



## Porirua City Residual Waste Management – Alternatives Assessment

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## Glossary

Term	Definition
Advanced thermal treatment (gasification)	A process in which waste products (including organic waste, plastics, and hazardous waste) are converted into gas, sometimes called syngas, through high temperature and controlled levels of oxygen.
Advanced thermal treatment (pyrolysis)	A thermal decomposition process that occurs in the absence of oxygen where waste materials are broken down into simpler molecules, producing gas, char, and a liquid known as pyrolytic oil or bio-oil. This process can significantly reduce the volume of the waste.
Aerobic	Processes that require the presence of oxygen, such as aerobic composting where microbes decompose organic matter into compost.
Anaerobic	Processes that occur in the absence of oxygen, such as anaerobic digestion where bacteria break down organic material into biogas (mainly methane and carbon dioxide) and digestate.
Autoclave	A pressure chamber used to sterilize equipment and other objects (in this context, it can also refer to a process that uses heat, steam and pressure to sterilise waste).
Digestate	The solid and liquid residuals that are the by-product of the anaerobic digestion of a biodegradable feedstock. Digestate can be used as a soil conditioner (additive to improve soils' physical properties).
Engineered landfill	A specially engineered site for the disposal of solid waste onto or into the land. These are designed to minimize the impact of waste on the environment and prevent the contamination of ground water.
Export of waste	The process by which waste is shipped from one region or country to another for further treatment, recycling, or disposal.
Homogeneous / homogenised waste	Waste feedstock of a similar waste type.
Incineration	A waste treatment process that involves the combustion of waste materials. This process converts the waste into ash, flue gas, and heat, which can be used to generate electricity.
Leachate	A liquid that has percolated through solid waste and has extracted, dissolved, or suspended materials in it. If not captured and treated, leachate has the potential to contaminate groundwater and surface water.
Lignin	A complex organic compound that is a significant component in the structure of plants. In the context of waste, it can interfere with processes like composting and anaerobic digestion due to its rigidity.
Mechanical biological treatment	A type of waste processing that combines both mechanical and biological treatment processes. The mechanical component sorts and processes the waste, while the biological treatment includes microbial activity to break down the organic portion of the waste.
Mechanical heat treatment	A process in which waste is treated using heat and mechanical processes to reduce its volume, change its physical properties and destroy or reduce its hazardous constituents.
Multi-criteria analysis (MCA)	A decision-making tool used to either prioritise or assess and rank multiple options considering several criteria, often used in environmental engineering and planning scenarios.
Municipal solid waste (MSW)	Waste from households and commercial properties and non-hazardous industrial waste.

Term	Definition
Ngāti Toa Rangatira (Ngāti Toa)	The Ngāti Toa are a Tainui iwi descended from the eponymous ancestor Toa Rangatira. The rohe of Ngāti Toa extends from the Whangaehu River south along the ranges to Turakirae. It then crosses Raukawa Moana (Cook Strait) to Marlborough and Nelson.
Refuse derived fuel	Fuel derived from a mix of non-hazardous waste materials that are unsuitable for direct recycling.
Sensitivity analysis	A systematic approach used to assess the impact of changes to variable criteria (i.e., weightings of each criterion can be adjusted higher or lower than others based on importance) on the outcomes of a model, such as a multi-criteria analysis.
Te Rūnanga O Toa Rangatira	The entity that represents Ngāti Toa Rangatira and manages their political and public interests.
Volatile organic compounds	Chemical compounds that easily become vapours or gases, often present in waste, especially organic waste, and can contribute to air pollution.
Waste Minimisation and Management Plan (WMMP)	Under the Waste Minimisation Act 2008, WMMPs are required to be adopted by Councils. The WMMP is a guiding document which identifies Council's vision, goals, objectives, targets and methods for achieving effective and efficient waste minimisation and management.

## Executive summary

Spicer Landfill is a significant Porirua City Council asset which provides residual waste disposal and recycling services to Porirua City, the Wellington region, and some areas beyond.

The Spicer Landfill is just one part of the waste management and minimisation system in Porirua City. The entire system enables the Porirua community to reduce and recycle unwanted materials (waste) where possible while providing for the safe disposal of residual waste. The focus of this study is on addressing the safe management of residual waste after all opportunities to reduce, recycle or recover waste have been exhausted.

The following process was used to complete this assessment of options for managing residual waste for Porirua City:

- 1 [Current situation](#) – a summary of the current policy framework and approach to residual waste management in Porirua City.
- 2 [Identification of potential technology approaches](#) – an overview of potential technology approaches that could be used to manage residual waste.
- 3 [Multi-criteria analysis of technology approaches](#) – an evaluation of the viability of each of the potential technology approaches to manage residual waste.
- 4 [Siting of technology approaches](#) – consideration of potential locations within Porirua City for the siting and establishment of the potential technology approaches.
- 5 [Detailed description of most viable options](#) – evaluation of the three most viable options for managing residual waste in Porirua City, determined via a combination of potential technology approach and siting considerations.
- 6 [Multi-criteria analysis of most viable options](#) – assessment of the three most viable options, including sensitivity analysis (whereby weightings of criteria for gate rate and objective for environment were adjusted) and considering iwi feedback relating to location.
- 7 [Conclusion and next steps](#) – recommendations for next steps for the Council.

Spicer Landfill provides waste disposal and recycling services to Porirua City, the Wellington region, and some areas beyond. It operates under four regional consents which are due to expire on 30 June 2030. Porirua City Council (the Council) needs to either obtain new resource consents to develop and operate the landfill beyond 2030 or implement a suitable alternative for managing residual waste.

As such, the Council engaged Tonkin + Taylor Ltd (T+T) to undertake a high-level review of alternative approaches and options for managing residual waste to demonstrate whether developing Spicer Landfill is the most appropriate option.

A critical starting point for this assessment was defining clear objectives to help inform the Council's decision-making process. These objectives stated that the preferred option should:

- 1 ensure that Porirua City residents and businesses have ongoing access to appropriate residual waste services.
- 2 deliver an affordable and cost effective/competitive residual waste service for Porirua City residents and businesses.
- 3 manage any environmental impacts and minimise emissions associated with residual waste services.

Criteria were developed for each objective and used in a multi-criteria analysis (MCA) framework to assess six technology approaches. These technology approaches were conventional incineration, advanced thermal treatment (gasification), advanced thermal treatment (pyrolysis), mechanical biological treatment (MBT), mechanical heat treatment (MHT), and engineered landfill.

Evaluating the technology approaches was completed in three stages:

- 1 The T+T team completed a preliminary analysis, noting key evidence and proposing a preliminary score for each technology approach.
- 2 Discussion involving T+T and the Council's project team on the preliminary scoring, to come to a consensus on the scoring.
- 3 Discussions involving Te Rūnanga O Toa Rangatira (Te Rūnanga), the Council's project team and T+T to finalise scoring of each of the technology approaches.

To assess the viability of these technology approaches for the Council, several site selection parameters were identified, followed by GIS analysis and mapping to identify potentially suitable sites within Porirua City. Existing landfills outside of the Porirua City area were also considered with the assumption that a transfer station within Porirua City would be required to maintain access for residents and businesses.

T+T's GIS analysis found that there were no sites within Porirua City of the appropriate size for a new engineered landfill development. This meant the engineered landfill approach only left the options of expanding Spicer Landfill or exporting waste outside of Porirua.

The analysis also concluded that there were not any general industrial zoned locations suitable for an MBT facility due to size and/or surrounding land use. It may be possible however to place an MBT facility in general rural zoned land, although this would require acquiring several land parcels.

Considering this analysis, three options (combining an approach and location) were defined for consideration in a second MCA assessment. These options were:

- 1 A new consent for the development of Spicer Landfill.
- 2 Export of waste to a landfill outside Porirua City.
- 3 MBT within Porirua City with access to landfill.

Following the definition and consensus on these three options, Te Rūnanga was consulted to help define parameters for cultural considerations to inform the assessment of the options alongside the results of the technology approaches analysis and location information.

The options were initially assessed with even weightings across the three objectives. The assessment of the three options, with even weightings across the three objectives resulted in expansion of Spicer Landfill scoring highest (2.32 out of a possible 3), then export of waste to a landfill outside Porirua City (2.2 out of a possible 3) and finally, MBT within Porirua City with access to a landfill for disposal of residual material scoring lowest (1.75 out of a possible 3).

Given the closeness of scores, a sensitivity analysis was undertaken with the Council to re-examine the viability of these options. The sensitivity analysis covered four scenarios as follows:

- 1 Double the weighting for objective 3 (environment), with the rest of the criteria weighted equally.
- 2 Treble the weighting for objective 3 (environment), with the rest of the criteria weighted equally.
- 3 Zero weighting for the criteria relating to gate rate (within the cost criteria), with the rest of the criteria weighted equally.
- 4 Abandoning the development of Spicer Landfill considered as an option.

Results of the sensitivity analysis are displayed in Table 0.1 below.

**Table 0.1: MCA scores and sensitivity analysis for the three options defined for consideration**

Option name	MCA score – no sensitivity factors applied	Sensitivity – double for objective 3	Sensitivity – treble for objective 3	Sensitivity – remove gate rate	Sensitivity – Spicer Landfill not re-consented by 2030
<b>New consent for Spicer Landfill</b>	2.32	2.18	2.09	2.10	2.03
<b>Export of waste to a landfill outside Porirua City</b>	2.20	2.15	2.12	2.40	2.20
<b>MBT within Porirua City with access to a landfill</b>	1.85	1.95	2.01	2.00	1.85

Based on both the MCA of technology approaches and of the three options, a preferred, two-phased approach was identified:

- 1 Phase 1 – management of waste from now until 2035: Re-consent Spicer Landfill to 2035.
- 2 Phase 2 – planning for beyond 2035: Scope regional solutions with neighbouring councils and waste management facilities.

This two-phased approach acknowledges that while an extension of consent for Spicer Landfill is the preferred option in this analysis, it is unlikely to provide a long-term solution. In light of this, providing for residual waste disposal for Porirua residents will be planned for and managed by the Council in the short-term. Any medium to long-term solution will likely be regional in nature.

To implement this two-phased approach, the Council will need to plan for a future programme of work that allows for phase 2 to be pursued while phase 1 is delivered.

The next step for the Council will be to decide on the way forward in accordance with legislative requirements and in alignment to their Waste Minimisation and Management Plan (WMMP).

## 1 Introduction and context

### 1.1 Project background

Spicer Landfill is a significant Porirua City Council asset which provides residual waste disposal and recycling services to Porirua City, the Wellington region, and some areas beyond.

The landfill is currently consented to operate until 30 June 2030 and has plans for capacity to enable acceptance of waste until then.

The Spicer Landfill is just one part of the waste management and minimisation system in Porirua City. The system includes:

- Information and education to encourage households and businesses to reduce the amount of waste that they produce and recycle what they can.
- Kerbside recycling and refuse collections for households.
- Recycling, resource recovery and green waste drop off at Spicer Landfill.
- Private sector green waste collections for households and businesses.
- Private sector recycling services for businesses.
- Food rescue services redistributing unwanted food.
- Second hand clothing and furniture stores.
- Commercial scrap metal recycling.

The entire waste management and minimisation system enables the Porirua community to reduce and recycle unwanted materials (waste) where possible while providing for the safe disposal of residual waste. The focus of this study is on addressing the safe management of residual waste after all opportunities to reduce, recycle or recover waste have been exhausted.

The Council's Long-Term Plan allows capital funds to build additional capacity up until 2050. However, a new resource consent is required to further develop Spicer Landfill to receive waste beyond 2030. This would need to be designed, consented, and partially constructed before 2030 if the site is to continue operating.

As part of the consenting process, the Council obtained legal advice relating to its obligations under the *Resource Management Act 1991* where Section 171(1)(b) requires "adequate consideration [of] alternative ... methods of undertaking the work".

Tonkin + Taylor (T+T) was engaged to undertake a high-level technology review of alternative approaches for managing residual waste (this assessment), to enable the Council to demonstrate whether expanding Spicer Landfill is appropriate given other available technologies. The assessment focuses on residual waste, i.e. materials remaining after waste reduction, recycling and resource recovery activities.

### 1.2 Objectives for residual waste management

A critical starting point for this project was the early definition of clear objectives that incorporated all the elements the Council needed to inform its decision-making process.

These objectives were developed at a staff workshop in October 2022 and further refined and finalised following discussions with Te Rūnanga. The finalised objectives and associated criteria are captured in Table 1.1.

**Table 1.1: Objectives and criteria for residual waste management assessment**

Objective	Requirements
The preferred option should ensure that Porirua City residents and businesses have ongoing access to appropriate residual waste services.	<ul style="list-style-type: none"> <li>• <b>Availability</b> – must be operational prior to the expiry of the current landfill consent, or before the current landfill cell reaches capacity, whichever occurs first. Capable of receiving minimum (current) residual waste of ~80,000 t/year. Must be able to manage current sludge demand or identify an alternative for sludge disposal.</li> <li>• <b>Operationally sound</b> – confidence that the options can be designed, constructed and operated reliably.</li> <li>• <b>Consenting risk</b> – must be likely to obtain consent to enable operations beyond the end of the current landfill consent period (June 2030) and then operate in compliance with consent.</li> <li>• <b>Resilience</b> – must be capable of continuing operation in the event of natural hazards e.g. earthquake or other disruptions (pandemic, economic).</li> <li>• <b>Flexibility</b> – potential to respond to current, signalled and potential future government policy intervention that may change the quantity or nature of residual waste materials requiring management.</li> </ul>
The preferred option should deliver an affordable and cost effective/competitive residual waste service for Porirua City residents and businesses.	<ul style="list-style-type: none"> <li>• <b>Indicative gate rate</b> – must be affordable for Porirua City residents and businesses and be competitive, to avoid diversion to other residual waste services and/or illegal dumping.</li> <li>• <b>Local capability to deliver</b> – the preferred option must be able to be operated locally. Design/construction should ideally be delivered by New Zealand organisations, supported by external specialists where relevant.</li> </ul>
The preferred option should manage any environmental impacts and minimise emissions associated with residual waste services.	<ul style="list-style-type: none"> <li>• <b>Direct environmental impacts</b> – must be acceptable, this includes air quality (odour, dust etc.), water quality (e.g. healthy harbour, local streams), noise and impact to land (terrestrial ecology).</li> <li>• <b>Greenhouse gas emissions (GHG)</b> –emissions arising from operations (landfill gas, plant and equipment), transport, offset, must be minimised (or equivalent/no worse than current on a per tonne basis)].</li> <li>• <b>Social impact</b> – odour, noise, traffic, visual, health/wellbeing must be minimised (or equivalent/no worse than current on a per tonne basis).</li> <li>• <b>Cultural impacts</b> – To be defined with iwi.</li> </ul>

### 1.3 Our approach

Our process to complete an assessment of options for managing residual waste makes use of the objectives detailed in Table 1.1. Key steps in the process were:

- 1 [Current situation](#) – a summary of the current policy framework and approach to residual waste management in Porirua City.
- 2 [Identification and evaluation of potential technology approaches](#) – an overview of potential technology approaches that could be used to manage residual waste. An evaluation of the viability of each of the potential technology approaches to manage residual waste.
- 3 [Siting of technology approaches](#) – consideration of potential locations within Porirua City for the siting and establishment of the potential technology approaches.
- 4 [Detailed description of most viable options](#) – evaluation of the three most viable options (approach and location) for managing residual waste in Porirua City.
- 5 [Multi-criteria analysis of most viable options](#) – assessment of the three most viable options, including sensitivity analysis and considering iwi feedback relating to location.
- 6 [Conclusion and next steps](#) – recommendations for next steps for the Council.

## 2 Current situation

### 2.1 National and regional policy context

The management of residual waste in Porirua City takes place within the context of national, regional and local policy as summarised below.

#### 2.1.1 Regional Waste Management and Minimisation Plan (2023-2029)

The Wellington Regional Waste Management and Minimisation Plan was reviewed and adopted in late 2023 and is built on the following key priority areas:

- Providing and supporting education initiatives within the Wellington region that focus on waste minimisation and responsible consumption.
- Supporting new and existing regional and local waste minimisation initiatives.
- Improving the ways we connect and collaborate across the region on waste management and minimisation initiatives.
- Ensuring appropriate kerbside services are in place for recycling and organic waste.
- Ensuring appropriate regional infrastructure is in place to meet our targets and objectives.
- Investigating ways to effectively manage and monitor cross-boundary and inter-regional waste flows.
- Investigating options for future disposal of residual waste and what this may look like in the long term.

#### 2.1.2 Aotearoa New Zealand Waste Strategy (2023)

The Te rautaki para Waste Strategy – getting rid of waste for a circular Aotearoa New Zealand<sup>1</sup> (New Zealand Waste Strategy), outlines a vision that commits New Zealand to a low-emissions, low-waste circular economy, by 2050. Phase 1 of the New Zealand Waste Strategy includes actions relating to circular management of products and materials as well as actions to reduce emissions from waste. The supporting targets for phase 1 also indicate the Government’s desire to reduce waste generation, disposal and associated emissions.

#### 2.1.3 Waste legislation

At the beginning of 2023, in response to the Transforming Recycling<sup>2</sup> consultation process, central Government announced a move to standardise kerbside recycling across the country. The announcement was followed by a gazette notice (developed under the *Waste Minimisation Act 2008*) in September 2023 which sets out the first tranche of performance standards<sup>3</sup> related to standardisation of materials collected for recycling at the kerbside. It has been signalled that further regulations will be developed which will make food scraps collection services available to households in all urban areas by 2030, although this could be delayed. The need for businesses to also separate food scraps from general waste by 2030, as signalled in the original announcement, is likely to be considered as part of the broader waste legislation review process.

<sup>1</sup> Ministry for the Environment (2023), *Aotearoa New Zealand Waste Strategy*, <https://environment.govt.nz/what-government-is-doing/areas-of-work/waste/aotearoa-new-zealand-waste-strategy/>, accessed 10 April 2024.

<sup>2</sup> Ministry for the Environment (2022), *Transforming Recycling*, <https://environment.govt.nz/assets/publications/Transforming-recycling-consultation-document.pdf>, accessed 10 April 2024.

<sup>3</sup> Ministry for the Environment (2023), *Standard Materials for Kerbside Collections Notice 2023 (Notice No. 1)*, <https://gazette.govt.nz/notice/id/2023-go4222>, accessed 10 April 2024.

The *Waste Minimisation Act 2008* includes provisions for a waste disposal levy, which is currently \$60/tonne and increasing to \$65/tonne from 1 July 2025.

Revenue from the waste disposal levy must be used to fund waste minimisation initiatives, with the Ministry for the Environment indicating a desire for a greater focus on improving resource recovery infrastructure. In addition to the waste levy funding received directly by councils, they are also able to apply for funding for larger projects through the Waste Minimisation Fund.

#### **2.1.4 Emissions Reduction Plan (2022)**

The Aotearoa Emissions Reduction Plan was released in 2022 and is a mechanism to allow New Zealand to prepare for, and adapt to, the effects of climate change, transitioning towards a more resilient low emissions economy. This plan sets out policies and strategies for the decarbonisation of every sector. In terms of waste, organic waste is a key focus area at both a household and business level, alongside exploration of bans or limits for the diversion of organics from landfill.

#### **2.1.5 Resource Management Act (1991)**

The *Resource Management Act 1991* promotes sustainable management of natural and physical resources. Although it does not specifically define 'waste', it addresses waste management and minimisation through controls on the environmental effects of waste management. In early 2024, the Government started working through a reform of resource management law in New Zealand, including a proposed fast track process for nationally or regionally significant infrastructure.

## **2.2 Current management of residual waste in Porirua City**

Spicer Landfill is located at the southern end of Broken Hill Road, Porirua. It is a Class 1 landfill that accepts approximately 80,000 tonnes of residual waste per annum. There is a refuse transfer station and green waste drop off area accessible by the public, Trash Palace second-hand shop and a recycling station located opposite Trash Palace.

Spicer Landfill is currently filling in Stage 2 of its multi-stage development. Stage 1 comprises the old, unlined landfill. Stage 2 was constructed with a landfill liner over the top of Stage 1 following Council approval in 2009. The filling of Stage 2 commenced late 2012.

The landfill has a leachate collection system capturing leachate from stages 1 and 2 in a lined leachate pond at the toe of the landfill. This is then piped to the Porirua Wastewater Treatment Plant.

The overlay liner used in Stage 2 was designed to improve the capture of leachate and provides a preferential path for it into the Stage 2 leachate system. It also reduces surface water infiltration into the old Stage 1 landfill, minimising the potential for long-term discharge of leachate into the ground.

Landfill gas is extracted for incineration at the site's landfill gas flare. The gas extraction system has been progressively extended as Stage 2 was developed, with introduction of new wells and lateral gas collectors.

An upgrade of the stormwater system was completed in May 2016 to provide separation of clean water, which is discharged directly to the natural waterway (Mitchell Stream), while directing silt laden water through the sediment retention pond for treatment prior to discharge.

There is approximately 550,000 cubic metres of airspace remaining within Stage 2 comprising three filling phases which are expected to reach capacity by 2027-28.

As an immediate solution to Porirua City's ongoing requirement for waste disposal, a new refuse disposal cell at Spicer Landfill needs to be developed and operational by mid-2026 to allow a managed transition from filling within the current cell.

### 2.3 Waste characteristics

As a Class 1 landfill, Spicer Landfill has resource consents to accept general domestic and commercial waste, but restrictions apply to some other types of waste. The waste acceptance criteria for the landfill (available on the [Council's website](#)) is determined by the Council (except for the sewage sludge moisture and mixing limits which are set out in the consents). The criteria sets out what is:

- **Acceptable** – includes general domestic and commercial waste and other waste compliant with the Spicer Landfill waste acceptance criteria that doesn't require special disposal.
- **Prohibited/unacceptable** – includes liquid waste and waste that does not comply with the Spicer Landfill waste acceptance criteria.
- **Special disposal waste** – includes waste which is acceptable but which due to its physical, and or chemical nature, requires specific disposal management such as sewage sludge, and other sludges, asbestos containing materials, animal carcasses, green wastes, used tyres and clean fill.

## 3 Identification of potential technology approaches

### 3.1 Overview

Residual waste refers to mixed waste which cannot be reused or recycled. Upstream recycling is important to remove materials which are not suitable for residual waste treatment and those materials which have a market value, e.g. metals, glass, concrete. Capturing these types of materials at source allows for the value of these materials to be realised.

Pre-processing requirements for several of the technology approaches listed require the removal of materials unsuitable for disposal or processing. Removal of these materials before they end up as part of the residual waste stream ensures efficiency of the technology application for residual waste treatment and/or avoids damage to process equipment.

In addition to any pre-treatment immediately prior to processing or disposal, we have assumed a continuation and ongoing development of the upstream waste minimisation and resource recovery activities are in place for all options considered in this assessment. This comprises:

- Promotion of reusable items – e.g. coffee cups, shopping bags, bottles.
- Comprehensive kerbside and bulk drop off recycling service for households.
- Comprehensive at premise (commercial service) and bulk drop off recycling service for businesses.
- Comprehensive commercial hazardous waste management services for businesses.
- Drop off service for bulky recyclables, garden waste, reusable items, e-waste and household hazardous waste.

When thinking about the different options suitable for residual waste management it is important to consider them with regards to the residual waste management objectives. [Section 1.2](#) outlined the objectives and the relevant criteria reflecting each objective. These criteria formed the basis of our multi-criteria analysis (MCA) of options.

The approach adopted for this assessment has been to identify and evaluate potential technology approaches for residual waste management. Once the options have been identified, potential locations (in Porirua City and elsewhere) have been evaluated. The focus of Section 3 of this report is on residual waste management approaches only.

The residual waste management approaches considered are listed below, summarised in sections 3.2 to 3.8, with additional detail in **Appendix A**.

- [Conventional incineration](#).
- [Advanced thermal treatment – gasification](#).
- [Advanced thermal treatment – pyrolysis](#).
- [Mechanical biological treatment \(MBT\)](#).
- [Mechanical heat treatment \(MHT\)](#).
- [Engineered landfill](#).

### 3.2 Conventional incineration (mass burn)<sup>4</sup>

With this technology, waste is treated by conventional incineration, which involves combustion and generally includes energy recovery.

Waste inputs for incineration include domestic, commercial and combustible special wastes only (for example dewatered sewage sludge). Special wastes such as asbestos containing materials are not suitable.

Pre-processing is limited to the removal of non-combustible materials prior to incineration and any asbestos containing materials.

Incineration involves the combustion of waste through the introduction of oxygen with systems designed to provide sufficient airflow to allow for efficient combustion. Combustion temperatures typically reach more than 850°C. Modern incineration facilities are fully compliant with air pollution controls (EU/USEPA compliant).

By-products from conventional incineration include energy production and bottom ash:

- **Energy recovery** – most facilities convert energy into electricity which is distributed and sold via power networks. Other facilities produce heat which can be used for district heating or providing industrial heat (to locations local to the facility). Some facilities are set up to produce combined heat and power, which allows for varying power demand and offers lower carbon emissions per unit of energy utilised in comparison to a heat or power only plant.
- **Bottom ash** – is the non-combustible material remaining after combustion. Bottom ash consists of approximately 20-30% of the original waste weight and 10% by volume. Some recovery of materials from bottom ash can occur through additional processing, e.g. metals. Bottom ash can also be used as aggregate and backfill material, however, further processing would be required, alongside identification of markets and approval for use. Bottom ash is not always used in this way and in many cases bottom ash is placed in dedicated ash landfills.

Outputs unable to be recovered and not allowed to be discharged to air include fly-ash, spent lime/bicarbonate and spent activated carbon. These airborne products of the combustion process require capture and appropriate management as they are classified as hazardous and require stabilisation and appropriate disposal through multiple processes.

Conventional incineration is widely used internationally, however, there are currently no plants in New Zealand. Applications tend to be larger scale facilities (250,000 tonnes per year or more) which benefit from economies of scale (lower per unit cost for operation) reflecting the high cost of air pollution control.

It should be noted that the combustion of mixed waste results in the emission of fossil derived CO<sub>2</sub> from plastics, rubber and a range of other synthetic materials. The treatment of CO<sub>2</sub> emissions from incineration or other thermal conversion processes in the New Zealand Emissions Trading Scheme (NZ ETS) is not clear at the time of writing. It is possible however that emissions of this type will ultimately come under the NZ ETS.

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<sup>4</sup> Department for Environment Food & Rural Affairs (2013), *Incineration of Municipal Solid Waste*, [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/221036/pb13889-incineration-municipal-waste.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/221036/pb13889-incineration-municipal-waste.pdf), accessed 10 April 2024.

### 3.3 Advanced thermal treatment (gasification)<sup>5,6</sup>

Gasification is the process where waste thermally decomposes in an oxygen limited atmosphere with the aim of using the secondary products produced to generate energy.

Waste inputs for gasification include domestic waste, commercial waste and some combustible special waste streams. Some special wastes are not suitable e.g. asbestos containing materials. The process generally operates more consistently if the waste feedstock is of a similar waste type (homogenous).

Pre-processing of waste prior to gasification is important and may include:

- Production of refuse derived fuel (RDF) from offsite processing, or processing of incoming mixed waste through a materials recovery facility.
- Mechanical processes to remove unsuitable material (non-combustible materials, bulky items).
- Drying of higher moisture waste streams.
- Homogenous feedstock to feed the gasifier.

The gasification process works by exposing the waste to partial oxidation, which produces a synthetic gas (syngas) which can be autothermal (self-sustaining). Gasification requires temperatures around 650°C (varying between 400°C and over 1,000°C). Recent gasification technologies have adopted a plasma (electric) arc at extremely high temperatures to gasify the waste. This produces a higher quality syngas with reduced contaminants.

By-products created through gasification include:

- Syngas, which contains carbon monoxide, hydrogen and methane.
- Energy, where most facilities have a secondary combustion chamber where the syngas is burnt for energy recovery through a steam circuit.
- Bottom ash, a solid non-combustible residue which contains relatively low levels of carbon and will ultimately require disposal.

Gasification is widely used across North America, Europe and Japan, with some applications in the United Kingdom. There are currently no gasification plants for mixed waste in New Zealand. It is worth noting that mixed waste gasification has a limited track record and are generally smaller in scale (typically capacity 50,000 – 250,000 tonnes per annum<sup>7</sup>), compared with single stream gasification of materials, e.g. plastics, wood.

### 3.4 Advanced thermal treatment (pyrolysis)<sup>5</sup>

Pyrolysis is the process where waste is thermally heated in the absence of oxygen. The targeted outputs are pyrolysis oil and/or char (carbon).

Waste inputs for pyrolysis include domestic waste, commercial waste and some combustible special waste streams. Some special wastes are not suitable, for example asbestos containing materials. The process generally operates more consistently if there is homogenous feedstock.

<sup>5</sup> Department for Environment Food & Rural Affairs (2013), *Advanced Thermal Treatment of Municipal Solid Waste*, [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/221035/pb13888-thermal-treatment-waste.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/221035/pb13888-thermal-treatment-waste.pdf), accessed 10 April 2024.

<sup>6</sup> Chartered Institution of Wastes Management, *Gasification*, <https://www.ciwm.co.uk/ciwm/knowledge/gasification.aspx>, accessed 10 April 2024.

<sup>7</sup> Sustainability Victoria (2018), *Resource Recovery Technology Guide*. [Guide-Waste-Resource-Recovery-Technology-Guide.pdf](#), accessed 22 October 2024.

Pre-processing of input materials is required and may include:

- Production of RDF from offsite processing, or processing of incoming mixed waste through a materials recovery facility.
- Drying of higher moisture waste streams.
- Removal of inert materials.
- The creation of a homogeneous feedstock.

Pyrolysis in general follows a batch process, thermally degrading the waste in the absence of oxygen. An external heat source is required, unlike gasification. Temperatures for mixed waste range between 300°C to 850°C.

By-products for use include:

- Syngas, which is a mixture of gases including volatile organic carbons. A proportion of which can be condensed to produce oils, waxes and tars. Outlets for products will depend on the input materials stream and end product specifications.
- A solid residue (char) which is a mixture of non-combustible materials and carbon which requires disposal.
- Any remaining volatile organic carbons which are not converted to useful products, which would require disposal.

Application of pyrolysis is more limited than non-advanced thermal treatment technologies and is more commonly applied to single waste streams e.g. wood, tyres and plastics. Smaller scale applications (typically capacity 10,000-100,000 tonnes per annum<sup>8</sup>) could provide for more local/integrated waste management needs and potentially make it easier for identification of local markets for any of the heat generated. There are currently no pyrolysis plants for mixed waste in New Zealand.

### 3.5 Mechanical biological treatment<sup>9,10</sup>

Mechanical biological treatment (MBT) is used to define an integrated system for several mechanical and biological processes, found in other waste management facilities, e.g. materials recovery/recycling facilities, composting or anaerobic digestion plants.

Waste inputs for MBT include domestic, commercial and some special wastes which includes dewatered sewage sludge (for the organic processing component).

Pre-processing for MBT plants includes mechanical separation techniques to remove large items. This can involve screening (the removal of larger pieces of waste), magnetic separation (removal of ferrous metals), eddy current separation (removal of non-ferrous metals), optical sorting (separation of certain types of plastic), and air classification (removal of light materials such as paper). As for the other processes noted here, MBT is generally applied to a mixed waste stream where recycling services are available and in some cases with a separate organic waste collection.

<sup>8</sup> Sustainability Victoria (2018), *Resource Recovery Technology Guide*. [Guide-Waste-Resource-Recovery-Technology-Guide.pdf](#), accessed 22 October 2024.

<sup>9</sup> Chartered Institution of Wastes Management, *Mechanical Biological Treatment*, <https://www.ciwm.co.uk/ciwm/knowledge/mechanical-biological-treatment.aspx?WebsiteKey=4a155547-1b67-492b-91d6-2f034eab56ba>, accessed 10 April 2024.

<sup>10</sup> Department for Environment Food & Rural Affairs (2013), *Mechanical Biological Treatment of Municipal Solid Waste*, [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/221039/pb13890-treatment-solid-waste.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/221039/pb13890-treatment-solid-waste.pdf), accessed 10 April 2024.

The biological component of the process may employ aerobic (e.g., composting) or anaerobic processing. The result is stabilisation and volume reduction of the degradable materials. Aerobic processing produces heat (because of microbial action) which dries the material being processed (bio-drying). Anaerobic processes (where there is an absence of oxygen) produce biogas that can be utilised for process heating.

Mechanical separation of recyclable materials is made easier, leaving stabilised organic and fibre waste available for use or further processing.

By-products created through the MBT process include:

- Digestate (from anaerobic processing) which may be disposed to landfill or further processed through composting before use as a low-grade soil amendment.
- A compost like output which may be disposed to landfill or require maturation before use as a low-grade soil amendment.
- Low grade recyclable materials which may be suitable for recycling if markets can be identified. Otherwise, this material will require disposal at landfill.
- Stabilised and dried organics may be suitable for use as an RDF. Noting that there is currently no market for RDF within New Zealand, this by-product could be deemed a rejected output from processing.

MBT is widely used internationally, particularly in Europe including Germany, Austria, Italy, Switzerland, the Netherlands and the United Kingdom. MBT is not however used in New Zealand and processing internationally is dominated by larger scale facilities (100,000 tonnes per year or more).

### 3.6 Mechanical heat treatment<sup>11</sup>

Mechanical heat treatment (MHT) uses both mechanical and thermal technology (steam and/or pressure) to treat waste. The MHT process enables mixed waste separation focussing on capturing materials in the mixed waste stream for recycling and/or recovery and sanitises/stabilises any waste.

Waste inputs for MHT include domestic, commercial and some special wastes. Some special wastes (for example dewatered sewage sludge and contaminated soil) may be accepted for processing. Asbestos containing materials are likely to be removed prior to any MHT process and sent for appropriate disposal.

Pre-processing for MHT includes mechanical separation techniques to remove large items. As for the other processes noted here, MHT is generally applied to a mixed waste stream where recycling services are available and in some cases with organic waste collection.

The autoclave approach (batch processing) uses a pressure vessel to direct steam to treat the waste at a constant temperature and pressure. Autoclave can be applied as a pre-treatment process to pasteurise, clean and break down organic matter including lignin structures (complex organic compounds that gives plants their rigidity and can be difficult to breakdown). Mechanical separation of recyclable materials is then made easier, leaving stabilised organic and fibre waste available for onward biological processing or energy recovery. There are also heat treatment systems under atmospheric pressure, often through a rotating vessel that agitates and moves the waste as it is heated. This arrangement allows for continuous processing.

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<sup>11</sup> Department for Environment Food & Rural Affairs (2013), *Mechanical Heat Treatment of Municipal Solid Waste*. [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/221040/pb13891-heat-treatment-waste.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/221040/pb13891-heat-treatment-waste.pdf), accessed 10 April 2024.

By-products created from MHT vary depending on facility design, but can include:

- Recyclables for onward markets (for example glass, metals and plastics).
- Plastics which will be low-grade, suitable markets may not be available.
- Oversize or bulky items removed prior to processing.
- Stabilised fibre (paper, card, textiles) and organic material (low grade, known as floc):
  - The stabilised material is sometimes marketed as RDF.
  - This material may also be used as a feedstock for biological processing or a low-grade soil amendment for land rehabilitation.

MHT is used across the United Kingdom, United States of America and Europe including other countries internationally. Their typical capacity is 75,000-300,000 tonnes per annum<sup>12</sup>. There are currently no MHT plants in operation in New Zealand.

### 3.7 Engineered landfill<sup>13</sup>

Class 1 landfills, or engineered landfills (which includes Spicer Landfill), are designed to accept municipal solid waste (MSW)<sup>14</sup>, which includes waste from households, general commercial activity, construction and demolition waste, some industrial wastes, contaminated soils and non-hazardous industrial waste. Hazardous waste generally needs to be disposed of in a specified area at a Class 1 landfill and may require stabilisation prior to disposal.

Pre-processing requirements include the removal/non-acceptance or pre-treatment of unsuitable materials for landfill. For example, asbestos containing materials which usually requires a permit for disposal and appropriate containment prior to disposal and pre-treatment of highly contaminated materials would be removed at this stage.

A modern Class 1 landfill requires the following minimum components:

- An assessment of siting constraints, considering all factors, aimed at achieving a high level of containment.
- Engineered environmental protection using a liner and leachate collection system and an appropriate cap.
- Landfill gas management.
- Active site management including compaction and daily cover of input waste materials.

By-products from a fully lined landfill include:

- Gas, which is typically captured through a landfill gas collection system. Landfill gas is either flared, in some cases with heat recovery and/or used for power generation.
- Leachate, which requires treatment at either a wastewater treatment plant or a dedicated leachate treatment system.

Fully engineered landfills, with gas capture and power production are common in New Zealand (examples include Redvale Landfill in Auckland and the Southern and Silverstream landfills in the Wellington region) and are also common internationally. Large, engineered landfills typically have

<sup>12</sup> Sustainability Victoria (2018), *Resource Recovery Technology Guide*. [Guide-Waste-Resource-Recovery-Technology-Guide.pdf](#), accessed 22 October 2024.

<sup>13</sup> WasteMINZ (2018), *Technical Guidelines for Disposal to Land*. [Technical Guidelines for Disposal to Land \(wasteminz.org.nz\)](#), accessed: 10 April 2024.

<sup>14</sup> Any non-hazardous, solid waste from household, commercial and/or industrial sources. It includes putrescible waste, garden waste, biosolids, and clinical and related waste sterilised to a standard acceptable to the Ministry of Health.

capacity to receive more than 100,000 tonnes of waste per annum<sup>15</sup>, however, can be scaled up and down to suit available land and other site conditions. Additionally, engineered landfills have flexibility to accept surge loads of waste, such as following disaster events.

### 3.8 Summary of technology approaches

The technology approaches discussed in sections 3.2 to 3.7 are summarised in Table 3.1. The engineered landfill approach is the only approach that accepts all waste streams currently disposed at Spicer Landfill, e.g. concrete, contaminated soils and asbestos containing materials. All other approaches have by-products and/or reject materials that are likely to require pretreatment and/or disposal to an engineered landfill.

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<sup>15</sup> Department of Climate Change, Energy, the Environment and Water (2013). *Australia's waste and resource recovery infrastructure*. <https://www.dceew.gov.au/environment/protection/waste/publications/national-waste-reports/2013/infrastructure> (accessed 22 October 2024).

**Table 3.1: Technology summary by attribute**

Technology	Input material	Pre-processing requirements	By-products	Reject materials	Onward processing required	Typical capacity (TPA) <sup>16</sup>	Technology applications
Conventional incineration	MSW	✓	Bottom ash Energy – heat and/or power	Bottom ash Air pollution residues (hazardous)	Processing of bottom ash for use (if there is a market) or disposal at an engineered landfill. Stabilisation of air pollution residues prior to disposal at an engineered landfill. Energy production (where not part of the facility).	50,000 – 400,000 (largest plants are 1 million+)	Internationally generally larger scale
Gasification	MSW or specific waste streams (plastics, wood)	✓	Syngas Energy recovery	Ash (solid)	Processing of ash (solid) for use (if there is a market) or disposal at an engineered landfill. Energy production from syngas. Stabilisation of air pollution residues.	50,000 – 250,000	Internationally
Pyrolysis	MSW or specific waste streams (plastics, wood)	✓	Syngas (less than gasification) Char (solid) and pyrolysis oil (subject to outlets)	Char (solid)	Processing of char (solid) for use (if there is a market) or disposal at an engineered landfill. Energy production from syngas. Stabilisation of air pollution residues prior to disposal at an engineered landfill.	10,000-100,000	Internationally

<sup>16</sup> Sustainability Victoria (2018), *Resource Recovery Technology Guide*. [Guide-Waste-Resource-Recovery-Technology-Guide.pdf](#), accessed 22 October 2024.

Technology	Input material	Pre-processing requirements	By-products	Reject materials	Onward processing required	Typical capacity (TPA) <sup>16</sup>	Technology applications
MBT	MSW and source separated organics	✓	Recyclables, biogas, digestate, RDF, low grade compost (all subject to outlets)	Low grade soil conditioner (additive to improve soils' physical properties).	Where there's no market, landfill will be required.	50,000-250,000	Internationally
MHT	MSW	✓	Recyclables, RDF (subject to outlets), floc/fibre	RDF and low-grade soil amendment.	Composting/ anaerobic digestion. Where there's no market, landfill will be required.	75,000-300,000	Internationally
Engineered landfill	MSW and contaminated soils.	✘	Gas used for energy recovery	Gas (when flared) Leachate	Wastewater treatment plant.	100,000	New Zealand and internationally

Note: Some materials such as potentially hazardous wastes or asbestos containing materials will require pre-treatment and/or central handling.

## 4 Multi-criteria analysis of technology approaches

### 4.1 Assessment of technology approaches

The technology approaches set out in [Section 3](#) were evaluated using a multi criteria analysis (MCA) that was designed using the project objectives and criteria set out in [Section 1.2](#). For each of the criteria, a four-point graduated scale was developed to guide scoring (Appendix B).

Weightings were initially applied evenly across all criteria, with no other variations considered. However, in later discussions with the Council, this was amended to include two additional variations for analysis. These are:

- Where the gate rate was weighted zero and the rest of the criteria were weighted equally.
- Where the weighting for objective 3 (environment) was doubled, and the rest of the criteria were weighted equally.

Evaluating the various technology approaches was completed in several stages. In all cases the emphasis was on using available evidence to develop a consensus view on the scoring of each approach against the MCA criteria. This involved:

- The T+T team completing preliminary analysis, noting key evidence and proposing a preliminary score for each approach against each of the criteria.
- Discussions between T+T and the Council's project team on the preliminary scoring and coming to a consensus on the scoring. This provided an updated preliminary score for each of the technology approaches.
- Discussions involving Te Rūnanga, the Council project team and T+T to finalise scoring of each of the residual waste management approaches. This provided scores for each of the residual waste management approaches.

In the discussions with the Council and Te Rūnanga it became clear that in the absence of a specific location it was difficult to comment on the cultural impacts of a residual waste management approach. The following additional points were raised and discussed:

- It would be viewed as culturally inappropriate to transport waste and/or soil (whenua) from one iwi rohe to another. As such, it would be preferable to manage waste within the region, and for and soil that is excavated to be kept within the region too.
- Protecting the catchment of the harbour and the coastal environment is paramount. The estuaries and waterways of the region are culturally and environmentally significant.
- There are several sites of cultural significance in the area, and once technology approaches and possible locations are identified, Te Rūnanga is open to discussing specific sites of significance – both mapped and unmapped.
- Areas to the east and inland are likely to be preferable as a location for residual waste management activity.
- It would be best for a cultural lens to be placed over each of the other criteria.

This was the approach adopted, as noted above, with Te Rūnanga providing comment on the assessment of options against all the criteria.

Following this discussion, it was decided to exclude the cultural impacts criteria from the MCA scoring of residual waste management approaches and instead assess cultural impacts when considering a specific location.

## 4.2 Preferred technology approaches

Table 4.1 displays the results of the MCA, in order of ranking. Appendix C shows the full results table. The highest score attainable was three, the lowest score attainable was zero.

Importantly, the scores presented below should not define a preferred option. Rather the scores indicate which approaches are likely to deliver more effectively across the objectives for residual waste management.

**Table 4.1: Residual waste management approaches – MCA results**

Option name	Description	Weighting – all criteria equal	Weighting – gate rate removed	Weighting – objective 3 (environment) doubled
Engineered landfill	Class 1 landfills, or engineered landfills (which includes Spicer Landfill), are designed to accept MSW.	2.50	2.30	2.54
MBT	MBT is used to define an integrated system for several mechanical and biological processes, found in other waste management facilities.	1.80	1.60	1.85
MHT	MHT uses mechanical and thermal technology (steam and/or pressure) to treat waste.	1.60	1.50	1.69
Incineration	Conventional incineration involves the thermal treatment of waste and generally includes energy recovery.	1.50	1.40	1.54
Advanced thermal treatment - gasification	Gasification is the process by which waste thermally decomposes in an oxygen limited atmosphere with the aim of using the secondary products produced to generate energy.	1.30	1.60	1.85
Advanced thermal treatment - pyrolysis	Pyrolysis is the process by which waste is thermally heated in the absence of oxygen. The targeted outputs are pyrolysis oil and /or char (carbon).	1.30	1.20	1.46

Based on the assessment summarised in Table 4.1, the option most likely to achieve the objectives for the management of residual waste from Porirua City is engineered landfill. MBT is also considered a potential approach, combined with an engineered landfill. Landfill is required to accept waste materials unsuitable for treatment and residual materials from the treatment process that cannot be reused.

## 5 Siting of technology approaches

As an alternative to the continued operation of Spicer Landfill, the Council has considered the option of establishing a new engineered landfill and/or a MBT facility in another part of Porirua City. This process involved the identification of several site selection parameters to assess the potential locations and a GIS analysis to identify potentially suitable sites.

This section summarises the process undertaken to do this, including the assessment of the alternative sites and the requirements which would determine the suitability of any proposed site. In addition to considering potential locations within Porirua City we have considered existing landfill sites outside of the city.

### 5.1 Identified site selection parameters

Several key factors needed to be considered in the site selection process for a new residual waste facility (MBT or landfill) and associated ancillary facilities. These included:

- A site large enough to provide for:
  - A landfill and ancillary activities and enable security of operation for the landfill into the future (more than 30 hectares).
  - An MBT facility and ancillary activities (around 10 hectares).
- A site that is readily accessible from the state highway network to enable suitable access.
- A site where the underlying geology was workable and did not present any fatal flaws for a new landfill (MBT is less reliant on geology as plants are constructed on a hardstand).
- Sites and areas of significance to Māori and additional Ngāti Toa cultural significance.
- Other parameters:
  - Avoiding other sites of significance: historic areas, outstanding natural landscapes etc.
  - Avoiding significant hazards: coastal and inland flood, tsunami, earthquake hazard fault rupture zone.
  - Avoiding areas of identified ecological importance.
  - Infrastructure – needs a buffer distance from the national grid and a gas transmission pipeline corridor of 100 metres.
  - Being aware of future hazards from sea level rise.
- Planning overlays and zones, particularly to avoid sites that might be within areas of archaeological, or ecological significance as identified through planning documents.

### 5.2 GIS analysis

Based on the key factors identified above, a geographical information system (GIS) mapping exercise was undertaken to identify areas which may be suitable for the establishment of a new landfill. The data layers and the parameters that were applied are listed in the sub-sections below. The data came from the following sources:

- Proposed Porirua District Plan: Any new landfilling facility would likely require consent under this plan. Therefore, the zoning and overlays of the plan with relevant analysis were considered appropriate to use.
- Ngāti Toa (excluding locations on the western side of the district).
- Department of Conservation.
- Land Information New Zealand.
- Greater Wellington Regional Council.

### 5.2.1 Zoning

Based on the purpose, objectives and policies in the Proposed Porirua District Plan, the appropriate zones for the development of a landfill are within the rural, industrial or rural industrial zone. In addition, a 1-kilometre buffer area was applied to the outer boundary of any residential zones, to ensure an appropriate distance from residential areas. All other zones were excluded from the GIS analysis.

### 5.2.2 Natural hazards

The natural hazard layers identified in the Proposed Porirua District Plan were used to exclude areas that are subject to potential natural hazards in the city. This included the earthquake hazard fault rupture zone, tsunami hazard 100 year – 1000 year, current and future coastal erosion hazard and the flood hazard: stream corridor, overland flow and ponding.

### 5.2.3 Infrastructure

Locating a landfill in the vicinity of infrastructure facilities can affect the efficient management and use of this existing infrastructure. Conversely, constraints on work around such infrastructure can affect the development and operation of the landfill. As such, the gas transmission pipeline corridor and the national grid corridor, and the appropriate buffer distances, were excluded from potential landfill locations.

### 5.2.4 Sites of significance and heritage

The sites and areas of significance to Māori and historic heritage site extent and setting (as identified in the Proposed Porirua District Plan) were also excluded from the potential landfill locations.

### 5.2.5 Natural areas

Any outstanding natural features and landscapes, and significant natural areas identified in the proposed plan, were excluded from the potential landfill locations.

In addition, reserves that are administered by the Department of Conservation gazetted for specified purposes under the *Reserves Act 1977* were excluded. These are subject to additional approvals and notification processes. These areas have been excluded, along with the Department of Conservation covenant areas, reserves and public conservation areas.

The river name lines dataset from Land Information New Zealand was used to exclude areas where a significant body of water was located. A small buffer of 10 metres to those areas was applied. This was for the purposes of avoiding the requirements of damming, diversion or reclamation of riverbeds.

### 5.2.6 Access

As identified in the key factors above, accessibility is essential for the operation of a landfill. A 5-kilometre maximum proximity distance was applied to the state highways within Porirua City to provide appropriate access to the landfill. The purpose of this was to exclude any land that was further than 5-kilometres from a state highway as it would result in a site that was difficult to access and could generate adverse traffic effects by sending heavy vehicles along local roads for long distances.

### 5.2.7 Topography

The light detection and ranging (LiDAR) grid was used from the Greater Wellington Regional Council dataset to derive the slopes that were steeper than 26 degrees (1V:2H). These slopes were then

excluded, due to landfill design constraints and costs associated with designing landfills to these topographies.

### 5.2.8 GIS analysis summary output

We applied the Proposed Porirua District Plan (rather than the Operative District Plan) as it is the most up to date and future focused, containing zones such as the ‘future urban zone. Figure 5.1 displays the available locations based on these parameters, and maps attached in Appendix D identify the relevant constraints grouped by theme. These constraints are explained below.

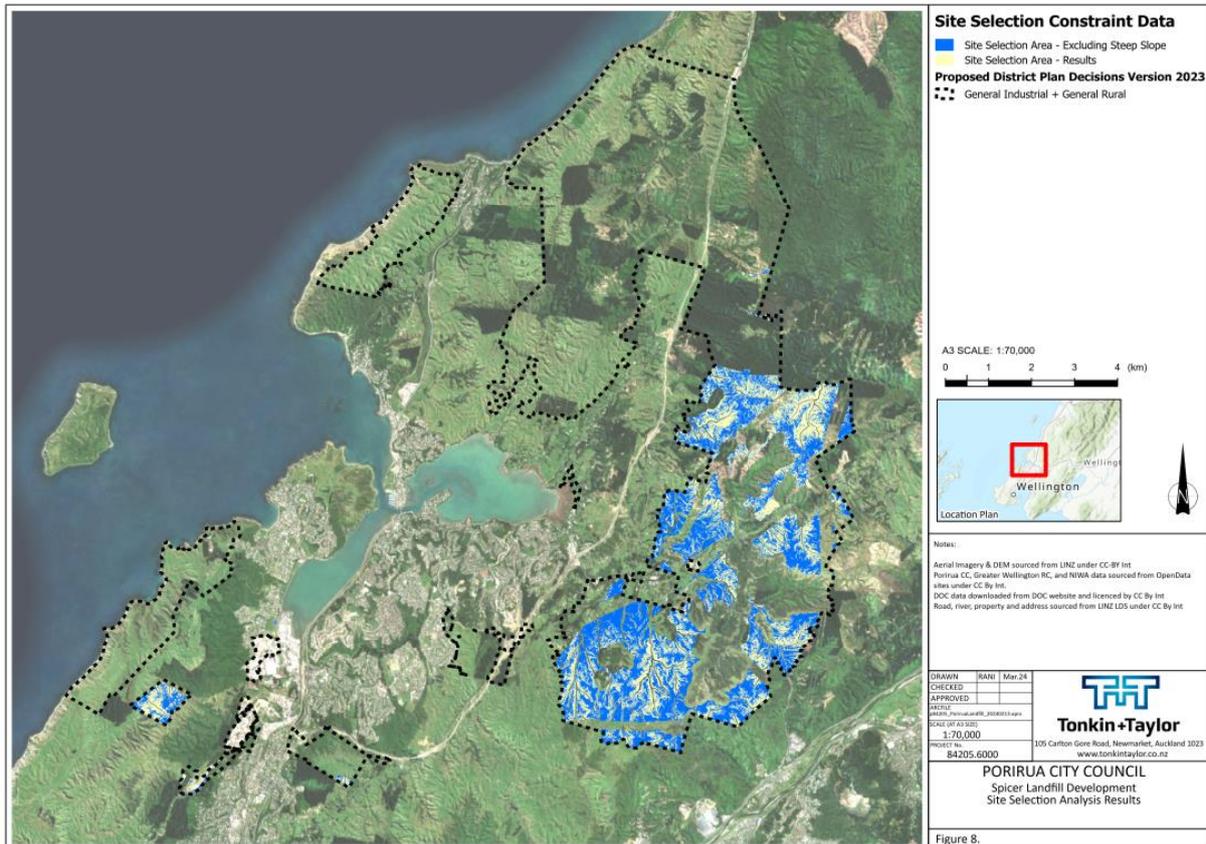


Figure 5.1: New residual waste management facility site selection: GIS analysis

## 5.3 Potential new residual waste management locations

### 5.3.1 Engineered landfill

Our GIS analysis found no locations of the size required for a new engineered landfill development (approximately 30 hectares) in Porirua City. That means there are no obvious alternative locations to develop a new landfill within the city.

If an engineered landfill option was to be adopted as the preferred residual waste management approach it would need to be undertaken at Spicer Landfill (requiring a new consent), or at a location outside of Porirua City. We note that the existing Spicer Landfill site would not meet the criteria we applied in our GIS analysis, however, as it is an existing landfill, with associated infrastructure, it has been retained as an option for consideration.

In relation to landfills outside of the city, both the Silverstream Landfill and the Southern Landfill can and do currently accept waste from outside their respective council boundaries. However, both have limited capacity to accept additional materials, with the 80,000 tonnes per annum currently accepted at Spicer Landfill likely to be problematic.

Silverstream has 18 years until consent expiry, however, if operational constraints<sup>17</sup> could be overcome, an increase in the volume of waste into this landfill would shorten its lifespan by filling up the remaining airspace more quickly. This would reduce the resilience of the waste management system across the region making it less resistant to the impacts of natural disasters.

The Southern Landfill has recently been granted consent for the Southern Landfill extension piggyback option (SLEPO)<sup>18</sup>.

Hutt and Wellington City Councils Long-Term Plans do not currently include provision for rapid development of either of the landfills to receive the increased waste tonnages should one of the other landfills in the region close its operations.

Bonny Glen Landfill in Marton is a potential long-term option with substantial remaining capacity. Utilising Bonny Glen Landfill would require the transport of residual waste. For this potential option to work a substantial upgrade to the existing transfer station, or development of a new facility at Spicer Landfill, to handle the transfer of the 80,000 tonnes per annum currently disposed there, would be required.

### 5.3.2 Mechanical biological treatment (MBT)

No general industrial zoned locations within Porirua City have been identified that are suitable for a MBT facility due to size and/or surrounding land use. There are general rural zoned sites that could potentially accommodate an MBT facility based on the criteria set out in [Section 5.1](#).

The analysis found that the largest contiguous land parcel was approximately 8.5 hectares. There were, however, contiguous areas that provide 10+ hectares but these span across multiple property boundaries.

<sup>17</sup> Short-term capacity constraints as new cells are constructed can limit the amount of waste that can be accepted each year

<sup>18</sup> Wellington City Council (2024), *Te Whakaroanga Ruapara Taha Tonga Southern Landfill extension*, <https://wellington.govt.nz/your-council/projects/southern-landfill-extension>, accessed 12 April 2024.

If land could be acquired, the Council would still require access to a landfill to dispose of the residual materials; this would need to be either at Spicer Landfill or a landfill outside of the city. Additionally, daily load allowances and the ability to accept higher-than-normal loads in the event of a natural disaster (where additional capacity is required with some urgency) would need to be considered at the consenting stage. If the MBT facility was not consented to accept such materials, access to landfill would be required for this too.

### 5.3.3 Existing landfills

Three Class 1 landfills operate within the Wellington region; Southern Landfill, located within Wellington City, Silverstream Landfill, located within Upper Hutt City, and Spicer Landfill. Bonny Glen Landfill, located near Marton is also potentially accessible for material from Porirua City. Bonny Glen currently accepts materials from Kāpiti and the Wairarapa.

The remaining void space and resulting capacity for each of the landfills operating in the Wellington region and Bonny Glen Landfill, is estimated in Table 5.1.

**Table 5.1: Estimated remaining void space for Class 1 landfills in the Wellington region**

	Southern Landfill (Wellington)	Silverstream Landfill (Lower Hutt)	Spicer Landfill (Porirua City)	Totals across the Wellington region	Bonny Glen Landfill (Marton)
Resource consents expire (year)	Stage III = 2026 SLEPO = 2059*	2039	2030	N/A	2050
Air space remaining as of January 2024 (cubic metres)	Stage III = 500,000 SLEPO = 2,200,000	~4,000,000**	650,000***	7,350,000	Est. 10,000,000
Waste inputs (tonnes per annum)	100,000	~150,000	80,000	330,000	Up to 250,000

\* SLEPO is an extension to Southern Landfill that has been consented but not constructed.

\*\* Consented capacity, design and construction work is in progress to create this airspace.

\*\*\*Note: Including Spicer Landfill Cell 3A currently being constructed to provide an additional 300,000 cubic metres capacity.

Source: Wellington Region Waste Assessment 2023.

This is based on current waste volumes which could alter depending on waste diversion and recycling initiatives and the extent of natural disasters. Both Southern Landfill and Silverstream Landfill are operating under constraints that mean accepting an additional 80,000 tonnes per annum would be difficult in the short to medium-term.

Bonny Glen Landfill is operated as a regional landfill servicing the lower North Island. The site currently accepts materials from Kāpiti, Horowhenua, Manawatu, Taranaki and Wairarapa and has significant consented capacity.

As mentioned previously, any disposal site outside Porirua City is likely to mean that a local transfer station will be required. This could be at the existing Spicer Landfill site (where there is a simple on-site transfer station) or elsewhere in the city. The current onsite facility would likely require upgrading to manage larger quantities of material. This is because a significant proportion of the 80,000 tonnes currently accepted at Spicer Landfill is transported directly to the tip face rather than staged through the onsite transfer station. Note, that if an MBT facility was to be selected as the preferred option, this may impact these proportions and tonnages.

Depending on transport distance, material may be compacted prior to transport to a remote site. For closer sites, some loads may be transported directly rather than staged through a local transfer station.

#### **5.3.3.1 Silverstream Landfill (Lower Hutt)**

Silverstream Landfill is located at Silverstream, Upper Hutt. It is a Class 1 landfill that accepts non-hazardous residential, commercial and industrial solid waste, special and hazardous waste on approval and manageable sludges from the Lower Hutt and Upper Hutt areas, and waste from other locations.

Hazardous wastes are not accepted for disposal without appropriate pre-treatment to ensure they meet the waste acceptance criteria.

Silverstream Landfill resource consents do not place a limit on the volume of waste that the landfill can accept, or the origin of the waste. The site can, and does, accept waste from outside its council boundary.

However, the site is currently close to the maximum volume of waste it can accept without causing operational challenges. Increasing the volume of waste into this landfill will shorten its lifespan by filling up the remaining airspace more quickly.

#### **5.3.3.2 Southern Landfill (Wellington)**

Southern Landfill is in Wellington City, between the suburbs of Brooklyn and Ōwhiro Bay and is accessed from Happy Valley Road. Southern Landfill operates as a Class 1 landfill that accepts only non-hazardous residential, commercial and industrial solid waste and manageable sludges waste from the Wellington City area and from other locations.

Hazardous wastes are accepted for disposal if they meet the waste acceptance criteria.

The site has recently been granted consent for the SLEPO<sup>19</sup> extension.

#### **5.3.3.3 Spicer Landfill (Porirua City)**

Spicer Landfill is in Porirua City on Broken Hill Road. The site operates as a Class 1 landfill that accepts non-hazardous residential, commercial and industrial solid waste, and manageable sludges from the Porirua City area, northern Wellington City (Tawa and surrounds) and from other locations.

Hazardous wastes are accepted for disposal if they meet the waste acceptance criteria.

The current consents for landfill operation expire in 2030 and will require renewal if the site is to accept waste for disposal after that time. Further design and construction will also be required to develop space for ongoing residual waste disposal.

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<sup>19</sup> Wellington City Council (2024), *Te Whakaroanga Ruapara Taha Tonga Southern Landfill extension*, <https://wellington.govt.nz/your-council/projects/southern-landfill-extension>, accessed 12 April 2024.

#### 5.3.3.4 Bonny Glen Landfill

Bonny Glen Landfill is located near Marton in the Rangitikei District. The site operates as a Class 1 landfill that accepts non-hazardous residential, commercial and industrial solid waste, and manageable sludges from Taranaki, Manawatu, Wairarapa, Horowhenua and Kāpiti and from other locations.

Hazardous wastes are not accepted for disposal without appropriate pre-treatment to ensure they meet the waste acceptance criteria.

The current consents for landfill operation run to 2050 and the site has substantial capacity. The site is privately owned and operated by MidWest Disposals Limited, a joint venture between Waste Management New Zealand Limited and EnviroNZ.

### 5.4 Potential options (location and approach) for residual waste management

Considering the information in this section, our assessment is that closing Spicer Landfill and sending all of Porirua City's waste to another landfill in the Wellington region is not a viable option. Export of residual waste out of the city (to a location outside the Wellington region), ongoing disposal at Spicer Landfill and developing an MBT with associated residual waste disposal are considered to be the most viable options. Therefore the options considered in the next stage of assessment (refer [Section 6](#) and [Section 7](#)) in this report are:

- A MBT facility within Porirua City (with rejects and residual material to landfill).
- A new consent for Spicer Landfill.
- The export of waste to a landfill outside Porirua City.

## 6 Detailed description of most viable options

As concluded in [Section 5.4](#), three options were identified for further exploration and assessment. These options combine an approach to managing residual waste with a location and are described in the following subsections.

### 6.1 MBT within Porirua City

An MBT facility would take a minimum of seven to ten years to establish, from decision, to investment, to commencing operation. This includes feasibility assessment, planning, design, consenting, construction, commissioning and then, operation. It is not realistic to have an MBT facility operational in the city by 2030, but a facility could be planned over a longer period of time.

The location analysis ([section 5.2](#)) found that there were no suitable locations within Porirua for an MBT facility to be located due to land required and continued access to an operational landfill. This could be Spicer Landfill (if consented to operate) or a landfill outside of the city.

Additionally, daily load allowances and the ability to accept higher-than-normal loads, for example in the event of a natural disaster, (where additional capacity is required with some urgency) would need to be considered at the consenting stage.

In relation to odour, litter and noise, MBT facilities are typically housed entirely indoors, with covered receival bays. This means that these risks can be mitigated through engineered controls and careful operations.

Key features of this option are:

- An MBT facility (approximately 3-4 hectares including large industrial warehouse/building and surrounding yard space) located in the rural zoned area in the east of the city.
- Processing of mixed residual waste:
  - Removal of unsuitable materials (bulky, potentially hazardous).
  - Removal of recyclable/recoverable materials.
  - Stabilisation of degradable materials.
- Disposal of stabilised and 'unsuitable' materials:
  - At Spicer Landfill (if a new consent is granted).
  - At a landfill outside of Porirua City.
- Indicative disposal cost (gate rate) in the region of \$350 per tonne (current estimates). This is based on pricing for facilities operating in Australia with access to landfill disposal close by.

There are several factors that require additional consideration if this option is developed further. This will provide more certainty regarding the scale of the facility, capital cost, operational costs and detailed understanding of impacts and feasible mitigations. These include:

- Handling of incoming material – likely a mix of direct delivery from waste collections and a transfer station (on-or-off-site) for residual and light commercial materials.
- Biological process to be adopted including considerations for odour management, use of products such as process heat (composting) and/or biogas (anaerobic digestion).
- Handling of residual materials (stabilised degradable material, unsuitable feedstock) – disposal location options to be explored.

## 6.2 New consent for Spicer Landfill

While Spicer Landfill has the potential capacity (dependent on consent and design) through to approximately 2050, it is currently only consented until 2030. A new consent allowing Spicer Landfill to provide ongoing disposal of residual waste and sludge would take approximately two to three years, with an additional two to four years to design and construct the additional landfill cells.

Key concerns in securing a new consent for Spicer Landfill are the ongoing odour issues and how these will be addressed, and social and cultural acceptance to operate. Ngāti Toa has indicated that extending Spicer Landfill is their least preferred option. They would like to see the landfill closed.

There are also technical issues such as the landfill's proximity to the Ohariu fault that will need to be addressed in a resource consent application. These matters mean that there is a risk that a new consent cannot be obtained.

Key features of this option are:

- Ongoing use of Spicer Landfill for residual waste disposal, including an expansion of the landfill footprint and placing additional waste on top of the existing landfill.
- Ongoing management of discharges and potential impacts:
  - Capture and flaring of landfill gas.
  - Collection and treatment of leachate.
  - Operational procedures (waste acceptance, placement, working and intermediate cover, landfill gas system operation) to manage odour.
- Indicative disposal cost (gate rate) in the region of \$230 per tonne (2023/2024 charges).

## 6.3 Export of waste to a landfill outside Porirua City

This option considers the transport of residual waste outside of Porirua City for disposal at an existing engineered landfill, with Bonny Glen Landfill noted as a potential option. This approach could be implemented within a relatively short time period and would provide for ongoing disposal of residual waste and sludge. However, developing a facility to optimise the acceptance and transfer of around 80,000 tonnes of material per year will take some time. Key activities will include confirming transfer station location, developing design and costings, securing appropriate consents for transfer station construction and operations and construction of the facility.

In this scenario, ongoing management of landfill operations and impacts will be the responsibility of the landfill operator. For larger sites including Bonny Glen this includes:

- Capture and flaring of landfill gas.
- Collection and treatment of leachate.
- Operational procedures (waste acceptance, placement, working and intermediate cover, landfill gas system operation) to manage odour.

Key features of this option are:

- A transfer station facility in Porirua City, nominally designed to accept household and light commercial materials as well as materials from household and business waste collections.
- Transfer of residual waste materials to a landfill outside Porirua City.
- Indicative disposal cost (gate rate) in the region of \$280 per tonne (2023/2024 charge at Otaihanga Transfer Station, Paraparaumu).

There are several factors that require further consideration if this option is developed further. This will provide more certainty regarding the scale of the facility, capital cost, operational costs and a detailed understanding of impacts and feasible mitigations. These factors include:

- Quantity and handling of incoming material – likely a mix of direct delivery from waste collections and residential and light commercial materials. Some materials may be diverted to other locations in the region depending on pricing and logistics.
- Material handling for transport – whether materials are transported to a landfill compacted or uncompacted, transport configuration (compactor bins/truck and trailer, semi-trailer).
- Location of a transfer station within Porirua City.
- Ownership and operational arrangements for the transfer station.

## 7 Multi-criteria analysis of most viable options

### 7.1 Assessment of three options

Following the definition and consensus on the three options described in [Section 6](#), the MCA was duplicated, and the technology approaches replaced with the three options now under consideration.

Following this, Te Rūnanga was consulted to assist in defining parameters for cultural considerations for these options. Their consolidated feedback, provided to the Council on 9 April 2024, is presented in Appendix E.

This feedback, as well as additional qualitative data gathered in workshops with Te Rūnanga in January and March 2024, was used to inform the development of the scale for the cultural impacts criteria of objective 3. This scale is presented in Appendix F.

The weightings were equal for each of the three objectives in this MCA.

Where specific landfill locations/operations were considered, this also changed some of the assessments against other criteria.

Evaluating the three options was completed in several stages. As for evaluation of approaches, in all cases the emphasis was on using available evidence to develop a consensus view on the scoring of each approach against the MCA criteria. This involved:

- The T+T team completing preliminary analysis, noting key evidence and proposing a preliminary score for each option against each of the criteria drawing on the scoring of approaches and reflecting location specific considerations.
- Discussions between T+T and the Council's project team on the preliminary scoring to reach a consensus. This provided an updated preliminary scoring for each of the residual waste management options.
- Discussion involving Te Rūnanga, the Council's project team and T+T to finalise scoring of each of the residual waste management options. This provided scoring for each of the residual waste management options. We acknowledge here that the feedback from Te Rūnanga was only applied to options within the Porirua City district in respect of not speaking on behalf of another iwi.

Table 7.1 displays the results of the MCA of the three options from highest to lowest. Appendix G shows the full results table. The highest score attainable was three, the lowest score attainable was zero.

**Table 7.1: Results of the MCA of the agreed three options**

Option name	Description	Total MCA
<b>New consent for Spicer Landfill</b>	New consent for Spicer Landfill beyond 2030, possibly including the expansion of the landfill to accept waste to 2050.	2.32
<b>Export of waste to a landfill outside Porirua City</b>	Transport and bulk haulage of residual waste outside of Porirua City for disposal at an existing engineered landfill.	2.20
<b>MBT within Porirua City with access to landfill</b>	Feasibility assessment, planning, design, permitting, construction, commissioning and operation of an MBT facility, supported by landfill disposal of stabilised material.	1.85

The three options each have advantages and disadvantages. The analysis highlighted some of the key differences between options:

- Export of waste is the most likely to be available from 2030 with consented landfill capacity likely to be available (outside of the region) and a transfer station within Porirua City considered relatively straightforward to design, consent and construct.
- Disposal at a re-consented Spicer Landfill is likely to offer the lowest cost to Porirua City residents and businesses.
- An MBT facility in Porirua City is likely to be more expensive and unlikely to be available from 2030 (allowing for design, consenting and construction). These factors, combined with consenting risks, resilience and flexibility issues mean that this option does not score as well as the other two that were considered.

## 7.2 Sensitivity analysis

Given the closeness of scores, a sensitivity analysis which adjusted the weightings of adjustable objectives and criteria was undertaken with the Council to re-examine the viability of these options. The objectives and criteria that were adjusted based on their level of importance to the Council and covered four scenarios as follows:

- 1 Double the weighting for objective 3 (environment), with the rest of the criteria weighted equally.
- 2 Treble the weighting for objective 3 (environment), with the rest of the criteria weighted equally.
- 3 Zero weighting for the criteria relating to gate rate (within the cost criteria), with the rest of the criteria weighted equally.
- 4 Abandoning the development of Spicer Landfill considered as an option.

Results of the sensitivity analysis are displayed in Table 7.2.

**Table 7.2: MCA scores and sensitivity analysis for the three options defined for consideration**

Option name	MCA score – no sensitivity factors applied	Sensitivity – double for objective 3	Sensitivity – treble for objective 3	Sensitivity – remove gate rate	Sensitivity – Spicer Landfill not reconcented by 2030
<b>New consent for Spicer Landfill</b>	2.32	2.18	2.09	2.10	2.03
<b>Export of waste to a landfill outside Porirua City</b>	2.20	2.15	2.12	2.40	2.20
<b>MBT within Porirua City with access to a landfill</b>	1.85	1.95	2.01	2.00	1.85

When the criteria associated with objective 3 are weighted double that of the criteria for objectives 1 and 2, the difference between the options is reduced. If the weighting for objective 3 was increased to three times, then export of waste overtakes the option to extend the consent for Spicer Landfill. When price is removed as a consideration, the score associated with exporting waste increases markedly, whilst the other two options remain almost the same.

If it is assumed that it will be difficult to re-consent Spicer Landfill, export of waste remains the highest scoring option, with development of an MBT facility in Porirua City having the lowest scores across all scenarios, with and without sensitivity factors applied.

This simple sensitivity analysis indicates that while continuing to use Spicer Landfill is the preferred option this outcome is sensitive to changes in the weighting and scoring of various criteria. Specifically, the analysis is sensitive to the impact of cost to residents and businesses and the likelihood of Spicer Landfill gaining consent for continued operation.

### **7.3 Proposed preferred option next steps**

Through this alternatives assessment, we have undertaken a high-level review and analysis of technology approaches and options for managing residual waste to demonstrate whether developing Porirua City's Spicer Landfill is appropriate given other available options.

In undertaking this review, T+T has found that the options that could be implemented by 2030 (in the short-term) are a new consent for Spicer Landfill or export of waste to Bonny Glen Landfill. Spicer Landfill, however, is the preferred option of these two, where other options, such as a MBT facility, will likely require a regional approach due to scale requirements.

Based on both the analysis of technology approaches and the evaluation of the three potential options (approach with a location) in more detail, we have arrived at a proposed preferred, two-phase approach:

#### **1 Phase 1 – management of waste from now until 2035: Consent Spicer Landfill to 2035.**

In this phase, the Council would seek to obtain a resource consent for the expansion of Spicer Landfill to allow for filling until 2035. Any application for consent would need to satisfy the requirements of schedule 4 of the *Resource Management Act (1991)*, and this report will provide technical background information on the alternatives that were considered.

Assuming that the required consents are granted, the Council would then need to plan and construct the extension. The consent process will require ongoing technical input from planning experts, a range of technical specialists and the Council's legal counsel.

It is noted that expanding and extending the life of Spicer Landfill is not preferred by Ngāti Toa, and that continued engagement regarding Council's intended approach is critical, as is the continuance of waste minimisation programming.

As noted previously, there are also some technical challenges to obtaining a new consent for Spicer Landfill, and there is a risk that such a consent will not be granted or will be delayed. In the event that a new consent cannot be obtained, export of waste to a landfill outside Porirua would be required.

#### **2 Phase 2 – planning for beyond 2035: Scope regional solutions with neighbouring councils and waste management operators.**

We propose that a scope of work be prepared in parallel to phase 1. The scope for phase 2 is anticipated to include, but not be limited to, an assessment of options for alternative disposal approaches, sites, and scenario planning for waste disposal post 2035. As signalled in the Regional Waste Minimisation and Management Plan, this may include the development of a masterplan for a regional solution that will service Porirua City Council and neighbouring councils beyond 2035.

The two-phased approach acknowledges that while an extension of consent for Spicer Landfill is the preferred option in this analysis, it is unlikely to provide a long-term solution. In light of this,

appropriate residual waste disposal for Porirua residents will be planned for and managed by Porirua City Council in the short-term. Any medium- to long-term solution is likely to be regional in nature.

## 8 Conclusion and next steps

The consent for Spicer Landfill is due to expire in 2030. This report has been prepared on behalf of Porirua City Council to inform further exploration of the preferred two-phased approach for managing residual waste as defined in [Section 7.3](#) of this report. The preferred, two-phase approach is summarised as:

- 1 Phase 1 – management of waste from now until 2035: Re-consent Spicer Landfill to 2035, with a contingency plan to export waste in the event that a consent cannot be obtained.
- 2 Phase 2 – planning for beyond 2035: Scope regional solutions with neighbouring councils and waste management operators.

The approach positions Porirua City Council to:

- Ensure that residents and businesses in the city have ongoing access to appropriate residual waste services.
- Deliver an affordable and cost effective/competitive residual waste service for Porirua City residents and businesses.
- Manage any environmental impacts and minimise emissions associated with residual waste services.

The next step for the Council will be to decide on the way forward in accordance with legislative requirements.

## 9 Applicability

This report has been prepared for the exclusive use of our client Porirua City Council, with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose, or by any person other than our client, without our prior written agreement.

We understand and agree that our client will submit this report as part of an application for resource consent and that Porirua City Council and Greater Wellington Regional Council as the consenting authority will use this report for the purpose of assessing that application.

Tonkin & Taylor Ltd  
Environmental and Engineering Consultants

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CHP

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## Appendix A Summary of residual waste management approaches

Table Appendix A.1 : Conventional incineration (mass burn)

Element	Description
Waste input type	MSW (household, commercial, non-hazardous industrial).
Pre-processing requirements (e.g. removing materials unsuitable for processing)	Not required, however it is desirable to remove bulky and non-combustible items such as scrap steel and rubble.
A description of the process	<p>MSW is fed into a combustion chamber with a range of material and ash handling systems. Excess air is fed into the combustion chamber to facilitate full combustion of the waste.</p> <p>Most of the non-combustible material ends up as bottom ash with a range of ash removal systems on the market. This material may have recoverable materials (metals) and is most typically disposed of in a dedicated ash landfill. Bottom ash can be further processed for use as an aggregate or filler, at this stage outside of New Zealand only.</p> <p>Various contaminants are removed from exhaust air through a series of air pollution control processes. The resulting materials are termed air pollution control residues. These residues are generally treated as hazardous waste requiring specific management and stabilisation prior to disposal at an appropriate facility.</p> <p>The combustion of mixed waste results in the emission of fossil derived CO<sub>2</sub>. It is considered likely that emissions of this type will ultimately come under the NZ ETS.</p>
By-products produced through processing which have a beneficial use	<p>The hot exhaust air can be used to produce steam for industrial heat and/or to generate power.</p> <p>As noted above, bottom ash may have application as an aggregate or filler.</p>
Rejected materials which require onward processing or disposal	<p>As noted above, bottom ash is typically placed in an ash landfill.</p> <p>Air pollution control residues require treatment/stabilisation before placement in an appropriate disposal site.</p>
Technology application	<p>Suitable for MSW.</p> <p>The investment required in air pollution control equipment to meet discharge requirements, process control and combustion chamber means this technology is typically applied where large quantities of waste are available (200,000 - 300,000 tonnes per year or more).</p>

**Table Appendix A.2 : Advanced thermal treatment – gasification**

Element	Description
Waste input type	MSW and specific waste materials (plastics, wood).
Pre-processing requirements (for example removing materials unsuitable for processing)	Pre-processing is typically required to produce input material that is consistent with respect to size, moisture content and calorific value.
A description of the process	<p>Homogenised waste is fed into a gasification chamber with a range of feed systems. Temperature, pressure and air are controlled to create the desired conditions for gasification of the waste to occur.</p> <p>The non-combustible material ends up as bottom ash with a range of ash removal systems on the market. This material may have recoverable materials (metals) and is most typically disposed of in a dedicated ash landfill. Bottom ash can be further processed for use as an aggregate or filler, at this stage outside of New Zealand only.</p> <p>The syngas may require some cleaning prior to combustion (for energy recovery) or may be used as an input to other chemical processes. Various contaminants are removed from syngas and combustion exhaust through a series of air pollution control processes. The resulting materials are termed air pollution control residues. These residues are generally treated as hazardous waste requiring specific management and stabilisation prior to disposal at an appropriate facility.</p> <p>The combustion of syngas results in the emission of fossil derived CO<sub>2</sub>. It is considered likely that emissions of this type will ultimately come under the NZ ETS.</p>
By-products produced through processing which have a beneficial use	<p>The hot exhaust air from syngas and syngas combustion can be used to produce steam for industrial heat and/or to generate power.</p> <p>As noted above, bottom ash may have application as an aggregate or filler.</p>
Rejected materials which require onward processing or disposal	<p>As noted above, ash is typically placed in an ash landfill.</p> <p>Air pollution control residues require treatment/stabilisation before placement in an appropriate disposal site.</p>
Technology application	<p>Suitable for MSW with appropriate pre-processing.</p> <p>The investment required in air pollution control equipment to meet discharge requirements, process control and gasification chamber means this technology is typically applied where there are large quantities of waste available although gasification has been applied at lower tonnages (50,000 - 100,000 tonnes per year).</p>

**Table Appendix A.3 : Advanced thermal treatment – pyrolysis**

Element	Description
Waste input type	Homogenised MSW. Specific waste materials (plastics, wood).
Pre-processing requirements (for example removing materials unsuitable for processing)	Pre-processing is typically required to produce input material that is consistent with respect to size, moisture content and calorific value.
A description of the process	<p>Homogenised waste is fed into a pyrolysis chamber with a range of feed systems. This is usually a batch process, i.e. load, exclude oxygen in sealed pyrolysis chamber, heat to pyrolyze the material in the chamber, cool and empty. Temperature, pressure and atmosphere are controlled to create the desired conditions for pyrolysis of the waste to occur. Conditions can be manipulated to change the proportion of pyrolysis oils and char produced.</p> <p>Any non-combustible material ends up in the char as bottom ash with a range of ash removal systems on the market. The char can be a relatively pure carbon product with potential for further processing to produce activated carbon or carbon soil amendments.</p> <p>The oil or tar products are likely to require some cleaning prior combustion (for energy recovery) or use as an input to other chemical processes.</p> <p>Various contaminants are removed from exhaust/flue gases from pyrolysis or combustion processes through a series of air pollution control processes. The resulting materials are generically termed 'air pollution control residues'. These residues are generally treated as hazardous waste requiring specific management and stabilisation prior to disposal at an appropriate facility.</p> <p>The combustion of syngas or pyrolysis oil results in the emission of fossil derived CO<sub>2</sub>. It is considered likely that emissions of this type will ultimately come under the NZ ETS.</p>
By-products produced through processing which have a beneficial use	<p>The hot exhaust air from the pyrolysis or combustion can be used to produce steam for industrial heat and/or to generate power.</p> <p>As noted above, char and pyrolysis oil may have a range of applications including as activated carbon, soil amendment chemical feedstock or fuel.</p>
Rejected materials which require onward processing or disposal	<p>In some cases, char may require placement in an appropriate landfill.</p> <p>Air pollution control residues require treatment/stabilisation before placement in an appropriate disposal site.</p>
Technology application	<p>Suitable for MSW with appropriate pre-processing.</p> <p>The investment required in air pollution control equipment to meet discharge requirements, process control and pyrolysis chamber means this technology is typically applied where there are large quantities of waste available although pyrolysis has been applied at lower tonnages (50,000 - 100,000 tonnes per year).</p>

**Table Appendix A.4 : Mechanical biological treatment (MBT)**

Element	Description
Waste input type	MSW (household, commercial, non-hazardous industrial). Organics separated at the source (for biological processing only), for example dewatered sewage sludge.
Pre-processing requirements (for example removing materials unsuitable for processing)	Not required, systems typically remove bulky items such as scrap steel and rubble.
A description of the process	Plant design and configuration varies and, as the name suggests, includes both mechanical and biological components. Mixed waste is fed into the system with mechanical sorting for the removal of larger items (unsuitable for processing), plastics, glass and metals (iron and steel) using magnets. All remaining waste undergoes a biological treatment via aerobic (composting) or anaerobic processes. Venting of the process area via a biofilter is typically required to manage odour.
By-products produced through processing which have a beneficial use	Recyclables tend to be separated out prior to any biological process which includes the extraction of low-grade recyclable plastics, glass (mixed colour) and metals. Stabilised organics and fibre (low grade soil conditioner, digestate, refuse derived fuel (by-product of waste processing which has a <i>recoverable calorific value that can be used to replace a portion fossil fuel inputs</i> ). Biogas is also produced where anaerobic digestion is applied.
Rejected materials which require onward processing or disposal	Rejected materials such as plastics, textiles, metals, large pieces of wood. By-products where markets are not available for example low grade soil conditioner and/or digestate.
Technology application	Suitable for MSW with appropriate pre-processing. Configuration of processing equipment should consider market availability for all by-products and the availability on onward processing facilities for organic outputs following biological treatment. This technology is typically applied where there are large quantities of waste available (50,000 - 300,000 tonnes per year) with over 300 facilities in use across Europe.

**Table Appendix A.5 : Mechanical heat treatment (MHT)**

Element	Description
Waste input type	MSW (household, commercial, non-hazardous industrial).
Pre-processing requirements (for example removing materials unsuitable for processing)	Not required, processing systems typically remove bulky items such as scrap steel and rubble.
A description of the process	<p>Mixed waste is fed into the system with mechanical sorting usually limited to the removal of larger items with other mechanical separation after heat treatment.</p> <p>Either batch (autoclave) or continuous processing can be used, with autoclave being most commonly used. Autoclave directs steam within a pressure vessel to treat the waste at a constant pressure and temperature. This process effectively creates a waste which is pasteurised, i.e. removes contaminants, cleans and breaks down organic matter. Continuous processing removes the pressure element but can result in a degree of pasteurisation depending on the temperatures achieved.</p> <p>Mechanical processing is the next stage of the process, whereby mechanical separation is used to remove recyclable materials. With this separation occurring after heat treatment of mixed waste, it is often referred to as a dirty MRF (Materials Recovery Facility).</p>
By-products produced through processing which have a beneficial use	<p>Recyclables separated through mechanical processing include glass (mixed colour) and metals. Low grade plastics are also produced; however, the impact of heat treatment and general waste handling means these will be of low quality i.e. have limited markets in New Zealand or offshore.</p> <p>Stabilised organics and fibre (floc) can be used as a feedstock for onward processing through composting, which would ultimately produce a low-grade soil conditioner. Floc may also be marketed as RDF, although there are no existing markets for this type of product in New Zealand.</p>
Rejected materials which require onward processing or disposal	Depending on market availability: low grade plastics and the floc could ultimately end up requiring disposal.
Technology application	<p>Suitable for MSW with appropriate pre-processing.</p> <p>Configuration of plant equipment and processing should consider market availability and any onward processing requirements post processing via mechanical heat treatment.</p> <p>This technology is typically applied where there are large quantities of waste available (75,000 - 250,000 tonnes per year).</p>

**Table Appendix A.6 : Class 1 Landfill**

Element	Description
Waste input type	MSW (household, commercial, non-hazardous industrial), contaminated soils.
Pre-processing requirements (for example removing materials unsuitable for processing)	N/A.
A description of the process	Active management at a Class 1 landfill includes the compaction and covering of waste daily. Waste arrives at Class 1 landfills and will be deposited on the ground in a designated operational area. Once the waste has been deposited on the ground, heavy machinery will be used to compact the waste. At the end of each day the deposited waste will be covered with a material such as soil, thus containing waste and reducing the potential for odour release, windblown litter and vermin.
By-products produced through processing which have a beneficial use	Landfill gas (from degradable material) which is captured for energy recovery.
Rejected materials which require onward processing or disposal	Landfill gas (from degradable material) – fugitive emissions, captured and flared. The untreated emission of landfill gas attracts a charge under the NZ ETS. Leachate is captured for treatment at a wastewater treatment plant.
Technology application	Class 1 landfills are suitable for a typical solid waste stream. Class 1 landfills cater for a range of waste quantities.

## Appendix B Multi-criteria analysis – aspect scoring and weighting

Objective	Criteria	Scale	Weighting	Guidance
<b>Assessment criteria</b>				
1. The preferred option should ensure that Porirua City residents and businesses have ongoing access to appropriate residual waste services.	Availability	0: Not applicable. 1: Does not meet availability requirements. 2: Partially meets availability requirements. 3: Meets all availability requirements.	7	Must be operational prior to the expiry of the current landfill consent, or before the current landfill cell reaches capacity, whichever occurs first. Capable of receiving minimum (current) residual waste of ~85,000 T/year. Manage current sludge demand or identify an alternative for sludge disposal.
	Operationally sound	0: Technology in research and development stage. 1: Emerging technology globally. 2: Emerging technology in New Zealand; good track record internationally for some applications. 3: Good track record of this technology in New Zealand.	7	Confidence that the options can be designed/constructed and operated reliably.
	Consenting risk	0: Will not obtain consent by June 2030. 1: Unlikely to obtain consent to operate by June 2030; does not expect to be able to operate in compliance. 2: Likely to obtain consent to operate by June 2030; expectation to be able to operate in compliance. 3: Highly likely to obtain consent to operate by June 2030; expectation to be able to operate in compliance.	7	Must be likely to obtain consent to enable operations by end of current landfill consent period, June 2030, and then operate in compliance with consent.

Objective	Criteria	Scale	Weighting	Guidance
	Resilience	<p>0: Not applicable.</p> <p>1: Technology cannot be relied upon to be resilient to disruption.</p> <p>2: Technology has some track record to provide capability and/or capacity to operate in times of most precedented disruptions.</p> <p>3: Technology has solid track record in New Zealand to provide both capability and capacity to operate in times of all precedented disruptions.</p>	7	Must be capable of continuing operation in the event of natural hazard e.g. earthquake or other disruptions (pandemic, economic).
	Flexibility	<p>0: Not applicable.</p> <p>1: Technology is not aligned with current, signalled or potential future government policy.</p> <p>2: Technology is somewhat aligned with current government policy; uncertainty whether alignment with signalled and potential future government policy.</p> <p>3: Technology is strongly aligned with current, signalled and potential future government policy.</p>	7	Potential to respond to current, signalled and potential future government policy intervention that may change the quantity or nature of residual waste materials requiring management.
2. The preferred option should deliver an affordable and cost effective/competitive residual waste service for Porirua City residents and businesses.	Indicative gate rate	<p>0: Gate rate unknown.</p> <p>1: Gate rate is &gt;15% of current services; Tonnages cannot be guaranteed; Illegal dumping likely to increase.</p> <p>2: Gate rate is &gt;5%-15% of current services; Expected tonnages are expected to be reliable; Illegal dumping may increase.</p> <p>3: Gate rate is +/- 5% of current services; Expected tonnages are reliable; Illegal dumping is not expected to increase.</p>	17	Must be affordable for Porirua City residents and businesses and competitive, to avoid diversion to other residual waste services and/or illegal dumping.

Objective	Criteria	Scale	Weighting	Guidance
	Local capability to deliver	<p>0: No known organisation in the market to design, construct or operate.</p> <p>1: No New Zealand organisations to design, construct or operate; heavy reliance on international organisations required.</p> <p>2: Organisations available for design, construction and operation would likely be a mix of New Zealand and international.</p> <p>3: Several skilled New Zealand organisations available for design, construction and operation.</p>	17	There must be local capability to operate the preferred option. Design/construction should ideally be delivered by New Zealand organisations, supported by external specialists where relevant.
3. The preferred option should manage any environmental impacts and minimise emissions associated with residual waste services.	Direct environmental impacts	<p>0: Not applicable.</p> <p>1: Technology has known environmental impacts which, at present, cannot be prevented or managed effectively.</p> <p>2: Technology has track record in effectively managing environmental impacts both proactively and reactively.</p> <p>3: Technology has few environmental impacts, e.g. is quiet, low to no odour etc. Solid track record in effectively managing environmental impacts both proactively and reactively.</p>	11	Must be acceptable considering air quality (odour, dust, ...), water quality (e.g. healthy harbour, local streams), noise, impact to land (terrestrial ecology).
	Greenhouse gas (GHG) emissions	<p>0: GHG emissions unknown.</p> <p>1: GHG emissions from operations are &gt;5% worse than current on a per tonne basis.</p> <p>2: GHG emissions from operations are 0-5% worse than current on a per tonne basis.</p> <p>3: GHG emissions from operations are equivalent to/no worse than current on a per tonne basis.</p>	11	GHG arising from operations (landfill gas, plant and equipment), transport, offset, must be minimised [or equivalent/no worse than current on a per tonne basis].

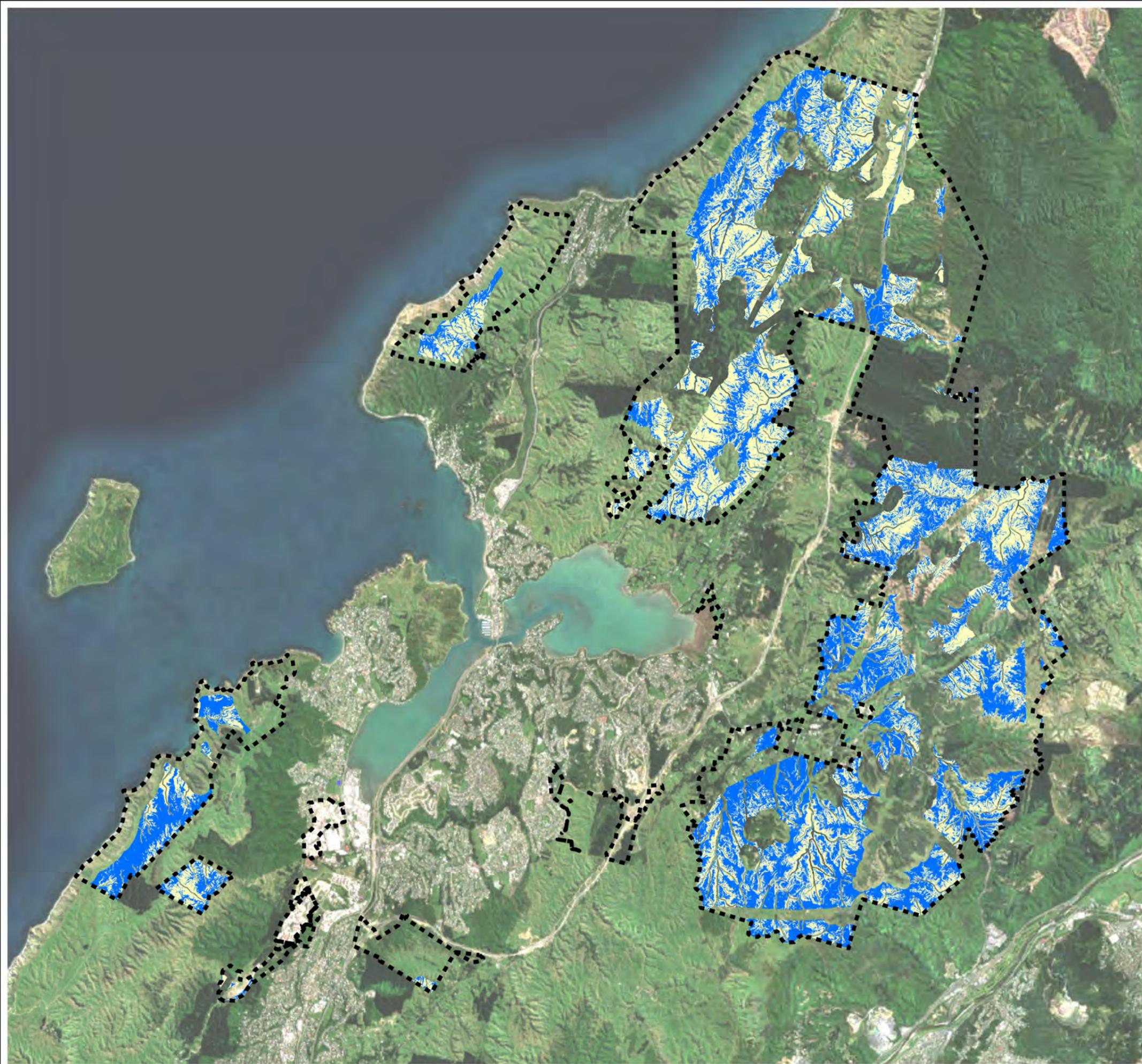
Objective	Criteria	Scale	Weighting	Guidance
	Social impacts	<p>0: Not applicable.</p> <p>1: Technology is not understood or accepted by the community; community is mostly opposed to it.</p> <p>2: Technology is somewhat understood by the community; community acceptance is varied, leaning towards opposition.</p> <p>3: Technology is widely understood and accepted by the community; some opposing views relating to factors such as odour, noise, traffic, visual, health/wellbeing.</p>	11	Including odour, noise, traffic, visual, health/wellbeing.
	Cultural impacts	<p>This requirement was spoken about at length at a workshop with local iwi and the Council on 24 January 2024. In this discussion, iwi representatives offered the following feedback:</p> <p>That it would be best for a cultural lens to be placed over each of the other requirements. Note: There were no red flags noted in the work that has taken place so far.</p> <p>That the location and placement of the technology, once selected, is a key engagement point.</p> <p>With this noted, the decision was made NOT to assign scores to this requirement, but rather, for the Council to work closely with local Iwi to apply a cultural lens to the project more holistically - both across the other requirements and when a location is to be selected.</p>		

## Appendix C MCA scoring (technology approaches)

Option name	1. The preferred option should ensure that Porirua City residents and businesses have ongoing access to appropriate residual waste services.					2. The preferred option should deliver an affordable and cost effective/competitive residual waste service for Porirua City residents and businesses.		3. The preferred option should manage any environmental impacts and minimise emissions associated with residual waste services.			TOTAL MCA
	Availability	Operationally sound	Consenting risk	Resilience	Flexibility	Indicative gate rate	Local capability to deliver	Direct environmental impacts	Greenhouse gas emissions	Social impacts	
Landfill	2	3	2	2	2	3	3	3	3	2	2.62
Incineration	1	2	1	2	1	1	2	2	2	1	1.52
Advanced thermal treatment – gasification	1	1	1	1	1	1	1	1	3	2	1.33
Advanced thermal treatment – pyrolysis	1	1	1	1	1	1	1	1	3	2	1.33
Mechanical biological treatment (MBT)	2	2	2	2	2	1	1	1	3	2	1.67
Mechanical heat treatment (MHT)	2	1	2	2	1	1	1	1	3	2	1.53

## **Appendix D    GIS analysis maps**

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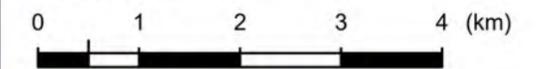
### Site Selection Constraint Data

- Site Selection Area - Excluding Steep Slope
- Site Selection Area - Results

### Proposed District Plan Decisions Version 2023

- General Industrial + General Rural

A3 SCALE: 1:70,000



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SCALE (AT A3 SIZE) 1:70,000		
PROJECT No. 84205.6000		

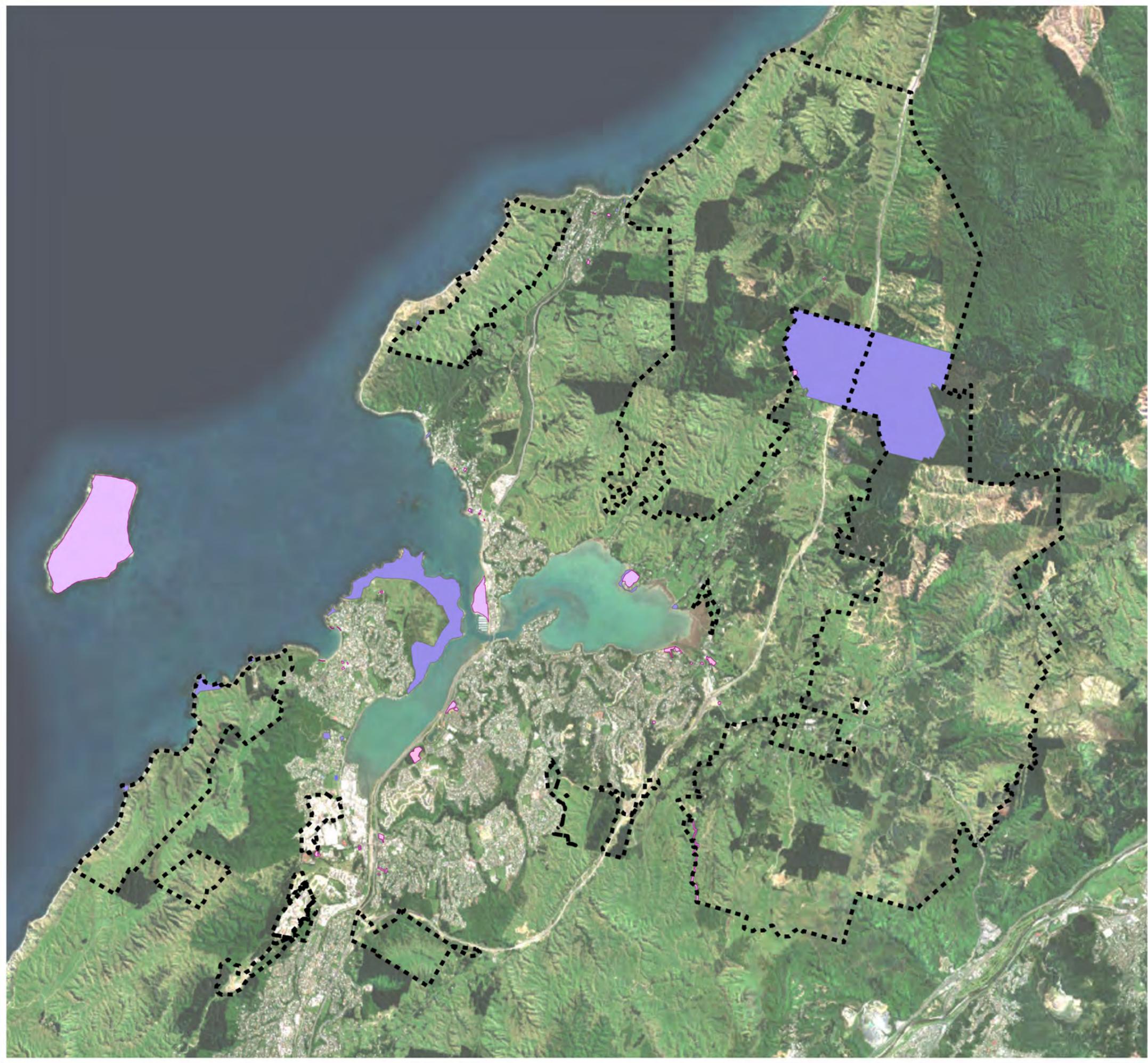


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 Spicer Landfill Development  
 Site Selection Analysis Results

Figure 8.

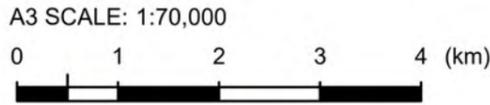


**Site Selection Constraint Data**

- Historic Heritage Site
- Heritage Setting
- Heritage Item Extent
- Sites and Areas of Significance to Māori

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**Notes:**

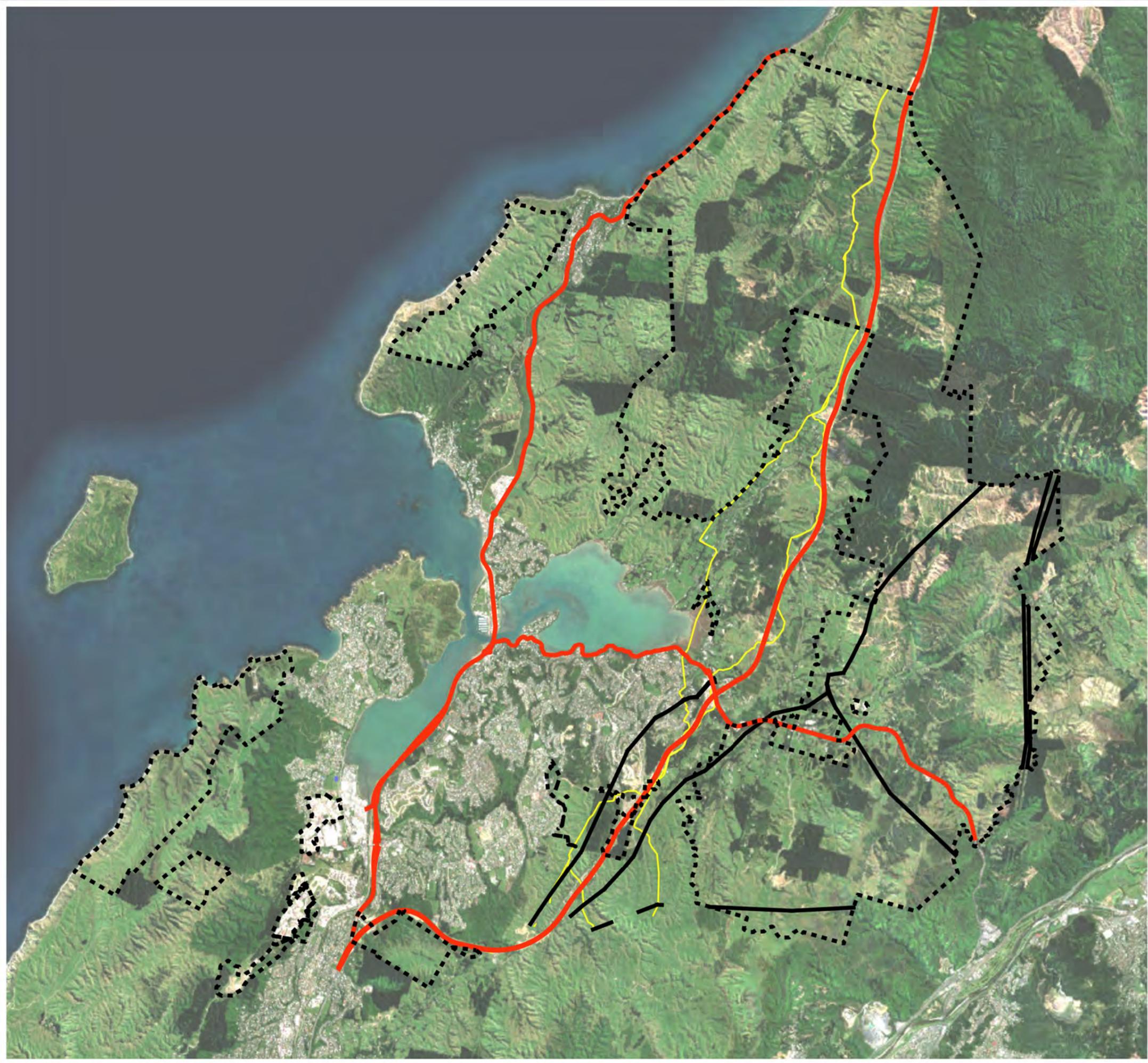
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 Cultural and Heritage Significance

Figure 4.



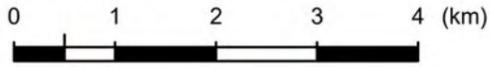
**Site Selection Constraint Data**

- NZ Road Centrelines
- National Grid
- Gas Transmission Pipeline Corridor

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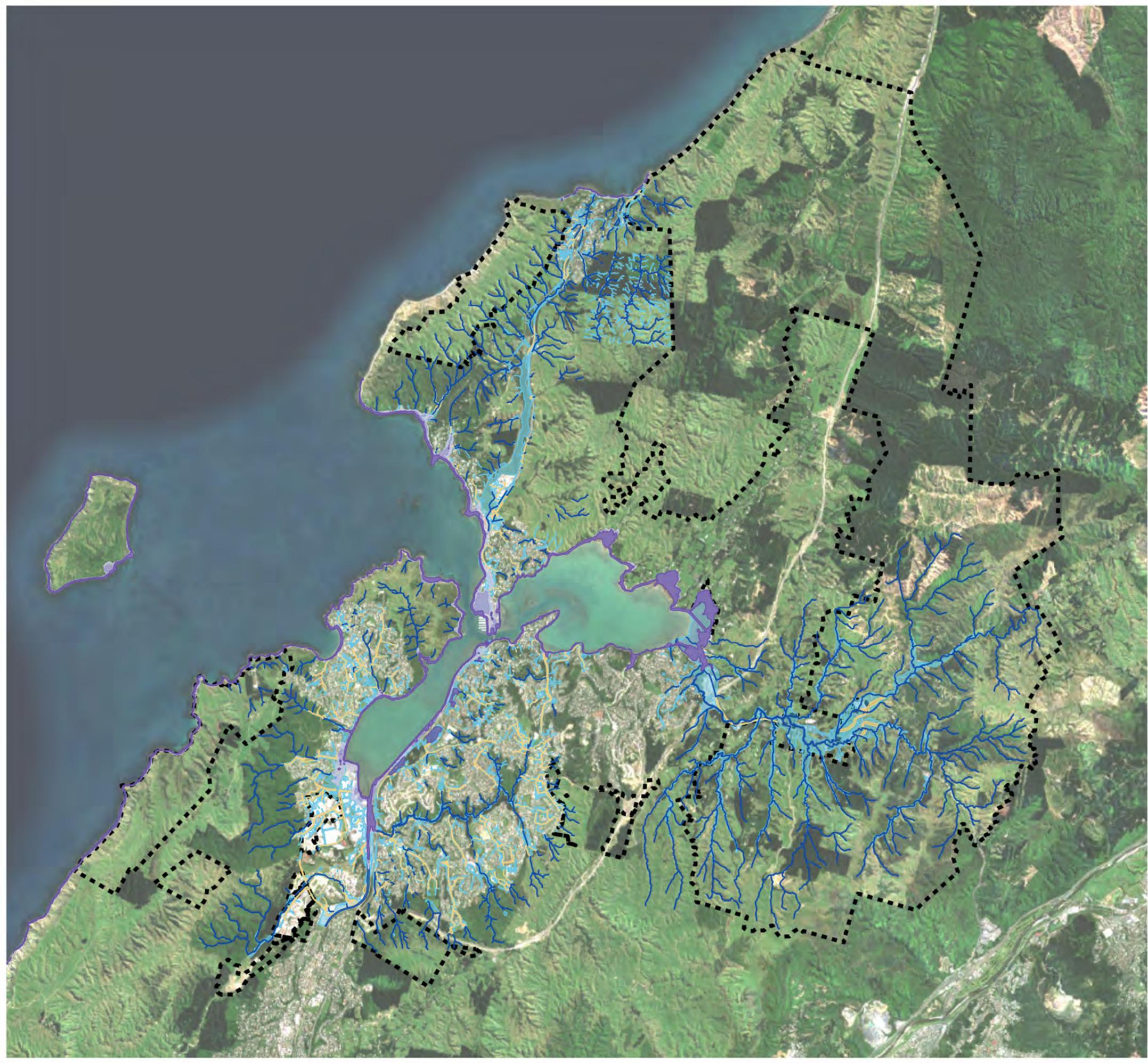


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 Infrastructure

Figure 3.



**Site Selection Constraint Data**

**Flood Hazard**

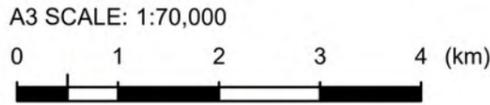
- Stream Corridor
- Overland Flow
- Inundation

**Tsunami Hazard**

- 1 in 100yr Inundation
- 1 in 500yr Inundation
- 1 in 1000yr Inundation

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 Flood and Tsunami Hazard

Figure 2A.



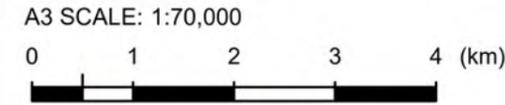
**Site Selection Constraint Data**

- Coastal Flood Hazard**
- 1:100yr Storm Surge
  - 1:100yr Storm Surge (with 1m SLR)

- Coastal Erosion**
- Current Hazard
  - Future Hazard 1m SLR

**Proposed District Plan Decisions Version 2023**

- General Industrial + General Rural



**Notes:**

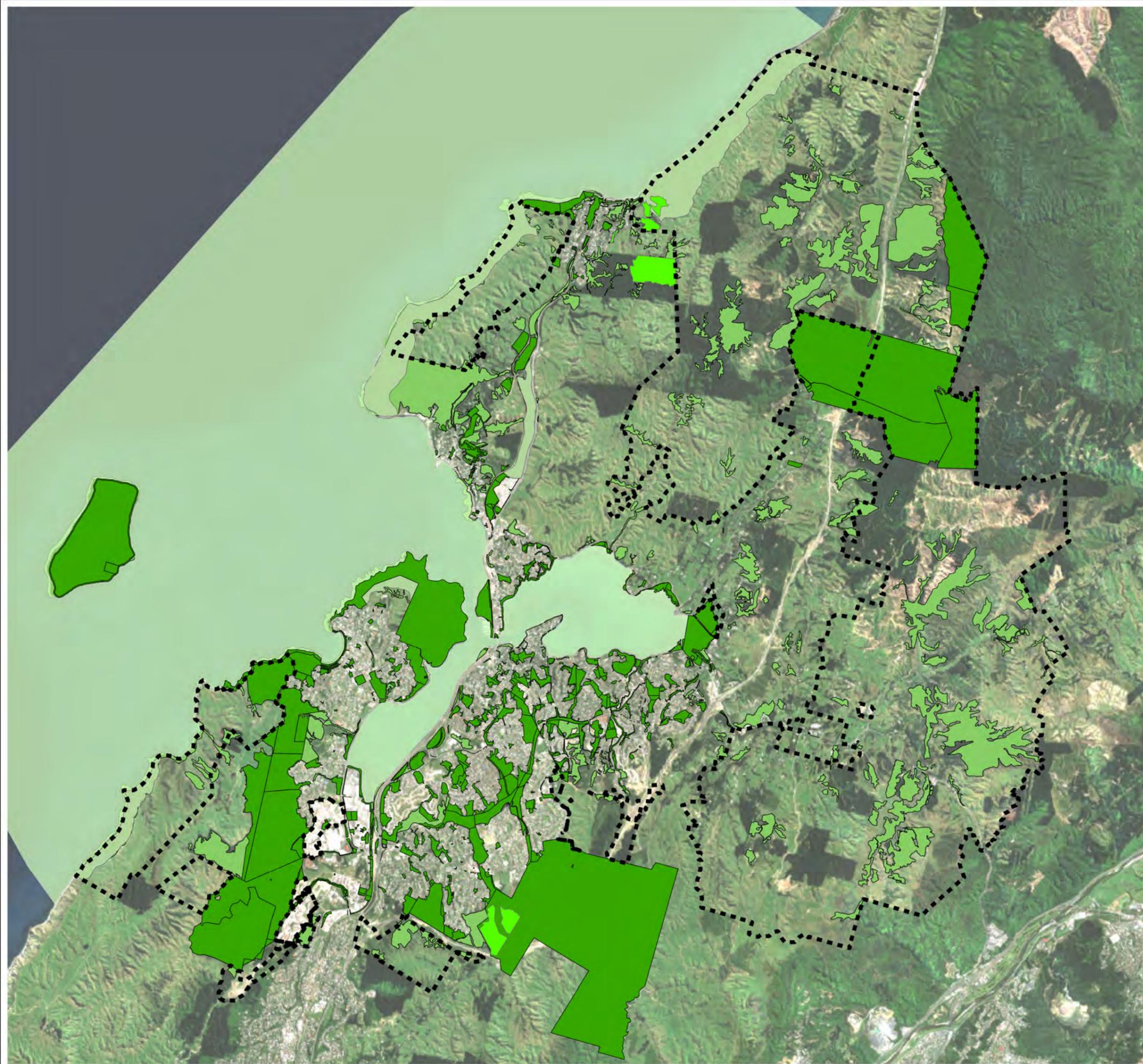
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 Coastal Erosion and Inundation Hazard

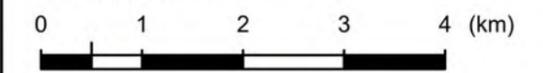
Figure 2B.



### Site Selection Constraint Data

- Covenant Area
  - Reserves
  - Public Conservation Areas
  - Outstanding Natural Features and Landscapes
  - Significant Natural Areas
- Proposed District Plan Decisions Version 2023**
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 Spicer Landfill Development  
 Natural Significance

Figure 5.



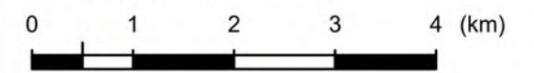
### Site Selection Constraint Data

- NZ Property Titles Including Owners
- NZ Road Centrelines

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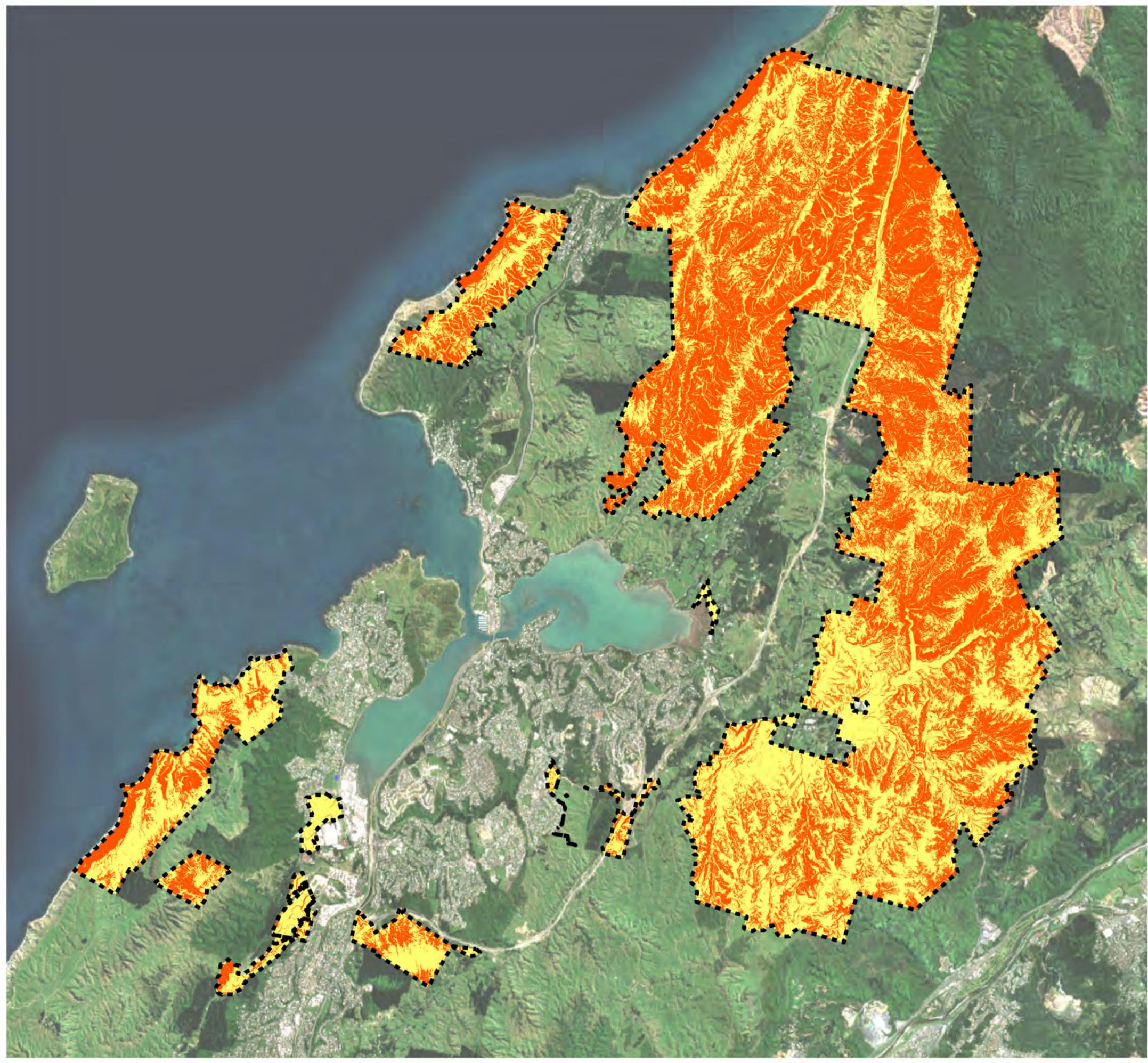


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 LINZ Property Boundaries

Figure 6.



**Site Selection Constraint Data**

**LINZ DEM 2023**

Degrees

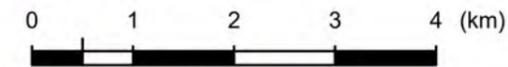
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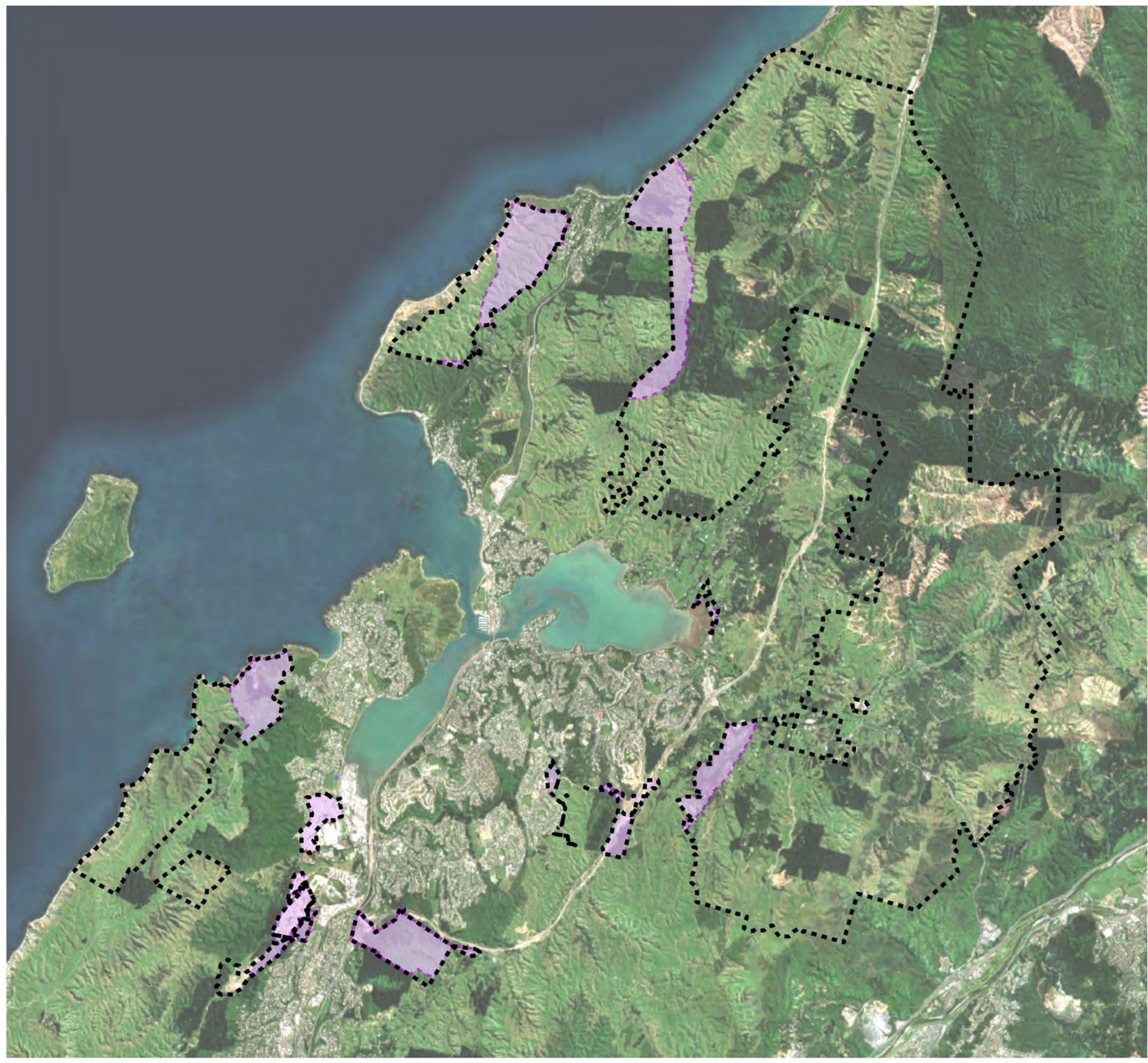
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 Topography - Slope Analysis

Figure 7.

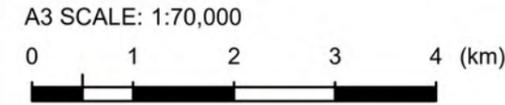


**Site Selection Constraint Data**

 Medium and High Density Residential Zones (1km Buffer)

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 Spicer Landfill Development  
 Zoning

Figure 1.

# Appendix E Feedback from Ngāti Toa Rangatira

---



## TE RŪNANGA O TOA RANGATIRA

### Waste Management Alternatives Assessment

#### Method/ Technology

As shown in the assessment of alternatives methods and technologies for residual waste management, landfill is rated the best against the objectives for assessment.

Incineration, Gasification, and Pyrolysis produce by-products which could be used to generate energy. (Although there are more efficient ways to produce energy in Aotearoa such as through wind).

Mechanical Biological Treatment and Mechanical Heat Treatment produce by-products which will likely to need to go to landfill. Therefore, there is still a need for landfill with these processes.

All these technologies (excluding landfill) are designed for specific waste quantities and compositions. Needing a certain amount and type of waste to keep these machines running could result in the need to produce more waste rather than encouraging the reduction of waste.

#### Location

Inappropriate locations for waste management facilities

- Near marae
- Near urupā
- Near pā or wāhi tūpuna
- Near mahinga kai (e.g. wetlands)
- Coastal environment
- Near the harbours and estuaries
- Near waterways - especially waterways of significance that have major impacts on the environment
- Near papakāinga (e.g. Hongoeka)
- Indigenous forests
- Cultural landscapes (e.g. Plimmerton and Pukerua Bay – places of cultural significance where there are pā, wāhi tapu, tracks, urupā, wetlands etc.)

#### Cultural impacts

Impacts on whenua, wai, rākau, ecosystems and biodiversity, mahinga kai, wāhi tapu, marae, papakāinga, hauora, mātauranga, tikanga, whanaungatanga and connection to land.

Consider principles (whakapapa, kaitiakitanga, mātauranga etc.) and values relating to particular places (mahinga kai, wāhi tapu, cultivations, cultural harvesting).

Cultural and environmental outcomes – planning for cultural landscape, climate change, cultural health monitoring.

Building capacity and resourcing for diversion of waste through recycling, composting etc.

### **Other considerations**

- Looking at existing infrastructure and building capacity at those places rather than creating new places to dispose waste
  - Existing closed landfills
  - Wellington Southern Landfill
  - Marton Landfill
- Employment opportunities
- Environmental restoration
- Regional waste management and minimisation

24 September 2024

## Mana Whenua Recommendations

Kaimahi of Te Mana Taiao Team assessed three different options for the management of residual waste, these options included the extension of Spicer Landfill, mechanical biological treatment, and the export of waste to Bonny Glen Landfill in Marton. When undertaking this assessment, we considered how the various options aligned with the values, objectives and aspirations of Ngāti Toa Rangatira.

### Moemoeā

The natural environment of te rohe o Ngāti Toa are returned to health and we are kaitiaki for our taiao and its protection for future generations.

Te Mana Taiao Strategic Objectives			
<b>Aonui</b>	Reclaimed connections and mātauranga relevant to Ngāti Toa Rangatira	<b>Kaitiaki-tanga</b>	Empowered kaitiaki who are leaders and co-managers of our natural environment
<b>Whakauka</b>	Commitment to environmental sustainability	<b>Urutau</b>	Ability to adapt to the impacts of climate change

### Results of the assessment

In relation to the values of Ngāti Toa Rangatira and our objectives, these are the average ratings between 1-10 which the team gave for each waste management option with 1 being the worst and 10 being the best.



Option	Aonui	Kaitiakitanga	Whakauka	Urutau	Total	Whakaaro
Extend Spicer Landfill consent until 2035	2.25	3.25	3	4.25	<b>12.75</b>	<p>Rangituhi is our whakapapa which needs to be protected.</p> <p>Ko Rangituhi te maunga. Our maunga and waterways deserve to rest and regenerate. Continual dumping at Spicer Landfill will not clean our harbour and waterways.</p> <p>Extending the consent for Spicer Landfill is the simplest option which allows us to manage our own waste but has a significant adverse cultural and environmental impacts for Porirua.</p>



Mechanical Biological Treatment & landfill for residual waste	5.5	6.25	5.5	5.75	<b>23</b>	<p>From a consenting perspective this is the most difficult option and may require more time than both other options. However, I believe that it offers an exciting opportunity to manage waste in a new way and has lesser cultural &amp; environmental impacts than the other options. Perhaps this is a longer-term solution rather than being viable in the near future.</p> <p>MBT has not been used in Aotearoa, which will mean there could be many problems to navigate. This method will still produce odour; however, it seems more sustainable than landfill. Anything relying on mechanical operations are subject to breaking down and need specialists to fix any problems. We are not sure about the long-term impacts of this method.</p>
Export waste to Marton Landfill & develop transfer station	5	5	4.5	4.25	<b>18.75</b>	<p>We are currently taking some of our waste outside of Porirua and sending it to other landfills around the rohe. We are also accepting waste from other cities; however, this seems like an out of sight out of mind scenario.</p> <p>We would need to conversate with the iwi in Marton and if they agree it could be an option to consider. However, this also produces problems such as significant emissions associated with the transport. There could also be problems if the roads are closed.</p> <p>This option would reduce the harm to Rangituhi and the local environment in Porirua, however the associated affects are just being transferred to another community.</p>

## Recommendations

We understand that a significantly greater amount of time would be needed to consent a mechanical biological treatment facility. Despite MBT being the highest rated option in our cultural values assessment, we understand that this option would only be viable in the long-term.

This leaves only two options remaining – either a new consent for Spicer Landfill or the export of waste to Bonny Glen Landfill. Both options pose significant challenges. The most prominent concerns for Ngāti Toa Rangatira regarding Spicer Landfill are the cultural, social and environmental impacts the landfill and its operations have on our ancestral maunga and waterways. In relation to the export of Porirua’s waste to Bonny Glen, the key issues are a potential reduction in affordability for Porirua residents and businesses the logistical considerations of a new waste transfer station, and the increased emissions from the transport and bulk haulage of waste from Porirua to Marton. For this option, it is also highly important for Ngāti Toa to consider how comfortable we are with exporting the waste (and associated issues) onto another community and iwi.

With everything considered, the option that is supported most by Te Rūnanga o Toa Rangatira is to export waste to a landfill site outside of Porirua (likely to be Bonny Glen). We believe that it is of the utmost importance to continue working together to find a more sustainable long-term solution which aligns with the values of Ngāti Toa Rangatira and Te Mana Taiao strategic objectives. This solution must account for all aspects of the waste cycle not just the management of waste but also the production, consumption and minimization of waste. Major changes to the cycle of waste need to be made to ensure that we are upholding kaitiakitanga and to produce more sustainable outcomes for te taiao, whānau and future generations.

## Appendix F Cultural impacts scale

Priority area	Requirement	Scale	Weighting
<b>Assessment criteria</b>			
<b>3. The preferred option should manage any environmental impacts and minimise emissions associated with residual waste services.</b>	<b>Cultural impacts</b>	<p>0: Not applicable.</p> <p>1. Technology disincentivises waste reduction; facility is in an inappropriate location; facility negatively impacts on cultural values; waste is managed entirely outside Porirua City.</p> <p>2. Technology neither incentivises nor disincentivises waste reduction; facility can be placed in an acceptable location; facility has neither positive nor negative impacts on cultural values; waste is managed in part outside Porirua City.</p> <p>3. Technology incentivises waste reduction; facility can be placed in an acceptable location; facility has positive impacts on cultural values; waste is managed wholly inside Porirua City.</p>	8

## Appendix G MCA scoring (three options) with sensitivity analysis applied

Option name	1. The preferred option should ensure that Porirua residents and businesses have ongoing access to appropriate residual waste services.					2. The preferred option should deliver an affordable and cost effective/competitive residual waste service for Porirua residents and businesses.		3. The preferred option should manage any environmental impacts and minimise emissions associated with residual waste services.				TOTAL MCA	Sensitivity – double for objective 3	Sensitivity – treble for objective 3	Sensitivity – remove gate rate	Sensitivity – Spicer abandoned
	Availability	Operationally sound	Consenting risk	Resilience	Flexibility	Indicative gate rate	Local capability to deliver	Direct environmental impacts	Greenhouse gas emissions	Social impacts	Cultural impacts					
MBT within Porirua City with access to landfill	1	2	2	2	2	1	2	2	3	2	2	1.85	1.95	2.01	2.00	1.85
New consent for Spicer Landfill	2	2	2	3	2	3	3	1	3	2	1	2.32	2.18	2.09	2.10	2.03
Export of waste to a landfill outside Porirua	3	3	3	2	2	1	3	2	3	2	1	2.20	2.15	2.12	2.40	2.20

Sensitivity – Spicer abandoned	Option name	Availability	Operationally sound	Consenting risk	Resilience	Flexibility	Indicative gate rate	Local capability to deliver	Direct environmental impacts	Greenhouse gas emissions	Social impacts	Cultural impacts
	MBT within Porirua City with access to landfill	1	2	2	2	2	1	2	2	3	2	2
	New consent for Spicer Landfill	1	2	1	2	2	3	3	1	3	1	1
	Export of waste to a landfill outside Porirua	3	3	3	2	2	1	3	2	3	2	1

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