REGIONAL BIOSOLIDS STRATEGY

LOWER NORTH ISLAND

PART A: A STRATEGY FOR THE COLLECTIVE MANAGEMENT OF BIOSOLIDS.

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Regional Biosolids Strategy – Lower North Island

Part A: A Strategy for the Collective Management of Biosolids

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1 EXECUTIVE SUMMARY

Background

The MfE funded Regional Biosolids Strategy - Lower North Island was a collaborative project involving ten lower North Island Councils working in partnership to develop a biosolids strategy that included the potential collective management of municipal wastewater treatment sludge, with a focus on beneficial use. The strategy was led and co-ordinated by Lowe Environmental Impact (LEI) with contributions from Massey University and The Institute of Environmental Science and Research Ltd (ESR).

Process

This project was implemented over three years, with work divided into stages to collect and collate the information required to achieve a collective strategy for the region. The steps to develop a strategy covered:

- Analysis of knowledge gaps to determine the scale of the sludge issue within the lower North Island;
- Summaries of the current state of oxidation ponds within the region and technical analysis of oxidation pond sludge to better understand the potential for its use;
- Exploring the challenges facing councils and iwi when working around biosolids issues;
- Identifying and developing potential pathways for Councils to work together to achieve their aims for biosolids use, and mapping how these might look; and
- Exploring the technical feasibility of a range of biosolids end-use options through the implementation of trials and cost analysis.

Outcomes

The project achievements were vast; some key points can be summarised as follows:

- Council/regional specific strategies for biosolids management were developed that highlight potential pathways for collective management;
- While few Councils have investigated alternative end-use options for sludge, (most dispose to landfill, monofill or stockpile) all are keen for beneficial re-use;
- Working together was considered favourably, with one major outcome of the project being the facilitation of a forum to bring Councils together to discuss sludge management; and
- This project was able to achieve outputs that many Councils could not have achieved individually, in particular smaller Councils that are constrained due to lesser economies of scale.

2 BACKGROUND

Approximately 320,000 tonnes of wastewater treatment plant solids (at 20% dry solids) are produced annually in NZ. In addition, there are approximately 200 waste treatment pond systems which have been in operation for 30-50 years and now require desludging to continue effective operations. All territorial authorities face the same problem of what to do with these solids.

Management of solids is especially difficult for smaller communities where limitations as a result of lesser economies of scale can stifle the development and creation of workable solutions. In the lower North Island there is an estimated 80,000 tonnes of sludge (at 20% solids) produced from the approximate 45 oxidation ponds (every 30-50 years) and additional sludge from five high rate treatment plants – with the majority of this sludge currently ending up in landfills.

The quality of these wastewater solids is highly variable, ranging from raw sludge to more processed sludges which are termed 'biosolids'. The range of different materials, along with often challenging regulatory processes, add to the complexity of finding a long-term sustainable and affordable solution. Many smaller Territorial Local Authorities' (TLAs) simply do not have the budget to investigate alternatives to landfilling of sludge, which may require significant investment in community and Iwi consultation, fulfilling regulatory processes, assessments of environmental impacts and developing infrastructure solutions.

Landfilling is not a long-term management option and is becoming more difficult due to increased levies, lack of space and transportation distance, and a general community expectation of a need to develop sustainable use options. In addition, landfilling creates a significant regional economic and environmental issue and runs contrary to central government policy.

Proposal: This project aimed to facilitate Councils in the lower North Island to work together to develop a collective biosolids strategy and use programme. By working together, beneficial use of sludge is considered much more feasible than when working as individual entities.

The MfE funded Regional Biosolids Strategy - Lower North Island is a collaborative project involving ten lower North Island Councils (Figure 2.1) providing co-funding and working in partnership to develop a biosolids strategy that includes the potential collective management of sludge, with a focus on beneficial use. The strategy is led and co-ordinated by Lowe Environmental Impact (LEI) with contributions from Massey University and The Institute of Environmental Science and Research Ltd (ESR) and has been running for three years.

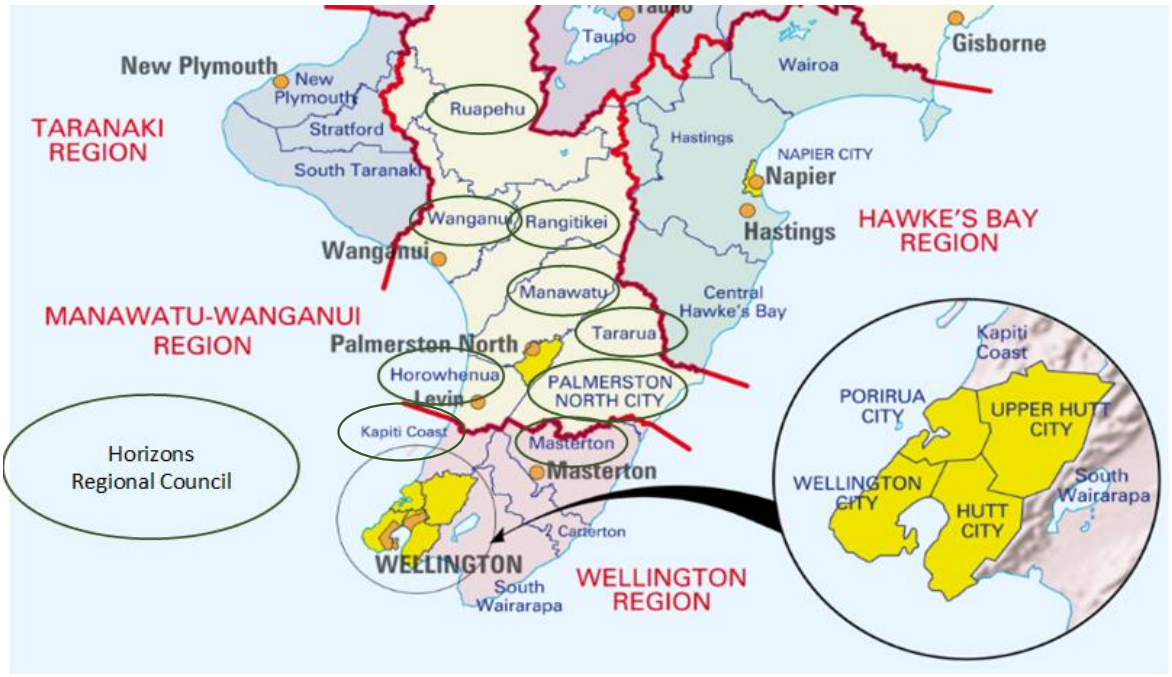


Figure 2.1. Councils involved in the Regional Biosolids Strategy - Lower North Island

3 THE PROCESS TO ESTABLISH A STRATEGY

3.1 Introduction

A strategy involves understanding the current situation and planning ahead. Where a collaborative strategy is developed, there is a need for parties to work together and plan ahead. Both the strategy and collaboration component of this project has produced several outputs that are of value to biosolids use in New Zealand, and has highlighted various complexities due to cultural and regulatory influences that create differing requirements than what may be observed overseas. The project outputs consist of short summaries of key outputs (fact sheets), reports, reviews and research papers that cover a range of topics related to biosolids use in New Zealand, including but not limited to:

- Analysis of knowledge gaps to determine the scale of the sludge issue within the lower North Island;
- Summaries of the current state of oxidation ponds within the region and technical analysis of oxidation pond sludge to better understand the potential for its use;
- Exploring the challenges facing councils and iwi when working around biosolids issues;
- Identifying and developing potential pathways for Councils to work together to achieve their aims for biosolids use, and mapping how these might look; and
- Exploring the technical feasibility of a range of biosolids end-use options through the implementation of trials.

The Regional Biosolids Strategy – Lower North Island is set out into three Sections. Part A aims to briefly present the knowledge gained and key project outputs. Full executive summaries of outputs (reports 1-12) can be found in Part A: Appendix A with full reports included in Part C. The fact sheets presented in Part B offer short-easily digestible summaries of key outputs.

3.2 Process

The development of the strategy has seen the use of a staged approach, with the key steps set out as follows:

- Step 1 – Group Formation
- Step 2 – Gap Analysis
- Step 3 – Working Together Opportunities
- Step 4 – End Use
- Step 5 – Financial Feasibility
- Step 6 – Trials
- Step 7 – Strategy Sequence
- Step 8 – Strategy Grouping
- Final strategy Development

These steps are discussed in detail in sections 3 and 4 below.

Step 1 – Group Formation

A Technical and Governance Group was formed comprising of representatives from 9 councils and project partners. The Governance Group met 4 times per year and provided guidance to the project partners that directed the work to be undertaken. The Technical Group provided support

for more technical aspects of the project such as site and sample access and historical data collection.

Step 2 – Gap Analysis

Initial stages of the project undertook a stocktake and gaps analysis to determine the scale of the current sludge problem for each district (Figure 3.1; Reports 1 and 2). Information was collected on volumes and characteristics of sludge in the region as well as the current regulatory environment and limitations.

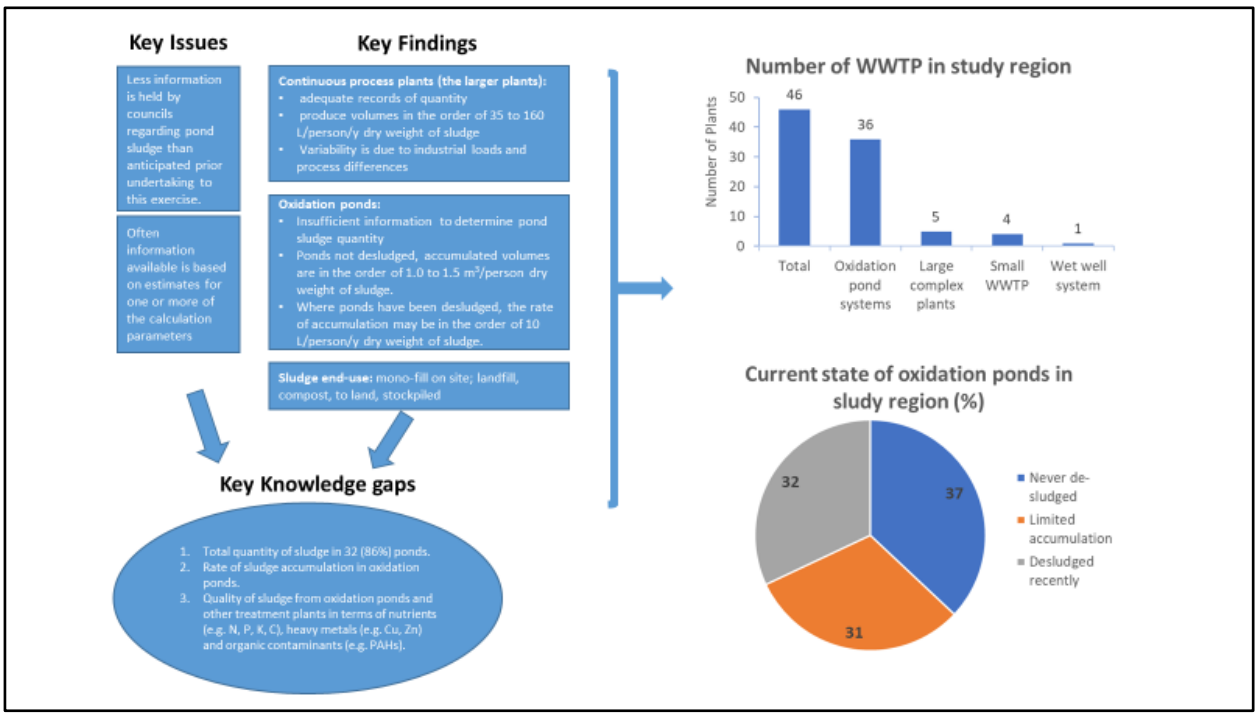


Figure 3.1: A summary of findings from the Regional Biosolids Strategy gaps analysis

Across the lower North Island there are 46 wastewater treatment plants (WWTPs) - 37 oxidation pond systems, 4 small advanced treatment plants (Waiouru, Whakapapa, Pipiriki and Mangaweka), and five larger advanced treatment plants: Paraparaumu (KCDC), Levin (HDC), Palmerston North (PNCC), Feilding (MDC) and Whanganui (WDC). For many councils, information on sludge volumes and quality was limited.

Few Councils have investigated alternative end-use options for sludge, (most dispose to landfill, monofill or stockpile) but all were interested in beneficial re-use.

Step 3 – Working Together Opportunities

From the gaps analysis, potential areas for collaboration and common problems faced by all Councils were identified (Figure 3.2; Report 2). Based on the information gathered on the size of the sludge problem, and common issues, the Governance Group workshopped how they might work together. Many opportunities exist for Councils to work collaboratively including:

- Sharing sludge processing infrastructure (location or equipment);
- The development of a Global Regulatory Framework;
- Sharing technical knowledge and maintaining collaboration to establish effective contingency plans, and learn from past inefficiencies; and
- Sharing knowledge around community engagement processes.

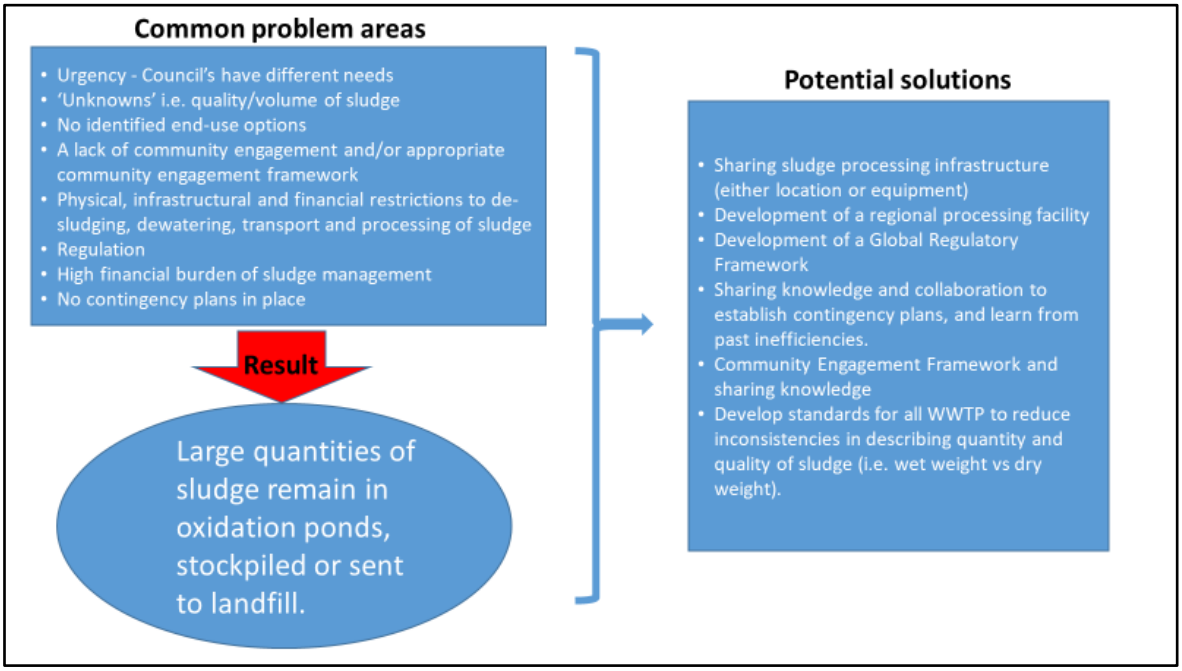


Figure 3.2: Common problems and opportunities to work together for sludge management

Step 4 – End Use

Joint end-use was identified by the Governance Group as a key area that they could collaborate and work together. This was investigated through an assessment of the potential end-use options available to the study region. End-use options were identified (Report 14) including:

- Forestry;
- Dairy and drystock (sheep and beef) farms;
- Horticulturalists / orchardists / market gardeners;
- Municipal landscaping;
- Land rehabilitation;
- Road corridors;
- Landfill capping; and
- Commercial enterprises (compost, potting media, etc).

Multiple criteria need to be considered when evaluating the feasibility of any use option such as:

- National guidelines;
- Regional and District plans and rules;
- Iwi views and perceptions;
- Community considerations;
- Resource consenting costs;
- Capital costs;
- Operational costs;
- Fuel / transport; and
- Land use in the region.

Step 5 – Financial Feasibility

To aid in investigating the feasibility of the potential end-use option, a detailed cost analysis was carried out for key components within a number of end-use options (Reports 13 and 14). Potential options were discussed at workshops and preferred ones, including composting, seed raising

mixtures and land application, were chosen for further investigation through laboratory and field trials (Reports 6, 9, and 10).

Step 6 - Trials

Field trials were set up to investigate the feasibility of potential end-use options. The research trials demonstrated the feasibility of beneficial re-use through these means (detailed results are available in Reports 6, 9 and 10).

Summary: While few Councils had investigated alternative end-use options for sludge, all were interested in beneficial re-use. In addition, working together was considered advantageous, with one major outcome of the project being the facilitation of a forum for bringing Councils together.

Step 7 – Strategy Sequence

Final strategies for working together were developed once again through workshops with the Governance Group. Discussions between member Councils and the project team identified three scenarios for investigation. A brief outline of these scenarios is shown in Figure 3.3. The three scenarios were chosen to cover a broad range of options but were not intended to reflect all possible scenarios for collective management.

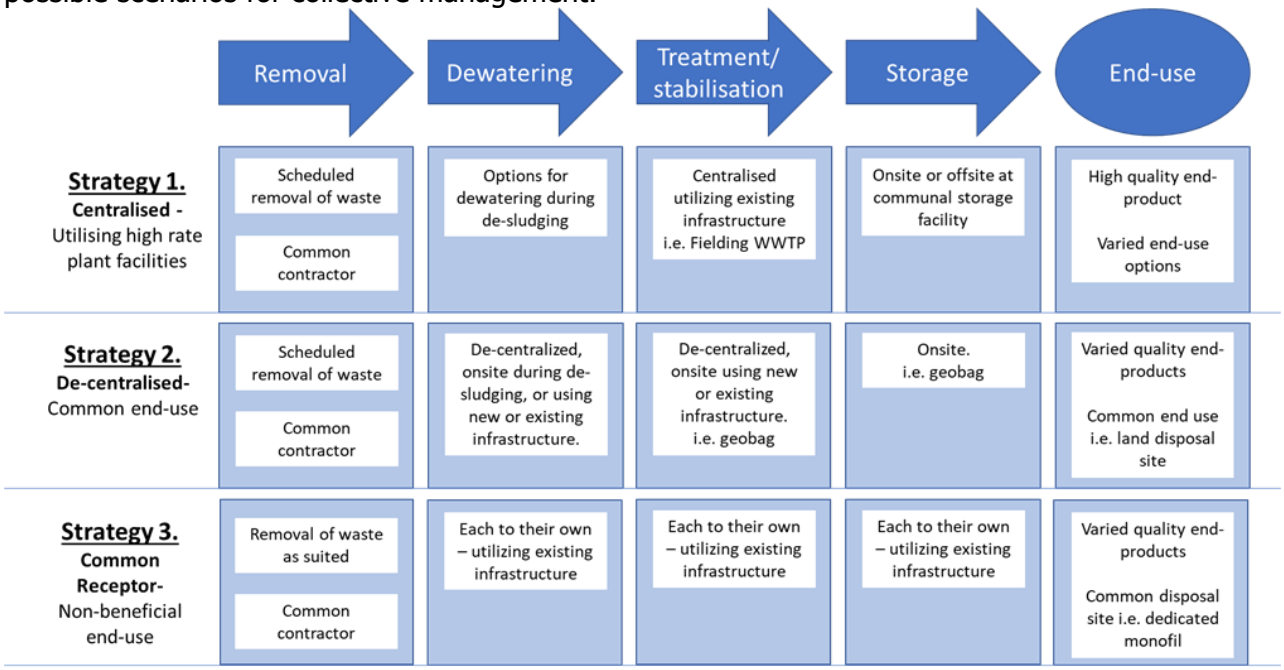


Figure 3.3: Overview of three potential collective strategies for the lower North Island

Step 8 – Strategy Grouping

Strategies were further broken down into three groups (strawman options) and estimated costings applied for comparison. A summary of each strategy group is provided below and diagrammatic representations of how these three strategies can be applied is given in Figures 4.1 – 4.4 in the next section.

The principle basis of **Strategy 1** (Figure 3.4) is the communal use of existing infrastructure at an identified high rate WWTP for the dewatering and treatment/stabilisation of sludge from smaller community WWTPs. It was determined that by utilising one (or more) main treatment facility the chance of producing a high-quality end-product with greater potential for re-use is more likely. In this scenario a 'high quality end-product' is defined as meeting Grade Aa in the current NZ Guidelines for the Safe Application of Biosolids to Land (NZWWA, 2003).

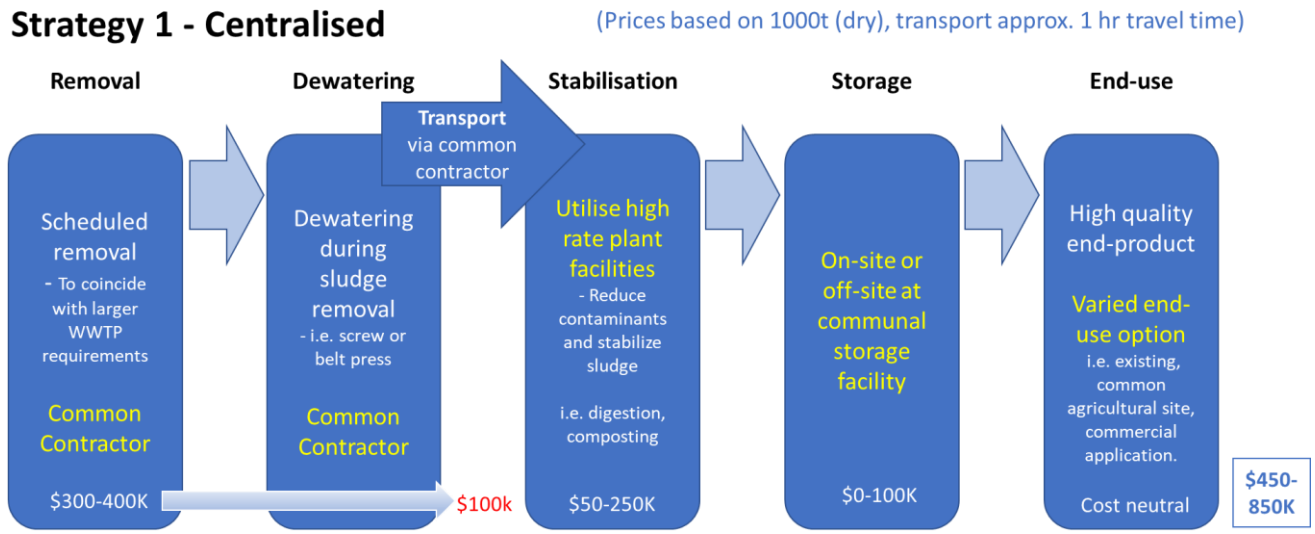


Figure 3.4. Overview of 'strategy 1: Centralised treatment' for collective management of biosolids for the Lower North Island.

Strategy 2 (Figure 3.5) focuses on independent treatment but with a common end-use; in this case a communal land discharge site is suggested. The main driver for Strategy 2 is a common beneficial end-use with less associated costs than landfill or independent discharge. Geobags have been highlighted as a valuable de-watering and stabilising technique (Report 2) and have been recommended here.

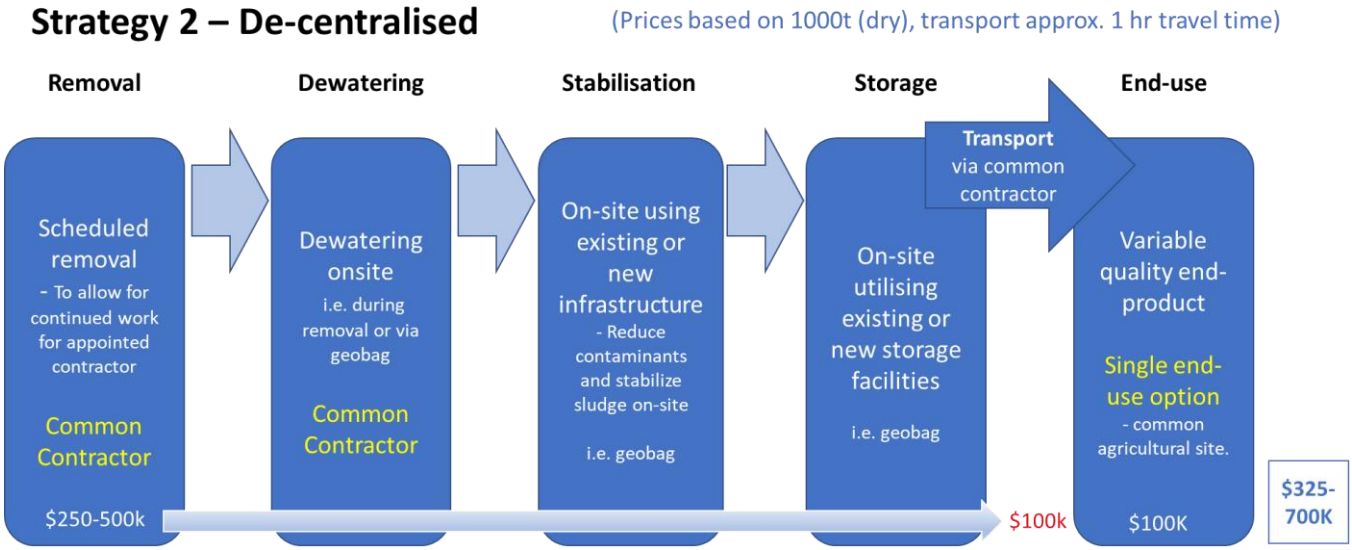


Figure 3.5. Overview of 'strategy 2: De-centralised treatment' for collective management of biosolids for the Lower North Island.

Strategy 3 (Figure 3.6) represents the 'status quo' in terms of discharge practice in many cases. The use of a common contractor and utilising one preferred discharge site may reduce associated costs through a reduction in consenting requirements and reduced landfill fees.

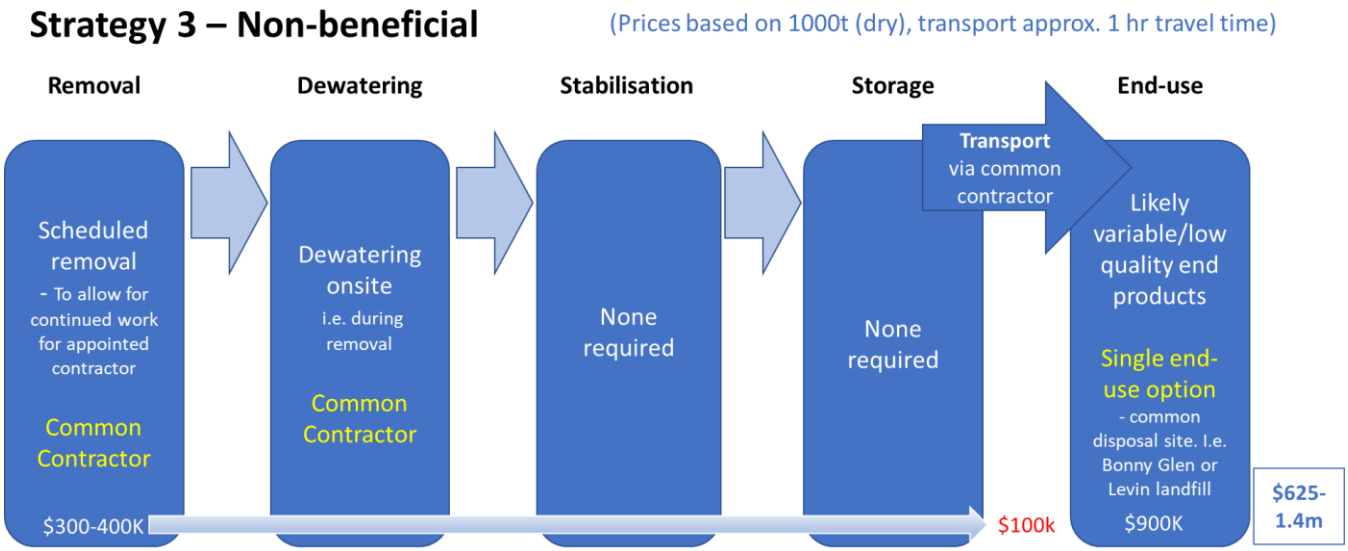


Figure 3.6. Overview of 'strategy 3: Non-beneficial' for collective management of biosolids for the Lower North Island.

Final stages

The final stages of development sought to combine the three 'straw man' strategies into regional specific pathways that highlight areas where working together would be beneficial. These strategy diagrams are presented in Section 4.

4 A REGIONAL BIOSOLIDS STRATEGY FOR THE LOWER NORTH ISLAND

4.1 Strategy overview

A general overview of the developed strategy is presented in Figure 4.1, with more specific details of how this strategy applies to different Councils in Figures 4.2 - 4.7 (Report 4).

The strategy has a focus on collective management and beneficial end-use and has sought to incorporate variations for different Council requirements. The following sections (Sections 4.2 – 4.7) provide diagrammatic representation and further explanation of these strategies.

The diagrams below include pathways that highlight where the previously discussed 'straw-man' scenarios (Section 3) fit into the new strategies. These are as follows:

Strategy 1 – Centralised Orange
Strategy 2 – De-centralised Blue
Strategy 3 – Non-beneficial end-use Green

Figure 4.1 provides a general overview of the proposed collective strategy for the region. This flow diagram is intended to be brief, showing only the main pathways, and does not outline all the possible scenarios. For further information of Council specific strategies see sections 4.3 – 4.8.

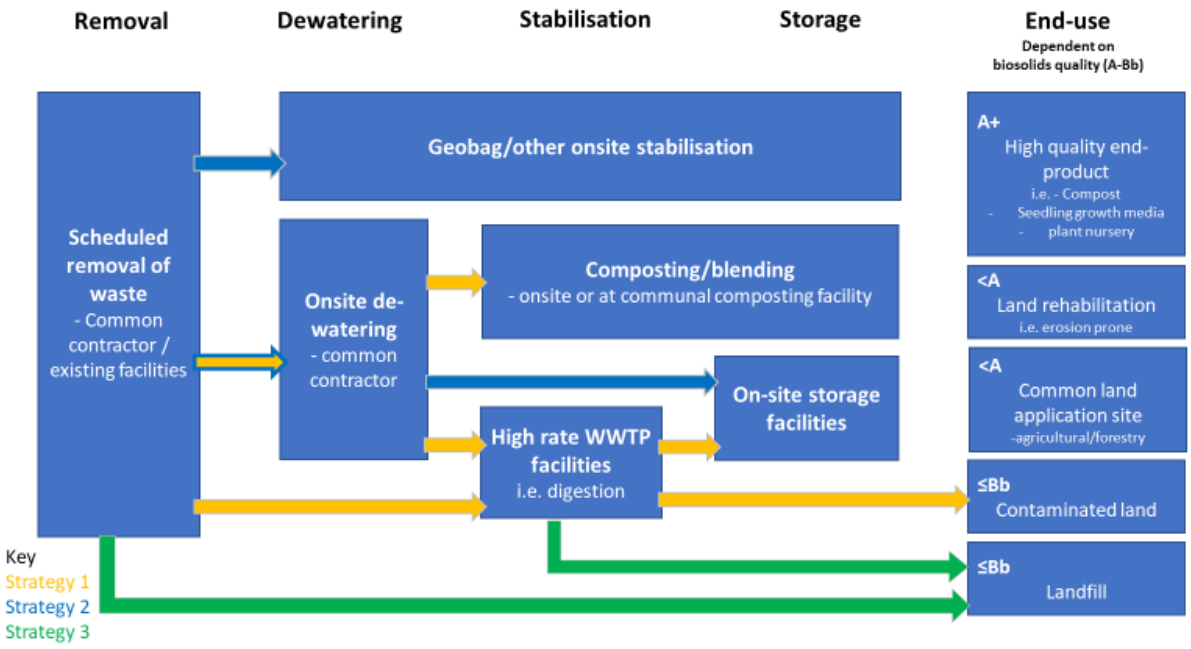


Figure 4.1. An overview of the potential Lower North Island Regional Biosolids Strategy

4.2 Regional specific strategies for biosolids management

The following strategies identify what can work for individual Councils and communities. However, there is a significant component of the strategy where there is an opportunity for Councils to work together (both between WWTP and between council regions). These opportunities are identified in the figures by the yellow boxes which indicate areas where a collaborative approach may be beneficial.

4.2.1 Manawatu District Council/ Rangitikei District Council

Manawatu District Council (MDC)/ Rangitikei District Council (RDC)[1] oversee 14 small to medium WWTP's consisting primarily of oxidation pond systems and the Fielding WWTP. The Fielding WWTP is a high rate treatment facility consisting of digestors as well as on-site composting. During discussions it was proposed that collective treatment could be achieved by Fielding WWTP accepting other facilities oxidation pond sludge which is reflected in the strategy (Figure 4.2). Oxidation pond sludge and stockpiled sludge is covered in Section 4.7.

Proposed Strategy for MDC

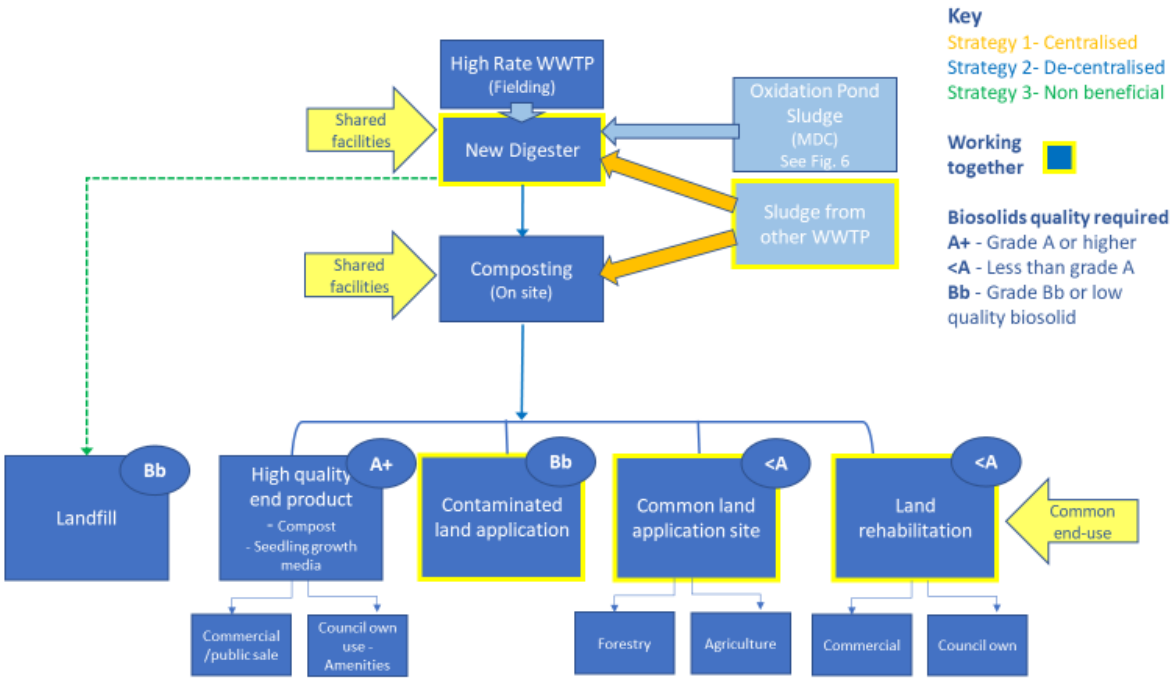


Figure 4.2. A Potential Draft Biosolids Strategy for the Manawatu/ Rangitikei District Council – Fielding WWTP

[1] Manawatu District Council and Rangitikei District Council operate together under a joint service arrangement.

4.2.2 Horowhenua District Council

Horowhenua District Council (HDC) manage five small to medium WWTP's consisting primarily of oxidation pond systems and the Levin WWTP. The Levin WWTP is a high rate plant that generates digested sludge which is landfilled on a weekly basis. Many collective management options are available for the Levin WWTP as can be seen in the strategy below (Figure 4.3). Oxidation pond sludge and stockpiled sludge is covered in Section 4.7.

Proposed Strategy for HDC

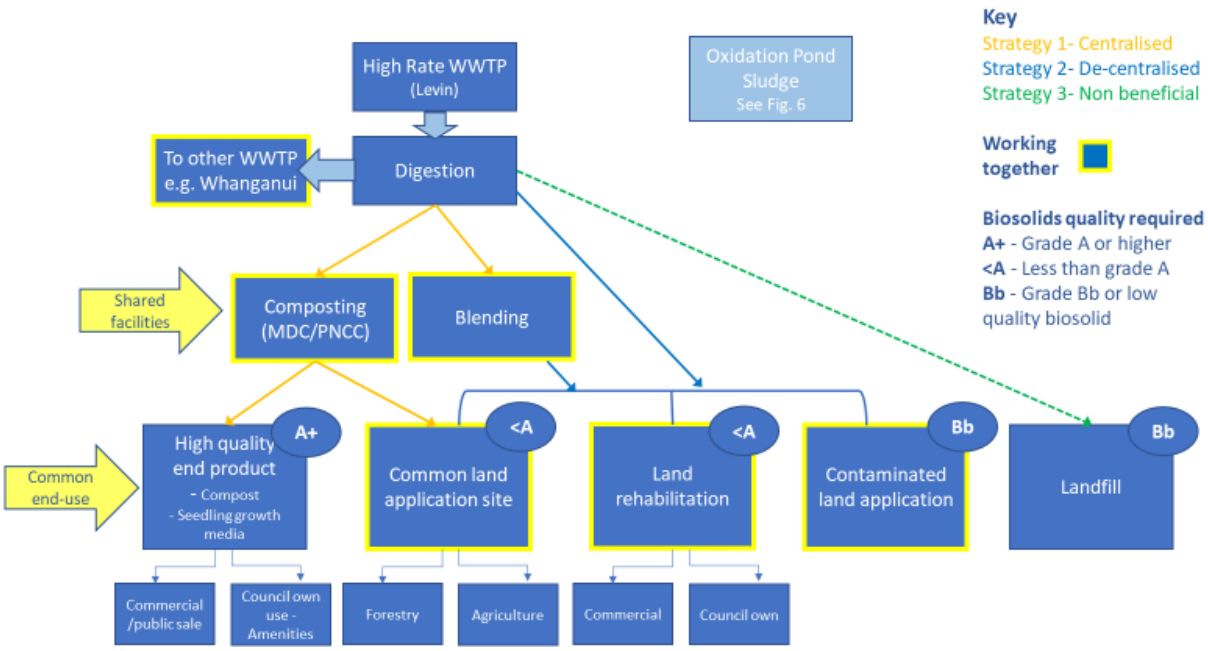


Figure 4.3. A Potential Draft Biosolids Strategy for the Horowhenua District Council – Levin WWTP

4.2.3 Whanganui District Council

Whanganui District Council (WDC) sludge is processed at Airport Road WWTP. Airport Road WWTP is a high rate plant with de-watering and thermal drying facilities. Sludge from the WWTP is currently stored on-site, however, this space will soon run out. Options for end-use for this sludge is presented in the strategy (Figure 4.4), as well as the potential for WDC to accept sludge from other WWTP for the purpose of treatment to a better-quality product.

Proposed Strategy For WDC

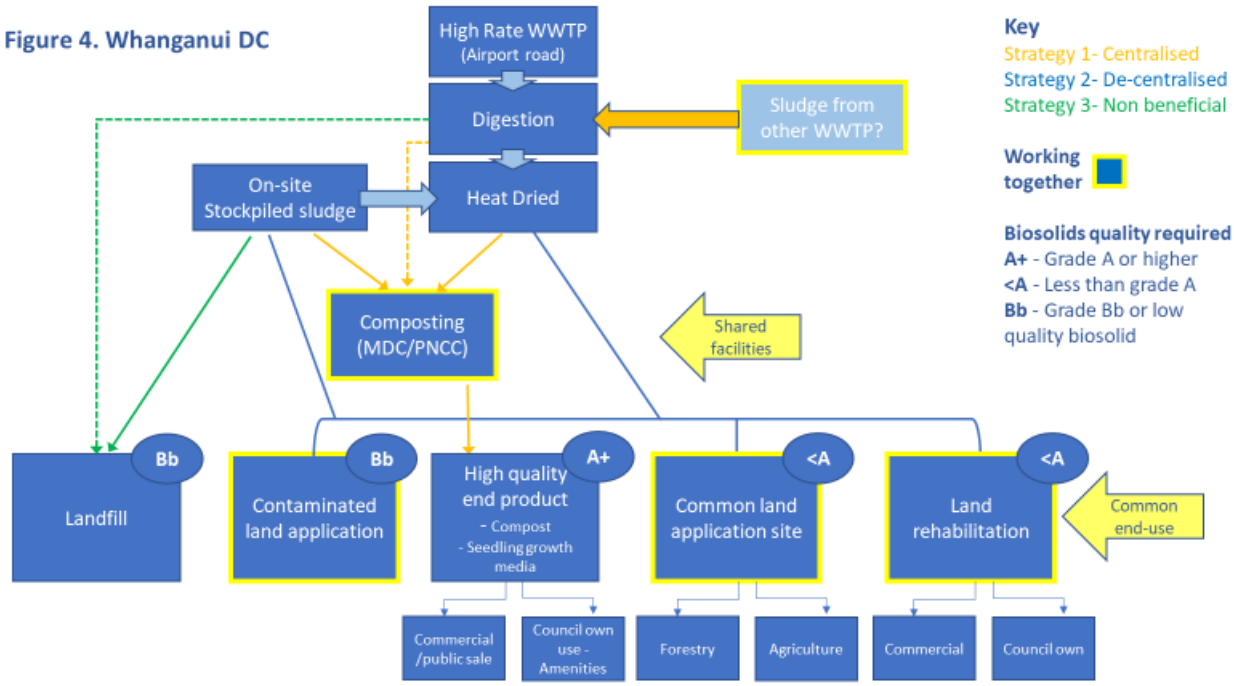


Figure 4.4. A Potential Draft Biosolids Strategy for the Whanganui District Council – Airport Road WWTP

4.2.4 Palmerston North City Council

Palmerston North City Council (PNCC) process all sludge at the Totara Road WWTP. Totara Road is a high rate treatment plant, digested sludge is dewatered and then composted before transporting to landfill where it is used for topping. There may be capacity for PNCC to accept other WWTP sludge into either the treatment facilities or composting process as is reflected in Figure 4.5.

Proposed Strategy for PNCC

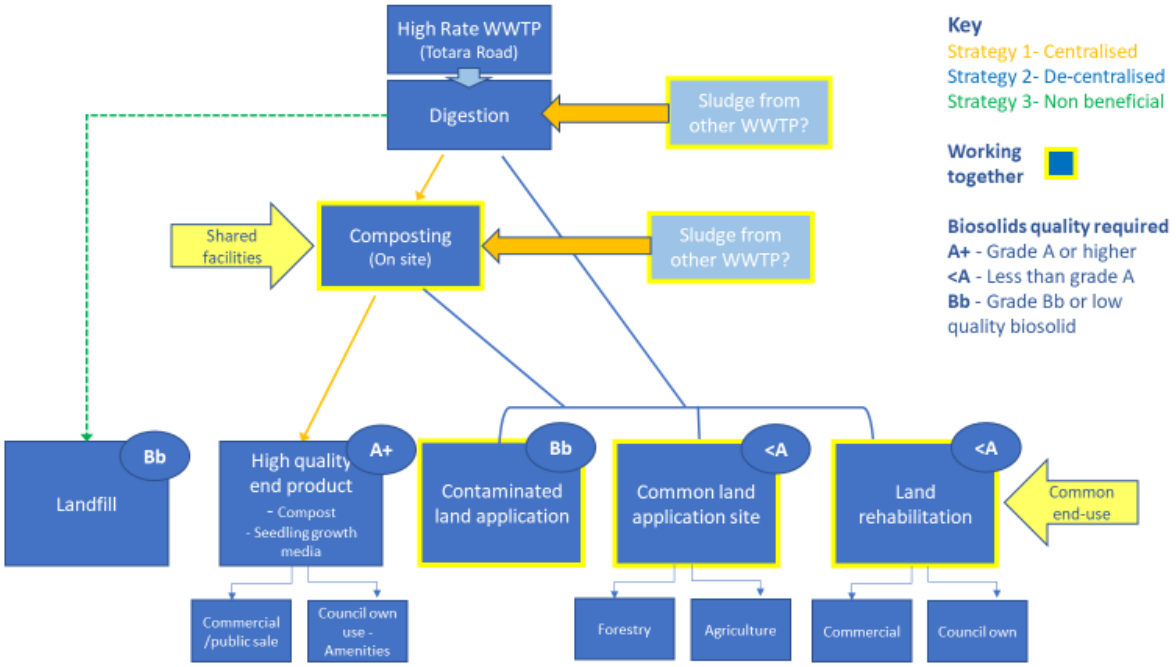


Figure 4.5. A Potential Draft Biosolids Strategy for Palmerston North City Council – Totara Road WWTP

4.2.5 Kapiti Coast District Council

The Kapiti Coast District Council (KCDC) has two WWTP's, Paraparaumu and Otaki. Paraparaumu WWTP is a high rate treatment plant producing heat treated biosolids that currently goes to landfill. The ponds at Otaki WWTP are used for processing the liquid content only, with the primary sludge processed by clarifier, centrifuged and transported by tanker to the Paraparaumu WWTP where it is processed with the inlet flow (Figure 4.6). Old sludge remains onsite at Paraparaumu in six decommissioned oxidation ponds. Strategy 4.7 can be applied to this sludge depending on its quality.

Proposed Strategy for KCDC

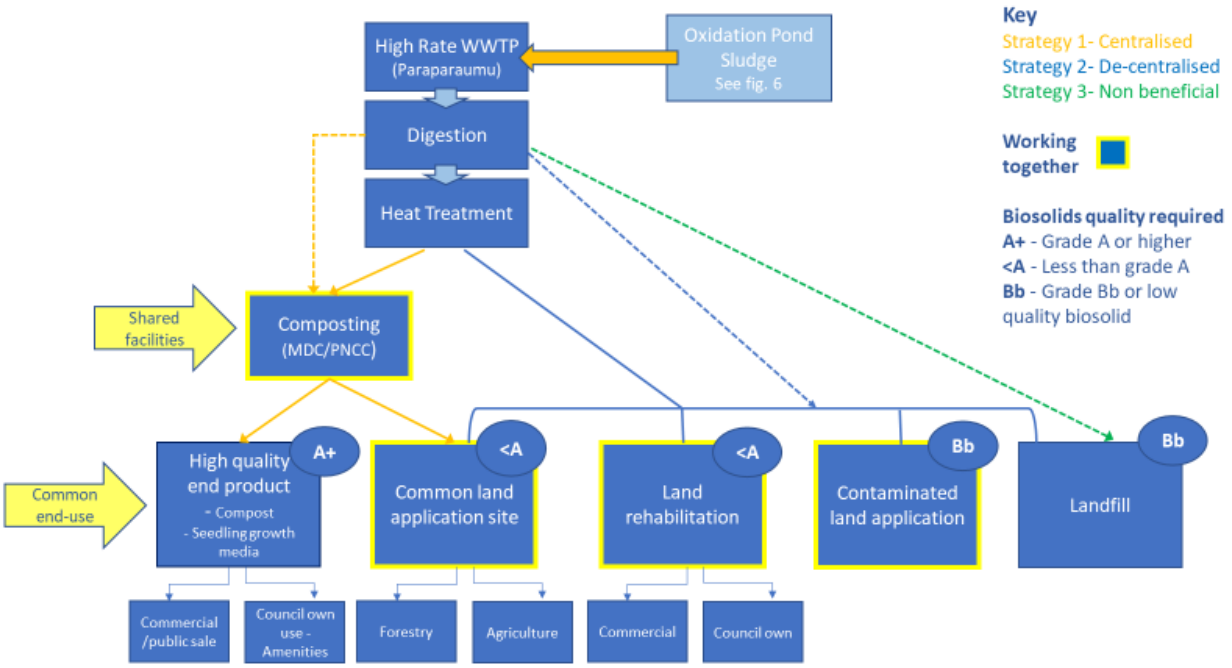


Figure 4.6. A Potential Draft Biosolids Strategy for Kapiti Coast District Council – Paraparaumu WWTP

4.2.6 Lower North Island Oxidation Ponds Systems

Within the study region there are several communities that rely primarily/solely on oxidation pond systems for wastewater treatment. As such, many require management of oxidation pond sludge in varying stages/states of maturity, moisture and quality. The Councils who require oxidation pond sludge management are as follows:

- Masterton District Council – 4 sites
- Horowhenua District Council – 5 sites
- Manawatu District Council – 14 sites
- Tararua District Council – 7 sites
- Ruapehu District Council – 5 sites

In addition, many oxidation WWTPs have stockpiled sludge on-site. Where it is deemed necessary for this sludge to be moved off-site it can be treated as dewatered sludge/geobag sludge for the purpose of Strategy 4.7 (depending on sludge quality and moisture content). There are numerous means for collective management of oxidation pond sludge and these are outlined in Figure 4.7.

Proposed Strategy for oxidation pond and stockpiled sludge

A large proportion of smaller communities within the study region have oxidation ponds that are either at capacity or close to capacity and will require de-sludging within less than five years. Significant opportunities exist for these communities to work collectively (both between WWTP and Council Regions) to achieve beneficial use that individually they may not have achieved due to lesser economies of scale. Pathways to collective management are highlighted in yellow (Figure 4.7)

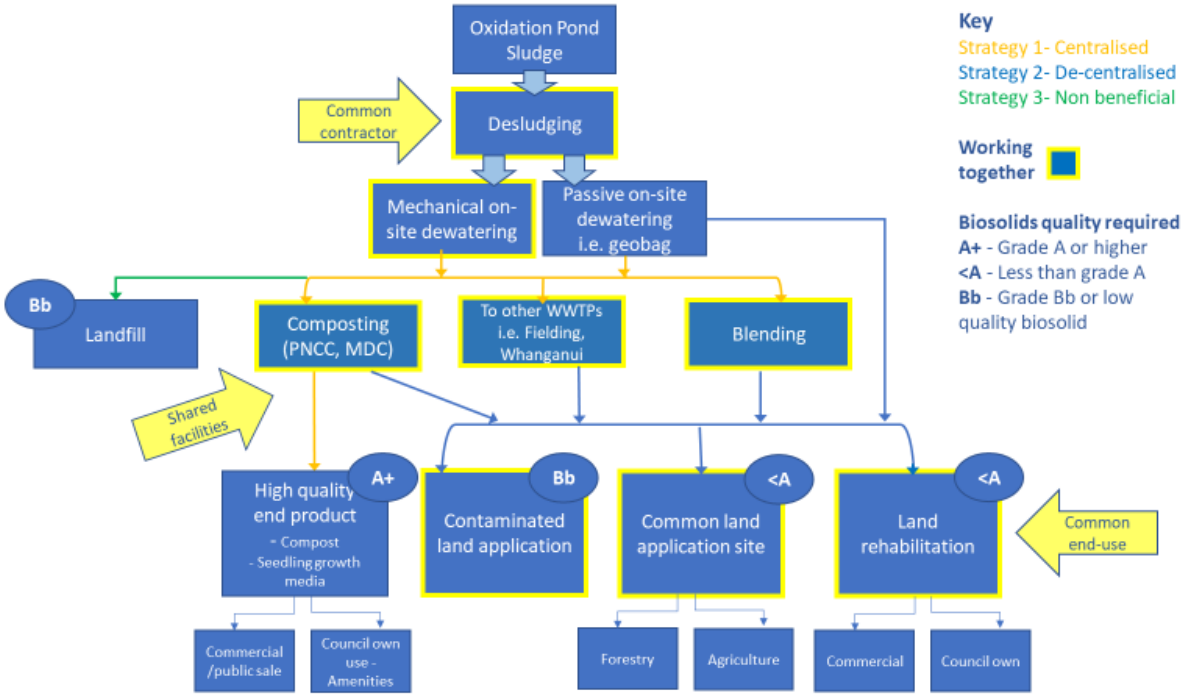


Figure 4.7. A Potential Draft Biosolids Strategy for Oxidation Pond Sludge

5 ADDITIONAL CONSIDERATIONS

5.1 Continued Sharing of Knowledge

The project has provided Councils with a forum for meeting and sharing information. Through this forum Councils were able to highlight common problems facing their communities (particularly smaller communities) and opportunities for working together were identified.

It is recommended that the sharing of knowledge be continued. This may be achieved through meetings between nominated Council members, or the development of a special interest group, through which information on regional changes and opportunities can be shared. A protocol for maintaining this may include the following:

- Yearly meetings of Council representatives (e.g. Governance Group) where discussion on recent changes and requirements can occur; this may facilitate cost reductions and encourage working together and keep councils up to date with new/decommissioned equipment or opportunities that they may not have been aware of. It may also facilitate the development of joint infrastructure projects that allow economies of scale to be realised.
- A central repository where up to date information on sludge quality and quantity at each site can be documented for easy reference. This repository may take the form of a location (Regional Council) or Ministry maintained GIS map such as the one developed in Report 7.

5.2 Shared Approach to Managing the Regional Regulatory Framework

It has been identified through the strategy development process that consenting and regulatory requirements are one of the most prohibitive costs associated with biosolids management. Consenting processes are often drawn out, complex and create uncertainty.

Currently, applications for discharge are facing increasingly complex assessments (AEE based) requiring levels of detail that prove prohibitive for smaller communities, even when the environmental consequences of discharge would be minimal. This applies to both the provision of technical information and engagement processes. As a result, smaller councils or those with small discharge quantities are continuing to landfill or stockpile sludge; especially as there is a higher degree of certainty surrounding timing and costs for such disposal options.

A shared approach to managing the current regional regulatory framework would allow individual councils to work together in obtaining consents to reduce overall cost to individual councils (Report 11). It may also mean there is a very clear template or process to be used.

It has been suggested that Horizons RC may be able to develop this framework.

5.3 Community/iwi Engagement Frameworks

It was indicated that a key part of biosolids management for the Councils is community and iwi engagement. The project explored the challenges facing Councils and iwi when working on biosolids issues through investigations into current available cultural frameworks (Report 7), sharing lessons learned (Report 5), the development of a GIS mapping tool (Report 8) and

incorporating cultural monitoring alongside Western science in research trials (Report 9). Some key factors to consider when approaching community and iwi engagement are:

- It is fundamental to the success of any future strategy that the community engagement process begins before any physical aspects of the project are put into practice. i.e. avoid 'a cart before horse' approach;
- There are many complex dynamics to hapū and inter-regional Iwi ownership, including historical decisions and events, sites of cultural significance, mahinga kai, multiple and sometimes conflicting interests of hapū, Iwi and councils pertaining to wastewater treatment, WWTP locations, water quality and land-use issues in the region;
- Engagement takes time, can be costly and comes with uncertainty; meaning that some Councils avoid engagement; and
- Frameworks are useful tools but there is no 'one size fits all' solution for community or iwi engagement.

5.4 Guidelines

Current guidelines for sludge management are based on the 'Guidelines for the Safe Application of Biosolids to Land in New Zealand (NZWWA, 2003)' which contains information to assist producers, dischargers and regulators to manage the discharge of treated domestic sewage to land in New Zealand. Within the guidelines are nationally agreed criteria for monitoring the contaminant loading of sludges, biosolids and receiving soils.

It has been acknowledged that the limits in the guidelines are not always practical and often present a barrier to re-use. Led by WaterNZ and involving industry (WasteMinz, and The NZ Land Treatment Collective) and research partners (The Centre for Integrated Biowaste Research), a new technical guide is being drafted that recognises the commonalities of all organic waste and describes quality criteria for beneficial use. This guideline will supersede, update and reference existing guidelines and standards including the NZ Biosolids Guidelines and the NZS4454 Composting Standards. It is hoped that once complete the new guideline will contain more attainable standards and therefore be less prohibitive to beneficial re-use. However, as the current NZWWA guidelines are presently used in many regional plans there will be initial limitations to the ability to adopt the new guidelines.

5.5 Waste Minimisation Levies

The current costs of disposal are set to increase due to new Government initiatives designed to reduce the volumes of waste being disposed of to landfill. This will provide further incentives for beneficial re-use. However, if uncertainty surrounding engagement and consenting is not addressed Councils may still choose to take the more expensive option of landfilling.

6 NATIONAL CONTEXT

A stocktake of sludge volumes residing in oxidation ponds is not included in national waste management surveys prepared by WaterNZ. This project aimed to provide more information about sludge volumes and quality in oxidation ponds within the region surveyed. Extrapolating this information to a nationwide scale indicates there are likely to be some 200 waste treatment pond systems in New Zealand; with many likely to contain large quantities of sludge as they have never been desludged. A number of these plants will require sludge management within the next five years.

The quality of the sludge in these oxidation ponds is likely to be highly variable (see Appendix B for a summary of sludge quality variation between treatment paths). If the WWTP's have minimal trade waste inputs, pond sludge is likely to meet Grade B levels for the presence of heavy metals and can be potentially beneficially re-used with no or minimal further processing. For those with lower grade sludge, further stabilisation through composting with green-waste and/or blending sludges of different quality will enable a wider range of end-uses by producing a higher value product.

Whilst the project has focussed on the lower North Island, it is likely that the same sludge management issues exist at a national scale. It is also likely that the solutions outlined are relevant to other regions. Issues likely to effect biosolids re-use at a national scale are:

- Limited information is available on quantity and quality of sludge in oxidation ponds and other on-site storage locations;
- There is a significant lack of beneficial end-use options identified, with most regions likely to be resorting to landfill and/or stockpiling;
- There are physical, financial and infrastructural restrictions to beneficial re-use that need to be considered;
- The high financial burden of resource consenting is prohibitive to re-use; and
- The requirement of Council to engage iwi and community in *all* applications is costly and provides significant barriers to re-use.

Potential national solutions based on the project outputs include:

- Collaborative management of sludge presents an opportunity for smaller communities that otherwise may not afford to beneficially re-use, likely to be the case in many rural regions (working together);
- The facilitation of a forum to bring Councils together can be extrapolated to create a forum to talk nationally about limitations and solutions; and
- Sharing knowledge between regions and providing a national database for storage of up to date data on sludge volumes and locations will help future proof and allow for better planning for the ongoing management of these resources.

7 REFERENCES

NZWWA. (2003). Guidelines for the Safe Application of Biosolids to Land in New Zealand. New Zealand Water and Waste Association.

8 AKNOWLEDGEMENTS

Ministry for the Environment (Waste Minimisation Fund), Kapiti Coast District Council, Tararua District Council, Palmerston North City Council, Masterton District Council, Ruapehu District Council, Manawatu District Council, Rangitikei District Council, Whanganui District Council, Horizons Regional Council, Tanenuiarangi Manawatu Inc, The Centre for Integrated Biowaste Research.

Contribution funding for some tasks within the project has also been provided by LEI and ESR.

9 APPENDICES

Appendix A Full executive summaries of project outputs
Appendix B Sludge quality by region
Appendix C Project in review

REGIONAL BIOSOLIDS STRATEGY
LOWER NORTH ISLAND

APPENDIX A

Full executive summaries of project outputs

Project outputs

The project outputs are summarised into the year in which they were complete followed by the milestone and activity which they relate to. They are summarised as follows:

Year 1
- Report 1: Gaps analysis: investigating knowledge gaps for sludge in the Lower North Island;
- Report 2: A quantitative assessment of sludge in the Lower North Island; and
- Report 3: Identifying opportunities for Councils to work together for sludge management.

Year 2
- Report 4: A Draft Strategy for the collective management of biosolids – Lower North Island;
- Report 5: Exploring the challenges facing councils and iwi when working around biosolids issues; Key insights and lessons learned;
- Report 6: Biosolids Processing Trials; Trial for assessing the reuse of biosolids as a growing substrate for nursery plants;
- Report 7: Exploring the challenges facing councils and iwi when working around biosolids issues; Developing a regional GIS map; and
- Report 8: Exploring the challenges facing councils and iwi when working around biosolids issues; Assessment of Cultural Frameworks.

Year 3
- Report 9: Biosolids Processing Trials; Biosolids composting trial final report;
- Report 10: Biosolids Processing Trials; Biosolids field trial final report;
- Report 11: Memo: Consenting framework for discharges of biosolids to land;
- Report 12: Memo: Guidance on determining nitrogen mineralisation rates;
- Report 13: Potential end-use options for the Lower North Island; and
- Report 14: Memo: A cost analysis summary for end-use options in the Lower North Island

REGIONAL BIOSOLIDS STRATEGY
LOWER NORTH ISLAND

Project Year 1

Report 1: Gaps analysis: investigating knowledge gaps for sludge in the Lower North Island.

Background

In the lower North Island, there is an estimated 80,000 tonnes of sludge (at 20% solids) produced from oxidation ponds (every 30-50 years) and additional sludge from 5 high rate treatment plants. Most of this sludge ends up in landfills. Landfilling is not a long-term management option and is becoming more difficult due to increased levies, space required and transportation distances. There is an increasing community expectation of a need to develop sustainable use options. Management of solids is especially difficult for smaller communities where limitations because of lesser economies of scale can stifle the development and creation of workable solutions. All territorial authorities are facing the same problem – what to do with their biosolids.

ten lower North Island councils are working in partnership to develop a collaborative biosolids strategy that includes the potential collective management of sludge and beneficial use programmes. The strategy is led and co-ordinated by Lowe Environmental Impact (LEI) and The Institute of Environmental Science and Research Ltd (ESR).

The first step in the project is to undertake a stock take and gaps analysis to determine the scale of the current sludge problem for each district. The project partners will then work together to determine potential collective solutions including processing, end-uses, consenting and stakeholder engagement processes. Some of the potential solutions will be trialled (e.g. field trials of composting). The outcome will be a 'toolbox' of different scenarios that provides a model of operation that can be applied in other regions around New Zealand.

The purpose of this report is to:

- examine the availability of information held by councils regarding the sludge and biosolids in their district;
- provide a summary of the information; and
- identify gaps in the available data which need to be filled to allow the sludge volume and quality of the area covered by the partner councils to be properly quantified.

To do this, information was collected on volumes and characteristics of sludge in the region as well as the current regulatory environment and limitations. This data was used to extrapolate likely sludge quantity and quality to the national level.

Information Collection

A comprehensive survey template was emailed to each council partner. This was followed up with emails and phone calls to collect the data on sludge quantity and quality in each district. Of the eight council partners involved in the project, six filled out the survey and a further two were interviewed by telephone. Most data sets were incomplete and accessing external data sources was required, including online sources, consultants (e.g. LEI) and resource consents. The ninth Council involved in the project is Horizons Regional Council, who are not responsible for any wastewater treatment plants, and so were not required to respond.

Findings

The main finding of the "Gaps Analysis" is that for many councils, information on sludge volumes and quality is simply not available, mainly because it has never been investigated. Below is a summary of the information collected.

Across the Lower North Island there are 46 wastewater treatment plants (WWTPs); 37 are oxidation ponds (some with additional treatment such as screening and/or maturation cells), four are small advanced treatment plants (Waiouru, Whakapapa, Pipiriki and Mangaweka), and five are larger advanced treatment plants serving bigger populations that discharge sludge on a continual basis. The five larger plants are: Paraparaumu (KCDC); Levin (HDC), Palmerston North (PNCC); Feilding (MDC) and Whanganui (WDC) that produce a variety of digested sludge and have reasonable data on sludge volumes (excluding Palmerston North), quality and end-use. Sludge produced at the five larger plants is either disposed to landfill (Paraparaumu, Levin, Whanganui), stockpiled on site (Feilding, Whanganui) or composted (Palmerston North and Feilding). There is very limited information on trace elements and organic contaminants content, with data only available for one plant (Levin). Most plants have information on heavy metals. Sludge quality is variable with large inputs of trade waste into some plants.

Of the 37 oxidation ponds in the region, there is no data available on sludge quantity for 32 ponds, and variable, scattered data on quality with little consistency for what has been measured. Councils which have undertaken desludging operations recently tended to have a more detailed record of sludge quality and quantity i.e. Masterton District Council have data on the sludge from their decommissioned ponds and Tararua District Council have data for the sludge in sludge cells at Woodville.

The oxidation pond systems vary in design configuration depending on population size; some towns have a sequence of ponds while other smaller localities have a single pond system. The ponds are of variable size, with not all having inlet screens. Information supplied suggests that eleven of the ponds, accounting for a third of the plants reviewed, do not accumulate sludge, or if they do, it is at a very slow rate. An additional third (11) of the ponds have been desludged in the last 5 years. The final third have never been desludged.

For those ponds that have been desludged, the sludge is either stored on-site or landfilled. For most small towns with oxidation ponds, trade waste inputs are negligible, and it is probable that the concentrations of inorganic contaminants (e.g. heavy metals) would be low. However, nutrient content and the degree of sludge stabilisation will depend on the age of the pond and the time since emptying etc.; further analysis, as well as confirmatory heavy metal analysis, will be undertaken in the next part of the project (Task 1b Site visits and field investigations).

<u>Extrapolation to National Picture</u>

Extrapolation of the information on sludge volumes and quality collected from the 8 councils involved in this project to give a national picture is difficult. This is partly because there is very little data available. This lack of data is likely to be similar across New Zealand and we estimate there could be around 800 oxidation ponds in New Zealand. As these limitations will be common in all districts and regions, we would expect similar levels of landfilling and mono-filling to be occurring at a national level.

Beneficial use of sludge and biosolids is not widely practiced (at only one plant reviewed). A potential roadblock is likely to be that producers consider biosolids use other than disposal (landfill, monofill, construction fill) to be expensive and resource intensive with significant expenditure attributable to planning, applying for, and ongoing monitoring associated with resource consent requirements.

Regulatory Environment

National guidelines exist (Guidelines for the Safe Application of Biosolids to Land in New Zealand, NZWWA, 2003), to assist producers, dischargers and regulators (regional councils) to manage the discharge of treated domestic sewage to land in New Zealand. These guidelines have no legal status and the application of biosolids to land is regulated by the Resource Management Act (RMA) (1991). Within the guidelines are standard or nationally agreed criteria for monitoring the contaminant loading of biosolids and receiving soils. The Guidelines propose a grading system whereby biosolids are assigned a stabilisation (microbiological) grade 'A' or 'B', and a chemical contaminant grade 'a' or 'b'.

The NZWWA (2003) guidelines were proposed to be a living document to allow for updates as new information became available. Led by WaterNZ and involving industry (WasteMinz, and The Land Treatment Collective) and research (The Centre for Integrated Biowaste Research) partners, a new generic technical guideline is currently being drafted containing quality criteria for beneficial re-use of all organic wastes.

The partner councils involved in this project span the Horizons (Manawatu/Wanganui) and Greater Wellington (GW) regions. Discharges of biosolids to land are allowed by rules in each regional council's regional plan. For GW and Horizons, specific rules apply to the discharge of biosolids, but not to sludge. It is possible to apply biosolids as a permitted activity (not requiring resource consent) if an Aa grade (based on NZ Biosolid Guidelines, NZWWA, 2003) can be achieved. However, it is uncommon in smaller areas (compared to Auckland or Wellington) to maintain a testing programme that complies with and demonstrates Aa grade requirements. It is reasonable to anticipate that all discharges from pond treatment systems will not be classed as an Aa grade biosolid and will therefore require a discharge consent. Consent application requirements are likely to include provision of information on material characterisation, the discharge site and mitigation and management plans.

Conditions of consent generally reflect the risk of the consented activity as perceived by the consenting authority. In practice, conditions for new consents are often modelled on existing resource consents, and may have more, but seldom less restrictive conditions than have been applied elsewhere previously.

Summary

Key outcomes of the report are:

- Less information is held by councils regarding pond sludge than anticipated prior to undertaking this exercise;
- Often information available is based on estimates for one or more of the calculation parameters;
- Continuous process plants (the larger plants), with discharge from the treatment system on a daily basis, tend to have adequate records of quantity, and produce volumes in the order of 35 to 160 L/person/y dry weight of sludge. Variability is likely due to industrial loads and process differences (e.g. digestion), but further investigation is required to confirm this;
- Copper and zinc are the components of most concern, and most commonly measured. Other trace element data is not collected. Organic compounds and pathogen content is not commonly monitored; and
- Insufficient information is available to determine pond sludge quantity relationships with certainty, however the limited information available suggests in ponds that are not desludged, accumulated volumes are in the order of 1.0 to 1.5 m3/person dry weight of

sludge. Where ponds have been desludged, the rate of accumulation may be in the order of 10 L/person/y dry weight of sludge. Additional investigation is required to reduce uncertainty around these figures.

Several knowledge gaps have been identified and are detailed in this report. These include:

- Total quantity of sludge in 32 ponds;
- Rate of sludge accumulation in oxidation ponds; and
- Quality of sludge from oxidation ponds and other treatment plants in terms of nutrients (e.g. N, P, K, C), heavy metals (e.g. Cu, Zn) and organic contaminants (e.g. PAHs).

To obtain a clearer understanding of the scale of the sludge issue (i.e. quantity and quality) in the region, further investigations need to be undertaken. It is clear from the gaps analysis that the largest knowledge gaps relate to oxidation ponds; very little data exists on the sludge volumes and quality in oxidation ponds across the region, thus oxidation ponds will be the focus of further investigations. It is recommended that the next phase of this project, Task 1b Site visits and field investigations, focus on this issue and approach it in two ways:

1) Collect qualitative information on sludge volumes and quality using data such as age of the pond, if it has been emptied before, population and pond size. This type of information will allow estimates to be made on the volume of sludge likely to be in the pond and the possible quality.
2) Quantitative information collected by undertaking field work to assess sludge levels within a representative number of ponds and full analysis of sludge to determine composition for a range of variables (e.g. organic Matter, Dry Matter, Volatile Solids, Copper, Phosphorus, Zinc, pH, Total Nitrogen, Ammonium-N, Nitrite-N, Nitrate-N, Nitrate-N + Nitrite-N, Total Carbon and Escherichia coli). It is recommended that field work is restricted to those ponds likely to require de-sludging in the next 5 years, for example, Foxton and Marton, as these locations will have more urgent requirements for the information gained. This data can then be used as a baseline for planning further stages of this project.

REGIONAL BIOSOLIDS STRATEGY
LOWER NORTH ISLAND

Report 2: A quantitative assessment of sludge in the Lower North Island

Background

Ten lower North Island councils are working in partnership to develop a biosolids strategy that includes a potential collective approach for sludge management and beneficial use programmes. The strategy is led and co-ordinated by Lowe Environmental Impact (LEI) and The Institute of Environmental Science and Research Ltd (ESR).

The first step in the project is to undertake a stock take and gaps analysis to determine the scale of the current sludge problem for each district. The project partners will then work together to determine potential collective solutions including processing, end-uses, consenting and stakeholder engagement processes. Some of the potential solutions will be trialled (e.g. field trials of composting). The outcome will be a 'tool box' of different scenarios that provides a model of operation that can be applied in other regions around New Zealand.

This report follows on from an earlier survey of the partner councils, which identified that information held by the councils regarding sludge volumes and quality in oxidation pond systems was limited (Stage 1 Gap analysis, Task 1a Desk top study, June 2017).

The purpose of this report is to provide more information on quantity and quality of sludge in oxidation ponds in the Lower North Island. Site investigations and sludge analyses were undertaken at two WWTPs where there are ponds likely to require de-sludging in the next 5 years (Foxton and Marton); and sludge in geobags at Shannon and Tokomaru WWTPs.

Information Collection

Investigations were undertaken to assess the sludge levels within ponds at Foxton and Marton; samples of sludge were collected from the pond areas at both sites and analysed for a range of variables in order to determine sludge quality. At Tokomaru and Shannon, sludge was stored on site in geobags. The geobags were opened and representative sludge samples taken and analysed for a range of variables in order to determine sludge quality.

Key Findings

The main findings from the site visits and field study are that:

- WWTP's that receive trade or industrial wastes are likely to have significantly higher sludge concentrations of metal contaminants. In this case, zinc was elevated in Foxton and all metals were elevated in Marton compared to Tokomaru and Shannon. For pond sludges in Marton and Foxton, zinc levels may limit beneficial re-use options without further treatment of the sludge (e.g. composting with green waste or blending with other WWTP sludge to dilute the metals);
- Differences in sludge quality were found between oxidation ponds depending where the pond was in the treatment sequence. Ponds at the beginning of the treatment train had higher organic matter, ammonia and heavy metals;
- Wastewater inputs into Tokomaru and Shannon ponds are mainly residential. Sludge from these ponds contained levels of heavy metals that meet current Biosolids guideline limits for Grade B biosolids and could be beneficially used with resource consents (e.g. land application);
- Levels of copper are similar between oxidation pond sludges suggesting that copper inputs are mainly domestically sourced;
- Pond sludges that have been geobagged are more stable than sludges accumulated and stored in oxidation ponds;

- Sludges in geobags contain less water than oxidation pond sludges indicating that the use of geobags to de-water oxidation pond sludge is successful;
- Large volumes of sludge are currently stored in the oxidation ponds at Foxton and Marton (25,500 tonnes and 47,500 tonnes wet weight, respectively); and
- There are significant difficulties in measuring sludge volumes in oxidation ponds, mainly due to uneven pond floors and water levels in the ponds.

Regional statement on oxidation pond sludge and characteristics

Qualitative data was obtained from surveys and interviews with partner council members to collate information on oxidation ponds in the region.

A summary of the information obtained is as follows:

- There are approximately 62 oxidation ponds in the study region;
- Approximately 11 of these oxidation ponds require de-sludging in the next five years; and
- Of the 11 pond systems needing de-sludging at least two have significant trade waste inputs and it is likely the sludge will require further treatment/blending before beneficial use to manage the contaminants.

National statement on oxidation pond sludge and characteristics

Sludge residing in oxidation ponds is not included in national waste management surveys. This Gaps Analysis can start to provide more information (qualitative and quantitative) about sludge volumes and quality in oxidation ponds nationwide. The key findings are:

- The 200 waste treatment pond systems in New Zealand are likely to contain over 4,000,000 tonnes of sludge (at 8 % dry solids). While this does not require management immediately, it will need to be managed over time;
- If WWTP's have minimal trade waste inputs, pond sludge is likely to meet Grade B levels for the presence of heavy metals and can be potentially beneficially re-used with no or minimal further processing;
- Sludge quality is dependent on where the sludge is in the treatment train; with sludges at the beginning of the treatment system having a lower quality and requiring further treatment before beneficial re-use. Sludges at the end of the treatment train are of a higher quality and could be beneficially used without further treatment;
- Geobags (or similar) may be a cost-effective sludge management option as they appear to dewater and further stabilise pond sludge to a point where it could be beneficially re-used after 18 months in bags;
- Sludge surveys have a high degree of error due to the uneven pond base, variable water levels, detection of the sludge interface and uneven sludge build up. This makes it very difficult for Council's to plan, and allocate budget to sludge management plans; and
- There are real options for beneficial re-use if the sludge is further stabilised by composting with green-waste, or by blending sludges of different quality to obtain high value products.

REGIONAL BIOSOLIDS STRATEGY
LOWER NORTH ISLAND

Report 3: Identifying opportunities for Councils to work together for sludge management

Background

Ten lower North Island councils are working in partnership to develop a biosolids strategy that includes a potential collective approach for sludge management and beneficial use programmes. The strategy is led and co-ordinated by Lowe Environmental Impact (LEI) and The Institute of Environmental Science and Research Ltd (ESR).

A stock-take and gaps analysis were undertaken to determine the scale of the current sludge problem for each district. Using the findings from this analysis the project partners aim to work together to determine potential collective solutions including processing, end-uses, consenting and stakeholder engagement processes. Some of the potential solutions will be trialled (e.g. biosolids composting field trials). The final project outcome will be a 'tool box' of different scenarios that provide a model of operation that can be applied in other regions around New Zealand.

Scope

The purpose of this report is to summarise the findings of the Stage 1 Gaps analysis (Stage 1 Gap analysis, Task 1a Desk top study, June 2017 and Task 1b Site visits and field investigation, October 2017) and use this information to identify common problem areas faced by councils with regards to biosolids management, and investigate potential solutions. This report addresses Stage 2: Opportunities to Work Together, Task 2a by identifying areas where Councils could work together, sharing costs, existing infrastructure and providing contingency scenarios. A draft MoU has been prepared to enable Partner Councils to signal a willingness to further explore opportunities to work together, including potential for joint research projects, joint field trials, sharing of and enhancing of intellectual property and sharing resources and infrastructure.

Key Findings

Results from the initial gaps analysis surveys indicated that information held by the councils in the Lower North Island regarding sludge volumes and quality in oxidation pond systems was limited, as was information on quality and quantity of stockpiled sludge (Stage 1 Gap analysis, Task 1a Desk top study, June 2017 and Task 1b Site visits and field investigation, October 2017). However, a number of common problem areas and potential collective solutions were identified. The main findings of this report were as follows:

- Few Councils have investigated alternative end-use options for sludge, most dispose to landfill, monofill or stockpile sludge;
- Common problem areas for sludge management are:
    - Urgency;
    - Unknown quality and volume of sludge;
    - No identified end-use;
    - A lack of community engagement and/or appropriate community engagement framework;
    - Physical, infrastructural and financial restrictions to de-sludging, dewatering, transport and processing of sludge;
    - Regulation;
    - High financial burden of sludge management; and
    - No contingency plans in place.
- The result of these common problems is large quantities of sludge remaining in oxidation ponds, stockpiled or sent to landfill;

- Many opportunities exist for Councils to work collaboratively to achieve a collective biosolids strategy that would benefit all parties, including:
    - Sharing sludge processing infrastructure (either location or equipment);
    - The development of a Global Regulatory Framework;
    - Sharing knowledge and maintaining collaboration to establish effective contingency plans, and learn from past inefficiencies;
    - Shared Community Engagement Framework and sharing knowledge around community engagement processes; and
    - The development of standards for all WWTP to reduce inconsistencies in describing quantity and quality of sludge (i.e. wet weight vs dry weight) and variability of material.
- The findings proved a good starting point for discussions that will be built upon through Stage 4 (Scenario evaluation: T4a Development of 'straw men' scenarios) and Stage 5 (Draft strategy: T5b Draft strategy) of this project.

Project Year 2

Report 4: A Draft Strategy for the collective management of biosolids – Lower North Island

Background

Ten lower North Island councils are working in partnership to develop a biosolids strategy that includes a potential collective approach for sludge management and beneficial end-use. The strategy is led and co-ordinated by a collaborative management team of Lowe Environmental Impact (LEI), Massey University and The Institute of Environmental Science and Research Ltd (ESR).

A stock-take and gaps analysis was undertaken in year 1 (Stage 1 Gap analysis; Task 1a Desk top study, and Task 1b Site visits and field investigations) of this research programme and highlighted the scale of the sludge problem in the region as well as areas where councils could potentially work together to manage their sludge (Stage 2 Opportunities to Work Together; Task 2a Opportunities to Work Together). Initial 'straw-men' strategies (Stage 4 Scenario Evaluation;

Task 4a Development of 'straw men' scenarios and 4b Workshop Discussion) were developed and progressed through discussion to the development of draft strategies for the collective management of biosolids for the Lower North Island.

Scope

The purpose of this report is to summarise the findings of the project so far and highlight how this information has been used to develop a draft strategy for collective management of biosolids for the Lower North Island. This report addresses Activity 3 Biosolids Strategy: Produce a Finalised Draft Strategy for circulation to Council and MfE.

Key Findings

- A draft strategy for the potential collective approach for sludge management (Lower North Island) has been developed through the collaboration between project partners (LEI, Massey and ESR) and ten Lower North Island councils;
- A general overview of the developed strategy is presented as well as more specific details of how this strategy applies to different regions;
- The strategy has a focus on collective management and beneficial end-use and has sought to incorporate variations for different regions requirements;
- Presentation of the strategy to Council Partners (by email and at the Governance Group meeting 18th September, 2018) was well received and minor amendments were made to the strategy diagrams;
- Council Partners would like to see the inclusion of cost comparisons and end-use options in the final strategy document;
- Councils are committed to working together and to developing sustainable end-uses for their sludge;
- Supplementary information for a strategy could include:
    - Shared regulatory framework;
    - Practical guidelines for analysis;
    - Community engagement frameworks; and
    - A framework for the continued sharing of knowledge.

REGIONAL BIOSOLIDS STRATEGY
LOWER NORTH ISLAND

Report 5: Exploring the challenges facing councils and iwi when working around biosolids issues; Key insights and lessons learned

Background

Ten lower North Island councils are working in partnership to develop a biosolids strategy that includes a potential collective approach for sludge management and beneficial end-use. The strategy is led and co-ordinated by a collaborative management team of Lowe Environmental Impact (LEI), Massey University and The Institute of Environmental Science and Research Ltd (ESR).

Initial stages of this project included plans to develop an iwi and wider community engagement framework that aimed to incorporate community views into long-term, regional wide solutions for managing biosolids. Recognising the importance of stakeholder engagement, one of the first steps towards this project goal was to investigate the potential to develop a framework for engaging with tangata whenua, mana whenua and the wider community within the study region. It was anticipated that such a framework could aid in identifying positive processes for bringing individuals and groups together and help establish common principles for managing biosolids and sludges in the lower North Island region.

This milestone (Year 1, Stage 3; Community and Stakeholder Engagement Framework) aimed to utilise social/cultural science expertise and resources from previous community engagement work conducted by the Centre for Biowaste Research (CIBR) programme (Ataria et al 2016; Baker et al 2016) to support the design of a pilot strategy for Iwi engagement.

This document provides a short summary of the progress made in developing a pilot Iwi engagement plan (Appendix 1). Outlining achievements to date, roadblocks, challenges and lessons learnt through 18 months of consultation/discussion.

Project Progress

- The project aimed to develop a pilot Iwi engagement strategy with the guidance of Iwi/hapū and the Kāpiti Coast District Council (KCDC)
- The project's social and cultural researchers supported an Iwi engagement process which was led by KCDC staff who maintain a well-established council/iwi relationship
- The model followed was to ensure that KCDC staff would lead the relationship building and bring the researchers into the conversations where and when appropriate
- The development of the framework was initiated via emails, face to face meetings and phone calls.
- The progress of the project was hindered by many factors including external complexities across the region involving water, wastewater and land-use issues
- Despite the best efforts from all involved, the Project Team were unable to gain significant traction with the Iwi/hapū involved on how to best proceed with a pilot engagement approach.

Key insights and lessons learned

Despite best efforts, the development of an iwi engagement framework has not progressed as intended. The occurrence of misunderstandings and misalignments has hindered this work and the wider project. The Project Team does however acknowledge that significant learnings have been achieved through this process:

- It is evident that sole focus should not be on biosolids waste without the inclusion of related water, wastewater and land-use issues when engaging with iwi and community stakeholders.
- Māori representation in the governance arrangements for the regional strategy project was essential to iwi. As such the Project Team took immediate steps to ensure Māori representation in the high-level governance of the regional strategy. This should be taken into consideration at the initial stages of any similar project in the future.
- It is fundamental to the success of any future strategy that the community engagement process begins before any physical aspects of the project are put into practice. i.e. avoid 'a cart before horse' approach.
- There are many complex dynamics to hapū and inter-regional Iwi ownership, including historical decisions and events, sites of cultural significance, mahinga kai, multiple and sometimes conflicting interests of hapū, Iwi and councils pertaining to wastewater treatment, WWTP locations, water quality and land-use issues in the region.
- Irrespective to KCDC's well-established council/iwi relationship, there was an evident lack of trust and confidence in council decision making in some areas, exacerbated by wider dynamics not pertaining to the project.

Next steps

More positively the Project Team have engaged and responded as best as possible to the signals from KCDC and Iwi representatives to reappraise the approach for Iwi engagement within the wider project. This has included establishing a Terms of Reference and appointment of a Māori Cultural Advisor in the project governance team. There is commitment from all currently involved to explore and support improved Iwi and council engagement in negotiating issues of municipal wastewater and biosolids treatment in context of developing a regional strategy.

The Project Team plans to do this by:

- Continuing to strengthen and support Iwi/advisory engagement in the governance and regional strategy forum; and
- By building a better understanding of the interconnected biosolids, wastewater and water quality challenges facing Councils and Iwi when working on biosolids issues.

The Project Team are grateful for the time and commitment of all involved in contributing to this summary and helping shape the revised next steps.

REGIONAL BIOSOLIDS STRATEGY
LOWER NORTH ISLAND

Report 6: Biosolids Processing Trials; Trial for assessing the reuse of biosolids as a growing substrate for nursery plants

One of the potential uses for biosolids is as a seedling growth media in nurseries. Therefore, LEI and ESR designed a greenhouse seedling trial to investigate which concentration of biosolids can be used to grow a variety of native NZ seedlings.

Six plant species commonly grown in nurseries were chosen for this trial: *Hebe stricta* (koromiko), *Poa cita* (silver tussock), *Corokia cheesemanii, Phormium tenax* (harakeke or NZ flax), *Griselinia* sp. (broadleaf) and *Cordyline australis* (Cabbage tree/ tī kōuka).

These six plant species were exposed to increasing concentrations of four types of biosolids mixed with bark as an inert substrate. The biosolids used were fresh biosolids from Auckland, fresh digested biosolids from Whanganui (both at 0%, 5%, 10%, 15%, 25% concentrations), aged geobag biosolids from Tokomaru, and composted biosolids from Palmerston North (both at 0%, 10%, 20%, 30%, 50%).

Plants were potted into 36-well trays with one row for each biosolids concentration and one plant type per tray. Six replicates of each plant species were planted in each of the five biosolid/bark ratios, and for each type of biosolids, totalling 720 planted seedlings. Plants were grown in the biosolid/bark mix for 17 to 19 weeks. Growth was monitored fortnightly by measuring plant height or number of leaves. At the end of the experiment, the aerial part of the plants was harvested and dried to determine the aerial dry weight.

Biosolids from Palmerston North had adequate concentration of nitrogen (N), phosphorus (P) and potassium (K), and low concentration of trace elements. All plant species except broadleaf grew well up to the highest concentration of these biosolids, and did not present toxicity symptoms. Recommended ratio for these biosolids, which could be used straight forward, is 30 % dry weight if mixed with bark.

Biosolids from Tokomaru had low concentration of nutrients, high copper (Cu), and low pH, which explain the fact that plants showed less vigour and growth than those grown in the other three biosolids, even if they grew better than in control treatments. Mixing these biosolids with others with higher concentration of nutrients, and higher pH, or adding lime, would be required for using these as potting mix.

Biosolids from Auckland have high concentration of N (6 %), and P (2.7 %), and plants grew well throughout the experiment and presented good health and coloration. The highest concentration of these biosolids was observed to be deleterious for koromiko, and broadleaf, probably due to high Cu, or high NH4+, which in combination with low K may lead to a K deficiency. *E. coli* numbers, and concentration of Zn and Cu limits the use of these biosolids, which would need further treatment for safe use. 15 % of dry weight of these biosolids is the recommended ratio when mixed with bark for a growing mix for all native species.

Chromium is the main concern in biosolids from Whanganui, which had a concentration of 1.7%. Even like that, all the plant species treated with these biosolids grew significantly better than the control, since they contain adequate levels of N and P. Discontinuing the discharge of the tannery effluent will reduce the levels of Cr, and likely the salinity and Na in the biosolids. In that case, these biosolids had a good potential for been used as growing mix at 15 % dry weight concentration, for NZ native plants.

REGIONAL BIOSOLIDS STRATEGY
LOWER NORTH ISLAND

Report 7: Exploring the challenges facing councils and iwi when working around biosolids issues; Developing a regional GIS map

Background

Ten lower North Island councils are working in partnership to develop a biosolids strategy that includes a potential collective approach for sludge management and beneficial end-use. The strategy is led and coordinated by a collaborative management team of Lowe Environmental Impact (LEI), Massey University and The Institute of Environmental Science and Research Ltd (ESR).

Initial stages of the project included a gaps analysis to highlight the scale of the sludge problem in the region as well as areas where councils could work together to manage their sludge. Initial 'straw-men' strategies were developed and progressed through discussion to the development of draft strategies for the collective management of biosolids for the Lower North Island (Stage 5 Draft Strategy; Task 5b Development of a Draft Strategy).

Engaging with hapū and Iwi, and incorporating community views into waste management decisions is an essential part of the decision making process in New Zealand. Within the realm of the wider project, a project objective "Exploring the challenges facing Councils and Iwi when working around biosolids issues" was developed to reflect this.

This objective has been addressed through discussions (Milestone 1, Activity 2: Exploring the challenges facing Councils and Iwi when working around biosolids issues; Key insights and lessons learned), and reviews of currently available Cultural Impact Assessment Frameworks that could be used to evaluate impacts of biosolids re-use (Milestone 2, Activity 2: Assessment of Cultural Frameworks). This report forms the next phase of this objective and addresses Activity 2; 2A. GIS Mapping.

Scope

This report outlines progress in the development of a GIS map for potential use in applications for biosolids use. Addressing deliverable Year 2, Milestone 2 "Activity 2: Exploring the challenges facing Councils and Iwi when working around biosolids issues: 2A. GIS Mapping" by developing a regional GIS map with information on location of WWTP, type of treatment, current state (e.g. consent expiry), regional and district boundaries and iwi areas of interest.

Key Findings

- Locating the relevant information for WWTP location, type and consents was not straightforward, however this information was obtained through email and phone contact with Councils and collated for use;
- The Office of Treaty Settlements (OTS) provided shape files for areas of interest in the Wellington and Manawatu-Whanganui regions for iwi settlement claims that had been complete (or were far enough advanced);
- Shape files for territorial and regional boundaries were obtained from the Stats NZ datafinder portal (https://datafinder.stats.govt.nz);
- The collated shape files were put together using QGIS with the WWTP information to produce a point and click GIS map showing relevant WWTP information, Council boundaries and Māori areas of interest;
- Whilst QGIS was found to be a useful program for the development of a tool such as this, it has limitations for the dissemination of the information as individuals need the relevant software to view/access it;

- The project team is investigating the possibility of uploading the map to a shared portal such as Koordinates, a data publishing platform that allows for clients or users to access a shared dataset; and
- The project partners see further value in developing the map to a form that would be more widely/easily accessible and incorporating further information.

REGIONAL BIOSOLIDS STRATEGY
LOWER NORTH ISLAND

Report 8: Exploring the challenges facing councils and iwi when working around biosolids issues; Assessment of Cultural Frameworks

Background

Ten lower North Island councils are working in partnership to develop a biosolids strategy that includes a potential collective approach for sludge management and beneficial end-use. The strategy is led and coordinated by a collaborative management team of Lowe Environmental Impact (LEI), Massey University and The Institute of Environmental Science and Research Ltd (ESR).

Initial stages of the project have carried out stock-take and gaps analysis to highlight the scale of the sludge problem in the region as well as areas where councils could potentially work together to manage their sludge. Initial 'straw-men' strategies were developed and progressed through discussion to the development of draft strategies for the collective management of biosolids for the Lower North Island (Stage 5 Draft Strategy; Task 5b Development of a Draft Strategy).

New Zealand drivers for consultation and public engagement in environmental matters include the Local Government Act (2002), the resource Management Act (1991/2013) and obligations under the Treaty of Waitangi. As a Treaty partner, key stakeholder and environmental guardian, iwi and rūnanga have a very keen interest in being involved in water management and environmental issues. One means by which community interests are considered is through the use of cultural impact assessments (CIA), often carried out as a way of documenting Māori cultural values, interests and associations with an area or a resource, and the potential impacts of a proposed activity on these. A CIA is a planning tool that helps to facilitate Māori participation in the planning process. The CIA may contain a cultural framework which is a tool used to identify the effects of a proposed activity (such as biosolids re-use) on tangata whenua cultural associations with the environment.

There are several cultural health frameworks in New Zealand. These have been developed by academic researchers, scientists, Iwi and other individuals, both Māori and non-Māori to help communicate the needs, intentions and beliefs of Māori which must be considered during project planning and execution.

Scope

The purpose of this report is to review all available Cultural Impact Assessment Frameworks that could be used to evaluate impacts of biosolids re-use. This report acts as a resource for council and related groups to consult when investigating or determining an appropriate framework for application in this area. Incorporating the values important to Māori is critical to understanding who might be affected by a proposed action or change and how.

Key Findings

Eight frameworks have been included in this report. It is important to note that more may exist, however, the following have been selected for their appropriateness to the topic of biosolids management and have adequate and detailed information accessible for review.

The cultural health frameworks are based on atua (Māori beliefs and custom, and values); Tikanga (customary protocols and traditions) or mana whenua perspectives.
This report outlines the most commonly used frameworks which include:

1) Using mātauranga Māori to inform freshwater management – Tikanga based;
2) Mauri-Ometer Indigenous Maori Knowledge and Perspectives of Ecosystems – mana whenua and tikanga based;

3) Mauri Compass – mana whenua and tikanga based;
4) Nga Mahi: Kaupapa Māori Outcomes and Indicators Kete – mana whenua and tikanga based;
5) Cultural flows – mana whenua and tikanga based;
6) Treaty-Based Planning Framework - mana whenua and tikanga based; and
7) A Cultural Health Index for Streams and Waterways: a tool for nationwide use - mana whenua and tikanga based.

Monitoring provides Māori with tools to articulate perceptions of environmental change, environmental health, and Māori well-being. While the assessed frameworks are a way of capturing some of the values, practices and principles important to Māori, they should be used alongside consultation with tangata whenua, iwi and related parties.
Each marae, hapū and iwi across New Zealand may have different perceptions and values to the next, therefore consultation to understand what is important to each is paramount. The frameworks may act as a way to guide such articulation, but nonetheless engaging with tangata whenua is critical to undertake co-planning, goal setting and joint actions.

REGIONAL BIOSOLIDS STRATEGY
LOWER NORTH ISLAND

Project Year 3

Report 9: Biosolids Processing Trials; Biosolids composting trial final report

Background

The MfE Waste Minimisation funded project "Collective Biosolids Strategy – Lower North Island" is taking a collaborative approach to sludge management with the aim to develop a regional biosolids strategy focussing on beneficial end-use. The project has tested the feasibility of a selection of potential end-use options through on ground application (research trials) and desktop feasibility/cost analysis. One of these trials has investigated the practical and/or technical viability of sludge composting by way of a large-scale field trial.

Aims

The purpose of this report is to outline the methods, processes and results of a large-scale sludge composting trial designed to determine if a high-quality compost product could be produced from varying mixtures of contrasting sludge.

Trial

This report outlines the set up and results of this trial summarised as follows:

- A large-scale field trial was established at the PNCC Awapuni composting facility throughout early 2019;
- The trial consisted of 12 windrows of sludges mixed with green waste at a ratio of 1:4 (237 m^3 of material forming 12 m long windrows);
- Three contrasting sludge types were chosen and blended either individually or in combination:
    - Palmerston North WWTP digester sludge;
    - Palmerston North WWTP alum sludge; and
    - Bunnythorpe oxidation pond sludge
- The compost windrows were tested at establishment and monthly for an array of parameters to assess the microbial and chemical contaminants present and the effectivity of the composting process; and
- This trial incorporated a cultural monitoring plan (Rangitāne o Manawatū Cultural Values Assessments and Cultural Monitoring) alongside the Western science that was facilitated by a representative from Tanenuiarangi Manawatū Incorporated (TMI, Siobhan Lynch-Karaitiana), the outcomes of which are presented in Appendix A.

Results

- Results indicate that both chemical (trace metal) and microbial (*E. coli*) contaminants are reduced to below guideline levels (Grade Ab, NZWWA, 2003) within six months of establishment through dilution and composting processes;
- Composting reduced the moisture content of the initial product which can make transport of the material easier due to improved handling;
- Results from analysis of *E. coli*, ammonium-N and DHA indicated that the sludge compost was sufficiently stabilised after six months;
- Based on analysis of phosphorus, organic-N ammonium-N and nitrate-N it is evident that all 12 sludge composts would provide adequate short-term and long-term nutrition for use as a soil conditioner or plant amendment;
- Elevated trace metals (Zn) in some final composts was a result of reduction in total volume of the product through natural processes, and indicates initial dilution ratios need to take this into account when dealing with metal containing sludges;

    - These levels were such that the compost could be bought below 'grade Aa' limits if all 12 were mixed together; and
- Significant insight into local iwi views and the cultural effects of biosolids composting at Awapuni Resource Recovery Centre was gained through the production of a cultural impact assessment (CIA) by Te Ao Turoa Environmental Centre (TATEC) researchers that indicated:
    - Beneficial use of biosolids is viewed positively;
    - Landfilling of biosolids was strongly rejected;
    - It is important that biosolids are not applied around waterways and wahi tapu;
    - The most supported options for use were non-food producing locations such as forestry or biodiversity regeneration/restoration; and
    - Whilst composting was viewed positively, it did not significantly alter the participants views on acceptable use options.

Conclusions

This trial aimed to investigate the practical and/or technical viability of sludge composting by way of a large-scale field trial. The composting process stabilised microbial contaminants and effectively diluted chemical contaminants to produce a product that met guidelines for composts in NZ (NZS4454, 2005) and 'Grade Aa' and/or 'Grade Ab' biosolids (NZWWA, 2003).

This was evident in all three contrasting sludge products used for this trial suggesting that, excluding high levels of chemical contaminants, the sludge used in the initial feedstock had little effect on the quality of the final product. Based on the results of this trial it is suggested that commercial composting, under optimal conditions and following recommended procedures, is a viable means of producing a material suitable for a wide range of end uses which might otherwise not be available to un-composted WWTP sludge.

Report 10: Biosolids Processing Trials; Biosolids field trial final report

Background

The MfE Waste Minimisation funded project "Collective Biosolids Strategy – Lower North Island" is taking a collaborative approach to the issue of sludge management. Together with the Project Team ((Lowe Environmental Impact (LEI), Massey University and Institute of Environmental Science and Research Ltd (ESR)) a collective of ten New Zealand territorial authorities are working in partnership to develop a regional biosolids strategy with a focus on beneficial end-use.

This report presents the setup and results of a field trial to explore the use of biosolids as a soil conditioner for application to crops not intended for direct human consumption. Biosolids are rich in carbon, nitrogen, phosphorous and essential micronutrients (e.g. zinc) and therefore have the potential to improve crop/pasture performance.

Aims

This trial aims to explore the potential use of biosolids as a soil conditioner by assessing the growth response of three grazing crops; Oats, Italian Ryegrass and existing pasture grown in biosolids amended soil.

Trial

The trial was located at Massey University's Sheep, Beef and Deer Research Unit, where thirty-six plots of 1 m² each were established containing three forage groups grown in four biosolids treatments:

- Control (C) – no treatment applied;
- Fresh digested sludge (B);
- Pond sludge (P); and
- Diammonium phosphate fertiliser (F).

The trial was regularly maintained and monitored and ran for 5 months. At the end of the experiment, soil and herbage was analysed for a variety of chemical and biochemical parameters and biomass production was quantified.

Results

The results indicated that the application of Biosolids or Pond Sludge increased the growth of pasture and ryegrass in the long-term compared with fertiliser. This is attributed to the increased supply of slow release nitrogen and phosphorous in biosolids products.

Although trace elements were present in both crops (Zn and Mo), and soils (Cr, Zn, and Pb), the resulting concentrations were within the normal range, and do not present a risk for cattle, sheep or ecological parameters of the soil.

The numbers of *E. coli* in the soil after the 6-month period of the experiment were below 30 MPN/g DW, with the only exception being samples from Biosolids treated pasture soil where median *E. coli* was 66 MPN/g DW. This is within the limit (< 100 MPN/g) considered to be safe for public.

REGIONAL BIOSOLIDS STRATEGY
LOWER NORTH ISLAND

Report 11: Memo: Consenting Framework for Discharges of Biosolids to Land use

Overview

This memo sets out a process and opportunity for applying for resource consent (Blue Print) to allow biosolids and sludges to be discharged to land in a way that can reduce the complications and high level of detail needed for individual consent applications.

REGIONAL BIOSOLIDS STRATEGY
LOWER NORTH ISLAND

Report 12: Memo: Guidance on determining nitrogen mineralisation rates

Overview

This memo aims to collate current literature on the mineralisation of Nitrogen (N) in biosolids to provide guidance on N mineralisation rates when applied to land. A broad range of resources are already available on the topic that effectively outline relevant research and existing knowledge. This memo summarises these resources highlighting primary influencing factors and providing a full reference list with summaries for further information (Appendix A).

REGIONAL BIOSOLIDS STRATEGY
LOWER NORTH ISLAND

Report 13: Potential End-Use Options for the Lower North Island

Background

A three-year project involving 10 district and regional councils from the lower North Island and supported by the Ministry for the Environment, called the Regional Biosolids Strategy (RBS), has aimed to identify pathways for councils to beneficially use sludge and biosolids. Uptake of the RBS is reliant on feasible end use options being available as alternatives to current biosolids management practices. Council representatives made clear that this information was critical to inform the final biosolids strategy. Whilst there have been several end-use options explored through the strategy development, Council Partners wanted to examine the full list of potential end-use options available specific to the region.

Scope

This report presents the results of an investigation into opportunities for beneficial use that are available in the lower North Island.

Key Findings

Key to a successful biosolids use programme are:

- The ability to utilise the total biosolids production from the partner councils, assessed as being approximately 94,400 tonnes of sludge (at 20% solids);
- Suitability for both large, one-off sludge volumes (e.g. pond desludging) and for continuous low volumes of biosolids (e.g. from waste activated processes);
- Compatibility with community and iwi expectations and regulatory requirements; and
- Affordability.

The main ways to dispose of biosolids are:

- Amass and bury (landfill and monofill);
- Apply to land for beneficial use or rehabilitation; and
- Thermally degrade.

Landfill and monofill are presently the most commonly used disposal methods in the study region. These methods are not considered to be sustainable long-term and may not be available in the future. There may be scope to monofill sludge where there is the potential to mine the material for later use. Later use would fall into the category of re-use. It is an aim of the Regional Biosolids Strategy to facilitate the diversion of sludge and biosolids away from landfill. Options considered in this report include landfill as the base option.

Thermal degradation, which may include energy recovery or energy generation, is widely practiced overseas. Typically, these facilities serve large municipalities, greater than the combined population equivalent of the lower North Island. Preliminary investigations into these facilities indicates that they become unaffordable when scaled down. Regulatory approval is challenging due to the potential for air quality impacts. Thermal degradation of biosolids is not considered further in this report.

End use options available to partner councils are dependent on:

- The regulatory environment;
- The characteristics of the material for discharge;
- The availability of target land uses in transportable distance;
- The costs incurred in beneficial use operations including:
    - Processing
    - Transport

  - Land application; and
  - Consenting costs.
- Consideration of community and iwi concerns and aspirations.

Discharge to land, whether for beneficial use or for land rehabilitation, is considered to be well suited to the lower North Island due to the large amount of potentially available land area. For most councils, suitable land is within a reasonable transport distance and a wide range of land uses are present. End uses considered in this report include:

- Forestry;
- Dairy and drystock (sheep and beef) farms;
- Horticulturalists / orchardists / market gardeners;
- Municipal landscaping;
- Land rehabilitation;
- Road corridors;
- Landfill capping; and
- Commercial enterprises (compost, potting media, etc).

To achieve safe application of sludge and biosolids, meaning low risk to public health and low risk of environmental impacts, the end use of the land must be considered. Table 1.1 shows suitable end uses for different types of biosolids.

Table 1.1: Impact of Sludge Processing on End-Use Options

Suitable for:	Raw sludge	Restricted use biosolids	Unrestricted use biosolids	Composted biosolids	Vermi-composted biosolids	Thermally dried biosolids
Forestry	✓	✓	✓	✓	✓	✓
Dairy and Drystock (sheep and beef) Farms	×	✓	✓	✓	✓	✓
Horticulturalists / Orchardists / Market Gardeners	×	×	✓	✓	✓	✓
Municipal Landscaping	×	✓	✓	✓	✓	✓
Land Rehabilitation	✓	✓	✓	✓	✓	✓
Road Corridors	✓	✓	✓	✓	✓	✓
Commercial enterprise	×	×	✓	✓	✓	✓

✓Suitable
×Not Suitable

Analysis given in Section 5 shows that it is possible to beneficially use all biosolids produced in the study area. Table 1.2 collates key considerations for a range of feasible options for the study area.

Table 1.2: End Use Option Summary

Option	Minimum processing level required	Total area in land use (ha)	Available area (ha)	Recommended Application Rate (kg N/ha)	Stability of End Use	Constraints on Use	% sludge and biosolids able to be used
Forestry	Sludge	1,230,000	123,000	200	High/ moderate	Moderate.	>100%
Agriculture	Aa to Bb Biosolids	1,680,000	168,000	200	Moderate	Moderate to high	>100%
Horticulture	Aa biosolids	25,000	500	200	Low	High	12%
Municipal landscaping	Ab biosolids	>6,000	~120	200-1,000	High/ moderate	Moderate	3-14%
Land rehab-ilitation	Sludge	350	7	1,000	Low/ moderate	Minor	1%
Road corridors	Sludge or Ab biosolids	958+	106+	1,000	Moderate	Minor	12%
Landfill capping	Bb biosolids	Variable	~4	1,000	Low/ moderate	Minor	0.50%
Commercial enterprise	Composted	NA	NA	200	Moderate	Moderate	Potentially 100%

Section 6 highlights that qualitative costs do not limit the feasibility of any option.

End use options will need to be resilient to manage changes in the ability to discharge the biosolids. This can be achieved by operating multiple end use options which enables biosolids streams to be diverted between end uses.

It is recommended that multiple options are pursued, including site specific evaluations. A staged approach to biosolids beneficial use could be taken to build resilience and avoid system redundancy. The staged approach would result in the initial discharge of biosolids with a lower degree of processing to less sensitive land areas i.e. forestry, low producing farmland and road corridors. This provides capacity to beneficially use all the biosolids produced in the study area in the interim while cost/benefits are refined, and markets are developed with high value users such as for landscaping or within the horticulture industry.

Report 14: Memo: A cost analysis summary for end-use options in the Lower North Island

MEMORANDUM **Job 10416 Y3M1:3A**

To: Biosolids Partner Councils

From: Hamish Lowe, LEI

Date: 29 January 2020

Subject: A cost analysis summary for end-use options in the Lower North Island.

SUMMARY

This memorandum provides a review of biosolids costs from a range of processes and locations around New Zealand. Costs have been adjusted to net present value (NPV, as at November 2019). Data from the review is presented in this memorandum for use to develop high level costings for planning of biosolids end use options. Steps to prepare costs for biosolids end use options are as follows:

1. Determine the amount of material to be processed
2. Assign costs from the tables provided below for each stage as follows

Processing	Stabilisation	Transport	End Use or Disposal
• Pond dredging • Pond sludge removal and dewatering • Continuous dewatering process	• Geobag • Bunker/pit • Composting • Vermi-composting • Thermal drying	• Raw sludge • Dewatered sludge or biosolids • Compost or vermi-compost • Dried biosolids	• Landfill • Slurry spreading • Solids spreading • Dry solids spreading

3. Sum and assess the NPV of the option for comparison and decision making

REGIONAL BIOSOLIDS STRATEGY
LOWER NORTH ISLAND

APPENDIX B

Sludge Quality by Region

REGIONAL BIOSOLIDS STRATEGY
LOWER NORTH ISLAND

Sludge Quality by Region

Location	Sludge/source	Grading	Notes
Foxton	Oxidation pond 1 - Facultative	**Exceeds Grade Bb**	- ↑ Zn, Cd, Cu. - ↑ *E. coli* - ↑ Sufficient plant available N and organic matter.
Foxton	Oxidation pond 2 - maturation	**Grade Ab**	- ↑ Zn, Cd, Cu. - ↑ Sufficient plant available N and organic matter.
Foxton	Oxidation pond 3 - maturation	**Grade Ab**	- ↑ Zn - ↑ Sufficient plant available N and organic matter.
Tokomaru	Geobag pond sludge	**Grade Ab**	- ↑ Cu - Sufficient N but low organic matter and high levels of silt/sand.
Shannon	Geobag pond sludge	**Grade Ab**	- ↑ Cu, Zn - Sufficient N but low organic matter and high levels of silt/sand.
Marton	Oxidation pond 1 – Facultative	**Exceeds Grade Ab**	- ↑ Zn, As, Cd, Cu, Hg - ↑ Sufficient plant available N and organic matter.
Marton	Oxidation pond 2 – maturation	**Exceeds Grade Ab**	- ↑ As, Zn, Cd, Cu - ↑ Sufficient plant available N and organic matter.
Masterton	Aged oxidation pond sludge	**Grade Ab**	- ↑ Cu, Zn - ↓ Nutrients offer little fertiliser value to soils.
Whanganui	Fresh digested sludge	**Exceeds Grade Ab**	- ↑ Cr, Zn, Cu - ↑ Sufficient plant available N and organic matter.
Auckland	Fresh WWTP sludge	**Grade Bb**	- ↑ Zn, Cu. - ↑ *E. coli.* - ↑ Sufficient plant available N and organic matter.
Palmerston North	Composted biosolids	**Grade Aa**	- ↑ Sufficient plant available N and organic matter. - Predominant form or N is Nitrate
Palmerston North	Fresh digested sludge	**Grade Bb**	- ↑ Zn, Cu. - ↑ *E. coli.* - ↑ Sufficient plant available N and organic matter.
Palmerston North	Bunnythorpe – aged oxidation pond	**Grade Bb**	- ↑ Zn, Cu, Cd. - ↑ *E. coli.* - ↑ Sufficient plant available N and organic matter.

Key

No restrictions to use

Land application would require restrictions/consent

Not suitable for land application in present state.

REGIONAL BIOSOLIDS STRATEGY
LOWER NORTH ISLAND

APPENDIX C

Project in Review

Project in Review

Overview

The project 'Regional Biosolids Strategy – Lower North Island' has provided Councils in the study region collective opportunities that individually they may not have been able to achieve. Whilst to some extent the project has failed to achieve a quantifiable reduction in sewage treatment plant waste being sent to landfill, it has highlighted the complex nature of the sludge management issue for Councils. There are numerous factors that need to be taken into account and these factors vary both between regions and individual communities. Major constraints that present as barriers to re-use are:

- Consenting, both costs and the laborious nature of the application process are prohibitive;
- Lack of infrastructure and funds associated with beneficial use alternatives (particularly for small communities);
- A lack of identified end-use options that are feasible and practical, especially coupled with resource consenting limitations;
- A lack of knowledge; inadequate records of both quantity and quality of sludge that is held at WWTP and in oxidation ponds; and
- Multiple and sometimes conflicting interests of hapū, Iwi and councils pertaining to wastewater treatment, WWTP locations, water quality and land-use issues which stall and sometimes prevent re-use.

Perhaps most significantly this project determined that Councils have a desire to beneficially re-use their biosolids. We have shown that this can be achieved through collective management and that by maintaining connections into the future many issues currently observed for smaller WWTP can be avoided, or at least solutions identified. Whilst a reduction in sewage waste to landfill cannot be quantified currently, it is anticipated that through the project discussions and outputs there has been a shift in thinking for the Councils involved and that this reduction will be evident over time. Councils have been provided with alternatives to the status quo, and through collective discussion and assessment the potential pathways to achieve these alternatives have been mapped out.

Two key factors to success will be:

- Support from Regional Councils with streamlining consenting would be a significant benefit to achieving beneficial use; and
- Fostering positive relationships between Iwi and Council, and maintaining an understanding around wider issues occurring within the region that may have an influence on local Iwi's current perspectives.

Council Partner Engagement

It was evident through the development of the strategy that engaging partner Councils to take part in projects such as this is not straightforward. Whilst most have a desire to work towards beneficial re-use as mentioned above, a lack of both time and resources mean that the issues are often shelved in favour of maintaining current practices. Generally, regular communication between Councils in the area of sludge management is minimal. The project team identified early on that the best means of maintaining engagement was to establish a Governance Group consisting of representatives from all the Councils involved. Face to face contact was favoured

over email communication, giving every member the opportunity to share their opinions. On occasion when documents were communicated by email feedback was minimal, suggesting that communication by this means was easily overlooked. Whilst presenting the same content at group meetings encouraged discussion and useful feedback.

Information Dissemination

Whilst this project produced useful information on a range of issues around sludge management it was noted by the project partners that the reports were often not disseminated to relevant parties within the Council. This may be due to a lack of communication between council departments. It is also possible that the format of reports, being long and detailed, were not easily digested and hence overlooked by staff who are already stretched for time. It was determined that a better way to present the information was through short and interesting 'fact sheets' that would better catch the reader's attention. It is hoped that these fact sheets provide relevant information in an easily digestible format, with the opportunity for sourcing the full reports if the reader requires it.

Final Observation

As a final observation, facilitating a group of council officers on a collaborative project over a period of time has challenges. 'Every-one' is busy; and making time available for coordination and facilitation of information and meeting attendance has been a challenge. This is completely understandable when in small councils the most relevant people to engage with have a number of competing requirements within the wider functions of that council. Furthermore, staff changes (and changes to role descriptions) have occurred with the leaving and incoming staff not exchanging the level of detail that had been developed. A variant on this are situations where there are multiple staff within a council working on related tasks, but the strategy work remaining with say, planning staff and not being provided to operational/project staff. This transferability and coordination of information within a Council could be easily remedied by the clear inclusion of sludge management in a dedicated role, with potentially the same description shared amongst Councils to provide for consistency.


Ministry for the
Environment
Manatū Mō Te Taiao


L W E
Environmental
I m p a c t

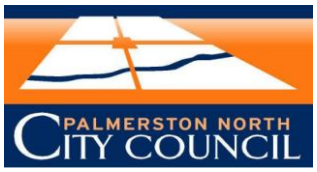

E/S/R
Science for Communities


Kāpiti Coast
DISTRICT COUNCIL
Me Huri Whakamuri, Ka Titiro Whakamua


MANAWATU
DISTRICT COUNCIL


WHANGANUI
DISTRICT COUNCIL
Te Kaunihera a Rohe o Whanganui


horizons
regional council


PALMERSTON NORTH
CITY COUNCIL


TARARUA
DISTRICT COUNCIL


RUAPEHU
DISTRICT COUNCIL


MASTERTON
DISTRICT COUNCIL
TE KAUNIHERA Ā-ROHE O WHAKAORIORI


RANGITĪKEI
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Horowhenua
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