EFFECT OF STORAGE AND NITROGEN REMOVAL EFFICIENCY ON NITRATE LEACHING FROM LAND TREATMENT SYSTEMS

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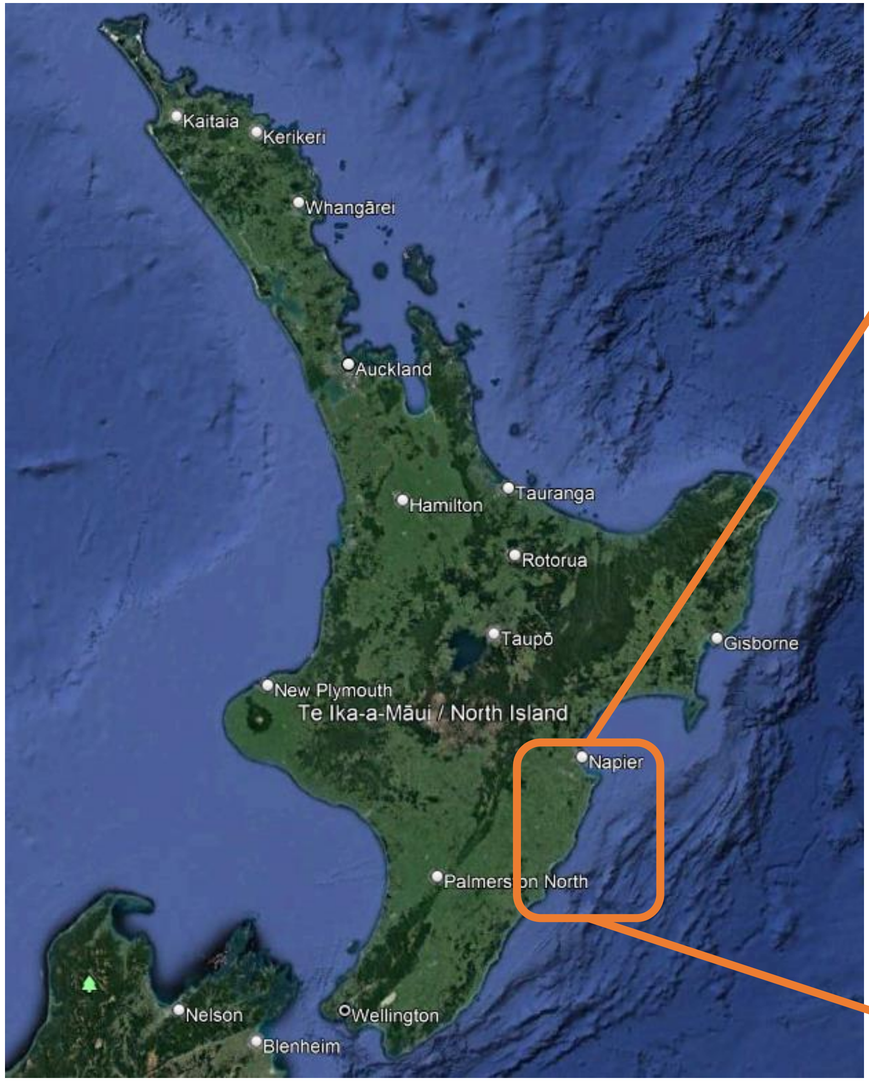
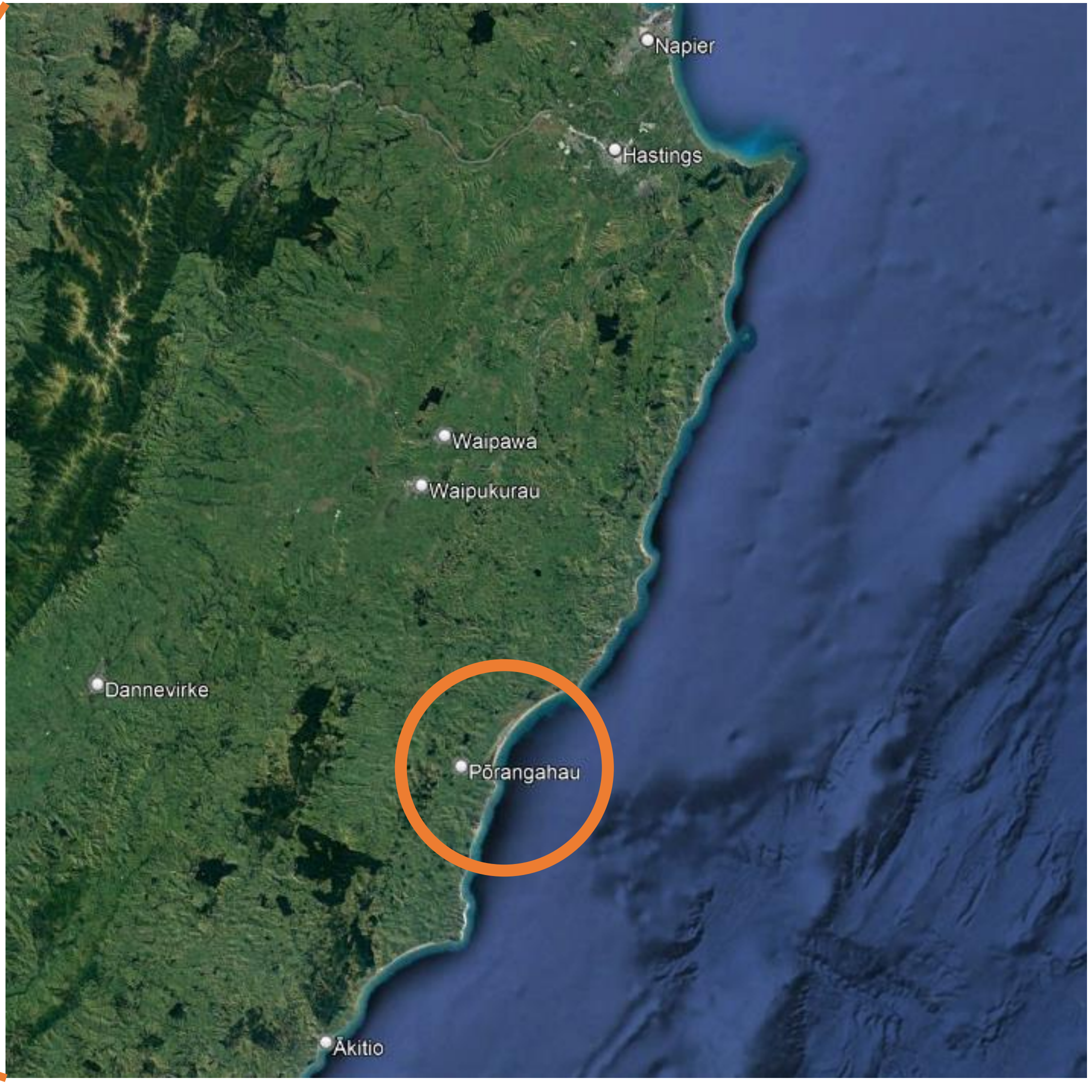
Presentation Outline

- Location – Pōrangahau/Te Paerahi – Case study
- What is the Project? – Status Quo
- What is the Project? – Proposed
- Tweaking of Levers
- Nitrate Leaching – Why does it matter?
- Lever 1 – Storage
- Lever 2 – Wastewater Quality (N)
- Findings – Lever 1 & 2 vs Nitrate Leaching
- Conclusions

Location – Pōrangahau/Te Paerahi

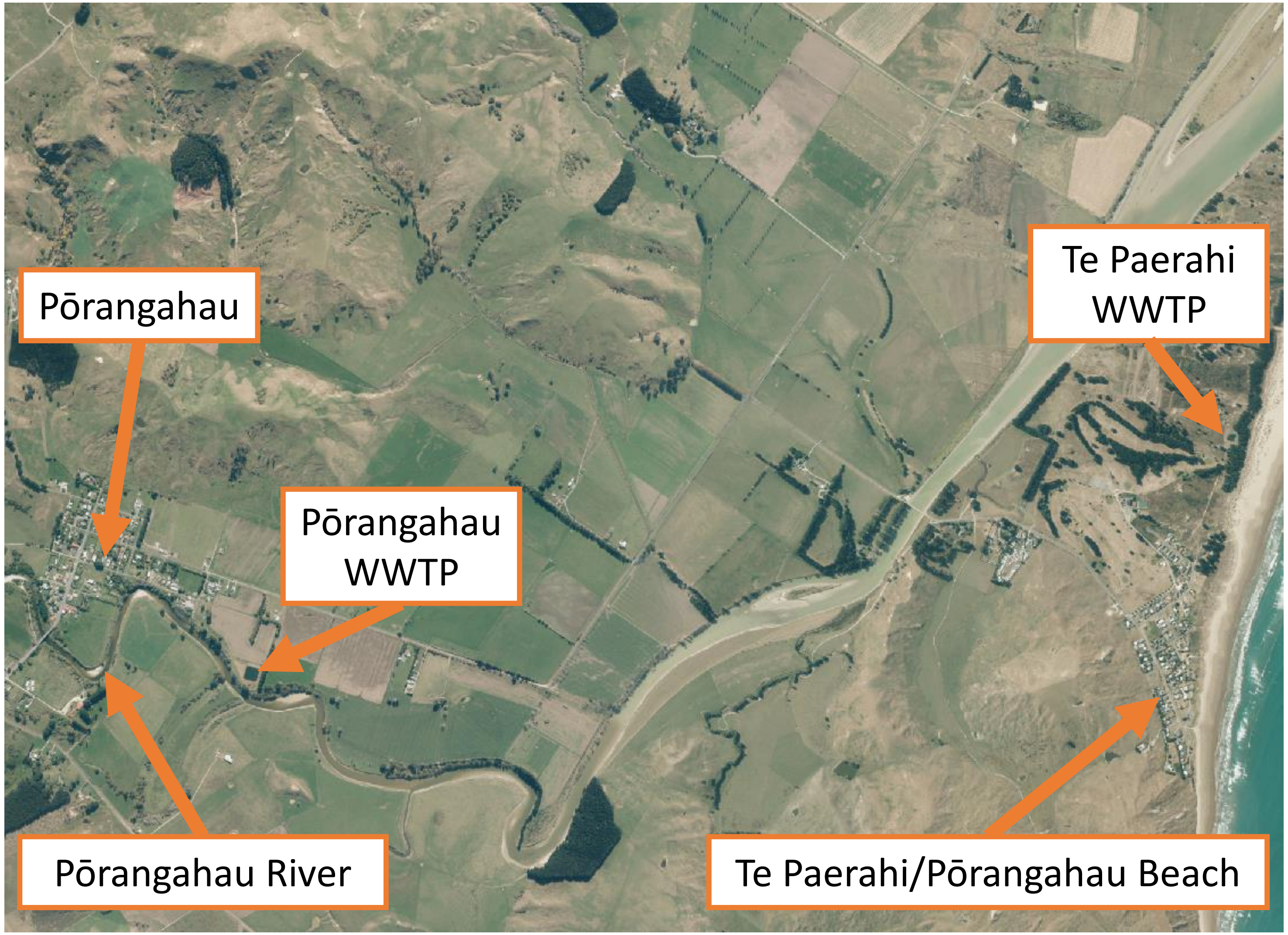




What is the Project? - Status Quo

- Pōranghau Community → Pōrangahau WWTP → Pōrangahau River;
- Te Paerahi Community → Te Paerahi WWTP → Adjacent Dunes;
- Existing discharges are to culturally sensitive environments – Change is needed!

Location



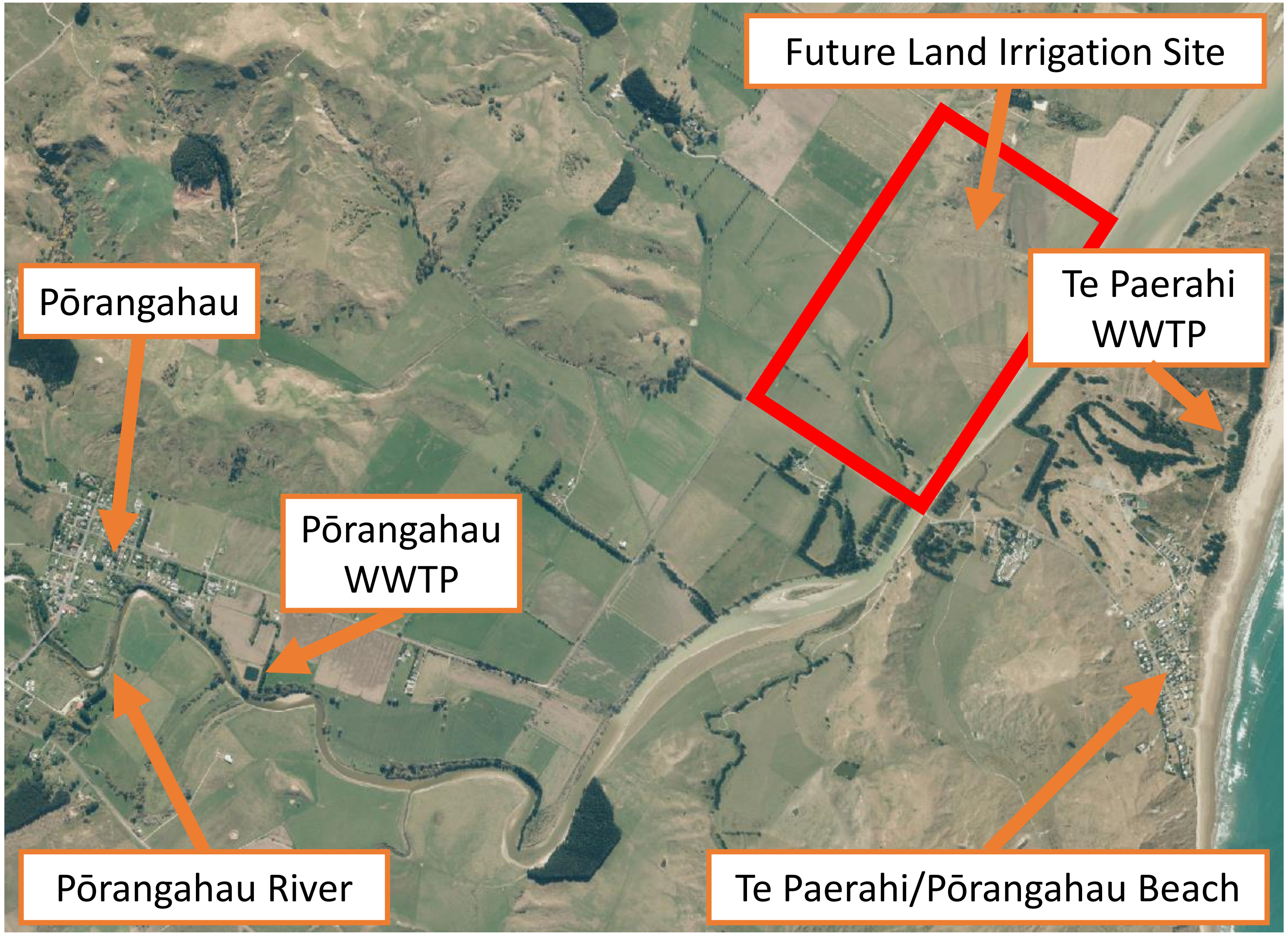
Pōrangahau
Te Paerahi WWTP
Pōrangahau WWTP
Pōrangahau River
Te Paerahi/Pōrangahau Beach

What is the Project? – Proposed

- Establishment of a common land irrigation site;
- Establishment of a new centralised BTF WWTP at the irrigation site;
- Construction of a 20,000 m^3 storage pond;
- Combination of high/low-rate irrigation to at least 40 ha;
- Cessation of both existing discharges; and
- Decommissioning of both existing WWTPs.


Land Irrigation Site

Location


Future Land Irrigation Site
Pōrangahau
Te Paerahi WWTP
Pōrangahau WWTP
Pōrangahau River
Te Paerahi/Pōrangahau Beach

Tweaking of Levers

- What are levers?
- Focus here is on levers assisting with nitrate-N management.
- Lever 1 – Storage
- Lever 2 – Wastewater Quality (N)

Nitrate Leaching – Why does it matter?

- Treated wastewater contains nitrate-N;
- Nitrate-N is highly mobile, flowing with water;
- If nitrate is not up taken, leaching will occur;
- Nitrate facilitates adverse environmental effects;
- Avoidance of leaching = better environmental outcomes.

Lever 1 – Storage

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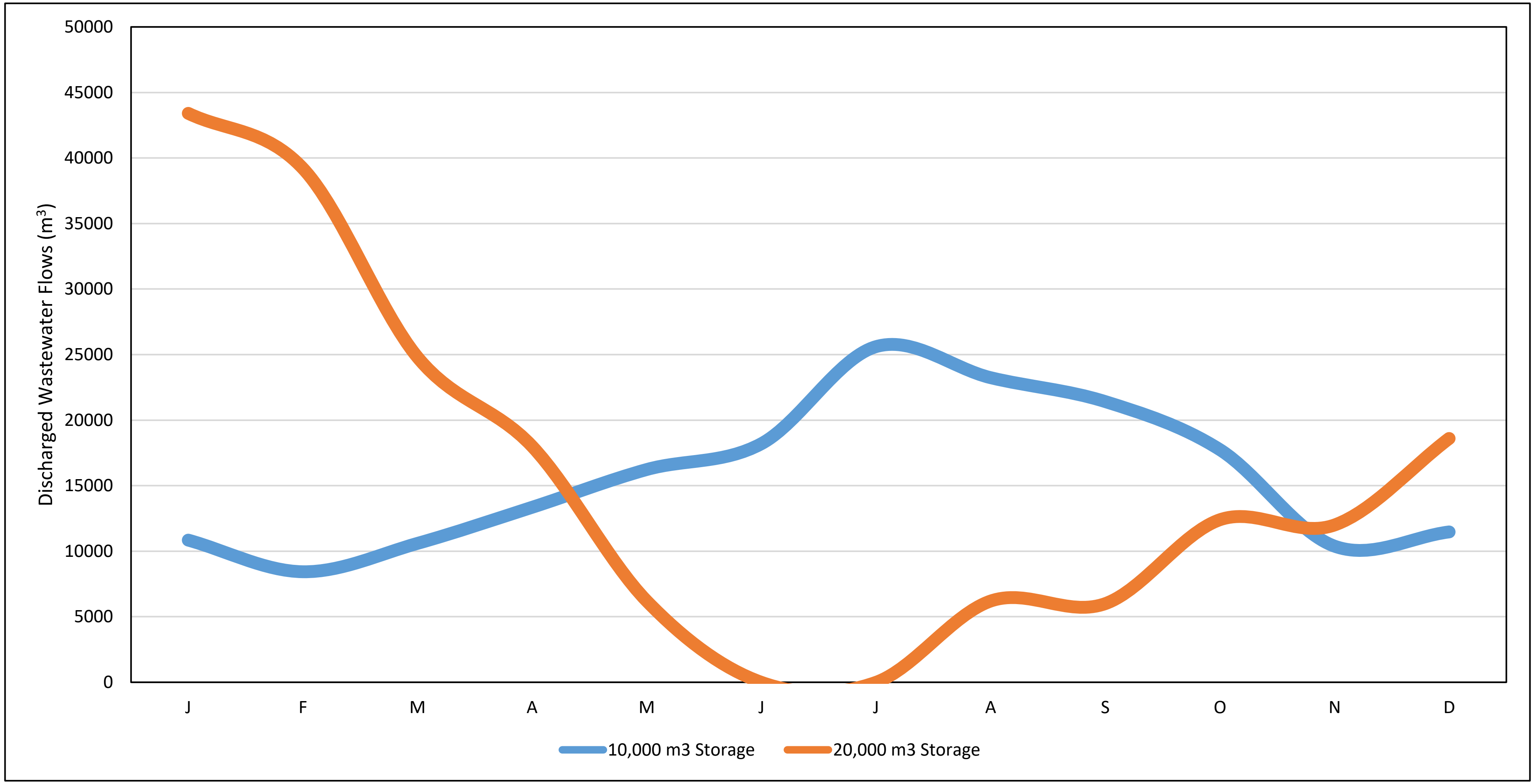
- Large pond holding treated wastewater;
- Allows for greater irrigation flexibility;
- When plants don’t need water, sent to storage and held until when plants do need the water;
- Provides wet weather buffering;
- Potential to reduce nitrate leaching through avoidance of irrigation when soil moisture is high (i.e. winter);
- Larger storage pond → more targeted irrigation → less leaching.

Storage – Changing the way we irrigate



Irrigation to 40 ha of farmland, however 20,000 m^3 storage allows for greater use of deficit irrigation therefore more plant uptake and less drainage, thus less risk of N leaching.

Lever 2 – Water Quality (N)

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- WWTPs remove contaminants/nutrients – (N);
- Wastewater irrigation, N needed to grow grass;
- More N = Greater grass growth;
- Greater N removal = Greater cost to WWTP design & more sludge;
- Regional Councils typically want high effluent quality parameters;
- With higher storage, can we have a higher N conc. wastewater, whilst maintaining the same environmental effects as low storage but low N conc. wastewater?
  - i.e. Does 25 g/m^3 of total N and low storage equal the same environmental effects as 35 g/m^3 of total N and high storage?

Findings – Lever 1 & 2 vs Nitrate Leaching

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- Overseer^{FM} Modelling Total N Concentration by Storage Volume

Lever 2 – Wastewater Quality (N)

Lever 1 – Storage		**25 g/m^3**	**30 g/m^3**	**35 g/m^3**
	10,000 m^3	35 kg N/ha	38 kg N/ha	38 kg N/ha
	*20,000 m^3 (No Change)	31 kg N/ha	33 kg N/ha	33 kg N/ha
	20,000 m^3 (Increased Stock)	33 kg N/ha	34 kg N/ha	36 kg N/ha

Conclusions

- Storage can assist with reducing N leaching losses;
- Can allow for greater wastewater concentrations to be maintained;
- First thoughts were a greater difference in N loss than that modelled;
- Debate around Overseer's accuracy of losses;
- Debate around Overseer's data resolution to accurately model losses (N and hydraulic loadings are relatively low).

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Advice AEE Agricultural Analysis Application Approachable Assessments Assimilation Assistance Biosolids Capability Client Communications Communities Compliance Compost Consents Consultation Contamination Coordinate Council Cultural Current Data Degradation Design Detention Developments Discharges Documentation Drafting E. coli Ecosystems Effects Engagement Environment Equipment Evidence Excellence Experienced Expert Facilitating Farming Feasibility Fieldwork First-flush Fit-for-purpose Flooding Fun Geology Graphs Greywater Groundwater Guidelines Handbag Hazardous Hydraulics Innovation Interpretation Investigation Irrigation Land Landfills Landscape Land-treatment Leaching Lodge Management Metals Microbiology Modelling Monitoring NES Nitrogen Nutrients Onsite Optimisation Organics Overseer Papers Pathogens Phosphorus Plain-english Plans Preparation Presentations Project Quality Relevant Remediation Reports Research Review Sampling Scientific Septage Sludge Soil Solutions Spreadsheets Standpipes Stormwater Strategy Support Surface Water Sustainability Systems Team Testing Timely Treatment Validation Wastewater Water Water-balance Waterways

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