FACT SHEET 2

PALMERSTON NORTH NATURE CALLS

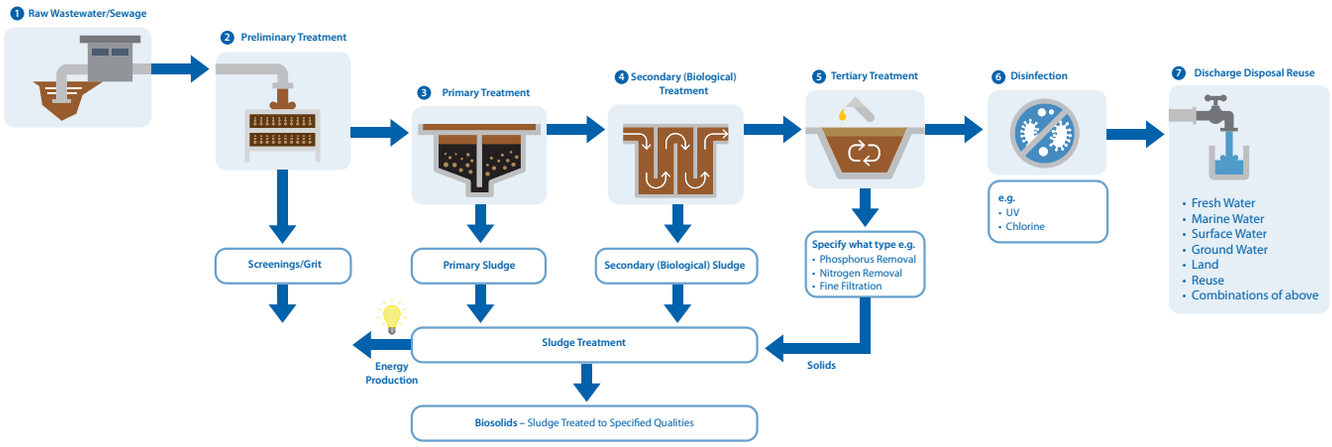
PALMERSTON NORTH CITY COUNCIL BEST PRACTICABLE OPTIONS REVIEW

WASTEWATER TREATMENT, BEST PRACTICE AND INNOVATION

WASTEWATER TREATMENT

Wastewater treatment involves a number of sequential treatment processes. The treatment requirements vary depending on the nature of the wastewater, flows and contaminant loads, and on the nature of the environment into which the treated wastewater is to be discharged.

The following graphic illustrates the commonly used generic treatment processes and shows the sequence they are arranged in.



The stages of wastewater treatment

- Preliminary treatment involves fine screens to remove rags, vegetables, plastic toys and other solid and inert material, and settling to remove stones and grit.
- Primary treatment involves the settling out of faecal and other material that has passed through the screens, along with fat and grease which floats to the surface of the primary treatment tanks.
- Secondary or biological treatment, which is normally a key part of the overall treatment plant, involves friendly microorganisms breaking down the organic strength of wastewater.
- Tertiary treatment involves a range of further treatment processes, such as extremely fine filtration and nutrient (nitrogen and phosphorus) removal.
- Disinfection, normally using ultra-light irradiation, involves killing the majority of the remaining microorganisms in the treated wastewater, the focus being on the pathogenic (germ) microorganisms.
- Sludge treatment involves processes that break down the faecal material removed in the primary treatment, and excess biological cell material removed from the secondary treatment, so that it is stabilised for reuse as biosolids and disposal.

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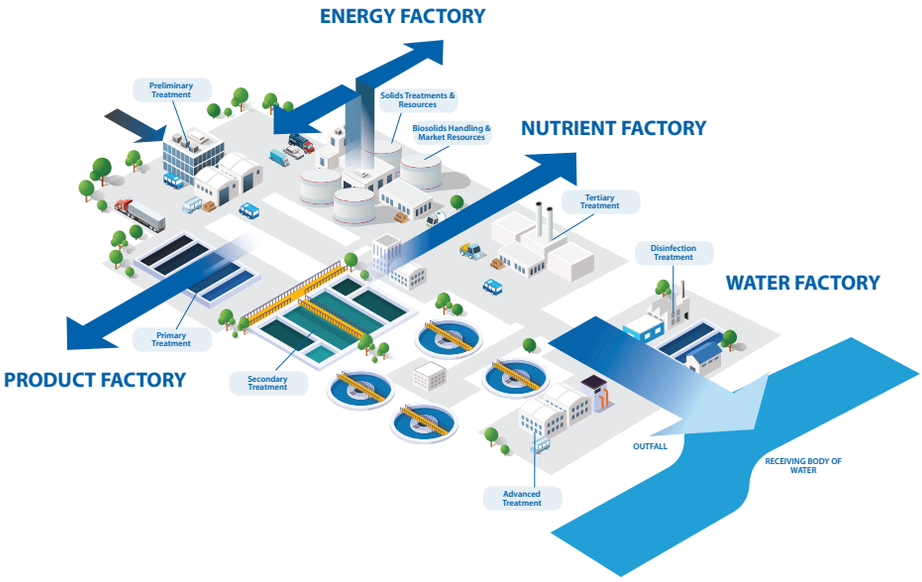
BEST PRACTICE AND INNOVATION IN WASTEWATER MANAGEMENT

Best Practice (or correct, most effective procedures) in wastewater management is a key focus in many countries of the developed world as it is in New Zealand. Innovation is also a key focus.

The following are examples of Best Practice including innovative approaches to wastewater management techniques.

1. **Wastewater collection and conveyance systems**
    - Water supply conservation and demand management: saving water and energy, while also reducing wastewater flows and volumes.
    - Effective trade waste management (refer Fact Sheet 1) where industrial dischargers undertake cleaner production, waste minimisation and trade waste (pre) treatment before discharging into the local authority's wastewater network.
    - Automated control systems that regulate the flow through the wastewater networks to efficiently use the infrastructure and reduce or eliminate overflows of untreated wastewater to the environment.
    - Energy efficiency through flow control of pumping systems, to minimise peak power demand and maximise off-peak power availability.

2. **For wastewater treatment systems, particularly larger city plants**
    - Innovation is the application of the principle that **"all waste streams are value streams."**
    - The graphic below highlights the approach where the wastewater treatment plant is considered a multi-resource factory that recovers energy and nutrients, and uses treated wastewater beneficially.



These multi-resource factory practices more specifically include:

- Identifying opportunities for energy demand reduction – optimisation of hydraulics and process, i.e. controls, along with equipment efficiency conversions.
- Extracting chemical and thermal energy embedded within raw wastewater sources.
- Collecting and re-directing organic carbon (carbon diversion technology) from industrial and commercial sources to enhance energy production, while reducing energy demands associated with removing organic waste carbon.
- Capturing of thermal energy from final treated effluent – heat pumps and heat distribution.

At Palmerston North's Tōtara Road Wastewater Treatment Plant, the energy factory concept is already at play with biogas captured for treatment processes used to generate electricity.

3. **Treated wastewater and bio-solids beneficial reuse:**
    - As New Zealand is relatively water-rich there has not been the same driver for re-use of treated wastewater as there has been in some water-short countries. However, there are practical options available and these will be considered in the Nature Calls project.
    - Typical beneficial non-potable reuse techniques include land application, injection into aquifers, industrial reuse, parks, gardens, golf courses and race courses, nurseries and forests. One further option used overseas in non-potable water reuse is a third pipe system to houses, for garden watering and toilet flushing.
    - Managed Aquifer Recharge (MAR) is another option for municipal wastewater beneficial re-use, where highly treated wastewater (often called reclaimed water) is injected into an aquifer to supplement the water available for abstraction. It has been successfully applied overseas for a number of years – particularly in regions with pressures on potable water supply sources (such as Los Angeles, California). There are examples of indirect municipal wastewater MAR re-use in New Zealand including the Rolleston Pines project.
    - Bio-solids are the treated, stabilised sludges that come from wastewater treatment processes. There are a number of beneficial reuse techniques for these including energy production, fertiliser and soil condition application for pasture, turf culture, forests and gardens.

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