Maryborough Waste Water Strategy 2010

WIDE BAY WATER CORPORATION

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1.0 INTRODUCTION

Maryborough Water was integrated into Wide Bay Water Corporation in 2009. It was essential for the Corporation to assess the capacity of the existing wastewater infrastructure in Maryborough.

This Wastewater Strategy's main objective is to evaluate the existing sewer network capacity to meet projected population forecasts and to identify infrastructure requirements to satisfactorily manage these demands to the year 2031.

A major part of the investigation was the assessment of the existing infrastructure and collation of available data.

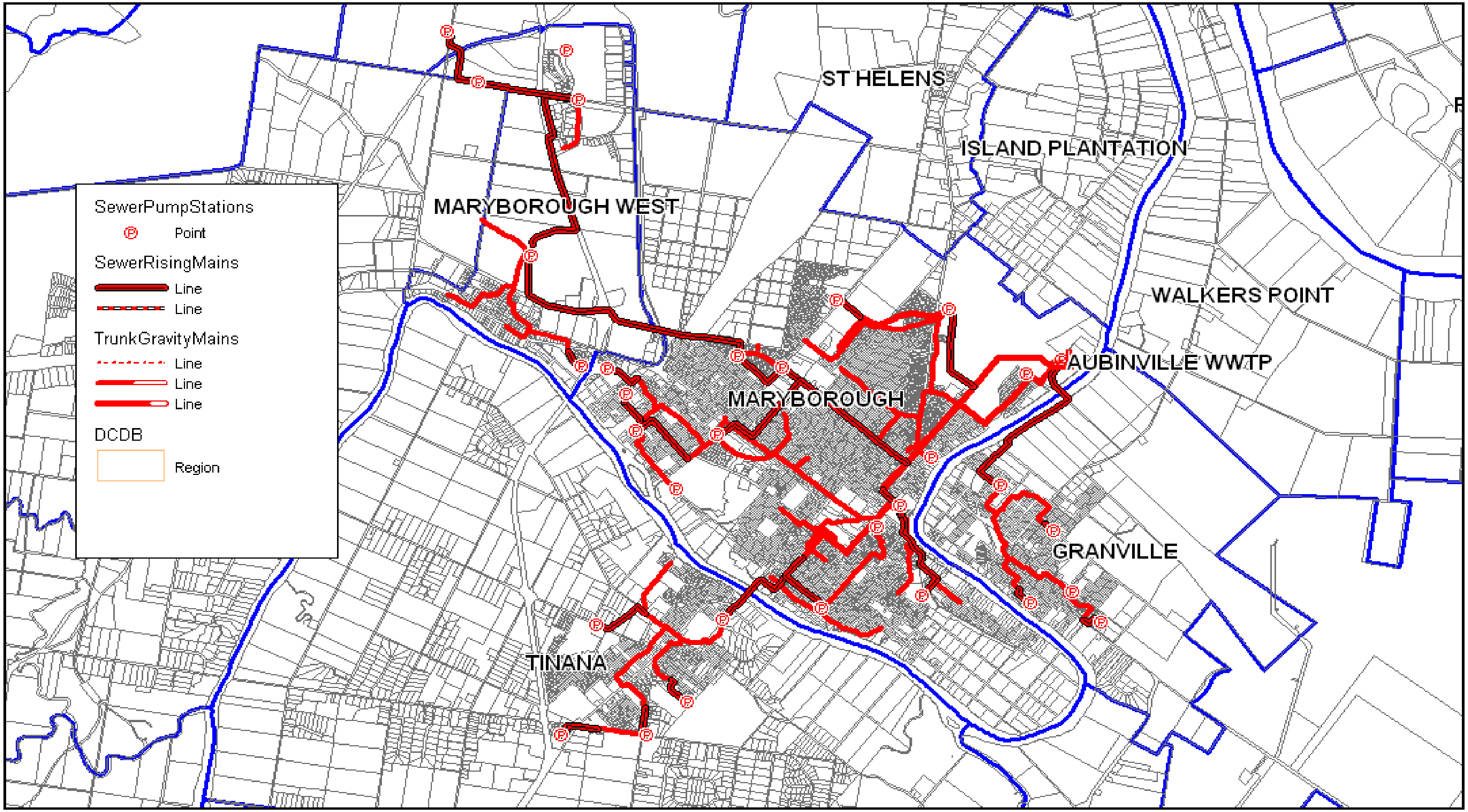
The primary objectives of this Report are to:

- Assess the existing wastewater loads based on the proclaim rates base;
- Assess the projected wastewater loads, up to 2031, based on revised population projections undertaken by Wide Bay Water and the Office of Economic and Statistical Research (OESR, *Queensland Treasury*);
- Evaluate the condition of the sewerage system through pump station analysis. The resulting inflow and infiltration data can be used as a guide to determine the condition of the assets;
- Identify the capacity of the existing wastewater treatment plant and determine the most appropriate method of augmentation to meet projected community growth;
- Evaluate the impacts that the population projections and development sequencing will have on the major wastewater transport infrastructure (eg. trunk mains, pump stations, rising mains);
- Build a network model for Maryborough that can be used as the basis for future infrastructure planning;
- Allocate the revised wastewater loads to the hydraulic model and identify where the system 'fails';
- Identify the additional wastewater infrastructure and the appropriate construction timing required to deliver the Standards of Service (SOS) to Wide Bay Water Corporation customers;
- Establish a preferred strategy for wastewater infrastructure planning up to 2031.

Effluent disposal and re-use is currently the subject of an independent assessment. Wastewater loads projected in this Strategy will be used for future effluent management planning.

1.1 Study Area

The study area incorporates the reticulation network within Maryborough City and the modelled future growth areas within the urban footprint of the Maryborough City Planning Scheme. The following figure shows the extent of the trunk network servicing Maryborough.



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Date Compiled: 07/02/2011

Existing Maryborough Trunk Infrastructure 2010

2.0 OBJECTIVES

2.1 Objectives of the Study

The aim of the investigation was to review existing and projected population projections and sewer loading within the study area. This will enable the development of a strategic infrastructure plan and associated capital works program with a 20 year planning horizon to the year 2031.

Consistent with the work required to achieving these aims, a population model and a detailed sewer network model have been prepared. These models will allow Wide Bay Water Corporation to periodically undertake system analyses on the sewer network system to verify and amend the 20 year works program as necessary.

The principal objectives of the study were to:

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

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

- **develop** sewer network models for the existing system and for each of the five (5) year planning horizons to the year 2031 system;

- **produce** a 20 year capital works program based on the results of the hydraulic modelling and determine the capital requirements associated with the various augmentation options developed;

2.2 Standards of Service

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

- Total sewerage overflows per 1,000 connections/year < 5
- Odour complaints per 1,000 connections/year: < 10
- Response/ reaction time to incidents: 1 Hour
- Compliance with EPA Licence: 98%
- Utilisation or disposal of Sewerage Sludge Biosolids 100%

3.0 POPULATION PROJECTIONS AND SYSTEM DEMAND

An infrastructure planning model (IPM) was prepared to determine the sewerage load on the existing system.

An Equivalent Dwelling (ED) has been used as the basis for infrastructure planning in Maryborough. An ED is defined as the average sewage load generated by a single residential dwelling on an allotment of between 400 and 1000 m^2. An ED also forms the basis for the calculation of Infrastructure Charges in the Fraser Coast Regional Council's Planning Scheme Policy No 4 (PSP4) in Hervey Bay where it is referred to as an Equivalent Demand Unit (EDU). It is anticipated that this terminology will be retained in the Infrastructure Charging Policy currently being developed for Maryborough.

Each property within the proposed sewered area was assigned an ED rating for sewerage loading based on their size, landuse and metered water consumption for the following planning horizons:-

- Existing 2010
- 2011
- 2016
- 2021
- 2026
- ED Ultimate – 2031

3.1 Demand Allocation

Demand allocation is dependent upon the number of equivalent dwellings (ED's) either existing or permitted under the planning scheme for a particular site. Over the twenty year planning period it is forecast that residential and non-residential development will increase by approximately 0.8% annually.

The number of people per Equivalent Dwelling (ED) was obtained from the Australian Bureau of Statistics data from 2006 which indicated a population density of 2.7 people per dwelling in Maryborough. It is anticipated that this number will decrease over the planning period.

3.2 Demand Types

For modelling purposes demand types have been simplified into two categories, residential and non-residential:

- Residential demand encompasses all residential development including low, medium and high density residential development;
- Non-residential development includes commercial, industrial, educational, sporting, recreational and health related premises.

The relative percentage of each demand type varies throughout Maryborough. Areas that have a high percentage of residential demand include Tinana, Maryborough CBD and Newtown Central. Maryborough West and the Maryborough CBD have a high percentage of non-residential demands.

3.3 Existing and Projected ED Demand

Maryborough City had a residential population of approximately 27,217 in 2006 (Census Data), and based on the Queensland Treasury's Office of Economic and Statistical Research (OESR) Urban Centre and Locality (UCL) estimates that will rise to 29 023 in 2011. OESR forecasts that Maryborough will continue to grow at 0.8% per annum which is consistent with previous PIFU Medium Series Growth Projections. This growth forecast has been used throughout the report.

The recently released Draft Wide Bay Burnett Regional Plan (WBBRP) proposes to double the population of Maryborough over the planning period, however the Plan provides no economic drivers to support this population growth. For the purposes of this report no provision beyond the OESR forecasts has been made in the Demand Model.

A Sewer Demand Model for Maryborough was developed with growth forecasts through to 2031. These forecasts were adjusted in 2010 and 2011 to allow for recent connections and developments currently underway.

It should be noted that OESR projections provide for growth throughout the previous Maryborough LGA whereas the Demand Model excludes those properties outside the immediate environs of the Maryborough urban area.

Inflow records for the Aubinville WWTP from 2006 to 2010 were analysed to determine the quantum of a sewer ED in Maryborough. Hydraulic loading at the plant has reduced during this period from approximately 5.4 ML/day in 2005 to 4.3 ML/day in 2010. Several factors can explain this reduction; introduction of water meters in 2004, compulsory fitting of water saving devices in new houses, water restrictions throughout the drought (2008-09), and the lowering of the groundwater table during drought conditions which can significantly reduce infiltration. Whether this reduction is sustainable in the longer term is questionable and more data is needed to reach this conclusion.

Based on the inflow information the current discharge to sewer from a residential property is approximately 400 L/ED/day. However for planning purposes 450L/ ED/day was adopted because of the uncertainty surrounding the sustainability of the current level of inflow to the WWTP.

To calculate existing and projected Non Residential demand the existing water consumption was evaluated and appropriate factors for discharge to sewer were applied to the development. The following factors were used in the evaluation:

- Current zoning provisions, environmental and flooding constraints under the Planning Scheme, Equivalent Dwelling Units (ED's or EDU's) from PSP 4 and current metered consumption.

Residential and Non-Residential ED's were applied to existing sewered properties (rates database) to determine the existing (2010) ED sewerage loads in the Model. Growth projections and distribution assumed in the Maryborough Water Model were then applied with the following results for sewerage demand over the planning period. It was assumed that all new development within the urban footprint of Maryborough would be connected to the sewer.

Table 1: Residential and Non-Residential ED Figures for Maryborough

	2010 (Existing)	**2011**	**2016**	**2021**	**2026**	**2031**
Residential ED	8289	8471	9310	9849	10402	10933
Non Residential ED	2414	2426	2490	2555	2622	2690
Total ED	10703	10897	11800	12404	13024	13623

4.0 COLLECTION AND TREATMENT

Wide Bay Water Corporation became the Successor at Law on 1 July 2009 of the Aubinville Wastewater Treatment Plant (WWTP) formerly managed by Fraser Coast Water. Since the amalgamation, the Corporation has been investigating and reviewing the WWTP's performance and has implemented measures to improve performance and environmental compliance at the plant.

Aubinville WWTP is located north east of Maryborough City within 300 metres of the suburb of Aubinville and is immediately adjacent to the Mary River. According to the available documentation the plant has a nominal design capacity of 30,000EP at 275 L/EP/day (8.25 ML/day) with a nominal wet weather treatment capacity of 3 x Average Dry Weather Flow (ADWF) and a nominal design hydraulic capacity of 5 x ADWF. The WWTP discharges to the Mary River approximately 33km from the river mouth in the Great Sandy Straits at River Heads. The sewerage network and plant were initially constructed during the 1930's, and the WWTP was subsequently augmented in 1976 to meet the growing demand.

The raw sewage load is predominantly domestic in origin. However, until recently the WWTP also received significant quantities of septic tank and grease-trap waste from within the greater Maryborough region. Due to the configuration of the WWTP and capacity issues associated with sludge management at the plant, this waste is now transported to the Pulgul WWTP in Hervey Bay.

Historically there has been no comprehensive policing of trade waste discharge to sewer in Maryborough. Trade Waste Agreements were not in place and no trade waste inspections were carried out. There was also little or no provision for pre-treatment of trade waste discharges to sewer. Gradually, pre-treatment devices are being installed and monitored, and trade waste agreements are being introduced and policed.

4.1 Collection

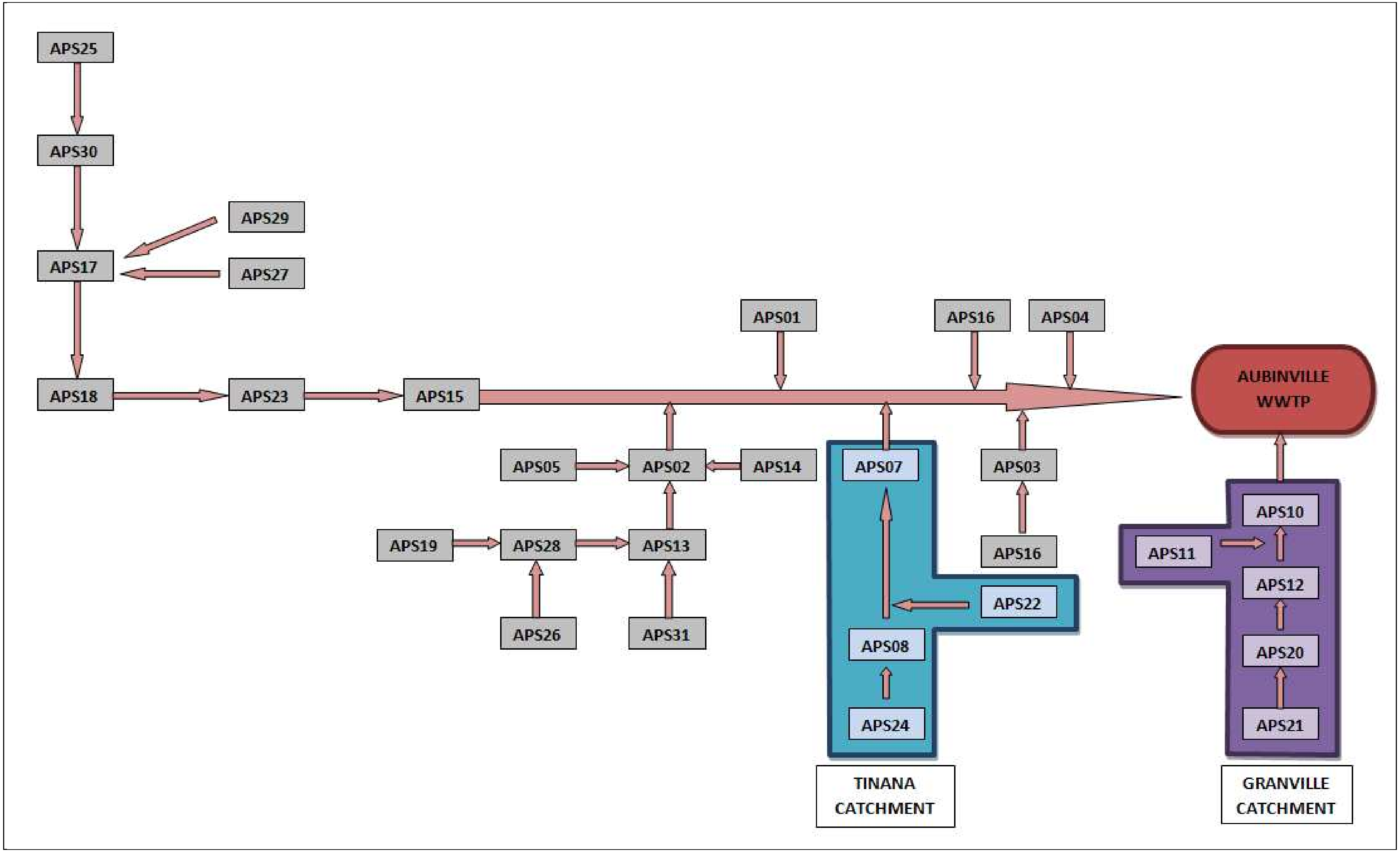
Development within the Aubinville WWTP catchment have extended the existing pipe network and due to the topography of the land a number of pump stations have been installed. There are 31 pump stations distributed throughout Maryborough. As some of these are within new developments, they are yet to come on maintenance with the Corporation.

The wastewater network has 212.30km of gravity mains and 25.0km of rising mains. The main truck sewer from the city to the WWTP is a DN1050 gravity sewer and during wet weather events acts as an online storage facility to attenuate flows before reaching the treatment plant.

The volumes of the wet wells are in the process of being confirmed. The wet well volumes assumed in this report are from the Cardno Maryborough Catchment Sewer Model Build Report 2008. Confirmation of well storage volumes is required before any planned augmentations can be carried out. The main concern is that the wet well capacity is not adequate for a majority of the wet wells and additional storage may be required in the future to control system overflows.

Below is a schematic layout of the Pump stations in Maryborough. In Appendix 1 details of the pump stations, wet well and rising main capacity calculations at average dry weather flow (ADWF), peak wet weather flow (PWWF) at 5 x ADWF and using NRM's guideline C1 factors, peak dry weather flow (PDWF).

Figure 1: Schematic layout of pump stations in Maryborough.



4.2 Aubinville Wastewater Treatment Plant

Inflow to the plant is received from a DN1050 gravity sewer and a DN250 rising main from PS 10 in Granville. These mains discharge into a lift pump station adjacent to the inlet works. There are three pumps installed in the lift station with manual duty selection. The capacity of the inlet works is insufficient to operate the 3 pumps simultaneously. This is due to the configuration of the inlet works, where surcharging of the vortex grit removal chamber occurs. The capacity of only 2 pumps operating in parallel is insufficient to meet the wet weather flows entering the lift station and as a result wet weather bypass at the plant is utilised.

There are two automatic (weir) overflow bypasses built into the plant. Each incorporates a coarse screen and discharges screened sewage directly to the Mary River. One is on the DN1050 trunk gravity main before it reaches the lift pump station within the plant and was installed around 2003. The other is within the lift pump station wet well structure immediately adjacent to the Inlet Works. Both of these bypasses are unmetered and historically overflows to the bypasses have not been reported to the EPA. WWTP's are often sized to fully treat 3 x ADWF during wet weather events with partial treatment for flows in excess of 3 and up to 5 x ADWF. The original design drawings for Aubinville show that the plant should have hydraulic capacity for 5 x ADWF (41.25 ML/day) but this is clearly not the case.

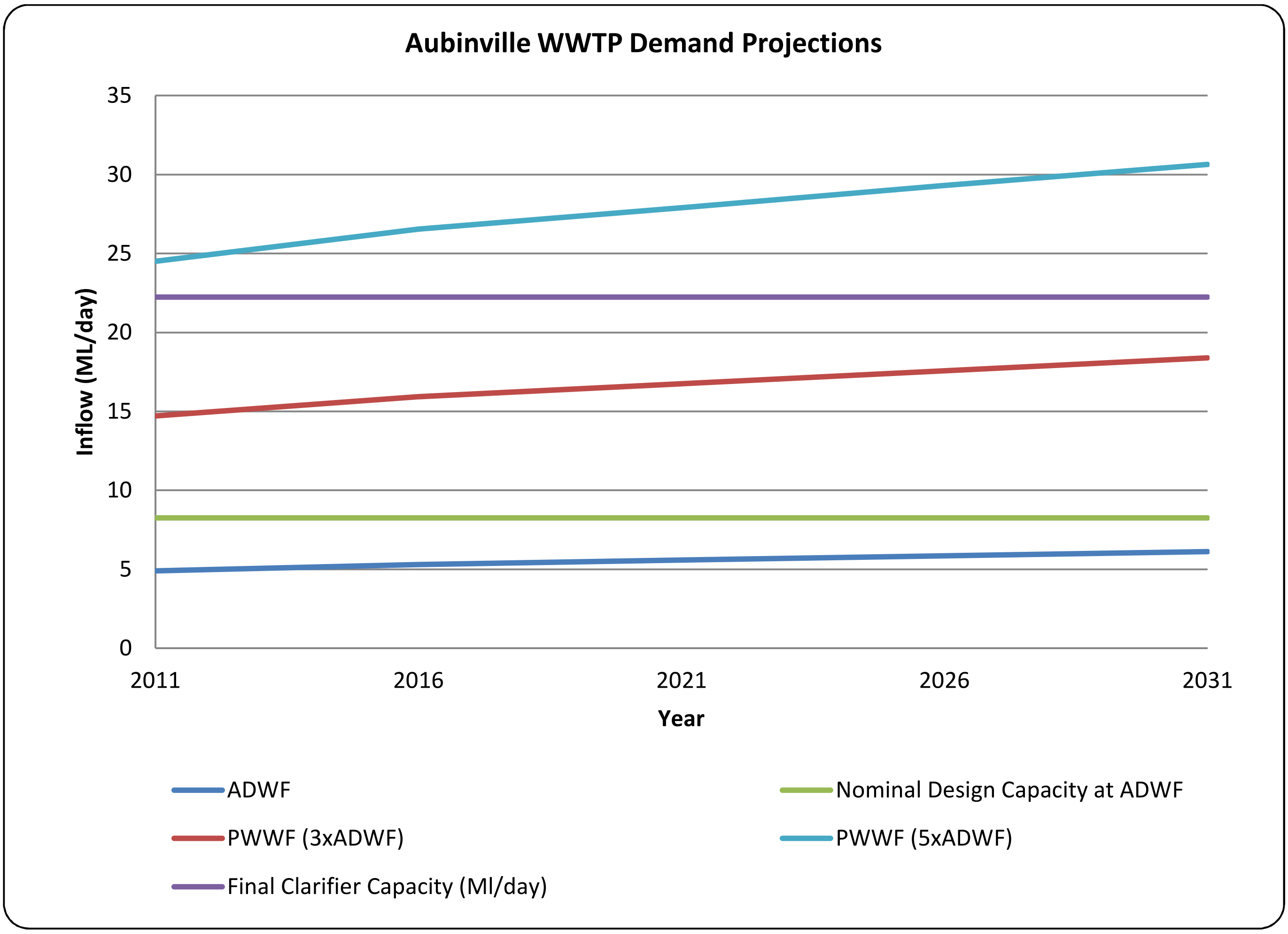
The plant configuration beyond the inlet works, where screening and grit removal occurs, is primary clarifiers (PC) followed by rock media biological trickling filtration (BTF) in-series with two parallel activated sludge reactors (AS). Secondary sedimentation beyond the AS reactors is carried out in 2 final clarifiers (FC). The plant configuration is unusual as these two entirely different systems are usually operated in parallel. Waste Activated Sludge (WAS) from the activated sludge reactors is returned to the inlet works with humus sludge from the trickling filters and passed through the primary clarifiers (PCs). Sludge withdrawal from the PC's is the only means of WAS control.

The Draft Maryborough Wastewater Treatment Plant Capacity Review Report prepared by Zemek Environmental Pty Ltd (ZE) in Feb 2008 stated, "the return of WAS back to the head of the plant and into the primary clarifiers is the most significant process impediment to the Aubinville plant." An internal review conducted by WBWC's Process Engineers presented as the Aubinville Short Term Solution Report came to the same conclusion. This report stated "the inability to remove and process biosolids created in the treatment plant will lead to the failure of unit processes and consequently failure to maintain plant discharges within licence limits."

WBWC's Operations Group is proposing to install a DAF plant on the WAS stream to remove the WAS from the PC's. This will result in a significant improvement in the operation of the PC's and produce a thicker sludge. This in turn will improve the quality of sludge leaving the digester by maintaining a minimum 12 day retention time in the digester.

The current ADWF entering the WWTP is approximately 4.3 ML/day although this was estimated at the end of an extended dry period. Where infiltration occurs due to a high water table, it is also possible to have exfiltration from the sewer reticulation when water tables are depressed. The current levels may therefore not be sustainable and forecasts have been based on 450 L/ED/day. Flow into the plant is limited by the capacity of the lift pumps which are in turn limited in their operation by the configuration and capacity of the inlet works. The hydraulic capacity of the WWTP as a whole is limited by the capacity of the final clarifiers which is estimated to be 22.24 ML/day.

Figure 2: Aubinville WWTP Demand Projection 2031



Biologically there is insufficient data on the influent quality entering the plant. The original design drawings rate the plant at 30000EP based on a BOD of 78g/EP/day. 2006 census data gives an occupancy rate of 2.7 EP/ED (persons/dwelling) in Maryborough. Assuming that the BOD load per person has remained constant, this suggests that the plant's nominal biological capacity is 10714 ED which is the estimated 2010 ED loading on the plant (excluding septic and grease trap wastes). There is an urgent need to determine the biological load on the plant as this may well be the factor that determines when capacity augmentations are required. From a hydraulic perspective there is no need for a major augmentation at the plant throughout the planning period provided wet weather inflows can be significantly reduced.

Wide Bay Water Corporation is currently negotiating the proposed discharge licence for Aubinville WWTP with the Environment Protection Authority (EPA). The proposed licence currently requires the plant to be upgraded with nutrient removal capabilities by mid 2012. This is not achievable in the specified timeframe as there are no current plans in place to provide this capability.

6.0 INFLOW AND INFILTRATION

Gravity sewerage reticulation systems have historically been designed for a Peak Wet Weather Flow (PWWF) of 5 times the Average Dry Weather Flow (ADWF) entering the system (depending upon the size of the contributing catchment). This is also a design guideline of the former Department of Natural Resources and Mines (NRM) and is applicable throughout Queensland.

The PWWF allowance provides for unwanted inflows entering the sewerage system which can be categorised into two sources:-

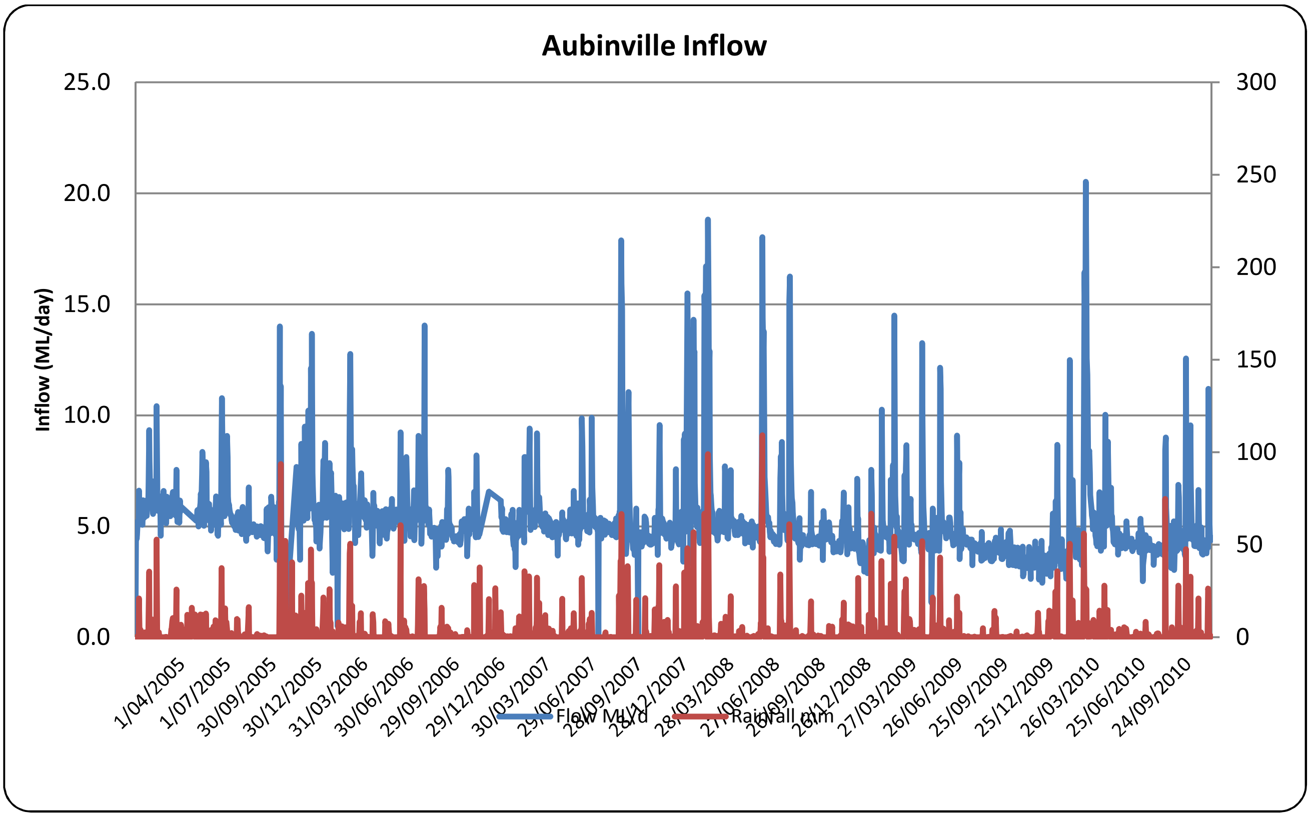
- **Infiltration** from groundwater into the sewerage system. This generally increases over the life of the sewer. It can result from poor installation/construction techniques and infrastructure integrity issues (cracked or broken pipes, failed pipe and manhole seals, broken or damaged house connection branches or jump-ups etc). Infiltration into the sewer is related to the height of the water table and in coastal areas can be influenced by tidal ranges. When inflow and rainfall are graphed, infiltration is shown by a recession curve over a long period of time following the rainfall event.

- **Inflow** into the system from direct connection to stormwater. This can occur through a number of means including illegal connections of stormwater drainage, paving around overflow relief gullies allowing stormwater to directly drain into the sewer, and damaged, broken or submerged manhole covers. As inflow is directly related to rainfall, when graphed it is shown as a sharp spike of inflow into the system during a storm event. An extended recession curve that follows this spike is infiltration into the system.

Inflow records for the Aubinville WWTP from December 2005 to November 2010 are reproduced in the following graph.

Inflow is clearly delineated by sharp spikes corresponding to rainfall events. There is a general reduction in daily flows over time from a daily average of approximately 5.4 ML/day in 2005 to around 4.3 ML/day in 2010.

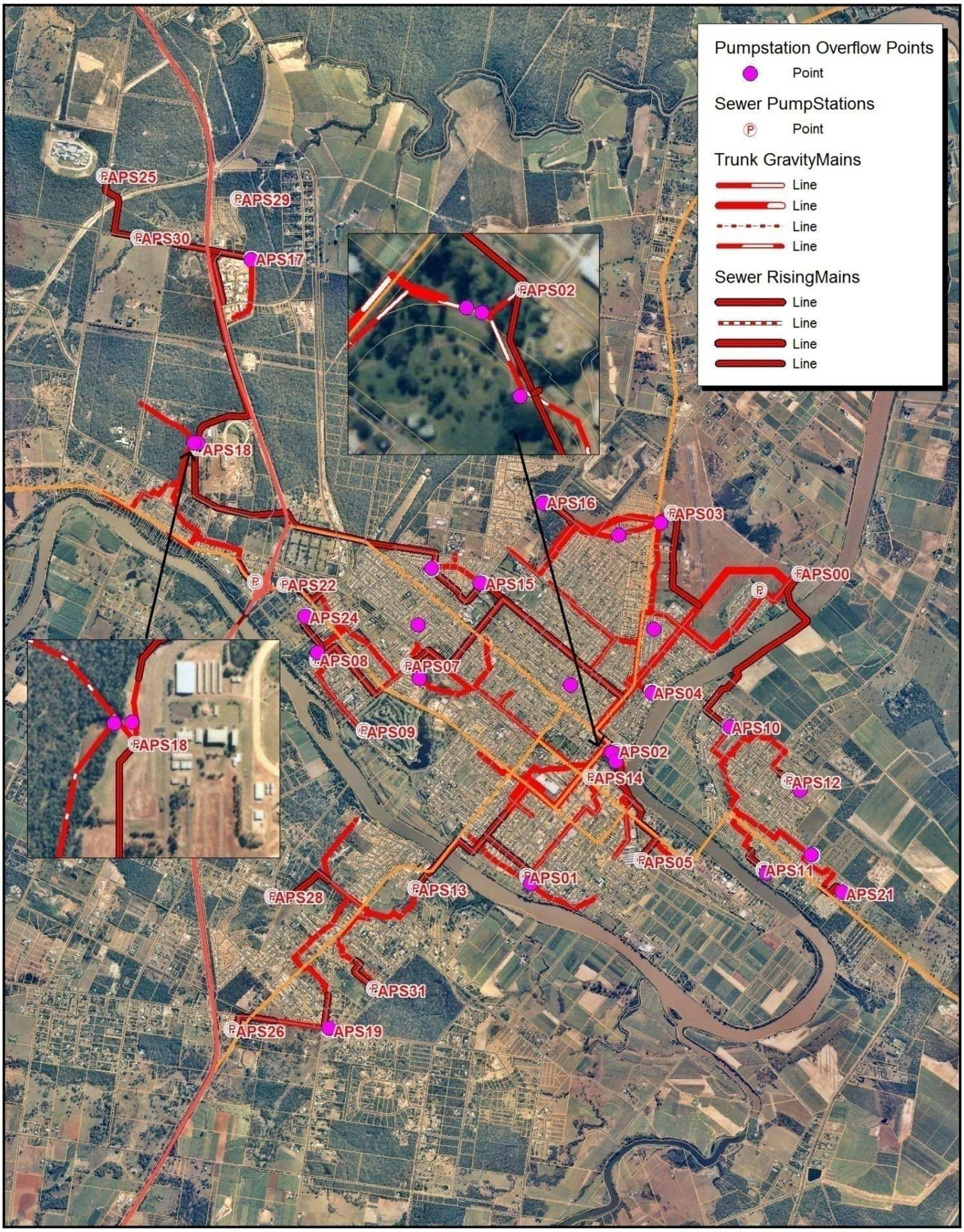
Figure 3: Aubinville WWTP Inflow and Rainfall 2005-2010



Where there is excessive Infiltration and Inflow (I/I) into a sewerage system overflows from the network can occur. Currently there are a number of overflow points built into the reticulation network and pump stations, and wet weather bypasses have been constructed at the Aubinville WWTP due to capacity limitations. None of the overflows are metered and consequently losses from the system cannot be determined with any accuracy. The sewerage network model estimates that at 5 times ADWF, overflow losses from surcharging manholes and pump stations total approximately 8ML per day. Actual peaking factors in many pump station catchments are significantly higher than 5. When all the overflow relief points were removed from the model and all wet weather flows (5xADWF) were transferred to the receiving well and lift pumps at the WWTP, approximately 5ML per day was lost through the bypass.

The following plan shows the location of pump stations in Maryborough and constructed overflow points throughout the network.

Modelling has assumed that PWWF is limited to 5 times ADWF but much higher ratios exist in many of the Maryborough pump station catchments. Records from the 12 months to November 2010 for each pump stations' inflow, estimated ADWF and rainfall for each catchment were plotted. Flow spikes associated with rainfall events (inflow) and the recession curves after the rainfall events (infiltration) are clearly shown with the magnitude of the wet weather peaks. The graph for Pump Station APS05 is a good demonstration of the Inflow spikes and the Infiltration recession curves. It should be noted that the largest rainfall event during this time period was not significant enough to represent a peak wet weather event.



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Important Notice!
This map is not a precise survey document. Accurate locations can only be determined by a survey on the ground.

Sewer Pumpstation Overflow Points Maryborough Strategy 2010

Figure 4: Pump station APS 01 Discharge and Rainfall 2010

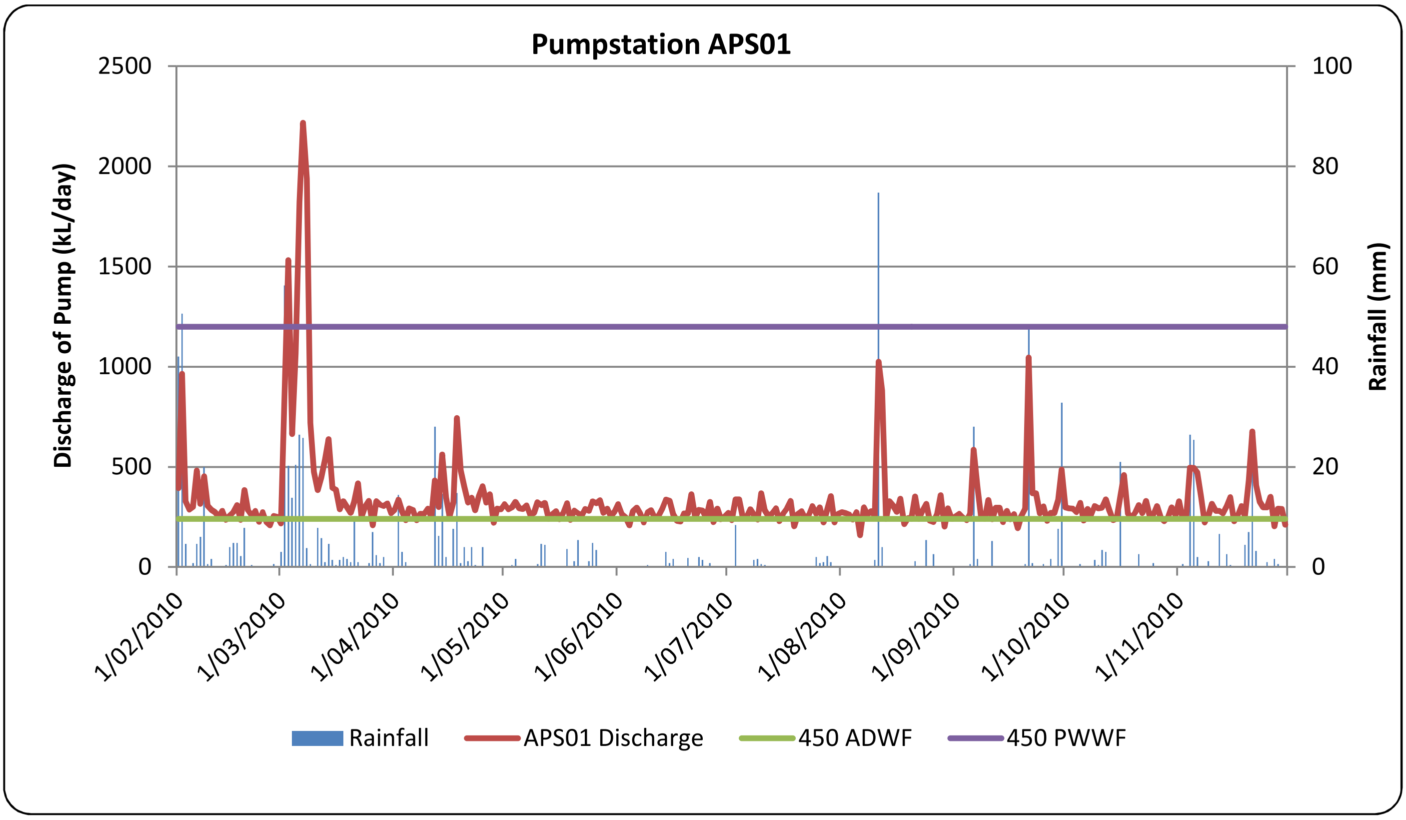


Figure 5: Pumpstation APS02 Discharge and Rainfall 2009-2010

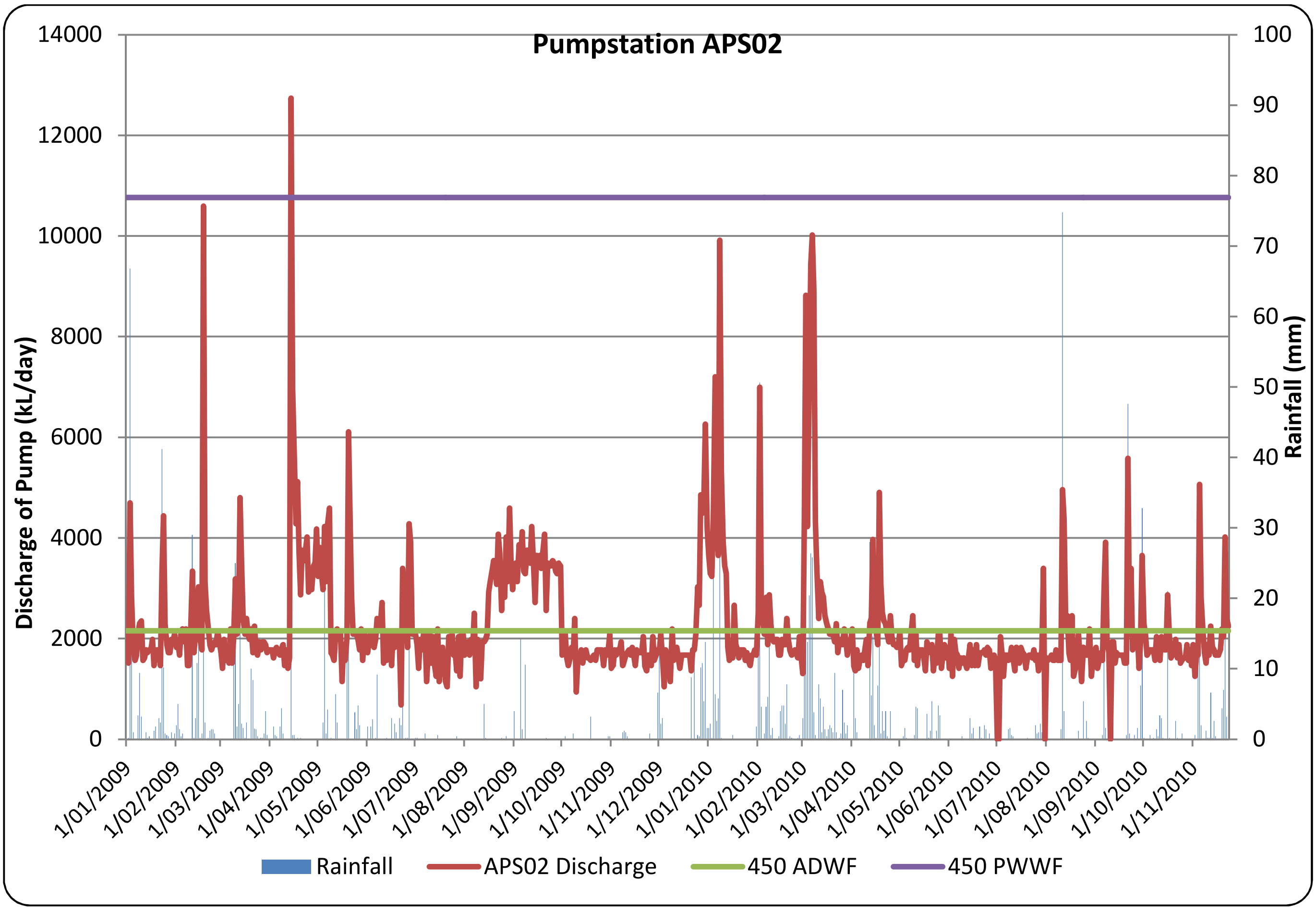


Figure 6: Pump station APS03 Discharge and Rainfall 2009-2010

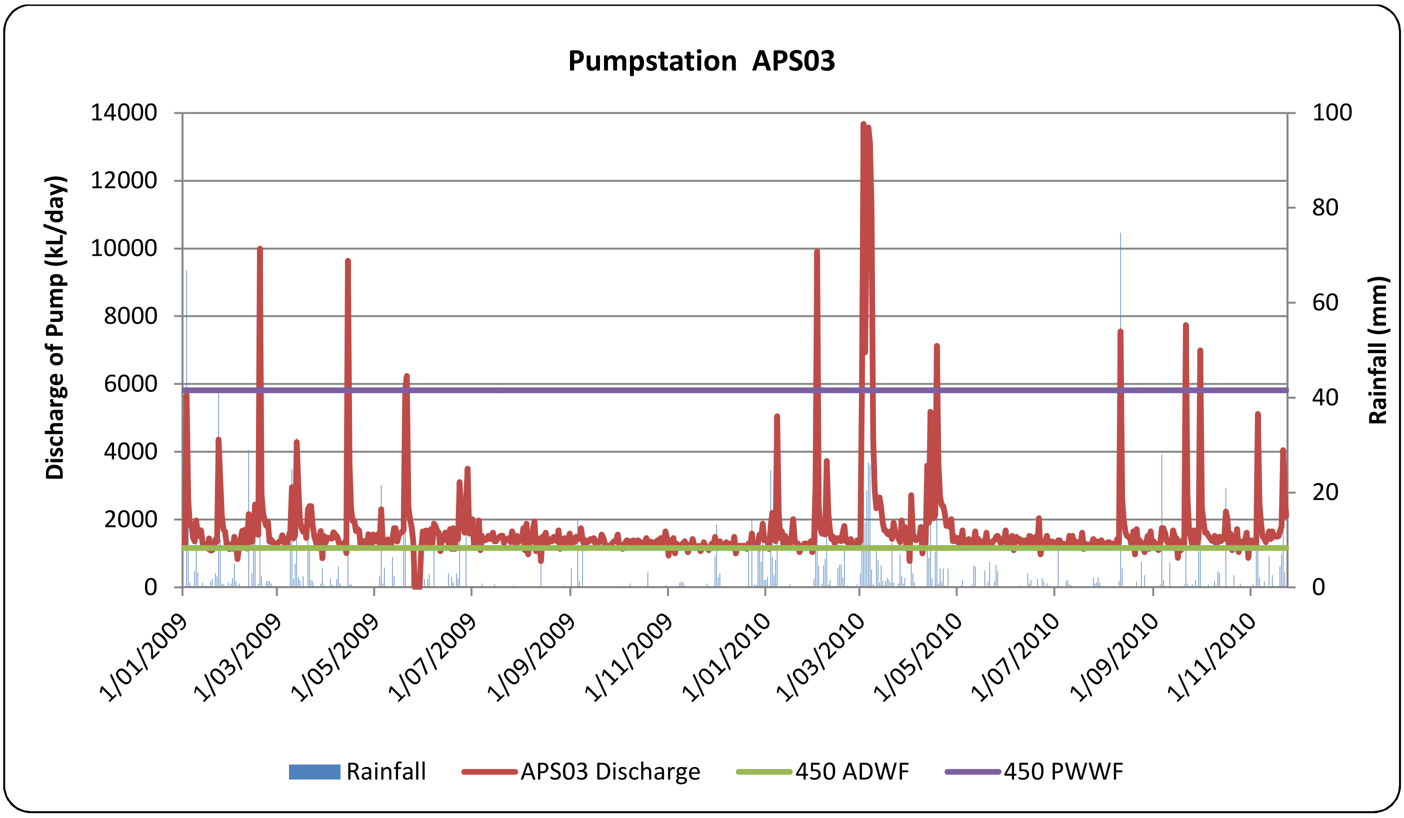


Figure 7: Pumpstation APS05 Discharge and Rainfall 2010

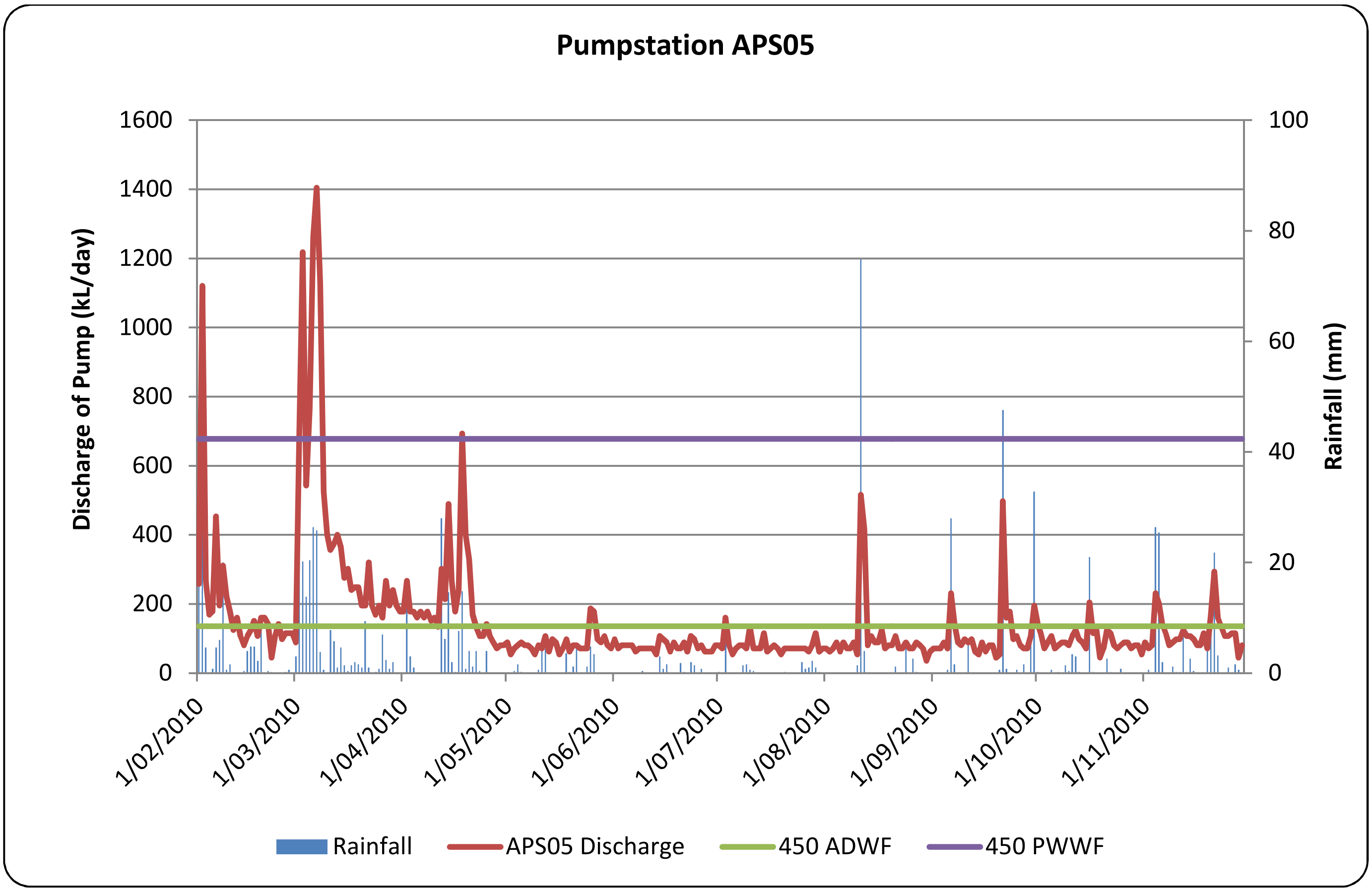
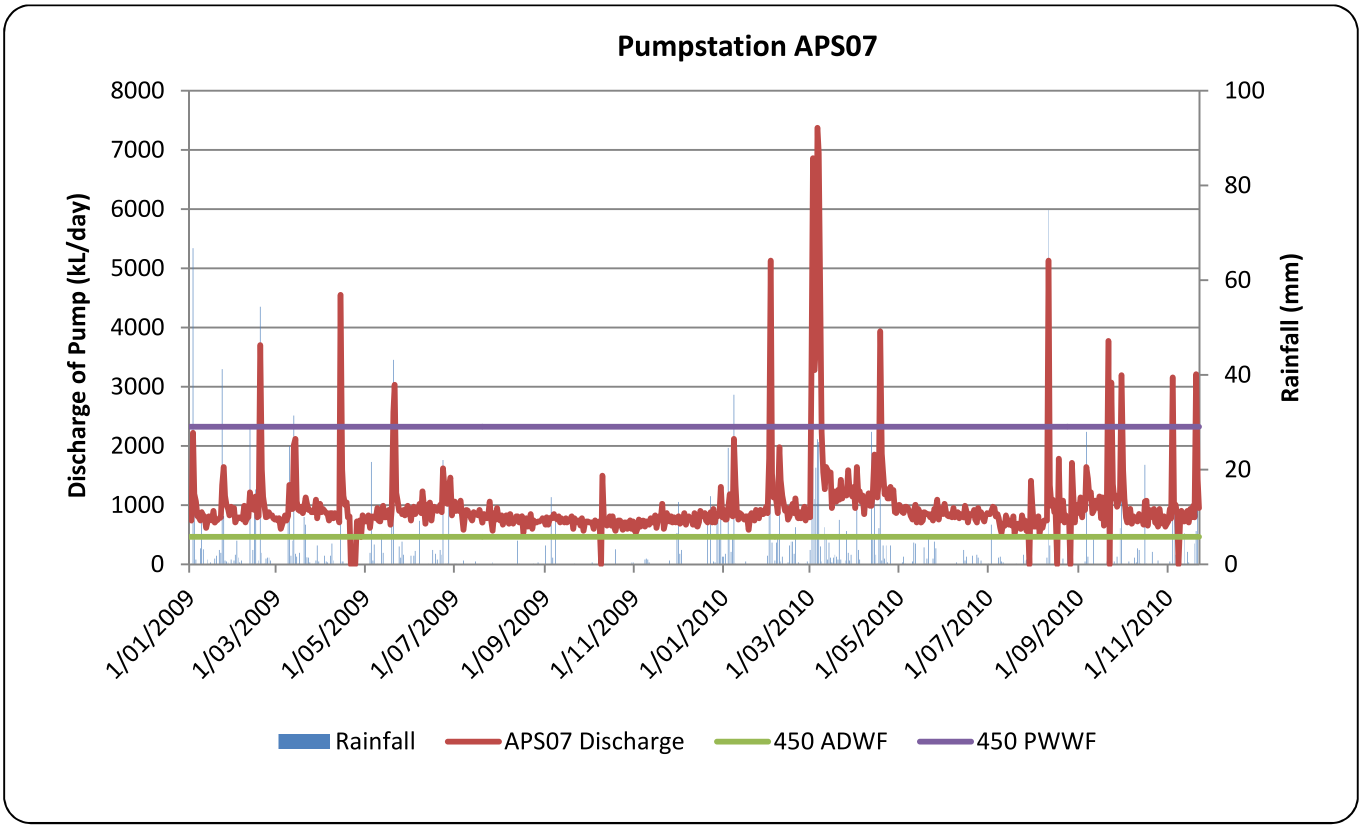


Figure 8: Pump station APS07 Discharge and Rainfall 2010



The additional volume of stormwater entering the reticulation system places additional demands on the system. It is required to be pumped and stored within the system, and at the WWTP it adds significant volumes to be treated. From the perspective of irrigation and effluent re-use it results in additional storage requirements and irrigation facilities to dispose of the treated effluent.

From an analysis of available pump station records the quantity of stormwater entering the system in Maryborough is estimated to be in excess of 250 ML for the 2009/10 financial year. An unknown volume of water was lost from the system through the existing overflows and the bypasses at the WWTP.

It is evident from this snapshot of pump station daily flows that there are significant I/I problems in Maryborough. From a capacity perspective, there are few pump station/rising main/reticulation upgrades required to meet projected PWWF at 5 times ADWF throughout the planning period to 2031. However, the peaking factors in Maryborough are significantly higher than 5 in the majority of pump station catchments. Where pump stations discharge to downstream pump stations the cumulative impact of upstream pump stations is transferred downstream.

7.0 OPTIONS REVIEW

7.1 Aubinville Treatment Plant

Load projections for the Aubinville WWTP indicate that the WWTP has adequate hydraulic capacity for ADWF throughout the planning period. At 3 x ADWF during wet weather events the plant has capacity to treat the flows but based on the capacity of the final clarifiers it will be only able to handle 4 x ADWF until around 2020. It is currently hydraulically overloaded at 5 x ADWF.

In addition to the process and sludge handling issues mentioned earlier in this report, the amount of sewage lost during PWWF events is a concern. The hydraulic capacity of the inlet works and the WWTP final clarifiers limits the capacity of the plant to treat wet weather flows and results in overflows to the Mary River through the by-passes.

There is a lack of information on the size and condition of buried pipes, valves and other equipment, the condition and capacity of individual process units and the influent quality entering the plant. There is also little performance data available on the individual process units. Whilst a preliminary assessment of biosolids management within the plant has been completed, a thorough review of the plant capacity at the component level needs to be undertaken to identify any process capacity issues beyond those already identified. A comprehensive analysis of influent quality also needs to be undertaken before any meaningful assessment of the hydraulic and biological capacity of the plant can be prepared.

There are also odour buffer issues at Aubinville with many dwellings constructed within 400 metres of the plant. One dwelling is located less than 50 metres from the sludge drying beds. Future planning for the plant will need to address this issue.

The proposed 2012 licence conditions (currently under negotiation with the EPA) indicate that discharge from the Aubinville WWTP to the Mary River at current effluent quality leaving the plant is unlikely to continue for much longer. It is likely that significant capital works will be required to either upgrade the plant to meet future licence requirements (particularly as they relate to nutrient removal), or to significantly increase re-use as a way of removing effluent from the river. Any options for upgrading the Aubinville WWTP need to be investigated with a view towards maximising the life of the existing infrastructure. At the same time a concerted effort needs to be made to reduce wet weather flows entering the plant.

Upgrading the existing plant and concentrating on effluent re-use to manage effluent from the plant may not be the most cost-effective solution to wastewater management in Maryborough. Augmentation of the plant to meet environmental requirements for discharge to the Mary River may well be a more cost effective solution in the longer term. Any additional process units should be located no closer to the existing residences in Aubinville. An appropriate odour buffer should be incorporated into the Planning Scheme to prevent further development from encroaching on the plant and to protect this valuable community asset.

A comprehensive investigation into, and documentation of, the Aubinville WWTP needs to be undertaken to confirm the as-constructed details and condition of the plant. This investigation should also address influent characteristics or biological load at the plant. Subsequent to this investigation, a Report needs to be prepared on the options available for wastewater treatment and management in Maryborough.

7.2 Inflow and Infiltration

Reduction of inflow and infiltration into the system to a manageable level is the only economical and environmentally viable solution. Simply over-sizing infrastructure to handle the inflows does not address the root cause of the problem. Major inflow and infiltration sources need to be located and eliminated. As inflow and infiltration occurs across the entire system it will be necessary to implement a planned and structured approach that will quantify the problem so that future capital works programs can be developed. A combination of CCTV, smoke and dye testing, and property by property inspections will be required.

Recently conducted CCTV inspections have also revealed sections of the network that are so old and structurally degraded from H_2S attack that structural relining or replacement may also be required.

It is not possible at this point to estimate the scale of remedial works required to address I/I in Maryborough, nor is it possible to quantify the condition of the underground infrastructure until a substantial amount of further investigation is undertaken. WBWC's Operations Manager has estimated that it will take approximately 3 years to CCTV the reticulation network. The cost to remedy the I/I and condition issues within Maryborough is likely to cost in the millions due to the age and likely condition of the reticulation system.

It is recommended that assessment of I/I and the development of a structured approach to I/I reduction in Maryborough be given a high priority.

Effective management and administration of an I/I program is resource intensive. Field investigation and repairs are only part of the work. Collation of data, engineering of solutions, development of remedial and capital works programs, assigning priorities, defect notifications to property owners, follow up inspections, follow up notices and progress reporting are but some of the administrative functions necessary to support such an undertaking. Effective delivery requires a dedicated position for a person with an engineering background to develop and deliver the program which is likely to take several years.

To support such a program it is suggested that a budget allocation of $500,000.00 will be required to carry out the first stage of the administrative and investigative component in the 2011/2012 financial year. A further $250,000.00 should be budgeted to effect repairs to major defects as they are discovered.

Results from modelling inflow and infiltration are found in Appendices 2 and 3.

8.0 CONCLUSIONS

The review of the available data and recent reports on the Maryborough Sewer System has concluded that the existing transport and reticulation network is generally capable of handling normal design flows, and with some augmentation will manage flows beyond 2031.

Inflow and infiltration and the age and condition of the network are the two major issues that need to investigated and addressed. Inflow and Infiltration currently contributes in excess of 250 ML/annum to the Aubinville WWTP and this additional volume of unwanted wastewater must be managed through either reuse or discharge to the Mary River.

It is also concluded that hydraulically the Aubinville WWTP has adequate capacity to treat projected dry weather flows to 2031 and that there are some capacity limitations with respect to wet weather flows at the plant. There is little information available on the biological load entering the plant and a comprehensive influent quality monitoring program needs to be undertaken. Plant biological loading is likely to be the driver for future plant augmentation. Sludge management issues have also been identified at the plant and steps have been taken to provide a belt filter press to improve sludge management.

9.0 RECOMMENDATIONS

The following recommendations are made with respect to this report:

1. That the Board adopts the Maryborough Wastewater Strategy Report 2010 as the basis for development of a Capital Works Programme for the period to 2031;
2. That this Report be reviewed every five years, as a minimum, to address any changes to wastewater production, population growth rates and development sequencing;
3. That reduction of Inflow and Infiltration into the Maryborough sewer reticulation system be given a high priority in the forward works program, and that a dedicated position be created to manage I/I in both Maryborough and Hervey Bay;
4. That details of the Aubinville Wastewater Treatment Plant be collected and documented and that influent quantity and quality be monitored to determine the current loading at the plant;
5. That a Report be prepared on Options for the future treatment and management of effluent for Maryborough, and that this investigation include an evaluation of the option of discharge to the Mary River.

10.0 20 YEAR CAPITAL WORKS PROGRAMME

Project Number	Task/ Location	Description	Year	Investigation	Planning and Design	Construction	Maintenance	Commission	10% Contingency	TOTAL	Notes
WWTP_IWU1	Aubinville WWTP	Increase the Capacity of the Lift Pumps into the Plant to 284 l/s (4 x ADWF)	2012		25000	220000		5000	25000	275000	May Tie into any augmentation works into Treatment Plant. Including, pipework and equipment, Mechanical, Electrical and Telemetry for a 70 kW pump Station
WWTP_PSU1		Increase the capacity of the inlet works	2011		100000					100000	
PSU13	Pump Station 13	Increase the capacity to 78l/s	2012/13		30000	183000		5000	21800	239800	Including Pipework and Equipment, Mechanical and Electrical and Telemetry for an estimated 50kW pump Station
RMU463	Rising Main 463 (from PS 28)	Upgrade to 150mm Diameter, 733 m along existing alignment	2025		30000	146000		10000	18600	204600	Based on construction in good soil in a rural area. Original Estimate $93112. Have accumulated original cost with a CPI of 3.0% as a price rise yearly for 15 years.
WWCI	Maryborough	Wet Well Capacity Investigation inc. Draw Down Tests	2011/12	100000						100000	
MII	Maryborough	Inflow Infiltration	2011/12	500000			250000			750000	

APPENDIX 1: PUMPSTATION AND RISING MAIN CAPACITY

Summary of Rising Mains in Maryborough

ID	Diameter	Length	Material	Internal Diameter	Capacity (@ 1.5 m/s)	Peak Wet Weather Flow (L/s)						Upstream connection	Downstream connection
	mm	m		mm	L/s	2010	2011	2016	2021	2026	Ult ED		
SRM459	225	959	UPVC	226	60	13	13	13	14	14	16	APS0100	MH55744
SRM441	300	303	UPVC	285	95	125	127	135	152	159	200	APS0200	MH52655
SRM439	300	1140	UPVC	285	95	65	65	67	70	71	91	APS0300	MH52651
SRM443	100	97	UPVC	102	12	1	1	1	1	1	2	APS0400	MH54405
SRM438	200	1426	UPVC	203	49	7	7	7	7	7	7	APS0500	APS0200
SRM442	150	50	UPVC	143	24	4	4	4	4	4	5	APS0600	MH52676
SRM458	375	3041	UPVC	376	167	26	26	26	28	28	39	APS0700	MH52659
SRM440	250	905	UPVC	253	75	14	14	15	16	16	24	APS0800	MH52652
SRM450	250	2410	UPVC	253	75	27	27	29	31	32	43	APS1000	APS0000
SRM447	100	281	UPVC	102	12	2	2	2	3	3	5	APS1100	MH53355
SRM446	100	128	UPVC	102	12	6	6	7	8	8	11	APS1200	MH53464
SRM437	200	1100	UPVC	203	49	31	34	39	53	56	70	APS1300	SRM459
SRM455	150	4	UPVC	143	24	12	12	12	13	13	16	APS1400	MH54604
SRM436	200	272	UPVC	203	49	31	31	31	33	34	52	APS1500	SRM458
SRM448	150	379	UPVC	143	24	8	8	8	9	9	12	APS1600	MH54201
SRM456	200	2926	UPVC	203	49	10	11	11	11	11	21	APS1700	MH52636
SRM451	200	3323	UPVC	203	49	18	18	19	20	20	36	APS1800	APS2300
SRM449	100	408	UPVC	102	12	2	2	2	3	3	5	APS1900	MH52955
SRM445	100	59	UPVC	102	12	0	0	1	1	1	1	APS2000	MH55854
SRM444	150	293	UPVC	143	24	1	1	1	1	1	2	APS2100	MH53354
SRM452	80	441	UPVC	79	7	0	0	0	0	0	2	APS2200	MH55721
SRM435	200	767	UPVC	203	49	25	25	25	26	27	44	APS2300	APS1500
SRM462	100	415	UPVC	143	24	1	1	1	1	1	1	APS2400	MH52466
SRM460	150	964.4	UPVC	143	24	2	2	2	2	2	5	APS2500	APS3000
SRM453	100	536	UPVC	102	12	0	0	0	0	0	1	APS2600	MH55614
SRM454	100	261	UPVC	102	12	0	0	0	1	1	1	APS2700	MH55576
SRM463	100	733	UPVC	102	12	1	1	2	8	8	8	APS2800	MH55660
SRM461	150	1185	UPVC	143	24	2	2	2	2	2	5	APS3000	MH52832
SRM464	150	256.3	UPVC	143	24	0	1	4	4	4	5	APS3100	MH55991
SRM457	150	7	UPVC	143	24							NONE	SRM438

Add summary of Pump station capacities from the excel spreadsheet in final folder. It’s the table called Pumpstationprintview.

APPENDIX 2
MODEL REVIEW AND ANALYSIS

Hydraulically the model assumes the system is in reasonable condition, but as condition assessments continue this is likely to need revision due to the age of the network. The mechanical relining of aging asbestos pipes will reduce the diameter and capacity of pipes. Modelling their improvements has not been possible. The model is may be used for the following:

- Capital Works Planning;
- Assist in the processing of development applications;
- Assist in identification of information gaps to improve confidence levels including manhole details, sewer pump station details and CCTV survey/condition ratings;
- Pump capacities.

The sewer model was constructed from the original Cardno Sewer Model created in XPS SWMM and was reconstructed in Infoworks CS which is the same software used for the Hervey Bay Sewer Model. The model was updated using the current GIS data (May 2010). This was essential to ensure consistent data for both cadastral and asset information. Spatial and attribute data was also imported. Pump station data was updated using specific pump curves available or sourced from suppliers. Confirmation of as constructed drawings for new pump stations 29 and 30 is outstanding and they have not been included in the sewer reticulation analysis.

Properties/catchments were designated initially by rated properties. Future growth properties were identified during this process thus enabling future requirements of the sewer system to be incorporated and consequently the scheduling of capital works upgrades. Increasing the area of future development will also enable any development within that area to be assessed accurately using the sewer model.

The hydraulic analysis adopted an ADWF load of 450 L/ED/Day. For design purposes the model was run at 5 x ADWF. All initial runs were completed to highlight areas that will require system upgrades. This illustrated the potential escalation of problems when upgrades are delayed.

All existing overflows in the system, that are currently present in the field and usually upstream of the pump stations, have been removed to provide the worst case scenario. This allowed potential problems to be highlighted without the band-aid solution of overflows taking the pressure off the pump stations and ultimately the treatment plant. The last overflow remains upstream of the lift pumps into Aubinville WWTP. This was implemented to show how much potential wastewater could bypass the treatment plant and discharge into the Mary River at the current time. The future scenarios for 2011, 2016, 2021, 2026 and 2031 have the bypass removed as it is unlikely that the continued use of the bypass will be acceptable to regulatory authorities.

Along with scheduled replacement of aging pipes, fittings and pump stations the model has illustrated upgrades required in the next 20 years. The growth area of Tinana requires a pump station upgrade to APS 13 which is the final pump station for the suburb before it is pumped across the Mary River. APS 13 requires a capacity upgrade to 78L/s, as it currently is has an estimated capacity of 21.8L/s. This upgrade is required in the next 2 years as the existing pumps are at capacity.

Rising Main SRM463 (from APS 28) will require and upgrade to 150 mm diameter in 2025 due to increased potential growth in that area over the next fifteen years. Rising Main SRM441, which is connected to Pumpstation 2 is under capacity. The flow rate at 1.5m/s within the pipe is 95 L/s while the current flow is estimated at 131L/s.

The imminent problem is the capacity of the lift pumps into Aubinville Waste Water Treatment Plant. They have been replaced in 2010 but do not have the 2031 capacity of 4 x ADWF of 285 L/s. Currently the model is indicting that using a bypass at the Aubinville Lift Pump Station to divert flows into the Mary River discharges 10.5 ML volume of raw sewerage into the Mary River at 5 x ADWF. There is nothing to substantiate this in the field this as there is no flow meters on the bypass but due to environmental restrictions on discharge this needs to be further investigated. The limiting factor is the hydraulic capacity of the plant. The inlet works and associated infrastructure restricts the amount that the plant can process. The model is used for reticulation only and cannot estimate the impact of the different aspects of treatment processes throughout the plant. It only highlights where reticulation requires attention and where emerging issues may arise.

APPENDIX 3
RESULTS OF MODELLING INFLOW AND INFILTRATION

The modelling process involved an investigation into the effects of infiltration and inflow on the system. The model was run at 8 x ADWF. Modelling excessive flows highlighted the catchments in order of priority that require works to decrease inflow and infiltration. Analysis of pumpstation records supports the modelling outputs but also indicates that I/I is generally widespread throughout the network.

Overflows/Sewerage Volume Lost 2011 –
Aubinville Lift Pumps: 20627.9KL
TMA/2A: 493.9KL located upstream of Aubinville – In Model ONLY
MH 52409 (formerly A1/1A): 862.4 KL located in catchment 13.

Overflows/Sewerage Volume Lost 2016
Aubinville Lift Pumps: 27203.7 KL
MH 52656 (formerly TM2/25): 5.7KL located in catchment 2
MH 52368 (formerly TM2/26): 26.5 KL located in catchment 2
MH 52675 (formerly TM7/6): 10.4 KL located in catchment 6
MH 52652 (formerly TM8/1): 12.9 KL located in catchment 9
MH 52653 (formerly TM8/2): 6.6 KL located in catchment 9
TMA/2A: 945.1 KL located upstream of Aubinville – In Model ONLY
TMA/2B: 3.7 KL located upstream of Aubinville – In Model ONLY

Overflows/Sewerage Volume Lost 2021
Aubinville Lift Pumps: 25951.2 KL
MH55833: 369.3 KL located in catchment 28.
TMA/2A: 855.4 KL located upstream of Aubinville – In Model ONLY

Overflows/Sewerage Volume Lost 2026
Aubinville Lift Pumps: 27228.9 KL
MH 59748 (formerly 1A/15): 19.8 KL in catchment 10
MH 59264 (formerly 1B/16): 11.6 KL in catchment 10
MH 53099 (formerly A/7): 618.3 KL in catchment 13
MH 52409 (formerly A1/1A): 465.1 KL in catchment 13
MH 52942 (formerly A20/1): 0.1 KL in catchment 13
MH 54196 (formerly M214G/4): 66.0 KL in catchment 3
TMA/2A: 937.8 KL located upstream of Aubinville

Overflows/Sewerage Volume Lost 2031
Aubinville Lift Pumps: 28150 KL
TMA/2A: 1027.2 KL located upstream of Aubinville – In Model ONLY
MH 59748 (formerly 1A/15): 163.7 KL in catchment 10
MH 59264 (formerly 1B/16): 58.1 KL in catchment 10
MH 53099 (formerly A/7): 953.6 KL in catchment 13
MH 52409 (formerly A1/1A): 837.0 KL in catchment 13
MH 52942 (formerly A20/1): 179.7 KL in catchment 13
MH 54196 (formerly M214G/4): 156.4 KL in catchment 3

First Order assessment of Inflow and Infiltration per sewer catchment

	Pumpstation Catchments	Total Catchment ED	Average INFLOW per Year (ML)	Average INFILTRATION per Year (ML)	Individual Pumpstation Catchment INFLOW	Individual Pumpstation Catchment INFILTRATION	Total Catchme Area (m2)
APS01		509	22.29	9.85	22.29	9.85	1,231,000
APS02	APS01, APS05, APS13, APS14, APS19, APS26, APS28 APS31	4785	34.36	6.56	-44.39	6.56	3,572,000
APS03	APS04, APS16	2509	85.04	28.84	80.63	28.84	3,320,000
APS04		37	0.52	0.14	0.52	0.14	78,340
APS05		286	12.55	3.56	12.55	3.56	1,128,000
APS06		144	0.21	0.01	0.21	0.01	205,400
APS07	APS08, APS09, APS22, APS24	980	65.83	35.98	50.33	26.42	797,800
APS08	APS09, APS22, APS24,	554	18.86	11.27	15.50	9.56	1,021,000
APS09		140	2.06	1.21	2.06	1.21	852,600
APS10	APS11, APS12, APS20, APS21	1043	5.19	1.48	-45.63	-37.35	1,564,000
APS11		90	1.22	0.39	1.22	0.39	235,700
APS12		242	50.73	38.99	49.59	38.44	554,400
APS13	APS19, APS26, APS28, APS31	1208	39.36	20.36	43.91	23.59	2,925,000
APS14		449			0.00	0.00	
APS15	APS17, APS18, APS23, APS25 APS27, APS29, APS30	1181	32.06	5.20	59.94	27.01	320,600
APS16		306	3.89	1.23	3.89	1.23	497,800
APS17	APS25, APS29, APS30	402	16.43	11.24	21.18	15.10	2,454,000
APS18	APS17, APS25, APS27, APS29, APS30	703	79.87	46.63	58.68	31.54	2,948,000
APS19	APS26	79	4.91	3.34	4.91	3.34	154,000
APS20		19	1.60	0.86	1.14	0.55	25,670

APS21		32	0.46	0.31	0.46	0.31	161,600
APS22		11	0.97	0.47	0.97	0.47	105,100
APS23	APS17,APS18, APS25 APS27, APS29, APS30	944	30.81	9.73	-27.88	-21.81	487,300
APS24		24	0.33	0.03	0.33	0.03	46,940
APS25		86	4.76	3.86	4.76	3.86	1,278,000
APS26	Need more data	3			0.00	0.00	
APS27	Need more data	18			0.00	0.00	
APS28	Need more data	57	0.35	0.11	-4.55	-3.23	326,800
APS29	Need more data	0			0.00	0.00	
APS30	APS25	86			-4.76	-3.86	
APS31	Need more data	5			0.00	0.00	
APS00	ALL AUBINVILLE	10643					
		Total for 450 L/ED/Day	**222.69**	**78.08**			**26,291,050**