Job No.10292

MEMORANDUM

To: Jamie Cox, Wairoa District Council

From: Hamish Lowe, Lowe Environmental Impact

Date: 9 October 2017

Subject: Task A5I2– Cost of land procurement

Purpose

This memo identifies costs for land treatment options for the Wairoa municipal wastewater discharge.

This memo has been produced as background information to consider the option of land treatment and the approximate cost of land for irrigation and storage accordingly. It is not intended to provide any recommendations to the future system at this stage.

Background

The Wairoa wastewater treatment system requires a replacement consent by May 2019. The continuation of the current discharge into the Wairoa River estuary is one of the options to be considered, but this will only be consentable if it is shown to be the best practicable option.

To assist with determining the opportunity and ultimately the feasibility of land application, an indicative idea of land areas and costs are needed.

Scope

This Memorandum supports Task A5I1 (Land Treatment Opportunities) of the Wairoa Wastewater Consenting Task Scopes. The matters to be addressed for **this** task are as follows:

- Broad assessment of land availability, including indicative costs;
- Identification of storage and irrigation area options for further, more detailed consideration; and
- Consideration of approximate land area requirements and wastewater discharge days and volumes.

This report does not consider the costs of any dispersal system (i.e. irrigation structures), which will then need to be added to the cost estimates provided in this report.

1.1 Land Application Scenarios

1.1.1 High Rate Scenario

For a 'Rapid Infiltration' (RI) system, the current **average** authorised discharge rate of 2,700 m^3/d would be discharged into purpose-built basins. The design would be dependent on the infiltration characteristics of the site selected from Zone A or the coastal sand country. On this basis, the land area required for an RI system would be between 0.5 ha and 1.4 ha as shown in Table 1.1.

Table 1.1: Alternative Land Discharge Area Requirements

Zone	Daily discharge volume (m3) (a)	Discharge System (b)	Discharge Area Required (ha) (c) = a/(b x 10)
A	2,700	**RI, 500 mm/d**	0.5
A	2,700	**RI, 200 mm/d**	1.4
A	2,700	**Irrigation, 2 mm/d**	135
A	2,700	**Irrigation, 5 mm/d**	54
B	2,700	**Irrigation 1.2 mm/d**	225
C	2,700	**Irrigation 0.8 mm/d**	338
D	2,700	**Irrigation 0.5 mm/d**	540
E	2,700	**N/A**	-

1.1.2 Low Rate, Town Catchment Only

For a 'Low Rate' irrigation system, the current average authorised discharge rate of 2,700 m^3/d could be irrigated onto productive land to a depth of between 0.5 mm/d and 5 mm/d, depending on the specific soil characteristics of the site selected within Zone A, B, C, or D. On this basis, the land area required for a low rate irrigation system would be between 135 ha and 540 ha as shown in Table 1.1. These areas are based on daily irrigation applications per year.

1.1.3 Low Rate, Town Catchment Plus AFFCO

The AFFCO export meat processing plant is the largest employer in Wairoa, and currently discharges its treated wastewater to the Wairoa River adjacent to the town. Its discharge is consented, and operated, entirely separately from the municipal wastewater discharge, and there is **no proposal** to combine any aspect of the two discharges. However, just as the re-

consenting of the municipal discharge requires a careful consideration of discharge alternatives, so also should it be expected that AFFCO will need to examine its discharge options when its re-consenting falls due. Given the significance of AFFCO to the employment and prosperity of Wairoa, it is prudent to consider the implications of a potential combined municipal/AFFCO wastewater management facility.

AFFCO is authorised by consent number DP070670Wb to discharge 7,000 m^3 per outgoing tide to the Wairoa River. Adding this volume to the 2,700 m^3/d from the municipal discharge, a total combined discharge of the order of 9,700 m^3/d could be involved. This volume, if applied to land by way of an irrigation system as briefly outlined in Table 1.1 above, would require a land area of between 1.94 ha for rapid infiltration and 1,940 ha if Zone D land was irrigated. These areas may need to be refined in light of the comparative nutrient and pathogen loadings of the respective wastewater streams.

1.2 General

Two land ownership options are briefly addressed here, to provide an indicative basis for further consideration. The size of the land area involved is dependent on both the application rate (amount in one hour) and the volume of wastewater to be discharged (both daily and annually).

1.3 Land Ownership Options

1.3.1 General

There are basically two options for Wairoa District Council (WDC) to secure the right to use an area(s) of land for wastewater discharge; the land can be purchased and/or owned by WDC, or an agreement can be entered into with the landowner involved to enable the discharge system to be operated.

1.3.2 Land Ownership by WDC

The land may already be owned by WDC, or alternatively arrangements could be made to purchase a suitable block at the going market rate. An alternative option could be to lease the land from its owner, thereby annualising the cost of the right to use the land and saving the large one-off capital investment in outright purchase.

Owning the land has the major advantage of security of tenure. The investment in, and dependence on, a land discharge system would be best protected for the long term by WDC owning the right to occupy and use the land involved. Its disadvantage is the cost of the investment, particularly if less expensive options to secure the right to use the land are available.

A lease of the land for wastewater discharge could be an alternative to outright purchase. The major difference between a lease and ownership for this purpose is that ownership is potentially permanent, while a lease always has an expiry date. Again, the trade-off is between cost and security. Leasing avoids the up-front cost of purchase, replacing that with an annual rental. However, the longer the term of the lease, the more uncertain will be the prospect of its renewal when it expires. There can be no guarantee that the lessor (or his/her successors) will agree to renew a lease at expiry, and if the wastewater discharge system is entirely

dependent on that land discharge option then WDC risks having nowhere to put its 2,700 m^3/d of wastewater.

1.3.3 Agreement with Landowner

There are landowners who recognise the benefits of wastewater irrigation, with both the nutrients and the water that carries them having the potential to enhance the productivity of the land involved.

There are market pressures (industry restrictions) acting against some types of product if human wastewater has been involved in their production. For example, dairy companies in particular are reluctant to take milk from dairy farms using human wastes unless the discharge is treated to a very high standard.

Nevertheless, there are sensible land use options, including the production of red meat, store stock, and cut-and-carry fodder crops that could be compatible with a wastewater irrigation scheme. An agreement with a landowner in this situation would have the same caveat as a lease arrangement, in that such an arrangement would have an expiry date, and WDC could not be certain whether such an agreement could be renewed upon its expiry. It would, however, have the significant advantage over a lease or purchase/ownership of leaving the land management to the owner/farmer, who is accustomed to making a living from land management, while leaving WDC free to concentrate on the core functions that are its statutory mandate.

While an agreement with a landowner could potentially be an attractive option for an irrigation discharge, the same could not be said for a Rapid Infiltration discharge. The small area of land used for RI would not be capable of being managed for any productive purpose, and would be used exclusively for wastewater disposal. In this regard, it would best be considered part of the wastewater treatment and disposal utility infrastructure, and sensibly it should not only be designated for this purpose, but should be owned by WDC as well.

1.4 Costs

1.4.1 Land Area Requirements

Any land area for the discharge of municipal wastewater would need not only the **actual area** to which the discharge would be made, but also a **buffer margin** to separate the discharge activity from neighbouring properties, roads, surface water courses, houses, and community facilities such as maraes, schools and golf courses. Resource consenting for such a discharge should be expected to specify different buffer widths from different neighbour situations, which is dependent on the level of treatment the wastewater has received before discharge.

Two factors that would have a major impact on the volume of water to be discharged, and consequently the land area and cost requirements, are whether AFFCO contributes its waste stream to the municipal discharge, and what reductions to stormwater inflow to the sewer can practicably be achieved. AFFCO's inclusion would increase the size and cost of land discharge options. Significant reductions in stormwater inflow should be expected to reduce the requirement for wastewater storage, and/or to reduce the dependence on a contingent discharge to water.

A further dimension of any land discharge system is a requirement for the management of wastewater at times when land discharge is not possible. This would involve **either** a facility for a contingency discharge to surface water (such as the current estuary discharge) **or** a wastewater storage facility. If a storage facility is to be considered, then its land requirement should also be considered.

It may prove possible for an RI discharge to operate in all weathers, but there is still the possibility of plant malfunction, outage for plant maintenance, or other reasons to need to defer, and therefore to store, wastewater discharge. For the purpose of comparison, a 2 week storage capacity would be 37,800 m^3 (based on a daily discharge volume of 2,700 m^3). This could be provided by a pond with a 4 m depth, and a square footprint of 97 m x 97 m.

For an irrigation discharge, a 90 day storage requirement (which is what is often used for agricultural effluents) would equate to 243,000 m^3, which could be delivered by a pond with a 4 m depth, and a square footprint of 246 m x 246 m. A more likely 120 day storage requirement would equate to 324,000 m^3, which could be delivered by a pond with a 4 m depth, and a square footprint of 285 m x 285 m.

It is again stressed that the land area requirements above are based on the current municipal discharge, without allowance for either the addition of AFFCO wastewater or the reduction of stormwater inflow to the sewer.

1.4.2Land Costs

A quick search of real estate websites shows larger landholdings (> 100 ha) for sale at $20,000 per hectare, while smaller holdings (< 10 ha) cost closer to $30,000 per hectare. For comparative purposes, these land purchase costs are shown against the area requirements for the discharge options across Zone A, B and C land only in Table 1.2.

Table 1.2: Indicative Land Purchase Costs for Land Discharge Options (land discharge area only, excludes buffer areas and inclusion of AFFCO)

Zone	Discharge System	Area Required (ha)	Indicative Cost to Purchase ($)
A	**RI, 500 mm/d**	0.5	$16,200
A	**RI, 200 mm/d**	1.4	$40,500
A	**Irrigation, 2 mm/d**	135	$2.7 M
B	**Irrigation, 1.2 mm/d**	225	$4.5 M
C	**Irrigation, 0.8 mm/d**	338	$6.7 M

In addition to the purchase costs for land to receive a wastewater discharge, potential costs for the land to accommodate a storage facility are shown in Table 1.3 below. These figures are based on an average daily discharge of 2,700 m^3/day and include a buffer distance of 100 m surrounding the storage pond. A land purchase cost of $30,000 per hectare is used for these estimates.

Table 1.3: Indicative Land Purchase Costs for Storage Options

Discharge System	Storage Area Required (m x m)	Buffer Margin Area @ m x 100	Total Area Required (ha)	Indicative Cost to Purchase ($)
2 week storage for RI	97 x 97	78,800	8.8 ha	$264,000
90 day Storage for Irrigation	246 x 246	138,400	20 ha	$600,000
120 day Storage for Irrigation	285 x 285	154,000	24 ha	$720,000

1.4.3 Land Cost Summary

The indicative land purchase costs described in this section of this report can be summarised as shown in Table 1.4. For the purpose of compiling this table, it is assumed that the comparatively small land areas for RI discharge would cost $30,000 per hectare, while the larger land areas required for irrigation would cost $20,000 per hectare. The land areas, and potential costs, are based on the current municipal discharge, without the addition of AFFCO wastewater, and without reduction of stormwater inflows to the sewer.

Table 1.4: Indicative Land Purchase Costs for Discharge and Storage Options

Zone	Discharge System plus Storage	Total Area Required (ha)	Indicative Cost to Purchase ($)
A	**RI, 500 mm/d, 2 weeks' Storage**	9.34	$280,200
A	**RI, 200 mm/d, 2 weeks' Storage**	10.15	$304,500
A	**Irrigation, 2 mm/d, 90 days' Storage**	155	$3.3 M
A	**Irrigation, 2 mm/d, 120 days' Storage**	159	$3.42M
B	**Irrigation, 1.2 mm/d, 90 days' Storage**	245	$5.1 M
B	**Irrigation, 1.2 mm/d, 120 days' Storage**	249	$5.2 M
C	**Irrigation, 0.8 mm/d, 90 days'**	358	$7.3 M
C	**Irrigation, 0.8 mm/d, 120 days'**	362	$7.42 M

An in-depth cost analysis of land treatment options will be performed in a later report, if needed.

1.5 Potential Availability of Land

This memo makes no recommendation of a favoured option, and no assessment has been made of potentially available properties. WDC would need to consider its options for the acquisition of land, including the following:

- Using land that it already owns;
- Purchasing a suitable area of land when it becomes available;
- Negotiating the purchase of land that may not currently be available;
- Arranging a long-term lease of a suitable area of land; and
- Entering into an agreement with a landowner for a long term to enable land discharge of treated wastewater.

These options would need to be considered in terms not only of up-front capital cost, but also of ongoing land management responsibilities. For an RI system, the size of the land area and its cost are comparatively modest, and land purchase and/or ownership should be regarded as the most secure option here. For irrigation options, the cost of the investment in land ownership is high enough to give leasing, and particularly agreement with a landowner, a good basis for further consideration.