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MIPP Early Stage Assessments

We Deliver

Interconnection of Hervey Bay to Maryborough Water Supply Schemes - Strategic Assessment of Service Requirements

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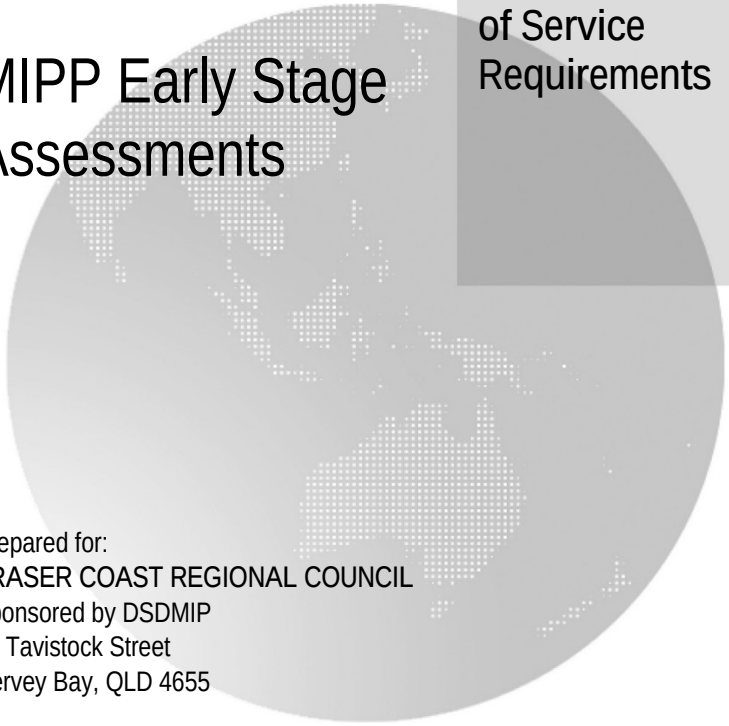
MIPP Early Stage Assessments



Prepared for:
FRASER COAST REGIONAL COUNCIL
Sponsored by DSDMIP
77 Tavistock Street
Hervey Bay, QLD 4655

Prepared by:
Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317
Level 11, 199 Grey Street | South Brisbane
Qld 4101 | Australia
GPO Box 633 | Brisbane Qld 4001 |
Australia

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Limitations Statement

The sole purpose of this report and the associated services performed by Kellogg Brown & Root Pty Ltd (KBR) is to present future Hervey Bay water source options in the form of a Strategic Assessment of Service Requirements (SASR), in accordance with the scope of services set out in the contract between KBR and Fraser Coast Regional Council ('the Client'). That scope of services was defined by the requests of the Client, by the time and budgetary constraints imposed by the Client, and by the availability of access to the site.

KBR derived the data in this report primarily from the findings from the 2015 Fraser Coast Water Supply Strategy. The passage of time, manifestation of latent conditions or impacts of future events may require further exploration at the site and subsequent data analysis, and re-evaluation of the findings, observations and conclusions expressed in this report.

In preparing this report, KBR has relied upon and presumed accurate certain information (or absence thereof) relative to existing infrastructure, existing water capacity, and future demands provided by government officials and authorities, the Client and others identified herein. Except as otherwise stated in the report, KBR has not attempted to verify the accuracy or completeness of any such information.

No warranty or guarantee, whether express or implied, is made with respect to the data reported or to the findings, observations and conclusions expressed in this report. Further, such data, findings, observations and conclusions are based solely upon Wide Bay Water Corporation's 2015 Fraser Coast Water Supply Strategy, in addition to Client supplied information on existing infrastructure, existing water capacity, and future demands in existence at the time of the investigation.

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Revision History

Revision	Date	Comment	Signatures			
			Originated by	Checked by	Technical Approval	Project Approval
A	20/09/18	Draft Issue	M. Herring	T. Belgrove	R. Populin	K. Fung
0	10/10/2018	Final	M. Herring	T. Belgrove	R. Populin	K. Fung

Contents

List of abbreviations

ADD	Average Day Demand
AHD	Australian Height Datum
ARI	Average Recurrence Interval
CWS	Clear Water Storage
DBP	Disinfection By-Products
DEWS	Department of Energy and Water Supply
DILGP	Department of Infrastructure, Local Government, and Planning
DOC	Dissolved Organic Carbon
DSDMIP	Department of State Development Manufacturing Infrastructure and Planning
ED	Equivalent Dwellings
FCRC	Fraser Coast Regional Council
KBR	Kellogg Brown & Root Pty Ltd
LOS	Levels of Service
MDMM	Mean Day Maximum Month
MIPP	Maturing the Infrastructure Pipeline Program
NOM	Natural Organic Matter
PAF	Project Assessment Framework
PE	Preliminary Evaluation
QGSO	Queensland Government Statistician's Office
SASR	Strategic Assessment of Service Requirements
THM	Trihalomethanes
TOC	Total Organic Carbon
WBW	Wide Bay Water
WTP	Water Treatment Plant

1 Introduction

1.1 PROJECT BACKGROUND

Fraser Coast Regional Council (FCRC) has undertaken planning studies for water supply and future water sources and these have identified a need to progress options to secure the long term reliable supply of water for the Fraser Coast community. The planning studies undertaken are:

- 2015 Fraser Coast Water Supply Strategy
- 2014 Fraser Coast Water Supply Grid and Future Source (Draft only).

FCRC identified benefits in the interconnection of the Hervey Bay and Maryborough water supply schemes. The proposed interconnection efficiently moves risk from individual water sources to the regional level. The Council put forward the Hervey Bay to Maryborough Interconnector (HMI) as a suitable project for funding support from the Queensland State Government under the Maturing the Infrastructure Pipeline Program (MIPP) – Early Stage Assessment. The Department of Infrastructure, Local Government, and Planning (DILGP) offered to progress these proposals, in partnership with FCRC, by engaging Kellogg Brown & Root Pty Ltd (KBR) to undertake early stage assessments. The assessments are undertaken in accordance with the Queensland Treasury Project Assessment Framework (PAF) and the Queensland Treasury Corporation Project Decision Framework in written correspondence dated 6 July 2017.

MIPP Process

The MIPP supports the development of a robust project pipeline and enables projects to be matured from conceptually good ideas into solid proposals. The MIPP follows the state governments PAF which defines steps in the process and requirements to meet the state government objectives in respect to projects that may be eligible for future funding and to promote due diligence in a project through the define lifecycle of a project.

The PAF defines the lifecycle of a project to include:

- Strategic assessment of service requirements (SASR)
- Preliminary evaluation (PE)
- Business case development
- Supply strategy development
- Source supplier/s
- Establish service capability
- Deliver service
- Benefits realisation.

The MIPP funding support was to progress the development of the SASR for the project. The SASR requirements can be summarised as follows:

- define the need to be addressed and outcome sought
- scope the outcome sought
- identify potential solutions to achieve the outcome
- develop a detailed plan and budget for conducting a Preliminary Evaluation (PE) of the potential solutions
- seek approval to proceed to the next step in the project lifecycle.

2 Identified needs and opportunities

2.1 HERVEY BAY & MARYBOROUGH RAW WATER SOURCE

The Hervey Bay area water supply is sourced from a raw water source on the Burrum River. The 2015 Fraser Coast Water Supply Strategy identified that augmentation of its water resources would be required in 2046 when the existing source capacity is exceeded. At that time Hervey Bay's water demand is projected to exceed the Burrum River extraction licence limit of Burrum River / Lake Lenthall (14,020 ML/a).

The Maryborough area water supply is sourced from a raw water source at Teddington Weir on Tinana Creek a tributary of the Mary River, and is projected to exceed the extraction licence limit of Teddington Weir (8,179 ML/a) by 2130. The 8,179 ML/a limit consists of the 6,819 ML/a high priority allocation from Teddington Weir and 1,360 ML/a from the Mary River Barrage via the Owanyilla channel system. It should be noted that the volume of water associated with the current extraction licence limit will not necessarily be available when the project is implemented.

FCRC has subsequently updated demand projections to account for the Queensland Government Statistician's Office (QGSO) revised population projections based on the 2016 census. The updated population projections are presented in Table 2.1, represented as Equivalent Dwellings (ED) and converted to Average Day Demand (ADD).

Based on these latest projections, Hervey Bay's projected demand is expected to exceed the extraction licence limit of Burrum River / Lake Lenthall by 2066, compared to the prior 2015 projections of 2046. Maryborough's projected growth has significantly reduced, with projected demands not expected to exceed the extraction licence limit of Teddington Weir for the next 300 years.

Table 2.1 Hervey Bay & Maryborough Demands

Year	Hervey Bay				Maryborough			
	Total ED[1]	Annual Demand (ML/a)[2]	Average Day Demand (ML/d)[2]	MDMM (ML/d)[3]	Total ED[1]	Annual Demand (ML/a)[2]	Average Day Demand (ML/d)[2]	MDMM (ML/d)[3]
2016	36630	8423	23.1	30.0	13482	3346	9.2	11.9
2021	38371	8823	24.2	31.4	13718	3405	9.3	12.1
2026	41084	9447	25.9	33.6	14081	3495	9.6	12.4
2031	44135	10149	27.8	36.1	14393	3572	9.8	12.7
2036	46846	10772	29.5	38.4	14700	3649	10.0	13.0
2041	49257	11327	31.0	40.3	15001	3723	10.2	13.3
2046	51668	11881	32.6	42.3	15302	3798	10.4	13.5
2051	54079	12435	34.1	44.3	15603	3873	10.6	13.8
2056	56490	12990	35.6	46.3	15904	3947	10.8	14.1

Year	Hervey Bay				Maryborough			
	Total ED[1]	Annual Demand (ML/a)[2]	Average Day Demand (ML/d)[2]	MDMM (ML/d)[3]	Total ED[1]	Annual Demand (ML/a)[2]	Average Day Demand (ML/d)[2]	MDMM (ML/d)[3]
2061	58901	13544	37.1	48.2	16205	4022	11.0	14.3
2066	61312	14099	38.6	50.2	16506	4097	11.2	14.6

1. Equivalent Dwelling. A measure to quantify loading of individual properties. Typically a 3 bedroom house is considered as 1 ED (2015 Fraser Coast Water Supply Strategy). Figures have been updated by FCRC from the 2015 Fraser Coast Water Supply Strategy, to account for the QGSO (2016 census) and subsequent projections.
2. Average Demand = 630L/ED/D x No. of ED's (Hervey Bay), 680L/ED/D x No. of ED's for Maryborough (2015 Fraser Coast Water Supply Strategy).
3. MDMM (Mean Day Maximum Month) Demand is the average demand expected to be experienced over the maximum month of the year. MDMM for domestic connections is calculated by multiplying average day demand by 1.3 (2015 Fraser Coast Water Supply Strategy).
4. 2046-2066 ED and Demands have been extrapolated based on 2036-41 growth data.

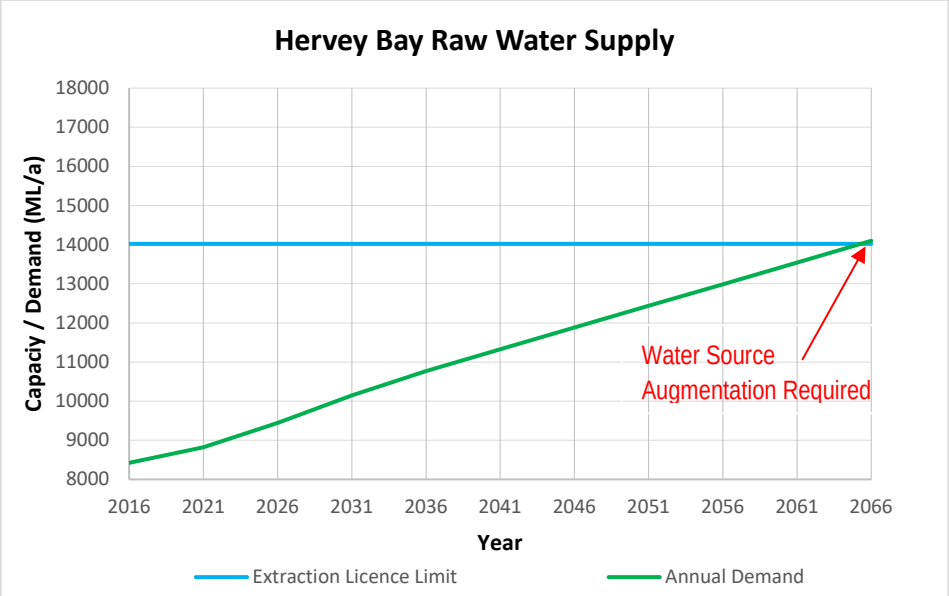

Figure 2.1 Hervey Bay Water Supply – Current Capacity and Projected Demand

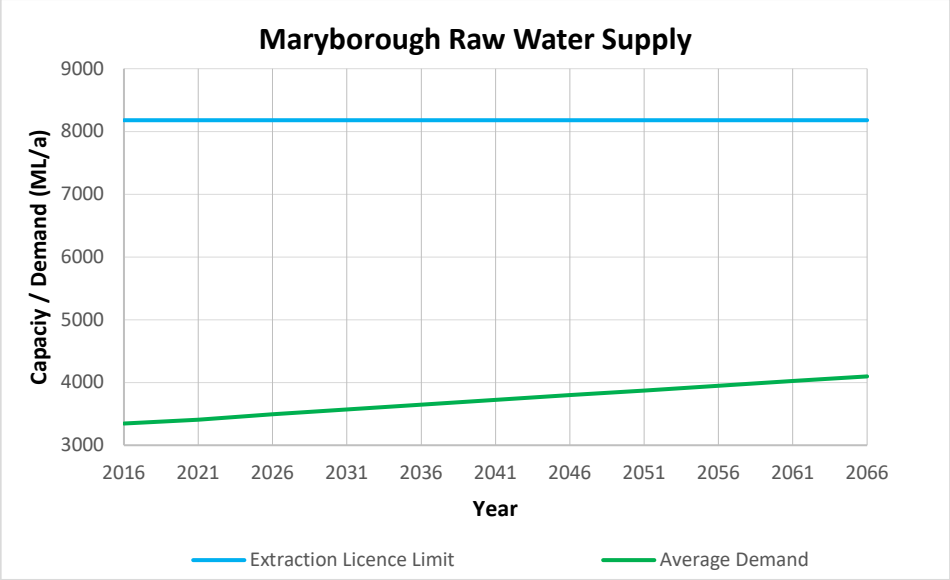

Figure 2.2 Maryborough Water Supply – Current Capacity and Projected Demand

Both the Hervey Bay and Maryborough water supplies are sufficient to provide an adequate long term level of service.

2.1.1 Frequency of Water Restrictions

Water restrictions are imposed when the water stored within the Lenthall Dam and Teddington Weir systems fall below pre-set values with the intent to reduce water demand to extend the water supply. The restriction trigger levels and targeted reduction in demand are shown in Table 2.2.

Table 2.2 Water Restriction: Targets

Water Restriction Level	Response	Hervey Bay Level in Lenthall Dam (m AHD)	Maryborough Level in Teddington Weir (m AHD)
Level 1 (permanent)	Nil	25.86	8.68
Level 2	5% target demand reduction	23.84	7.66
Level 3	20% target demand reduction	21.93	7.26
Level 4	40% target demand reduction	20.68	6.56

A Regional Water Supply Security Assessment undertaken by the Department of Energy and Water Supply (DEWS) (2015) investigated the likelihood of predetermined water levels being reached using stochastic modelling techniques with over 100 years of historical data. Assessments have been completed for Maryborough drawing water from the Teddington weir and associated catchment. The assessment presents the projected occurrence of the differing levels of water restrictions for varying annual extractions from the source. The results of the analysis are presented in Figure 2.3 with the expected occurrence of Level 2, 3 and 4 restrictions.

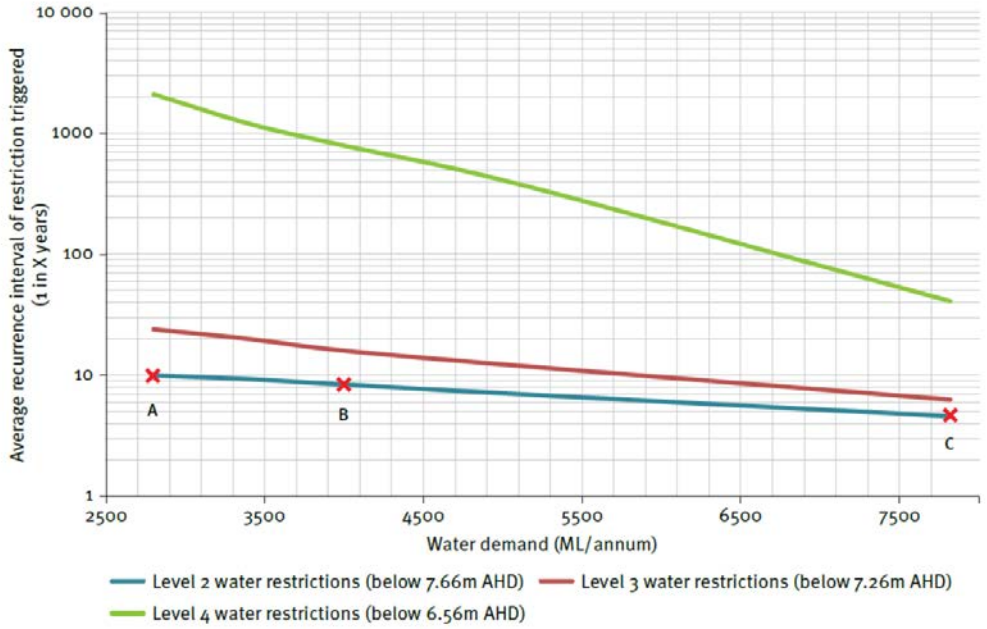

Figure 2.3 Maryborough - Frequency of Water Restrictions Against Total Annual Demand

Source: DEWS, 2015

A similar analysis was completed for the Hervey Bay water supply area drawing water from the Burrum River / Lenthall Dam system. The assessment evaluated the projected occurrence of Level 2, 3 and 4 restrictions in Hervey Bay along with probability of emptying of Lenthall Dam to dead storage level and the complete failure of the water supply (empty dam and Burrum No 1 and 2 weirs). The modelling results are shown below in Figure 2.4.

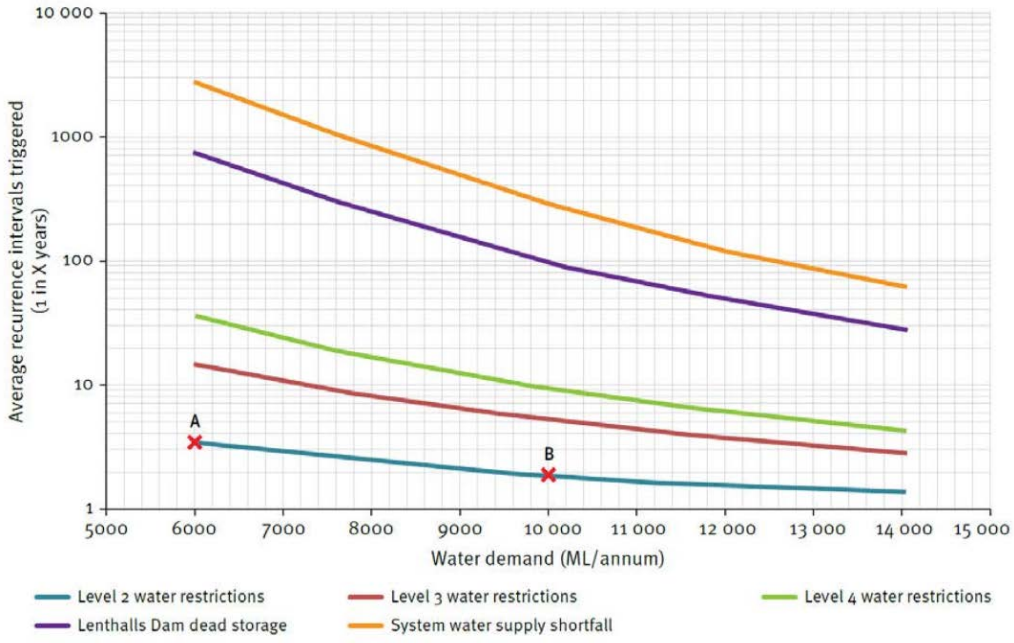

Figure 2.4 Hervey Bay - Frequency of Water Restrictions Against Total Annual Demand

Source: DEWS, 2015

Water Restrictions Summary

In assessing the water restrictions for the Hervey Bay and Maryborough regions, it is necessary to focus on level 3 and level 4 restrictions (i.e. moderate to severe restrictions). This is appropriate from an economic standpoint, as the low level impact of level 1 and level 2 restrictions mean that the implementation of these restrictions impose minimal cost on the community.

The Queensland State Government has recently released Water Security Level of Service Objectives – Guidelines for Development (April 2018). This approach allows for the community to set the target occurrences of restrictions in developing water source supply capacity requirements. An example provided in the document include the Cairns region which has adopted Levels of Service (LOS) objectives of Level 3 restrictions of 10 year Average Recurrence Interval (ARI). This approach has been used in South East Queensland for the yield assessment of water sources with the objectives for medium restrictions of 25 year ARI.

The frequency of occurrence of Level 3 and 4 restrictions for Hervey Bay and Maryborough are presented in Figure 2.5 and Figure 2.6 based on the data presented in Figure 2.3 and Figure 2.4.

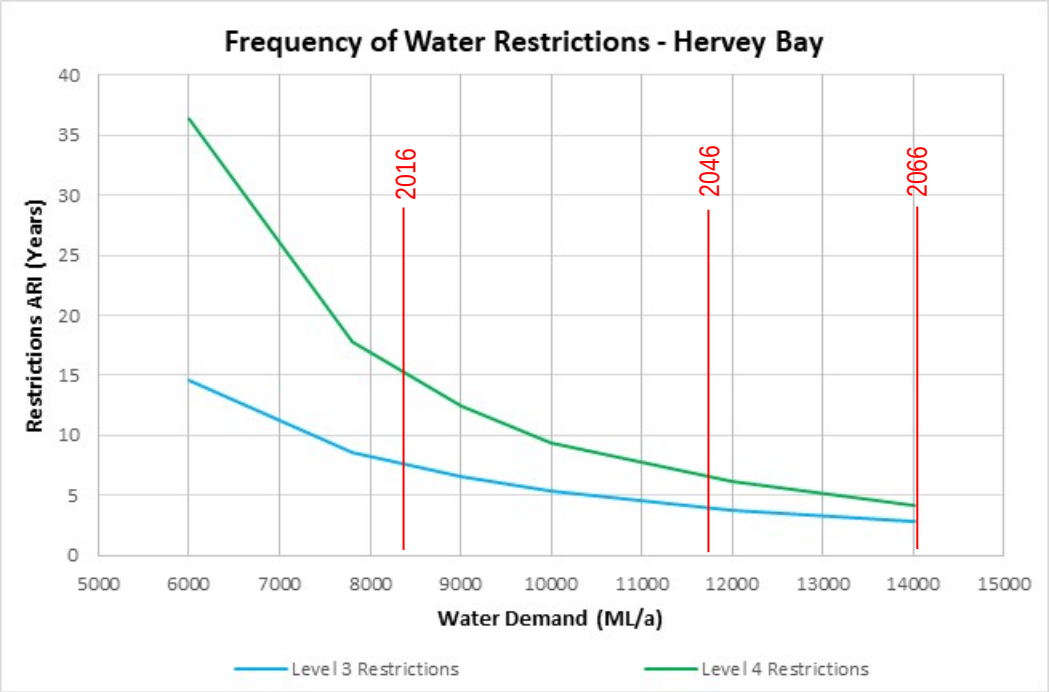

Figure 2.5 Hervey Bay – Frequency of Level 3 & 4 Water Restrictions Versus annual Demand

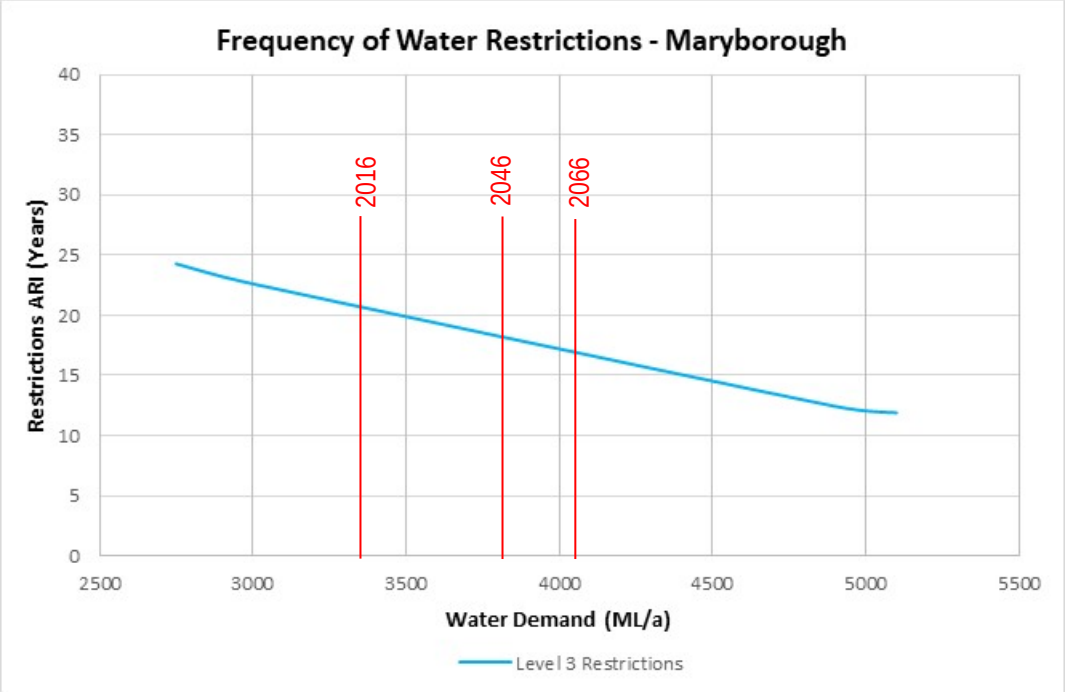

Figure 2.6 Maryborough– Frequency of Level 3 Water Restrictions Versus annual Demand

The Level 4 restrictions ARI for Maryborough do not plot on Figure 2.6 as they have an ARI frequency of greater than 50 years.

Hervey Bay water security is seen to be of greater concern than Maryborough. This is evident through the expected frequency of water restrictions over the 2016-2066 period:

Hervey Bay:

- Level 3 restrictions ranging from 1 in 8 years to 1 in 3 years.
- Level 4 restrictions ranging from 1 in 15 years to 1 in 4 years.

Maryborough:

- Level 3 restrictions ranging from 1 in 21 years to 1 in 17 years.
- Level 4 restrictions ranging from 1 in 1600, to 1 in 1100 years.

It is understood that, based on the low growth rate and current level of raw water supply in Maryborough, that there is not expected to be water security issues in the region over the long term.

Water security in the Hervey Bay region, however is of concern, with level 3 restrictions expected to occur more frequently than 1 in 10 years - 1 in 7 years for current demand increasing to 1 in 3 years by 2066. Similarly Level 4 restrictions would occur 1 in 4 years by 2066.

Based on these results, the Hervey Bay region would benefit from water supply from an additional water source.

2.1.2 Existing Infrastructure

Hervey Bay Supply

Hervey Bay's existing raw water supply is based on the Burrum River where three storages have been constructed (Burrum No.1 and Burrum No.2 Weirs and Lake Lenthall). These are able to supply water to

the main water treatment plants at Burgowan and at Howard with water extracted from the Burrum No.1 weir.

In addition, the system includes two relatively small dams on the headwaters of Beelbi Creek, near the Burgowan Water Treatment Plant (WTP) known as Cassava 1 (2,187 ML) and Cassava 2 (426 ML). The Cassava dams are managed as a balancing storage for raw water from the Burrum River.

Water from the Burrum River system supplies the Burgowan WTP while the Cassava Dams supplement supply to Burgowan WTP when required. Two raw water mains (DN600 and DN375) and a pump station, transfer water from the Burrum River to the Burgowan WTP and/or the Cassava Dams.

The Howard WTP is also supplied from the Burrum River via a DN450 raw water main. The Howard WTP is currently a standby treatment plant and is only used when demand exceeds the capacity of the Burgowan WTP or if operational reasons require it.

Most of the treated water from the Burgowan WTP and the Howard WTP is transferred to the Takura reservoirs, which includes Takura Reservoir No.1 (1 ML) and Takura Reservoir No.2 (9 ML). Uneven turnover of water in these reservoirs occurs because the reservoirs are constructed at different levels. As a result Takura No.1 is currently out of service because it has the highest detention time due to the uneven turnover and consequently has experienced water quality issues.

From Takura, water gravitates to the 32 ML Urraween Reservoir and from there it is pumped up to the Ghost Hill Reservoirs. Hervey Bay City and River Heads are supplied from the Ghost Hill No.1 (4.5 ML) Reservoir. Ghost Hill No.2 Reservoir (6.7 ML) supplies the higher ridge area of Kawungan and the Nikenbah Ridge (Summit Ridge and Bayridge housing developments).

Treated water from the Burgowan WTP and the Howard WTP also supply the townships of Howard, Torbanlea, Toogoom, Burrum Heads and Dundowran. An overview of the Hervey Bay treated water system in shown in Figure 2.7.

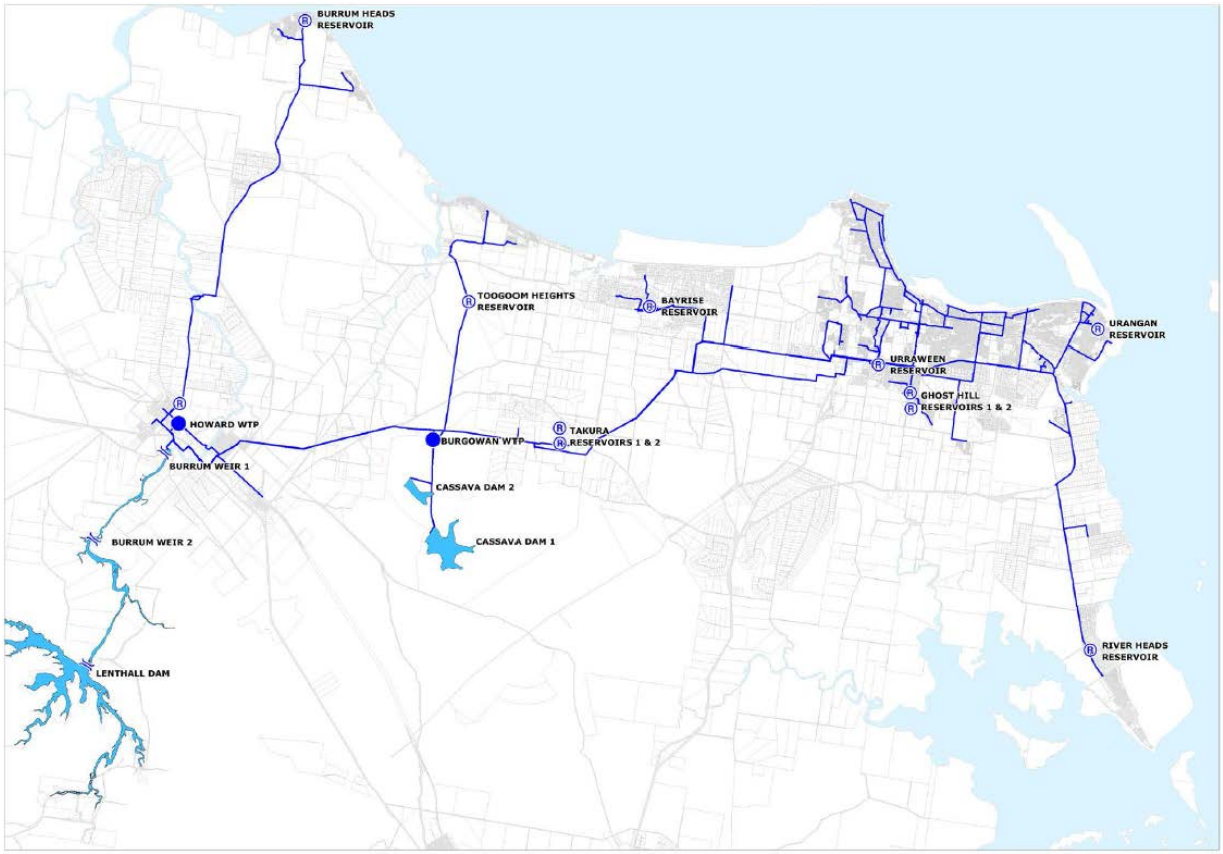

Figure 2.7 Hervey Bay Treated Water Supply Infrastructure

Maryborough Supply

Maryborough's existing raw water supply is sourced from Tinana Creek, a tributary of the Mary River, on which two storages have been constructed; Teddington and Talegalla Weirs.

Teddington Weir is located approximately 16 km south of Maryborough. Teddington and Talegalla Weirs are owned and operated by WBW. There is no direct drainage method from Talegalla Weir to Teddington Weir, which historically has been achieved through a portable syphon system over the wall. Due to pressure from the irrigation community, there is reluctance to utilise this additional yield from Talegalla Weir.

Raw water is extracted from Teddington Weir and is treated at the Teddington WTP located adjacent to the weir. The treated water is transferred from Teddington WTP via two DN525 transmission mains to Two Mile Reservoir (4.5 ML), where it is distributed via a DN600 to Boys Ave Reservoirs (10 ML and 9 ML) and a DN525 to supply Tinana.

While most of the customers are supplied through reticulation pipework, there are a number of customers along Teddington Rd that are connected directly to the transmission mains.

Raw water for Maryborough can be supplemented through a diversion channel at Owanyilla, taking water from the Mary River Barrage and discharging at Tinana Creek.This diverted water is typically used to supply WBW irrigation customers, but can be used to supplement Maryborough urban supplies when required. There is currently no spare high priority allocation in the Mary River system.

An overview of the Maryborough treated water system in shown in Figure 2.8.

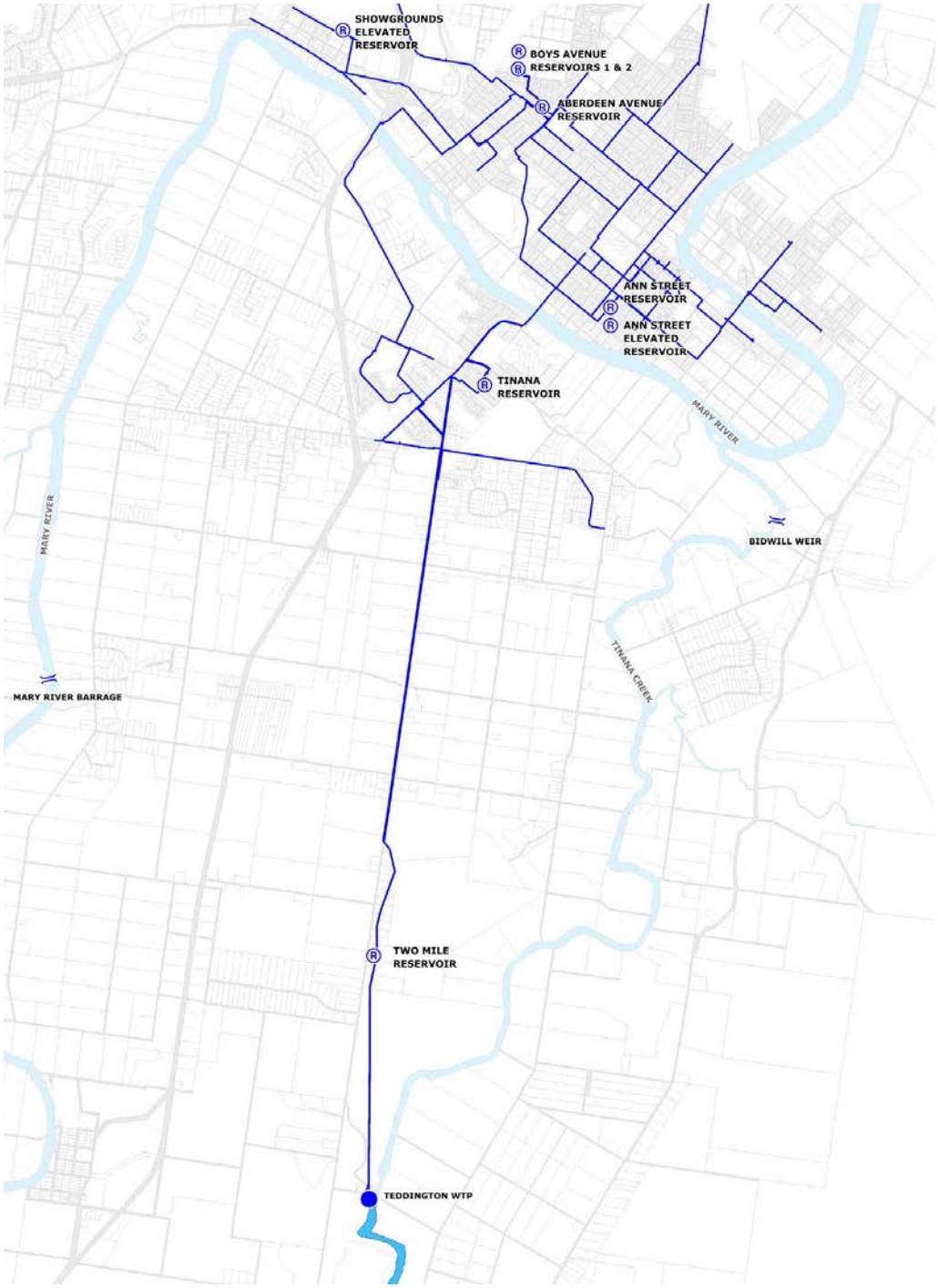

Figure 2.8 Maryborough Treated Water Supply Infrastructure

Maryborough Raw Water Sources

A summary of the capacities and current allocations of the Maryborough raw water sources are summarised in Table 2.3 below.

Table 2.3 Raw Water Sources

Criteria	Primary Source		Supplementary Source
	Teddington Weir	Talegalla Weir (auxillary)	Mary Barrage
Minimum Volume	400	-	5,050 ML
Full Supply Volume	3,710 ML	385 ML	12,000 ML
High Priority Allocation	6,819 ML/a	-	1,360 ML/a
Medium Priority Allocation	3,426 ML/a	-	-

Treatment Capacities

Treatment Capacity at Burgowan WTP

Burgowan WTP can produce a maximum of 41 ML/d treated water, and consists of the following two separate treatment processes:

- Dynasand – capable of producing 11 ML/d
- Ozone/BAC – capable of producing approximately 30 ML/d (following Actiflo upgrade in 2014).

Treatment Capacity at Howard WTP

The water treatment plant at Howard is considered a standby treatment plant and will only be used when major maintenance is being undertaken at the Burgowan WTP or if demand on the system exceeds the capacity of the Burgowan WTP. A treated water Hervey Bay to Maryborough interconnector could be utilised to transfer the additional capacity from Hervey Bay to supply the Maryborough region, should there be issues with treatment at Teddington WTP. If necessary the Howard WTP can be brought into service to increase the treatment capacity in Hervey Bay to support the transfer. The current plant capacity at Howard WTP is 18 ML/d.

Teddington WTP Treatment Capacity

Teddington Water Treatment Plant is a conventional treatment plant, consisting of two identical 18 ML/d process trains comprising aeration, flash mixing of coagulant, flocculation, clarification, filtration and chlorine disinfection. The process trains can either be run in isolation or parallel.

The total nominal capacity of the plant is 36 ML/d based on 22 hour operation. There are, however, limitations on the treatment capacity, with the water quality deteriorating with increased production rates. Historically, treated water demand has only reached a maximum of approximately 22 ML/d prior to 2008, with issues identified with treatment quality at flows greater than 20 ML/d. In order to achieve 36 ML/d significant upgrades would be required. The MDMM is forecast to increase to 14.6 ML/d in 2066, refer Section 2.1.

Raw water supply to the plant is pumped from the weir via one of two available pumping configurations, depending on the process stream being used. The raw water pump station was sized in 2015 to cater up to 20 ML/d. The design of the pump dry well is sized to accommodate larger pumps and pipework adjustments, to accommodate up to 40 ML/d (over a 22 hour operating day). The screens and suction pipework is designed for this ultimate case.

2.2 BURGOWAN RAW WATER TREATMENT

Burgowan WTP consists of the following two separate treatment processes, capable of producing a total of 41 ML/d treated water:

- Dynasand - 11 ML/d
- Ozone/BAC - 30 ML/d.

2.2.1 Dynasand Filtration

The preferred water source for the Dynasand Filtration Train at Burgowan WTP is Cassava, as it is typically lower in dissolved iron and manganese than the Burrum River, and is considered easier to treat. Soluble manganese can be removed through oxidation by dosing chlorine however this can lead to unacceptably high Trihalomethanes (THM) production rates.

The capability of the filters is also affected by changes in raw water quality, especially colour. High raw water colours are prevalent in the Burrum River system, and require an increase in coagulant dosing, producing levels of floc that the backwash process can't process.

The Dynasand Filtration system can only reliably treat water from the Cassava dams. The capacity of the plant is therefore taken as the extraction limit for the Cassava Dam storages, estimated to be 1,000 ML/a. This can be supplemented by water from the Burrum River, when conditions are suitable (i.e. low in colour).

The issues with the Dynasand Filtration system are attributed to a lack of polymer dosing. A pre-filtration liquid polymer dosing system was installed with the filter in 1993, but for undocumented reasons was not commissioned. It has since been used for spares for other systems. Works have been undertaken to facilitate the installation of a powder polymer dosing system, improving floc settlement and increasing filter throughput rates.

2.2.2 Ozone/BAC

The Ozone/BAC treatment train was commissioned in 2006, with a design capacity of 20 ML/d. During commissioning it was determined that the up-flow clarifiers required more frequent backwashing than originally anticipated during the design phase. The high raw water colours also resulted in reduced filter run times between backwashing, reducing the effective plant capacity to 15 ML/d.

An Actiflo module was installed in 2014 to reduce solids loading in the clarifier, and increased the plant capacity to 30 ML/d.

This treatment train can effectively treat a range of raw water characteristics from different sources, and remove a wide range of contaminants.

2.3 TEDDINGTON RAW WATER TREATMENT

FCRC have identified that there are water quality issues, in particular, the chlorination disinfection by-products (DBP) that need to be addressed to allow the Teddington WTP to continue to produce high quality drinking water while minimising water quality risks. Issues with the raw water quality in both the Teddington Weir, and Mary River catchments have been identified.

2.3.1 Teddington Weir Catchment Water Quality

The raw water extracted from Teddington Weir originates from the state forest and has a history of having high colour / dissolved organics, often resulting in high THM's in the treated water. The weir has also

experienced issues with water weed (hyacinth), which proliferates, but is eventually washed away when the weir spills.

The raw water contains high levels of natural organic matter (NOM, measured as total and dissolved organic carbon or TOC and DOC), as well as elevated levels of iron and manganese. The raw water TOC is typically 500-800% of the levels that would normally be encountered in other raw water along the East Coast of Australia (Hunter Water, 2011. Teddington WTP Upgrade – Planning Report 2739-001).

The treatment plant currently provides effective removal for iron, manganese and turbidity; however, the principal water quality issue is the high levels of DBPs in the drinking water supply. Specifically, total THM levels in the distribution system frequently exceed the 250 µg/L limit set in the current Australian Drinking Water Guideline. Operational staff have optimised the enhanced coagulation process at the plant which is achieving the optimal THM precursor removal possible with the plant in its current form. However, the key issue is the very high levels of NOM in the raw water to start with.

The Tinana Creek catchment is also vulnerable to occurrences of blue-green algae which can potentially be a public health issue or impart taste and odours and toxins to water. There have been sporadic occurrences of blue-green algal events in Teddington Weir. The current strategy adopted at the plant in terms of such events is to dose powdered activated carbon (PAC) when an event is identified. While PAC dosing has so far been generally successful, it does not provide a reliable and continuous treatment barrier to protect the consumers from these organic contaminants. There are some limitations with the existing PAC system.

Due to the nature of the catchment, Cryptosporidium and Giardia, which are protozoan parasites, are also a potential raw water quality risk which needs to be considered in the development of any treatment process upgrade configuration for the Maryborough water supply. While the existing treatment process through coagulation, clarification and filtration should provide a significant barrier to such waterborne pathogens, there is a trend towards multiple barrier treatment to further reduce any potential risks. Chlorination, which is currently used at the plant, is not effective in inactivating Cryptosporidium.

2.3.2 Mary River Water Quality

Cyanobacteria (blue-green algae) and its attendant water quality and health problems are a significant consideration in the management of urban water supplies. There are concerns over potential threats to the town water supply from cyanobacterial blooms and their subsequent impacts on the water quality of Teddington Weir by potential transfers of algal laden waters from the Mary River. Minimisation of this threat is currently achieved through the constant monitoring of water quality during transfers from the Mary River (through the Owanyilla Channel) to Teddington Weir (Tinana Creek).

The biodiversity of the Teddington Weir pool is expected to change with the introduction of Mary River water. Changes that can be expected are an increased level of algae in the weir pool due to increased levels of alkalinity and reduced levels of colour (WBWC, 2015, 2015 Fraser Coast Water Supply Strategy, Wide Bay Water Corporation, Urangan, QLD).

2.3.3 Treatment Options Investigated

Orica MIEX Trial

A Magnetic Ion Exchange (MIEX) trial was conducted at Teddington WTP in 2004, with the objective of assessing the water quality following MIEX treatment and coagulation, and assessing the DOC removal compared with the existing coagulation process. Also assessed was the reduction in DBP formation as a result of the new process. The MIEX pre-treatment followed by significant reduced doses of alum coagulation produces an improved quality of water with:

- THM formation potential reduced by a further 38% than current treatment

- the process had the capable of producing water with colour <1 Pt-Co units
- UV_{254} Absorbance reduction <0.1cm^{-1}
- DOC levels 40% below current amounts
- a75% reduction in alum dose, reduced from 120mg/L on full scale to 30mg/L following the introduction of the MIEX process.

As a result of this trial, it was recommended that further investigations be carried out into the cost effectiveness of implementing the MIEX process at Teddington WTP.

Teddington WTP Planning Report

A draft planning study (Teddington WTP Upgrade – Planning Report 2739-001, Hunter Water 2011), reviewed potential treatment options to address the water quality issues experienced at Teddington WTP.

Based on the assessment of the treatment capability of the existing plant, and the significant water quality risks, the following conclusions were reached:

- Water quality risks associated with the raw water sourced from the Tinana Creek catchment are significant. The NOM levels in the creek are extremely high and with elevated soluble manganese and occasional algal blooms it makes treatment of this raw water very challenging. Additional treatment processes will be required to address the water quality issues in Maryborough and to ensure the water supply meets both Australian Drinking Water Guidelines requirements and ongoing community expectations. These include:
  - Significantly improve the capability of the treatment plant to remove NOM (THM precursors). Long term it is unacceptable for the plant to produce treated water quality that does not meet the Australian Drinking Water Guidelines.
  - Provide robust treatment barriers for both taste and odour compounds and algal toxins.
  - Continue to ensure the water supply provides ongoing disinfection of waterborne pathogens. This includes ensuring the treatment plant provides robust barriers to Cryptosporidium and Giardia.
  - Ensure the treatment plant is also capable of treating varying raw water from the Mary River.
  - Ensure the upgraded infrastructure can continue to effectively remove iron and manganese.
- No individual treatment process can ensure the treated water quality in Maryborough can meet the Australian Drinking Water Guidelines requirements at all times and that a multiple barrier treatment philosophy is required.

Subsequently, the following recommendations were made:

- Both MIEX and Ozone/BAC processes be retrofitted to Teddington WTP. When operated in series, these advanced treatment processes and the existing enhanced coagulation and filtration processes shall provide the necessary treatment barriers to ensure the Maryborough community is able to receive high quality treated water under all raw water scenarios.
- A value management review of capacities of individual unit operations be undertaken during design development to identify a sensible staging sequence for new assets. For example, the MIEX process is essentially a bolt-on pre-treatment process and can be introduced early to address the THM issue.
- Design development be commenced which in the first instance will involve the following:
  - Develop an overall process design for the treatment processes. This will include assessing options of designing the Ozone/BAC process to run either in the intermediate mode (prior to the existing pressure filters) or tertiary mode (post the existing pressure filters) and the relative sizing of unit operations.

- Develop a procurement strategy for the project to ensure a competitive price can be secured for the upgrade works.
- Develop a more detailed capital cost estimate for the project.
- Undertake more detailed project value and risks management exercises.

WBWC Teddington WTP Disinfection By-Product Report

Following the completion of the Hunter Water Planning Report in 2011, WBW investigated and compared the cost effectiveness of a variety of process technologies.

It was determined that the most cost effective method to reduce THM's was to optimise the current chlorination process. The Ozone/BAC system was identified as providing the least level of risk in achieving THM reduction, albeit representing the highest capital investment of all the assessed options.

Optimisation of the chlorination process involves exchanging pre-chlorination with a potassium permanganate dosing system, reducing residence times and reducing organic growth in the mains and reservoirs.

WBW are currently making efforts to reduce THM excursions in the network. This includes converting the Boys Avenue dual reservoirs placed in series, and the introduction of mixing and aeration, and a push to move to distributed chlorination in the network rather than single point dosing at Teddington WTP. In addition to disinfection at Teddington WTP, WBW also re-disinfect at Nathan Street Pump Station, Showground's Elevated Storage, and Aberdeen Avenue Pump Station.

3 Outcomes sought

3.1 OUTCOME SOUGHT DEFINITION

Based on the latest growth figures, water security (including source augmentation and frequency of water restrictions) is not expected to be an issue for the Maryborough Region in the long term.

Future water security for the Hervey Bay region is seen as an issue that needs to be addressed, and an opportunity has been identified via an inter-catchment transfer from the Maryborough region. This transfer would subsequently extend the horizon of the next raw water source augmentation for the Hervey Bay region and reduce the frequency of water restrictions.

Significant issues have been identified with the treated water reliability at Teddington WTP, in particular the chlorination disinfection by-products resulting from the treatment of water from Teddington Weir. A number of studies have been completed, and referenced in Section 2.3.3, to investigate options to improve the treated water reliability at Teddington WTP.

Issues with treatment reliability at Burgowan WTP have been identified, in particular the Dynasand Filtration Train. The current system cannot effectively treat high colour water from the Burrum River, and relies on raw water from Cassava dams. The extraction limit for the Cassava storages is estimated to be 1,000 ML/a (2.7 ML/d), significantly lower than the nominal treatment capacity of the filtration train (11 ML/d). In order to improve the reliability and capacity of the filtration system, FCRC have identified a need to install a polymer dosing system upstream of the filters.

The outcomes sought for this SASR are defined as the following:

- Improve the reliability of water supplies to provide water security for urban water supply in the Hervey Bay region. This will be achieved through the following outcomes:
  - reduce the frequency of water restrictions in Hervey Bay
  - the ability to source from two separate basins, hence more effectively utilising available storages in each region.
- Improve treated water reliability at Burgowan WTP and Teddington WTP. This will be achieved through the following outcomes:
  - addressing issues associated with water quality
  - improving the reliability of the treatment plant with respect to WTP failure and subsequent unplanned outages
  - improving the current WTP capacity.

3.2 SUCCESS CRITERIA

In order to identify a shortlist of options to be subject to the next stage (Preliminary Evaluation), it is necessary to develop a set of criteria to be applied to the long list of options identified above. Two sets of criteria are proposed:

- Primary Criteria:

  - reliability of water supply in the Hervey Bay region
  - reliability of treatment
  - ability to extend horizon for next water source augmentation.
- Secondary Criteria:
  - environmental and social impacts, being the extent to which the options may have adverse impacts that could impact on the option's economic feasibility
  - community acceptance, being the extent to which the options are impacted by community attitudes and perceptions relating to water supply and the impact of water supply infrastructure
  - complexity, including complexities associated with water supply infrastructure, technology or equipment, and potential issues obtaining the necessary regulatory approvals.

To be considered for inclusion in the shortlist of options, options must satisfy the primary criteria. Those options that meet the two primary criteria are then assessed against the secondary criteria to determine which options are to be assessed in the PE.

4 Potential options

4.1 OUTLINE OPTIONS

The following options were identified for assessment in consultation with WBW, to address the required project outcomes of improving the reliability of water supply to the Hervey Bay and Maryborough regions, and improving the raw water treatment reliability.

The following options have been identified to address these project outcomes, the options will also be assessed against the project success criteria developed in the previous section:

- Option 1 — Base Case (maintain the Status Quo)
- Option 2 — Bring forward other sources (Mary River, Burnett River)
- Option 3 — Hervey Bay to Maryborough Interconnector
  - Option 3 (a) — Treated Water Transfer
  - Option 3 (b) — Raw Water Transfer
- Option 4 — Burgowan WTP and Teddington WTP Process Improvements.

4.1.1 Option 1 – Base Case (Status Quo)

This option involves maintaining a 'Do Nothing' approach. This option does not meet the project needs of providing sufficient urban water supplies for water security in the Hervey Bay region. It also does not address the issues associated with treated water reliability or mitigation of a failure, at Burgowan WTP and Teddington WTP.

4.1.2 Option 2 – Bring Forward other Sources: Burnett River (Paradise Dam) to Howard Water Supply Pipeline

This option consists of augmenting the Hervey Bay water supply, through the supply of water to the region from an alternative catchment.

FCRC identified an option of sourcing high priority water from a Paradise Dam source on the Burnett River, and transferring the water to the Burrum Weir pump station, connected to both Burgowan WTP and Howard WTP. There is 20,000 ML of high priority water available within the Paradise Dam scheme, much of which remains unallocated.

This option will address long term water security in the Hervey Bay region, but will not rectify the issues associated with treated water reliability in the Maryborough catchment (Teddington WTP).

This option is currently being assessed under the Queensland State Government's Maturing the Infrastructure Pipeline Program (MIPP) – Early Stage Assessment Program.

4.1.3 Option 3 – Hervey Bay to Maryborough Interconnector

This option consists of transferring water (either treated or raw) through a bi-directional pipeline connecting Maryborough and Hervey Bay. This option allows for the more effective management of water supply in either region, and improves the combined reliability of water treatment in both regions. This is achieved through the ability to source water from two separate basins.

Option 3 (a) – Treated Water Transfer

This option consists of extending the treated water supply from the Boys Avenue Reservoirs to the Burgowan WTP Clear Water Storage (CWS).

The preliminary scope for this option consists of:

- utilising the existing treated water mains from Teddington WTP to Boys Avenue Reservoirs
- installation of a new section of treated water main from Boys Avenue Reservoirs to Burgowan WTP.

Reliability Analysis

A reliability analysis was conducted to consider the effects a treated water transfer between Hervey Bay and Maryborough would have on the ARI of restrictions in either region. 2046 figures were considered most appropriate for this analysis. The results of this analysis can subsequently be used to size the treated water transfer pipeline.

As identified in Section 2.1.1, Hervey Bay water security is seen to be of greater concern than Maryborough. As such, the reliability analysis in Table 4.1 considers the ARI's for a Maryborough to Hervey Bay treated water transfer scenario.

Table 4.1 Reliability Analysis with Treated Water Transfer

Year	Annual Demand (ML/a)		Transfer (ML/a)	Revised Annual Demand on Raw Water Source (ML/a)		Level 3 Restrictions ARI (Years)		Level 4 Restrictions ARI (Years)	
	HB	MBH		HB	MBH	HB	MBH	HB	MBH
2046	11881	3798	0	11881	3798	3.8	18.3	6.3	1294.0
2046	11881	3798	500	11381	4298	4.3	15.7	7.1	909.0
2046	11881	3798	1000	10881	4798	4.7	13.0	8.0	523.0
2046	11881	3798	1500	10381	5298	5.1	11.4	8.8	342.0
2046	11881	3798	2000	9881	5798	5.5	10.1	9.7	226.0
2046	11881	3798	2500	9381	6298	6.1	9.1	11.2	158.0
2046	11881	3798	3000	8881	6798	6.8	8.1	12.9	99.0
2046	11881	3798	3500	8381	7298	7.6	7.3	15.2	70.0
2046	11881	3798	4000	7881	7798	8.5	6.5	17.4	42.0
2046	11881	3798	4500	7381	8298	10.0	5.5	22.1	14.0

The results from the above table are represented below in Figure 4.1.

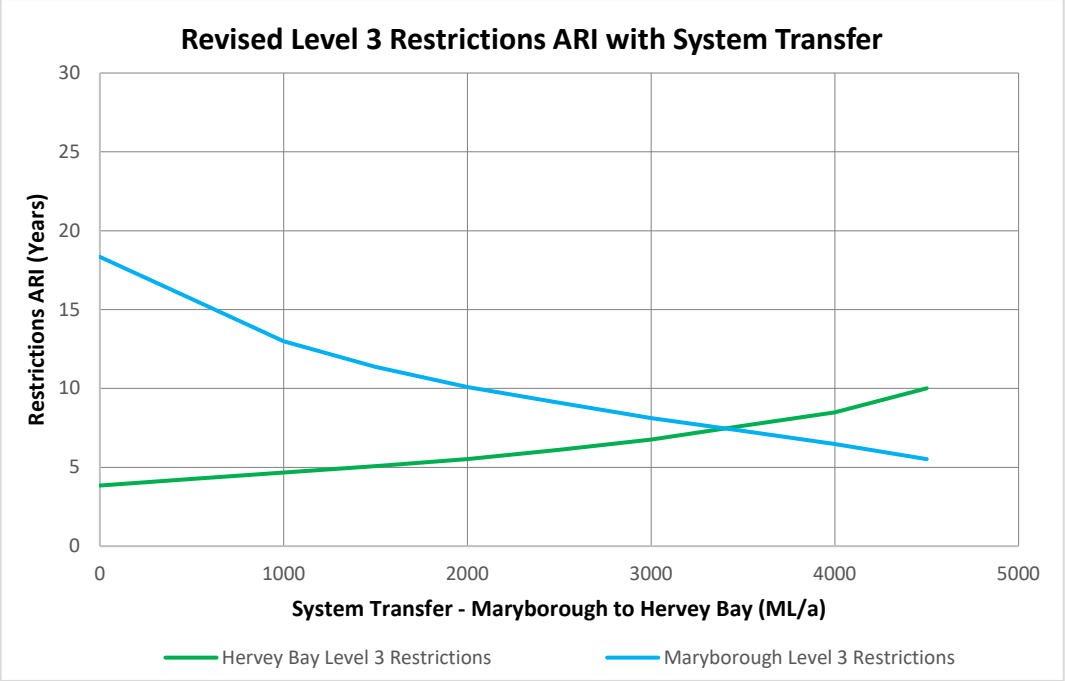

Figure 4.1 Reliability Analysis with Treated Water Transfer

Targeting a Level 3 restriction ARI of 1 in 10 years in Maryborough (in line with a Levels of Service objectives approach), results in a transfer rate of 2,000 ML/a from Maryborough to Hervey Bay. The equivalent Level 4 restriction ARI at this transfer rate is 1 in 226 years in Maryborough, and 1 in 10 years in Hervey Bay.

Balancing the recurrence of restrictions in both regions to approximately 1 in 7 years, will result in a transfer rate of 3,500 ML/a from Maryborough to Hervey Bay. The equivalent Level 4 restriction ARI at this transfer rate is 1 in 70 years in Maryborough, and 1 in 15 years in Hervey Bay.

Targeting a Level 3 restrictions ARI of 1 in 10 years in Hervey Bay, will result in a transfer rate of 4,500 ML/a from Maryborough to Hervey Bay. The equivalent Level 4 restriction ARI at this transfer rate is 1 in 14 years in Maryborough, and 1 in 22 years in Hervey Bay.

As per Section 2.1, the available extraction licence limit of Teddington Weir is currently 8,179 ML/a. Considering the 2046 Maryborough urban water demand of 3,798 ML/a, results in approximately 4,400 ML/a of remaining high priority water allocation. As such, a maximum transfer of approximately 4,500 ML/a (12.5 ML/d) is recommended from Maryborough to Hervey Bay.

Treatment Capacity

In addition to improving water security in the region, residual treatment capacity can be utilised to supply either township in the event of a treatment plant failure.

The total treatment capacities at each WTP site are summarised below:

- Burgowan WTP: 41 ML/d. This is based on the proposed polymer dosing system being installed in the Dynasand Filtration train, effectively utilising the full 11 ML/d treatment capacity. The Ozone/BAC train can reliably treat 30 ML/d.
- Howard WTP: 18 ML/d.
- Teddington WTP: 20 ML/d. This is based on the current capacity of Teddington WTP raw water pump station, noting that significant plant upgrades would be required to maintain treated water quality up to the nominal plant treatment capacity of 36 ML/d.

The residual treatment capacity for either region is represented in Table 4.2, and assessed against both the Average Day Demand, and the MDMM Demand.

Table 4.2 Residual WTP Capacity

Year	Hervey Bay				Maryborough			
	Average Day Demand (ML/d)	MDMM (ML/d)	Residual Treatment Capacity at Burgowan WTP (ML/d) *(to ADD)*	Residual Treatment Capacity at Burgowan WTP (ML/d) *(to MDMM)*	Average Day Demand (ML/d)	MDMM (ML/d)	Residual Treatment Capacity at Teddington WTP (ML/d) *(to ADD)*	Residual Treatment Capacity at Teddington WTP (ML/d) *(to MDMM)*
2016	23.1	30.0	17.9	11.0	9.2	12.0	10.8	8.0
2021	24.2	31.5	16.8	9.5	9.3	12.1	10.7	7.9
2026	25.9	33.7	15.1	7.3	9.6	12.5	10.4	7.5
2031	27.8	36.1	13.2	4.9	9.8	12.7	10.2	7.3
2036	29.5	38.4	11.5	2.7	10.0	13.0	10.0	7.0
2041	31.0	40.3	10.0	0.7	10.2	13.3	9.8	6.7
2046	32.6	42.4	8.4	-1.4	10.4	13.5	9.6	6.5

From Table 4.2 it can be seen that the available spare treatment capacity at Teddington WTP is not sufficient to cover Hervey Bay urban demands. The spare capacity at Teddington WTP can however be used in conjunction with the 18 ML/d available from Howard WTP (currently configured as a standby to Burgowan WTP) to supply Hervey Bay. Teddington WTP has spare capacity ranging from 10.8 ML/d to 9.6 ML/d (at Average Day Demand), and 8.0 ML/d to 6.5 ML/d (at MDMM), over the study period.

Under the treated water transfer option, the Howard WTP treatment capacity (18 ML/d) can be brought into service to increase the treatment capacity in Hervey Bay, and support the transfer to Maryborough in the event of a Teddington plant failure. This capacity can easily supply Maryborough demands, given the MDMM for the region is 13.5 ML/d in 2046.

Route Selection

There are a number of potential alignments for the new pipeline section from Boys Avenue Reservoirs to Burgowan WTP. Three potential alignments have been developed for this option.

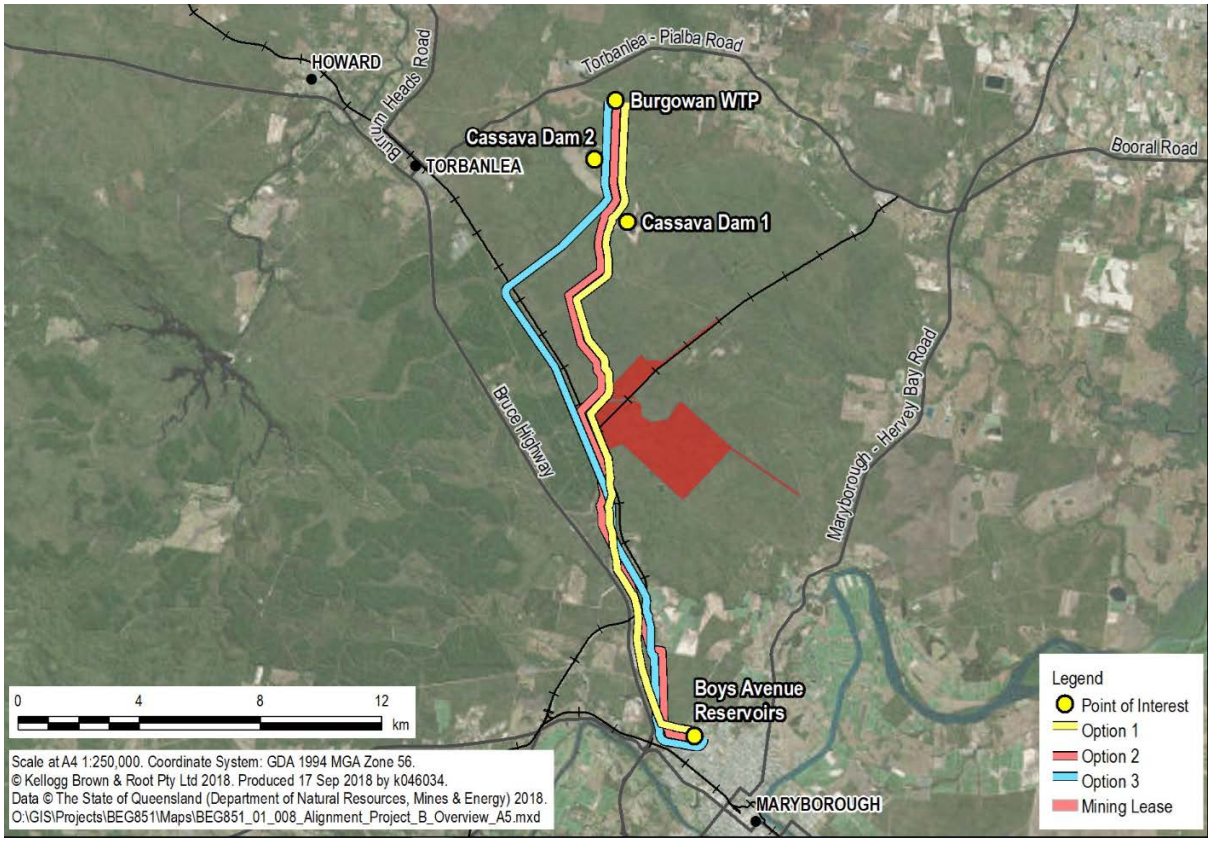

Figure 4.2: Hervey Bay to Maryborough Interconnector – Treated Water Transfer Options

All three options are approximately 24.5 km long, the last 3.5 km is a common alignment following the existing raw water main connecting Cassava Dam 1 to Burgowan WTP. All three options travel west along Walker St for approximately 800 m before crossing the North Coast Rail Line. Option 1 follows the Bruce Highway for approximately 5 km, before joining Options 2 and 3 at the North Coast Rail Line. Options 2 and 3 head north along Slaughterhouse Road for approximately 2.5 km, at which time Option 2 follows an existing HV power corridor, and Option 3 follows Neil Rd. All three options join to the east of the Colton mining lease, at which point Option 3 continues following the North Coast Rail Line, and Options 1 and 2 follow an alternative alignment to Cassava Dam 1. A detailed alignment drawing for the three alignments is included in Appendix A.

Infrastructure Sizing

Pipeline Capacity

In order to effectively utilise the spare treatment capacity at either WTP site, and improve the combined reliability of the Hervey Bay and Maryborough regions, it is recommended that the treated water main be sized off a nominal capacity of 15 ML/d.

Hydraulic Profile

Hydraulic profiles have been developed for each alignment, and are included in Appendix B.

Pipe Details

The following pipe details have been calculated, based on the assumed capacity of the pipeline.

Table 4.3 Pipe Details

Option	Pipe Size	Pipe Length
1	DN500	24.3 km
2	DN500	24.2 km
3	DN500	24.7 km

Pump Station

In order to develop a bi-directional treated water supply, a transfer pump station will be required at either end of the pipeline.

Option 3 (b) – Raw Water Transfer

This option consists of transferring raw water from Teddington Weir to the Burgowan WTP.

The preliminary scope for this option consists of:

- Conversion of one of the treated water mains that current runs from Teddington WTP to Boys Avenue Reservoirs, to a raw water main.
- Installation of a new section of raw water main extending the above main to a discharge point at Cassava Dams.
- Existing Cassava Dam pump stations and raw water main can be used to transfer flows to Burgowan WTP.

The same three alignments identified for the above treated water transfer pipeline can be utilised for the raw water transfer option.

In accordance with the treatment capacities in Section 2.1.2 and the estimated residual capacities in Table 4.2, further assessment can be undertaken to determine the applicability of utilising existing infrastructure for a raw water transfer.

Mining lease applications were approved in May 2017, for a proposed open cut coking coal mine to the east of the proposed alignments (Northern Energy Corporation Ltd / New Hope - Colton Coal Pty Ltd). There is uncertainty as to whether this mine would be interested in a raw water source from Teddington Weir. As such, this potential demand has been excluded from this study, but is however noted as an opportunity for further investigation.

4.1.4 Option 4 – Burgowan WTP and Teddington WTP Process Improvements

This option targets the improvement of treated water reliability at Burgowan WTP and Teddington WTP.

Following the recommendations for treatment plant upgrades, described in Section 2.2 and Section 2.3, these improvements consist of:

- Optimising the chlorination process at Teddington WTP, including exchanging pre-chlorination with a potassium permanganate dosing system.

4.2 OPTIONS ASSESSMENT

The above options have been assessed against the success criteria in Section 3.2, with the intention of shortlisting options for further investigation under the Preliminary Evaluation. Table 4.4 presents a summary of this assessment. Cells have been highlighted in either green or red, to indicate whether the option meets or does not meet the corresponding success criteria. Cells highlighted in orange indicate that the option has the potential to address the success criteria.

Table 4.4 Options Assessment

Option	Primary Assessment Criteria (Project Needs)							Secondary Assessment Criteria		
	Reliability of short term source			Reliability of treatment			Extend horizon for next source augmentation	Environmental and social impacts	Community acceptance	Complexity
	Reduce frequency of water restrictions		Ability to source from two separate basins	Water quality issues	WTP failure	WTP capacity				
	Hervey Bay	Maryborough								
Option 1: Base Case (maintain the Status Quo)	The increasing water demand in the region will increase the frequency of water restrictions.		N/A	Does not improve water quality issues	Does not increase WTP reliability	Does not provide additional WTP capacity	N/A	N/A	Increased frequency of water restrictions will have a negative impact on the community.	N/A
Option 2: Bring forward other supply sources: Burnett River (Paradise Dam) to Howard Pipeline	Additional water security for the Hervey Bay region.	No additional supply to Maryborough region.	Provides an additional source of water supply from the Burnett River.	Water from the Burnett is considered easier to treat than the Mary River and at Teddington Weir.	Does not increase WTP reliability	Does not provide additional WTP capacity	Provides an additional water supply source, extending the horizon for an additional source of water.	Potential to reduce the reliability of water supply to agricultural demands in the region	Project is expected to result in higher water costs for the customer (as a result of high CAPEX and ongoing OPEX of project). Pipeline routes would aim to follow road reserves/service corridors.	Low complexity

Option	Primary Assessment Criteria (Project Needs)							Secondary Assessment Criteria		
	Reliability of short term source			Reliability of treatment			Extend horizon for next source augmentation	Environmental and social impacts	Community acceptance	Complexity
	Reduce frequency of water restrictions		Ability to source from two separate basins	Water quality issues	WTP failure	WTP capacity				
	Hervey Bay	Maryborough								
Option 3 (a): Treated water transfer	Additional source of treated water supply to Burgowan WTP CWS will reduce the frequency of water restrictions in Hervey Bay.	Potential to develop a bi-directional treated water supply, servicing both the Hervey Bay and Maryborough regions.	Additional source from Teddington weir. Allows for efficient management of spare treatment capacity at Teddington WTP	Potential to improve water quality through selected use of water sources	Increases treated water reliability by providing an additional source of treated water	Additional treated water from Teddington WTP will delay the required capacity augmentation at Burgowan WTP	Provides an additional supply source, extending the horizon for finding an additional source of water.	Potential to reduce the reliability of water supply to agricultural demands in the region	Minimal impact to the community. Pipeline routes would aim to follow road reserves/service corridors.	Low complexity. Need to effectively manage the treated water in the interconnector pipeline.
Option 3 (b): Raw water transfer	Additional source of raw water supply will supply the Burgowan WTP, and reduce the frequency of water restrictions in Hervey Bay.	Potential to develop a bi-directional raw water supply, servicing both the Hervey Bay and Maryborough regions.	Additional source from Teddington weir. Allows for efficient management of spare raw water capacity between the two basins.	Does not improve water quality issues	Does not increase WTP reliability or mitigate against WTP failure.	Does not provide additional WTP capacity	Utilising additional raw water capacity from Teddington weir will extend the horizon for finding an additional source of water.	Potential to reduce the reliability of water supply to agricultural demands in the region	Minimal impact to the community. Pipeline routes would aim to follow road reserves/service corridors.	Low complexity
Option 4: Burgowan WTP and Teddington WTP process improvements	Does not provide an additional source of raw water, hence will not improve	Does not provide an additional source of raw water, hence will not improve water	N/A	WTP process improvements can address the current water quality issues	WTP process improvements can increase treatment plant reliability.	Potential to increase the capacity of Burgowan WTP via improving the	Doesn't provide an additional source.	No expected environmental and social impacts. All treatment plant upgrades will be	Minimal impact to the community.	Low complexity

Option	Primary Assessment Criteria (Project Needs)							Secondary Assessment Criteria		
	Reliability of short term source			Reliability of treatment			Extend horizon for next source augmentation	Environmental and social impacts	Community acceptance	Complexity
	Reduce frequency of water restrictions		Ability to source from two separate basins	Water quality issues	WTP failure	WTP capacity				
	Hervey Bay	Maryborough								
	water security in the region.	security in the region.				operation of the Dynasand Filtration train.		within the existing site boundary.		

The following observations can be made from the above assessment:

Option 1 (Base Case) does not address any of the required project outcomes and subsequent success criteria, and as such will not be considered for further evaluation.

Option 2, bringing forward other supply sources, will supply additional water for the Hervey Bay region, and as such will reduce the frequency of water restrictions in the region and extend the horizon for the next water source augmentation.

Although this option does not provide additional water to the Maryborough region, Section 2.1 has identified that Maryborough water sources are sufficient to provide long term water security for the region.

This option does not improve the issues associated with treating water at Burgowan WTP or Teddington WTP.

Option 3 (a) (treated water transfer), has the potential to service both the Hervey Bay and Maryborough regions, and utilise any spare treatment capacity at Teddington WTP. There is also the potential to improve water quality issues and system treatment reliability at Teddington WTP, by providing an additional source of treated water from Burgowan WTP. This benefit would be dependent on the spare capacity at Burgowan WTP.

Similar to Option 3 (a), Option 3 (b), raw water transfer, has the potential to create a bi-directional supply between Hervey Bay and Maryborough, allowing for effective management of spare capacity between the two regions. This option, however does not improve the issues associated with treating water at Teddington WTP.

Both Options 3 (a) and 3 (b) allow for more effective management of water supply in either region, and will increase the combined reliability of supply.

Option 4, Burgowan WTP and Teddington WTP process improvements, will improve issues associated with the existing raw water treatment at both plants. This option does not provide an additional source of water supply to Hervey Bay or Maryborough, and as such will not improve water security in either region. This option does not address the risks posed from a complete failure of one of the treatment plants.

4.3 OPTIONS SUMMARY

Option 3 (a) (treated water transfer) is the only option that has the potential to address both of the required project outcomes. This, however would be dependent on further investigation of the treatment capacity at both Burgowan and Teddington WTP.

In order to fully utilise the benefits of a bi-directional treated water transfer, the treatment capacity and reliability of both Burgowan and Teddington WTP sites must be investigated. As such it is recommended that Option 3 (a) is assessed in conjunction with Option 4.

Based on the outcomes of the assessment of the above options, Options 3 (a) & 4 will be subject to the next stage of the PAF process, Preliminary Evaluation.

5 Plan and budget for preliminary evaluation

The following is a proposed plan and budget for the preparation of the next stage of the PAF – the Preliminary Evaluation (PE).

As part of the PE, the outcomes outlined in Section 3 will be confirmed, following the feedback from the review of this SASR. As outlined in Section 4.3, the proposed options for further investigation are Option 3 (a) (treated water transfer) and Option 4 (Burgowan WTP and Teddington WTP Process Improvements).

Works required as part of the Preliminary Evaluation:

- confirm the outcomes from this SASR
- review the demands and transfer capacity of a treated water transfer pipeline
- undertake a stakeholder engagement process to consult relevant third parties affected by the proposed options
- assess the capacity and any required modifications to the existing infrastructure to accommodate the proposed options
- develop route alignments for the pipeline and assess potential connections at Burgowan WTP and Teddington WTP
- review the preliminary infrastructure sizing for the transfer pipeline
- identify and review water treatment reliability issues at either plant
- develop capital and operating and maintenance costs for the proposed options
- engage an economic consultant to complete a cost benefit analysis for the proposed options
- Identify preliminary risks associated with the proposed options.

If the project is deemed viable, the following is considered for further assessment:

- determine the most suitable procurement strategy
- detail proposed project governance and organisational arrangements
- develop a plan and budget for the Business Case as the next stage in the project.

The estimated fees for completion of a Preliminary Evaluation in accordance with the above scope is $150,000 (excl. GST).

6 References

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WBWC, 2015, *2015 Fraser Coast Water Supply Strategy*, Wide Bay Water Corporation, Urangan, QLD.

Appendix A

Treated Water Transfer Pipeline Alignments

We Deliver

Legend

- Point of Interest
- Option 1
- Option 2
- Option 3
- Mining Lease
- Railway
- Road
- Cadastre

HOWARD
Burrum Heads Road
TORBANLEA
Torbanlea - Pialba Road
Burgowan WTP
Cassava Dam 2
Cassava Dam 1
Bruce Highway
Maryborough - Hervey Bay Road
Boys Avenue Reservoirs
Maryborough - Biggenden Road
Mungar Road
MARYBOROUGH

Rockhampton
Brisbane
Gold Coast

0 2 4 6 8 km

Scale at A3 1:110,000

SOURCE
© The State of Queensland (Department of Natural Resources and Mines) 2015
Imagery © ESRI 2018

FILE PATH	COORDINATE SYSTEM	DATE
O:\GIS\Projects\BEG851\Maps\ BEG851_01_002_Alignment_Project_B_v2.mxd	GDA 1994 MGA Zone 56	17 Sep 2018

KBR

Level 11, 199 Grey Street, South Bank Qld 4101

Prepared: PC
Checked: MH

TITLE
Fraser Coast Regional Council
MIPP – Strategic Assessment of Service Requirements
Interconnection of Hervey Bay and Maryborough Water Supply Schemes
Treated Water Pipeline Route Overview

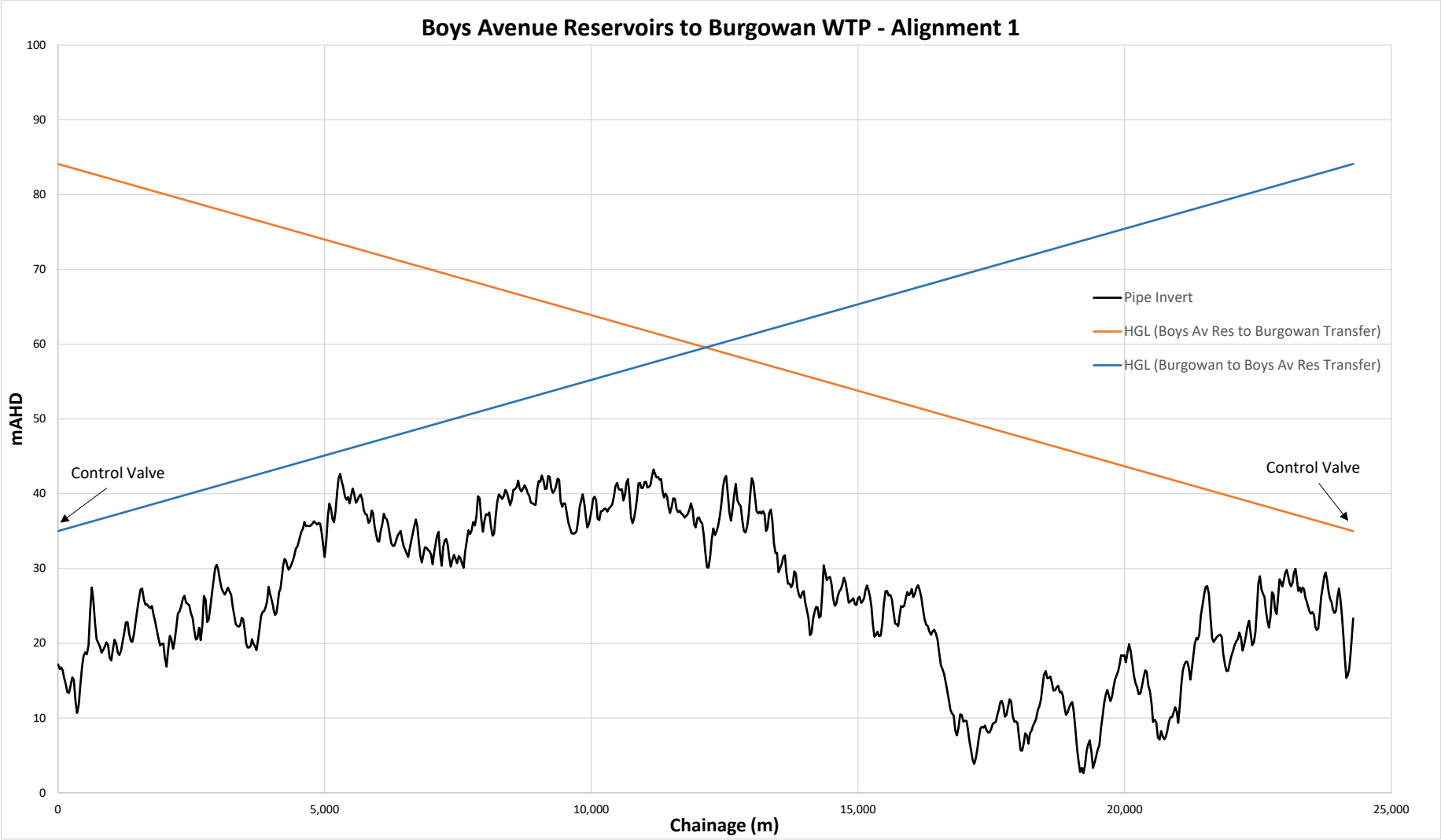
DOCUMENT NO.	REV.
BEG851-0001-TD-WE-GIS-0001-0002	A

Appendix B

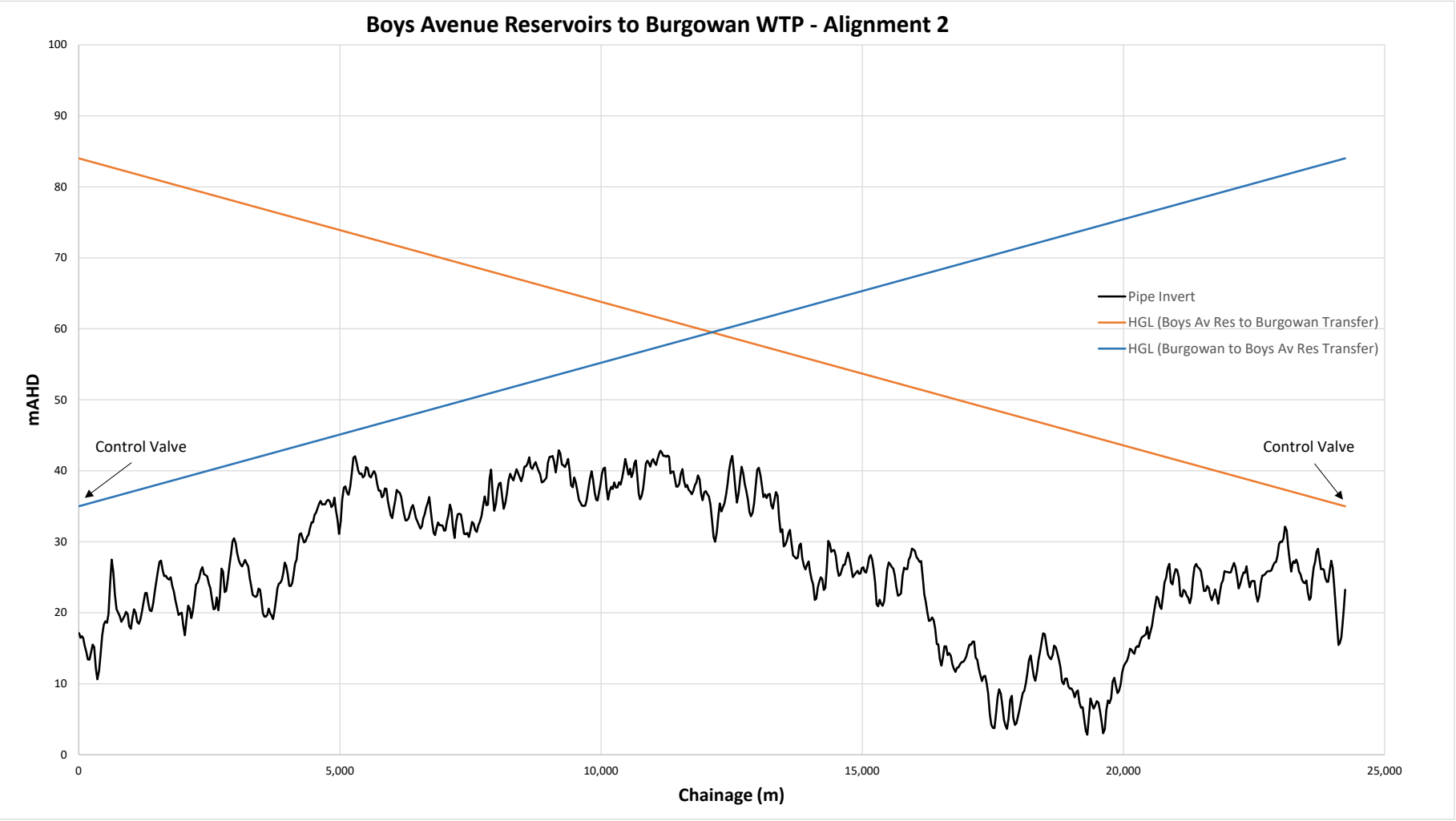
Treated Water Transfer Pipeline Profiles

We Deliver

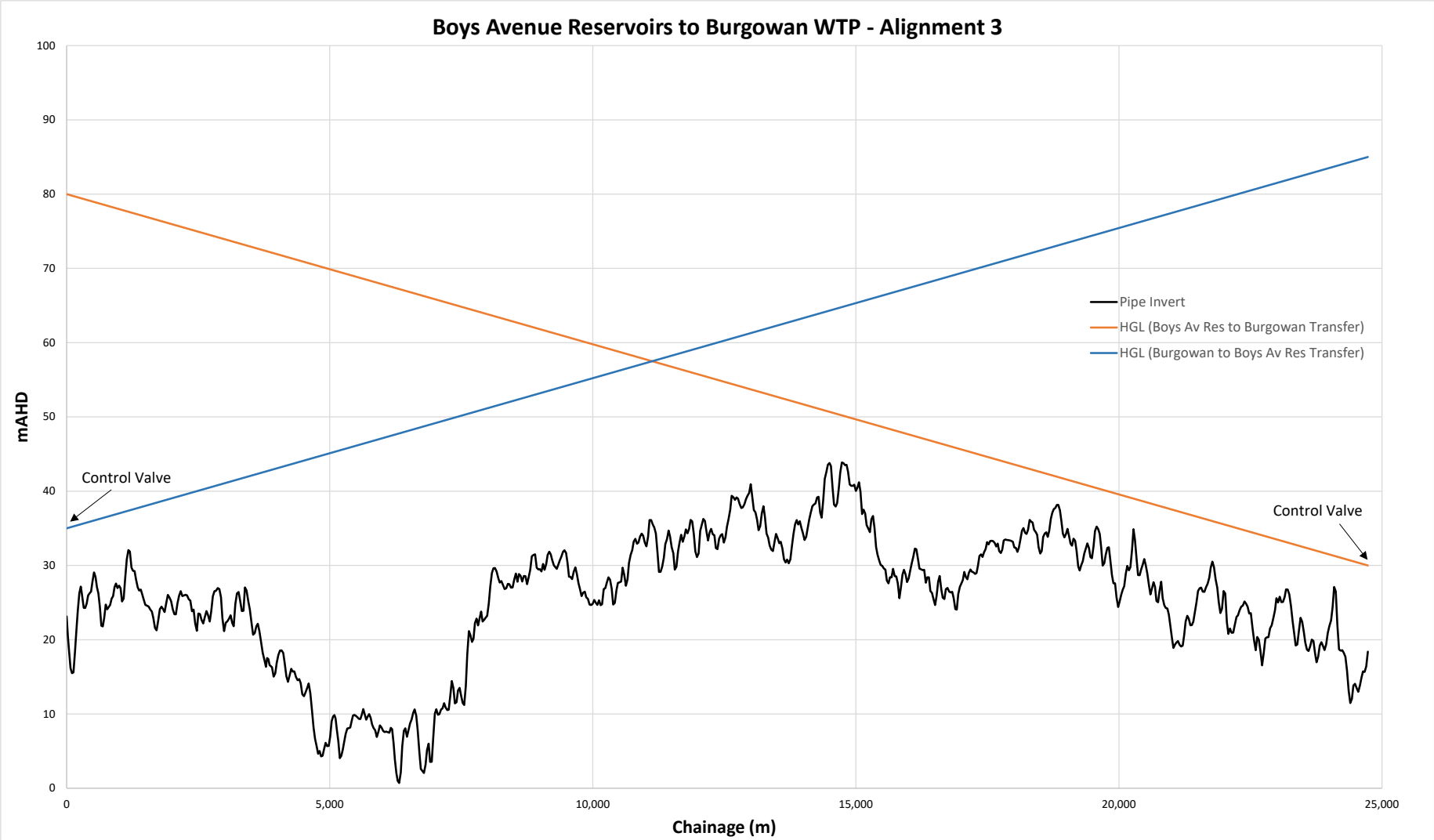
Alignment 1


Boys Avenue Reservoirs to Burgowan WTP - Alignment 1
mAHD
Chainage (m)
Pipe Invert
HGL (Boys Av Res to Burgowan Transfer)
HGL (Burgowan to Boys Av Res Transfer)
Control Valve
Control Valve
0
10
20
30
40
50
60
70
80
90
100
0
5,000
10,000
15,000
20,000
25,000

Alignment 2


Boys Avenue Reservoirs to Burgowan WTP - Alignment 2
mAHD
Chainage (m)
Pipe Invert
HGL (Boys Av Res to Burgowan Transfer)
HGL (Burgowan to Boys Av Res Transfer)
Control Valve
Control Valve
0
10
20
30
40
50
60
70
80
90
100
0
5,000
10,000
15,000
20,000
25,000

Alignment 3


Boys Avenue Reservoirs to Burgowan WTP - Alignment 3
mAHD
Chainage (m)
Pipe Invert
HGL (Boys Av Res to Burgowan Transfer)
HGL (Burgowan to Boys Av Res Transfer)
Control Valve
Control Valve
0
10
20
30
40
50
60
70
80
90
100
0
5,000
10,000
15,000
20,000
25,000