

---

# Assessing Nutrient Value Of Municipal Wastewater for Agricultural Reuse

---

Dannevirke STP – Tararua District Council

# Overview

- Me! – Ben Pasco
- Considering agricultural reuse – Practical issues
- Dannevirke Sewage Treatment Plant (STP)
- Key nutrient analysis (N, P)
- Application
- Cost implications

# Factors Promoting Reuse

- Higher prices for fertilisers (volatile)
- Escalating costs for discharge permits and compliance
- Environmental considerations - surface waters (Ammonia, P)

# Factors Hindering Agricultural Reuse

- Regulations (eg. Fonterra dairy production)
- Water historically not scarce in NZ
- High up-front setup costs (land)
- Negative public perceptions to reuse

# Dannevirke STP



- Population 5,500, ADWF 3,000 m<sup>3</sup>/day
- Zenon Membranes (pore size 0.035 – 0.1 um)

# General Discharge Quality

- Faecal coliforms < 1 per 100mL
- E. coli < 1 per 100mL
- TSS < 3 g/m<sup>3</sup>
- Conductivity around 550 uS/cm

This conductivity level compares well with international land application studies where:

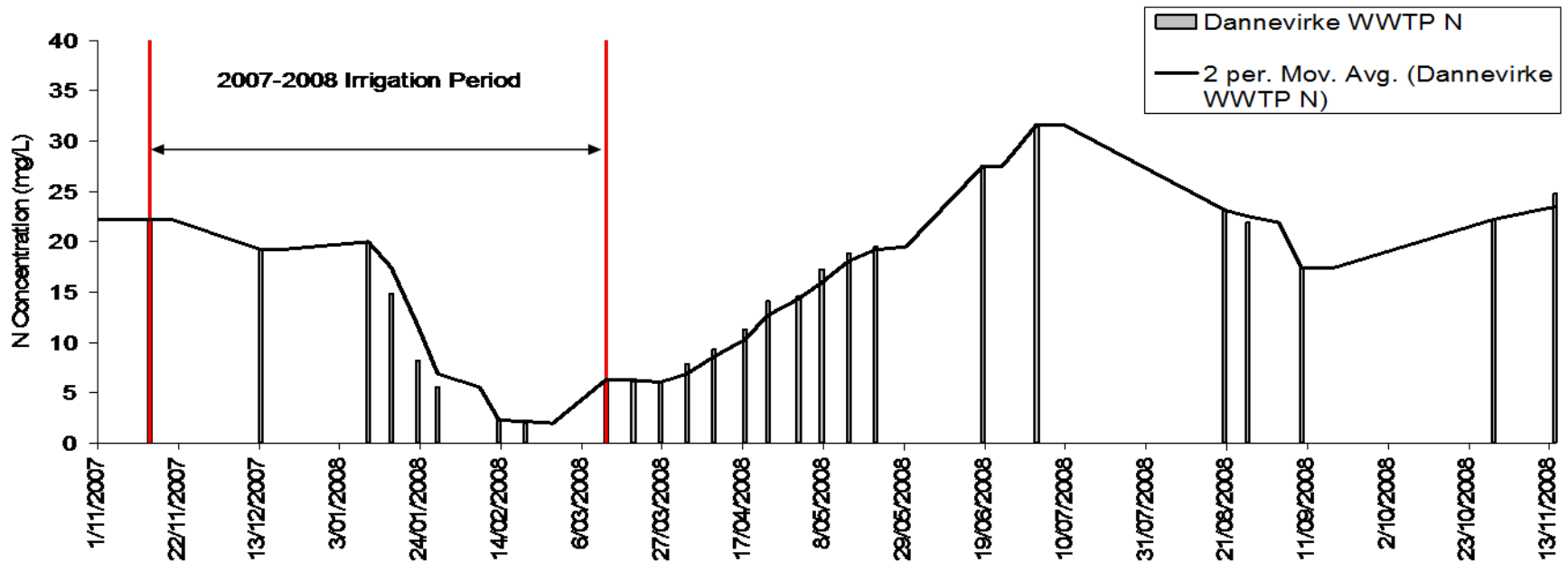
Ultrafiltration – 1,880

Reverse Osmosis – 350

- Flow for 07/08 summer 3,026 m<sup>3</sup>/day



# Nitrogen (SIN)



- Variability in N being delivered
- Average summer daily mass in discharge 47 kg/day
- Average annual mass 57 kg/day – mainly ammonia

# N Value



September 08 value:

Balance, Urea @ 46% N \$1,100/tonne

120 days x 47 kg/day x \$2.40 = \$NZ 13,500

\$US 7,600

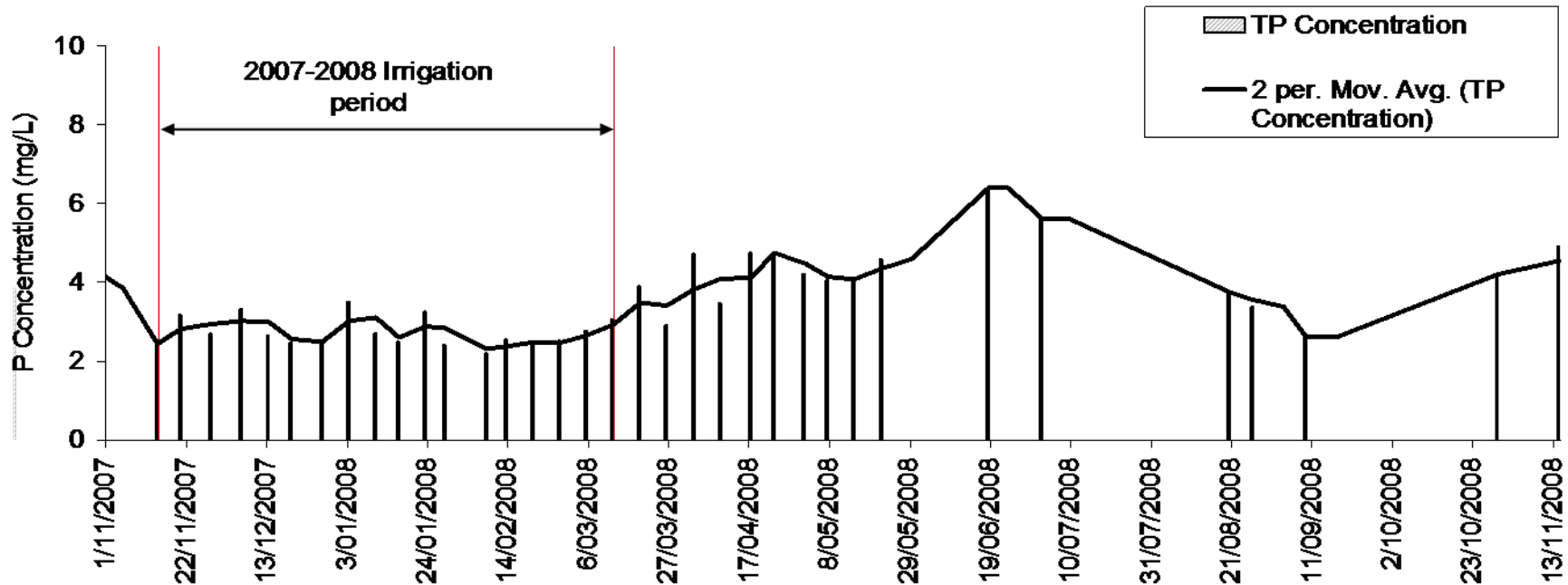
Current (4 March)

Balance, Urea @ 46% N \$693/tonne

= \$NZ 8,500

\$US 4,800

# Phosphorus



- Annual average for 07-08 was 3.9 g/m<sup>3</sup> or 11.8 kg/day
- Summer results affected by chemical precipitation – levels around 5 - 6 g/m<sup>3</sup> expected

# P Value

## September 08 value:

Balance, Superten @ 9% P plus other nutrients \$565/tonne

120 days x 11.8 kg/day x \$4.96 = \$ 7,000

\$US 3,900

## Current (4 March)

Balance, Superten @ \$398/tonne

= \$ 4,700

\$US 2,600



# Land Area

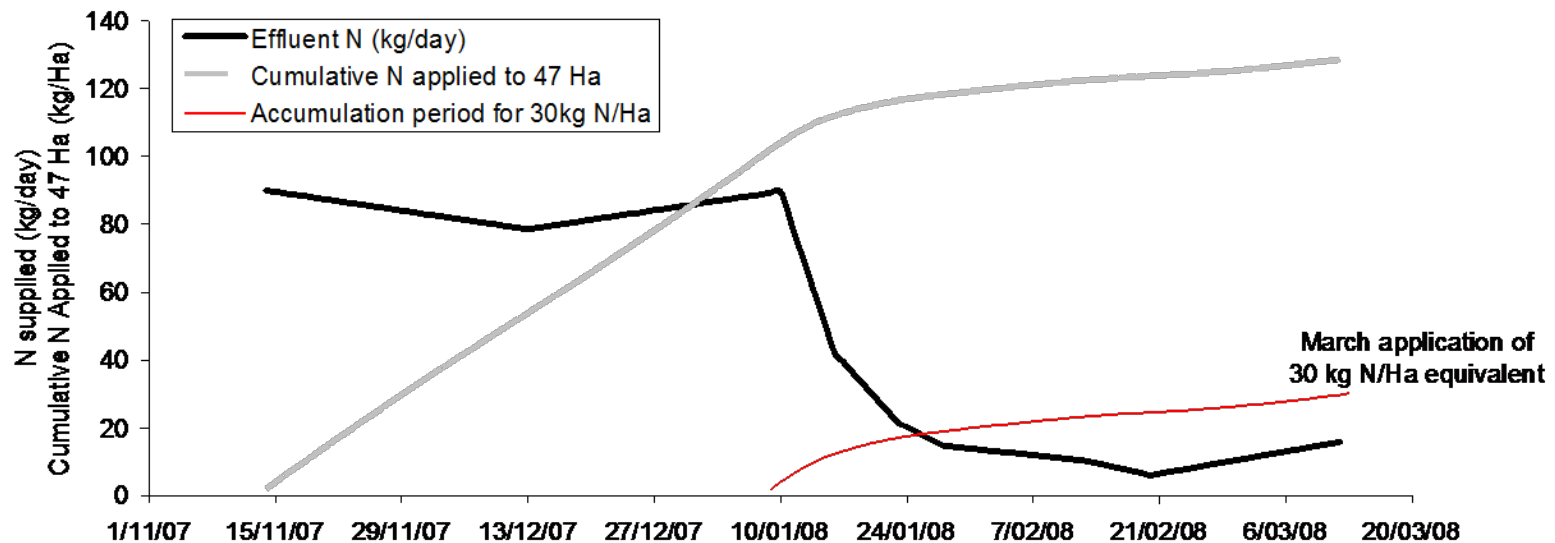
- 11.8 kg P/day = 1,400 kg P over 120 days  
@ 30kg P/ yr this will fertilise 47 Ha
- 57 kg N/day = 5,600 kg N  
@ 150kg N/ yr this will fertilise 38 Ha  

Or 5,600 kg N / 47 Ha = 120 kg N/Ha/yr

Farmers will typically use a combination of effluent nutrients and standard fertilisers.

# Timing of Nutrient Application

- Needs to fit with existing management practices
- N used to boost Spring and Autumn dairy pasture growth
- Application is too spread to achieve short term boost in growth



# Farmer Benefit : Cost Considerations

## Positive

- Irrigation benefit
- Reliable water supply during drought
- Reduced fertiliser demand

## Negative

- Impact on produce image
- Possible purchase of water / nutrients ?



# Benefit : Cost for Council

## Operational Savings

- Chemical use  $\approx$  \$70 - \$100 k/yr
- Reduced monitoring  $\approx$  \$2 k

## Operational Costs

- Capital costs  $\approx$  \$400 - \$600 k
- Farm monitoring  $\approx$  \$2 k
- Pumping  $\approx$  \$15 k

## Additional Benefits:

- Gaining discharge permits  $\approx$  Priceless!
- Potentially marketable product  
eg.  $5\text{c}/\text{m}^3 \times 3026 \times 120 = \$18 \text{ k}$

# Questions / Comments

