[LEI, 2017:A7I5]

Job No.10292

MEMORANDUM

To: Neil Cook

From: Hamish Lowe/Angela Lane

Date: 15 March 2017

Subject: A7I5 – High Level Options and Associated Costings

Background
The Wairoa wastewater treatment and discharge system requires re-consenting and possible modifications. All discharge options, including the status quo and any preferred option, will impose and create cost implications for the Wairoa District Council (WDC) and its ratepayers. The early identification of a range of high level options, and their estimated costs, will assist with informing the direction of the project.

Purpose
To set out combinations of reticulation, treatment, storage and discharge combinations that may be feasible. In addition, provide a broad spectrum of costs for possible options.

Overview
The following high level options have been identified to take into consideration the options available for the Wairoa wastewater treatment system and its discharge. The range of options, and their costs, are based on operational experience of Lowe Environmental Impact (LEI). The options have been broken down into a series of components, including:

- Community reticulation (i.e. status quo or upgrade of piping system)
- Level of treatment (i.e. primary, secondary and/or tertiary treatment)
- Treated reticulation of discharge (i.e. <1 km - >5 km piping distance)
- Storage of wastewater (i.e. buffer or winter storage)
- Final discharge (i.e. estuary outfall, land treatment, wetland)

Community Reticulation
Three options have been chosen to represent the reticulation system, being: status quo, major upgrade, and the installation of a pressure sewer to replace the existing gravity sewer.

Level of Wastewater Treatment
Wastewater treatment has been divided into two stages: primary and secondary, and tertiary. Four options of wastewater treatment have been chosen to represent primary and secondary treatment of wastewater, these being: status quo, improved treatment, new system and constructed wetland treatment. Three options for tertiary treatment of the Wairoa wastewater include: no treatment, low bug count and very low bug count treatment.

Treated Reticulation
Reticulation distance from the wastewater treatment plant (WWTP) to the discharge system can vary. Reticulation of wastewater discharge can cover three options; status quo (i.e. current outfall pipe), near (i.e. < 1km from WWTP) and far (i.e. 5 km from the WWTP).

Storage of Wastewater
If an option to discharge wastewater via land treatment (i.e. forestry) is chosen, a storage requirement will need to be considered, especially if there are no other discharge opportunities.

Storage of wastewater is necessary when soil conditions are not suitable to receive wastewater (i.e. when soil moisture is above field capacity, during a rainfall event). Storage options for wastewater include using: no storage (i.e. when soil moisture conditions are not suitable, wastewater is discharged through the current outfall system or similar), irrigation buffer storage (7 days), and winter irrigation storage (90 days).

Final Discharge
Discharge options include five primary options. These are: existing, ocean outfall, soakage, forestry/pasture and estuary/wetland.

Depending on the discharge system, and storage, a secondary option may be required which allows one to operate when it is not practical to operate the other. This might mean irrigation is used and an ocean outfall is used when soil conditions are not suitable and storage has been fully utilised.

The following figure summarises the options.

High Level Option Costs
Table 1 detailed below shows a possible 12 options for managing Wairoa's wastewater. There are many assumptions that go with these high level costs, and require further information and site specific information to confirm their viability and refine their costs. These assumptions are detailed in Annex 1.

The 12 options are ranked according to the cost required to design, construct, and consent each option. Option 1 maintains the current system and is ranked first due to minimal system changes with an estimated grand total of $1.5 Million. Option 9 maintains the current community reticulation but uses a constructed wetland and a status quo tertiary treatment before discharging via the existing outfall and is ranked second at an estimated cost of $3.3 Million. Option 3 uses the status quo community reticulation, and treatment and discharges via a a soakage system; this option is ranked third at an estimate cost of $4.6 Million. The most expensive option requires the upgrading of the community reticulation to a pressure sewer, installing a new treatment system and using the current discharge outfall piping system at an estimated cost of $65 Million.

Wairoa Wastewater - Potential Treatment and Discharge Options

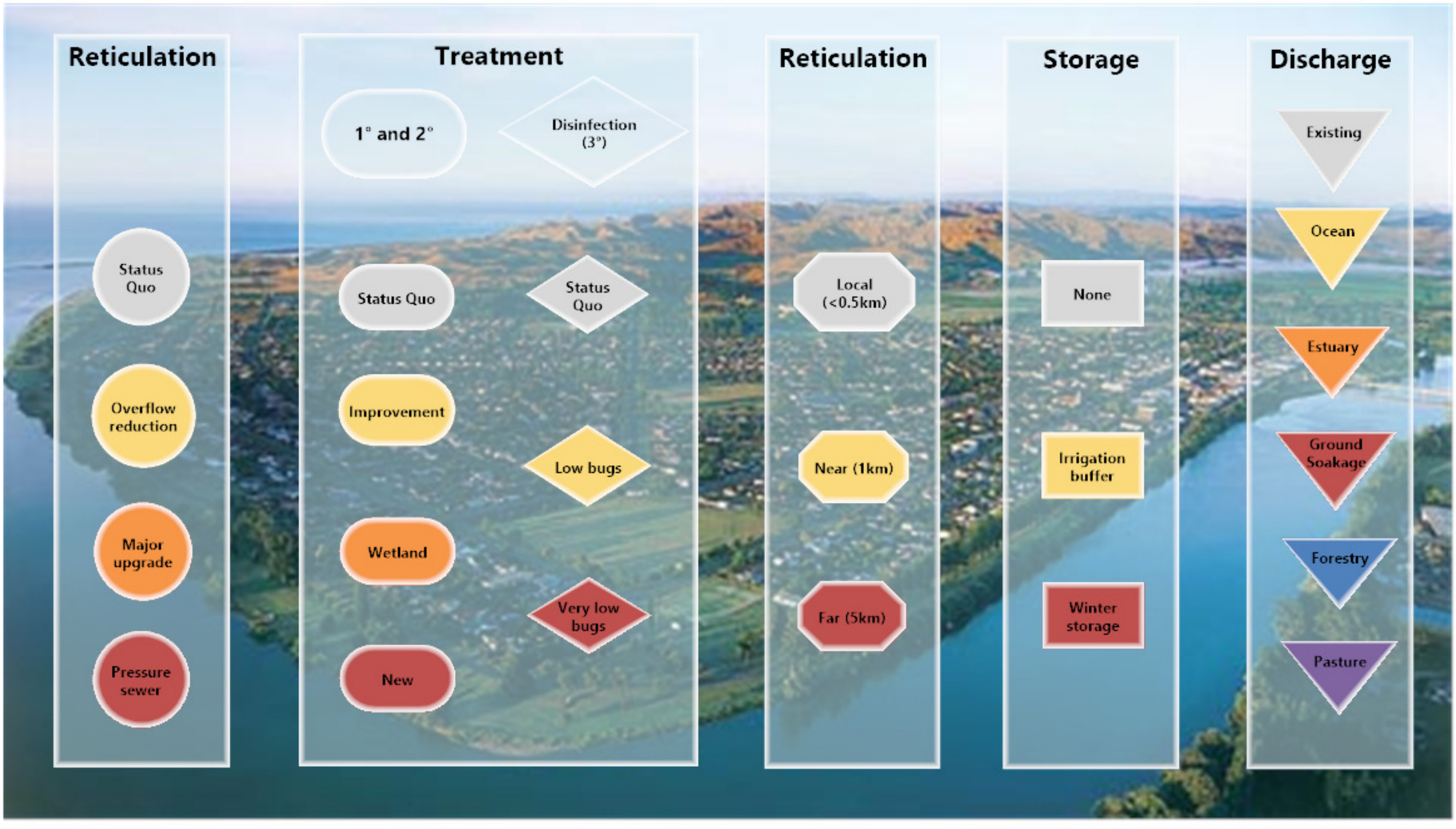

Table 1: High Level Options

Option	Reticulation Community	Treatment		Reticulation Treated	Storage	Discharge 1	Discharge 2
		1° & 2°	3°				
1	Status quo	Status quo	Status quo	Status quo	None	Existing	
2	Status quo	Status quo	Status quo	Near	None	Ocean	
3	Status quo	Status quo	Status quo	Near	None	Soakage	
4	Status quo	Improvement	Status quo	Far	Winter storage	Forestry	
5	Status quo	Improvement	Status quo	Far	Irrigation buffer	Forestry	Existing
6	Major upgrade	Improvement	Status quo	Far	Winter storage	Forestry	
7	Status quo	Improvement	Low bugs	Far	Winter storage	Forestry	
8	Major upgrade	New	Very low bug	Status quo	None	Existing	
9	Status quo	Wetland	Status quo	Near	None	Existing	
10	Status quo	Wetland	Very low bug	Near	None	Estuary	
11	Pressure sewer	New	Very low bug	Status quo	None	Existing	
12	Status quo	Wetland	Low bugs	Near	Irrigation buffer	Forestry	Estuary

Table 2: Costs of High Level Options

Option	Reticulation		Treatment				Reticulation		Storage		Discharge 1		Discharge 2		Total	Rank	Add contingency	Consent and Investigation	Grand Total
	Community		1o & 2o		3o		Treated										30% of total		
1	Status quo	$ -	Status quo	$ -	Status quo	$ -	Status quo	$ -	None	$ -	Existing	$ -			$ -	1	0	$ 1,500,000	**$ 1,500,000**
2	Status quo	$ -	Status quo	$ -	Status quo	$ -	Near	$ 300,000	None	$ -	Ocean	$ 20,000,000			$ 20,300,000	10	$ 6,090,000	$ 1,000,000	**$ 27,390,000**
3	Status quo	$ -	Status quo	$ -	Status quo	$ -	Near	$ 300,000	None	$ -	Soakage	$ 2,500,000			$ 2,800,000	3	$ 840,000	$ 1,000,000	**$ 4,640,000**
4	Status quo	$ -	Improvement	$ 500,000	Status quo	$ -	Far	$ 1,500,000	Winter storage	$ 6,750,000	Forestry	$ 3,600,000			$ 5,600,000	5	$ 1,680,000	$ 1,000,000	**$ 8,280,000**
5	Status quo	$ -	Improvement	$ 500,000	Status quo	$ -	Far	$ 1,500,000	Irrigation buffer	$ 525,000	Forestry	$ 3,600,000	Existing	$ -	$ 5,600,000	5	$ 1,680,000	$ 1,000,000	**$ 8,280,000**
6	Major upgrade	$ 11,000,000	Improvement	$ 500,000	Status quo	$ -	Far	$ 1,500,000	Winter storage	$ 5,062,500	Forestry	$ 2,700,000			$ 15,700,000	9	$ 4,710,000	$ 1,000,000	**$ 21,410,000**
7	Status quo	$ -	Improvement	$ 500,000	Low bugs	$ 250,000	Far	$ 1,500,000	Winter storage	$ 6,750,000	Forestry	$ 3,600,000			$ 5,850,000	7	$ 1,755,000	$ 1,000,000	**$ 8,605,000**
8	Major upgrade	$ 11,000,000	New	$ 15,000,000	Very low bug	$ 1,000,000	Status quo	$ -	None	$ -	Existing	$ -			$ 27,000,000	11	$ 8,100,000	$ 1,000,000	**$ 36,100,000**
9	Status quo	$ -	Wetland	$ 1,500,000	Status quo	$ -	Near	$ 300,000	None	$ -	Existing	$ -			$ 1,800,000	2	$ 540,000	$ 1,000,000	**$ 3,340,000**
10	Status quo	$ -	Wetland	$ 1,500,000	Very low bug	$ 1,000,000	Near	$ 300,000	None	$ -	Estuary	$ 1,000,000			$ 3,800,000	4	$ 1,140,000	$ 1,000,000	**$ 5,940,000**
11	Pressure sewer	$ 33,250,000	New	$ 15,000,000	Very low bug	$ 1,000,000	Status quo	$ -	None	$ -	Existing	$ -			$ 49,250,000	12	$ 14,775,000	$ 1,000,000	**$ 65,025,000**
12	Status quo	$ -	Wetland	$ 1,500,000	Low bugs	$ 250,000	Near	$ 300,000	Irrigation buffer	$ 525,000	Forestry	$ 3,600,000	Estuary	$ 1,000,000	$ 6,650,000	8	$ 1,995,000	$ 1,000,000	**$ 9,645,000**

Annexures

Annex 1 – Assumptions

Wairoa Wastewater - High level cost estimate assumptions			
		Inputs	**Unit**
Number of people		4,500	
Connections		1,750	
Pressure sewer connection		$19,000	$/connection
Pressure sewer treatment plant		$11,000	$/connection
Treated water reticulation (inc pumps)		$300	$/m
Storage days	Buffer	7	days
	Winter	90	days
W/w flow	current	2,500	m³/d
	major upgrade % reduction of W/w flow	25%	
	major upgrade	1,875	m³/d
	pressure sewer volume	0.3	m3/p
	pressure sewer	1,350	m³/d
D/w flow	current	1,900	m³/d
	major upgrade	1,425	m³/d
	pressure sewer	1,350	m³/d
Storage unit cost		$30	$/ m³
Soakage costs		$200	$/m²
		$2,000,000	$/ha
Soakage loading		200	mm/d (wet weather)
Forestry/pasture irrigation	unit cost	$30,000	per ha (includes some land purchase)
	buffer storage	5	mm/d
	winter storage	1.2	mm/d
	buffer area cf winter area	0.75	