It's All Good – Beneficial Biosolids Use in Practice

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ABSTRACT

Biosolids reuse in New Zealand has traditionally been driven by a "disposal" mind-set. The many beneficial aspects of biosolids use have largely been ignored or not considered. This paper outlines the benefits of using biosolids, which include (but are not limited to) improved soil water holding capacity, increased ability of the soil to bind and retain nutrients and increased biological activity.

Consenting biosolids application to land is often perceived as being a difficult process to achieve a successful outcome. A case study is presented, concerning the consenting process for biosolids application to a proposed effluent land treatment area (LTA), as part of a wastewater treatment plant upgrading process at Lake Hawea, near Wanaka. The LTA will be operated as a "cut and carry" system (to enhance nutrient removal), so improving soil quality prior to establishing the selected crop was considered essential.

The soil in the land treatment area has low soil fertility, poor water retaining capacity and low carbon content and thus low dry matter production; so it was proposed to apply biosolids from the decommissioned Wanaka wastewater treatment ponds to the LTA. The application of biosolids will act as a soil conditioner by adding organic matter and nutrients, improving water holding capacity and consequently increasing dry matter production.

The case study demonstrates that with active engagement and discussions with regulatory authorities, a successful consenting process (with consents granted on a non-notified basis) is possible.

KEY WORDS

Biosolids, beneficial use, consenting

INTRODUCTION

Biosolids are a by-product of wastewater treatment (from unit processes or maintenance/decommissioning activities). They are generally perceived as requiring "disposal", without much consideration of the possible benefits they can provide. Biosolids beneficial potential has not been been fully explored, leaving a valuable soil conditioning resource untapped.

The application of biosolids to land is an activity which generally requires resource consent to allow it to occur. There seems to be a perception that the consenting process can be difficult, expensive and drawn-out.

This paper presents a case study in which biosolids were used to improve soil conditions on a proposed wastewater treatment site, and how the consenting process was uncomplicated and straightforward.

BENEFITS OF BIOSOLIDS REUSE

Biosolids application to land has the potential to achieve the least-cost, highest benefit beneficial end use. A well planned application can be managed to ensure that the drawbacks are virtually non-existent. Some of the key traits of biosolids that benefit the soil are:

- **Nutrients:** Biosolids typically have a range of macro- and micronutrients, in relative proportions that are ideal for plant growth.
- **Organic matter:** The majority of biosolids solid matter is organic, which is beneficial in conditioning soil i.e. improving the texture, pore volume and size, and density of the soil. In addition, the organic compounds present in the biosolids provide buffering of soils which enables lower leaching or run-off losses, and improved nutrient storage and release of fertiliser applied to the soil.
- **Water Holding Capacity:** Biosolids added to excessively drained soils such as river sands, pumice lands and dune areas tend to allow the soils to retain more moisture, significantly improving vegetation growth and stabilisation that the vegetation growth can provide.
- **Carbon storage:** Biosolids are only beginning to be evaluated for their ability to trap and retain greenhouse gases, or to be used in carbon sequestration. Increasingly the ability to sequester carbon has the potential to off-set the effects of other processes for the biosolids producer or the land manger.
- **Energy:** As a “low-tech” process, land application has a relatively low energy requirement.

From a cropping perspective the improved soil condition results in improved crop yield and greater resilience of the land to machine and animal traffic.

CONSENTING – CASE STUDY

Site Details

Queenstown Lakes District Council (QLDC) operates a small WWTP serving the Lake Hawea township, near Wanaka in the southern South Island. **Figure 1** shows the location of Lake Hawea township.

QLDC holds a discharge consent from the Otago Regional Council (ORC) to discharge treated wastewater from the Lake Hawea wastewater treatment plant (WWTP) to land, via a single oxidation pond (artificial aeration) and an infiltration trench adjacent to the Hawea River.

QLDC is upgrading the current system, including installing a land treatment area (LTA) that will operate in tandem with the ponds and current disposal system. The LTA has been sown with lucerne, and is to be operated as a "cut and carry" system to enhance nutrient removal. QLDC were granted a resource consent (RM10.308.02) by ORC in 2010 for the upgraded system.

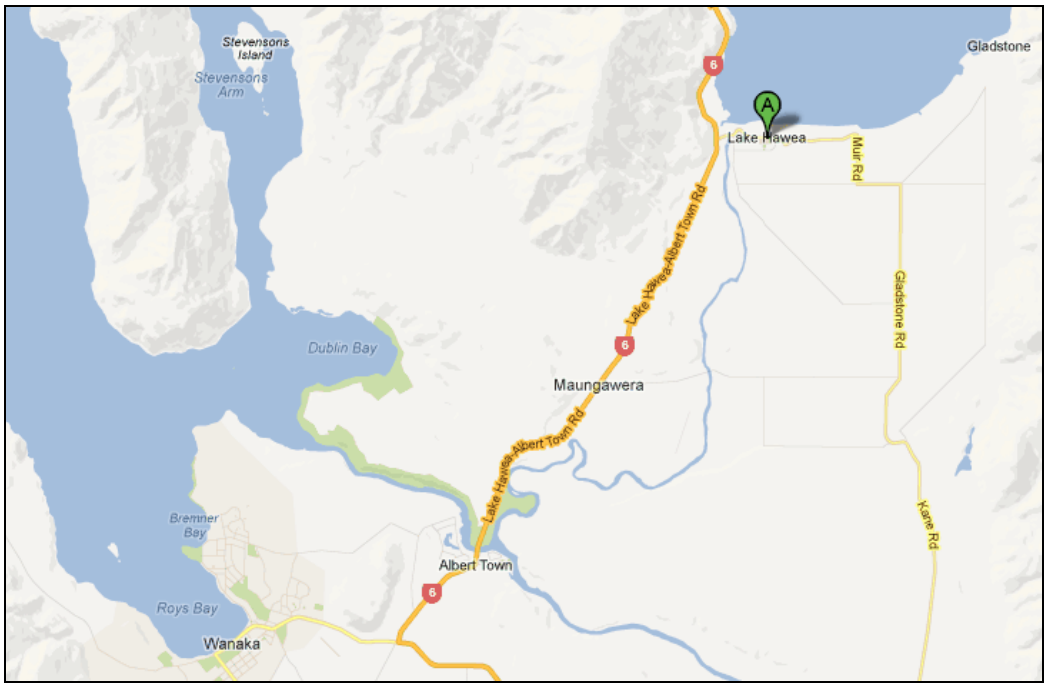

Fig. 1. Lake Hawea Township - Location Plan

Biosolids Application Details

The soil in the LTA had low soil fertility, poor water retaining capacity and low carbon content (and thus low dry matter production), so it was proposed to apply biosolids from the decommissioned Wanaka WWTP, as a 'one-off' application, to improve soil fertility and add soil conditioning material.

The biosolids were sourced from Pond 2 of the de-commissioned Wanaka WWTP ponds. After the ponds were drained in 2009, sludge from the pond inverts was excavated and formed into windrows. In early 2010, the biosolids were moved into stockpiles and covered with plastic sheeting. The biosolids were stored for two years, so met the VAR requirements and the recommended control relating to storage (minimum of a year). There had only been E.coli analysis on the samples, so the Grade "A" product pathogen standard was not met. Given the storage and proposed application method, the biosolids achieved a "B" grade. Tables 1 and 2 demonstrate that the biosolids complies with the "b" grading (in terms of chemical analytes), given the elevated chromium level present.

Table 1. Biosolid Composition Data – Trace Elements

Trace Elements	Measured Value[1]	a Guideline Value[2]	b Guideline Value[2]
As	15.54	20	30
Cd	1.03	3	10
Cr	**815**	**600**	**1,500**
Cu	180.8	300	1,250
Hg	1	2	7.5
Ni	20.16	60	135
Pb	48.72	300	300
Zn	529.2	600	1,500

Table 2. Biosolid Composition Data – Persistent Organics

Trace Elements	Measured Value[1]	a Guideline Value[2]	b Guideline Value[2]
DDT/DDD/DDE	0.0205	0.5	0.5
Aldrin	<0.001	0.02	0.2
Dieldrin	0.008	0.05	0.2
Chlordane	<0.001	0.02	0.2
Heptachlor	<0.001		
Heptachlor epoxide	<0.001	0.02	0.2
Hexachlorobenzene (HCB)	<0.001	0.02	0.2
Hexachlorocyclobenzene (Lindane)	<0.001	0.02	0.2
Benzene hexachloride (BHC)	<0.001	0.02	0.2
Total PCBs	<0.034	0.2	0.2
Total dioxin TEQ	NA	0.00003	0.00005

1 – QLDC testing data for period April 2010 – January 2011.
2 – NZWWA (2003): *Guidelines for the Safe Application of Biosolids to Land in New Zealand*, prior to 31 December 2012.

The biosolids were considered to have an overall grading of "**Bb**".

The biosolids had an average solids content of 70%. The proposed nitrogen loading rate was 600 kg N/ha over the LTA area (equates to an average application of 200 kg N/ha/year for the initial three years of N release). A total amount of 184.8 tonnes of biosolids was to be applied to the LT area (2.33 ha).

Biosolids would be trucked to the site on the day that it is to be applied to the LTA. The biosolids would be applied through a muck spreader or similar, with speed set based on the required application depth. It would be applied prior to a predicted dry spell of at least three (3) days. The material was to be disked or ploughed in the same day, to a depth of around 200 mm (as recommended in New Zealand guidelines).

As the biosolids had been stabilized, the various organic compounds present within it would have degraded significantly, resulting in a low odour potential. As the application activities would be of short duration (typically one day), associated odour release would be of similar duration. There could be dust generated during application activities, particularly during incorporation activities. The handling and application activities were to be completed within a day, so dust effects would be of short duration. The day of application and incorporation could be selected to reduce the potential for dust effects.

Once the biosolids have been applied, the site was to be left fallow until late 2012, then sown with lucerne (cultivar selected to be suitable for climatic conditions at the site) and managed under a “cut n carry” regime.

Consenting Process

The consenting process began, as a result of discussions surrounding previous consenting work undertaken for another biosolids application project in the Otago region (which did not

proceed). ORC were keen to promote the sustainable use of resources, and considered that biosolids application to land would be a good example of this.

Issues relevant to the proposed application were discussed and resolved at a high level, between senior ORC staff and the applicant's advisors, prior the consent application being prepared. ORC staff were helpful, pragmatic and willing to engage with the applicant in order to find common ground.

The consent application was then prepared and submitted to ORC on 30 August 2012. Two consents were applied for:

- A discharge consent to discharge biosolids from the decommissioned Wanaka wastewater treatment ponds onto land; and
- A discharge consent for discharge of contaminants to air from the application of biosolids to land.

The consent application document content was comprehensive, containing all the information pertinent to the application. As a result, no formal further information requests were made by ORC in respect of the application.

Under the current ORC planning documents, there are no permitted activity rules for the discharge of Category Bb biosolids to land in the Regional Plan:Water (RPW) and so consent is required under discretionary activity Rule 12.6.2.1 of the RPW. Discharges to air from the storage, transfer, treatment and disposal of liquid-borne municipal waste is a permitted activity under Rule 16.3.7.1 of the Regional Plan: Air (RPA). However, the proposed activity does not meet all of the conditions of this rule as the discharge will occur within 150 m of a public amenity area, being the cycle/walk track. As such, the proposed discharge to air is a discretionary activity pursuant to Rule 16.3.7.3 of the RPA.

ORC considered the effects of the proposed activity were minor, so a provisional decision was made to process the application under non-notified consent procedures, subject to the written approval of potentially affected parties. ORC expected that any effects from the proposed discharges would be no more than minor at or beyond the site boundary. There were not considered to be any affected parties to this application and so the requirements of the decision not to publicly notify this application were met.

ORC granted the two consents on a non-notified basis, with conditions, on 17 September 2012.

LESSONS TO BE LEARNT

Given our experience with the consenting process for biosolids application onto the case study site, we believe the following valuable lessons can be learnt and applied:

- ***Biosolids are a positive resource***

  Biosolids should not be viewed as a negative item suitable only for disposal. They have many beneficial qualities, which can be harnessed for positive outcomes.

- ***Pre-application discussions are invaluable***

  Discussing the proposed consent application with the local authority as early as possible is invaluable, as any issues that require resolution can be identified early (which will allow them to be addressed).

- ***Supply as much information as possible upfront***

  The consent application should be as comprehensive as possible, which will allow the regulatory authority to fully understand the proposal. It will also minimise the issuing of further information requests, which can introduce time delays (which may prove critical).

- ***The consenting process is a two way street***

  Establishing a positive working relationship with the authority processing the consent is essential, and this works both ways in terms of willingness to engage, supply of information and discussions on moving the process forward.

REFERENCES

CPG New Zealand (2012): Queenstown Lakes District Council Resource Consent Application and Assessment of Environmental Effects Discharge of Biosolids to Land Domain Road, Lake Hawea. Application submitted to Otago Regional Council.

NZWWA (2003): Guidelines for the Safe Application of Biosolids to Land in New Zealand.