

Wairoa WWTP and Reticulation Upgrade Options

(LEI, 2017:B1A1)

Prepared for

Wairoa District Council

Prepared by

L E W E
Environmental
I m p a c t

July 2017



Wairoa WWTP and Reticulation Upgrade Options (LEI, 2017:B1A1)

Wairoa District Council

This report has been prepared for the **Wairoa District Council** by Lowe Environmental Impact (LEI). No liability is accepted by this company or any employee or sub-consultant of this company with respect to its use by any other parties.

Quality Assurance Statement		
Task	Responsibility	Signature
Project Manager:	Hamish Lowe	
Prepared by:	Phil Lake	
Reviewed by:	Hamish Lowe	
Approved for Issue by:	Hamish Lowe	<i>H J Lowe</i>
Status:	Final	

Prepared by:

Low Environmental Impact
P O Box 4467
Palmerston North 4442

Ref: RE-10292-
Retic_WWTP_discharge_upgrade_options-
170710-Final.docx

| T | [+64] 6 359 3099
| E | office@lei.co.nz
| W | www.lei.co.nz

Job No.: 10292
Date: July 2017

Revision Status			
Version	Date	Author	What Changed and Why
1	10/07/2017	PL	Initial draft



TABLE OF CONTENTS

1	EXECUTIVE SUMMARY	1
2	INTRODUCTION	2
2.1	Background	2
2.2	Purpose	2
2.3	Scope	2
3	UPGRADE OPTIONS.....	3
3.1	General.....	3
3.2	Business as Usual	3
3.3	Reticulation Upgrades	3
3.4	WWTP Upgrades.....	4
3.5	Discharge Regime Changes.....	4
4	IMPLICATIONS OF UPGRADE OPTIONS.....	6
4.1	General.....	6
4.2	Business as Usual	6
4.3	Reticulation Upgrades	6
4.4	WWTP Upgrades.....	7
4.5	Discharge Regime Changes.....	7
5	CONCLUSIONS	9
6	RECOMMENDATIONS	10
7	REFERENCES	11



1 EXECUTIVE SUMMARY

The Wairoa District Council (WDC) owns and operates the Wastewater Treatment Plant (WWTP) for Wairoa, the largest town of the district. The WWTP was constructed in 1980 and consists of an inlet screen, a facultative pond with two aerators, and a maturation pond. The treated wastewater discharges into the Wairoa River estuary during falling tides at night time (6:00 pm to 6:00 am). The discharge resource consent authorising this expires on 31 May 2019.

The reticulated sewer system for Wairoa is of varying age with about 70% installed more than 60 years ago. It has deteriorated during recent years and allows inflows of significant volumes of stormwater and groundwater (I & I). During storm events, the additional volumes have caused flow and discharge management problems at the WWTP and, at times, caused breaches of consent conditions limiting the daily volumes and timing of discharges to the Wairoa River estuary. WDC have been addressing I & I sources through the disconnection of stormwater connections, sewer reticulation renewal, and pump station improvements.

This report reviews the implications of the following options:

- “Business as usual” – a continuation of the existing programmes of reticulation renewals and no changes to the WWTP or its discharge;
- Reticulation upgrades – a more intensive programme of reticulation upgrades than has been planned by WDC;
- WWTP upgrades – options for changes to the design and operation of the WWTP; and
- Discharge regime changes – options for changes to the timing and location of the treated wastewater discharge.

The “business as usual” option carries the greatest risks of causing on-going concerns from the community and Hawke’s Bay Regional Council (HBRC), and potentially either a short term future discharge consent or a declined consent decision. Reticulation upgrades, either continuing the existing planned programme or implementing a more intensive programme, will greatly assist with management of wastewater flows, treatment performance, storage, and discharge. A number of WWTP upgrades and/or discharge regime changes are possible, but WDC and the community need to understand and be confident of the drivers or need to implement any of the options and the likely outcomes of any such implementation.

The recommended strategy for assessing the need for any changes is to first determine, with the assistance of the community, the favoured discharge method and receiving environment for the treated wastewater from the WWTP. Once this has been selected with reasonable confidence that resource consent for it will be sought and it will be implemented, it will then be possible to assess whether the existing level of treatment is suitable for that discharge location. WWTP upgrade options should be considered only if they are necessary for minimising adverse effects of the future discharge on the environment (including addressing any cultural concerns). It is quite possible that there will be no need to modify the WWTP at all. If improvements are required, then options for targeted treatment and/or reticulation upgrades can be assessed on a more informed basis than can occur prior to determining the nature of the future discharge method and receiving environment.



2 INTRODUCTION

2.1 Background

The Wairoa District Council (WDC) owns and operates the Wastewater Treatment Plant (WWTP) for Wairoa, the largest town of the district. The WWTP was constructed in 1980 and consists of an inlet screen, a facultative pond with two aerators, and a maturation pond. The treated wastewater discharges into the Wairoa River estuary during falling tides at night time (6:00 pm to 6:00 am). The discharge resource consent authorising this expires on 31 May 2019.

The reticulated sewer system for Wairoa is of varying age with about 70% installed more than 60 years ago. It has deteriorated during recent years and allows inflows of significant volumes of stormwater and groundwater (I & I). During storm events, the additional volumes have caused flow and discharge management problems at the WWTP and, at times, caused breaches of consent conditions limiting the daily volumes and timing of discharges to the Wairoa River estuary. WDC have been addressing I & I sources through the disconnection of stormwater connections, sewer reticulation renewal, and pump station improvements.

In order to prepare a renewal discharge consent application WDC need to consider the various options for changing the reticulation and WWTP, understand the implications of each option or combination of options, and select the best practicable option (BPO) for seeking a renewed discharge consent from Hawke's Bay Regional Council (HBRC).

2.2 Purpose

The purpose of this report is to provide an initial high-level review of the various options for changing the reticulation and WWTP, and to describe the implications of each option or combination of options that WDC could implement as an integral part of their consent renewal project.

2.3 Scope

This report reviews the implications of the following options:

- "Business as usual" – a continuation of the existing programmes of reticulation renewals and no changes to the WWTP or its discharge;
- Reticulation upgrades – a more intensive programme of reticulation upgrades than has been planned by WDC;
- WWTP upgrades – options for changes to the design and operation of the WWTP; and
- Discharge regime changes – options for changes to the timing and location of the treated wastewater discharge.



3 UPGRADE OPTIONS

3.1 General

There is a continuum of potential upgrade options for each of the reticulation, the WWTP, and the discharge of treated wastewater. The extremes of these are “do nothing” through to “major upgrades.” In reality, WDC is already implementing a programme of reticulation improvements and is required to consider options for the WWTP and its discharge as an integral part of the imminent discharge resource consent renewal application, so the “do nothing” option has already been dismissed as unacceptable. This leaves “business as usual” as the de facto status quo scenario, which incorporates all of the infrastructure works that have been programmed into WDC’s current long term plan (2015-25 LTP).

The sections below provide examples of the general groups of options that WDC could reasonably consider for upgrades of the reticulation, WWTP, and discharge components.

3.2 Business as Usual

This is a continuation of the existing programmes of reticulation renewals and no changes to the WWTP or its discharge. In relation to the reticulation, WDC have:

- Redistributed and refurbished pumps at the pump stations;
- Installed flap valves on the pump station outlet pipelines to the river to prevent the historical problem of floodwaters surcharging back into the reticulation;
- Investigated and removed stormwater connections from the reticulated sewer; and
- Renewed and upgraded parts of the sewer reticulation.

The WWTP has had no upgrades or changes apart from routine maintenance and occasional de-sludging of the ponds.

All of the reticulation and WWTP maintenance and renewals programmed into the 2015-25 LTP will be implemented without any changes to the scope or timing of the various works.

3.3 Reticulation Upgrades

This option is an expansion and more rapid completion of the existing programmes of reticulation renewals. It is assumed that the pump capacities are more than adequate for the future flows, given that the reductions in I & I and limited growth (if any) in future population will reduce the daily flows and peak storm flows.

The ultimate form of reticulation upgrade could include pressurised sewer mains, but it is more likely to comprise modern continuous gravity flow piping with effective joint seals and no connections to stormwater (both private property and road runoff) across at least 90 % of the reticulated sewer network. It would involve large areas of roadworks and intensive catchment investigations of the integrity of all private connections to the network. CCTV and smoke testing are likely to be widely used as tools to investigate and prioritise the reticulation upgrades, but much of this could be avoided if WDC chose instead to merely prioritise upgrades based on the known levels of I & I in each pump station catchment (Kopu Road is the worst) and the ages of the existing pipes (replacing the oldest pipes first).



3.4 WWTP Upgrades

A wide range of WWTP upgrades is possible due to the wide range of treatment technologies and proprietors. The most dramatic upgrade would be abandonment of the existing WWTP and construction of an entirely new WWTP elsewhere, but this would need to have extremely strong reasons for its implementation. The least dramatic upgrades might be the addition of a new component such as an aerator or filtration.

Clearly most options are much higher performing than is needed for Wairoa's WWTP to meet acceptable treatment standards (assuming it doesn't already). Each stage of the WWTP process could be assessed for its performance and either an integrated package of additions or a selection of targeted treatment technologies could be selected by WDC for implementation. The criteria for selecting upgrades should be based on the desired improvement in specific wastewater parameter concentrations and how effective a particular option might be in achieving that target.

Some specific options that WDC might consider are:

- Installation of an inlet grit arrestor;
- Installation of additional aerators;
- Rearrangement of inlet or outlet structures for the ponds;
- Installation of baffles to improve circulation and mixing within the ponds;
- Installation of baffles or bunds to create one or two smaller maturation ponds within the footprint of the existing maturation pond;
- Construction of additional maturation ponds;
- Installation of clarifiers, sludge digestors, and/or trickling filters;
- Installation of a floating wetland near the outlet of the maturation pond;
- Chemical dosing to reduce phosphorus or pathogen concentrations;
- Filtration prior to discharge;
- UV radiation lamps to reduce pathogen concentrations.

Additional factors to consider when reviewing upgrade options should include the capital costs, operating costs, and additional complexity of treatment plant operations and maintenance. WDC should also bear in mind the rate of sludge formation within the WWTP ponds and ensuring that it remains practicable to remove the sludge when required without disrupting the WWTP and its treatment performance. It is possible that treatment upgrades will influence the rate of sludge accumulation and/or become physical obstacles for de-sludging machinery trying to remove the sludge from the base of the ponds.

3.5 Discharge Regime Changes

A range of discharge regime changes could be considered by WDC. It is important to note that a combination of discharge options can be a better overall environmental and practical solution than trying to optimise a single discharge option.

If the existing discharge to the Wairoa River estuary is to be continued, it is possible to adjust the timing and maximum daily volume. If it is to be used as a back-up or secondary discharge option for a combined discharge system (eg with a priority discharge to land), then it may be possible to limit the discharge to the estuary to river conditions such as the highest 20 % of annual flows (20th flow exceedance percentile, or 20FEP) or some other threshold flow rate, at least during summer months when the priority discharge to land receives wastewater during lower river flow conditions.



The discharge location could be moved within the estuary, and the design of the outlet could also be changed. The purpose of such changes might be to avoid siltation around the outlet and/or to access faster flowing and deeper water in order to improve the dispersion of the discharge.

A marine outfall could be considered, and there are a number of options for its route and distance out into Hawke Bay. The timing of discharge to a marine outfall could either be continuous or only during night time depending on the community's preferences.

Land discharges are possible, and will need to match the terrain, soil types, type of discharge (such as irrigation or rapid infiltration basins), and proximity to waterways or residences which will restrict the design, location and extent of such a system. There is a large variety of options for land discharge methods and designs. The footprint of each land discharge system ranges from very large for deficit irrigation¹ regimes through to very small for a rapid land passage (papatuanuku) system.

Additional storage may be a direct implication of changes to the discharge regime, as there are likely to be times when discharges are not appropriate for the prevailing environmental conditions, and the current 5,400 m³ storage may not be large enough. The size of the required storage will need to be determined for a worst-case scenario based on the known flows through the WWTP and the likely restrictions on discharges.

¹ Deficit irrigation aims to apply enough water to maintain soil moisture within its field capacity and avoids generating drainage through the plant roots to the groundwater below.



4 IMPLICATIONS OF UPGRADE OPTIONS

4.1 General

Each option provides reasonably certain outcomes but incurs risks as well as benefits. This section outlines these features for each of the broad options outlined in the previous Section 3.

4.2 Business as Usual

The likely outcomes of this option are:

- Daily flow volumes and particularly peak flows will reduce from 2009-14 levels because the I & I will reduce;
- Pump stations will continue to overflow during some storms as I & I overwhelms their pumping capacities;
- The sand and silt component of the sludge accumulating in the WWTP's facultative pond will reduce;
- The raw wastewater entering the WWTP will be more concentrated on average than previously;
- The average HRT of the WWTP will increase, which may result in improved treatment performance (which should be capable of delivering treated wastewater quality that is equal to or better than the current discharge despite the increased concentration of the incoming raw wastewater);
- The WWTP will be better able to retain daily inflows within its 5,400 m³ storage volume without having to rely on emergency overflows before the next discharge event is due to commence;

The implications of this option are:

- The pump station overflows will more likely require consenting in HBRC's view;
- Flows through the WWTP may remain higher than desirable for reliable treatment;
- Flows may continue to overwhelm the WWTP storage volume more often than is desirable for a good consent compliance record;
- More concentrated raw wastewater may result in more concentrated treated wastewater being discharged than has been the case in recent years, which could lead to:
 - greater concerns for adverse effects on the environment;
 - greater pressure for tougher constraints on the discharge consent conditions;
 - greater pressure for WDC to investigate and implement WWTP upgrades in order to return the treated wastewater to a quality equal to or better than previously
- Discharge consent constraints such as timing and daily volumes may be difficult to comply with at times

4.3 Reticulation Upgrades

The likely outcomes of these options are more rapid and more effective reductions in wastewater flows due to I & I reductions, which will exceed all of the "business as usual" outcomes in due course. It may be possible to avoid the need for resource consents for emergency discharges from the pump station overflow structures because these events have ceased altogether or have become very rare. It may also avoid the need for consideration of WWTP upgrades except what is required for satisfying community and HBRC requirements for the future discharge environment and regime (eg some form of land passage or additional pathogen reduction).



The risks of these options are:

- The costs will be unsustainably expensive for the community;
- The level of upgrade may be far more “gold-plated” than is necessary compared with consenting the occasional pump station overflows; and
- The timeframe for completion of these upgrade works is either unrealistic or becomes a very long-term project.

It is also possible (or even quite likely) that a major seismic event will undo all the good work well within the lifetime of the upgraded reticulation, and force WDC to repeat it all again much sooner than anticipated.

4.4 WWTP Upgrades

The likely outcomes of these options, apart from the intended improved treatment performance and improved treated wastewater quality, are:

- Significant to very large capital investment in new treatment technologies;
- Increased complexity of operation and maintenance, and likely increased power usage, leading to increased on-going operating costs;
- Additional financial burden on ratepayers.

The risks of these options are:

- The costs will be unsustainably expensive for the community;
- The level of upgrade is far more “gold-plated” than is necessary for protecting the environment or compared with consenting the discharges from the existing WWTP;
- The anticipated level of improved treatment may not be reliably achieved (leading to further reviews and implementations of other technologies while also risking breaches of consent conditions and ratepayer criticism);
- Unanticipated worsening of some wastewater parameters including generating offensive odours and pond failure (as a worst-case scenario).

4.5 Discharge Regime Changes

The likely outcomes of these options are:

- Minor to very large capital investment in modified or new discharge infrastructure;
- Increased complexity of operation and maintenance, and possibly increased power usage, leading to increased on-going operating costs;
- Potentially more intensive monitoring for environmental effects;
- Some reduction in adverse effects on the environment, or at least a perception that WDC have improved it in response to community feedback;
- If land discharge is selected, it will be challenging to implement. As has been noted in LEI (2017:A5I1), there is limited suitable land within a 10 km radius of the WWTP for wastewater discharges, mainly due to slope and drainage limitations. There are strong seasonal limitations due to wet soils for at least 8 months of each year. It is therefore apparent that land discharges will also be seasonal and only discharge a portion of the annual wastewater flows, which requires an alternative discharge environment (estuary or ocean) for the rest of the wastewater.

The risks of these options are:



- Cultural or public health values may over-ride financial impediments, or could force a change from a discharge system that has little or no detectable environmental effects to an alternative system that is environmentally no better.
- A marine outfall would have to overcome construction and erosion stability challenges to install a pipeline through the Wairoa estuary bar and out into Hawke Bay. There may well be recreational, cultural, fisheries, and financial obstacles to this option.
- A land discharge system may not be able to accommodate as much of the annual wastewater flows as the community would prefer;
- WDC may have difficulties finding a willing landowner to receive the treated wastewater;
- Large storage might be impracticable and financially unaffordable for the community.



5 CONCLUSIONS

This report reviews the implications of the following options:

- “Business as usual” – a continuation of the existing programmes of reticulation renewals and no changes to the WWTP or its discharge;
- Reticulation upgrades – a more intensive programme of reticulation upgrades than has been planned by WDC;
- WWTP upgrades – options for changes to the design and operation of the WWTP; and
- Discharge regime changes – options for changes to the timing and location of the treated wastewater discharge.

The “business as usual” option carries the greatest risks of causing on-going concerns from the community and Hawke’s Bay Regional Council (HBRC), and potentially either a short term future discharge consent or a declined consent decision. Reticulation upgrades, either continuing the existing planned programme or implementing a more intensive programme, will greatly assist with management of wastewater flows, treatment performance, storage, and discharge. WDC and their community need to determine whether the current programme outlined in the 2015-25 LTP is acceptable or whether it would be advantageous and affordable to accelerate and expand the reticulation upgrade programme.

A number of WWTP upgrades and/or discharge regime changes are possible, but WDC and the community need to understand and be confident of the drivers or need to implement any of the options and the likely outcomes of any such implementation. Depending on the discharge regime and receiving environment(s) selected, there may be little or no need to upgrade the WWTP, as the existing level of treatment may be suitable and adequate for the future discharge method and for achieving less than minor adverse effects on the receiving environment.



6 RECOMMENDATIONS

The recommended strategy for assessing the need for any changes is to first determine, with the assistance of the community, the favoured discharge method and receiving environment for the treated wastewater from the WWTP. Once this has been selected with reasonable confidence that resource consent for it will be sought and it will be implemented, it will then be possible to assess whether the existing level of treatment is suitable for that discharge location. WWTP upgrade options should be considered only if they are necessary for minimising adverse effects of the future discharge on the environment (including addressing any cultural concerns). It is quite possible that there will be no need to modify the WWTP at all. If improvements are required, then options for targeted treatment and/or reticulation upgrades can be assessed on a more informed basis than can occur prior to determining the nature of the future discharge method and receiving environment.

WDC should aim to implement any changes to the WWTP and/or discharge only after HBRC have processed the renewal discharge consent application to a decision. This will require careful wording of consent conditions to describe the works to be implemented and the timing of those works. Some flexibility of the types of WWTP changes may also be necessary to allow WDC to consider implementing a range of possible treatment options that may assist the WWTP to achieve specified levels of wastewater treatment – it can be beneficial to avoid locking the resource consent and WWTP down to specific items of treatment plant or design details.

It is recommended that WDC should also implement the following:

- Continue to implement the current programme of disconnection of stormwater connections into the reticulated sewer, alongside reticulation improvements and renewals;
- Consult with the community as to whether an accelerated and expanded programme of reticulation upgrades would be appropriate and affordable (and endorse this during the 2018-28 LTP consultation process if specific consultation is undertaken in advance of this);
- Ensure that the full 5,400 m³ storage capacity at the WWTP is kept available as much as possible for retaining storm inflows and managing discharges within consented discharge timing and volume constraints;



7 REFERENCES

- LEI (2015:A1I1). Wairoa wastewater discharge re-consenting summary of wastewater and stormwater overflow issues. Unpublished report to Wairoa District Council, October 2015.
- LEI (2017:A2I1). WWTP System Data and Compliance Summary. Unpublished report to Wairoa District Council, July 2017.
- LEI (2017:A3I2). Existing Environmental Data Summary. Unpublished report to Wairoa District Council, July 2017.
- LEI (2017:A5I1). Land Treatment Opportunities. Unpublished report to Wairoa District Council, May 2017.

