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# Palmerston North Wastewater Best Practicable Option (BPO) Review

## Project Objectives Assessment

August 2021

PALMERSTON NORTH
NATURE CALLS

Prepared for Palmerston North City Council by:

Stantec

## QUALITY STATEMENT

### Project Details

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### Report Details

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|---|---|---|
| Prepared by: | Jim Bradley/Melaina Voss/Paula Hunter/ BPO Technical Team | 21/07/2021 |
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| Reviewed by: | Client / Simpson Grierson | 4/08/2021 |
| Approved & Issued by: | Roger Hulme | 5/08/2021 |

## Executive Summary

This report has been prepared to assist the Council in identifying the Best Practicable Option (BPO) for wastewater management. This assessment forms one of seven assessments being carried out, to inform the final BPO selection.

In 2017, the Council adopted a Project Vision and 11 Project Objectives. These Objectives have been used to inform assessment criteria throughout the different options assessment phases, including the Traffic Light Assessment (2019) and Multi-Criteria Assessment process (2020).

This assessment has been undertaken with the involvement of technical experts, who have advised the Council on options development and assessments throughout the project.

Each of the 11 shortlisted options has been assessed against the 11 project objectives. The technical advisors recommend a scale of 1 to 5 is provided for comparing how well options are aligned to each of the Project Objectives (refer Table 2). The scores assigned and basis for the scoring is documented in Section 3 of this report (refer Table 2).

Technical advisors and Rangitāne o Manawatū have been involved in the assessment of all options against the Project Objectives. Rangitane o Manawatu have provided support to this assessment due to the relationship with the Strategy and mana whenua status over the city.

Overall, the options with the highest level of treatment and therefore lowest impact on the Manawatū River and ocean receiving environments (Options 1, 2, 10 and 11), are ranked in the top 4 when assessed against the level of alignment with the Project Objectives. Options with significant land area in the fluvial soil areas i.e. Options 4, 6, 7, 8 and 9 have ranked

### Project Vision

*"Management of the City's wastewater which enables growth, protects and enhances the environment, contributes to improving the health and mauri of the Manawatū River and provides a best practicable option solution."*

### Project Objectives

1. *Protects public health and minimises public health risk*
2. *Minimise adverse environmental effects on air, land, and water*
3. *Is sustainable, enduring, and resilient*
4. *Contributes to improving the health and mauri of the Manawatū River*
5. *Takes an integrated approach to the management of the Manawatū Catchment including understanding cumulative effects*
6. *Enhances people's use and enjoyment of the Manawatū River*
7. *Is affordable and cost effective*
8. *Minimises whole of life carbon emissions and optimises resource recovery*
9. *Is innovative while being evidence based*
10. *Facilitates long term growth and economic development*
11. *Is developed with the active engagement of the community and key stakeholders*

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# 1 Introduction

## 1.1 Overview of Assessment Process

An assessment of the short list options against the Project Objectives has been undertaken to help inform the process of determining the Best Practicable Option (BPO) for the Palmerston North City wastewater management solution. Figure 1 below illustrates how the Project Objectives assessment integrates with the other assessments and processes involved in determining the BPO.

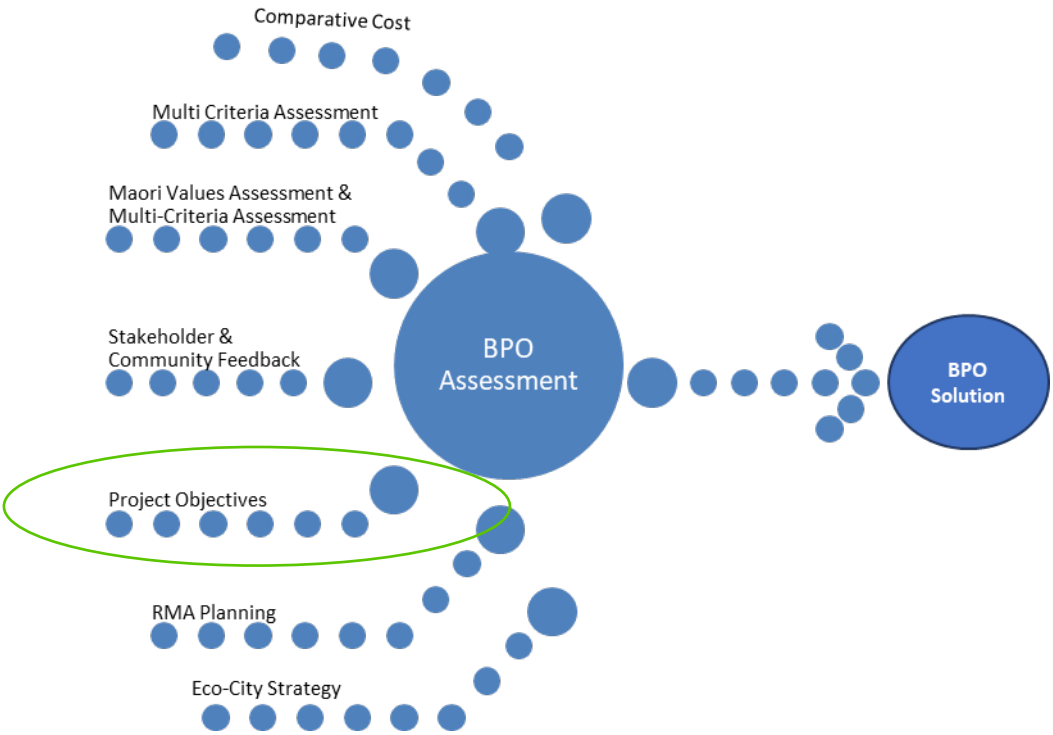


**Figure 1 BPO Assessment Process**

The Project Objectives assessment involves considering how each of the shortlisted options relative to one another aligns with each of the Project Objectives. This assessment draws on the technical work completed to determine the shortlist options and other assessment reports completed at the MCA stage of the project (refer Section 1.4 below). An outline of the methodology used to undertake this assessment is provided in Section 3 of this Report.

In carrying out this assessment, scoring provided within other assessments has been reviewed with the involvement of technical experts and Iwi to ensure there is consistency and alignment in the scoring.

## 1.2 Shortlist Options

The following table lists the shortlisted options assessed in this report. Technical details of each of the shortlist options are provided in the Shortlist Options Summary Report, July 2021.

**Table 1 Options Description / Reference**

| Option No. | Option Summary Description |
|---|---|
| 1 | R2(b) River discharge with Enhanced Treatment |
| 2 | R2 (b-2) River discharge with Enhanced Treatment, 75% ADWF to Land at low River flow. |
| 3 | Dual R+L (b) Two river discharge points, with 75% ADWF to Land low River flow. |
| 4 | L+R (a) 97% of the time to Land (inland) |
| 5 | L+R (b) 97% of the time to Land (coastal) |
| 6 | L+R (d-1) to Land <80m$^3$/s / 53% of the time to Land (inland) |
| 7 | L+R (d-2) to Land <62M$^3$/s / 43% of the time to Land (inland) |
| 8 | L+R (e-1) to Land <80m$^3$/s / 53% of the time to Land (coastal) TN = 35 mg/L |
| 9 | L+R (e-2) to Land <62m$^3$/s / 43%of the time to Land (coastal) TN = 35 mg/L |
| 10 | O+L / Ocean with Land |
| 11 | Ocean discharge |

## 1.3 Supporting Project Information

The following technical documents have been referred to, to inform this assessment:

- Wastewater BPO Shortlist Options Report August 2021
- Wastewater BPO Treatment Options Report, May 2021 and Addendum Report, May 2021
- Carbon Footprint Assessment Report, August 2021
- Stakeholder Engagement Feedback Report, July 2021
- Wastewater BPO MCA Process Report & Appendices, February 2021

# 2 Methodology for this Assessment

## 2.1 Classification Process

The first step in the assessment process was for the technical advisors to review each of the Objectives to determine if options could be comparatively scored against the Objective. This identified that 9 of the 11 Objectives could be comparatively scored. Two of the Objectives were excluded on the basis that there was no ability to differentiate between options. These objectives were:

> *5. Takes an integrated approach to the management of the Manawatū Catchment including understanding cumulative effects;* and
>
> *11. Is developed with the active engagement of the community and key stakeholders*

In some cases, the Objectives were further interrogated and divided into subcategories within the overall objective with scores given to each subcategory. For example, Objective 2, which seeks '*to minimise any adverse effects on air, land and water' was divided into 3 subcategories on* the basis it allowed each option to be assessed on how well the effects were minimised for each receiving environment. The overall score was then determined to be an average of the subcategory scores.

## 2.2 Scoring of Objectives

The assessment includes a judgement on the extent to which the proposed treatment level and discharge environment, aligned with the Project Objectives.

Table 5 sets out the suggested 1 to 5 banding/scoring for the assessment of the degree of alignment of each option with the Project Objectives. Table 3 details the allocated scores applied to each shortlist option and objectives based on the definitions outlined in Table 2.

**Table 2 Scoring Criteria**

| Level of alignment | Score |
|---|---|
| Strong alignment | 5 |
| Good alignment | 4 |
| General alignment | 3 |
| Weak alignment | 2 |
| Fails to align | 1 |

# 3 Scoring

The following section assigns the relative scores for options against 9 of the 11 Project Objectives.

**Table 3 Option Score for Alignment with Project Objectives**

| Objectives | Options Assessment | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1. Protects public health and minimises public health risk** | Qualitative risk assessment has determined these scores on the basis of the scale of the public health impacts and the frequency of the public health exposure. The potential exposure routes include recreation, both primary and secondary contact, food gathering and consumption, drinking water (surface water, ground water and tank water) and inhalation from spray drift.<br>Options 1 and 2, provide efficient pathogen removal through the multi-barrier treatment. Options 10 and 11 have effective dispersion and dispersion, in addition to natural disinfection.<br>Land application options, particularly inland, can give rise to a risk of groundwater contamination. | 4 | 4 | 3 | 2 | 2 | 2 | 2 | 3 | 3 | 4 | 5 |
| **2. Minimise adverse environmental effects on air, land, and water** | | | | | | | | | | | | |
| Air | Options 1 and 2 remove the aerated lagoons with a more highly controlled treatment process, which reduces the potential for adverse effects on air (odour).<br>Discharges to the Ocean and River (receiving environments), have minimal adverse effects on air.<br>Options with significant land application have the potential for odour generated associated with the application of wastewater over land during varying weather conditions and when stored in ponds. | 5 | 4 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 4 | 5 |
| Land | Options are assessed in relation to two key aspects, operational risks and potential long-term effects on the environment (land). While many adverse effects will be minimised through design, there is uncertainty as to the feasibility of operating large scale land irrigation systems. Options with 1,600ha of irrigation or more are more than three times the size of the largest current operational facility in New Zealand. The largest land area requirement for any of the options is 3,700ha (Option 4)<br>Over time, potential long term adverse effects on the land are considered likely because of irrigation of treated wastewater discharging to land. Long term effects may also include limitations on future land use, once the discharge of treated wastewater has ceased. Options with significant areas of land have therefore scored lower, and particularly inland (fluvial soils) which have more diverse and higher value land use options | 5 | 4 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 4 | 5 |
| Water | The assessment includes surface water, groundwater and marine (coastal) waters. Proposed treatment levels for the options have been used to determine the scores along with the potential adverse effects identified by the technical specialists.<br>Options 1 and 2 propose the highest levels of treatment, significantly reducing contaminants within the treated wastewater compared to other options discharging to the River. There is a moderate risk that targets in One Plan are not met during the low river flow period and a lower risk of this occurring for Option 2 on the basis that discharge at low river levels will be to land (reducing risks further).<br>Options 8 and 9 include sites in close proximity to coastal lakes, which are sensitive to and potentially impacted by land-based discharge.<br>Options 10 and 11 provide for the discharge of treated wastewater to the ocean. Environmental effects are minimised for these options on the basis that the appropriate treatment levels have been selected and the | 3 | 4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 5 |

| Objectives | Options Assessment | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | sensitivity of the receiving environment is low given it is a harsh environment, and has significant assimilative capacity providing significant dilution. . | | | | | | | | | | | |
| | Average Score | 4 | 4 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 4 | 5 |
| **3. Is sustainable, enduring, and resilient** | This assessment considers the ability of an option to achieve the standards and outcomes required in the face of significant natural hazards and climate change. The scoring also considers the sustainability and durability of infrastructure assets for the life of the consent (35 years).<br>Options with significant conveyance and/or large land areas have scored lower due to their greater vulnerability to climate change and natural hazards i.e. sea level rise and earthquakes. Climate change is predicted to result in higher sea levels and more wave-generated coastal erosion along with more frequent heavy rain events.<br>Options with large land areas will be sensitive to heavier rainfall due to reductions in the available water holding capacity, requiring a combination of additional storage and/or additional land to facilitate irrigation for the same or increased wastewater flows. Options with long conveyance pipelines will be vulnerable to climate change and natural disasters. Long conveyance is also more vulnerable to increased growth (beyond projected), resulting in the design capacity being exceeded and potential infrastructure failure.<br>In relation to the operation of ocean outfall (options 10 and 11), risks from outfall failure due to seismic events are considered low, however do need consideration. This will be accounted for through design in conjunction with wave and current effects associated with storm surge.<br>Enhanced treatment (Options 1 and 2) includes more complex and costly mechanical and electrical equipment which require on-going renewal and maintenance investment. Options with significant assets which are subject wear and tear are assessed to have low durability. Therefore, these options scored relatively well by comparison to options with higher risks associated with large areas of land and or pipeline. | 4 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 4 |
| **4. Contributes to improving the health and mauri of the Manawatū River** | The focus of this assessment is the mauri of the Manawatū River. Options 5, 10 and 11 have scored the highest on the basis the treated wastewater discharge will be removed completely from the Manawatū River. Options including large coastal land application areas will not impact on the Manawatū River.<br>Option 4 is scored lower than Option 5, because of the potential risk of irrigated wastewater infiltrating to the River. | 2 | 3 | 2 | 4 | 5 | 3 | 3 | 4 | 4 | 5 | 5 |
| **5. Takes an integrated approach to the management of the Manawatū Catchment including understanding cumulative effects** | This Objective is focused on potential cumulative effects for the entire catchment which in turn depends on actions undertaken by others outside the influence of Palmerston North City Council. On the basis of this external uncertainty and the fact that the final discharge location for a number of the options is unknown, it is considered inappropriate to score the options against this objective at this stage of the Project. | - | - | - | - | - | - | - | - | - | - | - |
| **6. Enhances people's use and enjoyment of the Manawatū River** | Recreational water quality standards can be met for all options including those with a river discharge. There are however differences between options in respect of the levels of achievement of the standards. The standards have the potential to influence recreational use of the river through the influence of public perception. As a result, those options which effectively eliminate discharges to the river are accorded the highest score. For options which discharge to the river, the score is a mix of the level of treatment provided and the extent to which discharge is removed from the river. Option 2 scores above option 1 because of the removal of wastewater discharge during the summer low flow period despite both options achieving similar very high levels of treatment. | 3 | 4 | 2 | 5 | 5 | 3 | 3 | 3 | 3 | 5 | 5 |

| Objectives | Options Assessment | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **7. Is affordable and cost effective** | Costs associated with each option have been assessed and scored in accordance with the Comparative Cost Assessment (CCA) prepared as part of this assessment process i.e. the same scores have been used. | 5 | 3 | 4 | 3 | 1 | 4 | 4 | 1 | 1 | 2 | 3 |
| **8. Minimises whole of life carbon emissions and optimises resource recovery** | | | | | | | | | | | | |
| Carbon Emissions | Options including carbon sequestration from trees on coastal land/soils score higher on the basis that they contribute meaningfully to reducing Council's organisational greenhouse gas emissions. Options 3 to 11 (inclusive) will continue to utilise aerated lagoons, and so will continue to have higher emissions compared to Options 1 and 2 which use alternative treatment processes with lower emissions. | 4 | 3 | 2 | 2 | 5 | 2 | 2 | 5 | 5 | 3 | 1 |
| Resource Recovery | This assessment has considered the extent to which an option provides opportunity for energy recovery, treated wastewater re-use and beneficial use of biosolids. Options 1 and 2 were given high scores on the basis that the enhanced treatment provides opportunities for enhanced energy production (for other use) and treated wastewater re-use due to the high quality and biosolids production (for re-use). A biosolids strategy provides the Council with an opportunity for resource recovery.<br>Options with aerated lagoons have lower scores due to the lower solids yield contributing to lower energy recovery opportunities.<br>Land application options provide for beneficial re-use of treated wastewater, due to the liquid and nutrient contributions to productive land use activities i.e. crops and so were given intermediate scores. | 5 | 5 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 1 |
| **9. Is innovative while being evidence based** | Treatment technology is the focus of this assessment, and options utilising current best practice in respect of treatment technology available in New Zealand were given the highest scores.<br>Options including large land areas, that are significantly larger than any existing operational facilities, are considered high risk in terms of operation and management of potential adverse effects ie the largest land application site in NZ is approximately 500ha, over two separate sites and pumice soils. Options with land areas exceeding 1,500ha, have scored relatively low on the basis that land-based irrigation at this scale has no precedent within New Zealand so is high risk.<br>Options 10 and 11, which require significant lengths of conveyance piping and multiple pump stations to discharge the treated wastewater to the ocean (over 34km) are considered well proven in a New Zealand context based on existing applications of this approach e.g. Timaru and Waimakariri. | 4 | 5 | 3 | 1 | 1 | 2 | 2 | 1 | 1 | 2 | 3 |
| **10. Facilitates long term growth and economic development** | While all options have been designed to cater for 35 years' growth (minimum) those options which could be adapted to provide a sub-regional scheme solution or can be easily expanded to accommodate more rapid growth have been given higher scores.<br>Options with large land areas that require conversion from a current high value land use to a cut and carry operation, have the potential to adversely impact regional economic activity and so are scored lower as a result. Options involving large areas of coastal land which would require conversion from livestock grazing to forestry have been scored slightly higher, although there is a risk of potential negative economic impact where current land use involves a higher value activity such as dairy farming.<br>Options with limited capacity (in respect of the receiving environment) to support ongoing increases in the discharge of the city's wastewater beyond 35 years have also been scored lower. Where there is the opportunity to improve treatment quality through plant upgrades, that are proven and affordable, such options have also been scored slightly higher. | 3 | 4 | 3 | 2 | 3 | 2 | 2 | 3 | 3 | 4 | 4 |

| Objectives | Options Assessment | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Options with significant conveyance infrastructure are likely to face capacity constraints which cannot be resolved until an alternative solution is provided i.e. additional pipeline or storage. | | | | | | | | | | | |
| **11. Is developed with the active engagement of the community and key stakeholders** | The BPO process has been based on a series of stakeholder and community engagement phases. It is not considered feasible to differentiate options based on this Objective given that all options have been included in each phase of the engagement process. | - | - | - | - | - | - | - | - | - | - | - |
| | **TOTAL SCORE (out of 55)** | 34 | 34 | 25 | 24 | 25 | 23 | 23 | 23 | 23 | 31 | 35 |

# 4 Overall Recommendation

The technical advisors recommend a scale of 1 to 5 is used to compare how well options align with the Project Objectives (refer Table 2). Those objectives where it is not possible to differentiate options have been excluded. For all other objectives the options have been scored on the degree to which the option aligns with the overall objective or sub-category. None of the options were considered to be fatally flawed. Technical advisors and Iwi have been involved in the assessment of all options against the Project Objectives.

Overall, the options with the highest level of treatment and therefore lowest impact on the Manawatū River and ocean receiving environments (Options 1, 2, 10 and 11), are ranked in the top 4 when assessed against the level of alignment with the Project Objectives. Options with significant land area in the fluvial soil areas (Options 4, 6, 7, 8 and 9) have ranked the lowest within the Project Objectives on the basis of their economic impact and technical and operational uncertainty.

Following the scoring assessment, an overall score for each option's alignment with all of the eight objectives was calculated. Based on this score the options were placed in rank order with the option having the highest alignment and highest score accorded the top rank. Options with equivalent scores were given equivalent ranking e.g. 8 and 10 equal.

Table 4 provides the overall scores and the ranking of the shortlisted options.

**Table 4 Summary of Options Ranking against Project Objectives**

| Option Description | Total Score | Ranking |
|---|---|---|
| R2 (b) (Level 4) | 34 | 3 |
| R2 (b) (75% DWF land): 760 ha. (Level 4) | 34 | 2 |
| Dual R+L (b) (75% DWF to land): 870 ha. (Level 2, TN=35) | 25 | 6 |
| L+R(a): 3760 ha. (Level 1) | 24 | 7 |
| L+R(b): 2570 ha. (Level 3, TN=10) | 25 | 5 |
| L+R(d-1) 80 m3/s trigger: 2000 ha. (Level 2, TN=35) | 23 | 10 |
| L+R(d-2) 62 m3/s trigger: 1640 ha. (Level 2, TN=35) | 23 | 10 |
| L+R(e-1) 80 m3/s trigger: 3640 ha. (Level 2, TN=35) | 23 | 8 |
| L+R(e-2) 62 m3/s trigger: 3010 ha. (Level 2, TN=35) | 23 | 8 |
| O+L: 1470 ha. (Level 1) | 31 | 4 |
| O no land (Level 1) | 35 | 1 |