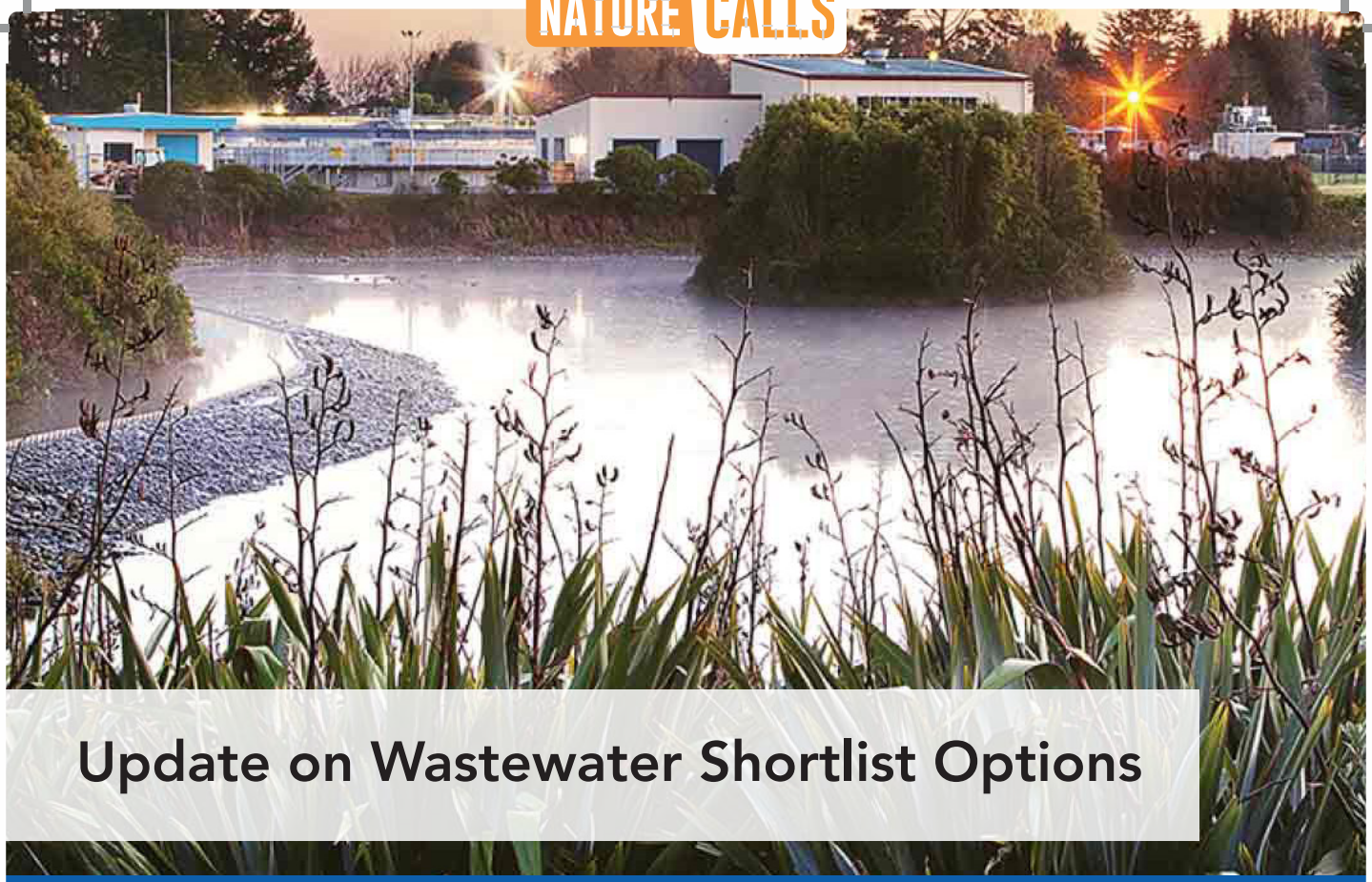
PALMERSTON NORTH NATURE CALLS



Update on Wastewater Shortlist Options

Investigations into aspects of our wastewater system have led to further refinement of the six shortlist options and development of variants within them. We've ruled out one option, added a variant and gained a better understanding of the costs and requirements for the remaining options.

We've drilled down on the most significant issues to get a better understanding of how each option will perform. This information will enable the community and stakeholders to understand the options, give informed feedback and provide decision makers with a solid evidence base for the preferred option.

Some of the questions we've been investigating across all shortlist options include:

- What extra treatment would be required for each option to meet quality and quantitiy requirements?
- What extra conveyance requirements (pipes and pump stations) would be required for each option?
- How much would each option cost to build, and how much would it cost to operate each year?

River discharge options

We also investgated two issues relating solely to the river discharge options (options 1, 2 and 4):

- Flow triggers: At what level of wastewater flow do we need to upgrade treatment or change tne way we discharge to river?
- Wetland and land passage: When we discharge wastewater into Manawatū River through wetland, how much wetland will we need and what are the land passage options?

Land discharge options

For the options with discharge onto land, we completed a preliminary survey of possible sites and considered potential uses for the land. Options for discharge to land include use of fluvial (inland) and coastal land, both of which have different requirements and implications for treatment and discharge. We've assessed opportunities to use the land productively, aiming to offset some of the cost of the BPO implementation.

This factsheet describes the issues we investigated, explains the findings and how they relate to each of the shortlist options and variants. We explain some of the technical aspects of the investigations, and summarise it all in a comparison table.

Updated options and variants

What happened to Option 5?

Option 5 proposed discharge to groundwater, the water that fills the spaces between soil particles and rock beneath the earth's surface.

Option 5 has been removed from the shortlist due to cost and environmental impacts.

Ocean discharge: A new variant

Option 6 proposed discharge into the ocean with allowance for a small percentage of discharge to land during drier months. The new variant to option 6 allows for discharge into the Manawatū River instead of land in exceptional circumstances, expected to be the highest 3% of days by wastewater treatment plant flow. This variant has been included in our investigations and you'll find more information about it through the factsheet.

When treated wastewater is discharged into the Manawatū River, it first passes through wetlands which act as an extra filter before the water enters the river.

What are the updated options and variants?

Exploring the different elements, requirements and impacts of each option, we've developed variants to ensure we consider all the alternatives available to get the best possible outcome. In total there are five options and 12 variants.

Option 1: Discharge into the river at the existing point (2 variants)

Discharge

Under both variants the treated wastewater is discharged via wetland or land passage system into the Manawatū River. One variant provides for a small percentage of discharge to land during dry periods when river flow is low.

Treatment

All wastewater is treated at the existing Totara treatment plant which will be upgraded and expanded to cope with increased capacity and provide higher level of phosporus and nitrogen removal, resulting in higher quality wastewater.

Option 2: Discharge into the river at two points (2 variants)

Discharge

Option 2 proposes wastewater discharge into the river when flow is above 37.5m3/s, using an additional discharge point at Oroua up to 62m3/s.

Variant 1 switches 100% of wastewater discharge to land when flow drops below 37.5m3/s. Variant 2 switches 75% of wastewater discharge to land below this point.

Treatment

All wastewater is treated at the existing Totara treatment plant which will be upgraded and expanded to meet a 50 year design life.

Option 3: Discharge to land, 97% and river, 3% (2 variants)

Discharge

Option 3 would have 97% of wastewater discharged to land, with the remainder (3% or 11 days of discharge) into the river. Within option 3 there are two variants, one discharges to fluvial land, the other to coastal land.

Treatment

Variant 1 (fluvial) would require upgrades to the inlet and UV functions of the existing treatment plant. The current standard of phosphorus removal is adequate.

Variant 2 (coastal) would require a new biological nutrient removal treatment plant. The sandy soil of coastal sites takes up less nutrients and leaching needs to be managed.

Phosphorous removal would not be required when flow is being discharged to land, or with very high flows into the river.

Option 4: Discharge to land, 45-55% and river, 45-55% (4 variants)

Discharge

Option 4 contains four variants, with combinations providing for land discharge to coastal and fluvial soils, and for two different flow cut off trigger levels that will result in slightly different balances of discharge to land and river. Variants 1 and 2 discharge to fluvial soils and variants 3 and 4 discharge to coastal soils.

Treatment

For all four variants the current treatment standard for phosphorus without chemical dosing is adequate. However some plant upgrades will be required to inlet works and the UV function to meet a 50-year design life.

Option 6: Discharge into ocean, 97% and land or river, 3% (2 variants).

Discharge

Option 6 includes two variants which both discharge into the ocean. Variant 1 is a mix of land and ocean with 50% of wastewater discharged to land during dry months (November to April) and the other 50% discharging into the ocean. Variant 2 proposes discharge into the ocean at all times. Both variants provide for discharge on the highest 3% of days into the Manawatū River through the existing Totara discharge point.

Treatment

For both variants within option 6 the current treatment standard for nitrogen and phosphorus without chemical dosing is adequate. Plant upgrades will be required similar to option 4 to extend the design life of the treatment plant.

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The issues

There are five key issues that affect the effectiveness, feasibility and affordability of all options.

Flow triggers:

How much can we discharge before we affect the receiving environment?

As the volume of wastewater discharge increases, so does the amount of phosphorus and nitrogen being discharged into the receiving environment. When the volume reaches a certain point (flow trigger) there's a risk that that safe and acceptable phosphorus and nitrogen levels could be exceeded. To be prepared for this, we've built into the options various alternative discharge options and additional treatments when wastewater flow is high or when the receiving environment is sensitive, for example when river flows are low.

As an example of flow triggers in action, option 2, variant 2 has a flow trigger for river discharge of 62m3 a second. When river flow is above this, it's safe to discharge treated wastewater at the Totara point. When the river flow drops below 37.5m3/s, 75% of wastewater would be redirected to land. Between these two trigger points, a second river discharge point would be used to mitigate the effect of the discharge on the river environment. Flow triggers can also be time based, for example option 3 variant 1 mostly discharges to land but allows for river discharge 3% of the time, or on the 11 days of the year with the highest wastewater flow.

Treatment:

What factors do we consider in treatment and how much treatment is required?

Treatment requirements vary for river, land and ocean discharge, and also for different amounts of wastewater. We assessed the treatment options against these factors:

- process reliability
- process flexibility
- process constructability and space requirements
- process affordability – costs to build and operate
- other process impacts including odour, noise, chemical consumption and energy demand, health and safety.

We also considered operating effects, planning aspects and possible future development of the existing treatment site at Totara Road.

Wetlands and land passage:

Wastewater first travels through wetlands before making its way into the river.

Factors we consider for wetland sites are the amount of wetland required, the length of land passage to water and the characteristics of land passage. BPO options include use of wetlands to provide the:

- surface flow with shallow open planted ponds that drain to a river
- vertical flow where treated wastewater passes through granular media into a planted filter bed or similar
- diffuse land passage where wastewater is spread out over a wide area.

Where an option proposes discharge into the river but switches to land during dry periods, we will continue discharging a small amount of treated wastewater into river through the wetlands, sufficient to maintain them.

Land application sites and land use:

What kind of land are we looking for, how much will we need and what happens to the land?

Options and variants include discharge to fluvial land and to coastal land. Factors we consider are soil type and implications for treatment levels, discharge and also productive use of the land.

Coastal land typically has sandy soils that take up less nutrients than inland soils and are more prone to leaching. Generally coastal sites are suitable for exotic forestry.

Inland sites have high productivity fluvial soils that are suitable for growing cut and carry crops such as lucerne or barley.

Conveyance:

How long will the pipelines be and how many pump stations will be needed?

The range of pipe lengths and number of pump stations are based on the potential land application sites identified. Where there are multiple land parcels, the centroid has been considered as the discharge point.

Pipe distances range from 11km (option 1 and variants in options 3 and 4) to 38km (option 6). The longer the pipe length, the more pump stations are required.

When determining the conveyance requirements, we factor in the size of wetlands and/or length of land passages, the diameter of pipeline, and the number of pump stations and power requirements.

The length of pipelines and number of stations will affect the cost of each option.

Totara wastewater treatment plant. The current wastewater treatment process takes around four days and includes filtration, settling, and disinfecting.

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Summary table of updated shortlist options and variants

The table below summarises the updated shortlist options and variants, showing costs to build (Capex) and annual costs to opera
The table summarises treatment requirements, the amount of land needed and potential uses for that land, and conveyance requ

Option	Variant	Capex (millions)	Opex (millions)	Treatment requirements	Land requirements and potential uses
Option 1	R2 (b) River	$193m	$7m	• New Biological Nutrient Removal (BNR) plant with membrane bioreactor • DRP (phosphorus) alum dosing addition.	• River discharge: Approximately 36ha of wetland with diffuse land pa river.
	R2 (b-2) River + 75% land during dry weather flows	$315m	$8m	As above	• River discharge: As above. • Land application: 670ha inland fluvial soils with pot and carry crops.
Option 2	Dual R + L (a) River at 2 points + 100% dry weather flow to land	$292m	$6m	Plant upgrades will be required including inlet works and UV treatment to meet a 50-year design life.	• River discharge: At Totara - Wetland with diffuse passage discharge At Opiki - surface flow wetland with diffuse passage • Land application: 970 ha of fluvial soils with potential for cut and carr
	Dual R + L (b) River at 2 points + 75% dry weather flow to land	$272m	$6m	As above	• River discharge: At Totara - Vertical flow wetland with diffuse land pa At Opiki - surface flow wetland with diffuse land pas • Land application: 740ha of fluvial soils with potential for cut and carry
Option 3	L + R (a) Inland land 97% + River 3%	$399m	$3m	Plant upgrades will be required including inlet works and UV treatment to meet a 50-year design life.	• Land application: 3215ha fluvial soils with potential for cut and carry • River discharge: Wetland with overland flow and diffuse land passag
	L + R (b) Coastal land 97% + River 3%	$502m	$3m	• New Biological Nutrient Removal (BNR) plant • Additional treatment is required for the coastal sites, compared to inland.	• Land application: 2260ha required for onsite storage facility, lagoon a • River discharge: Wetland with overland flow and diffuse land passag
Option 4	L + R (d-1) Inland land + River 45 – 55%	$256m	$5m	Plant upgrades will be required including inlet works and UV treatment to meet a 50-year design life.	• Land application: 1740ha required for irrigation, storage facility and soils, high productivity for cut and carry crops • River discharge: Surface flow wetlands.
	L + R (d-2) Inland land + River 55 – 45%	$230m	$5m	As above	• Land application: 1430ha required for irrigation, storage facility and l soils, high productivity for cut and carry crops • River discharge: Surface flow wetlands.
	L + R (e-1) Coastal land + River 45 – 55%	$387m	$1m	As above	• Land discharge: 3110ha including irrigation, storage facility and rap Coastal sandy soils suited for exotic forestry • River discharge: Surface flow wetlands.
	L + R (e-2) Coastal land + River 55 – 45%	$360m	$2m	As above	• Land application: 2570ha required for irrigation, storage facility, lago system. Coastal sandy soils for exotic forestry • River discharge: Surface flow wetlands.
Option 6	O + L Ocean 97% + Land and River 3%	$408m	$3m	Plant upgrades will be required including inlet works and UV treatment to meet a 50-year design life.	• Ocean outfall: 2km offshore, approx 20m depth at discharge • Land application: 1230ha for irrigation, storage facility and lagoon are suitable for exotic forestry. • River discharge: Overland flow and diffuse land passage
	Ocean discharge only Ocean 97% + River 3%	$343m	$3m	As above	• Ocean outfall: 2km offshore, approx 20m depth at discharge • River discharge: Overland flow grass and diffuse land passage to wa

te (opex). All costs are shown as net present value (NPV).
irements for each option and variant.

	Conveyance requirements	Key matters
assage discharging to	Additional conveyance costs for wetland or land passage have been allowed for.	• River discharge point likely to be within PNCC boundary • High level of treatment which increases as river flow drops • Potential staging of treatment plant upgrades • Lowest NPV cost • Wetland and land passage must be acceptable to iwi.
ential production of cut	As above, plus • 11km of pipeline in the road reserve • 1 pump station including power supply.	• River discharge point likely to be within PNCC boundary • High level of treatment whic increases as river flow drops • Potential staging of treatment plant upgrades • Wetland and land passage must be acceptable to iwi • Relatively small land area and number of land parcels affected.
to the Manawatū River e y crops.	• River discharge: At Opiki - 14km pipeline and 1 pump station with power supply • Land discharge: 7km pipeline and 1 pump station with power supply.	• Relatively small land area and number of land parcels affected • Opiki discharge outside PNCC boundary • Limited staging options • Costs are associated with conveyance and land application rather than treatment • Less impacted by uncertainty around archaeological sites • Dual discharge provides assimilative advantage.
assage ssage y crops.	As above	As above
crops ge discharge to water	• 11km pipeline depending on site location • 1 pump station and power supply	• Discharge outside PNCC boundaries • Large land area required with many land parcels • Includes storage and rapid infiltration facilities • Archaeological sites in areas under investigation • Groundwater protection of nearby bore supplies • Would be the largest land application of municipal wastewater in NZ • Discharges minimised to River to meet Horizons One Plan • Compatible with existing WWTP operation.
area and rapid infiltration ge discharge to water	• 36km pipeline depending on site location • 4 pump stations and power supply.	• Discharge outside PNCC boundary • Uncertainty about archaeological risk in the coastal areas • Limited staging options • High capital cost but income stream from forestry • Groundwater likely flows to ocean, so less potential for contamination of bore water.
lagoon. Inland fluvial	• 11km pipeline • 1 pump station including power supply.	• Discharge outside PNCC boundary • Significant land area required with many parcels and landowners • Limited staging options • Lower cost due to reduced irrigation in wetter periods • Archaeological sites in areas under investigation • Protection of bore supplies in/adjacent to the area • Compatible with existing WWTP operation.
agoon. Inland fluvial	As above	As above
id infiltration system.	• 36km pipeline • 4 pump stations including power supply	• Discharge outside PNCC boundary • Limited staging options for conveyance • Large land area required • High capital cost but income stream from forestry • Lower cost due to reduced irrigation in wetter periods • Depending on location groundwater flows likely to be to ocean, less potential for contamination of bore water.
on and rapid infiltration	As above	As above
ea. Coastal location	• 38km pipeline • 4 pump stations and power supplies	• Discharge outside of PNCC boundary • Small land area required with large land parcels so fewer affected parties • Limited staging options • High capital cost but income stream from forestry • Lower cost due to reduced irrigation in wetter periods • Depending on location groundwater flows likely to be to ocean, so less potential than inland options for (any) contamination of bore water • Assumption that land application sites are near the ocean outfall starting point • Compatible with existing WWTP operation.
ter.	As above	• Discharge outside of PNCC boundary • Limited staging options for conveyance • High capital cost and no income stream • Compatible with existing WWTP operation.

Key outcomes for the Best Practicable Option (BPO).

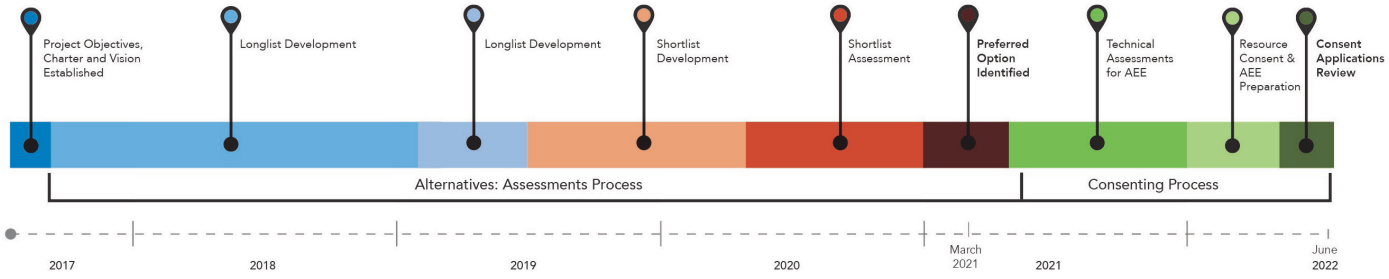
The preferred shortlist option will:

- Protect public health and minimise public health risks.
- Minimise environmental effects on air, land and water, minimise whole-of-life carbon emissions and optimise resource recovery.
- Contribute to improving the health and mauri of the Manawatū River.
- Be developed with the active engagement of the community and key stakeholders.
- Be affordable and cost effective.
- Be innovative and evidence based.
- Be sustainable, enduring, and resilient. Take an integrated approach to the management and cumulative effects on the Manawatū River catchment.
- Facilitate long term growth and economic development.
- Enhance people's use and enjoyment of the Manawatū River.

About this project

The Nature Calls project takes a fresh look at how we manage wastewater in Palmerston North and what we need to achieve before 2022 to future-proof our wastewater management and infrastructure. The process involves engagement with iwi, the community and stakeholders as well as technical investigations, including this one. The timeline below shows expected project progress through to June 2022 when the consent applications for the preferred option will be lodged.

Project timeline



Contact us.

For more information about wastewater, the Nature Calls project and the shortlist options:

Visit www.pncc.govt.nz/naturecalls

Call us on 06 356 8199

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