A Successful Long Term Strategy for Wastewater Infrastructure Planning and Consenting

Mark Allingham (South Wairarapa District Council), Bill Sloan (South Wairarapa District Council), Sarah Sunich (Mott MacDonald), Jason Ewert (Mott MacDonald)

ABSTRACT

South Wairarapa District Council (SWDC) is responsible for the operation of wastewater treatment and disposal facilities at Featherston, Martinborough, and Greytown. In 2008, replacement resource consents for all three urban facilities were required to enable their continuing operation. Currently each scheme comprises pond based treatment discharging treated wastewater to sensitive inland surface freshwater bodies.

There are increasing demands and pressures on small territorial local authorities in New Zealand to decrease the actual and potential effects of treated wastewater and disposal on the environment, commonly resulting in increasing financial pressure on small communities with associated ageing and declining population bases. SWDC has experienced these pressures and has responded to this challenge by developing a comprehensive long-term integrated strategy for wastewater management ("the Strategy") in the District.

The Strategy is focused on the treatment of wastewater through land disposal, and removal of effluent from local rivers and streams in an affordable staged manner to optimise the reduction in adverse effects associated with direct discharges of treated effluent to water, particularly during low river and stream flow conditions where potential effects on water quality are greatest. The stages have been determined primarily on the basis of the SWDC funding approval processes and community affordability. The prioritised implementation of land application during low environmental flow conditions will form Stage 1 of the upgrades and is programmed to commence in the current Long Term Plan period 2015-2025. Following the completion of the Stage 2 upgrades (future Long Term Plan 2025-2035), there will be no wastewater discharged to surface water bodies below 3-times median flow, thereby avoiding the majority of effects which are currently being observed.

Following a comprehensive review of affordability across all Council services, SWDC identified a programme of expenditure of over $30M to give effect to the first 35 years of the Strategy. The implementation of the Strategy therefore relies upon a level of certainty which can best be provided by long term consents. As such, SWDC has sought the maximum term of 35 years for the replacement consents associated with each treatment plant. To support the applications for long term consents, a comprehensive suite of proposed consent conditions has been developed based on robust and proven technology and a commitment to future expenditure within the ability of SWDC to fund.

Resource consents with the maximum allowable term of thirty five years have recently been granted for both Greytown and Martinborough wastewater treatment plants. The consents require the development and approval of a suite of management plans (Inflow and Infiltration Reduction Management Plan; Tangata Whenua Values Management Plan; Odour Management Plan; Water Discharge Management Plan; Land Discharge Management Plan; and others) that will form the details by which the activities must operate. These management plans require suitably qualified independent review, input and review by an appointed Community Liaison Group, and Regulator certification prior to specific stages of the scheme being implemented. This process ensures a collaborative approach to consent implementation and review whilst providing SWDC, the community and the regulator with flexibility to manage uncertainty associated with long term consent timeframes. The implementation of an Environmental Monitoring Plan is also required to enable confirmation and ongoing assessment of actual effects. In addition, two key reporting milestones at the completion of Stage 1 and Stage 2 are required to prove the outcomes of the long term plan are being met.

KEYWORDS

Long Term Strategy, Wastewater, Affordability, Resource Consents

1 INTRODUCTION

South Wairarapa District Council is responsible for the operation of four municipal wastewater treatment and disposal facilities at Lake Ferry, Featherston, Martinborough and Greytown; the latter three are the focus of this paper. Figure 1 below illustrates the location of the townships and district.

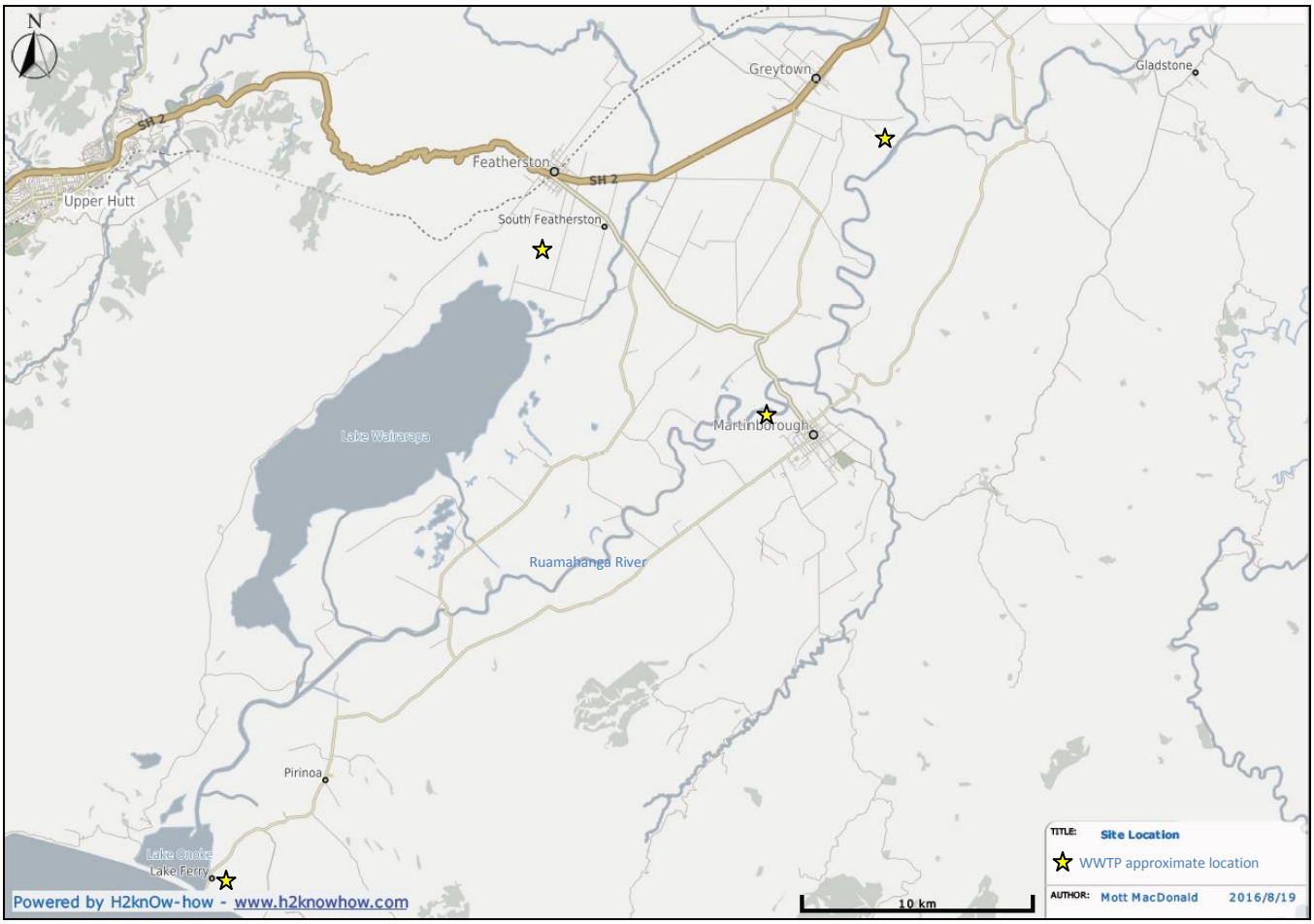

Figure 1: Location of South Wairarapa District Council Urban Wastewater Treatment Facilities

The current reticulated wastewater networks range in age with the oldest constructed up to 70 years ago. The associated wastewater treatment plants (WWTP's) were built in the 1970's and consist of pond based treatment systems which discharge treated effluent to inland surface freshwater bodies. Martinborough and Featherston wastewater treatment facilities also include UV disinfection plants. Currently the Featherston WWTP services a population equivalent (PE) of 2,253 (occupying 996 dwellings); Greytown WWTP a PE of 2,202 (occupying 1,122 dwellings); and Martinborough WWTP a PE of 1,470 (living in 954 dwellings). Each town also services a small number of light industrial and commercial activities but these comprise less than 5% of the sewage volume produced.

The South Wairarapa community is one of the smallest and most economically constrained in New Zealand ranking 55th in population size out of the 67 districts. Although the district experienced reasonable growth of 7.2% during the period 2006-2013 (compared against the overall national growth of 5.3%) (Statistics NZ, 2013), the long-term projected growth is understood to fall between -0.5% & 0.6% on the basis of the 2012 statistics New Zealand subnational population projections to 2031(Statistics NZ, 2012). The resident population at 2031 is also projected to age relative to the existing, with 2.31 people over the age of 65 for every child (aged 0-14) (Statistics NZ, 2013). The small existing contributor rating base and relatively flat projected growth for the district is a significant issue requiring careful management when considering scheme upgrade options and their impacts on community affordability.

Inflow and infiltration (I&I) has also been identified as a significant issue in the District's aging network infrastructure and which has a large effect on the size and cost of future long term treatment and disposal

options. Infiltration is the long-term seepage of groundwater into the wastewater pipes and manholes through cracks and unsealed joints. This contributes to a high base flow in areas where the gravity reticulation network is below the groundwater table. Inflow is stormwater that enters the system via illegal connections, flooding over surface entry points and entry via cracks during storm events. This contributes to the sharp peaks in flow through the network during and after wet weather events.

Typical domestic per capita wastewater flows in NZ range between 210 – 475L/per/d (Potts & Ellwood, 2000) and many councils use an average per capita flow of 250 litres/person/day for design purposes. Table 1 illustrates that the average per capita flows in Greytown and Martinborough are at the higher end of the range, and Featherston's average per capita flows are significantly higher than would normally be expected, with around 74% of the average daily flow being attributed to I&I.

		Greytown	Featherston	Martinborough
Average daily flow	m^3/d	860	2721	574
Wet weather flow	m^3/d	1293	4669	1106
Population	PE	2001	2340	1326
Average per capita flow at ADF	L/per/d	430	1163	433
Estimated base flow	m^3/d	500	585	332
Estimated I/I portion of ADF	m^3/d	360	2136	243
	% of ADF	42%	74%	42%
Estimated I/I portion of WWF	m^3/d	793	4084	775
	% of WWF	61%	85%	70%

Table 1: Estimated I&I

Due to the nature of the geology in the area, groundwater levels are relatively high, thus the majority of the I&I is likely to be a result of groundwater infiltration. Night flow isolation work undertaken in Featherston have confirmed this to be the case in the Featherston network (AWT, 2013b).

Figure 2: Night flows observed during night flow isolation I&I investigations in Featherston (note clarity of sewer flow)

All three WWTP's discharge to sensitive lowland fresh waterbodies within the Ruamahanga River catchment. Martinborough WWTP discharges directly to the Ruamahanga River, whilst Greytown WWTP discharges firstly to the Papawai Stream, a small tributary of the Ruamahanga River. Featherston WWTP is authorised to discharge treated wastewater to Donald Creek at a discharge location approximately 5 km upstream from Lake Wairarapa. Resource consents authorising each plant's discharge all expired in 2008.

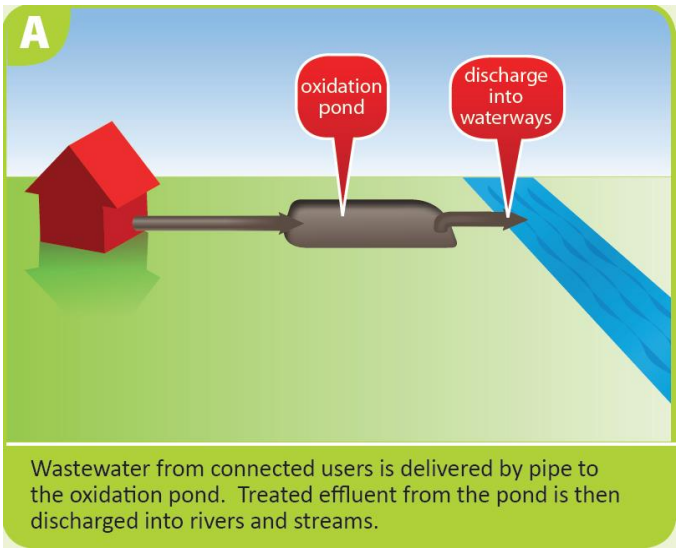

Figure 3: Current Situation for Greytown, Martinborough and Featherston WWTP's

The existing discharges have been shown to result in significant increases in downstream Dissolved Reactive Phosphorus (DRP), ammoniacal nitrogen and free ammonia concentrations, and in the case of Greytown, elevated bacteria concentrations is also an issue. In many cases nutrient concentrations are well in excess of relevant ecological trigger values. Discolouration, foaming and the presence of sewage fungus downstream of the Featherston WWTP discharge have also been identified during summer ecological surveys.

The biological and ecological health of these waterbodies is frequently compromised as a result of these elevated nutrient loads particularly during summer months. Results from ecological surveys confirm that nutrients from the WWTP's are a key management consideration with increased periphyton cover and decreased instream habitat quality downstream of each discharge (Geange 2014a, b and c).

It is however important to note that these effects are not limited to the treated wastewater discharges alone. Monitoring data upstream of the discharges indicate that water quality in these waterways are also compromised from high nutrient enrichment with upstream nutrient concentrations (in particular DRP and Dissolved Inorganic Nitrogen (DIN)) exceeding ANZECC (2000) guideline values resulting in no or limited assimilative capacity for these contaminants under most flow conditions. This degraded upstream water quality is a result of factors such as rural runoff and stock access to the waterways, urban stormwater and other upstream wastewater treatment plant discharges outside of the district.

2 ENVIRONMENTAL REGULATORY CONTEXT

There is increasing pressure from central government and regional councils for territorial local authorities such as SWDC to reduce the current and future effects of wastewater treatment and disposal on the environment.

The National Policy Statement for Fresh Water Management (NPSFM) requires regional councils to make or change regional plans to ensure they establish freshwater objectives and water quality limits. The National Objectives Framework (NOF) contained within the NPSFM provides an approach to which Regional Councils establish their objectives for freshwater values, and sets new national water quality bottom lines and targets for the future.

The aims of the NPSFM are represented in the Proposed Natural Resources Plan (PNRP), which is a Greater Wellington Regional Council and community driven planning document. Applicable objectives and policies of the PNRP seek to maintain or improve water quality and biodiversity. The relevant water quality objectives (O23, O24, O25, O27 and O30) seek to maintain or enhance water quality, uses, riparian margins and habitat, and sets numerical targets that are to be met by the resource users.

In addition, the Greater Wellington Regional Policy Statement, Operative Regional Freshwater Plan and PNRP contain policies encouraging land treatment of municipal wastewater over direct discharges as a method for mitigating environmental effects on fresh waterbodies.

In 2008, replacement resource consents for all three urban facilities were required in accordance with the Resource Management Act (RMA) 1991, to enable their continuing operation. The ageing and outdated treatment facilities at the existing WWTP's are not able to provide treatment to the expectations set out by the NPSFM and the new generation PNRP. Thus upgrades to the treatment and disposal systems have been recognised as necessary.

The purpose and principles of the RMA do however provide for a balance to be achieved between essential community services using existing physical infrastructure while managing the potential adverse effects of the activity (RMA, Part II). The Act also allows a level of pragmatism to be taken, by enabling regard to be given to community affordability as part of the decision making process (Best Practicable Option definition), and providing for a consent term of up to 35 years where there is a need for an applicant to protect its investment with as much security as is consistent with sustainable management.

3 WASTEWATER INFRASTRUCTURE STRATEGY

The statutory requirement to renew all three consents at once, and the pressures to reduce the environmental effects of the current discharges, has necessitated Council to strategically plan any future upgrades and enabled any economies of scale to be taken full advantage of.

In 2008 Council set up a working group to ascertain the overall strategy and set the way forward in relation to South Wairarapa's four wastewater schemes. Extensive review of historic practices and the WWTP assets in conjunction with community consultation was undertaken to confirm constraints, opportunities, and priorities. The work culminated in the "SWDC Wastewater Strategy" (2010) [1]("**the Strategy**").

The overriding objective of the Strategy, is considered straight forward but aspirational (Crimp, 2014):

> *To collect, treat and dispose of wastewater from the urban areas of Featherston, Greytown, Martinborough and Lake Ferry so as to provide public health protection with minimal effects on the environment.*

The key aspects of the Strategy adopted are as follows:

- Due to the significant capital costs involved (estimated cost of $31.5 Million) and financial constraints of the SWDC community, SWDC have taken a long-term view of solutions (50+ year horizon) in an integrated way across all three urban WWTP's.
- The need to develop the best practicable option[2] for each site and on a combined basis, offering a high degree of performance certainty fundamentally based on parameters of; risk, public health, environmental effects, and community affordability.
- To ensure continued consultation with key stakeholders, including iwi, and community groups (which has been ongoing since 2008), and Greater Wellington Regional Council ("GWRC", as the regulator) in developing and implementing the preferred long-term options.
- To obtain the required degree of certainty through a commitment in the short-term (i.e. to 2025) to optimise performance of the existing plants where practicable, and implement the preliminary stages of the best practicable option at each site.

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1 The Wastewater Strategy remains in a 'final draft' form. It will be reviewed following the granting of the resource consents for all three urban plants to ensure that review is fully informed.

2 Best Practicable Option is defined in the Resource Management Act 1991 as

"in relation to a discharge of a contaminant or an emission of noise, means the best method for preventing or minimising the adverse effects on the environment having regard, among other things, to—

(a) the nature of the discharge or emission and the sensitivity of the receiving environment to adverse effects; and

(b) the financial implications, and the effects on the environment, of that option when compared with other options; and

(c) the current state of technical knowledge and the likelihood that the option can be successfully applied"

- Deliver sustainable projects based on the philosophy of implementing the best practicable option and "Do it once – Do it Right".

These overriding principles have set the foundations from which the proposed upgrades for each WWTP have been developed (Geange, 2014a, b and c).

The strategy has short (stage 1 next ten years), medium (stage 2 following 25 years) and long-term (50+ years) components which work towards delivering improved treatment of wastewater through optimising the existing WWTP's and moving to land treatment where practicable, resulting in the removal of a majority of the effluent discharges from the districts urban communities into local rivers and streams.

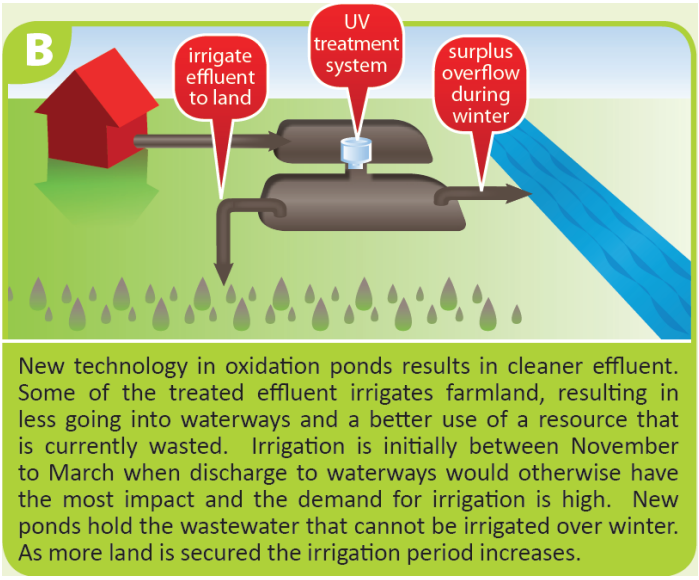

Figure 3: Future Aspirations for Greytown, Martinborough and Featherston WWTP's

These stages have been determined primarily on the basis of SWDC funding approval processes and community affordability. The Strategy is recognised and implemented through SWDC's management documents, including the Long Term Plan and Annual Plan. Each stage of the strategy builds upon the previous to achieve the long-term goals for the district. To align with this staged approach, a maximum consent term of 35 years has been sought for each of the WWTP's contributing to the following outcomes:

1) Appropriately spreading significant cost increases to ratepayers to ensure the risk of community unaffordability is mitigated;

2) Providing certainty for Council to facilitate significant capital investment;

3) Enabling comprehensive investigation and development of effluent treatment strategies and discharge options through adaptive management to ensure the best practicable option is obtained for each individual site and on a combined basis before committing resources.

4 AFFORDABILITY

Following the development of the Wastewater Strategy, SWDC undertook a comprehensive review of affordability across all Council services in conjunction with a high level conceptual evaluation of land treatment versus high rate (mechanical) treatment at each of the sites to confirm the likely overall budget for the project. High rate treatment was considered in the event suitable land was unavailable and continued discharge to water was required. In addition, consideration was also given to the option of combining the schemes into one centralised treatment and disposal scheme vs. retaining and further developing the separate individual treatment and disposal schemes (AWT, 2013a). Based on this evaluation, SWDC identified a budget of over $31.5 million to give effect to the first 35 years of the Strategy across all three sites.

The assumption through this process has been to fully fund works by ratepayers connected to the schemes as no government or other subsidy is currently available nor confirmed as proposed, and "public-private partnerships" have proven difficult and unsuccessful for similar schemes throughout New Zealand. As a result, the spending must be spread over a sufficient timeframe so as to not result in unaffordable increases in rates (either from direct spending or the cost of borrowing). Such a significant programme of works can affect the economic wellbeing of not only the current community, but future communities as well (Crimp, 2015).

SWDC commenced expenditure during 2010 in anticipation of applying for the current resource consents. This expenditure was on items that would be required regardless of the consent conditions such as UV plants at Featherston and Martinborough and land acquisition as it became available. At that time (2010/11 year) the wastewater rate charged across the properties connected to the system was $268 pa. The charge for the 2015/16 year is $471 pa, an increase of $203pa (176%) over that time. While the average $3.90 per week increase may not seem much, this amount on top of normal inflationary increases is still significant. Over the period commencing 2015/16 to 2050, it is anticipated the overall wastewater rates will steadily increase from $471 pa to approximately $1,000 pa (213% increase). This equates to an average increase of $15 year on year and is on top of other general cost increases.

Analysis of a reduced project timeframe of 2020 showed that overall rates would increase from approximately $40.00 per week to $59.00 per week during that time period. This annual rates increase was overlaid on evidence held by Council of discretionary income and of ratepayers who are already struggling, and it was shown that in a few years' rates affordability would become a significant issue for many local families (Crimp, 2015).

5 OPTIONS AND ALTERNATIVES ASSESSMENTS

As part of the ongoing development of SWDC's long-term management strategy, several solutions were evaluated to determine the best practicable option for each site. A comparison of separate and integrated treatment schemes concluded that separate treatment schemes required less capital investment than an integrated scheme. Advantages such as economies of scale, in long-term operation and land purchases, were not great enough to outweigh the significant investment in reticulation infrastructure that would be required for an integrated scheme (AWT, 2013a).

Following this, separate investigations were carried out for each WWTP to confirm the best practicable solution for each site. A selection of traditional treatment options, pond 'add ons', high rate treatment options and land treatment were compared including:

- Do nothing/status quo.
- I & I network rehabilitation to reduce inflows.
- Pond enhancement options; including desludging, flow directing curtains, overflow/flow control weirs, pond level control, raising pond embankments, additional pond(s), enzyme and microbiological culture, coagulant addition, additional aeration, inlet screening and floating wetlands.
- Pond add-on solutions; including soil beds, **P**ond **E**nhanced **TR**eatment and **O**peration (PETRO) system, sand filtration, membrane filtration, ultra-violet (UV) Disinfection, chlorination, ozonation, Biofiltro and Constructed Wetlands.
- Replacement of the pond treatment system with high rate activated sludge based treatment systems such as membrane bio-reactor (MBR), sequential batch-reactor (SBR) or conventional biological nutrient removal (BNR).
- Full and partial Land Treatment solutions; including full land application with deferred storage or a seasonal combination of land and water disposal.

A tiered multi-criteria analysis (MCA) was used to select the best practical option to prevent or minimise the adverse effects on the environment whilst having regards to the financial implications to the community.

Whilst there are upgrade options which technically could achieve significant improvements quickly, the affordability of those options over a short timeframe made them unfeasible. For example, both full land

treatment and a new high rate treatment plant were considered at current influent flow volumes, but these options were simply cost prohibitive.

Network I&I rehabilitation was identified as important at all sites in order to reduce the volumes of influent flow (with a primary focus for FWWTP) over the short to medium term for the success of all treatment and disposal options considered. The capital costs of high rate treatment and land based treatment and disposal schemes were calculated for different levels of influent flow reduction achieved through I&I rehabilitation at Featherston. This allowed the optimum financial solution for the complete upgrade (including I&I rehabilitation) to be found, balancing the savings on treatment and disposal against the increasing I&I rehabilitation costs. With no I&I reduction the capital cost of a high rate treatment plant and a land based treatment and disposal scheme was estimated at $15.4M and $18.8M, respectively. The most economical high rate treatment scenario was achieved through $0.98M of network rehabilitation works which would result in a 27.5% reduction in average dry weather flow ("ADWF") and achieve a $2.6M capital cost saving at the WWTP compared with no I&I reduction. The total project net saving under this scenario was estimated at $1.62M including the cost of network rehabilitation. The most economical land disposal scenario was reached at $1.48M of network rehabilitation, resulting in a 31% reduction in ADWF which would achieve a $5.71M capital cost saving at the WWTP compared with no I&I reduction. The total project net saving under this scenario was $4.23M including the cost of network rehabilitation (Park and Yang, 2014).

Short-term capital improvements to the pond based treatment systems were considered to improve effluent quality to address non-compliance issues and/or mitigate effects on the receiving environment until such time as land treatment could be commenced (e.g. installing additional treatment during Stage 1). However this approach would have required extending the programme to deliver the land treatment scheme (due to affordability). Some of the short-term pond treatment improvement options available would become redundant under a land treatment regime, further increasing "sunk" costs and pushing out the implementation of the long-term solution. In addition, it was considered that short term treatment and disposal upgrade options alone would unlikely achieve compliance with future proposed effluent quality limits. For these reasons the majority of the short-term capital improvement options were discounted.

High rate (mechanical) treatment with disposal to water or land treatment of pond effluent were identified as the two most feasible options that would provide Council with the greatest certainty in terms of performance over the long-term and best achieve desired environmental outcomes. Land treatment was favoured from a cost perspective, due to its lower overall operational costs and ability to stage implementation costs. Land treatment also met the intent of the Council Wastewater Strategy. The technology is considered simple and readily available, comprised effectively of pumping and irrigation equipment and can be automated to run when climatic and soil conditions allow.

6 BEST PRACTICABLE OPTIONS CONFIRMED

The transition to land treatment will be staged in a manner to reduce the discharge to freshwater as quickly as possible during periods when the most significant environmental benefits are achieved and concentrating the effort on the most sensitive receiving environments, while still balancing the requirements across the three schemes.

Stage 1 of the strategy which aligns with the current Long Term Plan (2015-2025) prioritises works to reduce I&I and the implementation of land application of pond treated wastewater during low flow conditions in the existing receiving waterways. This stage includes minor improvements to the treatment systems through the addition of influent screening at all three sites as well as pond desludging and installation of UV treatment at Greytown.

Stage 2a of the strategy will occur over the period 2025 to 2050 and will result in no wastewater to be discharged to surface water bodies below three times the median flow in the receiving waterway, to avoid the majority of adverse effects associated with direct discharges. Council has acquired sufficient land to operate deficit irrigation schemes at both Greytown and Martinborough and a deferred irrigation scheme at Featherston. In conjunction, further I&I improvement works will be undertaken in the reticulation systems to reduce influent flows.

Stage 2b is the final long-term stage of the strategy, aiming to achieve the full environmental improvements initially set out by completing any remaining network I&I improvement works, expanding land treatment systems and implementing deferred storage ponds with the intention of removing the direct discharge of treated effluent into waterways year round with the exception of extreme wet years.

Table 2 provides a summary of the two-stage approach taken at all three WWTP's over the next 35 years.

Table 2: Land Management Stage Commissioning Programme

	Martinborough WWTP	**Greytown WWTP**	**Featherston WWTP**
Stage 1A	Plant Optimisation and minor capital works (primary screen and covering of maturation pond).	Plant Optimisation and minor capital works (primary screen, UV disinfection and pond desludging).	I&I rehabilitation works, Plant Optimisation and minor capital works (UV disinfection) and discharge of approximately 6% of the annual treated wastewater flow to "Site A" (8ha) during low flow conditions.
Stage 1B	Discharge of approximately 24% of the annual treated wastewater flow to "Martinborough WWTP Adjacent" block (5.3ha) during low-flow conditions.	Discharge of approximately 20% of the annual treated wastewater flow to "Site A" (16ha) during low-flow conditions.	Discharge of approximately 45% of the annual treated wastewater flow to "Site B" (70ha) during summer low-flow conditions.
Stage 2A	Discharge of approximately 42% of the annual treated wastewater flow to "Pain Farm" (53ha) without deferred storage.	Discharge of approximately 62% of the annual treated wastewater flow to "Site B" (85ha) of land without deferred storage.	Discharge of approximately 55% of the annual treated wastewater flow to Site B (116ha) without deferred storage.
Stage 2B	Full land discharge of treated wastewater to Pain Farm (53ha) with deferred storage (34,700m^3) for approximately 9 out of 10 years with contingency discharge to the Ruamahanga River at 3x median flow.	Full land discharge of treated wastewater at Site B (85ha) with deferred storage (94,000m^3) for approximately 9 out of 10 years with contingency discharge to the Papawai Stream at 3x median flow.	Land discharge of approximately 93% of the annual treated wastewater at Site B (116ha) with deferred storage (186,000m^3) with contingency discharge during most years to Donald Creek at 3x median flow.

Following the affordability criteria and the best technical option at each facility being determined, the most appropriate construction programme over the three sites was considered. Simultaneous development – where all three sites are developed at the same time; or Sequential development – where one facility is fully upgraded, then upon completion, the next facility is upgraded, and so on, have been considered.

Sequential development would require SWDC to prioritise between the Ruamahanga River and Lake Onoke (Greytown and Martinborough), the Papawai Stream (Greytown), and Donald Creek, Abbot Creek and Lake Wairarapa (Featherston). There are a number of criteria which could be adopted to determine a priority, however, given the affordability criteria, the timeframe between each site would be approximately 10 years, meaning the site given the third priority would effectively require adopting a "do nothing" option for 20 years.

It has therefore been determined that the most appropriate programme is a catchment based one with a programme of managed incremental improvements across the three sites. This upgrade programme recognises that:

- All three receiving environments ultimately discharge to Lake Onoke;
- All three sites have equally important (although different) cultural, community, and environmental significance which are inappropriate to arbitrarily prioritise;

- Water quality in all three receiving environments upstream of the discharge is significantly compromised by upstream point source and diffuse discharges outside of SWDC control, which are subject to a complex but necessary much wider, long-term, and regionally integrated strategy;
- The removal of nutrients in the short term during low-flow conditions will significantly decrease the contribution of nutrients from the wastewater discharges to the Ruamahanga River and Lake Wairarapa in terms of water quality for contact recreation and aquatic habitat, both key considerations across all three sites within the Wellington Regional Freshwater Plan objectives and policies;
- All three plants have existing land available adjacent to the WWTP which is readily available and suitable for land treatment during low flow conditions;

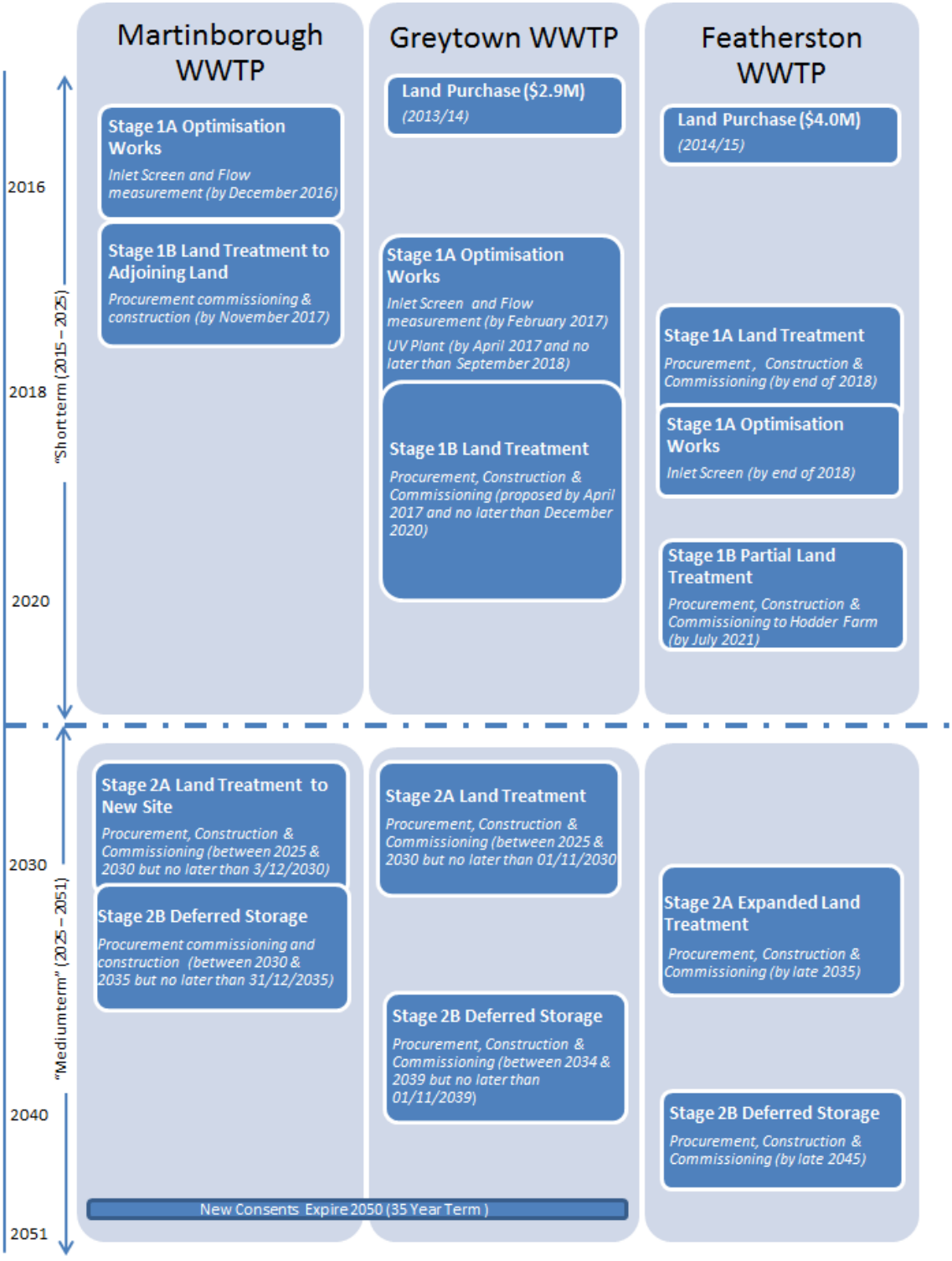

Figure 3 – Indicative Upgrade Works Programme pending finalisation of Featherston consenting process

7 CONSENTING OUTCOME

Greytown and Martinborough WWTP's have recently been granted consents for the maximum term of 35 years. The Featherston resource consent application process is currently underway and also seeks to achieve a 35 year consent term. High level conceptual objectives set the basis for the resource consent applications and as such uncertainties associated with matters pertaining to design and management of each stage were recognised, including:

- the degree of flow reduction achievable through I&I reduction and thus actual deferred storage pond and land treatment requirements;
- the complexity of managing stream driven discharge regimes and large storage ponds for land irrigation;
- the limited receiving environment data and thus certainty of effects during the progressive staged upgrades.

SWDC have therefore taken a precautionary approach and have applied the principles of adaptive management through the following:

- Committing to firm programmes for commissioning the land treatment schemes;
- Comprehensive monitoring of the sewerage systems and pond systems performance;
- Comprehensive monitoring of the receiving environments, including primary and secondary receiving environments;
- Quarterly exception reporting;
- A proposed annual reporting process, including a full review of system performance, I&I reduction results, and including a risk analysis of the proposed land treatment scheme at that point in time;
- A review of the efficacy of Stage 1B land treatment three years following commencement in order to determine whether or not the commencement of Stages 2A and 2B should be advanced; and
- A review of the efficacy of the Stage 2B land treatment three years following commencement in terms of avoiding, remedying or mitigating adverse effects of the discharges to the environment.

These consents require the development and approval of several management plans (e.g. I&I Reduction Management Plan, Tangata Whenua Values Management Plan, Discharge to Land and Water Management Plan, Odour Management Plan and several other site specific plans) that will form the details by which activities must operate. These plans will ensure actual and potential effects are mitigated and that key stakeholders are involved in a transparent process throughout the implementation of the consents and the long term solution. The conditions pertaining to the management plan objectives and content are comprehensive and each plan will be independently reviewed by a suitably qualified person prior to certification by Greater Wellington Regional Council.

The collaborative approach proposed with stakeholders (through conditions and Terms of Reference pertaining to the development of a Community Liaison Group) and Greater Wellington Regional Council (through a proposed Consent Implementation Partnership) are considered to provide a "no surprises" approach in this regard, with regular formal performance and risk feedback.

This process ensures a collaborative approach to consent implementation and review whilst providing the applicant, the community and the regulator with flexibility to manage uncertainty associated with a long term consent whilst providing the applicant with the certainty to plan for the longer term.

8 IMPLEMENTATION

A prioritised programme of optimisation works and treatment upgrades has been developed and integrated across all three sites (refer Figure 3) to concurrently deliver the BPO for each site. The programme has been refined for Greytown and Martinborough to support a procurement strategy which has been developed to identify opportunities for synergies between each site as part of the Stage 1 upgrades. The procurement strategy

and programme takes into account various work streams and considerations including financial cash flow, procurement, delivery of consent management plans and technical studies to inform detailed design. For example, procurement of similar UV units for Greytown to those used at Martinborough and Featherston has been proposed to ensure ease of operability, commonality of spares and maintenance.

The resource consent applications were based on high level conceptual objectives as reflected in conditions of consent with the detail to be prescribed in the associated management plans. To commence this detailed work, a concept hydraulic profile and concept arrangement has been undertaken of the overall scheme for both Greytown and Martinborough WWTP's through all stages from 1A to 2B prior to commencing the detailed design of Stage 1A. This will ensure that new infrastructure is installed at all stages at appropriate levels and with appropriate tie-in points for additional infrastructure for future stages. This concept planning will also ensure that appropriate thought and planning is undertaken to ensure that infrastructure installed in earlier stages does not become redundant in future stages. For example, Greytown WWTP includes two main stages of land treatment at two different sites at different times, hence pump station location, sizing and flexibility for modular expansion have been considered.

The proposed upgrades at Featherston WWTP comprise of three stages of land treatment implementation. One of the sites purchased by the council for land treatment already had pasture irrigation infrastructure installed. As part of the consent application process, the feasibility of using the existing irrigation infrastructure to advance land irrigation for Stage 1B has been considered. This would enable Council to defer capital costs while providing incremental environmental improvements to receiving waters by reducing a reasonable portion of the summer direct discharge to water and redirecting this to land. Although a number of limitations have been identified with the existing irrigation infrastructure for wastewater disposal (i.e. relatively intensive operational requirements, and issues regarding uniformity and control of wastewater application), the short-term environmental benefits are considered to outweigh these. A longer term view to replacing the irrigation equipment with a new, modern, automated and self-monitored irrigation system as affordability allows and deterioration of the existing irrigation infrastructure dictates is proposed.

9 CONCLUSIONS

The Featherston, Martinborough and Greytown WWTP's have been operating in excess of four decades and along with the existing sewerage networks, contribute to the existing and future infrastructure of the South Wairarapa District and the Region. The proposed upgrades will ensure that SWDC can continue to provide for the sewage collection, treatment, and disposal needs into the future.

The proposed staging of the upgrades, in combination with the integrated programme of works will ensure the SWDC long-term wastewater strategy is progressed in a manner which is environmentally and financially sustainable. SWDC have identified a programme of expenditure of over $30M to give effect to the first 35 years of the Strategy, the term of consent obtained for Greytown and Martinborough and sought for Featherston.

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