CENTRAL HAWKE'S BAY DISTRICT COUNCIL

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14th September 2015

Hawke's Bay Regional Council
Private Bag 6006
Napier 4142

Attention: Charlotte Drury

Dear Charlotte

Otane Wastewater Resource Consent Application
Request for Further Information - Your Ref: DP1502-07W and DP150208A

I write in response to your request for further information relating to our resource consent application for the Otane Wastewater Treatment Plant.

Question 1 : *Effect of discharge at times of no flow in Farm Drain*

Your first question asks for further information on the likely pathways for phosphorus discharged into the farm drain when the drain is not flowing (both under the current system and subsequent to the proposed upgrade of the treatment plant).

I respond: In section 7.1 of the consent application we have described the likely fate of phosphorus in the farm drain at times when there is no natural flow in the drain. We have predicted that dissolved reactive phosphorus (DRP) either adsorbs onto soil particles in the farm drain channel or stays in solution and percolates into groundwater. Either or both of these pathways may occur.

If the phosphorus binds to soil particles then it will be available for use by terrestrial plants growing within or alongside the drain, or could be re-mobilised in the winter as the drain start re-flowing. If it remains in solution and percolates through the soil into the groundwater then some portion may adsorb to soil in the groundwater zone while the balance remains mobile and in solution within the groundwater.

At summer groundwater depth (2 – 2.5m below ground level) this phosphorus will be mostly inaccessible to the roots of crops (pasture grass and grain crops) but could be accessible to trees. It may also be captured by groundwater irrigation takes – in which case the phosphorus in the water will be returned to the surface, irrigated onto crops, and taken up and utilised by these plants as a nutrient.

There are no registered potable drinking water bores in the vicinity of the discharge point from the Otane treatment plant or in the vicinity of the farm drain. There is, therefore, no pathway for any phosphorus that may be in the groundwater to end up in local drinking water. Phosphorus is not in any case a health issue in drinking water, or more generally in groundwater – it is only a problem in surface

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water where it has the potential to enhance the growth of periphyton / algae (which can then in turn affect water quality). The same process does not occur underground.

The potential effects of the discharge on periphyton growth has been assessed as part of the application. The key potential effect relates to the potential export of phosphorus to the mainstem of the Tukituki River, rather than in the Papanui Stream itself. The application estimates that the Otane WWTP discharge currently contributes 2% of the Papanui Stream catchment load and 1% of the Tukituki catchment load (at Red Bridge). Importantly, these figures are based on the discharge load estimated at the end of pipe and therefore provide a conservative estimate of the Otane WWTP's potential contribution of phosphorus to the catchment overall – i.e. regardless of the transport pathway (surface or groundwater) from the WWTP to the river.

Following the proposed upgrade the discharge will contribute 0.1% the Papanui Stream catchment load and 0.04% of the Tukituki River catchment load. This equates to a no more than minor potential effect, again regardless of the transport pathway (surface or groundwater).

Phosphorus in the groundwater that is not intercepted, either by the roots of plants, or by crop irrigation bores, or by adsorption to soil particles, would be expected to follow the general flow of groundwater toward the sea, moving slowly, dispersing and further diluting along the way. Some residual traces of this DRP may re-surface down-catchment or be extracted with irrigation bore water further down the catchment and sprayed onto crops (and utilised by crops) in the course of this journey.

We are unable to comment on whether the elevated level of phosphorus recorded in groundwater at HBRC monitoring well 16256 (referred to in your letter) is in any way related to the Otane wastewater discharge. You will be aware that there is also intensive crop farming in the area around the monitoring well and that reasonable amounts of fertilizer containing phosphorus are likely to be put onto the ground in this locality.

We are also unsure that comparisons with phosphorus at monitoring well 16256 versus in groundwater in the lower Papanui catchment are necessarily meaningful, given that these other monitoring bores (shown in the second of the two maps attached to Dougall Gordon's memo) appear to be in areas where there is likely to be a more rapid through-flow of groundwater through river gravels. If so, any phosphorus getting into the groundwater in these areas will tend to be quickly diluted. Mr Gordon acknowledges the potential for this explanation in his memo where he refers to the differing residence times of the groundwater.

That said, it is possible that some of the phosphorus measured in groundwater at this bore *may* have originated from the Otane discharge, via ground soakage and percolation through groundwater, but with so little data from other bores in the wider vicinity we can only speculate as to whether the origin of the phosphorus is from wastewater, farming or a combination of both. Nor can we be sure that the elevated concentration of phosphorus, as recorded, actually means exceptionally high inputs of phosphorus or whether this is just a symptom of slower groundwater movement and therefore longer groundwater residence times.

In any case, whilst the phosphorus concentrations measured in the monitoring well may have been influenced by the Otane WWTP discharge in the past, the question should now be largely irrelevant with the new consent application, and proposed treatment plant upgrade. The plant upgrade will result in a

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near-complete (95%) removal of phosphorus from the treated discharge and therefore essentially remove any remaining potential for adverse effects relating to this nutrient.

Design of proposed treatment upgrade – general comment

Before commenting in detail on the questions raised about the treatment process proposed, I wish to clarify that what has been offered in the resource consent application is still only a conceptual design based on existing information about the wastewater that has to be treated. No detailed design has been undertaken, nor will be undertaken, at this stage. Final design is carried out only when the parameters of the consent have been finally established. This will be after the consent has been issued.

The possibility of incorporating new technology that has not been envisaged in the final design must also be allowed for. We would not wish to exclude a better solution at final design stage simply because a specific design has been outlined in the application. There is, therefore, always the possibility that other better technology will be substituted in the detailed design stage.

Question 2 – Disc filter

You have asked for additional information on the type of disc filter proposed; the predicted performance of these filters; and whether a disc filter trial will be undertaken on effluent from the Waipawa and Waipukurau plants that are being upgraded with lamella clarifiers.

As regards the type of disc filter: At this stage the 'most likely' type of disc filter will be the cloth disc filter system shown in the accompanying brochure. This is a widely-used system, employed in conjunction with chemical dosing for phosphorus removal. The same system can be found working elsewhere in New Zealand at, for example, the Thames-Coromandel District Council's three wastewater treatment plants (WWTP) and at the Beachlands Maraetai WWTP in Manukau

The cloth disc filter is a physical barrier which prevents solids larger than the nominal pore size from passing through. A typical nominal pore size is 10µm. Studies and pilot trials on secondary effluent with TSS values of between 3.9 and 30mg/L show that cloth disc filters will generally produce finished effluent total suspended solids (TSS) concentrations of less than 1mg/L 92% of the time with, overall, approximately 97% TSS removal. Cardno, in the engineering assessment for the Otane wastewater plant (Appendix B to the consent application) conservatively assumed 90% removal – reducing the TSS load, through the filter stage, from approximately 33mg/L down to 3 mg/litre.

To illustrate, Cardno have provided the following diagram from *Metcalf & Eddy – Wastewater Engineering and Reuse* (p.1103). The diagram plots performance data for a cloth media disc filter system for secondary effluent with probability distributions for TSS. The data shows a reduction down to no more than 1mg/L TSS at least 90% of the time.

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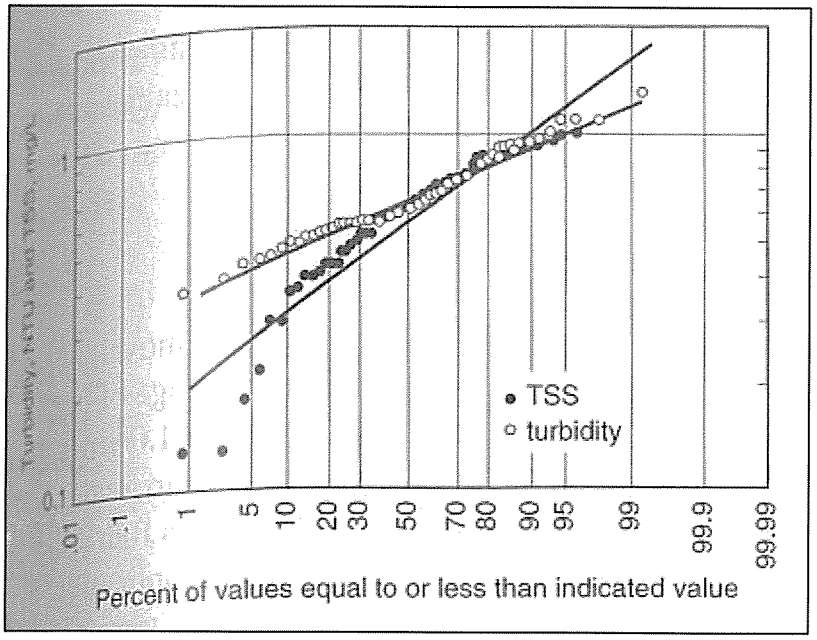

I stress again that the final choice of design of disc filter for the upgraded treatment plant will not be made until the final design phase. The information above is presented only to confirm that the finished effluent quality that has been promised in the resource consent application can be delivered with known and readily available technology (namely, cloth disc filters). This does not, however, preclude the possibility that some other better and totally different technology will be found and used in the final design phase. Additionally CHBDC has included a total sum of $730,990 in its Long Term Plan for the installation of the new treatment plant, compared to the estimate from Cardno of $428,000. This gives CHBDC the ability to ensure that the best treatment system at the time of detailed design is able to be installed.

As regards trialing of disc filters at the Waipawa / Waipukurau wastewater treatment plants, we are not expecting to do this. Any such trials will be carried out on the Otane wastewater, not on wastewater elsewhere. It is our experience that the wastewater at each of the three main treatment plants (Otane, Waipawa and Waipukurau) has slightly different characteristics and that what tends to work well at one site does not always work as well at another, or needs to be modified in some way between the different sites.

Question 3 – *sludge*

Beca have commented that they believe the modelled clarifier sludge outlet solids concentration of 2% may be too high (versus their experience of 0.2 – 1%) and that this may have implications for de-watering performance of the geotextile bags.

We have asked Cardno for comment. They advise that sludge handling / dewatering processes are designed on either a hydraulic or solids loading basis and that in most cases the solids (rather than hydraulic) loading basis is the size-determining factor. Whether the sludge is 2% or 1% dried solids concentration is therefore not a major issue – especially with a small treatment plant, as at Otane,

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where overall volumes are already relatively low. All that changes is the amount of filtrate returned to the head of the WWTP. That does not materially affect the cost or design of the upgrade.

Question 4 – *phosphorus and floating wetlands*

Beca have commented that, in their experience, the removal of phosphorus by floating wetlands can be variable and ask if this has been considered in the performance of the secondary treatment process.

We respond that the proposed upgraded wastewater treatment system puts no reliance at all on phosphorus removal through the floating wetland. Consistent and reliable phosphorus removal will be achieved solely by a mechanical / chemical filtration process, as proposed. The effect of the artificial wetlands on phosphorus removal (if any) can be disregarded.

Question 5 – flocculation tank

You ask for confirmation that there is an allowance for polymer dosing or a flocculation tank with the lamella clarifier.

Yes, we confirm that there will be a flocculation tank, or equivalent.

Question 6 – *pond liner*

You ask about the condition of the pond liner and the possibility (and effect of) pond leakage.

We advise that the pond has a clay liner and such liners typically work very well in our conditions. In particular their self-sealing abilities are essential in a district prone to earthquakes. There has never been any evidence of leakage from the pond. This includes any sign of unexplained ground seepage into adjacent farm drains. If significant losses were occurring through the bed of the pond we would expect to see, but have never seen, an emergence of effluent through the ground along the walls of one or other of these drains.

I trust this answers all of your questions. If you require any further detail, please do not hesitate to get in touch.

Yours faithfully,

Steve Thrush
Technical Services Manager

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Flexible Microscreen Filter

Hydrotech® Discfilter

VEOLIA WATER

Solutions & Technologies

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benchmark IN THE ENVIRONMENT ISO 14001 | benchmark IN SAFETY AS 4801 | benchmark IN QUALITY ISO 9001

Hydrotech Discfilter®

The world's leading microscreen filter is the ideal filtration system for fine solids removal and product recovery thanks to its superior design providing reliability, ease of use, small footprint and easy maintenance.

The Hydrotech® Discfilter is a **tertiary treatment process** - utilising microscreens - capable of producing effluent with both **low turbidity and low total suspended solids**. Discfilters are utilised in **wastewater treatments plants** primarily for **effluent polishing.**

By employing woven cloth filter elements installed on multiple discs, the Hydrotech® Discfilter supplies a **large filter area** within a **small footprint**. Its sturdy and compact design makes the Discfilter system a great choice for:

> **Effluent polishing of wastewater**
> **Water reclamation and reuse**
> **Product recovery** in industrial applications
> **Process water filtration**
> Where a filter with **small footprint** is required
> When a **low cost alternative** to sand filtration is required

Hydrotech® Discfilter: 75% smaller footprint than a traditional sand filter

Flexibility

> *For corrosive environments, components can be made of titanium or special alloys*

Key Characteristics

> **Sturdy and compact design** (commonly made of either 304 or 316 stainless steel)
> All units supplied with **covers**
> **Cost-effective technology** compared to conventional sand filtration
> **Small footprint**, 75% smaller than a traditional sand filter
> **Simple design** minimising mechanical equipment and other ancillary parts
> **Automatic backwash**
> **Easy to operate and to maintain**
> **Operational flexibility**
> Increased filtration levels or capacity by adding or replacing discs
> Low operation costs
> **Easy access** (components requiring periodic maintenance are easily accessible from outside the filter)
> **Strong 10-year operating experience** with more **than 4,000 Hydrotech® installations worldwide**
> **Capacity**: 10-4,000 kL/hour
> **Wide range of models**: diameters 1.7, 2.1, 2.2 and 3.1 m with up to 20 discs per filter
> **Filter opening**: 10-1,000 µm
> **Large filter area**: up to 112 m^2 filter area

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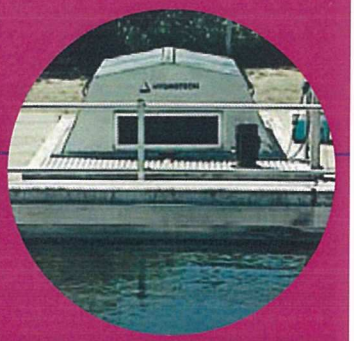
Wastewater Applications



> **Tertiary Filtration**: robust, low cost alternative to sand filtration
> **Water reuse** (pre-treatment)
> **Algae removal**

Discfilters provide a flexible means of tertiary filtration, which can be used in many wastewater treatment and water reuse applications.

Industrial Process Water Applications

> **Fine filtration** of intake water from surface water sources for industrial water supply systems.
> **Fine filtration** of intake water for aquaculture.
> **Solids removal** in recirculated aquaculture systems.
> **Spray water filtering** and pulp water recycling in the Pulp & Paper industry
> **Recycling water** in food processes
> **Polishing of effluent** from wastewater treatment works in food processing industries
> **Pre-treatment** for microfiltration / reverse osmosis systems for water recovery in many industrial applications

Technology Combination: Actidisk®

To achieve clarification and filtration of high suspended solids water, or phosphorous removal, the Actiflo® process followed by Discfilters is recommended. This new compact and efficient process is called Actidisk™.

Example: Tertiary Wastewater Treatment Plant in Barcelona, Spain, treating the municipal wastewater for 2 million people and using the treated effluent for irrigation of land and golf courses and supply environmental flows (capacity: over 300 megalitres a day).

Actiflo® Clarification + Hydrotech® Discfilters

= Actidisk™

Pilot Unit & Filtration Test Kit

To demonstrate the effectiveness of the Hydrotech® discfilter process, Veolia Water Solutions & Technologies can provide the service of a Hydrotech® discfilter **mobile pilot unit**. This standalone unit can be easily delivered by road to site and be operational within days.

A Hydrotech® **Filtration Test Kit** is also available to quickly ascertain whether discfilters are suitable for your application.

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Hastings Point Sewage Treatment Plant for Tweed Shire Council – NSW

> Design, supply and commissioning of an **Hydrotech® Discfilter** for **tertiary treatment**
> Capacity: 150 litres/second
> Process: biological treatment, settling ponds, and **filtration** (Discfilter) before discharge into a dunal system
> Application: **tertiary filtration** prior to discharge to environment

Kingscliff Sewerage Treatment Plant for Tweed Shire Council – NSW

> Design, Supply & Commissioning of a new tertiary wastewater treatment plant that will service 25,000 inhabitants
> Capacity: 30 Megalitres/day (peak flow)
> Process: 2 **Hydrotech® Discfilters** HSF 2216/15-2F
> Application: Advanced **tertiary effluent filtration** before discharge (class A water for possible agricultural reuse & irrigation)

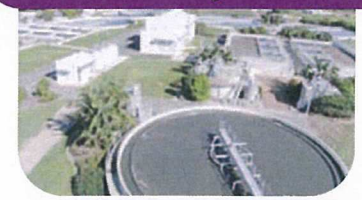
Kawakawa & Awanui Wastewater Treatment Plants for the Far North District Council – NZ

> Upgrade and refurbishment of two existing wastewater treatment plants servicing local communities
> Capacity:1,600 m³/day (Kawakawa) and 670 m³/day (Awanui)
> Process: **Hydrotech® Discfilter** (HSF-2104/3-1F at Kawakawa and HSF 1704-1F at Awanui)
> Application: **effluent polishing** prior to discharge to local streams both of which discharge into environmentally sensitive coastal areas

Ballarat Llanberris Water Treatment Plant for Ballarat Goldfields – VIC

> Water treatment plant to de-water the mine groundwater for underground mine workings at the Ballarat Goldfields mine site to remove heavy metals, manganese, arsenic, iron and other contaminants
> Capacity: 3.89 ML/day
> Process: oxidation followed by 1 Actiflo® ACP 500 + 1 Hydrotech® Discfilter HFS-1708 (Actidisk™ process) and sludge dewatering
> Application: treated water will meet Victorian EPA water quality guidelines for **discharge** into water streams, and improve environmental flows.

Maroochydore Sewage Treatment Plant for Maroochy Waters Alliance - QLD



> Upgrade of Sewage Treatment Plant with 2 channel-mounted Hydrotech® Discfilters
> Capacity: 12 ML/day (Average Dry Weather Flow), up to 36 ML/day (Peak Flow, 3 times ADWF)
> Process: tertiary effluent filtration (meeting USA Title 22 requirements for ADWF)
> Application: the advanced tertiary filtration is a key component of the STP upgrade and the Maroochy Shire Council's "River Recovery Project", to protect the river health, improve the quality of water discharged to the Maroochy River, and provide class A water for agricultural reuse and irrigation.

Three Wastewater Treatment Plants for Thames Coromandel District Council – NZ

> Design, supply, install and commissioning of 6 **Hydrotech® Discfilters** to treat municipal wastewater at three sites (Whitianga, Pauanui & Whangamata)
> Capacity: 29 Megalitres/day in total (3 plants)
> Process: 6 **Hydrotech® Discfilters**, 2200 Series (2 per site)
> Application: **tertiary filtration** of wastewater prior to discharge to estuaries in pristine coastal resorts of the Coromandel peninsula

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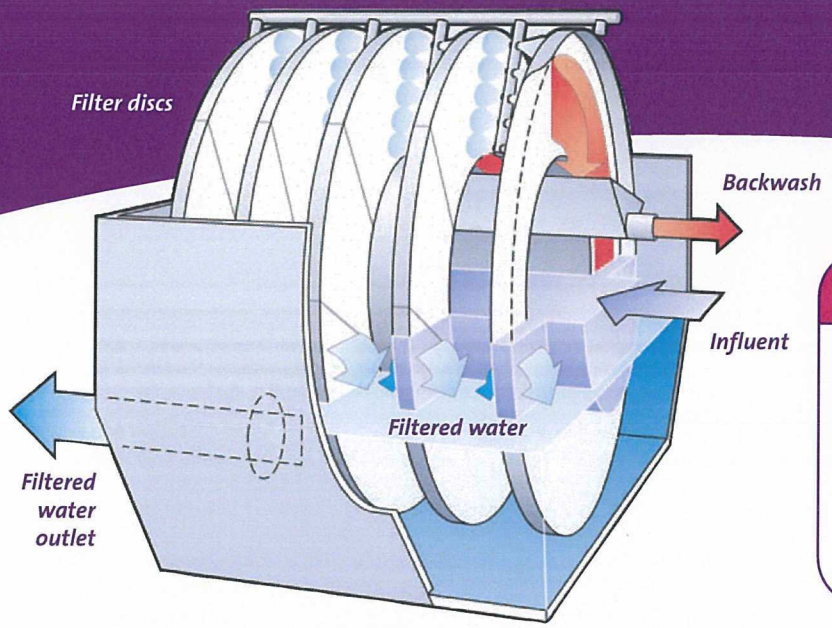
Hydrotech® Discfilter Process

An ideal filtration system for fine solids removal and product recovery



% of removal	Tertiary Treatment
TSS Reduction	50 - 99.6%
Influent TSS Range	5 – 260 mg/l
Effluent TSS Range	2-30 mg/l
Turbidity Reduction	50 – 95%
Influent Turbidity Range	0.5 - 34 NTU
Effluent NTU Range	typically < 2 NTU

> The water to be treated **flows by gravity** into the filter segments from the centre drum.

> **Solids catch** on the microscreen cloth, on the inside of the filter panels mounted on the two sides of the disc segments.

> As the suspended solids are captured onto the filter panels, the flow of water through the Discfilter is impeded. This causes the water on the inlet side to the Discfilter unit to **rise**, triggering a level sensor to start the **backwash cycle**.

> **High pressure rinse water** blasts the solids off the filter media and into the solids collection trough. Typically, the backwash requires 1-2% of the total flow and filtered water is used.

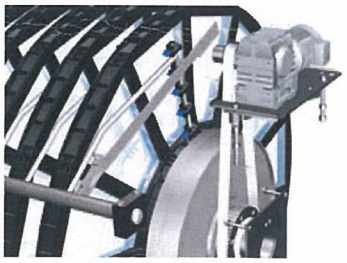
> The **spray headers** for backwash of the discs **fold out** to facilitate easy maintenance of the spray nozzles.

With tank

> *The tank version is provided with an internal emergency by-pass and a level weir to maintain the water level after the filter.*

Without tank

> *The versions without tanks are designed for installation on a concrete channel or basin.*



> *The Hydrotech® **moving backwash spray header** ensures **better cleaning** with **minimal water use** (20% savings of rinse water consumption) and longer life of the filter media*

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Creating Water Solutions

Present in Australia and New Zealand for over 70 years, **Veolia Water Solutions & Technologies** is a world leader in Design & Build of water and wastewater treatment plants. Our unique portfolio of differentiating technologies includes drinking water, industrial process water, and wastewater.

We provide Design & Build capabilities, Engineered Systems, Equipment Supply, Leasing of Mobile Plants and Services, focusing on reuse and desalination. Our approach for delivering innovative water solutions makes us the partner of choice for municipal and industrial customers.

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