between the centre and outlet weir	1	5	1	5
Final Clarifier 4	A point on the liquid surface halfway between the centre and outlet weir	1	5	1	5
Bioreactor 1 Aerobic Zone 1-2	A point on the liquid surface, from alternating cells each day	N/A	N/A	1	5
Bioreactor 1 Aerobic Zones 3-4 and De-aeration Zone 1	A point on the liquid surface, from alternating cells each day	N/A	N/A	1	5
Final Clarifier 1	A point on the liquid surface halfway between the centre and outlet weir	N/A	N/A	1	5
Final Clarifier 2	A point on the liquid surface halfway between the centre and outlet weir	N/A	N/A	1	5

Notes to Table 1:

N/ – Not applicable

Both sampling surveys shall be conducted in accordance with AS4323.3:2001, during daytime and with the plant generally under normal operating conditions.

The specific odour emission rates (SOERs, in OU/s/m^2) for the cells of Bioreactors 1 and 2 and Final Clarifiers 1-4, will be determined by olfactometry sampling as part of a two-stage process.

The Stage 1 Survey is to gauge the magnitude of emissions from Bioreactor 2 and Final Clarifiers 3 and 4 and gauge likelihood of meeting the action trigger level of 1832 odour units per second once the plant is fully upgraded. It involves a survey within 3 months of commissioning of the new secondary treatment process.

The Stage 2 Survey is to confirm gauge the magnitude of emissions from the upgraded plant and gauge likelihood of meeting the action trigger level of 1832 odour units per second. It will be conducted during summer once the full plant upgrade is complete and commissioned.

Table Air 2 – Contaminant release limits to air

Release point number/ Monitoring Point and Sources	Minimum release height (metres)	Minimum velocity (m/sec)	Contaminant	Maximum release limit	Minimum Monitoring frequency
RP-1 Stack serving outlet of odour control facility Sources see conditions Air 2 and 4.	20 (engineered with the option of extension if necessary to 30 m)	15	Odour	Situation 1 Concentration: 500 ou and Odour emission rate: 9375 ou.m^3/s (see Note 2)	Within three months of the commissioning of the facility; and then annually; and Upon a written request from the administering authority (see Note 1)
				Situation 2 Concentration: 500 ou and Odour emission rate: 11,100 ou.m^3/s (See Note 3 & 4)	
RP-2 Stack serving ventilation system for source viz. biosolids handling building	15	15	Odour	Situation 1 Concentration: 1000 ou and Odour emission rate: 6667 ou.m^3/s (See Note 2)	
				Situation 2 Concentration: 720 ou and Odour emission rate: 4000 ou.m^3/s (See Note 3 &4)	
Inlet to Odour Control Facility	N/A	N/A	Odour	Concentration: No specific limit and Odour emission rate: No specific limit	Within three months of the commissioning of the facility; and Upon a written request from the administering authority

Note 1: Annual odour monitoring for a source is not required where any odour monitoring conducted as a result of written request from the administering authority has been conducted within the preceding 3 months and the results of that monitoring indicated compliance with all the emission limitations in this Table for that source.
Note 2: Situation 1 is at commencement with aerobic zones being managed under conditions Air 3 and Air 4.
Note 3: Situation 2 arises if odours from aerobic zones are directed to the odour treatment facility under condition Air 4.
Note 4: Based on an air flow volume of 24,000 m^3/hour, being 20 building volume air changes per hour.

Table 1 – Noise Limits

Time period	Noise level at a 'Noise sensitive place' measured as the Adjusted Maximum Sound Pressure Level $L_{A,max\ adj\ T}$
7am - 6pm	45 dB(A) or background noise level plus 5 dB(A), whichever is the greater
6pm - 10pm	45 dB(A) or background noise level plus 5 dB(A), whichever is the greater
10pm - 7am	40 dB(A) or background noise level plus 3 dB(A), whichever is the greater
Time period	**Noise level at a 'Commercial place' measured as the Adjusted Maximum Sound Pressure Level $L_{A,\ max\ adj\ T}$**
7am - 6pm	50 dB(A) or background noise level plus 10 dB(A), whichever is the greater
6pm - 10pm	50 dB(A) or background noise level plus 10 dB(A), whichever is the greater
10pm - 7am	45 dB(A) or background noise level plus 8 dB(A), whichever is the greater

Table 1- Water-Mass Acceptance Limits for Reverse Osmosis Concentrate

MONITORING POINT FOR LOAD ACCEPTANCE	CONTAMINANT	TIMEFRAME APPLYING	LIMITS FOR MASS LOAD ACCEPTED (kg/day)[1]	LIMIT TYPE[2, 3]
Monitoring Point S3[4] – Discharge from AWTP1 into Murrumba WWTP	Total Phosphorus (as P, kg/day)	Until date of new plant	Intake Volume in ML X 2	50th Percentile Load
			Intake Volume in ML X 6	Maximum Load
		After date of new plant	Intake Volume in ML X 1	50th Percentile Load
			Intake Volume in ML X 3	Maximum Load
	Total Nitrogen (as N, kg/day)	Until date of new plant	[(Intake Volume in ML X 5) + 2.6)	50th Percentile Load
			[(Intake Volume in ML X 15) + 2.6)	Maximum Load
		After date of new plant	[(Intake Volume in ML X 3) + 2.6)	50th Percentile Load
			[(Intake Volume in ML X 9) + 2.6)	Maximum Load

[1] Loads accepted are the Discharge loads of Total Nitrogen (as N) and Total Phosphorus (as P) in kilograms form AWTP1 that are to be calculated as per the conditions of this development approval.
[2] Maximum load means the daily discharge load must not exceed the load limit on any one day.
[3] 50th percentile load means the median daily discharge load of all days on which a discharge actually occurred after 3 months operation. Once the AWTP has operated from 12 months, the data used in this calculation are the consecutive daily discharge loads of all days on which a discharge occurs over the preceding rolling 12 months.
[4] Monitoring point S3 – Monitoring Point for entry of Reverse Osmosis Concentrate into Murrumba Downs WWTP from AWTP1, [refer plan titled Murrumba Alliance Waste Water Treatment Works Development Approval Location of Monitoring Points Drawing 5-35102 Rev 1 attached to this approval]
[5] "Intake kg TN" means the daily intake load of Total Nitrogen (as N) in kilograms that is directed to AWTP1 for recycling, as calculated under the conditions of this approval.

Table 2- Water - Release Quality Limits prior to 30 September 2010 [see Note # below] – Contaminant releases to water – monitoring points, water quality limits and monitoring frequency

MONITORING POINT	QUALITY CHARACTERISTICS	RELEASE LIMIT	LIMIT TYPE	MINIMUM MONITORING FREQUENCY
S1[1] – Combined Flow below ROC inflow	Total Chlorine (as Cl)	No Limit	Maximum	Daily – if & when discharging ROC
	Dissolved Oxygen	4.0 mg/L	Minimum	Daily from Monday through to Saturday – if & when discharging ROC, else weekly
	pH	6.5 to 8.5	Range	Weekly
	Suspended Solids	No limit	No limit	Weekly (composite sample[2])
	5 Day Biochemical Oxygen Demand (inhibited)	No Limit	No limit	Weekly (composite sample[2])
	Ammonia Nitrogen (as N)	5 mg/L	Maximum	Daily (single measurement during maximum expect rate of ROC inflow
	Total Organic Carbon	No Limit	No Limit	Weekly (composite sample[2])
	Chemical Oxygen Demand	No Limit	No Limit	Weekly (composite sample[2])
	Faecal Coliforms	1000 cfu/100 ml	Median of minimum 5 samples, approx. 30 minutes apart	Weekly
		4000 cfu/100 ml	4 out of 5 of the above samples must meet this limit	
	Enterococci organisms	No Limit	No Limit	Weekly
Upstream of ROC Monitoring Point S2[3]	Free Chlorine (as Cl)	0.7 mg/L	Maximum	Daily
	Total Nitrogen (as N)	5 mg/L	Long term 50 percentile	Weekly (composite sample[2])
		7.5 mg/L	Short term 50 percentile	
		15 mg/L	Maximum	
	Total Phosphorus (as P)	2 mg/L	Long term 50 percentile	Weekly (composite sample[2])
		3 mg/L	Short term 50 percentile	
		6 mg/L	Maximum	

	Suspended Solids	15 mg/L	Long term 80 percentile	Weekly (composite sample[2])
		23 mg/L	Short term 80 percentile	
		45 mg/L	Maximum	
	5 Day Biochemical Oxygen Demand (inhibited)	10 mg/L	Long term 80 percentile	Weekly (composite sample[2])
		15 mg/L	Short term 80 percentile	
		30 mg/L	Maximum	
S3[4] – ROC Inflow	Total Chlorine (as Cl)	0.2 mg/L	Maximum	Daily – if & when discharging ROC
	Total Nitrogen (as N)	Load Limited, No Concentration Limit applies - Used in load calculations		Weekly (composite sample[2])
	Total Phosphorus (as P)	Load Limited, No Concentration Limit applies - Used in load calculations		Weekly (composite sample[2])
	Ammonia Nitrogen (as N)	Load and dilution ratio limited, No Concentration Limit applies - Used in load calculations		Daily (single measurement during maximum expect rate of ROC inflow
	5 Day Biochemical Oxygen Demand (inhibited)	Load Limited, No Concentration Limit applies - Used in load calculations		Weekly (composite sample[2])
S4[5] – Feed water to AWTP1	Total Nitrogen (as N)	No Concentration Limit applies Used in load calculations		Weekly (composite sample[2])
	Total Phosphorus (as P)	No Concentration Limit applies Used in load calculations		Weekly (composite sample[2])

[1] Monitoring point S1 – Monitoring Point for release of combined effluents (including Reverse Osmosis Concentrate accepted into Murrumba Downs WWTP from AWTP1), refer plan titled Murrumba Alliance Waste Water Treatment Works Development Approval Location of Monitoring Points Drawing 5-35102 Rev 1 attached to this approval.

[2] Composite Sample – Taken as a composite grab sample over a 2 hour period. The sample to be made up of sub-samples taken at least every 15 minute and mixed in equal proportion, all sub samples must comply the provisions of the EPA's most recent version of the Water Quality Sampling Manual.

3 Monitoring point S2 – Monitoring Point upstream of acceptance of Reverse Osmosis Concentrate from AWTP, after feed to AWTP refer plan titled Murrumba Alliance Waste Water Treatment Works Development Approval Location of Monitoring Points Drawing 5-35102 Rev 1 attached to this approval].

4 Monitoring Point S3 – Monitoring Point at which the Reverse Osmosis Concentrate outflows from AWTP1 that are released into waste water being discharged from the Murrumba Downs WWTP is measured. [refer plan titled Murrumba Alliance Waste Water Treatment Works Development Approval Location of Monitoring Points Drawing 5-35102 Rev 1 attached to this approval]

5 Monitoring Point S4 Monitoring Point for feedwater into AWTP1 refer plan titled Murrumba Alliance Waste Water Treatment Works Development Approval Location of Monitoring Points Drawing 5-35102 Rev 1 attached to this approval].

If Monitoring Point S2 is representative of feedwater quality, the holder may monitor water quality at S2 in place of S4.

 # or a later date agreed to in writing by the administering authority in the case of delays experienced in construction and commissioning of the upgraded WWTP, despite taking all reasonable efforts to effect completion and commissioning

Table 3 Water - Release Quality Limits from 1 October 2010 [see Note # below] – Contaminant releases to water – monitoring points, water quality limits and monitoring frequency

MONITORING POINT	QUALITY CHARACTERISTICS	RELEASE LIMIT	LIMIT TYPE	MINIMUM MONITORING FREQUENCY
S1[1] – Combined Flow below ROC inflow	Total Chlorine (as Cl)	0.2 mg/L	Maximum	Daily – if & when discharging ROC
	Dissolved Oxygen	4.0 mg/L	Minimum	Daily from Monday through to Saturday – if & when discharging ROC, else weekly
	pH	6.5 to 8.5	Range	Weekly
	Suspended Solids	No limit	No limit	Weekly (composite sample[2])
	5 Day Biochemical Oxygen Demand (inhibited)	No Limit	No limit	Weekly (composite sample[2])
	Ammonia Nitrogen (as N)	5 mg/L	Maximum	Daily (single measurement during maximum expected rate of ROC inflow
	Total Organic Carbon	No Limit	No Limit	Weekly (composite sample[2])
	Chemical Oxygen Demand	No Limit	No Limit	Weekly (composite sample[2])
S1[1] – Combined Flow below ROC inflow	Faecal Coliforms	150 cfu/100 ml	Median of minimum 5 samples, approx. 30 minutes apart	Weekly
		600 cfu/100 ml	4 out of 5 of the above samples must meet this limit	
	Enterococci organisms	No Limit	No Limit	Weekly
Upstream of ROC Monitoring Point S2[3]	Total Nitrogen (as N)	3 mg/L	Long term 50 percentile	Weekly (composite sample[2])
		4.5 mg/L	Short term 50 percentile [6]	
		9 mg/L	Maximum	
	Total Phosphorus (as P)	1 mg/L	Long term 50 percentile	Weekly (composite sample[2])
		1.5 mg/L	Short term 50 percentile [6]	
		3 mg/L	Maximum	
	Suspended Solids	10 mg/L	Long term 80 percentile	Weekly (composite sample[2])

		15 mg/L	Short term 80 percentile	
		20 mg/L	Maximum	
	5 Day Biochemical Oxygen Demand (inhibited)	5 mg/L	Long term 80 percentile	Weekly (composite sample[2])
		10 mg/L	Short term 80 percentile [6]	
		15 mg/L	Maximum	
	Ammonia Nitrogen (as N)	0.7 mg/L (see Note 7)	Long term 50 percentile	Daily (single measurement during maximum expected rate of ROC inflow
S3[4] – ROC Inflow	Total Nitrogen (as N)	Load Limited, No Concentration Limit applies - Used in load calculations		Weekly (composite sample[2])
	Total Phosphorus (as P)	Load Limited, No Concentration Limit applies - Used in load calculations		Weekly (composite sample[2])
	Ammonia Nitrogen (as N)	Load and dilution ratio limited, No Concentration Limit applies - Used in load calculations		Daily (single measurement during maximum expected rate of ROC inflow
	5 Day Biochemical Oxygen Demand (inhibited)	Load Limited, No Concentration Limit applies		Weekly (composite sample[2])
S4[5] – Feed water to AWTP1	Total Nitrogen (as N)	No Concentration Limit applies - Used in load calculations		Weekly (composite sample[2])
	Total Phosphorus (as P)	No Concentration Limit applies - Used in load calculations		Weekly (composite sample[2])

[1] Monitoring point S1 – Monitoring Point for release of combined effluents (including Reverse Osmosis Concentrate accepted into Murrumba Downs WWTP from AWTP1), [refer plan titled Murrumba Alliance Waste Water Treatment Works Development Approval Location of Monitoring Points Drawing 5-35102 Rev 1 attached to this approval].

[2] Composite Sample – Taken as a composite grab sample over a 2 hour period. The sample to be made up of sub-samples taken at least every 15 minute and mixed in equal proportion, all sub samples must comply the provisions of the EPA's most recent version of the Water Quality Sampling Manual.

3 Monitoring point S2 – Monitoring Point upstream of acceptance of Reverse Osmosis Concentrate from AWTP, after feed to AWTP [refer plan titled Murrumba Alliance Waste Water Treatment Works Development Approval Location of Monitoring Points Drawing 5-35102 Rev 1 attached to this approval].

4 Monitoring Point S3 – Monitoring Point at which the Reverse Osmosis Concentrate outflows from AWTP1 that are released into waste water being discharged from the Murrumba Downs WWTP is measured. [plan titled Murrumba Alliance Waste Water Treatment Works Development Approval Location of Monitoring Points Drawing 5-35102 Rev 1]

5 Monitoring Point S4 Monitoring Point for feedwater into AWTP1 [refer plan titled Murrumba Alliance Waste Water Treatment Works Development Approval Location of Monitoring Points Drawing 5-35102 Rev 1 attached to this approval]. If Monitoring Point S2 is representative of feedwater quality, the holder may monitor water quality at S2 in place of S4.

6 Short term limits for total nitrogen, total phosphorus and biochemical oxygen demand take effect three months after the date this table takes effect.

7. This limit of 0.7 mg/L applies until the oxygen demand study required by this approval is completed and thereafter ceases to have effect. # or a later date agreed to in writing by the administering authority in the case of delays experienced in construction and commissioning of the upgraded WWTP, despite taking all reasonable efforts to effect completion and commissioning

Table 4 - Water - Release to North Pine River - Mass Load Limits

MONITORING POINTS FOR LOAD CACULATIONS	CONTAMINANT	TIMEFRAME APPLYING	RELEASE LOAD LIMIT FOR COMPOSITE DISCHARGE (kg)[1]	LIMIT TYPE[2, 3]
Upstream of ROC Monitoring Point S2[4] AND S3[5] – ROC Inflow	Biochemical Oxygen Demand 5 day (inhibited)	For first year of operation of upgraded WWTP plant	29130 kg	Annual Dry Weather Load
			80 kg/day	50th percentile Load
		Following first year of operation of upgraded WWTP plant	24966 kg	Annual Dry Weather Load
			68 kg/day	50th percentile Load
	Ammonia Nitrogen (as N)	After commencement of operation of upgraded WWTP plant	No specific limit – see condition Water 15	Annual Dry Weather Load
			No specific limit – see condition Water 15	50th percentile Load
	Total Phosphorus as P, kg	After commencement of operation of upgraded WWTP plant	8470 kg	Annual Dry Weather Load
			23.2 kg/day	50th percentile Load
	Total Nitrogen as N	After commencement of operation of upgraded WWTP plant	29000 kg	Annual Dry Weather Load
			79.5 kg/day	50th percentile Load
	Total Nitrogen Target as N from 1 January 2013 See Note 6	From 1 January 2013	21175 kg	Target Annual Dry Weather Load
			58 kg/day	Target 50th percentile Load

[1] Loads accepted are the Discharge loads of Total Nitrogen (as N) and Total Phosphorus (as P) in kilograms form AWTP1 that are to be calculated as per the conditions of this development approval by summing the respective loads from S2 (WWTP effluent prior to ROC inlet) and S3 (ROC inflow loads) i.e. Load = S2 load + S3 load .

[2] 50th percentile load means the median of the daily total discharge loads i.e. the median of the daily totals of S2 load + S3 after 3 months operation. Once the AWTP has operated from 12 months, the data used in this calculation are the consecutive daily discharge loads of all days on which a discharge occurs over the preceding rolling 12 months.

[3] Annual load is to be calculated as prescribed in the conditions of the development approval by summating S2 loads and S3 loads. Once the WWTP has operated with the upgrade completed for 12 months, the data used in this calculation are the consecutive daily discharge loads of all days on which a discharge occurs over the preceding 12 months.

[4] Monitoring point S2 – Monitoring Point upstream of acceptance of Reverse Osmosis Concentrate from AWTP, after feed to AWTP [refer plan Murrumba Alliance Waste Water Treatment Works Development Approval Location of Monitoring Points Drawing 5-35102 Rev 1 attached to this approval].

[5] Monitoring Point S3 – Monitoring Point at which the Reverse Osmosis Concentrate outflows from AWTP1 that are released into waste water being discharged from the Murrumba Downs WWTP is measured. [refer plan titled Murrumba Alliance Waste Water Treatment Works Development Approval Location of Monitoring Points Drawing 5-35102 Rev 1 attached to this approval.]

[6] *These are the 2012 Healthy Waterways targets that the Healthy Waterways Load Reduction Requirements apply to – see separate condition water condition 16.*

Table 5 – Water - Volumetric release limits

Maximum permitted quantity of release			
Release point and Monitoring Point	**Maximum release on any dry weather day**	**Average release on any dry weather day**	**Maximum release on any one day**
RP1[Murrumba WWTP] Monitoring Point S1	41.3 megalitres (based on ADWF (excluding reuse) of 30.8 ML/day and a peaking factor of 1.6 minus 8 ML/day reuse volume)	22.8 Megalitres (based on ADWF (excluding reuse) of 30.8 ML/day minus 8 ML/day reuse volume)	146 megalitres (based on 5 X ADWF (excluding reuse) of 30.8 ML/day minus 8 ML/day reuse volume)

Table 6 – Minimum Requirements for Chemical Analysis of DTA-related test waters

Water quality indicators	**Units**
Electrical conductivity	µS/cm
Total dissolved solids	mg/L
Total Hardness (as $CaCO_3$)	mg/L
Suspended solids	mg/L
Turbidity	NTU
pH	pH units
Dissolved oxygen	mg/L
Ammonia (as N)	mg/L
Chlorine (free and total)	mg/L
Dissolved metals and metalloids	Units
Arsenic[1]	µg/L
Boron	µg/L
Cadmium	µg/L
Chromium[2]	µg/L
Cobalt	µg/L
Copper	µg/L
Lead	µg/L
Mercury (inorganic)	µg/L
Nickel	µg/L

Silver	µg/L
Zinc	µg/L
Additional Analytes[3]	
Aluminium [3]	µg/L
Arsenic (As III) [3]	µg/L
Arsenic (As V) [3]	µg/L
Chromium (Cr III) [3]	µg/L
Chromium (Cr VI) [3]	µg/L
Manganese [3]	µg/L
Molybdenum [3]	µg/L
Selenium [3]	µg/L

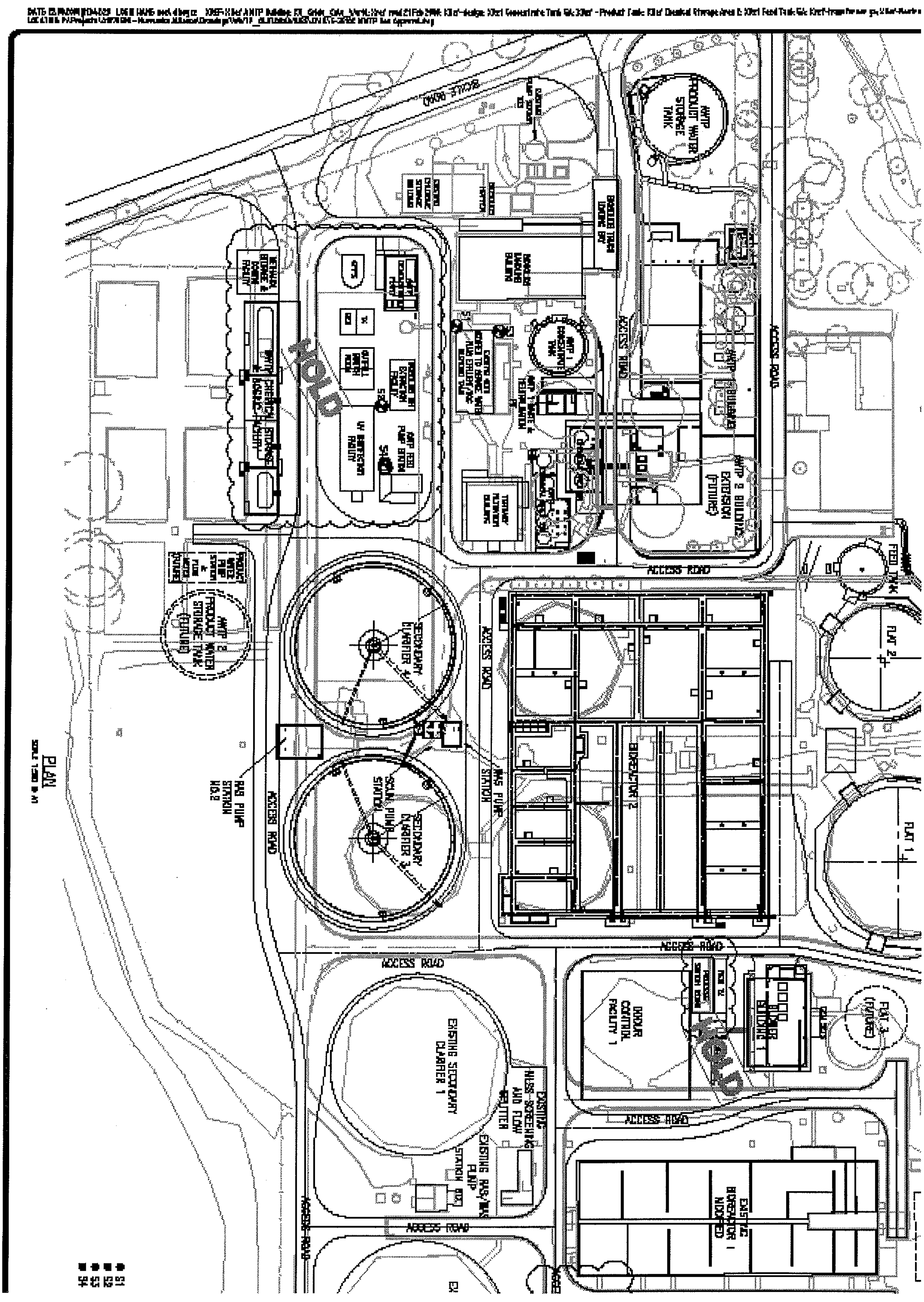
1 If dissolved As concentration is found to be >24 µg/L then speciated analyses will be required (i.e. As (III) and As (V)).

2 If dissolved Cr concentration is found to be >1 µg/L then speciated analyses will be required (i.e. Cr (III) and Cr (VI)).

3 These analytes must be included water quality analyses carried out with the Confirmation DTAs, but may be considered for exclusion from subsequent Routine DTAs in consultation with the toxicologist carrying out the DTA and the administering authority, which will predominantly be based upon previous chemical analysis and toxicity results.

END OF CONDITIONS

PLANS REFERRED TO IN CONDITIONS ATTACHED


PLAN
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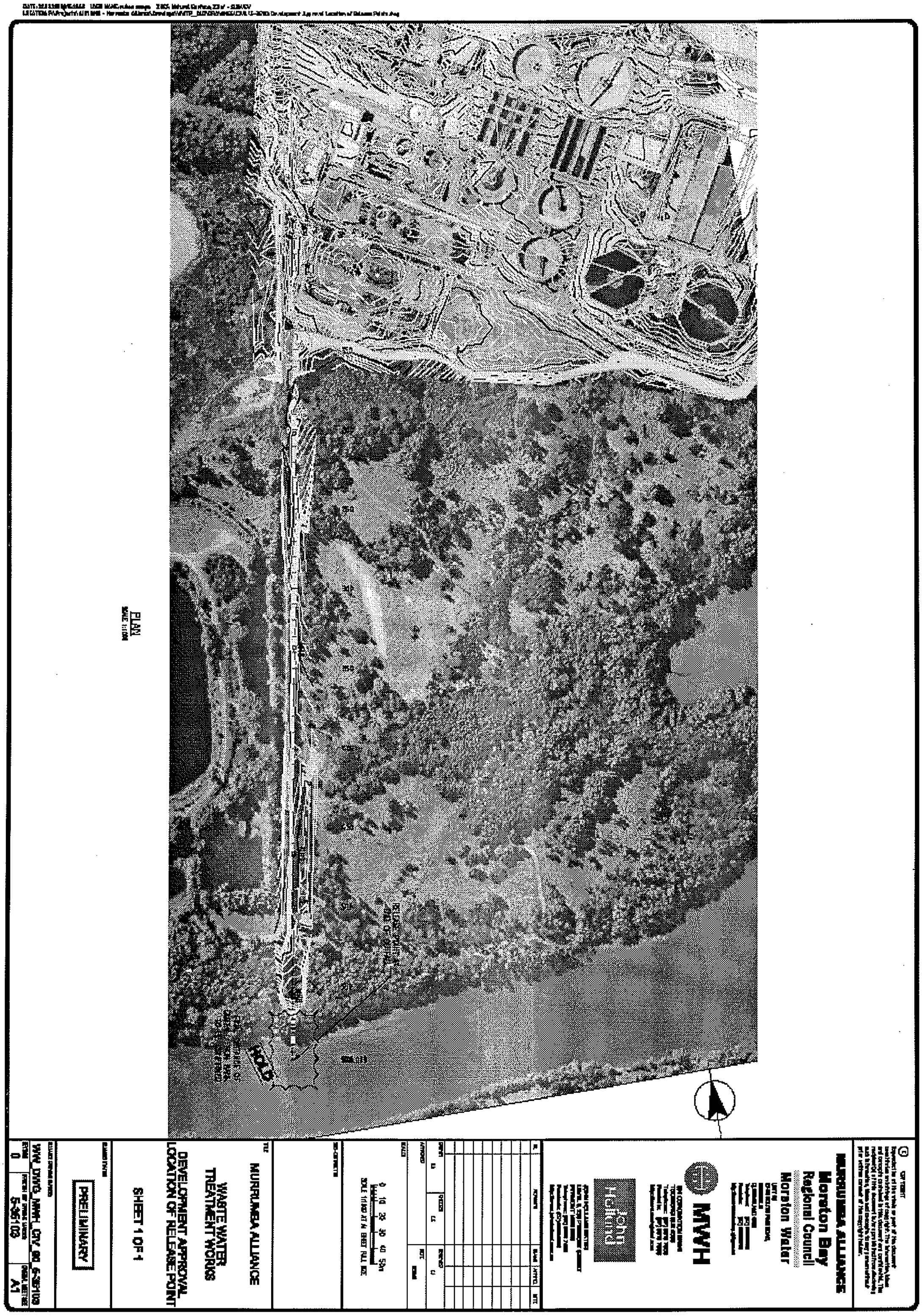
SECONDARY CLARIFIER 4
SECONDARY CLARIFIER 3
BIOREACTOR 2
FLAT 1
FLAT 2
FEED TANK
EXISTING SECONDARY CLARIFIER 1
RAS PUMP STATION NO.2
ODOUR CONTROL FACILITY 1
AWTP PRODUCT WATER STORAGE TANK


MURRUMBA ALLIANCE
Moreton Bay Regional Council
MWH
WASTE WATER TREATMENT WORKS
DEVELOPMENT APPROVAL LOCATION OF RELEASE POINT
SHEET 1 OF 1
PRELIMINARY
PLAN

Department of Environment
and Resource Management

Notice

Change to a development approval

This notice is issued by the Department of Environment and Resource Management pursuant to section 376 of the Sustainable Planning Act 2009 ("the Act").

Unitywater
20/27 South Pine Road
BRENDALE QLD 4510

Attention: Scott Lowe

cc. Moreton Bay Regional Council
Pine Rivers District Office
PO Box 5070
STRATHPINE QLD 4500

Our reference: 351093 / BNT128

Re: Request to change a development approval

1. The Chief Executive, Department of Environment and Resource Management (DERM) as concurrence agency received a request to change a development approval on 24 June 2010.

2. **Details of the development approval for the original application**

Assessment Manager ref.: SR1248 – Environmental Authority

Aspect(s) of development:

Material change of use - Environmentally relevant activities	*Sustainable Planning Regulation 2009* - Schedule 7, table 2, item 1

Property/Location description:

Lot 3 SP213172
Cribb Road, BRENDALE QLD 4500

Department of Environment and Resource Management
www.derm.qld.gov.au ABN 46 640 294 485

Queensland Government

Date of decision for the original application and development approval:

DERM original decision date 7 March 2001

Replacement development approval issued - ENDC00419305

3. The decision for the request to change a development approval made on 24 June 2010 is to approve the request.

4. Attached is a copy of the amended development approval. Please note that the permit reference number has changed from ENDC00419305 to SPCE00766210.

5. The application requested:

- Change to the lot on plan description of the approval place.
- Amend reference to Pine Rivers Shire Council to Moreton Bay Regional Council.
- Amend condition H28 to update the sampling and monitoring points for the plant.
- Add a list of existing pump stations that trigger the threshold for 63(1)(b).

The actual changes made to the approval, after agreement, are as follows:

- Lot on Plan details have been amended.
- Unitywater's details have been added to the front of the approval.
- Condition H28 has been amended as per the request.
- All pump stations listed have been added to the approval.
- The definition and number for environmentally relevant activity – sewage treatment has been updated in line with the *Environmental Protection Regulation 2008*.
- Condition A10 has been amended to include reference to Unitywater instead of the Pine Rivers Shire Council.
- Condition A15 has been amended to remove reference to the Pine Rivers Shire Council.

6. If this notice is given to the person who made the request, or to an entity that gave DERM as the responsible entity a notice under section 373 of the Act or a pre-request response notice, or if this notice is given by DERM as a concurrence agency and the concurrence agency's decision is to refuse the request or approve the request on conditions, such person or entity may appeal against the decision and the attached extract from the Act states how the person or entity may appeal.

Deena Murray
Delegate
Department of Environment and Resource Management
4 August 2010

Enquiries:
Department of Environment and Resource Management
PO Box 168, 29 The Esplanade
COTTON TREE QLD 4558
Phone: 07 5459 6121
Fax: 07 5443 9927
Email: deena.murray@derm.qld.gov.au

Attachments

- Information Sheet – Appeals – Sustainable Planning Act 2009 (extract from the Sustainable Planning Act 2009)
- Copy of the amended development approval

ecoaccess
environmental licences and permits

Replacement Development Approval

Section 621(4) *Environmental Protection Act 1994*

DERM development approval number:	SPCE00766210
Replacing:	ENDC00419305 (formally SR1248)
Relevant Laws and Policies:	*Environmental Protection Act 1994* and subordinate legislation

Under the provisions of the *Environmental Protection Act 1994* this development approval is issued to:
Unitywater
33 King Street
CABOOLTURE QLD 4510

Development Description:

Carrying out of Environmentally Relevant Activity (ERA):

63 Threshold 2 (e) – Sewage treatment – operating sewage treatment works, other than no release works, with a total daily peak design capacity of more than 10 000 equivalent persons but less than 50 000 equivalent persons.

at the following place:

Lot 3 SP213172, County of Stanley, Parish of Warner.

located at:

Brendale Sewage Treatment Plant, Cribb Road, BRENDALE QLD 4500

The pump stations listed in the following table are covered by this development approval:

Pump Station	Location	Lot on Plan Description
PS203	Agnes Street, Albany Creek	Within the Agnes Road Reserve
PS204	Stanton Reserve, Tanagar Street, Cash's Crossing, Albany Creek	Lot 800 Plan SL12499
PS205	Leitchs Park, Bevlin Court, Albany Creek	Lot 110 Plan RP125625
PS206	Doug Stevens Park, Riversleigh Crescent, Eatons Hill	Lot 507 Plan SP153889
PS211	2 Fairhaven Place, Albany Creek	Lot 27 Plan RP883050
PS230	Brendale Wastewater Treatment Plant, Cribb Road, Brendale	Lot 3 Plan SP213172
PS231	1 Leitchs Road, Brendale	Lot 109 RP153705
PS232	95 South Pine Road, Brendale	Lot 1 Plan RP158258
PS233	Johnstone Road, Brendale	Lot 1 Plan RP176114
PS234	34 Leonard Crescent, Brendale	Lot 111 Plan RP809895
PS235	Access via Kenworth Place, Brendale Nolan Road (Nolan Park)	Lot 99 Plan SP122845
PS241	Brendale Street, Brendale	Lot 19 Plan RP123982
PS259	Colins Road, Arlington Stage 2	Lot 991 Plan SP132804
PS260	Francis Road, Arana Hills	Lot 1 RP195917 & Lot 3 Plan SP136800
PS261	Cabrilla Street, Everton Hills	Lot 401 Plan RP176878
PS602	29 Station Road, Samford	Lot 6 Plan RP865540

[1] Permit includes licences, approvals, permits, authorisations, certificates, sanctions or equivalent/similar as required by legislation administered by the Department of Environment and Resource Management

The environmentally relevant activity must be constructed, operated and maintained in accordance with the conditions as set out in the attached schedule of conditions.

Further development permits required

Nil

Additional information for applicants

This approval pursuant to the *Environmental Protection Act 1994* does not remove the need to obtain any further approval for this development which might be required by other State and/or Commonwealth legislation. Applicants are advised to check with all relevant statutory authorities. Applicants also should comply with all relevant legislation.

It is a requirement of the *Environmental Protection Act 1994* that if the owner or occupier of this site becomes aware a Notifiable Activity (as defined under schedule 3 of the *Environmental Protection Act 1994*) is being carried out on this land or that the land has been affected by a hazardous contaminant, they must, within 22 business days after becoming aware the activity is being carried out, give notice to the Administering Authority. A list of Notifiable Activities is provided within Schedule 3 of the *Environmental Protection Act 1994*.

Appeal

This development approval is issued pursuant to section 621 of the *Environmental Protection Act 1994*. The rights of review and appeal are attached to this notice.

This development approval takes effect 10 Business days after you receive this notice, or if there is an appeal from the day the appeal is finally decided or is otherwise ended.

Signed

4 August 2010
Date

Deena Murray
Manager (Moreton Bay)
Environmental Services North
South East Region, DERM
Delegate of Administering Authority
Environmental Protection Act 1994

[1] Permit includes licences, approvals, permits, authorisations, certificates, sanctions or equivalent/similar as required by legislation administered by the Department of Environment and Resource Management

This development approval consists of the following schedules as follows:

Schedule A - General Conditions
Schedule B - Air
Schedule C - Water
Schedule D - Stormwater Management
Schedule E - Land Application
Schedule F - Noise
Schedule G - Waste Management
Schedule H - Monitoring and Reporting
Schedule I - Definitions

SCHEDULE A - GENERAL CONDITIONS

Maintenance of Plant and Equipment

(A1) The registered operator must:

(a) maintain all plant and equipment in a proper and efficient condition; and
(b) operate all plant and equipment in a proper and efficient manner.

In this condition, "plant and equipment" includes:

(i) any plant and equipment used to prevent and/or minimise the likelihood of environmental harm being caused;
(ii) any devices and structures to contain foreseeable escapes of contaminants and waste;
(iii) any vehicles used to transport waste;
(iv) any device or structure used to store, handle, treat or dispose of waste;
(v) any monitoring equipment and associated alarms; and
(vi) any backup systems that act in the event of failure of a primary system.

Display of Development approval

(A2) A copy of all parts of this development approval relevant to the carrying out the environmentally relevant activities must be kept in a location readily accessible to the personnel that are carrying out those environmentally relevant activities.

Records

(A3) Any records or documents are required to be kept by a condition of this development approval must be kept where practicable to do so at the approved place at which the activities are carried out and at the Pine River Shire Council Chambers for, except as otherwise provided, a period of at least five (5) years and be available for examination by an authorised person. The record retention requirements of this condition will be satisfied if any daily and weekly records are kept for a period of at least three (3) years and these records are then kept in the form of annual summaries after that period.

Alterations

(A4) No change, replacement or operation of any plant or equipment is permitted if the change, replacement or operation of the plant or equipment increases, or is likely to substantially increase, the risk of environmental harm above that expressly provided by this development approval.

[1] Permit includes licences, approvals, permits, authorisations, certificates, sanctions or equivalent/similar as required by legislation administered by the Department of Environment and Resource Management

An example of a substantial increase in the risk of environmental harm is an increase of 10% or more in the quantity of the contaminant to be released into the environment.

Calibration

(A5) All instruments and devices used for the measurement or monitoring of any parameter under any condition of this development approval must be calibrated, and appropriately operated and maintained.

Trained Operators

(A6) All persons engaged in the conduct of the activity, including but not limited to employees and contract staff, must be:

(i) trained in the procedures and practices necessary to:

(a) comply with the conditions of this development approval; and
(b) prevent environmental harm during normal operation and emergencies; or

(ii) under the close supervision of such a trained person.

Nuisance

(A7) Notwithstanding any other condition of this development approval, this development approval does not authorise any release of contaminants which causes or is likely to cause an environmental nuisance beyond the boundaries of the approved place.

Inspections by Authorised Persons

(A8) At all reasonable times, and to the satisfaction of an authorised person, the following must be provided to enable an authorised person to check compliance with the conditions of this development approval:

(i) monitoring facilities, and
(ii) access to such facilities, and
(iii) any reasonable assistance which the authorised person deems necessary.

Integrated Environmental Management System (IEMS)

(A9) The registered operator must implement the Integrated Environmental Management System (IEMS) submitted with the application for development approval and ensure that the implemented Integrated Environmental Management System provides for the effective and appropriate management by the registered operator of the actual and potential environmental impacts resulting from the carrying out of the environmentally relevant activities.

(A10) An up to date copy of the Integrated Environmental Management System must be kept at the Unity Water Headquarters and, where practicable to do so, at the approved place at which the activities are carried out.

(A11) The registered operator must not implement an Integrated Environmental Management System or amend the Integrated Environmental Management System where such implementation or amendment would result in a contravention of any condition of this development approval.

[1] Permit includes licences, approvals, permits, authorisations, certificates, sanctions or equivalent/similar as required by legislation administered by the Department of Environment and Resource Management

(A12) The registered operator must submit details of any amendment to the Integrated Environmental Management System annually to the administering authority with the Annual Return which immediately follows the enactment of any such amendment.

Site-Based Environmental Management Plan

(A13) The IEMS must provide for the development and implementation of a Site-Based Environmental Management Plan which address the management of the actual and potential environmental impacts resulting from the carrying out of the environmentally relevant activities (including any issue/site-specific environmental management plans required to be developed and implemented under the conditions of this development approval) at the approved premise.

(A14) The Site-Based Management Plan must address at least the following matters:

(i) routine operating procedures to prevent or minimise environmental harm, however occasioned or caused during normal operations;
(ii) maintenance practices and procedures;
(iii) contingency plans and emergency procedures to deal with foreseeable risks and hazards including corrective responses to prevent and mitigate environmental harm (including any necessary site rehabilitation);
(iv) monitoring of the release of contaminants into the environment including procedures, methods, record keeping and notification of results;
(v) assessment of the environmental impact of any releases of contaminants into the environment including procedures, methods, record keeping and notification of results;
(vi) handling of environmental complaints;
(vii) keeping and production of environmental records and reports;
(viii) lines and methods of communication to be utilised for communication of procedures, plans, incidents, potential environmental problems and results, including a feedback mechanism to ensure that management is made aware of potential environmental problems and any failure of procedures adopted; and
(ix) staff training and awareness of environmental issues related to the operation of the environmentally relevant activities, including responsibilities under the *Environmental Protection Act 1994.*

(A15) An up to date copy of the relevant Site-Based Environmental Management Plan (including any issue/site-specific environmental management plans required to be developed and implemented under the conditions of this development approval) must be kept at the approved place to which that plan relates, or if such is not practicable, at a place readily accessible to personnel that are carrying out the environmentally relevant activity, and be available for examination by an authorised person on request.

Management Plan for Blue-Green Algae

(A16) The registered operator, must develop and implement an effective and appropriate Plan for the Management of Blue-Green Algae within any associated storage pond. The plan should detail how the registered operator will manage the actual and potential environmental impacts resulting from any occurrence of blue-green algal outbreaks.

(A17) The Management Plan for Blue-Green Algae must address at least the following matters:

(i) weekly inspections to detect the presence of any bloom;
(ii) notification and reporting if blue-green algal blooms are confirmed;
(iii) the collection and analysis of samples if a bloom is suspected; and
(iv) remedial actions.

(A18) A copy of the Management Plan for Blue-Green Algae must be kept at the approved place.

[1] Permit includes licences, approvals, permits, authorisations, certificates, sanctions or equivalent/similar as required by legislation administered by the Department of Environment and Resource Management

(A19) The registered operator must not implement a Management Plan for Blue-Green Algae or amend a Management Plan for Blue-Green Algae where such implementation or amendment would result in a contravention of any condition of this development approval.

End of Conditions for Schedule A

SCHEDULE B - AIR

Release of Contaminants to the Atmosphere

(B1) Except as otherwise provided by the conditions of the air schedule, the environmentally relevant activity must be carried out by such practicable means necessary to prevent the release or likelihood of release of contaminants to the atmosphere.

(B2) Where it is not practicable to prevent the release of contaminants to the atmosphere as required by condition B1, the environmentally relevant activity must be carried out by such practicable means necessary to minimise the release or likelihood of any such release of contaminants to the atmosphere.

Noxious or Offensive Odour

(B3) Notwithstanding any other condition of this development approval, no release of contaminants from the approved place is to cause a noxious or offensive odour beyond the boundaries of the approved place.

End of Conditions for Schedule B

SCHEDULE C - WATER

Emergency Response/Contingency Plan

(C1) The registered operator must develop and implement an effective and appropriate Emergency Response/Contingency Plan to manage the environmental impacts of any release of contaminants from pump station and other ancillary equipment.

(C2) The Emergency Response/Contingency Plan must address at least the following matters:

(i) the location of the pump station and overflow;
(ii) procedures to be implemented to reduce the likelihood of any pump station failure and likelihood of any release of contaminants;
(iii) response procedures to prevent any further release, or if such is not practicable, minimise the extent and duration of any release to the greatest practicable extent;
(iv) the practices and procedures to be employed to restore the environment, or if such is not practicable, mitigate any environmental impacts of the release (including in both dry and wet conditions);
(v) a description of the resources to be used in response to a release;

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(vi) the training of staff that will be called upon to respond to a release;
(vii) procedures to investigate the cause of any release, and where necessary, implement remedial actions to reduce the likelihood of recurrence of a similar event;
(viii) the provision and availability of documented procedures to staff attending any release to enable them to effectively respond;
(ix) timely and accurate reporting of the circumstances and nature of release events to the administering authority;
(x) periodic estimation of the catchment population serviced by the pump station and hence daily dry weather flow to minimise any likelihood of the design capacity of the pump station being exceeded; and
(xi) the need to install screens be investigated and screens installed where appropriate and beneficial.

(C3) A copy of the Emergency Response/Contingency Plan and any subsequent amendment of the Emergency Response/Contingency Plan must be kept at the approved place and be available for examination by an authorised person on request.

(C4) An updated list of all pump stations connected to the sewage treatment plant must be forwarded to the administering authority with each Annual Return.

Release of Contaminants to Waters

(C5) Contaminants must not be directly or indirectly released from the approved place to any waters or the bed and banks of any waters except:

(i) as permitted under any water schedule in this development approval; or
(ii) as permitted under any stormwater schedule in this development approval; or
(iii) to a sewer as permitted or otherwise agreed from time to time by the relevant Local Government.

(C6) Contaminated wastewater generated from washing and/or degreasing of any vehicles, any plant and any equipment must be collected and:

(i) treated and disposed of to sewer with the approval of the relevant Local Government in accordance with a tradewaste permit; or
(ii) transported for disposal, recycled, reprocessed or treated at a facility that can lawfully accept such waste.

(C7) The only contaminants permitted to be released from the approved place at the release point W1 are sewage effluents from the treatment plant.

Release Points

(C8) Contaminants must not be directly or indirectly released from any source on the approved place to any waters at any location other than the contaminants and sources at the locations listed below:

Release Point W1	-	Sewage wastes from the treatment plant via an outfall pipe to waters described as the South Pine River, at approximately 7.5 km AMTD.
Other Release Points	-	Sewage wastes from the sewage pump station overflows as provided for in this development approval.

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Quantity of Contaminants Released

(C9) The total quantity of contaminants released from Release Point Number W1 during any dry weather day must not exceed 12 750 cubic metres and in any day must not exceed 37 500 cubic metres.

Quality Characteristics Of Release to Waters

(C10) The release of contaminants to waters must comply, at the sampling and in-situ measurement points specified in Schedule H, with each of the limits specified in Schedule C Table 1 for each quality characteristic.

SCHEDULE C TABLE 1 RELEASE QUALITY CHARACTERISTIC LIMITS

QUALITY CHARACTERISTICS	RELEASE LIMIT	LIMIT TYPE
5-day Biochemical Oxygen Demand (inhibited)	10 mg/L	long term 80 percentile compliance
5-day Biochemical Oxygen Demand (inhibited)	15 mg/L	short term 80 percentile compliance
5-day Biochemical Oxygen Demand (inhibited)	30 mg/L	maximum
Suspended Solids	15 mg/L	long term 80 percentile compliance
Suspended Solids	23 mg/L	short term 80 percentile compliance
Suspended Solids	45 mg/L	maximum
pH	6.5 to 8.5	range
Dissolved Oxygen	2.0 mg/L	minimum
Total Nitrogen (as Nitrogen)	5.0 mg/L	long term 50 percentile compliance
Total Nitrogen (as Nitrogen)	7.5 mg/L	short term 50 percentile compliance
Total Nitrogen (as Nitrogen)	15.0 mg/L	maximum
Total Phosphorus (as Phosphorus)	1.0 mg/L	long term 50 percentile compliance
Total Phosphorus (as Phosphorus)	1.5 mg/L	short term 50 percentile compliance
Total Phosphorus (as Phosphorus)	3.0 mg/L	maximum
Free Chlorine Residual	0.7 mg/L	maximum
Faecal Coliforms	1000 organisms per 100 mL as a median value (minimum of 5 samples taken at not less than half-hourly intervals in any one day, with 4 out of the 5 samples containing less than 4000 organisms per 100 mL)	

(C11) Notwithstanding the quality characteristic limits specified in Schedule C Table 1, the release of contaminants to waters must comply with the following qualitative characteristics:

(i) The release must not have any properties nor contain any organisms or other contaminants which are capable of causing environmental harm.

(ii) The release must not produce any slick or other visible evidence of oil or grease, nor contain visible floating oil, grease, scum, litter or other objectionable matter.

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Pump Stations and Overflow Structures

(C12) The only pump station permitted to release contaminants to any waters is that listed below at the corresponding overflow location:

SCHEDULE C TABLE 2 - PUMP STATION AND OVERFLOW

Pump Station	Street/Location	Discharge Location
203	Agnes Street, Albany Creek	Stormwater drain to South Pine River
204	Tanagar Street, Albany Creek	South Pine River
205	Bevlin Crescent, Albany Creek	Sandy Creek/South Pine River
211	The Boulevard, Albany Creek	South Pine River
220	Cash's Crossing, Eaton's Hill	South Pine River
221	Bunya Park Drive, Eaton's Hill	South Pine River
232	South Pine Road, Brendale	Conflagration Ck/South Pine River
233	Johnstone Road, Brendale	Open Drain/South Pine River
234	Leonard Crescent, Brendale	Open drain/Conflagration Ck/South Pine River
235	Nolan Road, Brendale	Stormwater/South Pine River
241	Brendale Street, Brendale	Stormwater/Open Drain/South Pine River
260	Francis Road, Arana Hills	Cabbage Tree Creek
261	Cabrilla Street, Everton Hills	Cabbage Tree Creek

(C13) The pump station whose failure will result in a direct or indirect release of contaminants to waters must be fitted with a stand-by pump and pump-failure alarm. Pump failure alarm must be able to operate without mains power.

(C14) No release of contaminants from the pump station or other ancillary works shall occur except as a result of power failure, excessive rainfall, accidental damage or other emergency.

End of Conditions for Schedule C

SCHEDULE D - STORMWATER MANAGEMENT

Contaminant Releases Caused by Rainfall

(D1) Except as otherwise provided by the conditions of the stormwater management schedule and the water schedule of this development approval, the environmentally relevant activity must be carried out by such practicable means necessary to prevent and/or minimise the release or likelihood of release of contaminated runoff from the approved place to any stormwater drain or waters or the bed or banks of any such waters. "Contaminated runoff" for the purposes of this condition means stormwater and/or stormwater runoff that contains contaminants that may cause environmental harm.

Cleaning and Spillages

(D2) The maintenance and cleaning of any vehicles, other equipment or plant must be carried out in areas where contaminants cannot be released into any waters, roadside gutter or stormwater drain.

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(D3) Any spillage of waste, contaminants or other materials must be cleaned up as quickly as practicable. Such spillages must not be cleaned up by hosing, sweeping or otherwise releasing such waste, contaminants or material to any stormwater drainage system, roadside gutter or waters.

Acid Sulphate Soils

(D4) Any acid sulphate soils or potential acid sulphate soils disturbed, extracted or unearthed as a result of carrying out the environmentally relevant activity or activities must be stored and/or treated and/or disposed of so as not to cause environmental harm to surface waters and/or groundwaters.

Bunding

(D5) All chemical tank storages must be bunded so that the capacity of the bund is sufficient to contain at least 100% of the largest storage tank plus 10% of the second largest tank within the bund.

(D6) All chemical drum storages must be bunded so that the capacity of the bund is sufficient to contain at least 25% of the maximum design storage volume within the bund.

(D7) All bunding must be constructed of materials which are impervious to the materials stored.

(D8) The base and walls of all bunded areas must be maintained free from gaps or cracks.

(D9) All bunding must be roofed where practicable.

(D10) Where it is impractical to completely roof a bunded area the registered operator must ensure that any stormwater captured within the bund is free from contaminants or wastes prior to any release.

(D11) All empty drums must be stored with their closures in place.

Minimise Sewer Infiltration

(D12) The registered operator must take all reasonable and practicable measures to minimise infiltration.

(D13) For the purposes of demonstrating compliance with condition D12, the registered operator must periodically report to the administering authority on the following matters:

(i) the estimated level of infiltration;
(ii) the reasonable and practicable measures intended to minimise infiltration;
(iii) the actions taken to minimise infiltration; and
(iv) periodic re-estimations of the level of infiltration and, by comparison with previous infiltration estimates and connected population, an assessment of the effectiveness of the actions taken to minimise infiltration.

(D14) The initial report must be lodged with the administering authority by 1 July 1998 with subsequent reports to be lodged with the annual return in 2000 and at least once every two (2) years thereafter.

End of Conditions for Schedule D

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SCHEDULE E – LAND APPLICATION

Release of Contaminants to Land

(E1) The defined contaminant release area is described as the landscaped areas at the approved place.

(E2) Except as otherwise provided by the conditions of the land schedule of this development approval, the environmentally relevant activity must be carried out by such practicable means necessary to prevent the release or likelihood of release of contaminants to land.

(E3) Where it is not practicable to prevent any release of contaminants to land as required by condition E2, the environmentally relevant activity must be carried out by such practicable means necessary to minimise the release or likelihood of release of any such contaminants to land.

Description of Contaminants

(E4) The only contaminants allowed to be released to land are sewage effluents from the treatment plant.

Contaminant Release Quality

(E5) Treated sewage effluent used for irrigation purposes, or supplied to another party for irrigation purposes or other use, must comply with the quality characteristics specified in Schedule C Table 1.

Contaminant Release Precautions at the Approved Place

(E6) The contaminant release areas must not be used for grazing, recreational activities or as a traffic thoroughfare.

(E7) The release of contaminants to land must not be carried out within 50 metres of any watercourse.

(E8) The release of contaminants to land must not be carried out if soil moisture conditions are such that surface runoff or ponding is likely to occur.

(E9) Spray from any release of contaminants to land must not drift beyond the boundaries of the approved place.

(E10) Public access to any contaminant release area must be denied during the release of contaminants to land and until the release area has dried.

(E11) Pipelines and fittings for the release of contaminants to land must be clearly identified. Standard water taps, hoses and cocks must not be fitted to contaminant release pipelines, and the contaminant release system must not be connected to other service pipelines. Lockable valves or removable handles must be fitted to the contaminant release pipelines where there is public access to the contaminant release areas.

End of Conditions for Schedule E

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SCHEDULE F - NOISE

Emission of Noise

(F1) In the event of a complaint about noise that constitutes intrusive noise being made to the administering authority, that the administering authority considers is not frivolous or vexatious, then the emission of noise from the approved place must not result in levels greater than those specified in Schedule F - Table 1.

SCHEDULE F TABLE 1

NOISE LIMITS AT A NOISE SENSITIVE PLACE	
Period	***Noise Level at a Noise Sensitive Place Measured as the Adjusted Maximum Sound Pressure Level*** $L_{Amax\ adj,\ T}$
7 am - 6 pm	Background noise level plus 5 dB(A)
6 pm - 10 pm	Background noise level plus 5 dB(A)
10 pm - 7 am	Background noise level plus 3 dB(A)
NOISE LIMITS AT A COMMERCIAL PLACE	
Period	***Noise Level at a Commercial Place measured as the Adjusted Maximum Sound Pressure Level*** $L_{Amax\ adj,\ T}$
7 am - 6 pm	Background noise level plus 10 dB(A)
6 pm - 10 pm	Background noise level plus 10 dB(A)
10 pm - 7 am	Background noise level plus 8 dB(A)

End of Condition for Schedule F

SCHEDULE G - WASTE MANAGEMENT

General

(G1) Waste must not be released to the environment, stored, transferred or disposed of contrary to any condition of this development approval.

(G2) The registered operator must not:

(i) allow waste to burn or be burnt at or on the approved place excepting as permitted in a condition of this development approval; nor

(ii) remove waste from the approved place and burn such waste elsewhere.

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Off Site Movement

(G3) Where regulated waste is removed from the approved place (other than by a release as permitted under another schedule of this development approval), the registered operator must monitor and keep records of the following:

(a) the date, quantity and type of waste removed; and
(b) name of the waste transporter and/or disposal operator that removed the waste; and
(c) the intended treatment/disposal destination of the waste.

(NOTE: Records of documents maintained in compliance with a waste tracking system established under the *Environmental Protection Act 1994* or any other law for regulated waste will be deemed to satisfy this condition.)

(G4) Regulated waste must not be released to the environment, stored, transferred or disposed of contrary to any condition of this development approval.

Notification of Improper Disposal Of Regulated Waste

(G5) If the registered operator becomes aware that a person has removed regulated waste from the approved place and disposed of the regulated waste in a manner which is not authorised by this development approval or is improper or unlawful, then the registered operator must, as soon as practicable, notify the administering authority of all relevant facts, matters and circumstances known concerning the disposal.

End of Conditions for Schedule G

SCHEDULE H - MONITORING AND REPORTING

Complaint Recording

(H1) All complaints received by the registered operator relating to releases of contaminants from operations at the approved place must be recorded and kept in a log with the following details:

(i) time, date and nature of complaint;
(ii) type of communication (telephone, letter, personal etc.);
(iii) name, contact address and contact telephone number of complainant (Note: if the complainant does not wish to be identified then "Not identified" is to be recorded);
(iv) response and investigation undertaken as a result of the complaint;
(v) name of person responsible for investigating complaint; and
(vi) action taken as a result of the complaint investigation and signature of responsible person.

Notification of Emergencies and Incidents

(H2) As soon as practicable after becoming aware of any emergency or incident which results in the release of contaminants not in accordance, or reasonably expected to be not in accordance with the conditions of this development approval, the registered operator must notify the administering authority of the release by telephone or facsimile.

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(H3) The notification of emergencies or incidents as required by condition H2 must include but not be limited to the following:

(i) the name of the holder of the development approval;
(ii) the location of the emergency or incident;
(iii) the number of the development approval;
(iv) the name and telephone number of the designated contact person;
(v) the time of the release;
(vi) the time the holder of the development approval became aware of the release;
(vii) the suspected cause of the release;
(viii) the environmental harm caused, threatened, or suspected to be caused by the release; and
(ix) actions taken to prevent further any release and mitigate any environmental harm caused by the release.

(H4) Not more than 14 days following the initial notification of an emergency or incident, the holder of the development approval must provide written advice of the information supplied in accordance with condition H3 in addition to:

(i) proposed actions to prevent a recurrence of the emergency or incident; and
(ii) outcomes of actions taken at the time to prevent or minimise environmental harm.

(H5) As soon as practicable, but not more than six weeks following the conduct of any environmental monitoring performed in relation to the emergency or incident, which results in the release of contaminants not in accordance, or reasonably expected to be not in accordance with the conditions of this development approval, the holder of the development approval must provide written advice of the results of any such monitoring performed to the administering authority.

Water Quality Determinations

(H6) All determinations of the quality of contaminants released to waters must be made in accordance with methods prescribed in the Water Quality Sampling Manual, 3rd Edition, December 1999, or more recent additions or supplements to that document as such become available.

(H7) All determinations of the quality of contaminants released must be performed by a person or body possessing appropriate experience and qualifications to perform the required measurements.

Noise Monitoring

(H8) For the purposes of checking compliance with condition F1 and investigating any complaint of noise annoyance, monitoring and recording of the noise levels from the activity/activities must be undertaken for the following descriptors, characteristics and conditions:

(i) $L_{Amax,\ adj\ T}$;
(ii) $L_{Abg,\ T}$ or $L_{A90,\ T}$;
(iii) $L_{AN,\ T}$ (where N equals statistical levels of 1, 10, 50, 90 and 99);
(iv) $L_{pA\ T}$;
(v) $L_{Aeq,\ T}$;
(vi) the level and frequency of occurrence of impulsive or tonal noise;
(vii) atmospheric conditions including temperature, relative humidity and wind speed and direction; and
(viii) effects due to extraneous factors such as traffic noise.

(H9) In conjunction with the measurement and recording of noise, the following parameters and conditions must be recorded:

(i) location, date and time of recording.

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(H10) Monitoring must also be undertaken to investigate any complaint of unreasonable and intrusive noise upon receipt of a written request from the administering authority to carry out such monitoring.

(H11) The method of measurement and reporting of noise levels must comply with the Noise Measurement Manual, 3rd edition, March 2000, or more recent additions or supplements to that document as become available.

(H12) The measurement and reporting of noise levels must be undertaken by a person or body possessing appropriate experience and qualifications to perform the required measurements.

Incident Recording

(H13) A record must be maintained of at least the following events:

(i) the time, date and duration of equipment malfunctions where the failure of the equipment resulted in the release of contaminants reasonably likely to cause environmental harm;
(ii) any uncontrolled release of contaminants reasonably likely to cause environmental harm; and
(iii) any emergency involving the release of contaminants reasonably likely to cause material or serious environmental harm requiring the use of fire fighting equipment.

Exception Reporting

(H14) The registered operator must notify the administering authority in writing of any monitoring result that indicates an exceedance of or non-compliance with any approval limit within 28 days of completion of analysis.

(H15) The written notification required by condition number H14 above must include:

(i) the full analysis results; and
(ii) details of investigation or corrective actions taken; and
(iii) any subsequent analysis.

Receiving Environment Monitoring Program

(H16) The registered operator must develop and implement a Receiving Environment Monitoring Program to monitor the effects of the release of contaminants on the "receiving environment" to effectively determine whether environmental values are being protected.

(H17) In developing the Receiving Environment Monitoring Program, the registered operator must:

(i) submit a proposal for the Receiving Environment Monitoring Program to the administering authority for its review and comment:

(a) in the case of the registered operator not becoming a "participating member" as defined in condition H24, 90 days from the date this development approval takes effect; or
(b) in the case of the registered operator ceasing to be a "participating member" as defined in condition H24, 60 days from the date the registered operator ceases to be a "participating member"; and

(ii) ensure the proposed program describes and addresses at least the following:

(a) description of potentially affected environment including key communities and ambient water quality;
(b) description of water quality objectives and biological objectives to be achieved;

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(c) description of selected physico-chemical and biological indicators and reasons for their inclusion;

(d) the proposed monitoring locations including control locations and reasons for their selection;

(e) the proposed sampling depths;

(f) the frequency of sampling and analysis;

(g) any historical data sets to be relied upon; and

(h) description of the statistical basis on which conclusions are drawn; and

(iii) have due regard to the comments of the administering authority in the finalisation of the Receiving Environment Monitoring Program.

(H18) In evaluating the effect of the release on environmental values of receiving environment, consideration must be given to at least the following:

(i) water quality criteria specified in the Australian & New Zealand Environment & Conservation Council's "Australian Water Quality Guidelines for Fresh and Marine Waters", November 1992; and

(ii) any Environmental Protection Policies enacted under *Queensland's Environmental Protection Act 1994* concerning water quality and ecosystems; and

(iii) any relevant reports produced with respect to the Department of Environment's Water Quality Monitoring Programs if applicable; and

(iv) any relevant reports produced by the Brisbane River and Moreton Bay Wastewater Management Study.

(H19) Within 30 days of the date of receipt of written comment from the administering authority as per condition H17, or such other period as advised in writing by the administering authority, the applicant must commence carrying out the Receiving Environment Monitoring Program.

(H20) All determinations of the environmental quality of the receiving environment must be made in accordance with methods prescribed in the Department of Environment, Water quality Sampling Manual, 2nd Edition, February 1995, or more recent additions or supplements to that document as such become available.

(H21) All determinations of the environmental quality of the receiving environment must be performed by a person or body possessing appropriate experience and qualifications to perform the required measurements.

(H22) The registered operator must submit a report of the results of the Receiving Environment Monitoring Program including an assessment of the impact of the release of contaminants upon the receiving environment with each annual return. The assessment must address whether environmental values are being protected with reference to water quality data and any other monitoring data obtained and state the basis on which the conclusions are drawn.

(H23) Records must be kept of the results of all determinations and monitoring carried out under the Receiving Environment Monitoring Program for a period of at least 5 years.

Option to become a 'participating member' in an equivalent Receiving Environment Monitoring Program carried out by other persons and/or agencies.

(H24) As an alternative to developing and implementing a Receiving Environment Monitoring Program for South Pine River and Moreton Bay, the registered operator may become and remain a "participating member" in a study carried out by other persons or agencies that meets the requirements of conditions H16 to H23 inclusive (the equivalent study), such as, the Southeast Queensland Water

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Quality Management Study and the Ecological Health Monitoring Program proposed to be carried out under the Study.

A "participating member" for the purposes of condition H17 and the conditions H24 to H26 inclusive means that the registered operator actively participates in the equivalent study and any monitoring program resulting from such study.

(H25) The registered operator will be deemed to comply with conditions H16 to H23 in so far as they relate to the South Pine River and Moreton Bay, so long as the registered operator continues to be a "participating member" in an equivalent study. In the event that the registered operator ceases to be a "participating member" in an equivalent study, then the registered operator must within sixty (60) days submit a proposal for a Receiving Environment Monitoring Program in accordance with condition H17.

(H26) If the registered operator ceases to be to be a participating member in an equivalent study, then the registered operator must within fourteen (14) days notify the administering authority in writing that they are no longer a "participating member".

Monitoring of Contaminant Releases to Waters

(H27) The registered operator is responsible for the making of determinations and keeping of records of the quality of the contaminants released for the release points, quality characteristics, and at the frequency specified in Schedule H Table 1:

SCHEDULE H TABLE 1

Quality Characteristic	Units	Frequency
5-day Biochemical Oxygen Demand	mg/L	Weekly
Suspended Solids	mg/L	Weekly
pH	pH scale	Weekly
Dissolved Oxygen	mg/L	Weekly
Free Chlorine Residual	mg/L	Weekly
Faecal Coliforms	cfu/100 mL	Weekly
Ammonia (as Nitrogen)	mg/L	Weekly
Total Nitrogen (as Nitrogen)	mg/L	Weekly
Total Phosphorus (as Phosphorus)	mg/L	Weekly

Sampling and Monitoring Point Details

(H28) Determinations of the quality of contaminants released to waters to check conformity with the release quality characteristics specified in the Water Schedule of this development approval must be undertaken at monitoring point B1, described as on the exit to the sand filters, and monitoring point B2, described as the covered tank on the exit of the chlorine detention lagoon.

(H29) The registered operator is responsible for the making of determinations of each quality characteristic at the monitoring point specified in Schedule H Table 2.

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SCHEDULE H TABLE 2

Quality Characteristic	Units	Monitoring Point
5-day Biochemical Oxygen Demand	mg/L	B1
Suspended Solids	mg/L	B1
pH	pH scale	B1
Dissolved Oxygen	mg/L	B2
Free Chlorine Residual	mg/L	B2
Faecal Coliforms	cfu/100 mL	B2
Ammonia (as Nitrogen)	mg/L	B1
Total Nitrogen (as Nitrogen)	mg/L	B1
Total Phosphorus (as Phosphorus)	mg/L	B1

Bypass Monitoring

(H30) Details concerning any bypass of plant effluent shall be monitored and recorded in terms of event date, duration, cause of bypass, and actions taken in reporting and averting the bypass.

Monitoring Reporting

(H31) The registered operator must ensure that the results of all monitoring performed in accordance with this development approval for the period covered by the return are submitted with the annual return.

(H32) Contaminant release quantities pertaining to the yearly period, compiled, collected or recorded in accordance with Schedule C Condition C9 shall be presented as follows:

(i) in a tabular format, showing date of recording and raw data; and
(ii) graphically showing raw data vs time.

(H33) Contaminant release quality pertaining to the yearly period, compiled, collected or recorded in accordance with Condition H27 shall be presented:

(i) in a tabular format, showing:

(a) date and times sampled;
(b) all raw data;
(c) any exceedance of levels of all parameters specified in Schedule C, Table 1; and
(d) maximum and minimum values for parameters specified in Schedule H Table 1; and

(ii) graphically showing data referred to in part (i) of this condition vs time.

(H34) Data pertaining to the yearly period, compiled, collected or recorded in accordance with Condition H29 of Schedule H (bypass of plant effluent) for the yearly period, shall be presented in a tabular format showing:

(i) date of commencement of bypass;
(ii) duration of bypass (hours);
(iii) cause of bypass;
(iv) total bypass duration for the period (hours); and
(v) actions taken in reporting and averting the bypass.

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End of Conditions for Schedule H

SCHEDULE I - DEFINITIONS

For the purposes of this development approval the following definitions apply:

General Definitions

(I1) ***"Act"*** means the *Environmental Protection Act 1994*.

(I2) ***"administering authority"*** means the Department of Environment and Resource Management or its successor.

(I3) ***"AMTD"*** means Adopted Middle Thread Distance as per the Queensland Water Resources Commission publication entitled "Atlas of AMTD Maps, January 1984".

(I4) ***"authorised person"*** means a person holding office as an authorised person under an appointment under the *Environmental Protection Act 1994* by the chief executive or chief executive officer of a local government.

(I5) ***"background noise level"*** means either:

$L_{A90,\,T}$ being the A-weighted sound pressure level exceeded for 90 percent of the time period not less than 15 minutes, using Fast response, or

$L_{Abg,\,T}$ being the arithmetic average of the minimum readings measured in the absence of the noise under investigation during a representative time period of not less than 15 minutes, using Fast response.

(I6) ***"cfu"*** means colony forming units.

(I7) ***"commercial place"*** means a place used as an office or for business or commercial purposes.

(I8) ***"dewatered"*** means the material does not yield free liquid and "free liquid" means liquid which readily separates from the solid portion of a waste under ambient temperature and pressure as determined by Method 9095 (Paint Filter Liquids Test) described in "U.S. EPA: Free Liquids (Paint Filter)" Federal Register, Vol. 50, No. 83, page 18370, April 30, 1985.

(I9) ***"drum"*** means any individual container for holding a chemical and having a capacity of not more that 250 litres.

(I10) ***"dry weather day"*** refers to a day during which no rainfall is recorded at any rainfall measuring station recognised by the Commonwealth Bureau of Meteorology within the sewered area connected to the sewage treatment plant, or if no such measuring station exists, at the nearest such station to the sewage treatment plant. The term also excludes days during which recorded rainfall over the three preceding days exceeds 100 mm.

(I11) ***"dry weather flow"*** refers to a day during which no rain falls within the catchment of the sewage treatment plant for the commencement of measurement for that day. The term also excludes days during which measurement is made which occur within three days following cumulative rainfall of 100 mm over the three preceding days.

(I12) ***"dwelling"*** means any of the following structures or vehicles that is principally used as a residence:

[1] Permit includes licences, approvals, permits, authorisations, certificates, sanctions or equivalent/similar as required by legislation administered by the Department of Environment and Resource Management

(a) a house, unit, motel, nursing home or other building or part of a building;
(b) a caravan, mobile home or other vehicle or structure on land; or
(c) a watercraft in a marina.

(I13) ***"groundwater monitoring system"*** means a system of groundwater monitoring devices, such as monitoring bores, used to provide data in respect to the level and quality of groundwater in the uppermost aquifer where the location of the groundwater monitoring devices is such that comparisons of groundwater quality and groundwater level can be made between groundwater flowing from beneath the site (down-gradient flow) of the activity and groundwater flowing towards the site of the activity (up-gradient flow).

(I14) ***"infiltration"*** means all flows entering a sewage reticulation system other than those flows that are legally permitted to enter the sewage reticulation system. Infiltration may be from:

(i) stormwater/groundwater inflows; or
(ii) illegal connections.

(I15) "***intrusive noise***" - means noise that, because of its frequency, duration, level, tonal characteristics, impulsiveness or vibration -

(a) is clearly audible to, or can be felt by, an individual; and
(b) annoys the individual.

In determining whether a noise annoys an individual and is unreasonably intrusive, regard must be had to Australian Standard 1055.2 - 1989 Acoustics - Description and Measurement of Environmental Noise Part 2 - Application to Specific Situations.

(I16) ***"$L_{Amax\ adj,\ T}$ "*** means the average maximum A-weighted sound pressure level, adjusted for noise character and measured over a time period of not less than 15 minutes, using Fast response.

(I17) ***"land"*** in any Land Application Schedule, means land excluding waters and the atmosphere.

(I18) ***"landfill facility"*** means land and structures at the approved place used for the disposal of solid waste.

(I19) ***"leachate"*** means a liquid that has passed through or emerged from, or is likely to have passed through or emerged from, a material stored, processed or disposed of at the approved place that contains soluble, suspended or miscible contaminants likely to have been derived from the said material.

(I20) ***"limited regulated waste"*** means any of the following regulated wastes - asbestos, infectious substances or quarantine waste that has been rendered non-infectious, contaminated soil, fish processing waste, food processing waste, poultry processing waste, tyres or treatment tank sludge or residue produced in sewage treatment or water treatment plants.

(I21) ***"long term 50 percentile compliance"*** means that the median value of the measured values in ranked order of the quality characteristic is not to exceed the stated release limit for any fifty (50) consecutive samples where:

(i) the consecutive samples are taken over a one year period;
(ii) the consecutive samples are taken at approximately equal periods; and
(iii) the time interval between the taking of each consecutive sample is not less than six days.

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(I22) ***"long term 80 percentile compliance"*** means that not more than ten (10) of the measured values of the quality characteristic are to exceed the stated release limit for any fifty (50) consecutive samples where:

(i) the consecutive samples are taken over a one year period;
(ii) the consecutive samples are taken at approximately equal periods; and
(iii) the time interval between the taking of each consecutive sample is not less than six days.

(I23) ***"maximum"*** means that the measured value of the quality characteristic or contaminant must not be greater than the release limit stated.

(I24) ***"MaxL$_{pA\ T}$"*** means the maximum A-weighted sound pressure level measured over a time period of not less than 15 minutes, using Fast response.

(I25) ***"median"*** means the middle value, where half the data are smaller, and half the data are larger. If the number of samples is even, the median is the arithmetic average of the two middle values.

(I26) ***"mg/L"*** means milligrams per litre.

(I27) ***"minimum"*** means that the measured value of the quality characteristic or contaminant must not be less than the release limit stated.

(I28) ***"noise sensitive place"*** as mentioned in Schedule 5 of the *Environmental Protection (Noise) Policy 1997* means any of the following places:

(a) a dwelling;
(b) a library, childcare centre, kindergarten, school, college, university or other educational institution;
(c) a hospital, surgery or other medical institution;
(d) a protected area, or an area identified under a conversation plan as a critical habitat or an area of major interest, under the Nature Conservation Act 1992;
(e) a marine park under the Marine Parks Act 1982; or
(f) a park or garden that is open to the public (whether or not on payment of money) for use other than for sport or organised entertainment.

(I29) ***"noxious"*** means harmful or injurious to health or physical well-being.

(I30) ***"offensive"*** means causing offence or displeasure; is disagreeable to the senses; disgusting, nauseous or repulsive.

(I31) ***"range"*** means that the measured value of the quality characteristic or contaminant must not be greater than the higher release limit stated nor less than the lower release limit stated.

(I32) ***"regulated waste"*** means non-domestic waste mentioned in Schedule 7 of the *Environmental Protection Regulation 1998* whether or not it has been treated or immobilised and includes -

(i) for an element - any chemical containing the element; and
(ii) anything that has contained a regulated waste.

(I33) ***"short term 50 percentile compliance"*** means that the median value of the measured values in ranked order of the quality characteristic is not to exceed the stated release limit for any five (5) consecutive samples where:

(i) the consecutive samples are taken over a five week period;
(ii) the consecutive samples are taken at approximately equal periods; and
(iii) the time interval between the taking of each consecutive sample is not less than six days.

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(I34) ***"short term 80 percentile compliance"*** means that not more than one (1) of the measured values of the quality characteristic are to exceed the stated release limit for any five (5) consecutive samples where:

(i) the consecutive samples are taken over a five week period;
(ii) the consecutive samples are taken at approximately equal periods; and
(iii) the time interval between the taking of each consecutive sample is not less than six days.

(I35) ***"STP"*** means Sewage Treatment Plant.

(I36) ***"tank"*** means any individual container for holding a chemical and having a capacity of more that 250 litres.

(I37) ***"total Nitrogen"*** means the sum of Organic Nitrogen, Ammonia, Nitrite plus Nitrate, as mg/L of Nitrogen.

(I38) ***"total Phosphorus"*** means the sum of the reactive phosphorus, acid-hydrolysable phosphorus and organic phosphorus, as mg/L of Phosphorus. This includes both the inorganic and organic fraction of phosphorus.

(I39) ***"uppermost aquifer"*** means the geologic formation nearest to the natural ground surface that is an aquifer. The term includes any aquifers that are likely to be hydraulically interconnected with this aquifer within the landfill facility property boundary.

End of Definitions for Schedule I

END OF CONDITIONS

[1] Permit includes licences, approvals, permits, authorisations, certificates, sanctions or equivalent/similar as required by legislation administered by the Department of Environment and Resource Management

QUEENSLAND GOVERNMENT
Environmental Protection Agency

Southern Region 288 Edward Street • Brisbane Queensland • GPO Box 2771 • BRISBANE QLD 4001 • AUSTRALIA
Telephone (07) 3224 5641 • Facsimile (07) 3225 8723 • www.env.qld.gov.au

Environmental Protection Act 1994

Notice of Decision to Grant Application for Environmental Authority

Section 45(1)

Enquiries to: Ricci Churchill
Telephone: (07) 3224 6166
Your Reference:
Our reference: 1EA1171

Anglian Water International Pty Ltd
6-18 Bridge Road
HORNSBY NSW 2077

Attn: Frank Placko

Dear Sir

Re: **Application for Environmental Authority by Anglian Water International Pty Ltd in respect of the operations described as environmentally relevant activity (ERA) 15(f) - Sewage Treatment located at 257 Duffield Road, Redcliffe Qld 4020.**

Your application for Environmental Authority has been granted.

A copy of the Licence No. **SR1617** which includes the schedule of conditions, is attached.

This licence takes effect from 25 July 2000.

Information relating to a review of the decision or appeals under this Act is attached to this notice.

signed .....

R T Anderson
Manager Licensing
Delegate of Administering Authority
Environmental Protection Act (1994)

date 4/7/00

Procedure for review

202.(1) A dissatisfied person may apply for a review of an original decision.

(2) The application must-

(a) be made in the approved form to the administering authority within-

(i) 14 days after the day on which the person receives notice of the original decision or the administering authority is taken to have made the decision (the **"review date"**); or

(ii) the longer period the authority in special circumstances allows; and

(b) be supported by enough information to enable the authority to decide the application.

(3) On or before making the application, the applicant must send the following documents to the other persons who were given notice of the original decision-

(a) notice of the application (the **"review notice"**); and

(b) a copy of the application and supporting documents.

(4) The review notice must inform the recipient that submission on the application may be made to the administering authority within 7 days after the application is made to the authority.

(5) If the administering authority is satisfied the applicant has complied with subsection (2) and (3), the authority must within 14 days after receiving the application -

(a) review the original decision; and

(b) consider any submissions properly made by a recipient of the review notice; and

(c) make a decision (the **"review decision"**) to-

(i) confirm or revoke the original decision; or

(ii) vary the original decision in a way the administering authority considers appropriate.

(6) The application does not stay the original decision.

(7) The application must not be dealt with by-

(a) the person who made the original decision; or

(b) a person in a less senior office than the person who made the original decision.

(8) Within 14 days after making the decision, the administering authority must give written notice of the decision to the applicant and persons who were given notice of the original decision.

(9) The notice must-

(a) include the reasons for the review decision; and

(b) inform the person of their right of appeal against the decision.

(10) If the administering authority does not comply with subsection (5) or (8) the authority is taken to have made a decision confirming the original decision.

(11) Subsection (7) applies despite section 27A(7) of the *Acts Interpretation Act 1954.*

(12) This section does not apply to an original decision made by-

(a) for a matter, the administration and enforcement of which has been devolved to a local government - the local government itself or the chief executive officer of the local government personally; or

(b) for another matter-the chief executive personally.

Who may appeal

204. (1) A dissatisfied person who is dissatisfied with a review decision may appeal against the decision to the Court.

(2) The chief executive may appeal against another administering authority 's decision (whether an original or review decision) to the Court.

(3) A dissatisfied person who is dissatisfied with an original decision to which section 202 (Procedure for review) does not apply may appeal against the decision to the Court.

Licence No. SR1617

Section 45(1)

Under the provisions of the *Environmental Protection Act 1994* this environmental authority is issued:

To: Anglian Water International Pty Ltd

Address: 6-18 Bridge Road
HORNSBY NSW 2077

in respect of carrying out the environmentally relevant activity at the following place(s):

Portion 276 and Portion 277, Parish of Redcliffe

located at: 257 Duffield Road
REDCLIFFE QLD 4020

ERA 15(f) - Sewage treatment-operating a standard sewage treatment works having a peak design capacity to treat sewage of 50 000 or more average persons but less than 100 000 equivalent persons

This environmental authority is issued subject to the conditions set out in the schedules attached to this environmental authority.

This environmental authority takes effect from 25 July 2000.

signed .....

R T Anderson
Manager Licensing
Delegate of Administering Authority
Environmental Protection Act (1994)

date 4.7.00

This environmental authority consists of the following schedules-

Schedule A - General Conditions

Schedule B - Air

Schedule C - Water

Schedule D - Stormwater Management

Schedule E - Land Application

Schedule F - Noise

Schedule G - Waste Management

Schedule H - Self Monitoring and Reporting

Schedule I - Definitions

Schedule J - Works Area

SCHEDULE A - GENERAL CONDITIONS

Compliance with Environmental Authority

(A1) In carrying out the environmentally relevant activity, the holder of this environmental authority must take all reasonable and practicable measures to prevent and/or to minimise the likelihood of environmental harm being caused. Any environmentally relevant activity, that, if carried out incompetently, may cause environmental harm, in a manner that could be prevented, shall be carried out in a proper manner by a competent person in accordance with the conditions of this authority.

(A2) The holder of this environmental authority must:

(a) install and operate all works and control equipment; and
(b) take all measures, perform all acts and do all things,

necessary to ensure compliance with the conditions of this environmental authority.

Display of Environmental Authority

(A3) A copy of this environmental authority must be kept in a location readily accessible to personnel carrying out the activity.

Trained Operators

(A4) All persons engaged in the conduct of the activity, including but not limited to employees and contract staff, must be:

(i) trained in the procedures and practices necessary to:

(a) comply with the conditions of this environmental authority; and
(b) prevent environmental harm during normal operation and emergencies; or

(ii) under the close supervision of such a trained person.

Inspections by Authorised Persons

(A5) At all reasonable times, and to the satisfaction of an authorised person, the following must be provided to enable an authorised person to check compliance with the conditions of this environmental authority:

(i) monitoring facilities; and
(ii) access to such facilities; and
(iii) any reasonable assistance which the authorised person deems necessary.

Records

(A6) Any record required to be kept by a condition of this environmental authority must be kept at the licensed place and be available for examination by an authorised person.

(A7) Copies of any record or document required to be kept by a condition of this environmental authority must be provided to any authorised person or the administering authority on request.

Alterations

(A8) No change, replacement or operation of any plant or equipment is permitted if the change, replacement or operation of the plant or equipment increases, or is likely to substantially increase, the risk of environmental harm.

Calibration

(A9) All instruments and measuring devices used for the measurement or monitoring of any parameter under any condition of this environmental authority must be calibrated, and appropriately operated and maintained.

Site-Based Management Plan

(A10) The holder of this environmental authority, must develop and implement an effective and appropriate Site-based Management Plan which details how the holder of this environmental authority will manage the actual and potential environmental impacts resulting from the carrying out of the environmentally relevant activity.

(A11) The Site-based Management Plan must address at least the following matters:

(i) routine operating procedures to prevent or minimise environmental harm, however occasioned or caused during normal operations;
(ii) maintenance practices and procedures;
(iii) contingency plans and emergency procedures to deal with foreseeable risks and hazards including corrective responses to prevent and mitigate environmental harm (including any necessary site rehabilitation);
(iv) monitoring of the release of contaminants into the environment including procedures, methods, record keeping and notification of results;
(v) assessment of the environmental impact of any releases of contaminants into the environment including procedures, methods, record keeping and notification of results;
(vi) handling of environmental complaints;
(vii) keeping and production of environmental records and reports;
(viii) lines and methods of communication to be utilised for communication of procedures, plans, incidents, potential environmental problems and results, including a feedback mechanism to ensure that management is made aware of potential environmental problems and any failure of procedures adopted; and

(ix) staff training and awareness of environmental issues related to the operation of the environmentally relevant activities, including responsibilities under the Environmental Protection Act.

(A12) A copy of the Site-based Management Plan and any subsequent amendment of the Site-based Management Plan must be kept at the licensed place.

(A13) The holder of this environmental authority must not implement a Site-based Management Plan or amend a Site-based Management Plan where such implementation or amendment would result in a contravention of any condition of this environmental authority.

Management Plan for Blue-Green Algae

(A14) The holder of this environmental authority, must develop and implement an effective and appropriate Plan for the Management of Blue-Green Algae within the effluent storage pond. The plan should detail how the holder of this environmental authority will manage the actual and potential environmental impacts resulting from any occurrence of blue-green algal outbreaks.

(A15) The Management Plan for Blue-Green Algae must address at least the following matters:

(i) weekly inspections to detect the presence of any bloom;
(ii) notification and reporting if blue-green algae blooms are confirmed;
(iii) the collection and analysis of samples if a bloom is suspected; and
(iv) remedial actions.

(A16) A copy of the Management Plan for Blue-Green Algae must be kept at the licensed place.

(A17) The holder of this environmental authority must not implement a Management Plan for Blue-Green Algae or amend a Management Plan for Blue-Green Algae where such implementation or amendment would result in a contravention of any condition of this environmental authority.

Nuisance

(A18) Notwithstanding any other condition of this environmental authority, this environmental authority does not authorise any release of contaminants which causes or is likely to cause an environmental nuisance beyond the boundaries of the licensed place.

End of Conditions for Schedule A

SCHEDULE B - AIR

Release of Contaminants to the Atmosphere

(B1) The environmentally relevant activity must be carried out by such practicable means necessary to prevent the release or likelihood of release of contaminants to the atmosphere.

(B2) Where it is not practicable to prevent the release of contaminants to the atmosphere as required by condition number B1, the environmentally relevant activity must be carried out by such practicable means necessary to minimise the release or likelihood of any such release of contaminants to the atmosphere.

Noxious or Offensive Odour

(B3) Notwithstanding any other condition of this environmental authority, no release of contaminants from the licensed place is to cause a noxious or offensive odour beyond the boundaries of the licensed place.

End of Conditions for Schedule B

SCHEDULE C - WATER

Release of Contaminants to Waters

(C1) Contaminants must not be directly or indirectly released from the licensed place to any waters or the bed and banks of any waters except as permitted under the Water Schedule or the Stormwater Management Schedule.

(C2) The only contaminants permitted to be released from the licensed place at the release point W1 are sewage treatment effluents from the sewage treatment plant.

Release Points

(C3) Contaminants must not be directly or indirectly released from any source on the licensed place to any waters at any location other than the contaminants and sources at the locations listed below:

Release Point W1 - Treated sewage wastes from the treatment plant discharged via the outfall pipe to waters described as the tidal reach of Hay's Inlet at AMTD 2 km.

Release Point Details

(C4) Release point number W1 must be submerged such that the top of the outfall pipe is at least 0.3 metres below Low Water Datum into the deep water channel in Moreton Bay.

Quantity of Contaminants Released

(C5) The total quantity of contaminants released from Release Point W1 during any dry weather day must not exceed 22 100 cubic metres and in any day must not exceed 80 000 cubic metres.

Quality Characteristics Of Release to Waters

(C6) The release of contaminants to waters must comply, at the sampling and in-situ measurement points specified in Schedule H, with each of the limits specified in Schedule C Table 1 for each quality characteristic.

SCHEDULE C TABLE 1 - RELEASE QUALITY CHARACTERISTIC LIMITS

Error! Bookmark not defined.QUALITY CHARACTERISTICS	RELEASE LIMIT	LIMIT TYPE
5-day Biochemical Oxygen Demand (inhibited)	10 mg/L	long term 80 percentile compliance
5-day Biochemical Oxygen Demand (inhibited)	15 mg/L	short term 80 percentile compliance
5-day Biochemical Oxygen Demand (inhibited)	30 mg/L	maximum
Suspended Solids	15 mg/L	long term 80 percentile compliance
Suspended Solids	23 mg/L	short term 80 percentile compliance
Suspended Solids	45 mg/L	maximum
pH	6.5 to 8.5	range
Dissolved Oxygen	2.0 mg/L	minimum
Total Nitrogen (as Nitrogen)	5.0 mg/L	long term 50 percentile compliance
Total Nitrogen (as Nitrogen)	7.5 mg/L	short term 50 percentile compliance
Total Nitrogen (as Nitrogen)	15.0 mg/L	maximum
Total Phosphorous (as Phosphorus)	1.0 mg/L	long term 50 percentile compliance
Total Phosphorus (as Phosphorus)	1.5 mg/L	short term 50 percentile compliance
Total Phosphorus (as Phosphorus)	3.0 mg/L	maximum
Free Chlorine Residual	0.7 mg/L	maximum
Faecal Coliforms	150 organisms per 100 mL as a median value (minimum of 5 samples taken at not less than half-hourly intervals in any one day, with 4 out of the 5 samples containing less than 400 organisms per 100 mL)	

(C7) Notwithstanding the quality characteristic limits specified in Schedule C Table 1, the release of contaminants to waters must comply with the following qualitative characteristics:

(i) The release must not have any properties nor contain any organisms or other contaminants which are capable of causing environmental harm.

(ii) The release must not produce any slick or other visible evidence of oil or grease, nor contain visible floating oil, grease, scum, litter or other objectionable matter.

End of Conditions for Schedule C

SCHEDULE D - STORMWATER MANAGEMENT

Contaminant Releases Caused by Rainfall

(D1) The environmentally relevant activity must be carried out by such practicable means necessary to prevent the contact of incident rainfall and stormwater runoff with wastes or other contaminants.

(D2) Where it is not practicable to prevent contact as required by condition number D1 above, the environmentally relevant activity must be carried out by such practicable means necessary to minimise any such contact.

Release of Contaminated Stormwater Runoff

(D3) Except as otherwise provided by the conditions of the Stormwater Management Schedule and the Water Schedule of this environmental authority, the environmentally relevant activity must be carried out by such practicable means necessary to prevent the release or likelihood of release of contaminated runoff from the licensed place to any stormwater drain or waters or the bed or banks of any such waters.

(D4) Where it is not practicable to prevent any release of contaminated runoff as required by condition number D3, the environmentally relevant activity must be carried out by such practicable means necessary to minimise any such release or the likelihood of any such release.

Stormwater Management Plan

(D5) The holder of this environmental authority, must develop and implement an effective and appropriate Stormwater Management Plan which details how the holder of this environmental authority will manage the actual and potential environmental impacts resulting from the contamination of stormwater at the licensed place.

(D6) The Stormwater Management Plan must address at least the following matters:

(i) prevention of incident stormwater and stormwater runoff from contacting wastes or contaminants; and
(ii) diversion of upstream runoff away from areas containing wastes or contaminants; and
(iii) minimisation of the size of contaminated areas; and
(iv) cleaning of contaminated areas without water; and
(v) installation of pollution control equipment such as oil separators, silt and rubbish traps, sedimentation ponds, settling pits and stormwater diversion systems;
(vi) paving and roofing of contaminated areas;
(vii) sampling and monitoring of contaminated stormwater released from the licensed place and assessment of the impact of any such release on the receiving environment;

(viii) reporting the results of the monitoring of stormwater releases and any assessment of the impact of the releases on the receiving environment to the administering authority; and

(ix) if soil is to be exposed or disturbed as a result of the activities conducted the Stormwater Management Plan must also address the following:

(a) minimisation of the amount of soil to be exposed or disturbed by staging works and the presence of any acid sulphate soils;
(b) revegetation of exposed or disturbed areas;
(c) installation of sediment control measures such as settling basins; and
(d) diversion of upstream runoff from exposed or disturbed areas.

(D7) A copy of the Stormwater Management Plan and any subsequent amendment of the Stormwater Management Plan must be kept at the licensed place and be available for examination by an authorised person on request.

(D8) The holder of this environmental authority must not implement the Stormwater Management Plan or amend the Stormwater Management Plan where such implementation or amendment would result in a contravention of any condition of this environmental authority.

Maintenance and Cleanup

(D9) The maintenance and cleaning of vehicles and any other equipment or plant must be carried out in areas from where contaminants cannot be released into any waters, roadside gutter or stormwater drainage system.

(D10) Any spillage of wastes, contaminants or other materials must be cleaned up as quickly as practicable. Such spillages must not be cleaned up by hosing, sweeping or otherwise releasing such wastes, contaminants or material to any stormwater drainage system, roadside gutter or waters.

Acid Sulphate Soils

(D11) Any acid sulphate soils or potential acid sulphate soils disturbed, extracted or unearthed as a result of carrying out the environmentally relevant activity or activities must be stored and/or treated and/or disposed of so as not to cause environmental harm to surface waters and/or groundwaters.

Bunding

(D12) All chemical tank storages must be bunded so that the capacity of the bund is sufficient to contain at least 100% of the largest storage tank plus 10% of the second largest tank within the bund.

(D13) All chemical drum storages must be bunded so that the capacity of the bund is sufficient to contain at least 25% of the maximum design storage volume within the bund.

(D14) All tanker loading/unloading areas must be bunded so that the capacity of the bund is sufficient to contain 100% of the largest compartment of any tanker using the area.

(D15) All bunding must be constructed of materials which are impervious to the materials stored.

(D16) The base and walls of all bunded areas must be maintained free from gaps or cracks.

(D17) All bunding must be roofed where practicable.

(D18) Where it is impractical to completely roof a bunded area the holder of this environmental authority must ensure that any stormwater captured within the bund is free from contaminants or wastes prior to any release.

(D19) All empty drums must be stored with their closures in place.

Pond conditions

(D20) All ponds used for the storage or treatment of contaminants or wastes must be constructed and maintained to ensure the stability of the ponds construction.

(D21) Suitable banks and or diversion drains must be installed and maintained to exclude stormwater runoff from any ponds or other structures used for the storage or treatment of contaminants or wastes.

End of Conditions for Schedule D

SCHEDULE E - LAND APPLICATION

Release of Contaminants to Land

(E1) Except as otherwise provided by the conditions of the Land Schedule of this environmental authority, the environmentally relevant activity must be carried out by such practicable means necessary to prevent the release or likelihood of release of contaminants to land.

(E2) Where it is not practicable to prevent any release of contaminants to land as required by condition number E1, the environmentally relevant activity must be carried out by such practicable means necessary to minimise the release or likelihood of release of any such contaminants to land.

Description of Contaminants

(E3) The only contaminants allowed to be released to land are sewage treatment effluents, dried sludge, fermenter and primary clarifier scum, screenings and grit from the sewage treatment plant.

Contaminant Release Location

(E4) The defined contaminant release areas are described as:

(i) solid waste disposal areas marked in Schedule J; and
(ii) landscaped areas of the licensed place.

Contaminant Release Quality

(E5) Treated sewage effluent used for irrigation purposes, or given to another party for irrigation purposes or other use, must comply with the quality characteristics specified in Schedule C Table 1.

Contaminant Release Precautions

(E6) The contaminant release areas must not be used for grazing, recreational activities or as a traffic thoroughfare.

(E7) The release of contaminants to land must not be carried out if soil moisture conditions are such that surface runoff or ponding is likely to occur.

(E8) Spray from any release of contaminants to land must not drift beyond the boundaries of the licensed place.

(E9) Public access to any contaminant release area must be denied during the release of contaminants to land and until the release area has dried.

(E10) Pipelines and fittings for the release of contaminants to land must be clearly identified. Standard water taps, hoses and cocks must not be fitted to contaminant release pipelines, and the contaminant release system must not be connected to other service pipelines. Lockable valves or removable handles must be fitted to the contaminant release pipelines where there is public access to the contaminant release areas.

End of Conditions of Schedule E

SCHEDULE F - NOISE

Emission of Noise

(F1) In the event of a complaint about noise that constitutes unreasonable intrusive noise being made to the administering authority, that the administering authority considers is not frivolous or vexatious, then the emission of noise from the licensed premises to which this environmental authority relates must not result in levels greater than those specified in Schedule F Table 1.

SCHEDULE F - TABLE 1

NOISE LIMITS AT A NOISE SENSITIVE PLACE	
Period	*Noise Level at a Noise Sensitive Place Measured as the Adjusted Maximum Sound Pressure Level* $L_{Amax\ adj,\ T}$
7 am - 6 pm	Background noise level plus 5 dB(A)
6 pm - 10 pm	Background noise level plus 5 dB(A)
10 pm - 7 am	Background noise level plus 3 dB(A)
NOISE LIMITS AT A COMMERCIAL PLACE	
Period	*Noise Level at a Commercial Place measured as the Adjusted Maximum Sound Pressure Level* $L_{Amax\ adj,\ T}$
7 am - 6 pm	Background noise level plus 10 dB(A)
6 pm - 10 pm	Background noise level plus 10 dB(A)
10 pm - 7 am	Background noise level plus 8 dB(A)

End of Conditions for Schedule F

SCHEDULE G - WASTE MANAGEMENT

General

(G1) Waste must not be released to the environment, stored, transferred or disposed contrary to any condition of this environmental authority.

(G2) The holder of this environmental authority must not:

(i) burn waste (apart from off-gases from the anaerobic digesters) at or on the licensed place; nor
(ii) allow waste to burn or be burnt at or on the licensed place; nor
(iii) remove waste from the licensed place and burn such waste elsewhere.

Waste Management Plan (WMP)

(G3) The holder of this environmental authority, must develop and implement an effective and appropriate Waste Management Plan which details how the holder of this environmental authority will manage the actual and potential environmental impacts resulting from all wastes produced at the licensed place.

(G4) The Waste Management Plan must address at least the following matters:

(i) the quantity and nature of each waste produced;
(ii) the current method of disposal;
(iii) proposed methods of pre-treatment or disposal;
(iv) expected reduction in quantity of waste produced through waste minimisation and cleaner production;
(v) investigation and evaluation of alternative treatment options which shall include at least the following:
  (a) cleaner production technologies including nutrient removal; and
  (b) disposal and/or reuse of effluent and biosolids;
  (c) reporting results of any investigation and evaluation to the administering authority; and
(vi) provisions for carrying out and submitting to the administering authority a waste audit within twelve (12) months from the date of issue of this environmental authority and thereafter every five (5) years; and
(vii) any sampling currently carried out or proposed to be carried out; and
(viii) potential onsite or offsite reuse.

(G5) A copy of the Waste Management Plan and any subsequent amendment of the Waste Management Plan must be kept at the licensed place and be available for examination by an authorised person on request.

(G6) The holder of this environmental authority must not implement the Waste Management Plan or amend the Waste Management Plan where such implementation or amendment would result in a contravention of any condition of this environmental authority.

Off Site Movement

(G7) Where regulated waste is removed from the licensed place (other than by a release as permitted under another schedule of this environmental authority), the holder of this environmental authority must monitor and record the following:

(i) the date, quantity and type of waste removed; and
(ii) name of the waste transporter and/or disposal operator that removed the waste; and
(iii) the intended treatment/disposal destination of the waste.

(NOTE: Records of documents maintained in compliance with a waste tracking system established under the *Environmental Protection Act 1994* or any other law for regulated waste will be deemed to satisfy this condition).

(G8) Regulated waste must not be sent for disposal at any facility without the written approval of the person operating that facility.

Records

(G9) Records must be maintained for a period of five (5) years for all wastes mentioned in this schedule.

Notification of Improper Disposal of Regulated Waste

(G10) If the holder of this environmental authority becomes aware that a person has removed regulated waste from the licensed place and disposed of the regulated waste in a manner which is not authorised by this environmental authority or improper or unlawful, then the holder of this environmental authority must, as soon as practicable, notify the administering authority of all relevant facts, matters and circumstances known concerning the disposal.

Spillage and Cleanup

(G11) The holder of this environmental authority must ensure that a facility or equipment is available for the containment and recovery of any spillages at the loading point.

End of Conditions for Schedule G

SCHEDULE H - SELF MONITORING AND REPORTING

Complaint Recording

(H1) All complaints received by the holder of this environmental authority relating to operations at the licensed place must be recorded in a log book with the following details:

(i) nature, time and date of complaint;
(ii) type of communication (telephone, letter, personal etc.);
(iii) name, contact address and contact telephone number of complainant (Note: if the complainant does not wish to be identified then "not identified" is to be recorded);
(iv) response and investigation undertaken as a result of the complaint;
(v) name of person responsible for investigating complaint; and
(vi) action taken as a result of the complaint investigation and signature of responsible person.

(H2) The complaints record required by condition number H1 must be maintained for a period of not less than five (5) years.

Incident Recording

(H3) A record must be maintained of events including but not limited to:

(i) the time, date and duration of equipment malfunctions, that may affect the environmental performance of the licensed place; and
(ii) any shut-downs of equipment upon which the environmental performance of the licensed place depends.

(H4) The record required by condition number H3 must be maintained for a period of not less than five (5) years.

Notification of Emergencies and Incidents

(H5) As soon as practicable after becoming aware of any emergency or incident which results in the release of contaminants not in accordance, or reasonably expected to be not in accordance with the conditions of this environmental authority, the holder of this environmental authority must notify the administering authority of the release by telephone or facsimile.

(H6) The notification of emergencies or incidents as required by condition number H5 must include but not be limited to the following:

(i) The name of the holder of the environmental authority;
(ii) the location of the emergency or incident;
(iii) the number of the environmental authority;
(iv) the name and telephone number of the designated contact person;
(v) the time of the release;
(vi) the time the holder of the environmental authority became aware of the release;
(vii) the suspected cause of the release;
(viii) the environmental harm caused, threatened, or suspected to be caused by the release; and
(ix) actions taken to prevent further any release and mitigate any environmental harm caused by the release.

(H7) Not more than fourteen (14) days following the initial notification of an emergency or incident, the holder of the environmental authority must provide written advice of the *information supplied in accordance with condition number H6 in addition to:*

(i) proposed actions to prevent a recurrence of the emergency or incident; and
(ii) outcomes of actions taken at the time to prevent or minimise environmental harm.

(H8) As soon as practicable, but not more than six (6) weeks following the conduct of any environmental monitoring performed in relation to the emergency or incident, which results in the release of contaminants not in accordance, or reasonably expected to be not in accordance with the conditions of this environmental authority, the holder of the environmental authority must provide written advice of the results of any such monitoring performed to the administering authority.

Monitoring of Contaminant Releases to Waters

(H9) The holder of this environmental authority is responsible for the making of determinations of the quality of the contaminants released for the release points, quality characteristics, and at the frequency specified in Schedule H Table 1:

SCHEDULE H - TABLE 1

Quality Characteristic	Units	Frequency
5-day Biochemical Oxygen Demand	mg/L	Weekly
Suspended Solids	mg/L	Weekly
pH	pH scale	Weekly
Dissolved Oxygen	mg/L	Weekly
Free Chlorine Residual	mg/L	Weekly
Faecal Coliforms	cfu/100 mL	Weekly
Total Nitrogen (as Nitrogen)	mg/L	Weekly
Total Phosphorus (as Phosphorus)	mg/L	Weekly

Sampling and In-situ Monitoring Point Details

(H10) Determinations of the quality of contaminants released to waters to check conformity with the release quality characteristics specified in Schedule C of this environmental authority must be undertaken at the sampling and in-situ measurement point described as the effluent collection tank located adjacent to the south-western edge of the plant boundary.

Quality Determinations

(H11) All determinations of the quality of contaminants released to waters must be made in accordance with methods prescribed in the Environmental Protection Agency Water Quality Sampling Manual, 3rd Edition, December 1999, or more recent additions or supplements to that document as such become available, or as specifically approved by the administering authority.

(H12) All determinations of the quality of contaminants released must be performed by a person or body possessing appropriate experience and qualifications to perform the required measurements.

(H13) Records must be kept of the results of all determinations of the quality of contaminants released to waters for a period of at least five (5) years.

Monitoring of Volume of Release

(H14) The daily quantity of contaminants released must be determined or estimated by an appropriate method, for example, a flow meter.

(H15) Records must be kept of the results of all determinations of the daily quantity of contaminants released to waters for a period of at least five (5) years.

Noise Monitoring

(H16) For the purposes of investigating any complaint made about noise annoyance and also for checking compliance with condition number F3 in Schedule F, monitoring and recording the noise levels from the environmentally relevant activity must be undertaken for at least the following descriptors, characteristics and conditions:

(i) $L_{Amax,\ Adj\ T}$;
(ii) $L_{Abg,\ T}$ (or $L_{A90,\ T}$);
(iii) $L_{AN,\ T}$ (where N equals statistical levels of 1, 10, 50, 90 and 99);
(iv) Max $L_{pA\ T}$;
(v) $L_{Aeq,\ T}$,
(vi) The level and frequency of occurrence of impulsive or tonal noise;
(vii) Atmospheric conditions including temperature, relative humidity and wind speed and direction; and
(viii) Effects due to extraneous factors such as traffic noise.

(H17) In conjunction with the measurement and recording of the noise, the following parameters and conditions must be recorded:

(i) Location, date and time of recording.

(H18) Monitoring must also be undertaken to investigate any complaint of noise annoyance upon receipt of a written request from the administering authority to carry out such monitoring.

(H19) The method of measurement and reporting of noise levels must comply with the *Department of Environment Noise Measurement Manual, second edition, March 1995*, or more recent additions or supplements to that document as become available.

(H20) The method of measurement and reporting of noise levels must be undertaken by a person or body possessing appropriate experience and qualifications to perform the required measurements.

(H21) Records must be kept of the results of all monitoring of noise levels and other information required to be recorded in conjunction with such monitoring for a period of at least five (5) years.

Exception Reporting

(H22) The holder of this environmental authority must notify the administering authority in writing of any monitoring result which indicates an exceedance of any licence limit within twenty-eight (28) days of completion of the analysis.

(H23) The written notification required by condition number H22 above must include:

(i) The full analysis results; and
(ii) Details of investigation or corrective actions taken; and
(iii) Any subsequent analysis.

Monitoring Reporting

(H24) Any monitoring data compiled, collected or recorded as required by conditions of this environmental authority shall be supplied to the administering authority on an annual basis.

Each annual Monitoring Report shall be delivered to the administering authority within eight (8) weeks of the close of twelve (12) months period.

(H25) Contaminant release quantities pertaining to the yearly period, compiled, collected or recorded in accordance with condition number C5 shall be presented, including appropriate precipitation data for the sewer catchment:

(i) in a tabular format, showing date of recording and raw data; and
(ii) graphically showing raw data vs time.

(H26) Contaminant release quality pertaining to the yearly period, compiled, collected or recorded in accordance with condition number H9 shall be presented:

(i) in a tabular format, showing:
  (a) date, times, and day of week sampled;
  (b) all raw data;
  (c) any exceedance of levels of all parameters specified in Schedule C, Table 1; and
  (d) maximum and minimum values for parameters specified in Schedule H Table 1;

(ii) graphically showing data referred to in part (i) of this condition vs time.

End of Conditions for Schedule H

SCHEDULE I - DEFINITIONS

(I1) For the purposes of this environmental authority any term not otherwise defined in the Act and any subordinate legislation made pursuant to the Act or in the Definitions Schedule of this environmental authority has the meaning conferred to that term in its common usage.

(I2) In the event of any inconsistency arising between the meaning of any term provided in the Definitions Schedule of this environmental authority and any common usage of that term, the meaning conferred in the Definitions Schedule of this environmental authority prevails.

For the purposes of this environmental authority the following definitions apply:

(I3) "Act" means the Environmental Protection Act 1994.

(I4) "administering authority" means the Environmental Protection Agency or its successor.

(I5) "AMTD" means Adopted Middle Thread Distance as per the Queensland Water Resources Commission publication entitled "Atlas of AMTD Maps, January 1984".

(I6) "authorised person" means a person holding office as an authorised person under an appointment under the *Environmental Protection Act 1994* by the chief executive or chief executive officer of a local government.

(I7) "land" in the Land Application Schedule, means land excluding waters and the atmosphere.

(I8) "mg/L" means milligrams per litre.

(I9) "cfu" means colony forming units.

(I10) "dry weather day" refers to a day during which no rainfall is recorded at any rainfall measuring station recognised by the Commonwealth Bureau of Meteorology within the sewered area connected to the sewage treatment plant, or if no such measuring station exists, at the nearest such station to the sewage treatment plant. The term also excludes days during which recorded rainfall over the three preceding days exceeds 100 mm.

(I11) "long term 80 percentile compliance" means that not more than ten (10) of the measured values of the quality characteristic are to exceed the stated release limit for any fifty (50) consecutive samples where:

(i) the consecutive samples are taken over a one year period;
(ii) the consecutive samples are taken at approximately equal periods; and
(iii) the time interval between the taking of each consecutive sample is not less than six (6) days.

(I12) "short term 80 percentile compliance" means that not more than one (1) of the measured values of the quality characteristic are to exceed the stated release limit for any five (5) consecutive samples where:

(i) the consecutive samples are taken over a five (5) week period;
(ii) the consecutive samples are taken at approximately equal periods; and
(iii) the time interval between the taking of each consecutive sample is not less than six (6) days.

(I13) "long term 50 percentile compliance" means that the median value of the measured values in ranked order of the quality characteristic is not to exceed the stated release limit for any fifty (50) consecutive samples where:

(i) the consecutive samples are taken over a one year period;
(ii) the consecutive samples are taken at approximately equal periods; and
(iii) the time interval between the taking of each consecutive sample is not less than six (6) days.

(I14) "short term 50 percentile compliance" means that the median value of the measured values in ranked order of the quality characteristic is not to exceed the stated release limit for any five (5) consecutive samples where:

(i) the consecutive samples are taken over a five (5) week period;
(ii) the consecutive samples are taken at approximately equal periods; and
(iii) the time interval between the taking of each consecutive sample is not less than six (6) days.

(I15) "median" means the middle value, where half the data are smaller, and half the data are larger. If the number of samples is even, the median is the arithmetic average of the two middle values.

(I16) "maximum" means that the measured value of the quality characteristic or contaminant must not be greater than the release limit stated.

(I17) "minimum" means that the measured value of the quality characteristic or contaminant must not be less than the release limit stated.

(I18) "range" means that the measured value of the quality characteristic or contaminant must not be greater than the higher release limit stated nor less than the lower release limit stated.

(I19) "$L_{Amax\ adj,\ T}$ " means the average maximum A-weighted sound pressure level, adjusted for noise character and measured over a time period of not less than 15 minutes, using Fast response.

(I20) "background noise level" means either:

$L_{A90,\,T}$ being the A-weighted sound pressure level exceeded for 90 percent of the time period not less than 15 minutes, using Fast response, or

$L_{Abg,\,T}$ being the arithmetic average of the minimum readings measured in the absence of the noise under investigation during a representative time period of not less than 15 minutes, using Fast response.

(I21) "Max$L_{pA\,T}$" means the maximum A-weighted sound pressure level measured over a time period of not less than 15 minutes, using Fast response.

(I22) "total Nitrogen" means the sum of Organic Nitrogen, Ammonia, Nitrite plus Nitrate, as mg/L of Nitrogen.

(I23) "total Phosphorus" means the sum of the reactive phosphorus, acid-hydrolysable phosphorus and organic phosphorus, as mg/L of Phosphorus. This includes both the inorganic and organic fraction of phosphorus.

(I24) "commercial place" means a place used as an office or for business or commercial purposes.

(I25) "noise sensitive place" means-

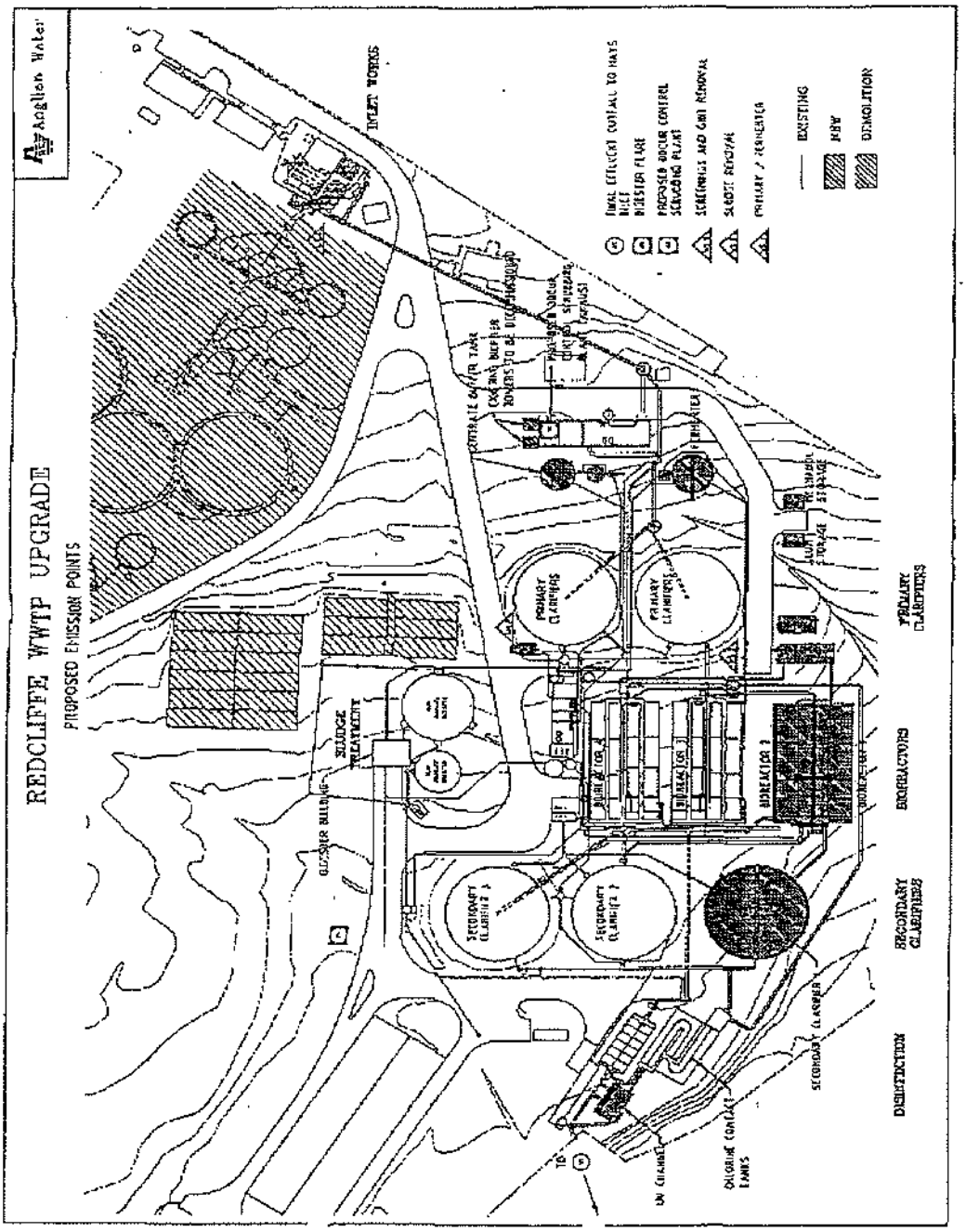
(a) a dwelling, mobile home or caravan park, residential marina or other residential premises; or
(b) a motel, hotel or hostel; or
(c) a kindergarten, school, university or other educational institution; or
(d) a medical centre or hospital; or
(e) a protected area; or
(f) a park or gardens.

(I26) "regulated waste" means non-domestic waste mentioned in Schedule 8 of the Environmental Protection (Interim) Regulation 1995, including but not limited to, for the purpose of this authority, bacterial sludge (septic tank and sewage) and includes-

(i) for an element - any chemical containing the element; and
(ii) anything that has contained a regulated waste; and
(iii) regulated waste that has been treated or immobilised.

End of Conditions for Schedule I

SCHEDULE J - WORKS AREA



End of Conditions for Schedule J

APPENDIX B: SEQ HEALTHY WATERWAYS STRATEGY – MBRC COMMITTED ACTIONS FOR IMPROVING WATER QUALITY

Action Plan	Action	Commitment Responsibility
Water Sensitive Urban Design	Amend Local Government Planning Scheme (and associated development guidelines) to comply with the SEQ Regional Plan WSUD-related policies and SEQ Regional Plan Implementation Guideline: WSUD - Design Objectives for Urban Stormwater Management	Former Caboolture Shire Council
Water Sensitive Urban Design	Investigate an integrated water management plan for Redcliffe City	Former Redcliffe City Council
Water Sensitive Urban Design	Investigate all existing stormwater outlets that drain into significant wetlands for pollutants and investigate treatment options	Former Redcliffe City Council
Water Sensitive Urban Design	Install a Gross Pollutant Trap at Walkers Creek	Former Redcliffe City Council
Water Sensitive Urban Design	Install side entry gully pit baskets in Redcliffe City	Former Redcliffe City Council
Water Sensitive Urban Design	Prepare Humpybong Creek Catchment Management Plan.	Former Redcliffe City Council
Water Sensitive Urban Design	Complete Stage 4-5 of the Bells Creek Natural Channel Design project	Former Redcliffe City Council
Water Sensitive Urban Design	Prepare an Integrated Water Strategy for the future urban area of the Shire that will determine the most effective strategy for managing the total water cycle, measured against agreed TBL assessment criteria. The Integrated Water Strategy was presented to Council in March 2006, and Council resolved to adopt Option 3 which includes the use of rainwater tanks for limited indoor use, recycled water for open space irrigation and a range of Water Sensitive Urban Design measures. Council has commissioned an addendum study to investigate and cost other opportunities for recycled water, and to develop an implementation plan.	Former Pine Rivers Shire Council
Water Sensitive Urban Design	Prepare an IUWCM Strategy for the existing urban area of the Shire that will determine the most effective way for managing the total water cycle, measured against agreed TBL assessment criteria	Former Pine Rivers Shire Council
Water Sensitive Urban Design	WSUD features – bio-filtration, wetlands, GPTs, water tanks – are included in new residential developments at North Lakes and Warner	Former Pine Rivers Shire Council
Water Sensitive Urban Design	Weed Management in Urban Dams (constructed waterbodies)	Former Pine Rivers Shire Council
Water Sensitive Urban Design	Monitoring Algal Blooms in Urban Dams (constructed water bodies)	Former Pine Rivers Shire Council
Water Sensitive Urban Design	Sediment control surveys of building sites between the hours of 2:00pm to 5:00pm to allow members of the	Former Pine Rivers Shire Council

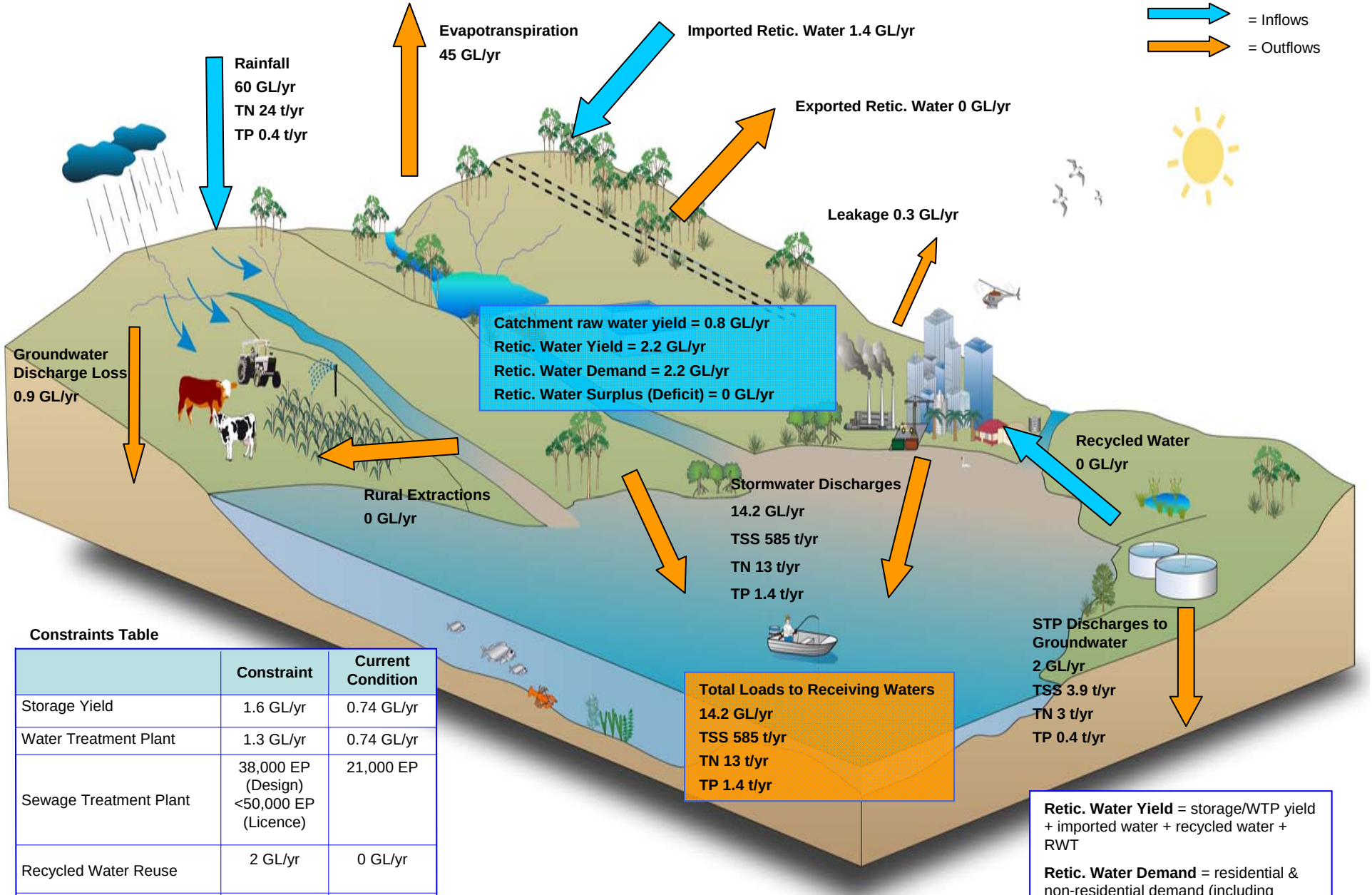
Action Plan	Action	Commitment Responsibility
	building industry to satisfactorily clean up the site following the days activities. Sediment control surveys of subdivisions and other development sites with approved sediment control plans. On the spot inspections for uncontrolled releases of sediment. Investigate customer requests relating to the release or potential release of sediment from building sites, subdivisions and other development sites.	
Water Sensitive Urban Design	Pilot project to retrofit WSUD features to road and drainage network at Mango Hill.	Former Pine Rivers Shire Council
Water Sensitive Urban Design	Design and construct a WSUD demonstration project in Caboolture Shire.	Former Caboolture Shire Council
Non-Urban Diffuse Source Pollution	Shire wide Waterways Management Strategy – Survey of all the Shires catchments to determine point and diffuse sources of pollution. A Shire wide riparian condition assessment has been undertaken and mapped. Management actions will commence in 2007.	Former Caboolture Shire Council
Non-Urban Diffuse Source Pollution	Council contributes to the funding of the Pine Rivers Catchment Association to revegetate and conduct weed control on riparian land along the following waterways: South Pine River, Dawson Creek, Wongan Creek, Cedar Creek, Kobble Creek, Armstrong Creek, Laceys Ck, Upper North Pine River, Terrors Creek, Whiteside Creek	Former Pine Rivers Shire Council
Non-Urban Diffuse Source Pollution	The production of a Priority Revegetation Plan for the Shire (from existing biodiversity assessment and priority documents).	Former Pine Rivers Shire Council
Non-Urban Diffuse Source Pollution	Provide the community with information and education on environmental issues concerning catchments, water cycle, water quality, and aquatic biota through Council's environmental centres, Kumbartcho and Osprey House.	Former Pine Rivers Shire Council
Protection and Conservation	Caboolture Shire Council Planning Scheme has provisions for the protection of waterways – Voluntary Conservation Agreements, Land for Wildlife and Urban Wildlife programs	Former Caboolture Shire Council
Protection and Conservation	Council continues to acquire riparian land through the development process and in addition to that acquires riparian and environmentally sensitive land in the steep upper catchments under the Environmental Levy Policy.	Former Pine Rivers Shire Council
Protection and Conservation	The protection of environmentally sensitive land, including riparian through the Land for Wildlife voluntary scheme. So far, at least 5.5 km of riparian zone is protected by the scheme.	Former Pine Rivers Shire Council
Protection and Conservation	Implement the Pine River Plan 2006 (IPA planning scheme). The Waterways Overlay Code and Biodiversity Overlay Code make development close to all waterways (50 to 150 m buffer) and within catchments of waterways of stream health class 'a' and 'b' (high ecological value) code assessable. The codes list overall and specific outcomes for all waterways and wetlands including riparian vegetation in the shire.	Former Pine Rivers Shire Council

Action Plan	Action	Commitment Responsibility
Protection and Conservation	Implement the Catchment Strategies for the drinking water storages Lake Samsonvale and Lake Kurwongbah that were prepared for the Planning Scheme ("Catchment Locality"). Development must not compromise the health of waterways in the catchment or the safe and economically efficient storage and provision of potable water. Uses and any associated effluent and waste disposal areas are set back at least 400m from the lake shores.	Former Pine Rivers Shire Council
Protection and Conservation	Support Pine Rivers Catchment Association in revegetating and conducting weed control on riparian land along the following waterways: South Pine River, Dawson Creek, Wongan Creek, Cedar Creek, Kobble Creek, Armstrong Creek, Laceys Ck, Upper North Pine River, Terrors Creek, Whiteside Creek	Former Pine Rivers Shire Council
Protection and Conservation	Implement and monitor results of Catchment Management Plans (CMPs) that have been completed for the following streams: Saltwater Creek (in cooperation with Caboolture & Redcliffe Councils), Freshwater Creek, Four Mile Creek, One Mile Creek, Cabbage Tree Creek (with Brisbane City Council), South Pine River.	Former Pine Rivers Shire Council, in cooperation with Caboolture & Redcliffe Shire Councils & Brisbane City Council.
Protection and Conservation	Investigate the implementation of biodiversity assessment mapping and planning in agreement with the SEQ Regional Plan	Former Redcliffe City Council
Protection and Conservation	Undertake a review of the existing Natural values zone planning scheme provision for the protection of waterways and wetlands in agreement with the SEQ Regional Plan	Former Redcliffe City Council
Protection and Conservation	Continue funding for the maintenance of waterways, riparian lands and coastal areas.	Former Redcliffe City Council
Protection and Conservation	Continue funding and partnership with SEQ Catchments for fencing of unauthorised access points to the Saltwater Creek corridor and the Hays Inlet Conservation Area	Former Redcliffe City Council
Protection and Conservation	Promote involvement in, and continue to, support of the Chelsea Street Bushcare Group for on-ground restoration work in Chelsea Street Reserve (public land).	Former Redcliffe City Council
Coastal Algae Blooms	Develop algal bloom nutrient hazard development assessment tools (assessment codes/models codes) for local government planning schemes and other planning documents	Former Caboolture Shire Council (under consideration only)
Coastal Algae Blooms	Pending funding, implement the Qld Acid Sulfate Soils Technical Manual including the revised Management Guidelines when assessing development applications that include actions that may disturb or alter soils.	Former Caboolture Shire & Redcliffe City Councils
Coastal Algae Blooms	Scope, pending funding, the preparation of algal bloom nutrient hazard maps at local government planning scheme scale including mapping of iron, dissolved organic carbon, acid sulfate soils and groundwater as per the Guidelines. Preparation of maps will depend on assistance from EPA.	Former Redcliffe City Council
Coastal Algae Blooms	Protection of Melaleuca and riparian vegetation through planning scheme provisions – refers to LMS section 2.13 and section 4.3. Melaleuca communities and other riparian	Former Pine Rivers Shire Council

Action Plan	Action	Commitment Responsibility
	vegetation are classified as 'endangered' or 'exceptional value' in the planning scheme. Development affecting this vegetation is code assessable.	
Coastal Algae Blooms	Incorporate recommendation of the Lyngbya Management Strategy (LMS) into relevant Local Government planning – Urban Stormwater Quality LMS section 2.15 Urban Stormwater Management: Pine Rivers Shire Council implemented a Stormwater Drainage Strategy Plan 1996 that aims to achieve a water quality standard for all of the Shire's watercourses, rivers and receiving waters that meets the shire's water quality guidelines (Stream Health Manual 2004) for freshwater or the ANZECC 2000 guidelines for estuarine waters.	Former Pine Rivers Shire Council
Point Source Pollution Management	Bribie STP - The remaining development areas will be provided with dual reticulation and the plant will be upgraded to top A+	Former Caboolture Shire Council
Point Source Pollution Management	Burpengary East STP upgrade: Higher treatment standard of 3mg/L- N, 0.3 mg/L - P and 15% (2ML/day) of effluent will be treated to A+ recycled standard and provide Narangba Industrial Estate (current demand 1ML/day)	Former Caboolture Shire Council
Point Source Pollution Management	Donnybrook WWTP (new plant) will treat to A or A+ recycled water standard probably similar in nutrient concentration values to the upgraded Burpengary East plant, currently treating 25% and using 10%.	Former Caboolture Shire Council
Point Source Pollution Management	All major areas of development within 5 kms north , 5kms east and 2kms south of the Caboolture STP will be conditioned to have dual reticulation	Former Caboolture Shire Council
Point Source Pollution Management	Management of On Site Wastewater Treatment Systems - Licensing of WWTP systems. Council conducts a suspended solids and faecal coliform count annually at a cost of $142.00. It is a requirement to have quarterly inspections to report on the performance treatment of the system from a recognised waste treatment maintenance operator . A copy of the reports are sent to Council	Former Caboolture Shire Council
Point Source Pollution Management	On Site Wastewater Treatment Education	Former Caboolture Shire Council
Point Source Pollution Management	Develop strategies to increase the use of recycled water from the Brendale WWTP.	Former Pine Rivers Shire
Point Source Pollution Management	Upgrade wastewater treatment plant performance at the Murrumba Downs wastewater treatment plant in accordance with the conditions of approval to be finalised in February 2007. The EIS for the Murrumba Downs Upgrade is currently being prepared, including extensive receiving water quality modelling of a range of treatment quality and recycled water combinations. Design criteria will not be finalised until the EIA process is complete, however a recycled water factory will be part of the scope of works with a minimum of 10% of the flow being beneficially re-used for open space irrigation. Upgraded plant and recycled water factory scheduled for commissioning in March 2009.	Former Pine Rivers Shire

Action Plan	Action	Commitment Responsibility
Point Source Pollution Management	Pine Rivers Shire has more than 7,900 on-site sewerage facilities. Council resolved to (1) develop and implement an information and awareness program on the maintenance and care of on-site sewerage facilities, (2) prepare a report for the implementation of an inspection program for identified areas of the Shire.	Former Pine Rivers Shire
Point Source Pollution Management	Implement Strategies to further reduce frequency and duration of overflow events. Pine Water has developed a multi-faceted strategy to manage sewer overflows after completing a risk analysis. All existing pump stations are being retrofitted to ensure a minimum of 6 hours dry weather storage capacity. New pump stations will also have 6 hour detention. Council plans to purchase two mobile generators to operate pump stations during extended blackouts. A dynamic computer model is being developed for the sewer network as part of the Inflow/Infiltration Reduction Strategy.	Former Pine Rivers Shire
Point Source Pollution Management	Investigation of water mining at Talobilla Park	Former Redcliffe City Council
Point Source Pollution Management	Investigate options for the increasing reuse of A class recycled water from the Redcliffe Wastewater Treatment Plant for the Redcliffe golf course, landscaping & operational works and other potential users.	Former Redcliffe City Council
Point Source Pollution Management	Improve business and industry awareness of the Redcliffe Trade Waste	Former Redcliffe City Council
Point Source Pollution Management	Investigation of practicable abatement and treatment options for wet weather overflows at priority areas as part of the Inflow and Infiltration Management	Former Redcliffe City Council

APPENDIX C: EXISTING WATER ACCOUNT FIGURES



Constraints Table

	Constraint	Current Condition
Storage Yield	1.6 GL/yr	0.74 GL/yr
Water Treatment Plant	1.3 GL/yr	0.74 GL/yr
Sewage Treatment Plant	38,000 EP (Design) <50,000 EP (Licence)	21,000 EP
Recycled Water Reuse	2 GL/yr	0 GL/yr
Sustainable Loads - TSS	?	585 t/yr
Sustainable Loads – TN	?	13 t/yr
Sustainable Loads - TP	?	1.4 t/yr
Environmental Flow	N/A	14.2 GL/yr

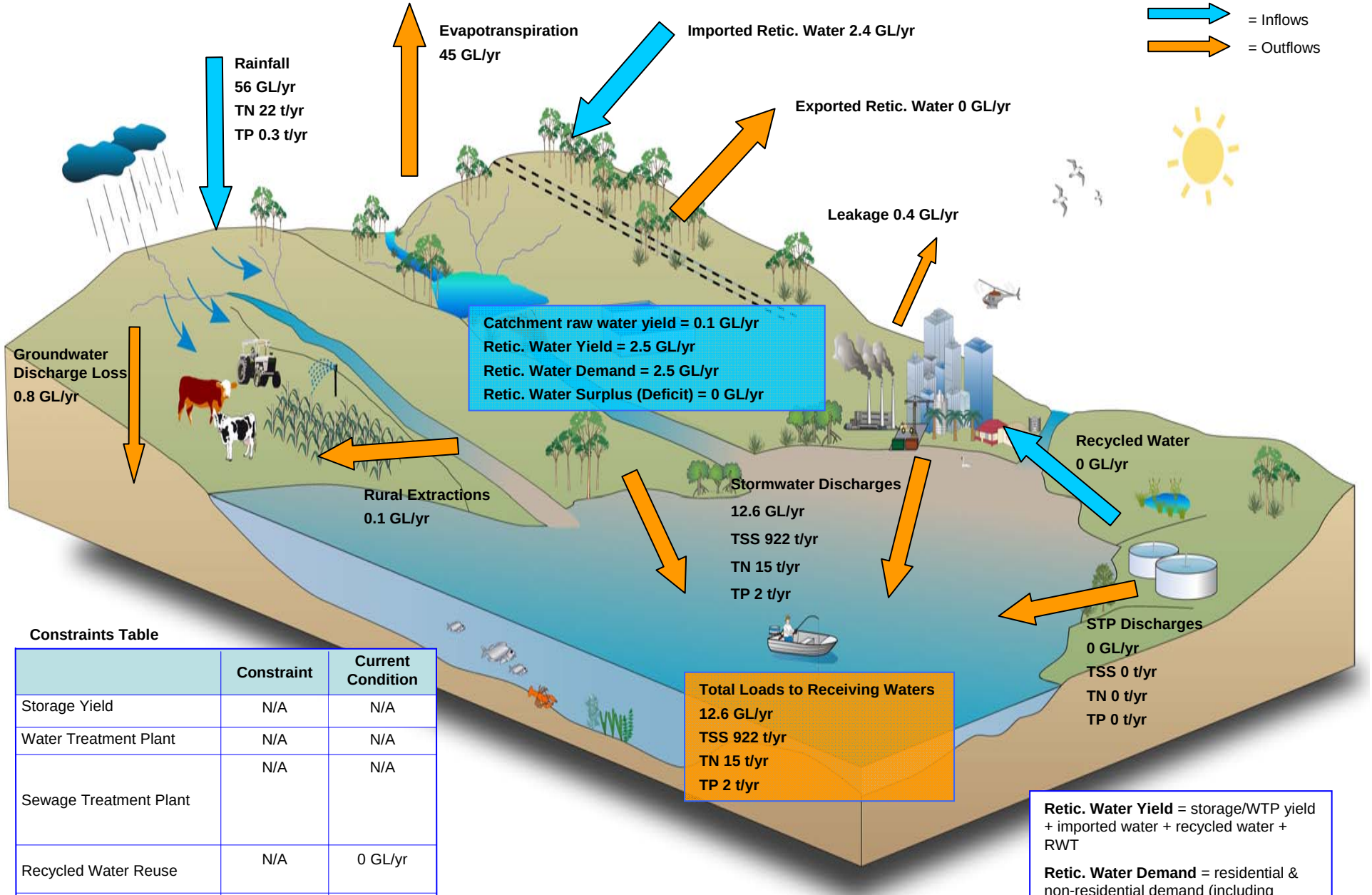
Bribie Island Catchment – 2010

Urban Population 17,133

Retic. Water Yield = storage/WTP yield + imported water + recycled water + RWT

Retic. Water Demand = residential & non-residential demand (including system losses) + exported water requirements

Loads to Receiving Waters = stormwater + Sewage Treatment Plant



Constraints Table

	Constraint	Current Condition
Storage Yield	N/A	N/A
Water Treatment Plant	N/A	N/A
Sewage Treatment Plant	N/A	N/A
Recycled Water Reuse	N/A	0 GL/yr
Sustainable Loads - TSS	?	922 t/yr
Sustainable Loads – TN	?	15 t/yr
Sustainable Loads - TP	?	2 t/yr
Environmental Flow	N/A	12.6 GL/yr

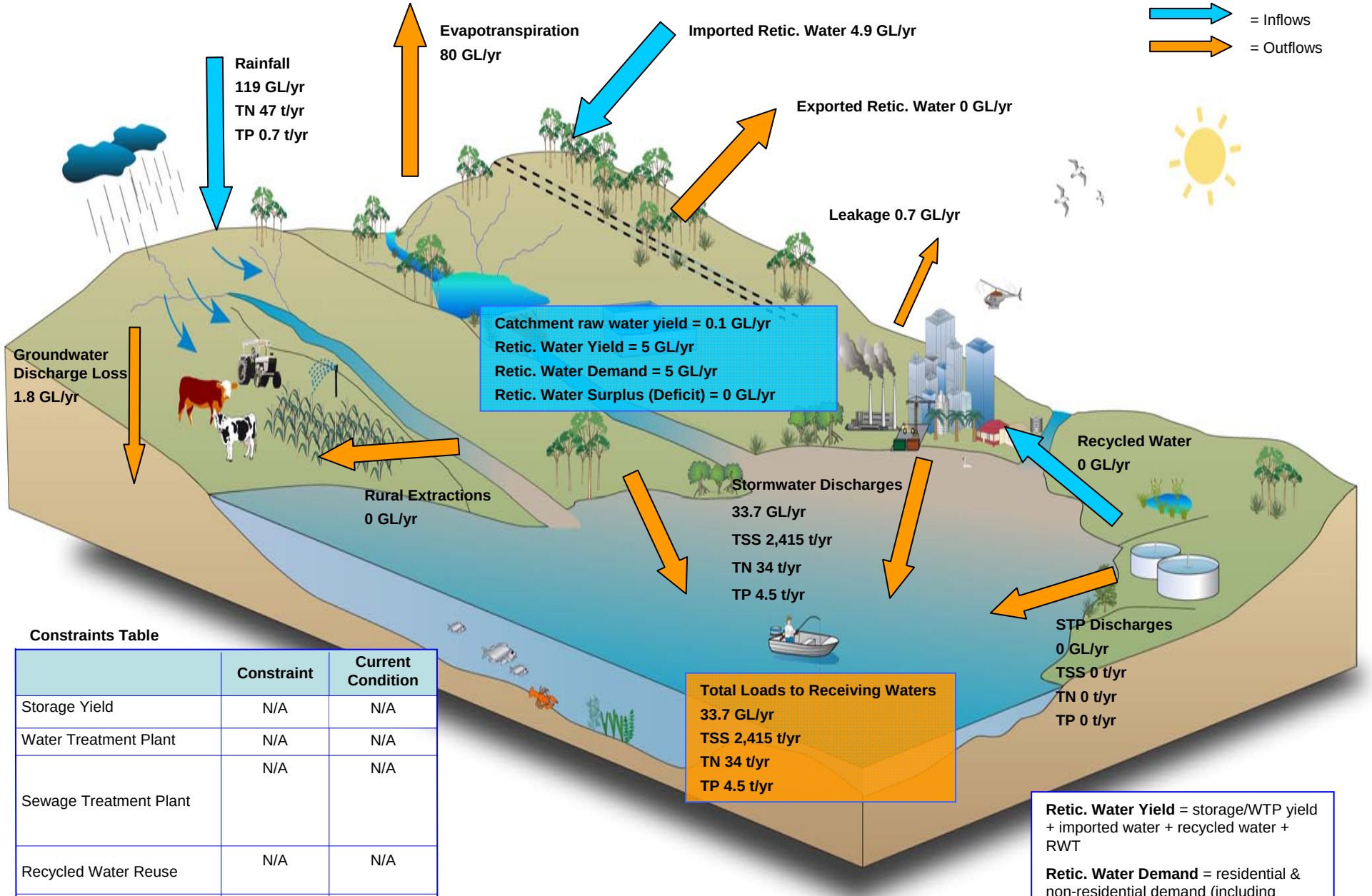
Brisbane Coastal Catchment – 2010

Urban Population 22,601

Retic. Water Yield = storage/WTP yield + imported water + recycled water + RWT

Retic. Water Demand = residential & non-residential demand (including system losses) + exported water requirements

Loads to Receiving Waters = stormwater + Sewage Treatment Plant



Constraints Table

	Constraint	Current Condition
Storage Yield	N/A	N/A
Water Treatment Plant	N/A	N/A
Sewage Treatment Plant	N/A	N/A
Recycled Water Reuse	N/A	N/A
Sustainable Loads - TSS	?	2,415 t/yr
Sustainable Loads – TN	?	34 t/yr
Sustainable Loads - TP	?	4.5 t/yr
Environmental Flow	N/A	33.7 GL/yr

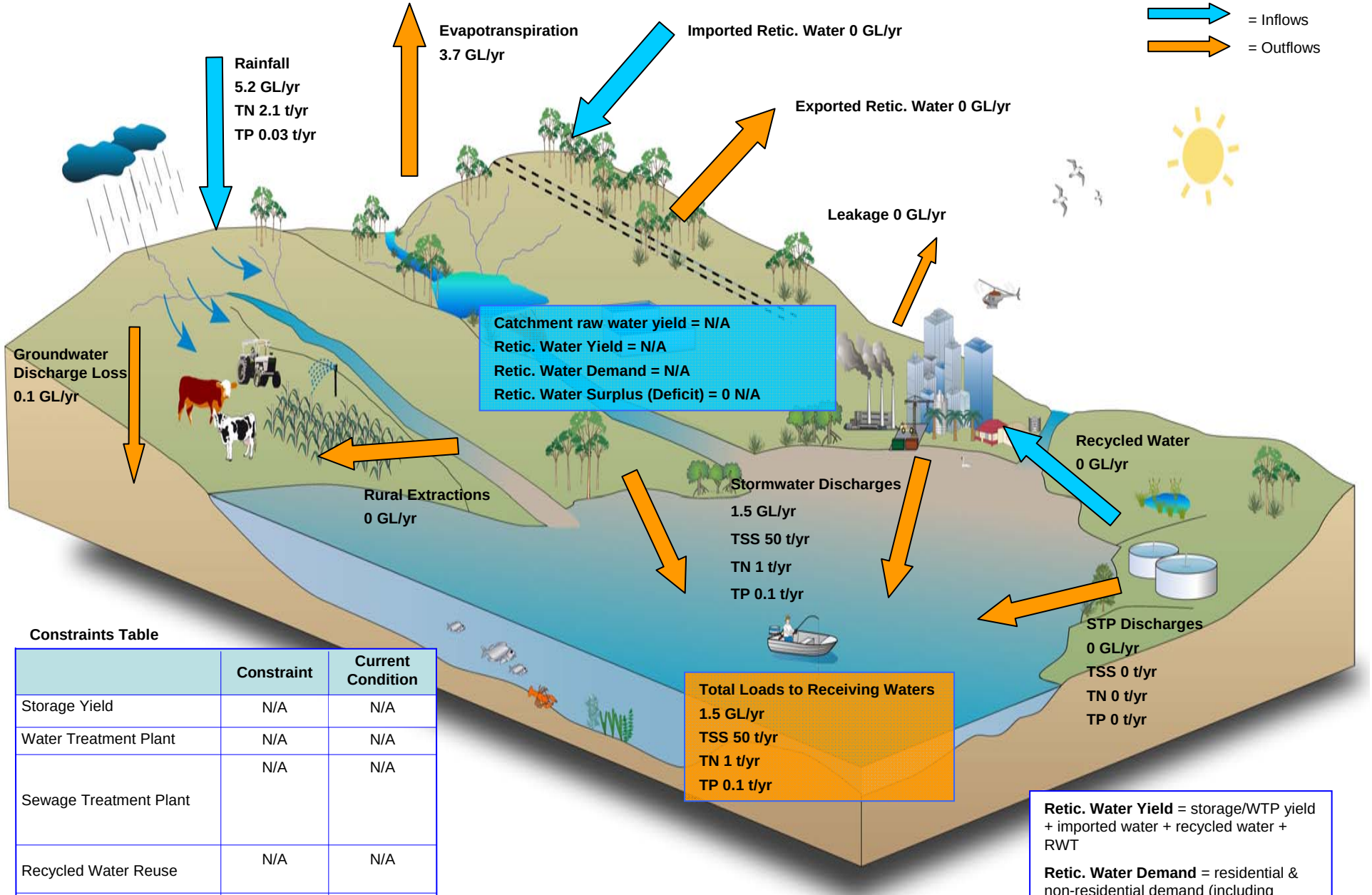
Burpengary Creek Catchment – 2010

Urban Population 42,766

Retic. Water Yield = storage/WTP yield + imported water + recycled water + RWT

Retic. Water Demand = residential & non-residential demand (including system losses) + exported water requirements

Loads to Receiving Waters = stormwater + Sewage Treatment Plant



Constraints Table

	Constraint	Current Condition
Storage Yield	N/A	N/A
Water Treatment Plant	N/A	N/A
Sewage Treatment Plant	N/A	N/A
Recycled Water Reuse	N/A	N/A
Sustainable Loads - TSS	?	50 t/yr
Sustainable Loads – TN	?	1 t/yr
Sustainable Loads - TP	?	0.1 t/yr
Environmental Flow	N/A	1.5 GL/yr

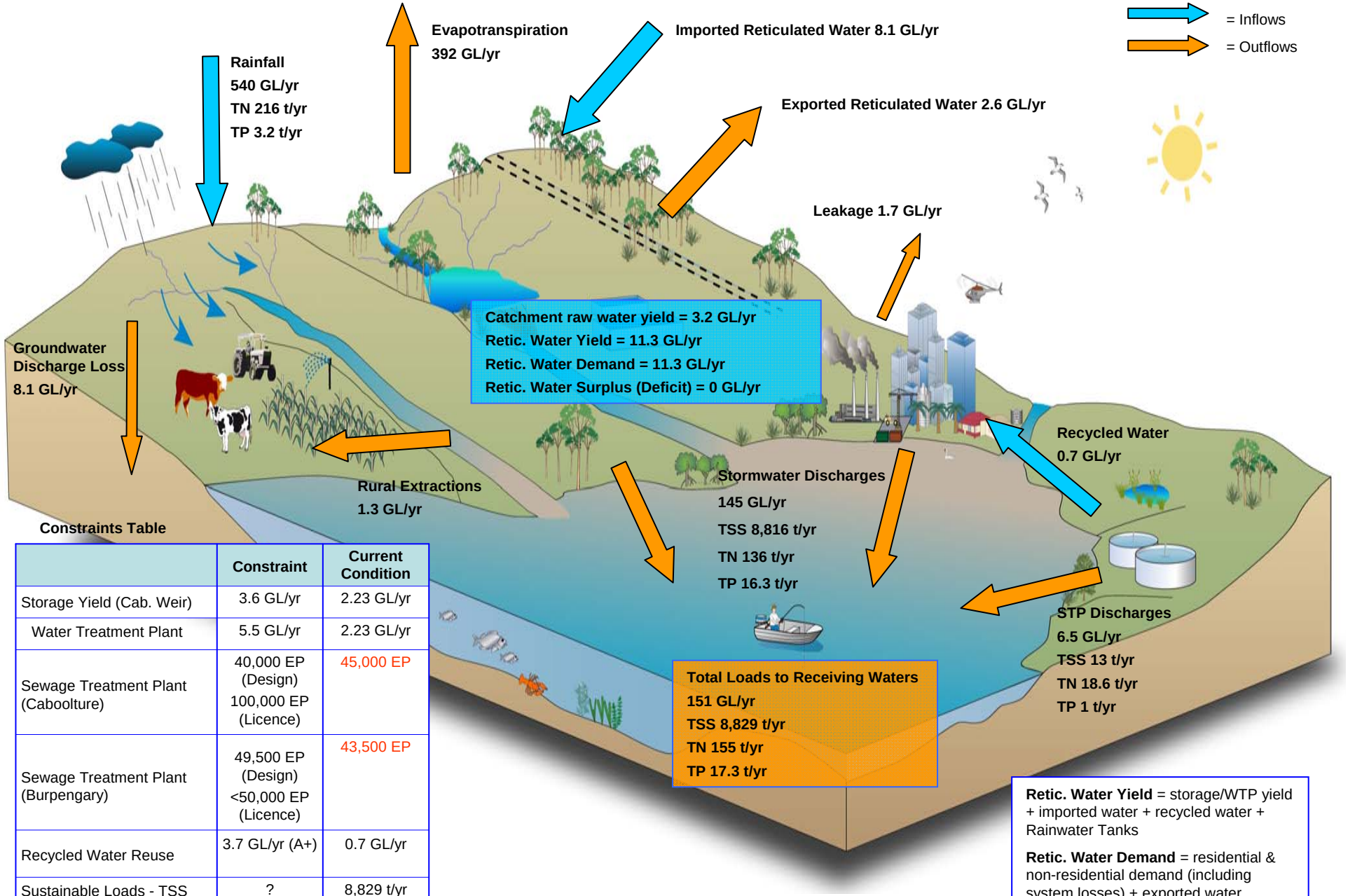
Byron Creek Catchment – 2010

Urban Population 0

Retic. Water Yield = storage/WTP yield + imported water + recycled water + RWT

Retic. Water Demand = residential & non-residential demand (including system losses) + exported water requirements

Loads to Receiving Waters = stormwater + Sewage Treatment Plant



Constraints Table

	Constraint	Current Condition
Storage Yield (Cab. Weir)	3.6 GL/yr	2.23 GL/yr
Water Treatment Plant	5.5 GL/yr	2.23 GL/yr
Sewage Treatment Plant (Caboolture)	40,000 EP (Design) 100,000 EP (Licence)	45,000 EP
Sewage Treatment Plant (Burpengary)	49,500 EP (Design) <50,000 EP (Licence)	43,500 EP
Recycled Water Reuse	3.7 GL/yr (A+)	0.7 GL/yr
Sustainable Loads - TSS	?	8,829 t/yr
Sustainable Loads – TN	27 t/yr	155 t/yr
Sustainable Loads - TP	?	17.3 t/yr
Environmental Flow	118 GL/yr	151 GL/yr

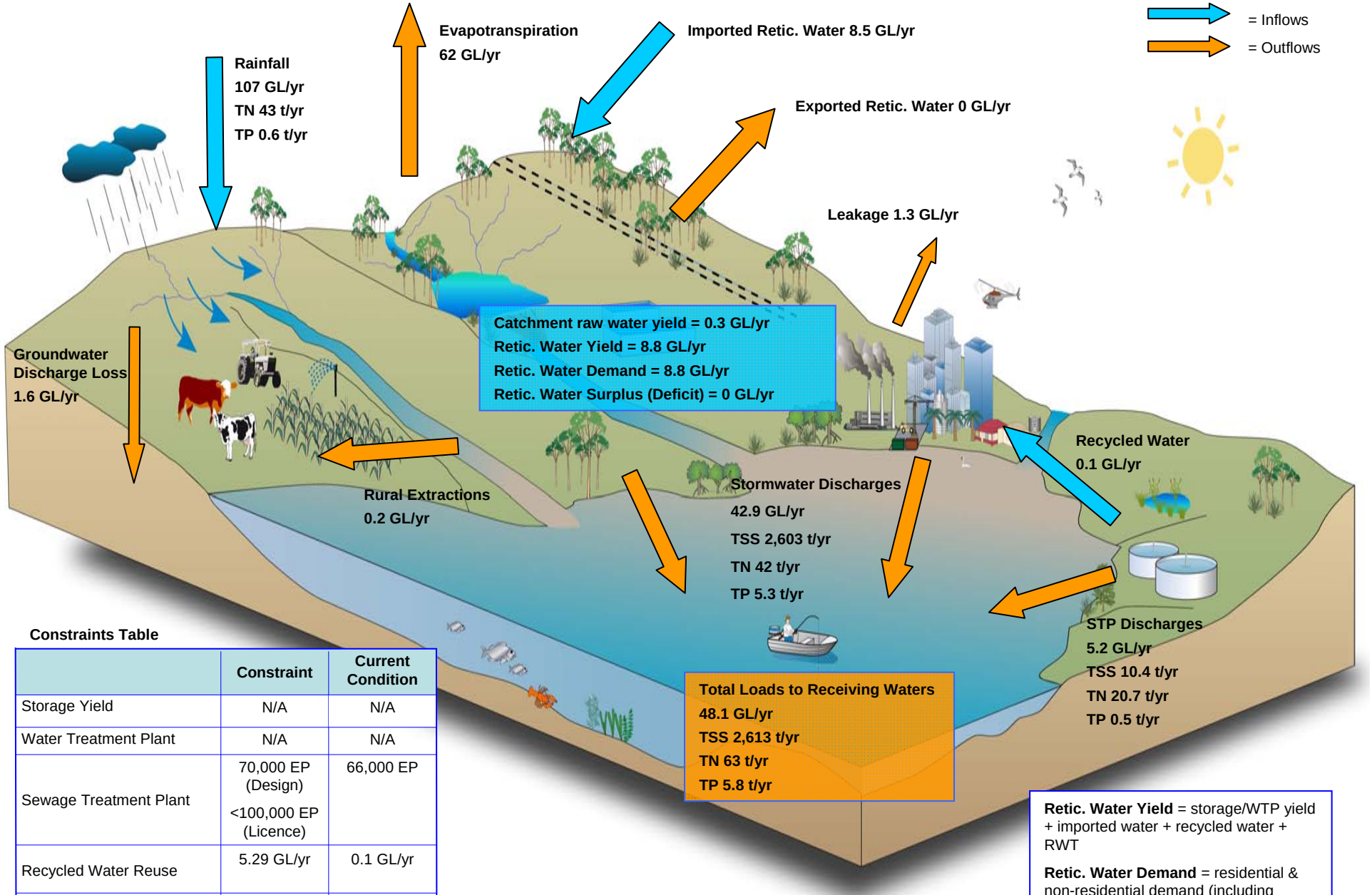
Caboolture River Catchment – 2010

Urban Population 69,500

Retic. Water Yield = storage/WTP yield + imported water + recycled water + Rainwater Tanks

Retic. Water Demand = residential & non-residential demand (including system losses) + exported water requirements

Loads to Receiving Waters = stormwater + Sewage Treatment Plant



Constraints Table

	Constraint	Current Condition
Storage Yield	N/A	N/A
Water Treatment Plant	N/A	N/A
Sewage Treatment Plant	70,000 EP (Design) <100,000 EP (Licence)	66,000 EP
Recycled Water Reuse	5.29 GL/yr	0.1 GL/yr
Sustainable Loads - TSS	606 t/yr	2,613 t/yr
Sustainable Loads – TN	13 t/yr	63 t/yr
Sustainable Loads - TP	1.8 t/yr	5.8 t/yr
Environmental Flow	N/A	48.1 GL/yr

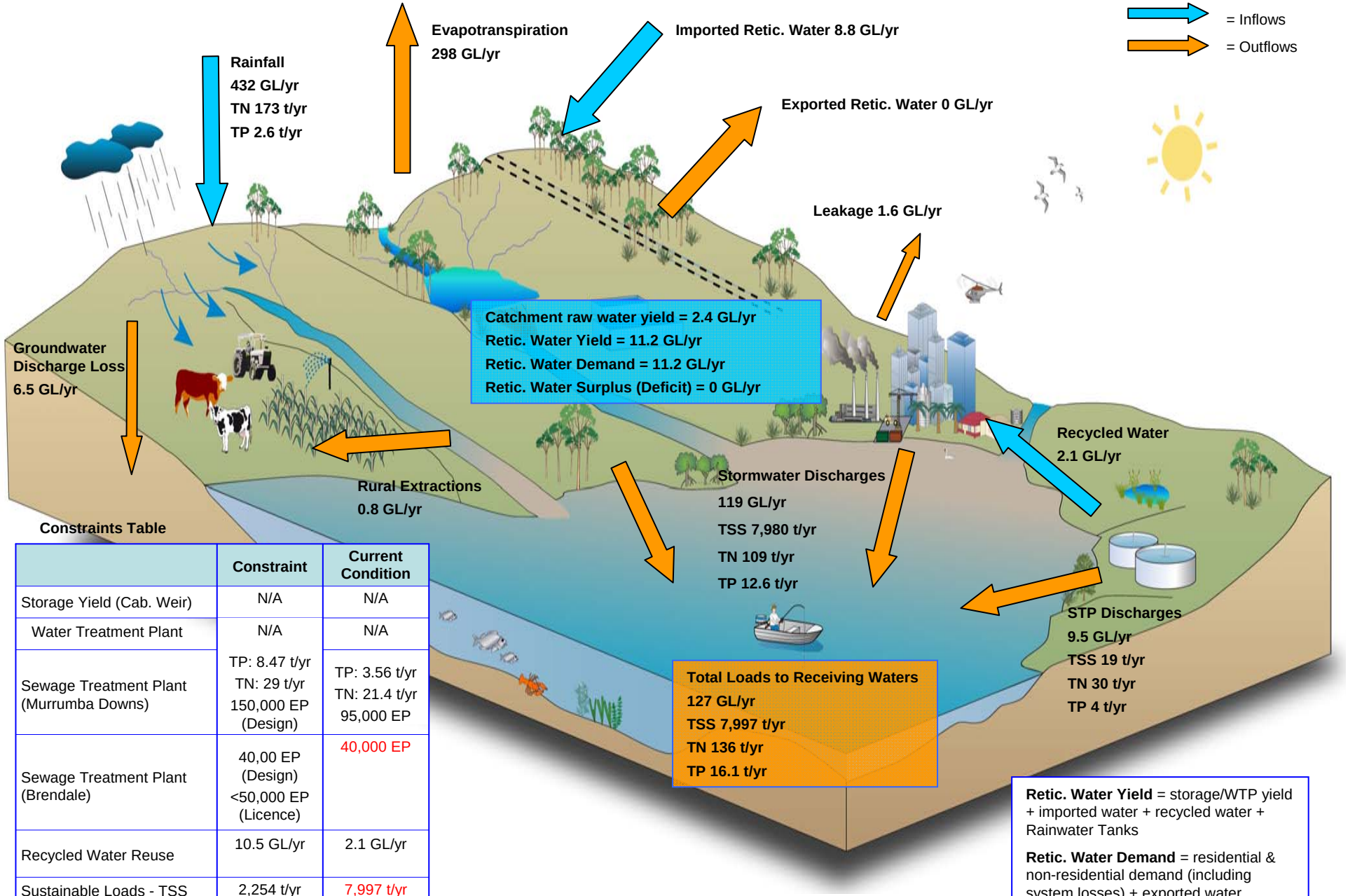
Hays Inlet Catchment – 2010

Urban Population 63,613

Retic. Water Yield = storage/WTP yield + imported water + recycled water + RWT

Retic. Water Demand = residential & non-residential demand (including system losses) + exported water requirements

Loads to Receiving Waters = stormwater + Sewage Treatment Plant



Constraints Table

	Constraint	Current Condition
Storage Yield (Cab. Weir)	N/A	N/A
Water Treatment Plant	N/A	N/A
Sewage Treatment Plant (Murrumba Downs)	TP: 8.47 t/yr TN: 29 t/yr 150,000 EP (Design)	TP: 3.56 t/yr TN: 21.4 t/yr 95,000 EP
Sewage Treatment Plant (Brendale)	40,00 EP (Design) <50,000 EP (Licence)	40,000 EP
Recycled Water Reuse	10.5 GL/yr	2.1 GL/yr
Sustainable Loads - TSS	2,254 t/yr	7,997 t/yr
Sustainable Loads – TN	50 t/yr	136 t/yr
Sustainable Loads - TP	6.8 t/yr	16.1 t/yr
Environmental Flow	92 GL/yr	127 GL/yr

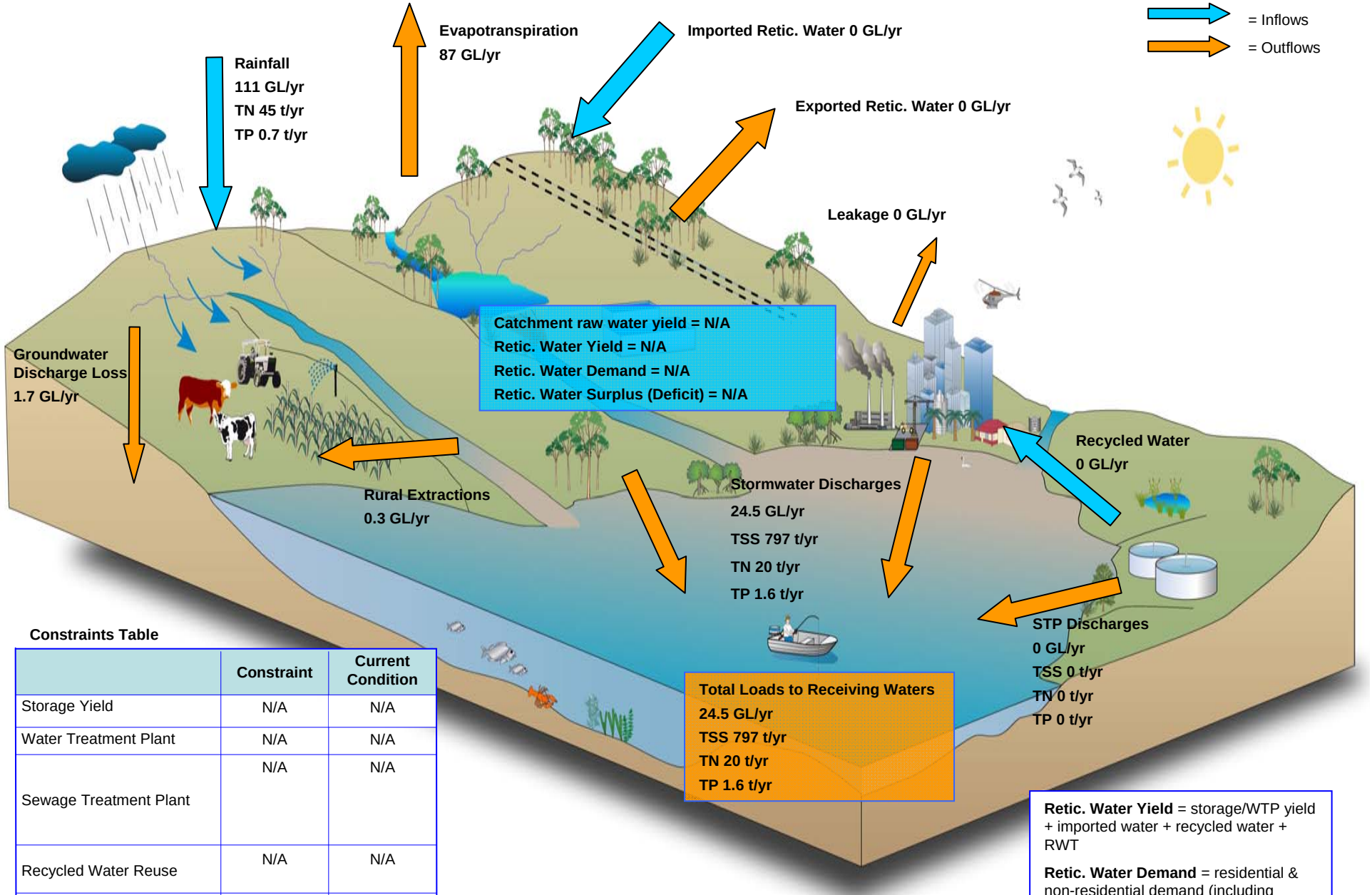
Lower Pine Catchment – 2010

Urban Population 90,695

Retic. Water Yield = storage/WTP yield + imported water + recycled water + Rainwater Tanks

Retic. Water Demand = residential & non-residential demand (including system losses) + exported water requirements

Loads to Receiving Waters = stormwater + Sewage Treatment Plant



Constraints Table

	Constraint	Current Condition
Storage Yield	N/A	N/A
Water Treatment Plant	N/A	N/A
Sewage Treatment Plant	N/A	N/A
Recycled Water Reuse	N/A	N/A
Sustainable Loads - TSS	?	797 t/yr
Sustainable Loads – TN	?	20 t/yr
Sustainable Loads - TP	?	1.6 t/yr
Environmental Flow	N/A	24.5 GL/yr

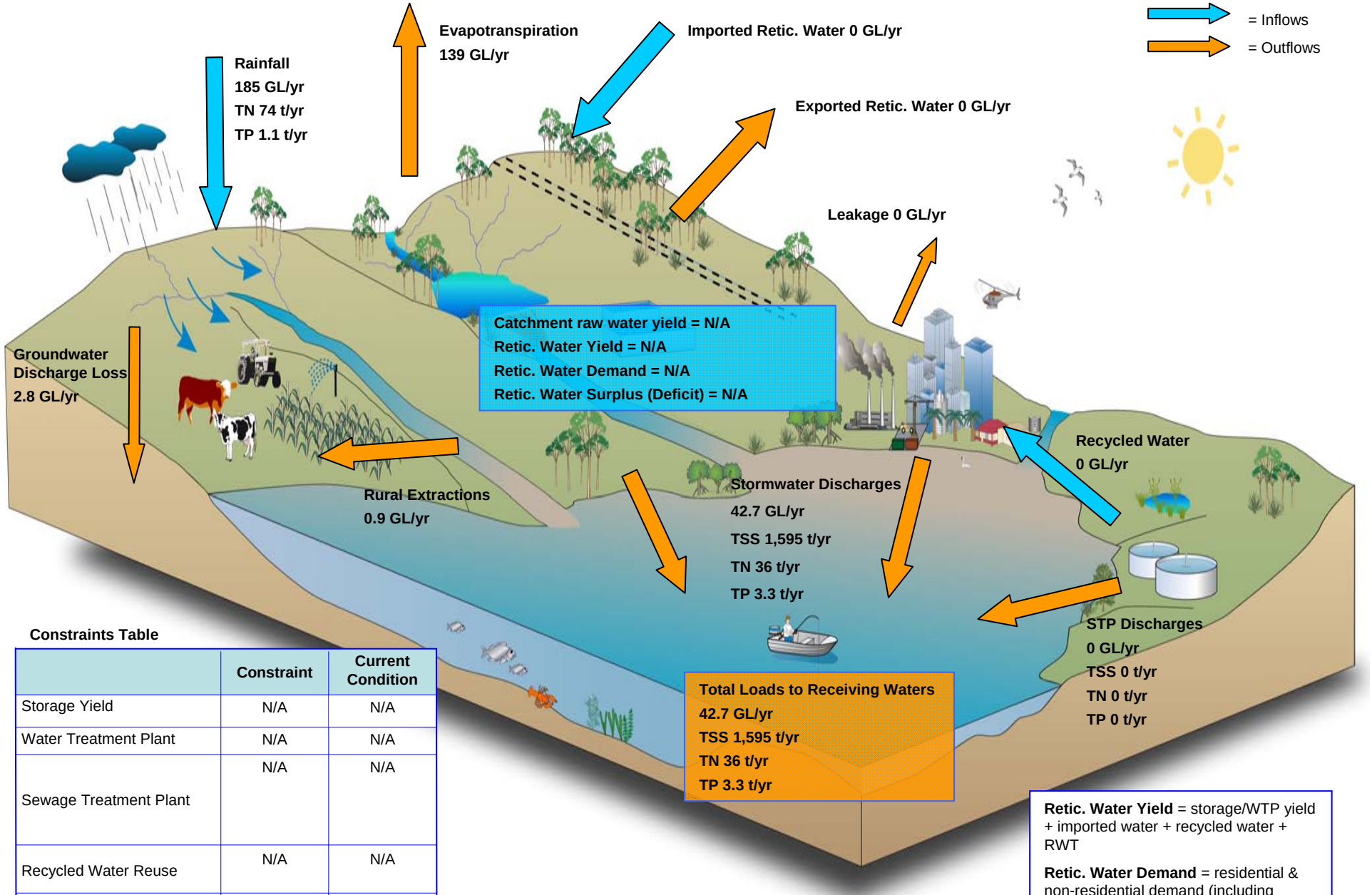
Mary River Catchment – 2010

Urban Population 0

Retic. Water Yield = storage/WTP yield + imported water + recycled water + RWT

Retic. Water Demand = residential & non-residential demand (including system losses) + exported water requirements

Loads to Receiving Waters = stormwater + Sewage Treatment Plant



Constraints Table

	Constraint	Current Condition
Storage Yield	N/A	N/A
Water Treatment Plant	N/A	N/A
Sewage Treatment Plant	N/A	N/A
Recycled Water Reuse	N/A	N/A
Sustainable Loads - TSS	?	1,595 t/yr
Sustainable Loads – TN	?	36 t/yr
Sustainable Loads - TP	?	3.3 t/yr
Environmental Flow	N/A	42.7 GL/yr

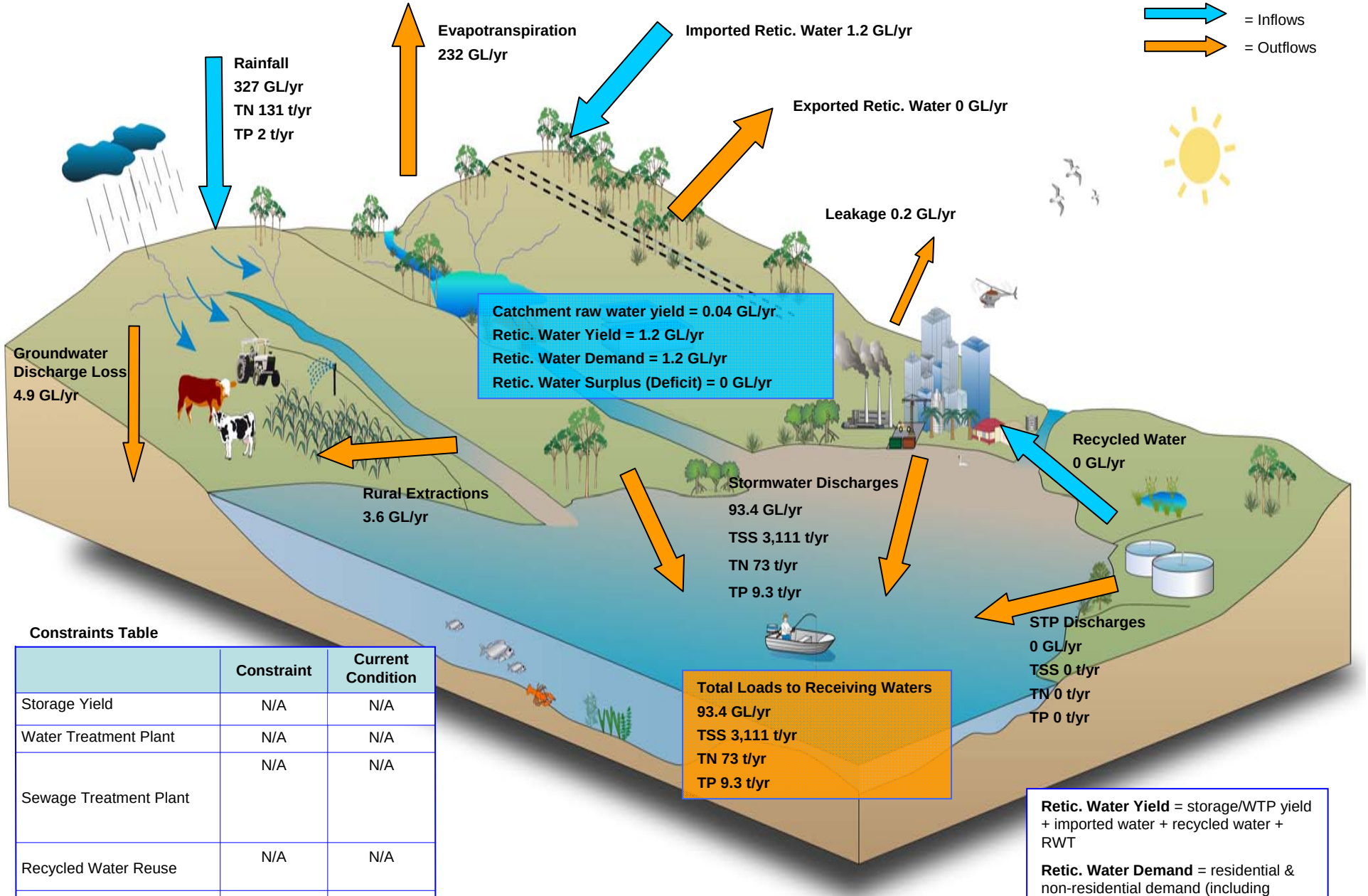
Neurum Creek Catchment – 2010

Urban Population 0

Retic. Water Yield = storage/WTP yield + imported water + recycled water + RWT

Retic. Water Demand = residential & non-residential demand (including system losses) + exported water requirements

Loads to Receiving Waters = stormwater + Sewage Treatment Plant



Constraints Table

	Constraint	Current Condition
Storage Yield	N/A	N/A
Water Treatment Plant	N/A	N/A
Sewage Treatment Plant	N/A	N/A
Recycled Water Reuse	N/A	N/A
Sustainable Loads - TSS	?	3,111 t/yr
Sustainable Loads – TN	?	73 t/yr
Sustainable Loads - TP	?	9.3 t/yr
Environmental Flow	82 GL/yr	93.4 GL/yr

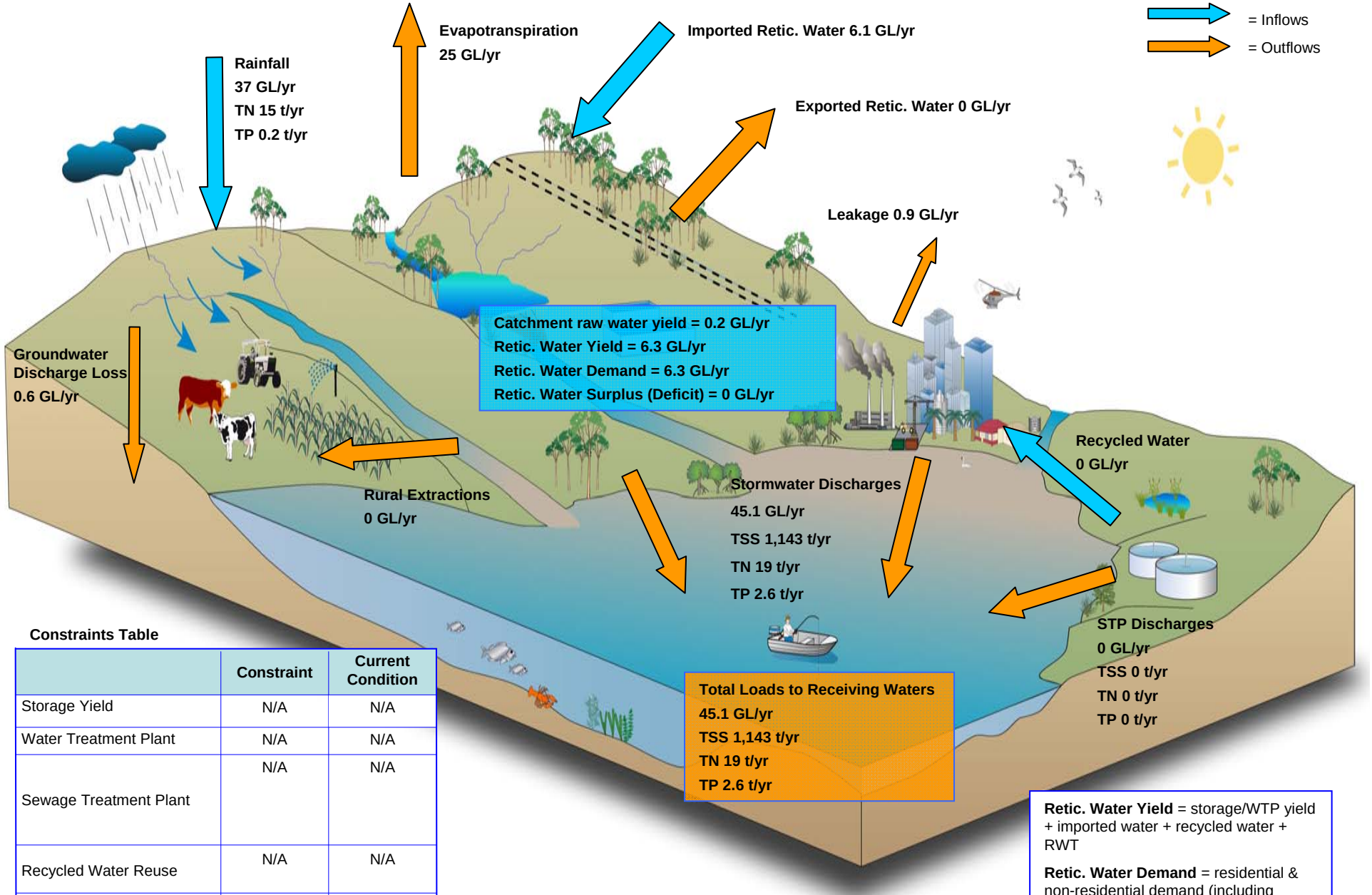
Pumicestone Passage Catchment – 2010

Urban Population 11,415

Retic. Water Yield = storage/WTP yield + imported water + recycled water + RWT

Retic. Water Demand = residential & non-residential demand (including system losses) + exported water requirements

Loads to Receiving Waters = stormwater + Sewage Treatment Plant



Constraints Table

	Constraint	Current Condition
Storage Yield	N/A	N/A
Water Treatment Plant	N/A	N/A
Sewage Treatment Plant	N/A	N/A
Recycled Water Reuse	N/A	N/A
Sustainable Loads - TSS	?	1,143 t/yr
Sustainable Loads – TN	?	19 t/yr
Sustainable Loads - TP	?	2.6 t/yr
Environmental Flow	N/A	45.1 GL/yr

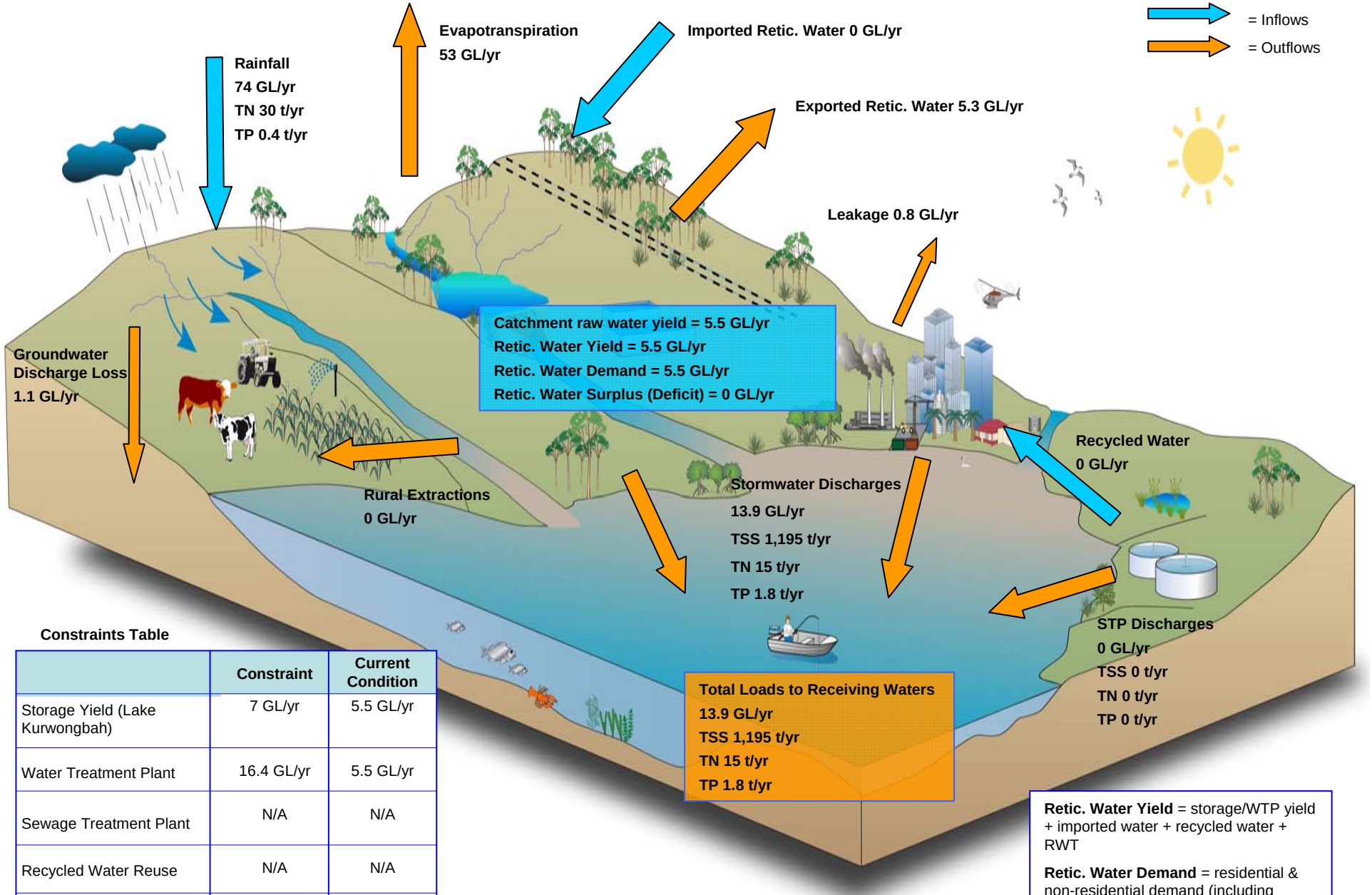
Redcliffe Catchment – 2010

Urban Population 49,638

Retic. Water Yield = storage/WTP yield + imported water + recycled water + RWT

Retic. Water Demand = residential & non-residential demand (including system losses) + exported water requirements

Loads to Receiving Waters = stormwater + Sewage Treatment Plant



Constraints Table

	Constraint	Current Condition
Storage Yield (Lake Kurwongbah)	7 GL/yr	5.5 GL/yr
Water Treatment Plant	16.4 GL/yr	5.5 GL/yr
Sewage Treatment Plant	N/A	N/A
Recycled Water Reuse	N/A	N/A
Sustainable Loads - TSS	420 t/yr	1,195 t/yr
Sustainable Loads – TN	9 t/yr	15 t/yr
Sustainable Loads - TP	1.3 t/yr	1.8 t/yr
Environmental Flow	N/A	13.9 GL/yr

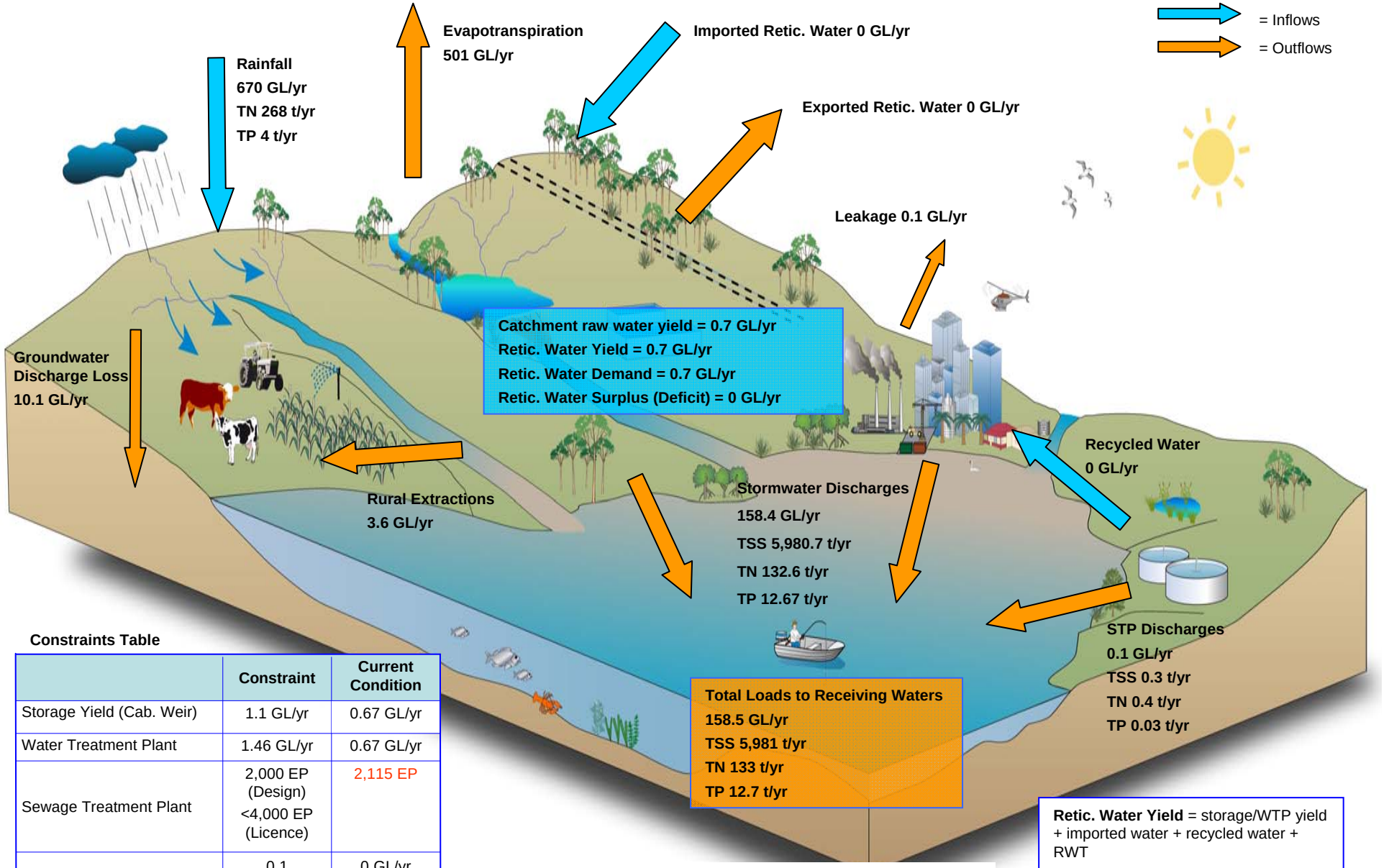
Sideling Creek Catchment – 2010

Urban Population 1,397

Retic. Water Yield = storage/WTP yield + imported water + recycled water + RWT

Retic. Water Demand = residential & non-residential demand (including system losses) + exported water requirements

Loads to Receiving Waters = stormwater + Sewage Treatment Plant



Constraints Table

	Constraint	Current Condition
Storage Yield (Cab. Weir)	1.1 GL/yr	0.67 GL/yr
Water Treatment Plant	1.46 GL/yr	0.67 GL/yr
Sewage Treatment Plant	2,000 EP (Design) <4,000 EP (Licence)	2,115 EP
Recycled Water Reuse	0.1	0 GL/yr
Sustainable Loads - TSS	WSC	5,981 t/yr
Sustainable Loads – TN	WSC	133 t/yr
Sustainable Loads - TP	WSC	12.7 t/yr
Environmental Flow *	86 GL/yr	79 GL/yr

Stanley River Catchment – 2010

Urban Population 4,073

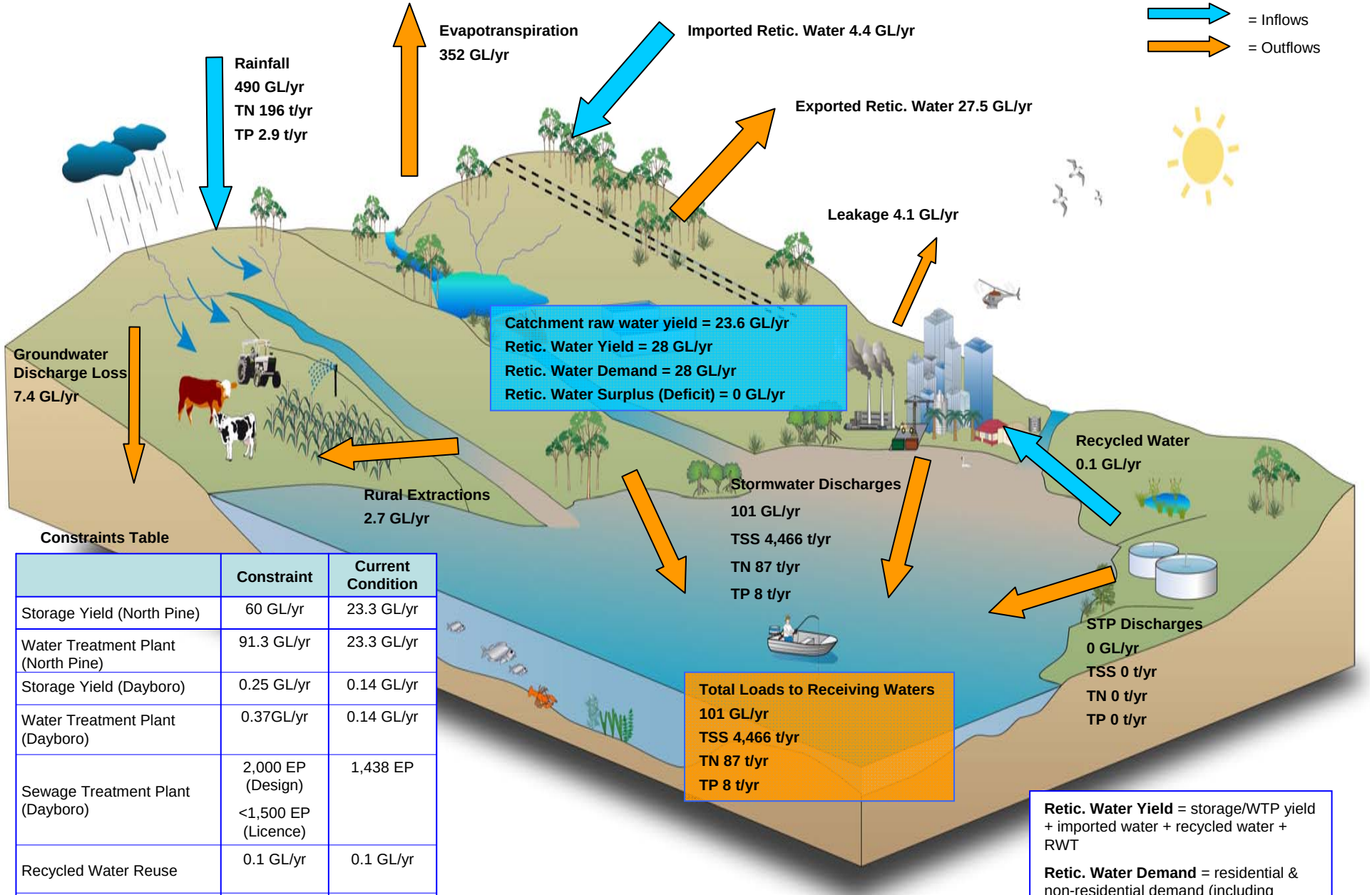
WSC = Drinking Water Supply Catchment

* Criteria at Woodford Weir

Retic. Water Yield = storage/WTP yield + imported water + recycled water + RWT

Retic. Water Demand = residential & non-residential demand (including system losses) + exported water requirements

Loads to Receiving Waters = stormwater + Sewage Treatment Plant



Constraints Table

	Constraint	Current Condition
Storage Yield (North Pine)	60 GL/yr	23.3 GL/yr
Water Treatment Plant (North Pine)	91.3 GL/yr	23.3 GL/yr
Storage Yield (Dayboro)	0.25 GL/yr	0.14 GL/yr
Water Treatment Plant (Dayboro)	0.37GL/yr	0.14 GL/yr
Sewage Treatment Plant (Dayboro)	2,000 EP (Design) <1,500 EP (Licence)	1,438 EP
Recycled Water Reuse	0.1 GL/yr	0.1 GL/yr
Sustainable Loads - TSS	2,781 t/yr	4,466 t/yr
Sustainable Loads – TN	62 t/yr	87 t/yr
Sustainable Loads - TP	8.4 t/yr	8 t/yr
Environmental Flow	N/A	101 GL/yr

Upper Pine Catchment – 2010

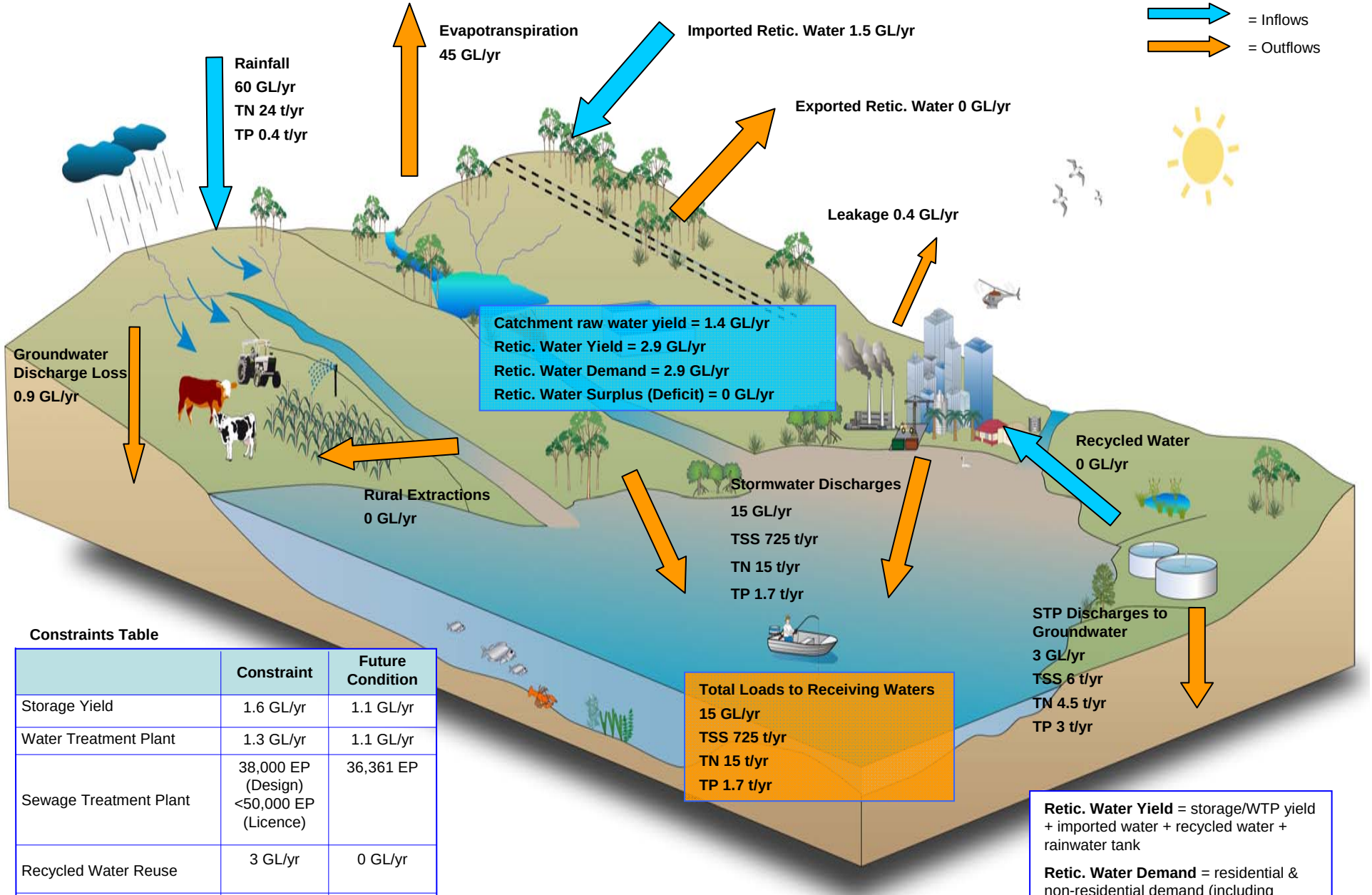
Urban Population 2,014

Retic. Water Yield = storage/WTP yield + imported water + recycled water + RWT

Retic. Water Demand = residential & non-residential demand (including system losses) + exported water requirements

Loads to Receiving Waters = stormwater + Sewage Treatment Plant

APPENDIX D: FUTURE WATER ACCOUNT FIGURES



Constraints Table

	Constraint	Future Condition
Storage Yield	1.6 GL/yr	1.1 GL/yr
Water Treatment Plant	1.3 GL/yr	1.1 GL/yr
Sewage Treatment Plant	38,000 EP (Design) <50,000 EP (Licence)	36,361 EP
Recycled Water Reuse	3 GL/yr	0 GL/yr
Sustainable Loads - TSS	?	725 t/yr
Sustainable Loads – TN	?	15 t/yr
Sustainable Loads - TP	?	1.7 t/yr
Environmental Flow	N/A	15 GL/yr

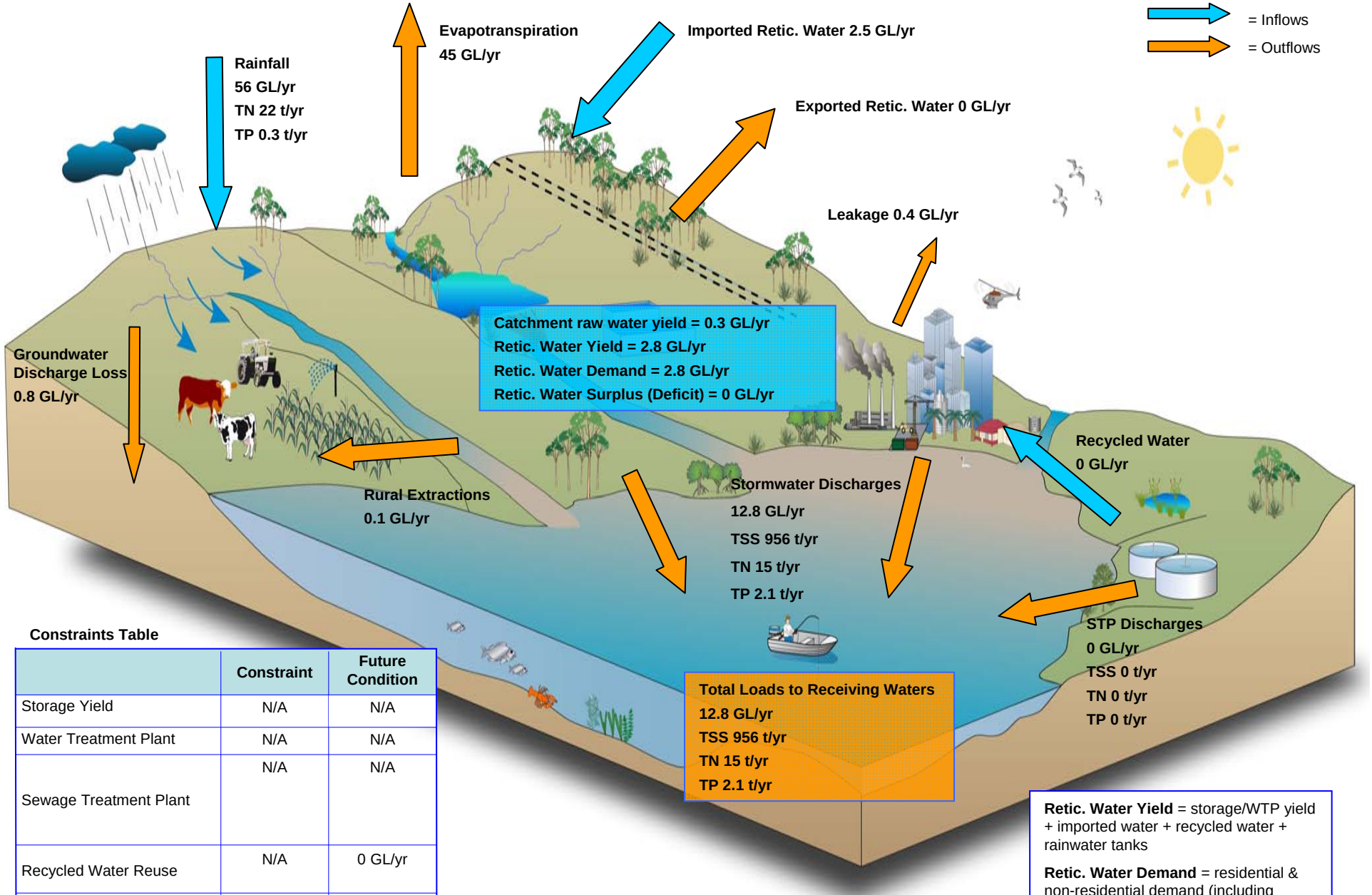
Bribie Island Catchment – 2031

Urban Population 21,830

Retic. Water Yield = storage/WTP yield + imported water + recycled water + rainwater tank

Retic. Water Demand = residential & non-residential demand (including system losses) + exported water requirements

Loads to Receiving Waters = stormwater + Sewage Treatment Plant



Constraints Table

	Constraint	Future Condition
Storage Yield	N/A	N/A
Water Treatment Plant	N/A	N/A
Sewage Treatment Plant	N/A	N/A
Recycled Water Reuse	N/A	0 GL/yr
Sustainable Loads - TSS	?	956 t/yr
Sustainable Loads – TN	?	15 t/yr
Sustainable Loads - TP	?	2.1 t/yr
Environmental Flow	N/A	12.8 GL/yr

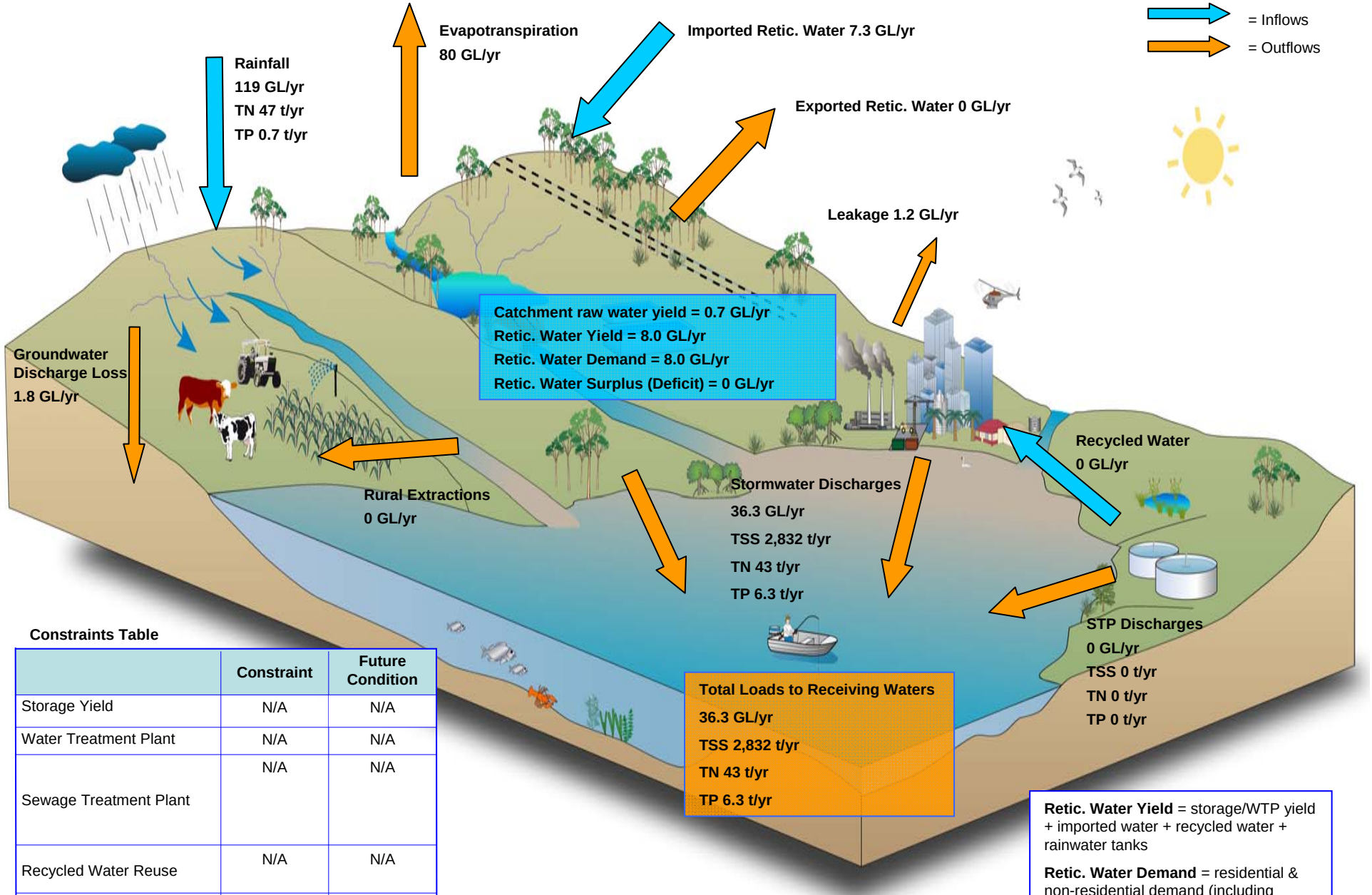
Brisbane Coastal Catchment – 2031

Urban Population 24,058

Retic. Water Yield = storage/WTP yield + imported water + recycled water + rainwater tanks

Retic. Water Demand = residential & non-residential demand (including system losses) + exported water requirements

Loads to Receiving Waters = stormwater + Sewage Treatment Plant



Constraints Table

	Constraint	Future Condition
Storage Yield	N/A	N/A
Water Treatment Plant	N/A	N/A
Sewage Treatment Plant	N/A	N/A
Recycled Water Reuse	N/A	N/A
Sustainable Loads - TSS	?	2,832 t/yr
Sustainable Loads – TN	?	43 t/yr
Sustainable Loads - TP	?	6.3 t/yr
Environmental Flow	N/A	36.3 GL/yr

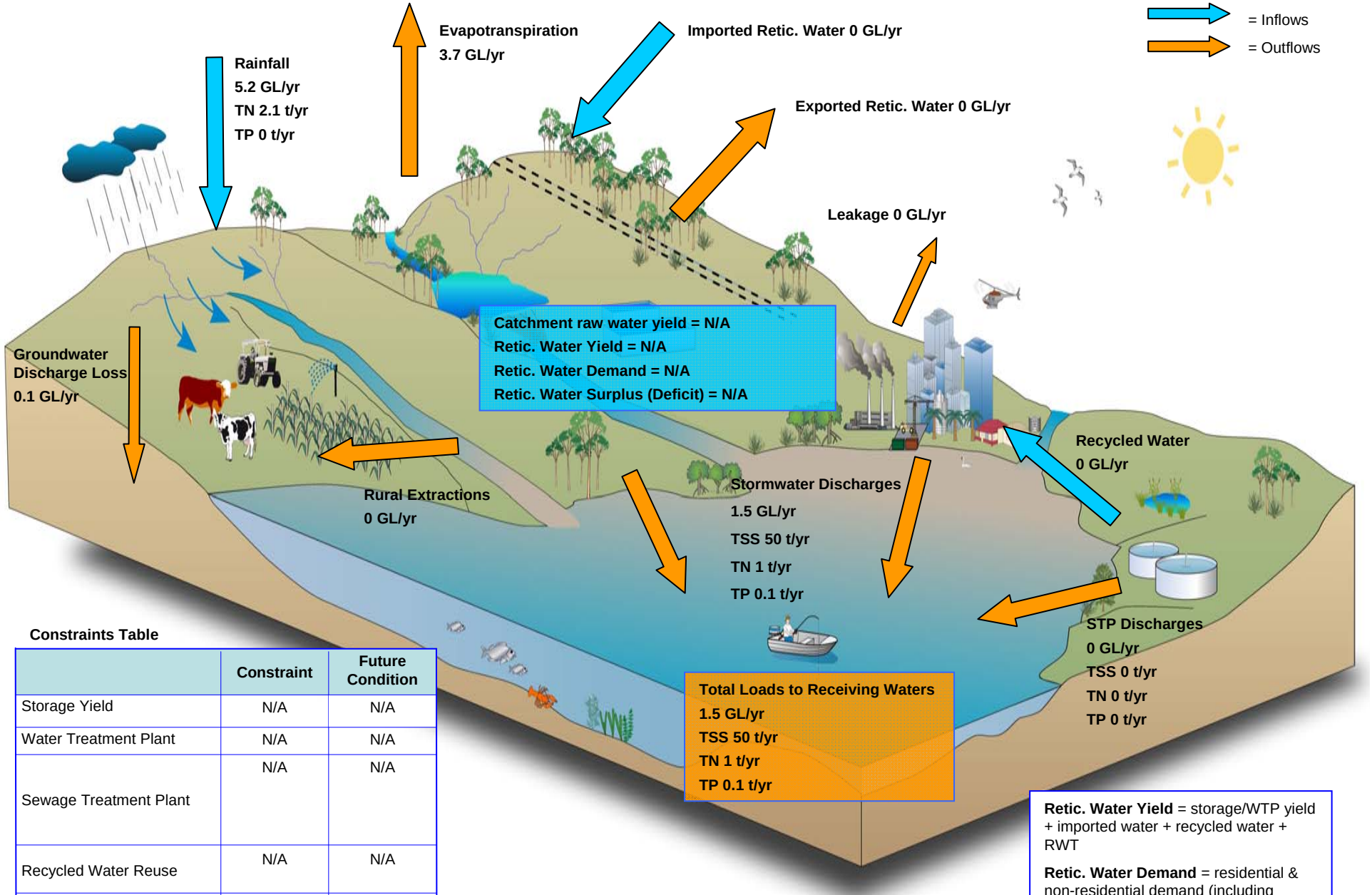
Burpengary Creek Catchment – 2031

Urban Population 64,396

Retic. Water Yield = storage/WTP yield + imported water + recycled water + rainwater tanks

Retic. Water Demand = residential & non-residential demand (including system losses) + exported water requirements

Loads to Receiving Waters = stormwater + Sewage Treatment Plant



Constraints Table

	Constraint	Future Condition
Storage Yield	N/A	N/A
Water Treatment Plant	N/A	N/A
Sewage Treatment Plant	N/A	N/A
Recycled Water Reuse	N/A	N/A
Sustainable Loads - TSS	?	50 t/yr
Sustainable Loads – TN	?	1 t/yr
Sustainable Loads - TP	?	0.1 t/yr
Environmental Flow	N/A	1.5 GL/yr

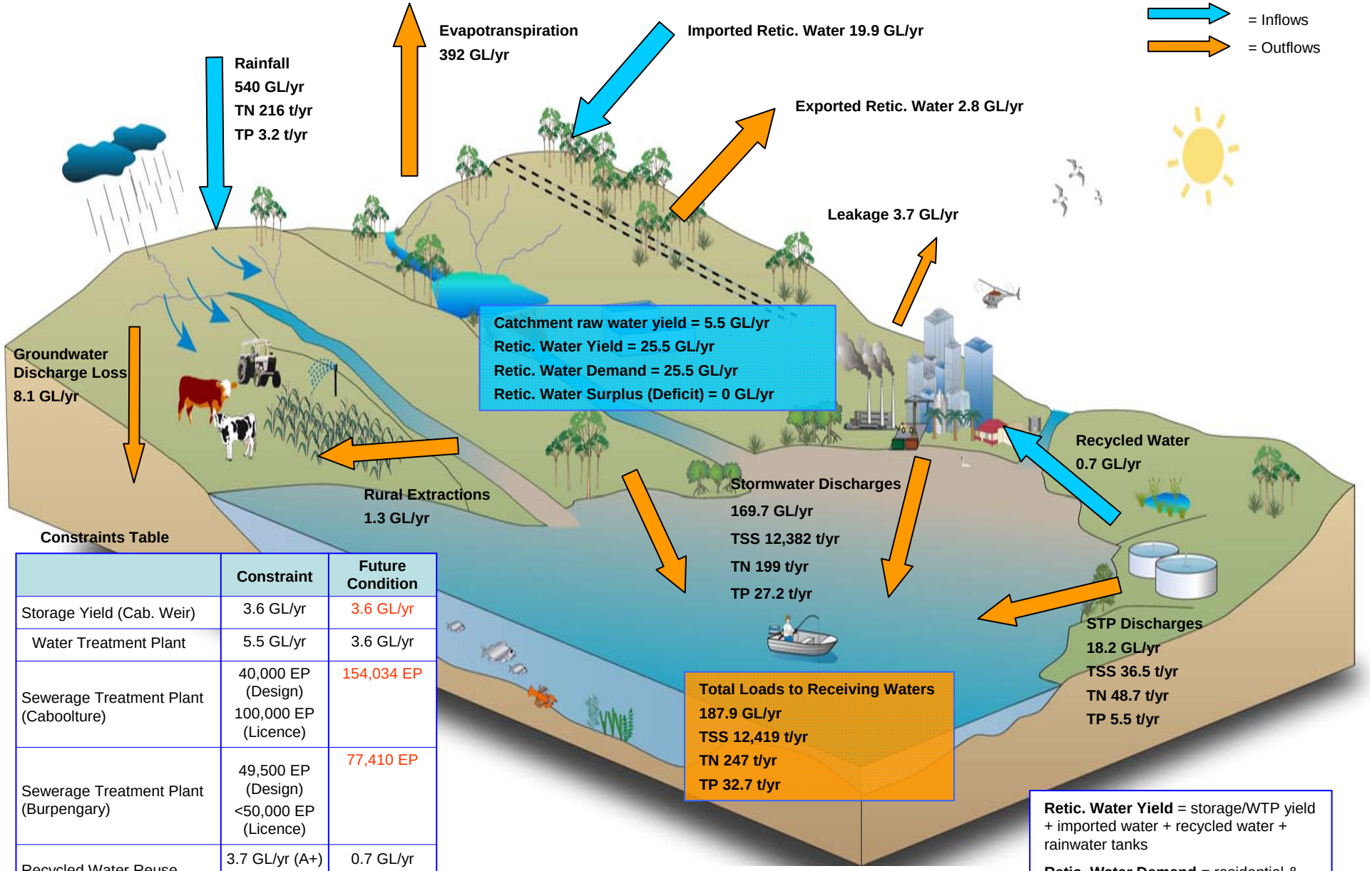
Byron Creek Catchment – 2031

Urban Population 0

Retic. Water Yield = storage/WTP yield + imported water + recycled water + RWT

Retic. Water Demand = residential & non-residential demand (including system losses) + exported water requirements

Loads to Receiving Waters = stormwater + Sewage Treatment Plant



Constraints Table

	Constraint	Future Condition
Storage Yield (Cab. Weir)	3.6 GL/yr	3.6 GL/yr
Water Treatment Plant	5.5 GL/yr	3.6 GL/yr
Sewerage Treatment Plant (Caboolture)	40,000 EP (Design) 100,000 EP (Licence)	154,034 EP
Sewerage Treatment Plant (Burpengary)	49,500 EP (Design) <50,000 EP (Licence)	77,410 EP
Recycled Water Reuse	3.7 GL/yr (A+)	0.7 GL/yr
Sustainable Loads - TSS	?	12,419 t/yr
Sustainable Loads – TN	27 t/yr	247 t/yr
Sustainable Loads - TP	?	32.7 t/yr
Environmental Flow	118 GL/yr	187.9 GL/yr

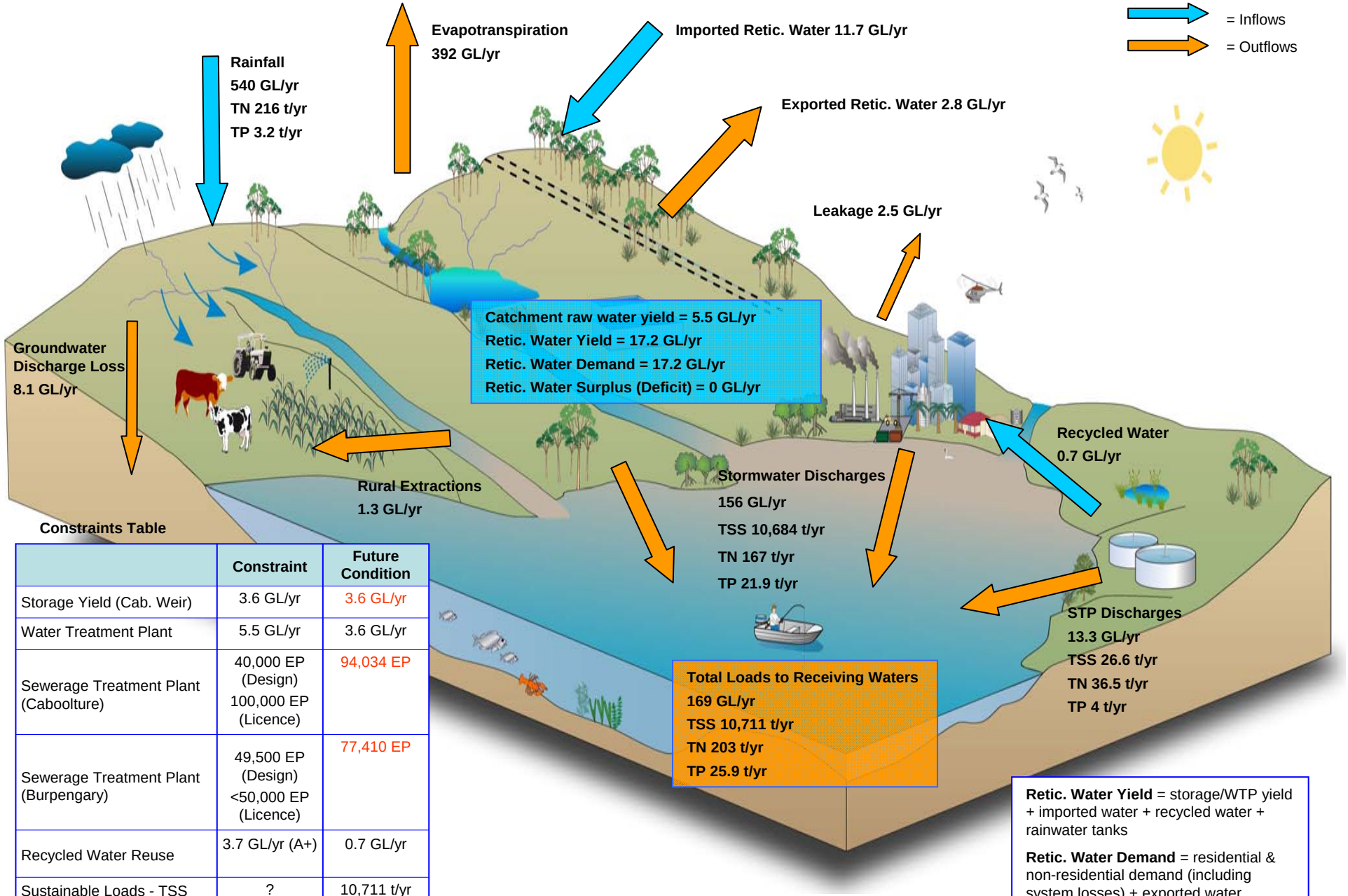
Caboolture River Catchment with CIGA – 2031

Urban Population 172,227

Retic. Water Yield = storage/WTP yield + imported water + recycled water + rainwater tanks

Retic. Water Demand = residential & non-residential demand (including system losses) + exported water requirements

Loads to Receiving Waters = stormwater + Sewage Treatment Plant



Constraints Table

	Constraint	Future Condition
Storage Yield (Cab. Weir)	3.6 GL/yr	3.6 GL/yr
Water Treatment Plant	5.5 GL/yr	3.6 GL/yr
Sewerage Treatment Plant (Caboolture)	40,000 EP (Design) 100,000 EP (Licence)	94,034 EP
Sewerage Treatment Plant (Burpengary)	49,500 EP (Design) <50,000 EP (Licence)	77,410 EP
Recycled Water Reuse	3.7 GL/yr (A+)	0.7 GL/yr
Sustainable Loads - TSS	?	10,711 t/yr
Sustainable Loads – TN	27 t/yr	203 t/yr
Sustainable Loads - TP	?	25.9 t/yr
Environmental Flow	118 GL/yr	169 GL/yr

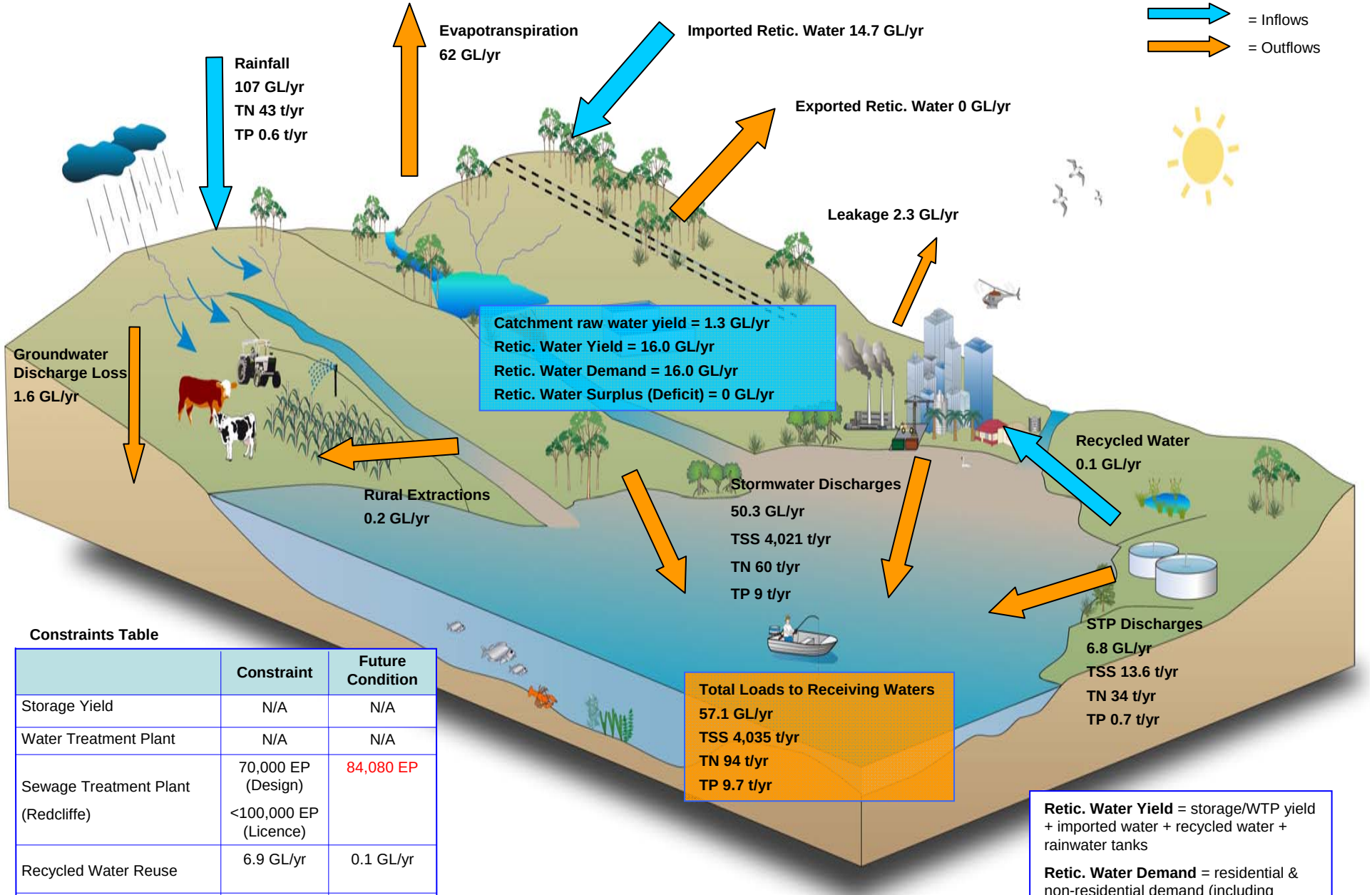
Caboolture River Catchment – 2031

Urban Population 112,227

Retic. Water Yield = storage/WTP yield + imported water + recycled water + rainwater tanks

Retic. Water Demand = residential & non-residential demand (including system losses) + exported water requirements

Loads to Receiving Waters = stormwater + Sewage Treatment Plant



Constraints Table

	Constraint	Future Condition
Storage Yield	N/A	N/A
Water Treatment Plant	N/A	N/A
Sewage Treatment Plant (Redcliffe)	70,000 EP (Design) <100,000 EP (Licence)	84,080 EP
Recycled Water Reuse	6.9 GL/yr	0.1 GL/yr
Sustainable Loads - TSS	606 t/yr	4,035 t/yr
Sustainable Loads – TN	13 t/yr	94 t/yr
Sustainable Loads - TP	1.8 t/yr	9.7 t/yr
Environmental Flow	N/A	57.1 GL/yr

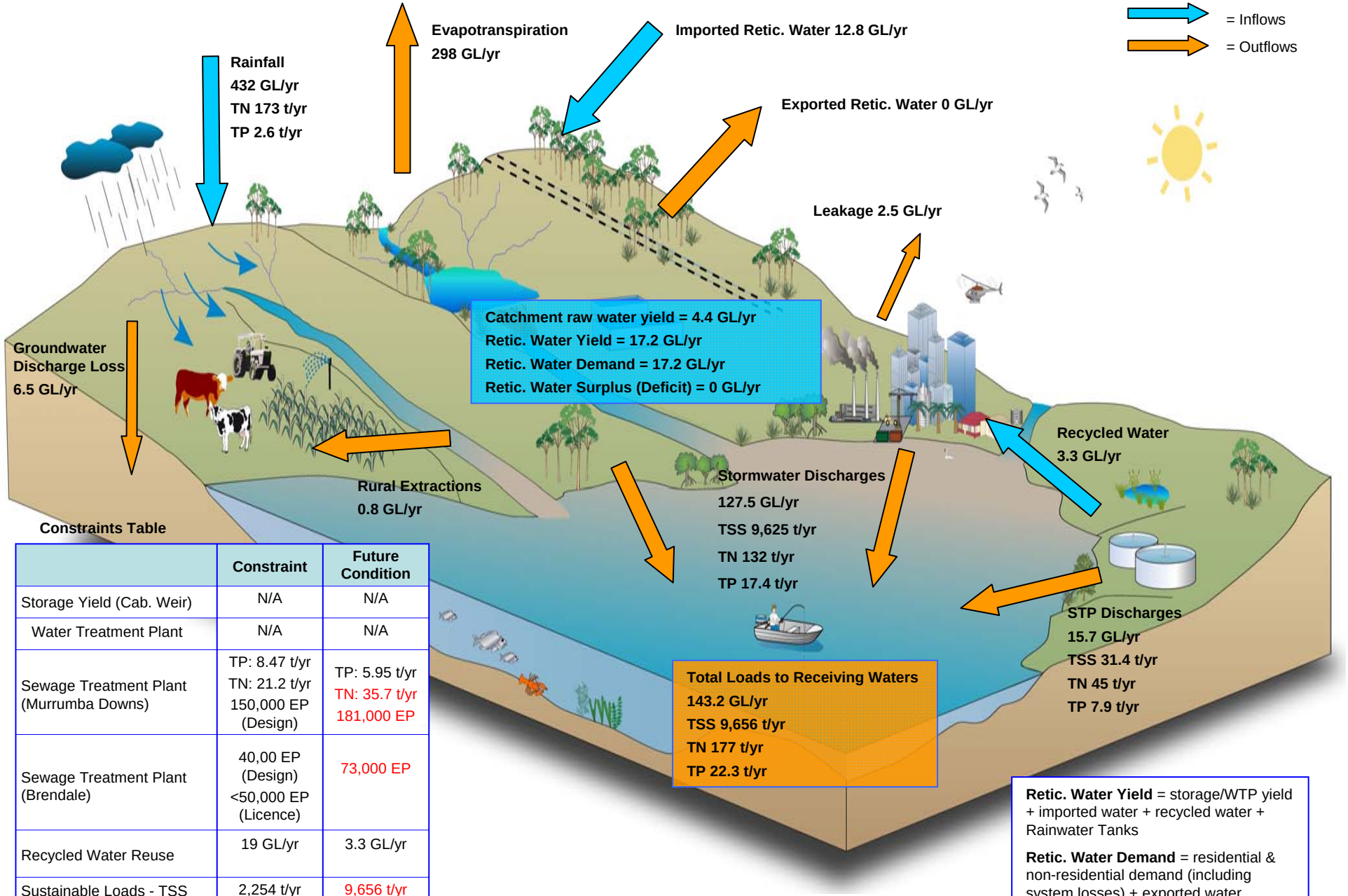
Hays Inlet Catchment – 2031

Urban Population 111,641

Retic. Water Yield = storage/WTP yield + imported water + recycled water + rainwater tanks

Retic. Water Demand = residential & non-residential demand (including system losses) + exported water requirements

Loads to Receiving Waters = stormwater + Sewage Treatment Plant



Constraints Table

	Constraint	Future Condition
Storage Yield (Cab. Weir)	N/A	N/A
Water Treatment Plant	N/A	N/A
Sewage Treatment Plant (Murrumba Downs)	TP: 8.47 t/yr TN: 21.2 t/yr 150,000 EP (Design)	TP: 5.95 t/yr TN: 35.7 t/yr 181,000 EP
Sewage Treatment Plant (Brendale)	40,00 EP (Design) <50,000 EP (Licence)	73,000 EP
Recycled Water Reuse	19 GL/yr	3.3 GL/yr
Sustainable Loads - TSS	2,254 t/yr	9,656 t/yr
Sustainable Loads – TN	50 t/yr	177 t/yr
Sustainable Loads - TP	6.8 t/yr	22 t/yr
Environmental Flow	>92 GL/yr	143 GL/yr

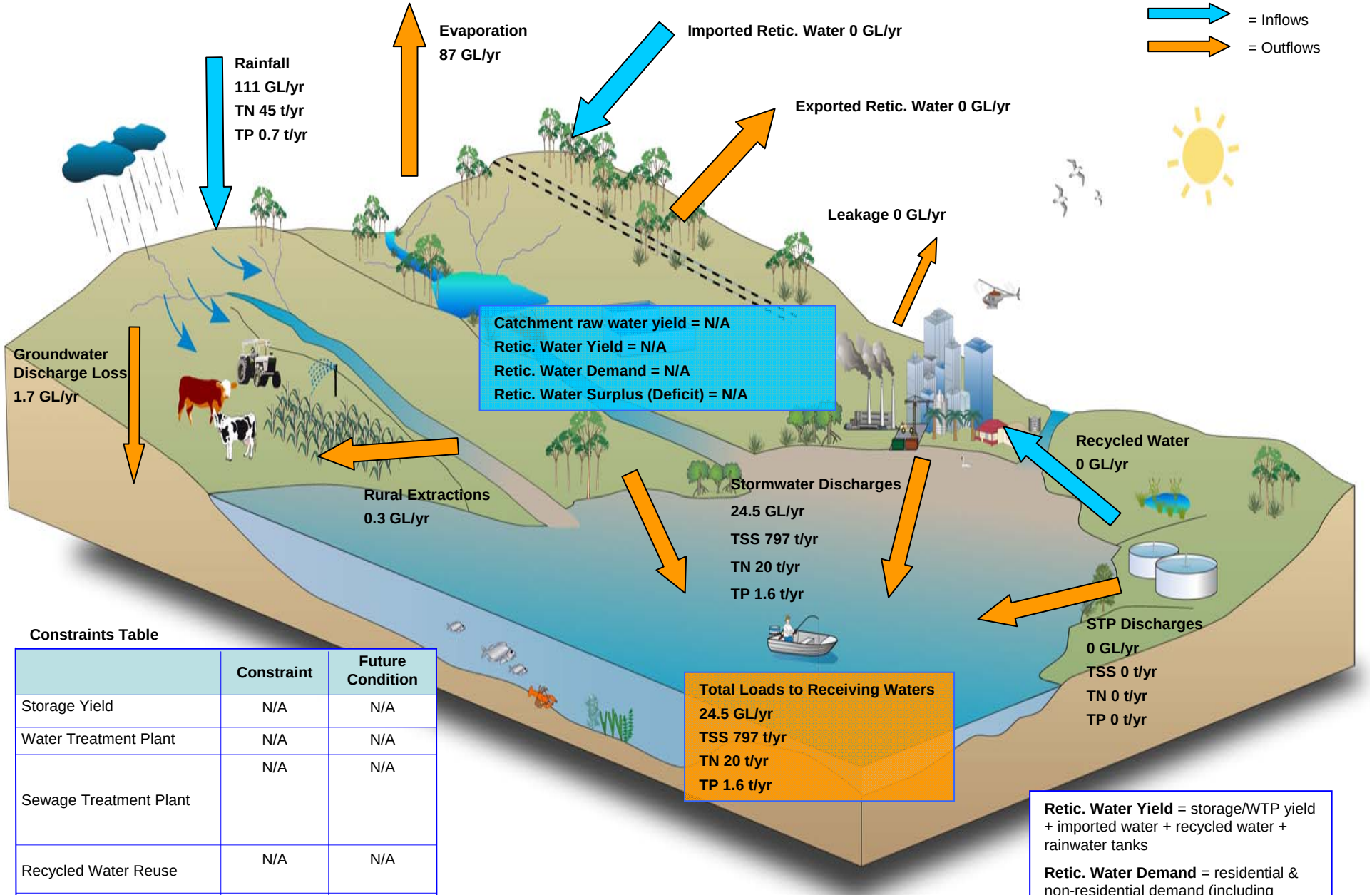
Lower Pine Catchment – 2031

Urban Population 132,974

Retic. Water Yield = storage/WTP yield + imported water + recycled water + Rainwater Tanks

Retic. Water Demand = residential & non-residential demand (including system losses) + exported water requirements

Loads to Receiving Waters = stormwater + Sewage Treatment Plant



Constraints Table

	Constraint	Future Condition
Storage Yield	N/A	N/A
Water Treatment Plant	N/A	N/A
Sewage Treatment Plant	N/A	N/A
Recycled Water Reuse	N/A	N/A
Sustainable Loads - TSS	?	797 t/yr
Sustainable Loads – TN	?	20 t/yr
Sustainable Loads - TP	?	1.6 t/yr
Environmental Flow	N/A	24.5 GL/yr

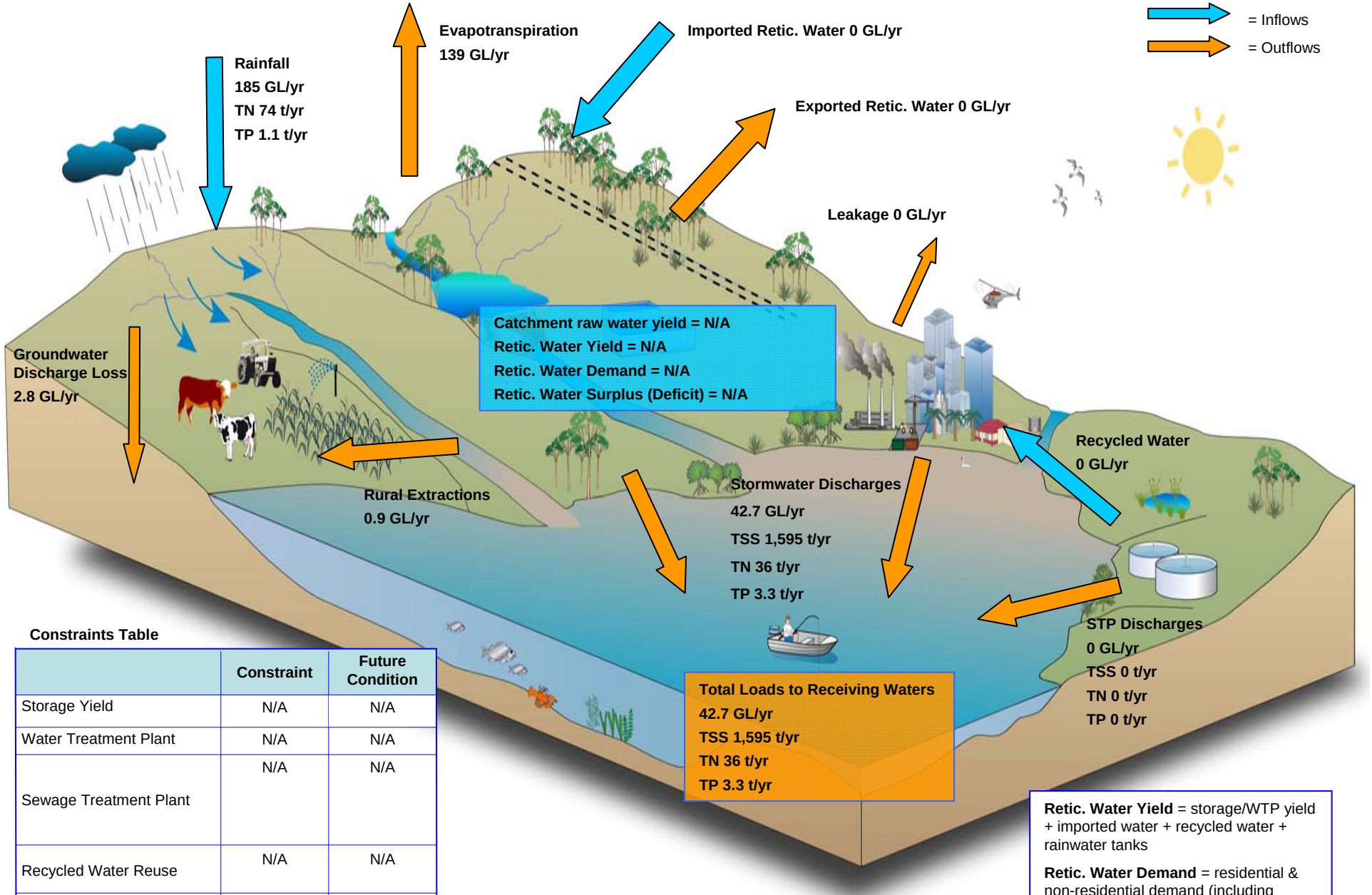
Mary River Catchment – 2031

Urban Population 0

Retic. Water Yield = storage/WTP yield + imported water + recycled water + rainwater tanks

Retic. Water Demand = residential & non-residential demand (including system losses) + exported water requirements

Loads to Receiving Waters = stormwater + Sewage Treatment Plant



Constraints Table

	Constraint	Future Condition
Storage Yield	N/A	N/A
Water Treatment Plant	N/A	N/A
Sewage Treatment Plant	N/A	N/A
Recycled Water Reuse	N/A	N/A
Sustainable Loads - TSS	?	1,595 t/yr
Sustainable Loads – TN	?	36 t/yr
Sustainable Loads - TP	?	3.3 t/yr
Environmental Flow	N/A	42.7 GL/yr

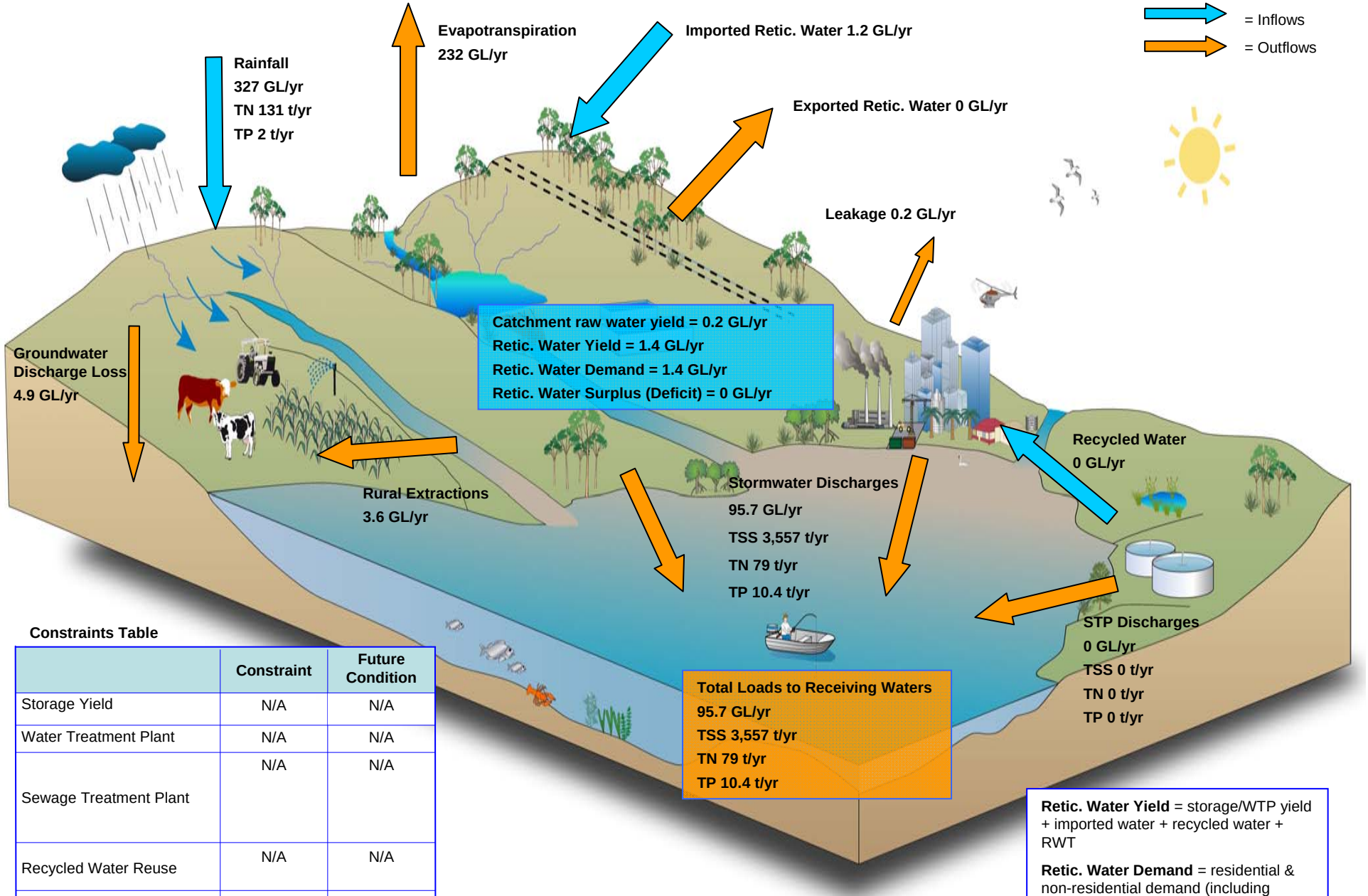
Neurum Creek Catchment – 2031

Urban Population 0

Retic. Water Yield = storage/WTP yield + imported water + recycled water + rainwater tanks

Retic. Water Demand = residential & non-residential demand (including system losses) + exported water requirements

Loads to Receiving Waters = stormwater + Sewage Treatment Plant



Constraints Table

	Constraint	Future Condition
Storage Yield	N/A	N/A
Water Treatment Plant	N/A	N/A
Sewage Treatment Plant	N/A	N/A
Recycled Water Reuse	N/A	N/A
Sustainable Loads - TSS	?	3,557 t/yr
Sustainable Loads – TN	?	79 t/yr
Sustainable Loads - TP	?	10.4 t/yr
Environmental Flow	82 GL/yr	95.7 GL/yr

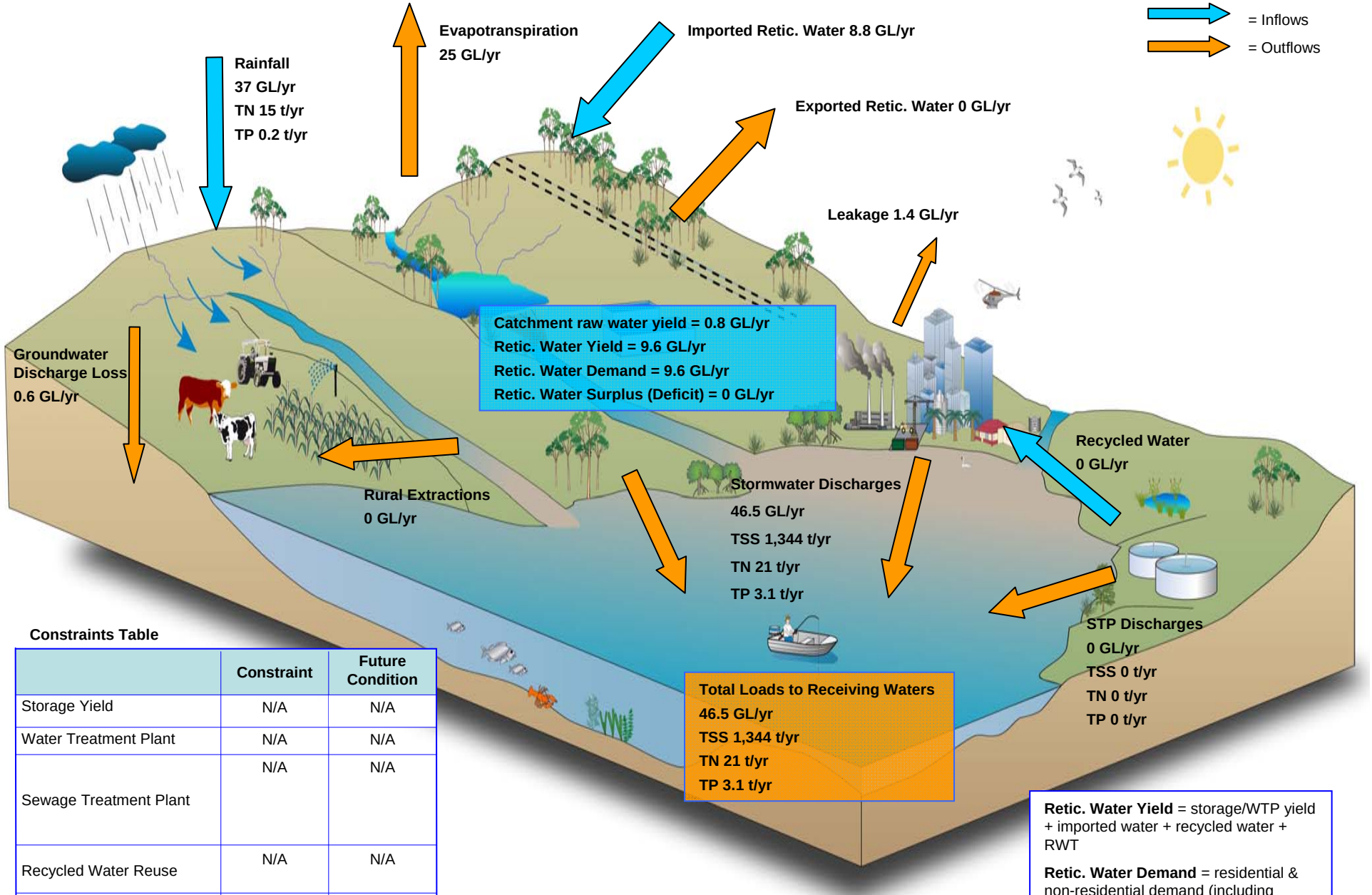
Pumicestone Passage Catchment – 2031

Urban Population 12,183

Retic. Water Yield = storage/WTP yield + imported water + recycled water + RWT

Retic. Water Demand = residential & non-residential demand (including system losses) + exported water requirements

Loads to Receiving Waters = stormwater + Sewage Treatment Plant



Constraints Table

	Constraint	Future Condition
Storage Yield	N/A	N/A
Water Treatment Plant	N/A	N/A
Sewage Treatment Plant	N/A	N/A
Recycled Water Reuse	N/A	N/A
Sustainable Loads - TSS	?	1,344 t/yr
Sustainable Loads – TN	?	21 t/yr
Sustainable Loads - TP	?	3.1 t/yr
Environmental Flow	N/A	46.5 GL/yr

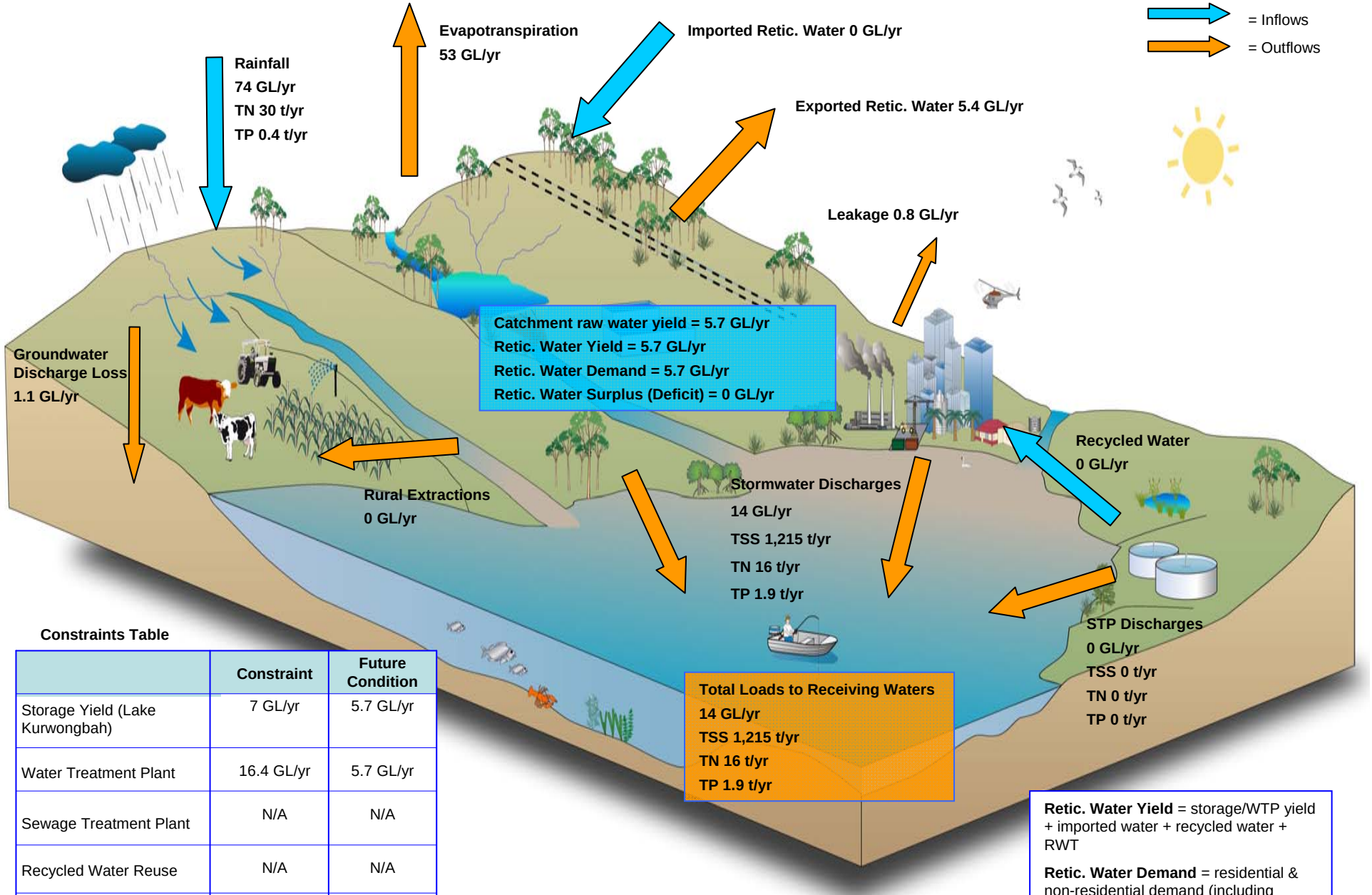
Redcliffe Catchment – 2031

Urban Population 72,858

Retic. Water Yield = storage/WTP yield + imported water + recycled water + RWT

Retic. Water Demand = residential & non-residential demand (including system losses) + exported water requirements

Loads to Receiving Waters = stormwater + Sewage Treatment Plant



Constraints Table

	Constraint	Future Condition
Storage Yield (Lake Kurwongbah)	7 GL/yr	5.7 GL/yr
Water Treatment Plant	16.4 GL/yr	5.7 GL/yr
Sewage Treatment Plant	N/A	N/A
Recycled Water Reuse	N/A	N/A
Sustainable Loads - TSS	420 t/yr	1,215 t/yr
Sustainable Loads – TN	9 t/yr	16 t/yr
Sustainable Loads - TP	1.3 t/yr	1.9 t/yr
Environmental Flow	N/A	14 GL/yr

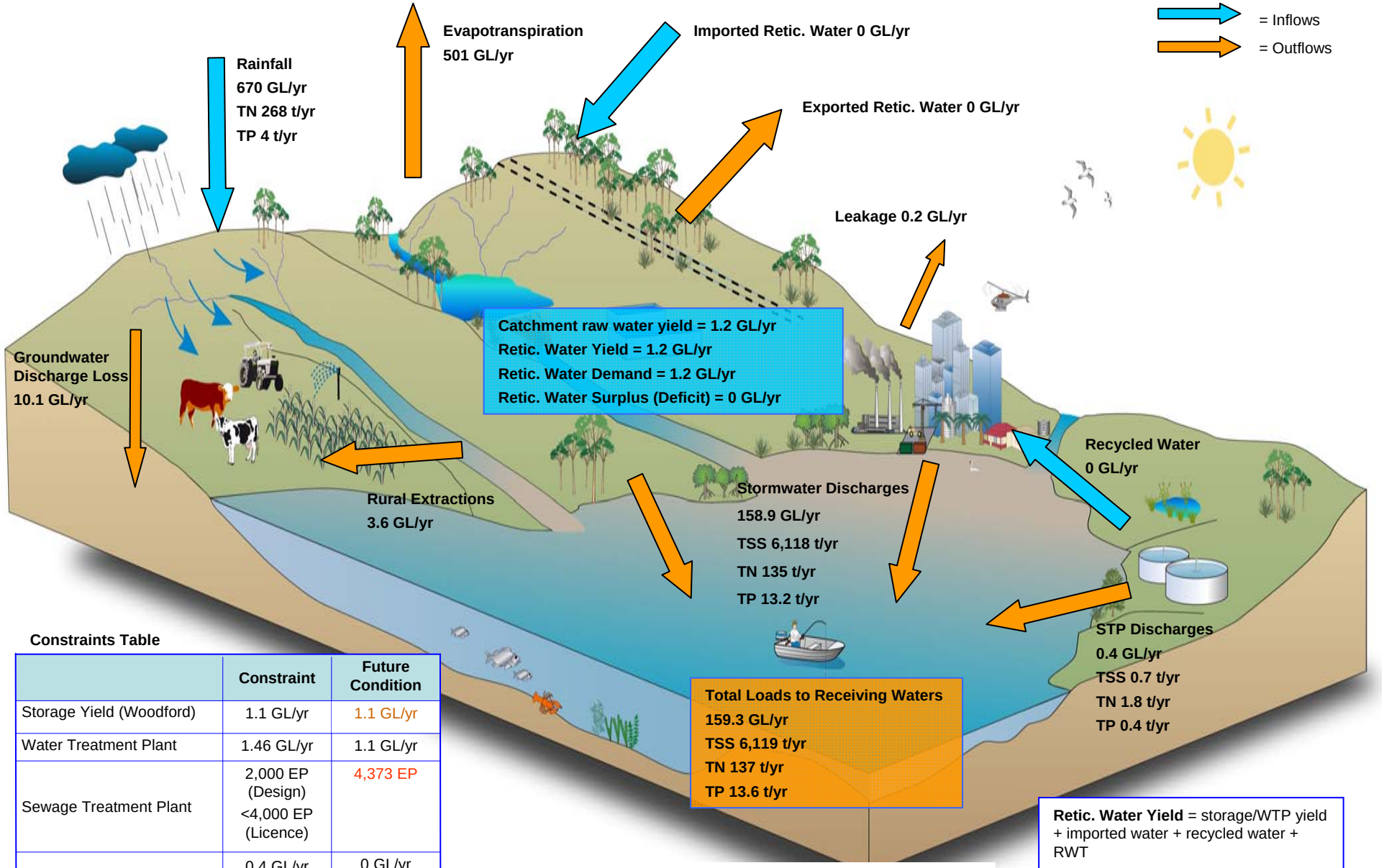
Sideling Creek Catchment – 2031

Urban Population 2,609

Retic. Water Yield = storage/WTP yield + imported water + recycled water + RWT

Retic. Water Demand = residential & non-residential demand (including system losses) + exported water requirements

Loads to Receiving Waters = stormwater + Sewage Treatment Plant



Constraints Table

	Constraint	Future Condition
Storage Yield (Woodford)	1.1 GL/yr	1.1 GL/yr
Water Treatment Plant	1.46 GL/yr	1.1 GL/yr
Sewage Treatment Plant	2,000 EP (Design) <4,000 EP (Licence)	4,373 EP
Recycled Water Reuse	0.4 GL/yr	0 GL/yr
Sustainable Loads - TSS	WSC	6,119 t/yr
Sustainable Loads – TN	WSC	137 t/yr
Sustainable Loads - TP	WSC	13.6 t/yr
Environmental Flow *	86 GL/yr	80 GL/yr

Stanley River Catchment – 2031

Urban Population 8,642

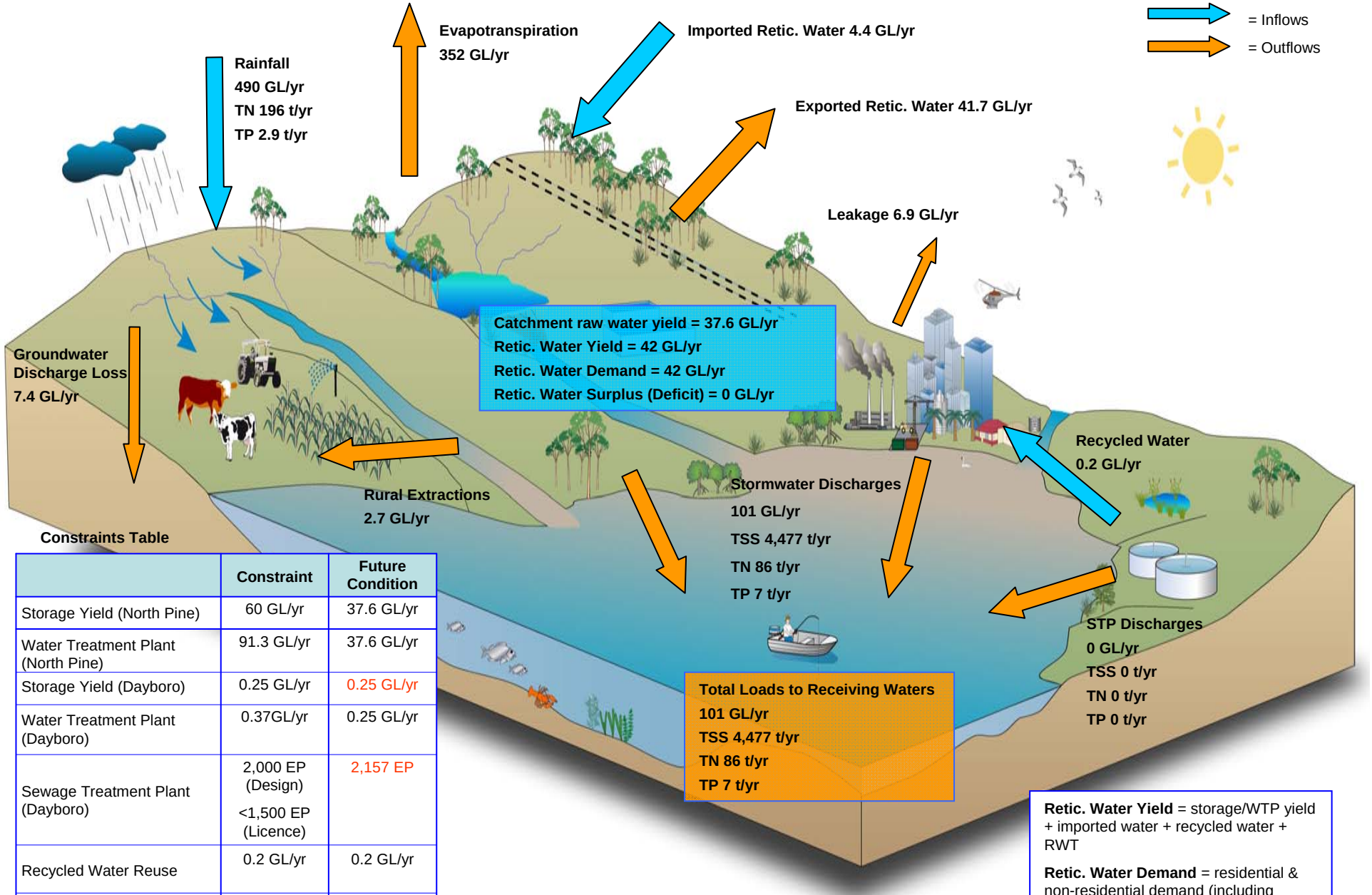
WSC = Drinking Water Supply Catchment

* Criteria at Woodford Weir

Retic. Water Yield = storage/WTP yield + imported water + recycled water + RWT

Retic. Water Demand = residential & non-residential demand (including system losses) + exported water requirements

Loads to Receiving Waters = stormwater + Sewage Treatment Plant



Constraints Table

	Constraint	Future Condition
Storage Yield (North Pine)	60 GL/yr	37.6 GL/yr
Water Treatment Plant (North Pine)	91.3 GL/yr	37.6 GL/yr
Storage Yield (Dayboro)	0.25 GL/yr	0.25 GL/yr
Water Treatment Plant (Dayboro)	0.37GL/yr	0.25 GL/yr
Sewage Treatment Plant (Dayboro)	2,000 EP (Design) <1,500 EP (Licence)	2,157 EP
Recycled Water Reuse	0.2 GL/yr	0.2 GL/yr
Sustainable Loads - TSS	2,781 t/yr	4,477 t/yr
Sustainable Loads – TN	62 t/yr	86 t/yr
Sustainable Loads - TP	8.4 t/yr	7 t/yr
Environmental Flow	N/A	101 GL/yr

Upper Pine Catchment – 2031

Urban Population 3,223

Retic. Water Yield = storage/WTP yield + imported water + recycled water + RWT

Retic. Water Demand = residential & non-residential demand (including system losses) + exported water requirements

Loads to Receiving Waters = stormwater + Sewage Treatment Plant

APPENDIX E: HSTP & SEPTIC SYSTEM POLLUTANT LOADS

			Home Sewage Treatment Plants (HSTP)				Septic Systems				Total HSTP & Septic			
Subcatchment	Lots with HSTP	Lots with Septic	Volume Treated Sewage ML/yr	TSS (t/yr)	TN (t/yr)	TP (t/yr)	Volume Treated Sewage ML/yr	TSS (t/yr)	TN (t/yr)	TP (t/yr)	Volume Treated Sewage ML/yr	TSS (t/yr)	TN (t/yr)	TP (t/yr)
Mary River	8	4	0.00	0.000	0.000	0.000	0.00	0.000	0.000	0.000	0.01	0.000	0.000	0.000
Stanley River	178	53	0.10	0.003	0.003	0.001	0.03	0.004	0.002	0.000	0.13	0.007	0.005	0.001
Nuerum Creek	27	10	0.02	0.000	0.001	0.000	0.01	0.001	0.000	0.000	0.02	0.001	0.001	0.000
Byron Creek	1	0	0.00	0.000	0.000	0.000	0.00	0.000	0.000	0.000	0.00	0.000	0.000	0.000
Caboolture River	1250	231	0.70	0.021	0.025	0.007	0.13	0.016	0.008	0.002	0.83	0.037	0.032	0.009
Pumicestone Passage	318	891	0.18	0.005	0.006	0.002	0.50	0.061	0.030	0.008	0.68	0.067	0.036	0.010
Bribie Island	5	2	0.00	0.000	0.000	0.000	0.00	0.000	0.000	0.000	0.00	0.000	0.000	0.000
Upper Pine River	352	8	0.20	0.006	0.007	0.002	0.00	0.001	0.000	0.000	0.20	0.006	0.007	0.002
Burpengary Creek	352	70	0.20	0.006	0.007	0.002	0.04	0.005	0.002	0.001	0.24	0.011	0.009	0.003
Sideling Creek	65	6	0.04	0.001	0.001	0.000	0.00	0.000	0.000	0.000	0.04	0.002	0.001	0.000
Hays Inlet	92	71	0.05	0.002	0.002	0.001	0.04	0.005	0.002	0.001	0.09	0.006	0.004	0.001
Lower Pine River	2283	16	1.28	0.038	0.045	0.013	0.01	0.001	0.001	0.000	1.29	0.040	0.045	0.013
Brisbane Coastal	15	1	0.01	0.000	0.000	0.000	0.00	0.000	0.000	0.000	0.01	0.000	0.000	0.000
Redcliffe	0	0	0	0.000	0.000	0.000	0.00	0.000	0.000	0.000	0.00	0.000	0.000	0.000

Assumptions

3 EP per rural household - source Caboolture District Demand Model 2010 Report

187 L sewage/EP/day

HSTP Effluent Quality: 30 mg/L TSS, 35 mg/L TN, 10 mg/L TP

Septic Effluent Quality: 123 mg/L TSS, 60 mg/L TN, 16 mg/L TP

Effluent quality derived from Qld Plumbing and Wastewater Code (2010) & On Site Sewerage Facilities Guidelines for Effluent Quality (2004), Department of Local Government and Planning

APPENDIX F: SOLUTION DESCRIPTIONS

Solution	Description	Type
S1: Build new regional surface water storages and associated infrastructure	Construct new regional surface water storages (i.e. dams) to meet increased demand for water and safeguard against potential reduction in storage yields due to climate change (-10%).	Centralised Conventional
S2: Upgrade Water Treatment Plants to provide additional capacity/ improve water quality	Increase the capacity of existing Water Treatment Plants (WTPs) to meet increased potable water demand and improve the quality of water for supply.	Centralised Conventional
S3: Rely on Water Supply Guarantee in the SEQ Water Strategy	Rely on water supply guarantee to provide water for future population growth as per SEQ Water Strategy	Centralised Conventional
S4: Upgrade and/or construct new trunk water supply infrastructure to boost capacity	Increase capacity of trunk infrastructure (i.e. pipe network) or construct new infrastructure to meet future water demand.	Centralised Conventional
S5: Recycled water supplied to urban users	Substitution of potable water with recycled water from centralised Sewage Treatment Plants (STPs), for urban use (i.e. residential, industrial, commercial, and construction purposes) - to meet increased potable water demands and delay the need for WTP upgrades	Centralised Stretch
S6: Recycled water supplied to agricultural users	Substitution of potable, surface or groundwater resources with recycled water from centralised STPs, for rural / agricultural purposes - to meet increased water demands, reduce pressure on existing water resources, preserve environmental flows and reduce pollutants discharged by STP (through reuse)	Centralised Innovative
S7: Sewer mining - small community based plants to treat and reuse sewage	Substitution of potable water with recycled water from decentralised sewer mining initiatives, for residential, industrial, commercial purposes - to meet increased potable water demands and delay the need for WTP upgrades	Decentralised Innovative
S8: Indirect Potable Reuse of Purified Recycled Water (PRW)	Top up surface water storages with purified recycled water from centralised STPs to meet increased potable water demands, assist to ensure water security (against drought, climate change) and reduce pollutant loads from STPs discharged to receiving waters (through reuse)	Centralised Innovative
S9: Rainwater tanks retrofitted	Substitution of potable water with	Decentralised

Solution	Description	Type
for non-potable uses	rainwater collected in tanks and retrofitted at existing residential, commercial and industrial premises, to meet increased potable water demands, delay the need for WTP upgrades and reduce stormwater pollutant loads to receiving waters	Conventional
S10: Stormwater harvesting for non-potable reuse	Substitution of potable water used for non-potable purposes (e.g. irrigation, toilet flushing) with stormwater harvested in decentralised systems, to meet increased potable water demands, delay the need for WTP upgrades and reduce stormwater pollutant loads to receiving waters	Decentralised Stretch
S11:Stormwater harvesting for potable reuse	Substitution of potable water with stormwater harvested and treated to potable water standards in decentralised systems, to meet increased potable water demands, delay the need for WTP upgrades and reduce stormwater pollutant loads to receiving waters.	Decentralised Innovative
S12: Mandatory lot-scale greywater reuse	Mandate the use of greywater to substitute potable water for irrigation, toilet flushing to meet increased potable water demands, reduce pressure on STP capacity, and delay the need for WTP & STP upgrades. Also has water quality benefits by reducing wastewater discharged from STP.	Decentralised Stretch
S13: Water efficient appliances and fittings	To reduce potable water demand, and delay or avoid the need for infrastructure upgrades, retrofit of water efficient appliances and fittings in existing residential, commercial and industrial buildings. It is mandatory to incorporate water efficiency in new buildings (Qld Development Code)	Decentralised Conventional
S14: Pressure reduction on trunk water supply infrastructure	Reduce pressure on trunk water supply infrastructure to reduce water use and delay need to source new water supplies/ upgrade infrastructure to meet increased future demands	Centralised Stretch
S15: Implementation of water restrictions	Introduce water restrictions to reduce water use and delay need to source new water supplies/ upgrade infrastructure to meet increased future demands	Centralised Stretch
S16: Education & /or Capacity Building and investment in incentive schemes	Education campaigns and capacity building projects for communities (i.e. new developments) and relevant organisations (i.e. construction industry, Councils) about the key issues impacting on water quality and water supply and how these impacts may be mitigated by the individual /company.	Decentralised Conventional

Solution	Description	Type
S17: Xeriscaping - landscaping using drought tolerant plant species	To reduce potable water demand, landscaping in new developments to incorporate drought tolerant species of plants requiring minimal irrigation. Also replacement of existing water-intensive landscaping with drought tolerant species	Decentralised Stretch
S18: Increase price of water to minimise water wastage	To reduce potable water demand, increase the price of water to reflect the true cost of supplying the water and provide an incentive for consumers to be 'water wise'.	Centralised Stretch
S19: Limit rural water extraction and supplement with other sources	To maintain environmental flows in waterways, water extracted from waterways and used for rural purposes could be substituted with other sources, such as recycled water/stormwater harvesting	Decentralised Stretch
S20: Implement WSUD for hydrologic management	The use of WSUD measures such as swales, bioretention systems and wetlands to promote infiltration and natural flow regimes to assist with the mitigation of peak flows from intensifying rainfall events.	Decentralised/ Centralised Stretch
S21: Strategic release of water from dams to maintain environmental flows downstream	To maintain environmental flows in waterways, a certain volume of water could be released when necessary from surface water storages into downstream waterways	Centralised Stretch
S22: Recycled water pumped to downstream side of dams and weirs (Environmental Flows)	To maintain environmental flows in waterways, recycled water from STPs could be pumped to the downstream side of dam walls or weirs (i.e. not into the potable water supply)	Centralised Stretch
S23: Upgrade STP Infrastructure	Increase the capacity of existing STPs to treat increased sewage generation	Centralised Conventional
S24: Storage of excess inflows during storm events	Storage of wet weather sewage flows usually bypassed during storm events until usual treatment can be facilitated prior to release.	Centralised Stretch
S25: Diversion of sewage to STPs with capacity	Diversion schemes to permanently/temporarily divert sewage to STPs with capacity	Centralised Conventional
S26: Smart sewers (reduced infiltration/inflows)	Upgrade or construct new reticulated sewerage network using smart sewers to reduce infiltration/inflows from stormwater and delay need to upgrade STPs capacity	Decentralised Stretch
S27: Prevention of illegal stormwater inflow connections to sewer	Program to prevent/reduce illegal stormwater inflow connections to sewer to increase conveyance during wet weather and delay need to upgrade STPs/infrastructure capacity	Decentralised Stretch

Solution	Description	Type
S28: Ocean outfall from STPs instead of discharge into rivers and creeks	Construction of offshore ocean outfalls to discharge wastewater pollutants (TN, TP, TSS) to ocean rather than waterways, thereby protecting local waterways and sensitive environments.	Centralised Conventional
S29: Waterway Rehabilitation - Riparian Zones - 3/4 order streams	Revegetation of waterway riparian corridors, particularly 3rd & 4th order streams, to improve waterway ecological health and water quality, and assist in protecting environmentally sensitive areas.	Decentralised stretch
S30: Increased implementation of Erosion & Sediment Control on development sites	Improved compliance of erosion and sediment control practices on construction sites through increased monitoring/ inspections/ fines to reduce sediment loads to waterways and protect environmentally sensitive areas from impacts of sediment on ecosystem health. (nb education separate issue)	Decentralised Conventional
S31: Existing WSUD Retrofit	Retrofit of distributed at source water sensitive urban design (eg buffers, swales, bioretention pods, pervious pavement) in existing urban areas to improve water quality (TSS, TN, TP, heavy metals, hydrocarbons, thermal pollution, faecal coliforms) and protect environmentally sensitive areas. Note greenfield WSUD required (BAU) to meet best practice 80% TSS, 60% TP, 45% TN removal.	Decentralised Stretch
S32: Future development WSUD measures achieve no worsening	Water sensitive urban design (eg buffers, swales, bioretention, wetlands, pervious pavement etc) applied to future greenfield development areas to achieve a no worsening/no net increase in existing loads for TSS, TN, TP.	Decentralised Innovative
S33: Rural Best Management Practices (e.g. limiting erosion, application of fertilisers and pesticides at minimal rates, etc)	Widespread adoption of best management practices in rural areas to reduce nutrient and sediment loads to receiving waters and protect environmentally sensitive areas. Also includes riparian revegetation of 1st and 2nd order streams;	Decentralised Conventional/ Stretch
S34: Implement floodplain risk management measures (property/response/flood modification measures) (Flooding)	Implement floodplain risk management measures (property/response/flood modification measures) to mitigate existing/ future flooding issues	Centralised Conventional
S35: Cap at current Population without any other solutions implemented	Implement policies to limit population growth in region, thereby reducing future pressures on STPs, water supply and water quality	Centralised Innovative

APPENDIX G: MCA CRITERIA DESCRIPTION FOR SCORING

Criteria Category	Criteria	Criteria Description
Environmental	Changes in water quality in inland water systems, as well as changes to biodiversity, and bed and bank integrity	What impact does the solution have on: ▪ the water quality of receiving waterways (suspended solids & nutrients)? ▪ ecological health (riparian and in stream)? ▪ environmental values in freshwater systems? ▪ water quality in drinking water catchments?
	Changes in hydrology	What impact does the solution have on: ▪ natural flow regimes, including changes to baseflow in waterways (which is maintained through gradual inflows from groundwater)? ▪ changes to mean annual flow volume (e.g. from stormwater harvesting, STP discharges, surface water extraction)? ▪ changes to flow frequency and peak flows and velocities from urban areas (which can impact on in-stream ecosystems from the effects of more frequent runoff and increased peak flows)?
	Changes to water quality and biodiversity in estuaries and Moreton Bay	What impact does the solution have on: ▪ Environmental Values and water quality in estuaries and Moreton Bay? ▪ critical habitats, marine species and key ecological processes? ▪ urban and non-urban diffuse and point source pollution entering Moreton Bay?
	Changes in water quality and flow and biodiversity of groundwater systems	What impact does the solution have on: ▪ natural flow and water quality of groundwater resources, including recharge of groundwater stores though infiltration (i.e. pervious areas)? ▪ the condition of groundwater ecosystems and groundwater dependent ecosystems?
	Changes in emissions of greenhouse gases	Are there any increases/decreases in greenhouse gas emissions as a result of changes in potable water production, wastewater and stormwater treatment (i.e. treatment infrastructure energy requirements)? Consider the amount of embodied energy (i.e. energy to produce, maintain and decommission infrastructure) associated with the solution.
	Impact on environmentally sensitive values	What impact does the solution have on environmentally sensitive values (e.g. protected and/or threatened species and High Environmental Value ecosystems)?
Social	Impacts on water supply	Does the solution have an impact on the ability to maintain a sufficient and reliable water supply to support a comfortable, sustainable and prosperous lifestyle, while meeting urban, rural and environmental needs?
	Impacts on human health	What impact does the solution have on: ▪ the day-to-day continuity of a safe, quality water supply? ▪ community wellbeing (e.g. displacement and/or other disturbance such as algae bloom)? ▪ environmental health (e.g. air, noise, light nuisances)? Also, what risk does the solution pose to human health

Criteria Category	Criteria	Criteria Description
		from alternate sources of water (e.g. such as stormwater harvesting)?
	Impacts on public amenity/recreation	What impact does the solution have on the aesthetic and recreational values from changes in: ▪ water quality (e.g. algae blooms & faecals affect swimming, impacts to oysters/fishing) ? ▪ water quantity (e.g. flooding)? ▪ construction of infrastructure (aesthetics)?
Social	Impacts on flooding hazard	What impact does the solution have on communities from increased flooding hazard as a result of: ▪ urbanisation? ▪ changes to flow paths? ▪ changes in waterway geomorphology?
	Level of community understanding, engagement and ownership	Does the solution provide an opportunity for community involvement and education?
	Public acceptability	What is the general level of public acceptability for the solution – in terms of the *perceived* environmental, social and economic impacts (i.e. is it affordable to the public)? Consideration should be given to those directly, indirectly and not affected by the solution.
	Financial impacts on MBRC/ Unitywater – Outlays, capital and operating expenditure and revenue	What financial impacts does the solution have on MBRC/ Unitywater, including: ▪ the capital costs in constructing/installing infrastructure? ▪ the operating and maintenance costs over the lifetime of the infrastructure? ▪ the potential revenue for MBRC from community use of the infrastructure? ▪ cost savings to MBRC through deferment or avoidance of infrastructure upgrades and/or construction?
Economic	Financial impacts including costs and cost savings on consumers (e.g. infrastructure charges) and other organisations	What financial impacts does the solution have on the community, in terms of: ▪ increased rates? ▪ Increased infrastructure charges? ▪ housing affordability? ▪ cost savings to the community from implementation of the solution (e.g. avoidance of increased rates due to avoidance of costly infrastructure upgrades)?
	Impacts on local industries that rely on the environment (Fisheries, tourism)	Due to changes in water quality and quantity in waterways and Moreton Bay, what financial impacts does the solution have on local industries such as fisheries or tourism which rely on the environment for income?
	Employment plus local economic sustainability	What financial impacts does the solution have on: ▪ employment in the region (e.g. jobs creation through creation of new industry, or job losses from loss of an industry)? ▪ the long-term economic sustainability of the region and gross regional product?

APPENDIX H: MCA WORKSHOP PARTICIPANTS

Councillor Rae Frawley

Councillor Mike Charlton

Julia Roso (MBRC)

Lavanya Susarla (MBRC)

Steve Roso (MBRC)

Peter Rawlinson (MBRC)

Evan Raymond (MBRC)

Andrew Sloan (Unitywater)

Ashley Lorenz (Unitywater)

Jon Black (Unitywater)

Nicole Ramilo (BMT WBM)

Brad Grant (BMT WBM)

Tony McAlister (BMT WBM)

David Hamlyn Harris (Blight Tanner)

APPENDIX I: EXAMPLE SCOPE OF WORKS FOR DETAILED PLANNING (PHASE 2)

Task	Description	Deliverables
1	Examine the solutions recommended in the TWCM Strategy	
	The consultant, in collaboration with MBRC and Unitywater, should undertake preliminary screening of each solution recommended in the Phase 1 TWCM Strategy document. This will entail determining the suitability of each solution on a catchment basis in terms of factors such as land availability, infrastructure, and the identification of any priority areas within the catchment.	Shortlist of solutions to be assessed in further detail
2	Model development	
	The evaluation tasks to be undertaken as part of this study will need to be underpinned by the construction and implementation of the integrated catchment and receiving water quality modelling framework described above. This framework should be applied to all estuarine systems, and will comprise three primary models: a ***Source Catchments*** catchment model, a ***RWQM V2/V3*** Receiving Water Quality Model and appropriate ***Urban Developer*** and ***MUSIC*** urban water balance/urban stormwater quality models. Where rural best management practices have been identified for implementation, modelling of these will be based on the best available literature and utilising the suite identified above For each catchment, appropriately parameterised ***Source Catchments*** models should be used to derive the inputs of diffuse catchment loads to the downstream ***RWQM V2/V3*** models. These loads should then be utilised by ***RWQM V2/V3*** as both flow and pollutant boundary conditions. ***Urban Developer*** and ***MUSIC*** urban water balance/urban stormwater quality models are the recommended tools to be used to define urban potable demands and stormwater flows and loads and for detailed TWCM efficacy assessments. Demand models within the urban water balance models should account for behavioural change as a result of the implementation of the Target 200 and other SEQ Water Strategy requirements. In undertaking this task, the consultant should utilise and update as appropriate existing catchment and receiving water quality models developed previously for the study area. These include a ***Source Catchment*** model developed by MBRC in 2010, along with ***RWQM V2*** models of the Pine and Caboolture estuaries, Pumicestone Passage and Moreton Bay developed by BMT WBM for the HWP in 2006. The ***RWQM V2*** model will need to be recalibrated using data from recent years as earlier calibration works were constrained by drought conditions to predominantly 'dry' condition data. The consultant also should utilise STP loads and flows data from Unitywater for input into ***RWQM V2/V3*** as point source discharges.	Calibrated and verified integrated catchment and receiving water quality modelling framework
3	Sustainable loads and yields assessment	
	Using the integrated catchment and receiving water quality modelling framework, sustainable loads for each catchment should be quantified, using existing discharge locations. The output from this task should be a determination of the quantum of reduction required for point and diffuse loads, or changes in upstream	Sustainable loads and yield targets for each estuary

	environmental flow rates, to enable water quality objectives in the upper, mid and lower portions of each estuary and Moreton Bay to ideally be complied with.	
4	Detailed assessment of solutions	
	The consultant should undertake detailed assessments of the potential solution sets identified for each catchment. These assessments should quantify the performance of the solution sets in terms of their potential impacts on environmental, social and economic factors including, but not limited to: water quality, water supply, water quantity, wastewater discharges, greenhouse gas emissions and capital and operational costs. This will also include defining the infrastructure required to implement each solution and any staging requirements for the delivery of the infrastructure Smaller scale catchment models such as ***MUSIC*** and ***Urban Developer*** should be utilised by the consultant to assist in determining stormwater discharges, extent of water source substitution, etc from solution scenarios. Outputs from these models will need to be used as inputs into the integrated catchment and receiving water quality modelling framework. In terms of water quality, the consultant should utilise the results of each solution set assessment to develop a quasi water quality Report Card rating for receiving estuaries using an Ecosystem Health Index (EHI) process, similar to that used in the Ecosystem Health Monitoring Program (EHMP) for converting EHMP field data to an effective score for condition of estuaries and the Bay. This will greatly assist the lay audience to understand the likely efficacy of the various potential management solutions being evaluated.	Matrix of solutions ranked in terms of environmental, social and economic performance and defined list of infrastructure (including staging plan)
5	Documentation of TWCM Plan	
	The results from the detailed planning and assessment of solution sets should be documented in a detailed planning report. This report is to include: • Solutions considered; • Rationale for screening solutions; • Targets (sustainable loads/sustainable yields); • Assessment criteria and commentary; • Performance of solution sets; • Costings and benefits; • Recommended solutions and rationale for their selection; • Any identified issues associated with the recommended solutions (*e.g. risks, institutional reforms required*); • Infrastructure implications; and • Delivery plan and implementation actions relating to the recommended solutions for inclusion in the subsequent Implementation Plan.	TWCM Plan

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