Appendix D

Hamilton WRP Options Identification

Prepared for: Environmental Protection Authority

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1 Introduction

The Hamilton Water Reclamation Plant (WRP) is located approximately four km's west of Hamilton, adjacent to the Municipal Landfill. The WRP was commissioned in the 1960s. The treatment process and reuse consists of the following components:

- Inlet Screening - coarse screen and vortex grit chamber
- Clarifiers - two circular primary up-flow sedimentation tanks
- Trickling filters - four circular biological trickling filters with rock media
- Primary aerated lagoon (65.8 ML), with 1 x 30 kW and 1 x 22 kW surface aerators
- Maturation lagoons – Lagoons 2 and 3
- 63.7 ML Balancing storage and 523.7 ML winter storage
- 115 Ha Irrigation area

The Hamilton WRP operation is licenced by the Environment Protection Authority (EPA) Victoria under section 20 of the Environmental Protection Act 1970. The site is licenced to reuse the treated effluent to land and discharge to waterway. However discharge to waterways is limited to years when wet weather has resulted in inflows exceeding the storage design capacity (storages are to be designed to a one in 10 year wet weather event). Discharges to waterways are to be temporary. The Hamilton WRP storage capacity and irrigation area is currently not sufficient to meet the EPA licence criteria to allow discharge to a waterway.

Discharge to a water body (river or lake) is outside the current EPA licence conditions for the Hamilton WRP. Previously Wannon Water has gained approval from the Environment Protection Authority (EPA) for these discharges via section 30A of the Environmental Protection Act 1970. However EPA has advised Wannon Water that operating outside of the current licence conditions is no longer appropriate and a more permanent solution is required for the disposal or reuse of treated wastewater.

2 Source of Inflow and Infiltration

The inflows to the Hamilton WRP exceed the plants design storage capacity. The winter storage is not compliant with the EPA requirement for storage to contain all reclaimed water up to a 90th percentile wet year (EPA publication 464.2).

In 2012, an investigation "Sewerage Infiltration and Water Balance Assessment and Strategic recommendations Report[1]" was carried out by consultants GHD.

The conclusions of the report were:

- The average dry weather flow (ADWF) is not significantly different to the estimated domestic flow, indicating minimal infiltration into the sewer.
- The rainfall derived inflow into the sewer was high, 0.712 ML per mm of rainfall.

[1] Sewerage Infiltration and Water Balance Assessment and Strategic recommendations Report GHD July 2012

Storm water infiltration has historically been an issue for the Hamilton sewer (GHD 1987[2]). Over the years remedial works have been undertaken, including most recently in 2017, with more works planned for 2018/19.

3 Options Identification for Additional Inflow

Wannon Water identified four options for dealing with additional flow at the Hamilton WRP over and above the design capacity of the plant. The Hamilton township has no forecast of additional population or industry growth, therefore all options are based on current and historical flows.

1 No change. Discharge from balancing storage to Grange Burn and from Monivae Winter Storage to Muddy Creek in winter.

2 Upgrade the current pumping capacity from balancing storage to Monivae Winter Storage to minimise discharges to the environment from the balancing storage.

3 Purchase additional land for irrigation and extend the winter storage to store all winter flows for subsequent irrigation in the dryer months.

4 Build a tertiary treatment plant to further treat the effluent, ensuring that the effluent quality is compliant with the SEPP guidelines prior to discharge to waterways.

3.1 Option 1 - Discharge from both the winter storage to the receiving waterways.

Wet weather infiltration into the sewer network has resulted in higher-than-designed flows at the Hamilton WRP during the winter months. As winter progresses the storage reaches capacity and recycled water is discharged into the Grange Burn from the Balancing Storage. Typically, this flow is around half of the total annual discharge. The other fifty percent of water is discharged to Muddy Creek from Monivae.

Under this option, Wannon Water would apply for a Licence Amendment to allow it to continue these discharges during the wetter months.

This is the lowest cost option and was used as a bench mark for all other options.

3.1.1 Environmental Impact of discharge from the balancing storage and winter storage

Discharge of the treated wastewater occurs during the wetter months of the year when flow rates in Muddy Creek are, on average, 184 times the discharge rate and flow rates in the grange burn are, on average, 30 times the discharge rate. As a percentage of the total waterways flow, the discharge volume from the Hamilton WRP is small.

The treated wastewater discharged has low levels of pathogens, salt and turbidity, with better water quality than the receiving waterways.

However, the phosphorus, total nitrogen and ammonia (nutrient) concentrations in the Hamilton WRP discharge water are greater than those in Muddy Creek and the Grange Burn. The discharge has been shown to increase the nutrient concentrations immediately downstream of the Hamilton WRP in Muddy Creek and at the downstream sample locations in the Grange Burn.

[2] GHD (1987) Infiltration/Inflow Reduction Study – Hamilton Water Board Hamilton Sewerage

Although the nutrient concentrations within the Grange Burn and Muddy Creek were impacted by the discharge there was no impact on macroinvertebrates and fish living within these systems.

3.2 Option 2 - Discharge to Muddy Creek from Monivae Winter Storage

By prioritising discharge from Monivae winter storage over the Balancing storage, the discharged water quality improves dramatically. The Monivae winter storage provides more than 97 days retention and the natural treatment processes within the winter storage improve the effluent quality significantly, as shown in the table below.

Table 1: Comparison of water quality between the balancing storage and Monivae winter storage

Parameter	Typical Concentration discharged during the winter months from the		% Improvement
	Monivae winter storage	Balancing storage	
Ammonia as N (mg/L)	1.1	8	86%
Biochemical Oxygen Demand (mg/L)	3	9	67%
E.coli (orgs/100mL)	12	32	63%
Electrical Conductivity (uS/cm)	1120	1100	No sig change
Nitrogen - Total (mg/L)	5.5	16	66%
pH	8.1	7.9	No sig change
Phosphorus - Total (mg/L)	3.8	5.1	25%
Suspended Solids (mg/L)	4	12	67%
Turbidity (NTU)	2.2	5	56%

To prioritise discharge from Monivae winter storage the transfer pump from the balancing storage to the winter storage will need to be upgraded. Preliminary costings for this upgrade are approximately $420,000.

3.3 Option 3 - Additional Winter Storage and Irrigation Area

In 2017 GHD consultants calculated the additional winter storage and irrigation requirements for the Hamilton WRP[3]. The EPA irrigation model, based on EPA Guideline 168 (The EPA Model and the Wannon Water Model), was used for the calculations with the following inputs:

- Inflow, based on a 20 year series of monthly modelled inflow volumes.
- 20 years of Climate data of monthly rainfall and evaporation.
- 100% pasture as the crop type.
- Crop Coefficient's taken from EPA Publication 168.
- Soil water storage factor of 0.89 (EPA publication 168).

[3] Hamilton WRP Capacity Review & Strategy Effluent Management Options GHD 2017

3.3.1 Results

The output of the model for Hamilton WRP is shown in the table below.

	Irrigation Area	Winter Storage
Current Situation	115 Ha	587 ML (Monivae & Balancing)
Updated EPA Model Requirement	200 Ha	605 ML
Deficit	85 Ha	18 ML

3.3.2 Land requirements

There is a deficit of 85 ha of land for irrigation. Wannon Water's current property can accommodate an additional 60 ha of irrigation areas, therefore an additional 25 ha of land would need to be purchased. It should be noted the 60 ha of land would need to be converted to be suitable for irrigation.

3.3.3 Costing

Based on the modelled winter storage demands the cost of the new winter storage and irrigation area is shown below. The total estimated cost is $2,085,000

Wannon Water
Hamilton WRP - Effluent Reuse
Preliminary Cost Estimate
17/08/2017

Option 1B - 200 ha of irrigation area and 605 ML of Winter Storage required

Desciption	No	Units	Rate	Total	Comment
Land purchase for irrigation	25	ha	$ 7,500	$ 187,500	Existing farm is 115 ha. WW have advised they already own additional 60 ha which is suitable for conversion
Conversion of dry land to irrigated crop	85	ha	$ 6,000	$ 510,000	200 ha required total, 115 ha existing. Assumes converted to centre pivot/lateral move irrigation
Water pipeline	500	m	$ 300	$ 150,000	Assumes DN250 pipeline, allowance for 500 m
Pump station	1	no.	$ 180,000	$ 180,000	
Extra winter storage volume	18	ML	$ 16,807	$ 302,518	605 ML total required, 587 ML existing
General improvements (civil)	1	No.	$ 40,000	$ 40,000	An allowance only, to cover various works, such as some by-pass pipework
General improvements (mechanical)	1	No.	$ -	$ -	
General improvements (I&C)	1	No.	$ 10,000	$ 10,000	An allowance only, to cover various works, such as some by-pass pipework
			Subtotal	*$ 1,390,000*	
Preliminaries			0.1	$ 139,000	
Design			0.1	$ 139,000	
Contingency			0.3	$ 417,000	
			Total	**$ 2,085,000**	+/- 40%

3.4 Option 4 - Tertiary Treatment and Discharge to the Grange Burn

A report from consultants GHD "*Report for Casterton and Other Towns Sewage Water Balance"*[4] investigated the option of building a tertiary treatment plant at the Hamilton WRP to further treat the effluent to meet the SEPP requirements for discharge into an inland waterway.

The report highlighted the key constraints for further treating the effluent are the stringent limits in SEPP for nitrogen (TN <0.9 mg/L) and phosphorous (TP<0.04 mg/L).

The proposed process for the tertiary treatment is for a 0.51 ML/d treatment plant consisting of the following process elements.

- Moving Bed Biological Reactor (MBBR) with ethanol dosing
- Dissolved Air Floatation Filtration (DAFF)
- Micro/Ultra Filtration (MF/UF)
- Reverse Osmosis (RO)
- Discharge to Grange Burn
- RO Waste trucking to Warrnambool for disposal

3.4.1 Costing

The report [4] provided the following cost for the tertiary treatment.

Capital Cost ($m)	$3.55
Operating Cost ($m)	$0.67
Net Present Value (over 20 years) ($m)	$11.5

[4] Report for Casterton and Other Towns Sewage Water Balance, Tertiary Treatment of Excess Effluent, GHD May 2012