APPENDIX T

ECONOMIC IMPACT ASSESSMENT

GCS Waste to Energy Plant

Economic Assessment

Prepared for Global Contracting Solutions

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Executive Summary

Global Contracting Solutions (GCS) is proposing to build and operate a Waste-to-Energy (WtE) plant that will generate power from thermal processing of Refuse-Derived Fuel (RDF). RDF is a product produced by shredding, sorting and dehydrating solid waste, typically consisting of combustible components of municipal solid waste (MSW) and other waste sources.

GCS has commissioned this research which covers economic aspects of the proposed WtE plant, specifically the role of the plant within the local and regional economy. This research will be used as part of the resource consent application for the WtE plant. The research covered the aspects of the proposed plant activity, the context in which the plant will operate and finally the economic role of the plant.

The Proposed Activity

The proposed WtE plant will employ modern technology to convert waste to energy and to recover additional resources from various waste sources. The selected technology has been developed and applied in Europe over many decades, and complies with stringent emissions rules. The assessment covered the proposed plant's location and design, construction and operational parameters, and its inputs and outputs. These factors are discussed in more detail in the application, but are relevant to summarise here as a foundation for this economic assessment. The following aspects of the proposed WtE plant are important to the economic assessment:

- The site location is strategic, giving good transport access to the Waikato Region.
- The construction and capital expenditure will be significant ($205m) and occur over a relatively short period.
- The operation will create new jobs (60 employees), which are relatively highly paid. The operation will include an education/training facility.
- The feedstock is expected to be come from several sources, municipal solid waste (78,880 tonnes), potentially remediation of old landfills (8,764 tonnes)[1], end-of-life tyres (35,058 tonnes), plastic (35,058 tonnes) and flock which is by-products from the metal recycling industry (17,529 tonnes).
- The outputs of the plant will include electricity (15MW), heat energy, and recycling (27,900 tonnes), all of which will feedback into the economy. This is based on the currently

[1] Landfill remediation is not part of this consent application.

proposed three furnace lines. If consent is obtained for the addition of a fourth line at some point in the future total electrical generation would increase to around 20 -22MW.

WTE Plant Context

The proposed WtE plant will operate within the context of several markets, the local community and economy. The context is important as the households and businesses in the local area will supply both feedstock for the plant, and other inputs during the construction and operation of the plant (labour and other supporting materials). In summary, the following aspects of the context are important to the economic assessment:

- The communities that will be served by the proposed WtE plant have grown significantly, and this growth is expected to continue in the future. This means that the waste management demands of the community are likely to increase in the coming decades. The proposed WtE plant, if approved, could provide additional capacity to meet the growing demands.
- The employment at the proposed WtE plant (60 jobs), will be sizable compared to most businesses in the District and much bigger than any existing waste management and electricity generator. The plant will be a large business within the Waipa economy.
- The District and Regional economies have a sizable industrial sector (approx. 25% of total economic activity) and construction sector (approx. 10% of total economic activity). At this point no contracts have been signed for the manufacturing of the plant equipment or construction of the building. However, it is expected that a substantial share of this work could be handled by businesses in the local and regional economies.
- The plant will operate within the wider waste management market, and will compete to source feedstock and supply outputs. The scale of the feedstock demands will be significant within the region, it was beyond the scope of the report to assess the ability of the proposed WtE plant to source sufficient feedstock. The strategic location, efficiency of operation and changes in policy, suggests that the proposed WtE plant may be expected to generate improved outcomes for the economy. This is addressed further in discussion in the planning report (s104(1)(d)).
- The energy outputs (electricity and heat energy) will be relatively small compared to the wider energy market, representing less than 0.2% of the entire energy market. Locally, the energy output would represent less than 0.5% of the regional installed power capacity, however it could deliver approximately 33% of the energy that would be consumed in the Waipa District.

WtE Role inf the Economy

The proposed WtE plant will generate economic activity within the local and regional economies. This will include not only the activity associated directly with the construction and operation of the plant, but also flow-on activity that is sustained in businesses that supply the plant (indirect) and the spending by the staff that work within the plant (induced).

There will also be efficiency gains from better handling of waste, which benefits businesses and the community (cheaper disposal) and local government (reduced need for new landfills). There are also expected to be benefits in terms of energy generated by the plant, which will enable the network to operate more efficiently.

Finally, the proposed WtE plant is expected to generate additional benefits to the wider economy because of auxiliary outcomes associated with the plant. The wider economic benefits include:

- improvement in circular use of resources in the economy,
- transport efficiency from reduced transportation of waste,
- competition improvements from having an additional competitor,
- opportunity benefits from reduced need to use land for landfill, and
- tourism activity associated with the education and information centre.

The economic assessment has quantified the key economic benefits of the proposed WtE plant. First, the construction of the plant will generate $14.1 million in GDP in the local Waipa economy, which would be equivalent to over 140 jobs. The regional economy would receive economic activity of $75.7 million GDP and a total of 760 jobs. This economic activity will be spread over the three year planning and construction phase.

Once operational, the plant will generate $18.9 million in GDP to the local Waipa economy, which would be equivalent to over 210 jobs or 1% of the employment in the district. The regional economy would receive economic activity of $37.6 million GDP and a total of 420 jobs. This economic activity will occur in every year of operation, starting in 2024.

Also the proposed WtE plant is expected to generate efficiency gains in terms of waste management. The modelling suggests that these efficiency gain could result in an increase of $19.1 million GDP and a further 240 jobs for the region. A small share of this benefit will accrue to Waipa District economy. Finally, electricity generation benefits at the national level may be in the order of several million dollars per annum, however this is yet to be confirmed.

Finally, the report qualitatively assesses the other wider economic benefits, while not quantified are expected to be smaller than the other economic benefits.

1 Introduction

Global Contracting Solutions (GCS) is proposing to build and operate a Waste-to-Energy (WtE) plant that will generate power from thermal processing of Refuse-Derived Fuel (RDF). RDF is a product produced by shredding, sorting, and dehydrating solid waste, typically consisting of combustible components of municipal solid waste (MSW) and other waste sources.

GCS is owned and operated by Global Metal Solutions, which has many decades of experience in the metal recycling industry and has three metal recycling sites, in Hamilton, New Plymouth and Auckland. Their goal is to support the environment through recycling activities and providing for opportunities for whanau and communities by providing quality employment. The proposed WtE plant is an extension of the goal of the company.

GCS has commissioned this research which covers economic aspects of the proposed WtE plant, specifically the role of the plant within the local and regional economy. This research will be used as part of the resource consent application for the WtE plant.

1.1 Objective and Scope

The objective of this report is to understand the potential economic effects of the application, and covers the:

- operational activities as a result of the proposed infrastructure, and any subsequent change in supply chain effects; and,
- the facilitated effects due to changing waste handling patterns facilitated by the proposed WtE plant, and the effects associated with productivity gains from the activity for the wider economy.

This research focuses on the economic impacts and role of the WtE plant, assuming that the plant is feasible and becomes operational. It is beyond the scope to assess the New Zealand wide implications of the plant within the network of waste management markets or other activities that GCS undertake at their other operations. This report does not assess the potential feasibility of the proposed WtE plant within the various markets it is expected to operate or provide a business case of the project.

1.2 Approach

The approach applied was to undertake four key steps:

- review the proposed WtE plant from first principles,
- undertake a site visit to establish the local context

- to engage with key stakeholders to inform; and,
- to model the economic role of the plant.

The foundation of the assessments is the definition of the counterfactual – i.e. the business-as-usual case, or the alternative to the proposed WtE plant. It is expected that the community and businesses will continue to generate waste in the future, and while it is likely that recycling will improve in the future, this will not be enough to enable zero waste in New Zealand. Therefore, some method of managing waste will still be required in the coming decades.

This means that the outcomes generated by the proposed WtE plant must be contrasted against the counterfactual of the current method of managing waste. Explicitly, waste is mostly "managed" in New Zealand by burying it in landfills, which has been the traditional method used by societies for much of human history. This method of waste management results in a number of negative environmental outcomes, both for today's community and future generations, and significantly constrains what landfill sites can be used for in the future. The landfill method also typically results in valuable resources being lost to the economy, with lower rates of recycling and reuse.

In contrast, the proposed WtE plant is a technologically advanced alternative which treats waste as a resource, and results in increased recycling of valuable resources and generation of power. This method also reduces both the amount of land being lost and potential environmental problems for future generations.

The first step in this assessment was a review of information on the proposed WtE plant, which included discussions with the client and experts from a range of disciplines (emissions, traffic, quantity surveyor, engineering) to establish an understanding of the proposed activity, throughout all phases from construction, input sourcing, on-site process, and outputs. We have also sourced secondary data that provides an understanding of the wider regional and district context. This review has sourced data from the following sources:

- **GCS Financial Projections:** the client has provided projections of revenues, expenditure and cashflows for the period 2023 to 2033. This data shows detailed line-item costing for the project, which includes salaries and wages by staff type.
- **GCS Capital Budgets**: this covers the purchase of the land, construction of buildings, WtE generation equipment, other development costs and information about the funding mechanisms that may be used to complete the project.
- **Formative Limited** (FL): proprietary economic data and models on economic activity in the local area, district, and region.
- **Statistics New Zealand** (SNZ): data on the population in the local area, district, and region.

- **Ministry for the Environment** (MfE): research on WtE and waste management which are used in this report.
- **Future Proof Partners** (FPP): research of industrial land supply and demand in Waipa and Te Awamutu.
- **Waipa District Council** (WDC): supplementary information about the economy.
- **Other studies and media reports**: range of studies from other agencies that cover waste management and WtE.

The second step was to undertake a site visit to establish the local context in Te Awamutu, in and around the proposed site of the WtE plant. The results of the first two steps are presented in section 2 and 3 to define the economic role of the plant.

The third step was to identify the economic role that the plant could play in the future, both within the district and region. Two economic measures are established, the net direct additional and facilitated economic activity.

We have measured the net direct additional value that is generated by the proposed WtE plant operations. This is different from the wider role of the proposed WtE plant, as it only measures economic activity that flows through the Waipa and Waikato economies if the proposed WtE plant is developed.

We also measure the wider role of infrastructure in an economy. In the case of WtE, it is important to understand the entire role of the plant as a facilitator of economic activity that utilises the plant for waste management and uses outputs (recycling and energy). WtE will have an important and broad role as a key piece of infrastructure that enables or facilitates economic activity. This assessment provides a total view of the proportion of the economy supported in some way by the proposed plant.

Once identified, the net direct additional and facilitated activity was run through our proprietary Economic Linkages Model (ELM, see Appendix A for details). ELM is a subnational input output model that allows the calculation of all flow-on effects associated with the net direct additional and facilitated activity of a business. The use of the ELM is important in this context as it allows cross-border flows between sub areas within New Zealand to be traced and captured in the calculations.

Most traditional impact assessment techniques treat these flows as either imports or exports and their effects are excluded. However, it is important that the effects of expenditure in Waipa District that supports business activity across the rest of the region, either through direct contracts or the purchase of additional intermediate goods and services, are captured.

Finally, the economic assessment also provides a qualitative discussion of the economic well-being outcomes that may occur if the WtE plant begins operation. The results from the economic modelling are presented in section 4.

1.3 Report Structure

This report is structured as follows:

- Section 2 describes the location, design, and operational aspects of the proposed WtE plant.
- Section 3 provides context for the assessment, and covers the community, economy, waste management, and the energy market. This context is important as the plant will have a wide-reaching role within the Waipa District and the Waikato Region.
- Section 4 estimates the potential economic role of the proposed WtE plant, including the construction phase, waste management operation, energy production and the wider role associated with benefits to the community from the improved efficiency associated with waste disposal. The section covers the net direct additional and facilitated economic activity associated with the WtE plant, which are presented in terms of value added, income and employment. Section 4 concludes with a qualitative discussion of the economic well-being outcomes associated with the plant.
- Section 5 summarises the report's key findings and provides conclusions about the economic role of the plant in the Waipa District and broader regional economies.

2 The Proposed Activity

The proposed WtE plant will employ modern technology to convert waste to energy and to recover additional resources from various waste sources. The selected technology has been developed and applied in Europe over many decades, and complies with stringent emissions rules.[2] This section provides an overview of the proposed plant's location and design, construction and operational parameters, and its inputs and outputs. These factors are discussed in more detail in the application, but are relevant to summarise here as a foundation for this economic assessment. The technical and scientific aspects of the proposed WtE plant are covered by other relevant expert reports (technical design, air emissions, noise, quantity surveyor, etc).

2.1 WtE Plant Location and Design

The plant is proposed to be located in Te Awamutu because of its strategic location between the applicant's three metal processing sites in New Plymouth, Hamilton and Auckland, which means that the proposed WtE plant can readily take delivery of flock and despatch metals to these sites. Te Awamutu is also close to Hamilton and Cambridge, and over two thirds of Waikato region's population live within Waipa District and Hamilton City. This means that there is a sizeable amount of waste produced in the immediate area around the plant.

Figure 2.1: Map of Region and proposed Waste to Energy Plant

[2] Lambion Energy Solutions (2020) Technical Plant Description - 01155 - RDF Power Plant 3 x 5Mwel.

The proposed WtE plant site ("the Site") is located on the northern side of Te Awamutu, adjacent to the main railway line north of Factory Road. The Site has road access via Racecourse Road, which links to State Highway 3 to the north and south.

The property is approximately 65 hectares, and is mainly zoned Rural. It is currently used as a farm with a dwelling and a number of outbuildings. The southern part of the property is zoned Industrial (11ha), which is where the proposed WtE plant will be situated.

Figure 2.2 shows the concept plan for the proposed WtE plant. The Site is bounded by:

- Waipa Racing Club's racecourse to the northeast;
- Mangapiko stream to the southeast, with Te Wharekura o Nga Purapura o Te Aroha Māori medium composite school across the stream;
- Fonterra settling ponds and treatment areas to the southwest;
- Fonterra product warehouse to the northwest; and,
- Several residential dwellings to the east, with three dwellings either side of the site access on to Racecourse Road.

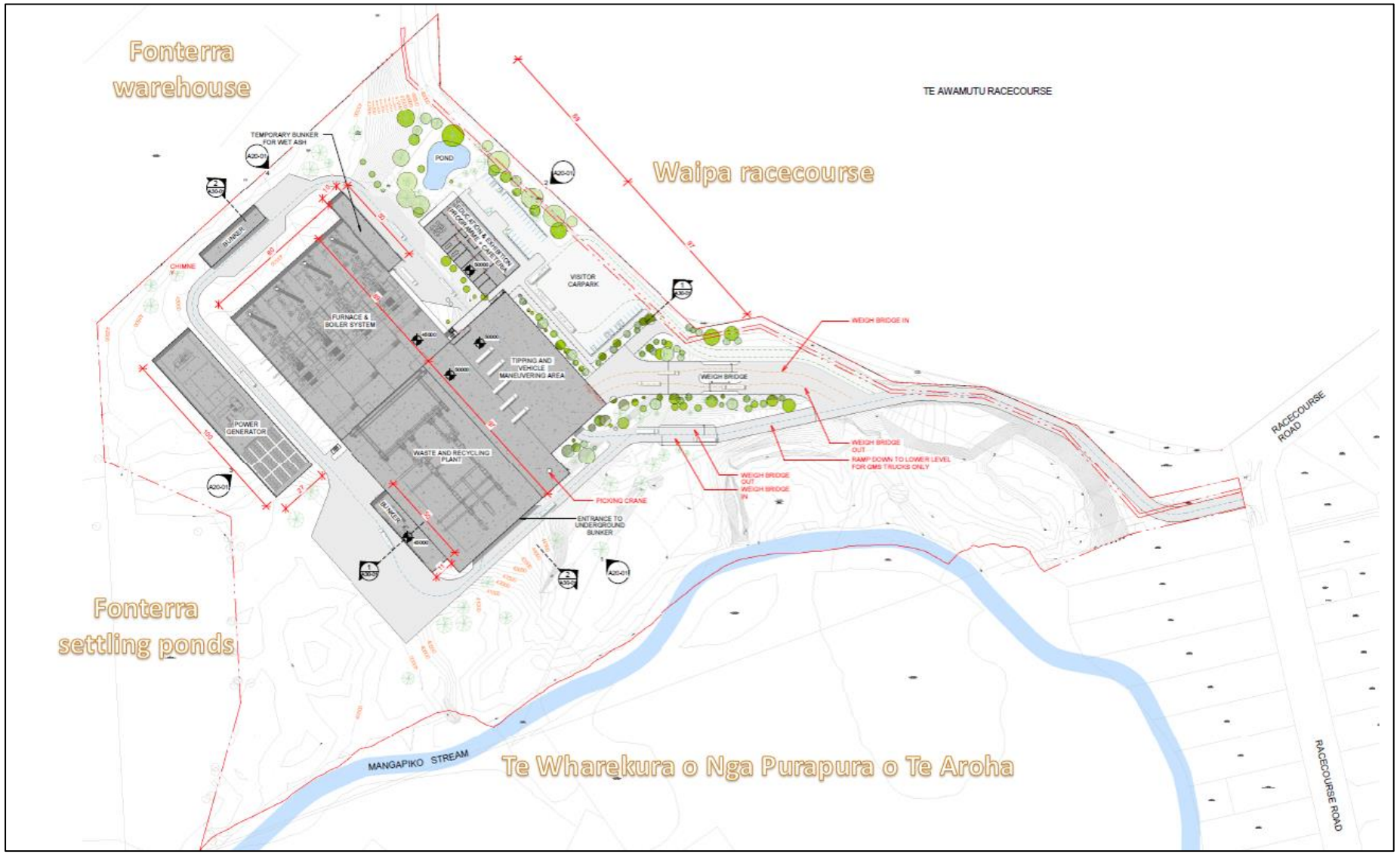
The proposed WtE plant will be situated on the western side of the Site, with the furnace/boiler system (blue building in Figure 2.2) being adjacent to Fonterra's warehouse and the recycling/receiving plant (purple building) adjacent to Fonterra's settlement ponds.

The visitor carparking and education/exhibition/cafeteria (yellow building) will be located on the northern part of the site, adjacent to the Waipa racecourse. The southern and eastern parts of the Site adjacent to Mangapiko Stream and residential properties will not be used for the plant.

The recycling/receiving plant and education/exhibition/cafeteria buildings will be a about 9m high and the furnace/boiler system building will be about 35m high. This compares to the existing industrial buildings in the area that are mostly more than 9m high and in some cases close to 35m (e.g. Fonterra plant).

The site access will run more or less parallel to the northern boundary of the Site. The manoeuvring and tipping areas are situated between education/exhibition/cafeteria and recycling/receiving plant buildings.

Figure 2.2: Concept Plan for proposed Waste to Energy Plant



2.2 WtE Plant Construction

The capital required to build the WtE plant is yet to be fully finalised, however initial estimates provided by a quantity surveyor suggest that the construction of the plant is expected to cost in the region of $205 million and require two and half years to complete.[3] The capital investment includes:

- Purchase of land at $7.5 million;
- Generation equipment, which is committed at €59.6 million, or approximately $105 million;
- Construction of building, infrastructure, recycling line and earthworks, which is expected to cost $90 million; and,
- Other costs of approximately $7 million, which includes design, consenting, management, etc.

Our understanding is that all the construction of the buildings and other costs will be undertaken by contractors located in Waikato, Auckland and rest of New Zealand. The generation equipment supplier will maximise manufacturing capabilities in New Zealand, so it is expected that about 70-75% of the equipment will be built by NZ manufacturers.

The capital expenditure will be funded firstly using local sources - commercial banks, public (bonds, public offer), equity partners or government support. If required, GCS has secured conditional funding offer from offshore banks and private credit groups.

2.3 WtE Plant Operation

The proposed WtE plant will operate 24 hours a day, with a total workforce of 60 staff. Most of the staff will be skilled, including engineers (27), a recycling team (22), a yard team (8) and office/other staff (6). The plant's workforce will receive relatively high incomes compared to the average worker in the Waipa district, estimated to be around 20% higher than average.[4]

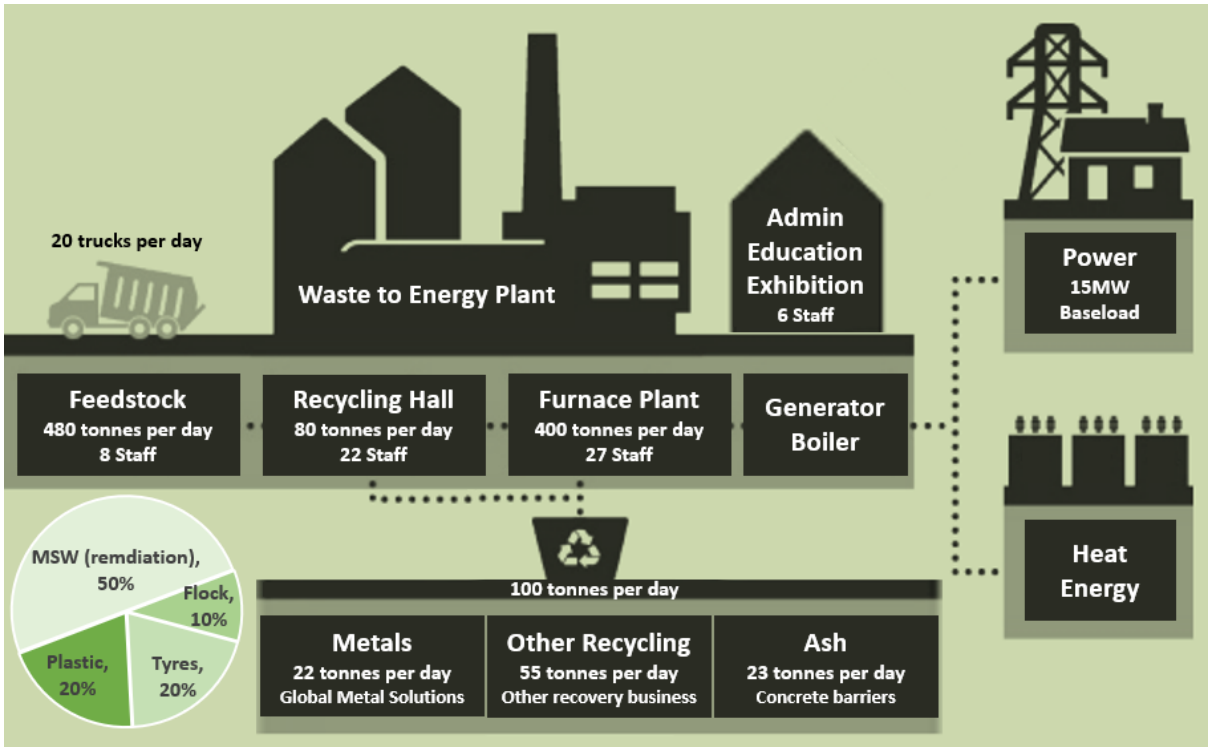
The plant will take delivery of approximately 480 tonnes of feedstock every day on twenty trucks. The feedstock will include MSW, plastic, tyres and flock. The feedstock will be sorted in the recycling hall to extract resources that can be recycled, which includes metals, glass, paper, etc.

The remaining feedstock then proceeds into the furnace/boiler system, which generates 15MW of power and heat energy (excess heat energy in water). The emissions proceed through a range of filters and scrubbers that remove any odours, harmful particulate matter and hazardous chemicals.

[3] Global Contracting Solutions (2021) Indicative Capital Costs for proposed WtE plant.
[4] Waipa District Council (2021) Economic Profile – Infometrics.

The ash from the furnace and boiler systems is then processed to extract metals which will be recycled by Global Metal Solutions. In total the plant will produce approximately 77 tonnes of recycled resources per day. Finally, the plant will produce approximately 23 tonnes of ash per day which can be used to produce concrete barriers.

Figure 2.3: Operation Diagram of proposed Waste to Energy Plant



GCS has provided detailed financial forecasts as input to this economics assessment, which includes the gate revenue by type of feedstock and revenue from electricity.[5] The financial forecasts include detail of the expenses, for twenty-five categories. The details of the revenue and costs are not presented in this report because they are commercially confidential, but they are used to calculate the economic effects presented in this assessment.

GCS has also provided indicative information on the competitive situation in the waste management market. This information suggests that the proposed WtE plant gate revenue is expected to be relatively competitive for the feedstock sources, potentially 70% cheaper than the alternative waste management options in the Waikato region.[6]

2.3.1 Plant Feedstock Inputs

The proposed WtE plant will require a regular supply of feedstock to maintain the operational efficiency of the furnace and boiler systems. GCS is proposing to draw feedstock from a number of

[5] Global Contracting Solutions (2021) Financial Forecasts for proposed WtE plant (2024-2032).
[6] Global Contracting Solutions (2021) Waste Management Gate Prices – Waikato Region.

sources, which will ensure that the operation can source sufficient feedstock and maintain the calorific value that is required for the plant to operate optimally.

Over the course of a year the proposed WtE plant is expected to take delivery of 175,289 tonnes of feedstock. The plan is to draw from five key sources:

- **Municipal Solid Waste**: approximately 78,880 tonnes of MSW, which is expected to be sourced from within the region (approx. 45% of total feedstock).
- **Remediation**: approximately 8,764 tonnes of waste is expected to be sourced from old MSW landfills in the region (approx. 5% of total feedstock).
- **Tyres**: approximately 35,058 tonnes of old tyres, which is expected to be sourced from within the region (approx. 20% of total feedstock).
- **Plastic**: approximately 35,058 tonnes of plastic waste, which is expected to be sourced from within the region (approx. 20% of total feedstock).
- **Flock**: approximately 17,529 tonnes of flock which is by-products from Global Metal Solutions' metal recycling processing, and will be sourced from their three operations in Auckland, Hamilton and New Plymouth (approx. 10% of total feedstock).

Section 3 covers the key context of waste management, which is relevant for each source of feedstock that the proposed WtE plant will need to receive to operate.

2.3.2 Plant Resource Outputs

The proposed WtE plant will output resources which can be used in the economy, including recovered resources from the recycling hall, power from the thermal generator, heat energy from the boiler system and concrete barriers, as explained below.

First, the recycling line will extract all metals, aluminium, glass prior to 'sizing' the waste for incineration. Post incineration, a magnet will extract all metallics from the ash. Importantly, 17% of the weight of tyres is steel and 2.3% of MSW will also be metals. In total approximately 8,000 tonnes of metal are expected to be recycled from the plant. These metals will be sent to Global Metal Solutions for recycling. There is also expected to be 20,000 tonnes of other resources recovered in the recycling hall, which will be sent to other resource recycling businesses.

Second, the thermal generator in the proposed WtE plant will generate 15MW of power, which is enough power to provide for approximately 14,000 average households,[7] or enough to provide for all of the power needs of approximately half of the households in Waipa District. Given the scale of the plant it is not feasible to connect it directly to the local electricity distribution network, owned by

[7] Renewable Generation Development (2021) Energy Assessment of Proposed Waste to Energy Plant).

Waipa Networks. It will therefore most likely connect to the "grid" at Transpower's Te Awamutu Grid exit point (GXP or substation).

The boiler will generate heat energy that could be used in the adjacent industrial area or the rest of Te Awamutu. At this point of the project the applicant has not established a use for the heat energy. However, it is likely that this resource will be put to some use in the local economy.

Finally, the ash will be converted into concrete barriers which can be used on the grounds of the plant or on other industrial sites.

Section 3 covers the key context of energy market and waste management, which is relevant for power generated and the recycling outputs.

2.4 WtE Plant Summary

In summary, the following aspects of the proposed WtE plant are important to the economic assessment:

- The site location is strategic, giving good transport access to Waikato Region.
- The construction and capital expenditure will be significant and occur over a short period.
- The operation will create new jobs, which are relatively highly paid.
- The feedstock is expected to come from several sources.
- The outputs of the plant will include electricity, heat energy, and recycling, all of which will feed back into the economy.

3 WtE Plant Context

The proposed WtE plant will operate within the context of several markets, the local community and economy. This section outlines the key aspects of the community and economy in which the plant will operate. This is important as the households and businesses in the local area will supply both feedstock for the plant, and other inputs during the construction and operation of the plant (labour and other supporting materials).

The remainder of the section covers the nature of key markets that will be directly influenced by the operations of the proposed WtE plant – waste management and electricity markets.

3.1 Community

The Waikato Region, along with the Auckland and Bay of Plenty regions, are commonly referred to as the 'Golden Triangle', being an area within which about half of New Zealand's population lives and much of the country's economic activity takes place.[8] Over the last decade these three regions attracted almost 60% of national population growth, and all signs are that the area will continue to capture a large share of the growth over the next three decades.[9]

At a local level the community directly around the proposed WtE plant has also experienced rapid growth. Waipa District and Hamilton City have both grown by more than 23% over the last decade, reaching a population of 57,800 in Waipa and 176,500 in Hamilton, as of 2020. Combined, these two areas represent almost half of the population in the Waikato region. In the future the population is projected to grow by 73,000 by 2048. The population immediately around the proposed WtE plant has also grown strongly over the last decade, and the joint population of Te Awamutu and Kihikihi grew from 13,480 in 2010 to 16,190 in 2020, a 20% increase.

Figure 3.1: Community Population – Waipa, Hamilton and Waikato Region 2010-2020

Community	2010	2020	% Change
Te Awamutu/Kihikihi	13,480	16,190	20%
Cambridge	15,600	20,500	31%
Rest of Waipa	17,820	21,110	18%
Waipa District	46,900	57,800	23%
Hamilton City	143,300	176,500	23%
Rest of Waikato Region	269,100	320,200	19%
Waikato Region	**412,400**	**496,700**	**20%**

[8] Statistics New Zealand (2021) Subnational population estimates (RC, SA2), by age and sex, at 30 June 1996-2020 (2020 boundaries).
[9] Statistics New Zealand (2021) Subnational population projections, by age and sex, 2018(base)-2048.

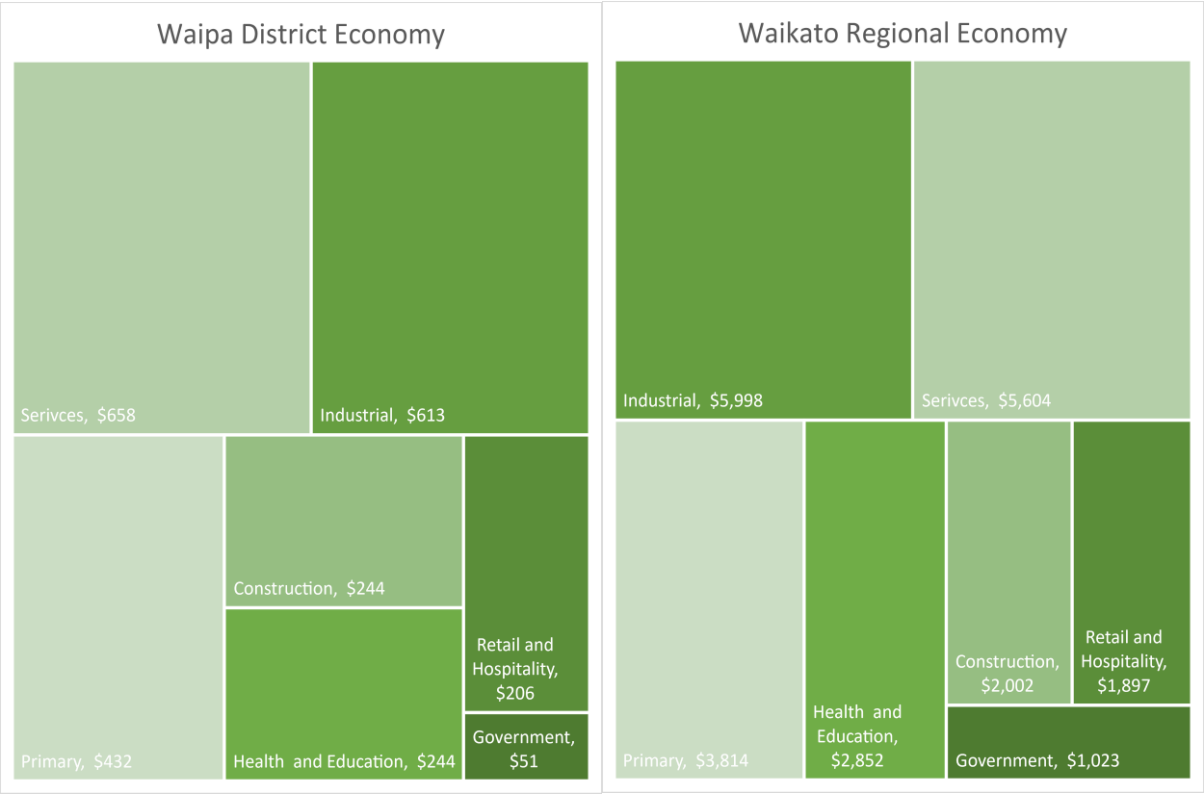
The community context shows that the communities which will be served by the proposed WtE plant have grown significantly, and that this growth is expected to continue in the future. This means that the waste management demands of the community are also likely to increase in the coming decades. The proposed WtE plant, if approved, could provide additional capacity to meet those growing demands.

3.2 Economy

The proposed WtE plant will operate within the context of the existing economy, drawing inputs from other business and employing locals, both during the construction and operation phases. At an aggregate level, the Waipa District economy generated $2.8 billion in GDP in 2020 and the Waikato regional economy generated $27.3 billion.[10]

In terms of structure, the Waipa District and Waikato Region economies have a sizable industrial sector (approximately 25%, worth $5.6 billion for the region) and construction sector (approximately 10%, worth $2.0 billion for the region). This suggests that the manufacturing of the plant equipment and plant building, will for the most part, be handled by businesses in the local economies. Specifically, a large share of the capital expenditure will be expected to flow to businesses in the regions.

Figure 3.2: Economic Structure of Waipa District and Waikato Region - 2020



[10] Waipa District Council (2021) Economic Profile – Infometrics.

In Waipa District there were 7,828 businesses and 23,710 jobs in 2020.[11] The industrial sector has the most jobs (4,660 jobs), followed closely by Services (4,550), Health and Education (4,000) and Retail/Hospitality (3,890). Most of the businesses in the District are small, with the average business supporting only three jobs. The largest employers in the District tend to be organisations related to the Government (25 jobs per business), Health and Education (10 jobs per business), Industrial (6 jobs per business) and Retail and Hospitality (6 jobs per business). Also there are very few businesses in the District that operate in Waste Management or Electricity Generation, with only three business with 23 jobs.

In this context the operation of the proposed WtE plant (60 jobs), will be sizable compared to most businesses in the District and much bigger than any existing business in the Waste Management and Electricity Generation sectors. This means that the plant will be a very large business within the Waipa economy.

Figure 3.3: Waipa District Business and Jobs - 2020

Waipa District	Businesses	Jobs	Jobs/Business
Primary	1,787	3,190	2
Industrial	727	4,660	6
Construction	934	2,780	3
Retail and Hospitality	619	3,890	6
Services	3,344	4,550	1
Health and Education	392	4,000	10
Government	25	640	25
Total	**7,828**	**23,710**	**3**
Waste Management/Electricity Gen	3	23	7

Finally, the operation of the proposed plant will directly create 60 new jobs within Te Awamutu itself, which is equivalent to 1% of the jobs recorded in 2020 (6,850 jobs). At this scale, the proposed WtE plant is expected to be a significant part of the town's economy. Most of the operational needs are expected to be supplied by local businesses in Te Awamutu, Cambridge and Hamilton, and most of the plant's staff are likely to live locally as well.

3.3 Waste Management

The proposed WtE plant will operate within the wider waste management market, and will need to work alongside and compete with existing businesses that currently manage waste. The following subsections outline the key aspects of each waste stream expected to be utilised as feedstock for the plant, including the origin of the feedstock and how it is currently managed. This is important as it

[11] Formative (2021) Business and Employment Database – Geographic Units and All Workers.

shows how the proposed WtE plant fits within the existing environment, as compared to the scale of the sources of feedstock and management supply that is available.

3.3.1 Municipal Solid Waste

The main source of feedstock for the proposed plant is expected to be sourced from MSW. New Zealand has one of the highest rates of waste production per capita in the developed world, disposing of approximately 15 million tonnes of waste per year.[12] Of this total, 9.75 million tonnes is sent to landfill, which equates to around 2.1 tonnes per person, and the remaining 35% is recovered for recycling.

In 2017, the Waikato region was estimated to have sent 220,741 tonnes of waste to landfill, which is 0.5 tonnes per person.[13] In Taupo District the average was estimated to be 0.7 tonnes per person.[14] Based on population projections for 2023 and the per capita regional waste production in 2017, we estimate that MSW that goes to landfill from the Waikato Region could be in the order of 242,000 tonnes per annum by 2023 (see Figure 3.4).

The proposed WtE plant is expected to consume 79,000 tonnes of MSW when it begins operations in 2024. Based on the regional supply of MSW and the expected feedstock for the proposed WtE plant, it is likely that approximately half of the waste from Hamilton, Waipa, Otorohanga and South Waikato, along with a tenth of the MSW generated in the rest of the region will be required. The proposed WtE plant would manage approximately one-third of the MSW in the region.

Figure 3.4: Projected Regional MSW by Source and WtE Feedstock (2023)

Regional MSW by Source Disposed to Landfill	2023 MSW tonnes p.a	WtE required Market Share	Feedstock tonnes p.a
Hamilton City	87,000	50%	44,000
Waipa District	28,000		14,000
Otorohanga District	5,000		3,000
South Waikato	12,000		6,000
Rest of Waikato	110,000	10%	12,000
Waikato Region	**242,000**	**33%**	**79,000**

The management of the MSW has three key steps, collection, transfer station, and landfill. Currently, MSW is collected from residential and business addresses by kerbside collection, while commercial/industrial sources, construction and rural are collected via skip bins.[15] Broadly, small loads of MSW are transported by truck to a transfer station, where it is accumulated. The public can also

[12] Wilson et al., (2017) The New Zealand Waste Disposal Levy: Potential Impacts of Adjustments to the Current Levy Rate and Structure.
[13] Waikato Regional Council (2021) Waste in the Waikato Region. https://www.waikatoregion.govt.nz/services/regional-services/waste-hazardous-substances-and-contaminated-sites/waste-in-the-waikato-region
[14] Taupo District Council (2018) Solid Waste Asset Management Plan.
[15] Infrastructure Commission (2021) Sector State of Play: Resource Recovery and Waste.

dispose of waste by the trailer or trunk load at many of the transfer stations. There are approximately twenty transfer stations in the Waikato region, mostly in the larger towns.

The MSW that is collected at each transfer station is then loaded onto large trucks and transported to landfills. The Waikato region has two major MSW landfills, Hampton Downs in the north and Tirohia in the east. These two sites currently receive 600,000 tonnes and 120,000 tonnes per annum of MSW respectively.

There are also three smaller landfills that have taken MSW, Taupo Landfill (25,000 tonnes per annum), Te Kuiti Landfill (10,000 tonnes per annum) and Tokoroa Landfill (7,000 tonnes per annum). The Tokoroa Landfill has recently closed, and South Waikato District Council is investigating alternative options for MSW.[16] Also, at current levels of disposal, the Te Kuiti landfill is expected to be full in the near future (before 2023).[17] Finally, the consent for the Taupo landfill ends in 2027 but there is considered to be capacity for an additional 20 years of landfill space after the expiry of the consent.[18] Importantly, none of these smaller landfills have greenhouse gas capture.[19]

Combining the total tonnages handled at the landfills in the Waikato region shows that the level of waste disposed is more than three times the level of waste generated in the region. This imbalance is mainly caused by the import of Auckland waste to the Hampton Downs landfill.

Another important aspect of the MSW, is that the majority of waste management is controlled by two multi-national waste management companies, EnviroWaste and Waste Management. These two companies are vertically integrated, controlling most of the kerbside collection, skip bin collection, transfer stations and landfills in the Region (and nationally).

The proposed WtE plant will mostly compete with the landfill operations of these two companies, however GCS is also considering whether to potentially enter the collection service and/or establish a network of transfer stations (potential via metal recycling sites).

Finally, there have been recent changes in the policy settings around waste management. Since 2009 landfill operators have been charged a levy of $10 per tonne for each tonne of MSW disposed of in landfill. MfE has recently set a schedule of increases for the levy, with the rate set to increase by $10 every year between 2021 and 2024. The levy will increase sixfold by 2024, reaching $60 per tonne.[20] These changes in the levy (and potential for future increases), may impact the competitiveness of some landfills within the region, and may increase the demand for alternative options for waste management.

[16] South Waikato District Council (2017) LTP 2018-2028.
[17] Waitomo District Council (2017) Solid Waste (Asset) Management and Minimisation Plan 2018-2024.
[18] Taupo District Council (2018) Solid Waste Asset Management Plan.
[19] Waste Note Consulting and Eunomia Research (2013) Bay of Plenty and Waikato Regions Waste Stocktake.
[20] Ministry for the Environment (2021) Waste Disposal Levy Expansion.

Also, MfE has estimated that up to $2.6 billion would be needed to invest in waste infrastructure by 2030 to meet the growing waste management problem.[21] The proposed WtE plant may have a role in reducing the need for additional investment in landfills in the future.

In this context, at current national waste levels, the proposed WtE plant would absorb less than 1% of New Zealand's total MSW to landfill. Alternatively, the proposed WtE plant would absorb 11% of the MSW received at the existing landfills in the region, or 33% of the MSW that is expected to be generated by the Region in 2023.

Also of importance is the waste management network structure, with the bulk of the landfill capacity being located on the northern and eastern edges of the region while the transfer stations are distributed, more or less, according to the density of the community and economy. This means that most MSW must be transported between 50 and 100 kilometres from the transfer stations to the nearest landfill.

The proposed WtE is located at a strategic position in the middle of the Waikato region, and is near many of the largest urban areas. The distance between existing transfer stations in the region and the proposed WtE plant is around 30 to 70 kilometres, which is a 30% to 40% shorter distance than the current landfill options. This means that the proposed WtE plant can be expected to generate transport efficiencies. Commute estimates that the plant may result in approximately 3 to 5 million kilometre tonnes being saved per annum.[22]

3.3.2 End-of-Life Tyres

The total volume of tyres (car, truck, aircraft etc.) which come to the end of their useful life in New Zealand each year is over 7.75 million passenger tyre equivalents. In weight terms this is some 73,700 tonnes of waste.[23] This means that each person in New Zealand generates 1.5 passenger tyre equivalents per annum, or 14kg per annum of waste.

Based on the population projections and the national ratio of end-of-life tyres per person, the Waikato Region may be expected to generate 0.8 million passenger tyre equivalents and approximately 7,400 tonnes per annum.

There is also a large stockpile of end-of-life tyres which have not gone to landfill. This includes consented stockpiles, illegal stockpiles, orphan tyres in the environment (3.5 million), and tyres on farms (silage pits, etc – there may be 60 million tyres). [24]

[21] Grant Thornton (2020) Report on Waste Disposal Levey Investment Options.
[22] Commute (2021) Industrial Plant Development 401 Racecourse Road, Te Awamutu Transportation Assessment Report.
[23] 3R Group (2020) Regulated Product Stewardship for end of life tyres "Tyrewise 2.0".
[24] Ibid.

End-of-life tyres are used by the farming industry (e.g. silage storage), roading (as a subbase), in concrete production (Golden Bay Cement, in Northland) and for artificial turfs. Golden Bay Cement has switched from burning coal to tyres, and has a long term contract to source 3.1 million passenger tyre equivalents from Waste Management. This is approximately half of the national annual output of end-of-life tyres per annum. These is no information about the proportion of tyres that are reused for other purposes or that go into stockpiles.

The proposed WtE plant is expected to receive 35,000 tonnes of end-of-life tyres, which is approximately 3.9 million passenger tyre equivalents. In the context of the market, at current national waste levels, the proposed WtE plant would absorb approximately half of New Zealand's total annual output of end-of-life tyres. Alternatively, the proposed WtE plant would absorb less than 0.1% of end-of-life tyres held in stockpiles in the country. At the regional level the proposed WtE plant would be equivalent to 470% of the annual output of end-of-life tyres that is expected to be generated by the region in the year 2023, indicating the plant will import tyres from outside the region.

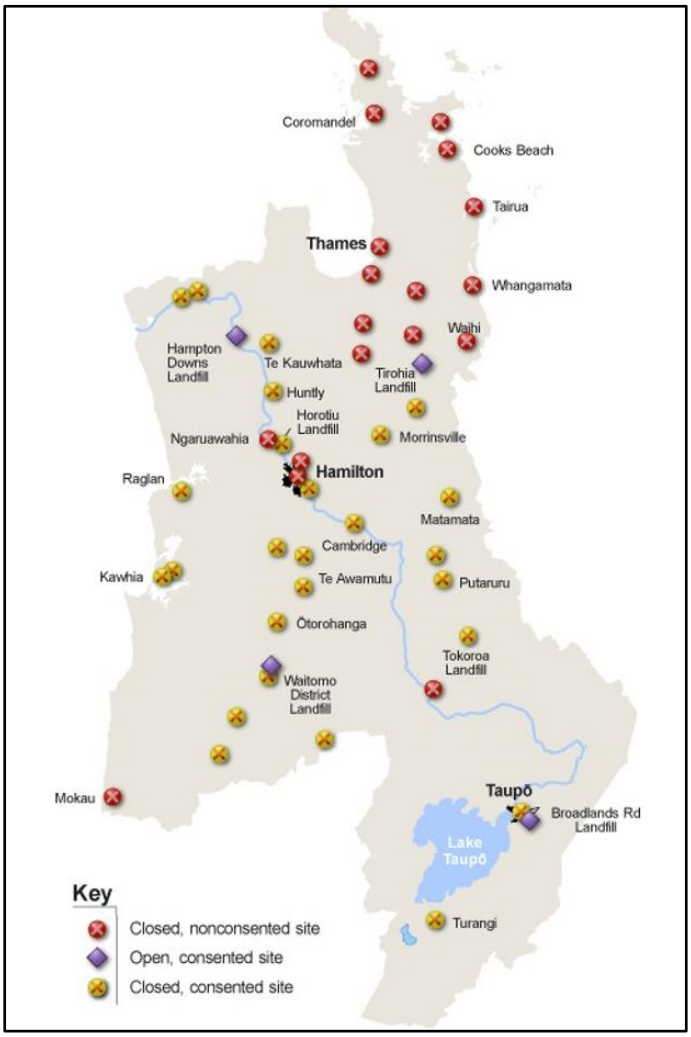
3.3.3 Remediation of Landfill

The proposed plant may take waste from remediated landfills from around the Waikato Region.[25] According to Waikato Regional Council there are over forty old landfills scattered across the entire region (see Figure 3.5).[26] There are 18 closed and not consented landfills (red dots) and 26 closed and consented landfills (yellow dots). It is likely that many of the old landfills will not have greenhouse gas capture.

Currently, there are no details on which landfills may be remediated or the feasibility of this activity. However, it is likely that there will be well over five million tonnes of MSW in the old landfills in the Waikato Region. This compares to the proposed WtE plant which is expected to remediate less than 9,000 tonnes per annum, which would be less than 0.1% of MSW in landfills. In this context, the proposed WtE plant would take many hundreds of years to remediate the existing waste in the existing closed landfills in the region.

[25] Landfill remediation is not part of this consent application.
[26] Waikato Regional Council (2021) Waste in the Waikato Region – Landfill map.

Figure 3.5: Regional Landfills – Open and Closed



3.3.4 Recycling

The waste management firms in New Zealand currently recycle around 35% of MSW before it goes to landfill. Of the MSW, 5.25 million tonnes are recovered for recycling, which equates to around 1 tonne per person.[27] The Waikato region is estimated to recover 500,000 tonnes for recycling.

The proposed WtE plant is expected to produce 8,000 tonnes of metal and 20,000 tonnes of recyclables, which would have otherwise gone into landfill. In the context of the market, at current national waste levels, the plant would output approximately 0.4% of New Zealand's total recycling. Alternatively, the plant would increase recycling in Waikato Region by around 4% each year.

[27] Wilson et al., (2017) The New Zealand Waste Disposal Levy: Potential Impacts of Adjustments to the Current Levy Rate and Structure.

3.4 Energy Market

The proposed WtE plant will produce 15MW of power, which will feed into the local and national grids. Currently, there is 9,342MW of installed power generators in New Zealand, which means that the WtE plant would represent less than 0.2% of the entire energy market.

At the national level the majority of power consumed is renewable (81% on average), with gas (14%) and coal (5%) supplying the rest of the demands. However, much of the renewable supply is in the South Island and most of the gas and coal capacity is in the North Island.

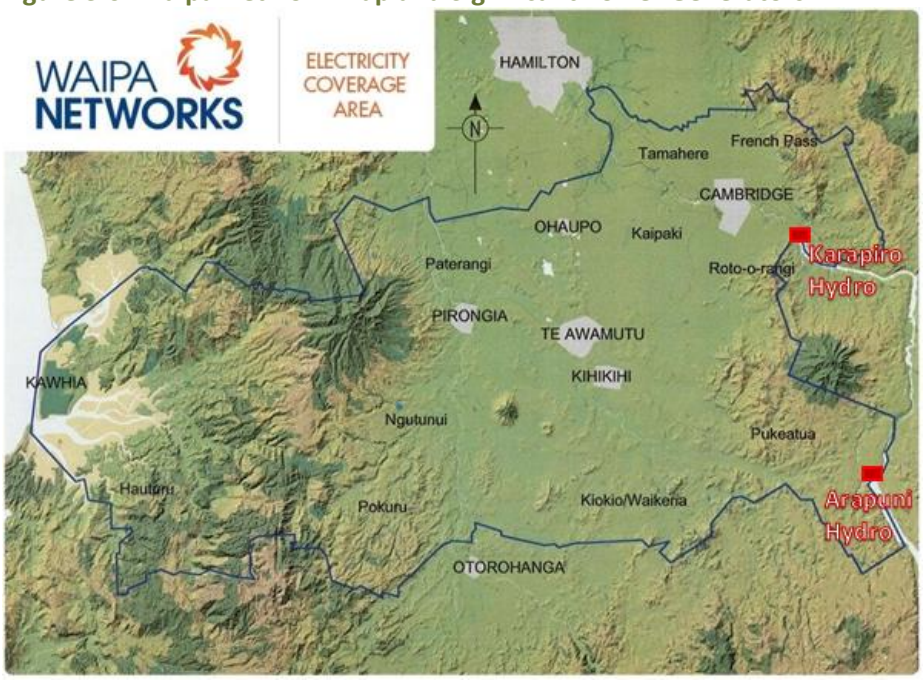
In terms of national demand, residential and commercial customers consume 57% of the power, with industrial users consuming 36% and agriculture consuming the remaining 7%.

Waikato region has a number of large power stations, mostly located along the Waikato River and the geothermal area near Taupo. The installed power generation capacity includes 933MW of hydro (32%), 849MW of geothermal (29%), 64MW of wind (2%) and 1,074MW of coal/gas/wood (37%). The Huntly Thermal Coal and Gas plant represents around a third of the total regional generation however this plant is reaching the end of its life and is progressively being shutdown.

The proposed WtE plant will be located in the middle of Waipa Network's distribution area (see Figure 3.6). Waipa Network's distribution system covers 1,865 square kilometres and is split into two networks - Te Awamutu GXP (approx. 14,500 connections) and Cambridge GXP (approx. 13,000 connections). The Paewira plant will likely be connected to the Te Awamutu GXP. The maximum power demand from Te Awamutu varies over the course of a year through a range from a low of approximately 10MW overnight in summer to peak at 41MW during winter.[28]

[28] Global Contacting Solutions (2021) Energy Assessment of Proposed Waste to Energy Plant - memo.

Figure 3.6: Waipa Network Map and Significant Power Generators



There is no substantial power generation within the network, although the Karapiro (90MW) and Arapuni (196MW) hydro plants are on the eastern border of the network. In this context, the proposed WtE plant would represent less than 0.5% of the regional installed power capacity, or 33% of the energy that would be consumed in the Waipa District.

Finally, it is important to note that there are a number of large industrial activities in Waikato that use coal to produce energy onsite for manufacturing processes. For example, roughly a third of Fonterra's sites rely on coal as their main source of energy.[29] Fonterra's Te Awamutu plant has recently converted to wood pellets which has resulted in a 10% reduction in the Co-op's coal use.[30] However, there are still a lot of industrial operations that rely on coal for energy, and as these sites transition to other sources there is likely to be increased demand for power. The proposed WtE plant could provide for some of this additional demand.

3.5 Context Summary

In summary, the following aspects of the context are important to the economic assessment:

- The communities that will be served by the proposed WtE plant have grown significantly, and this growth is expected to continue in the future. This means that the waste management demands of the community are likely to increase in the coming decades. The proposed WtE plant, if approved, could provide additional capacity to meet the growing demands.

[29] Fonterra (2021) Getting out of coal.
[30] Fonterra (2021) Fonterra's Stirling Site announces plans to get out of coal.

- The employment at the proposed WtE plant (60 jobs), will be sizable compared to most businesses in the District and much bigger than any existing waste management and electricity generator. The plant will be a large business within the Waipa economy.
- The District and Regional economies have sizable industrial sectors (approx. 25% of total economic activity) and construction sectors (approx. 10% of total economic activity). At this point no contracts have been signed for the manufacturing of the plant equipment or construction of the building. However, it is expected that a substantial share of this work could be handled by businesses in the local and regional economies.
- The plant will operate within the wider waste management market, and will compete to source feedstock and supply outputs. The scale of the feedstock demands will be significant within the region, it was beyond the scope of the report to assess the ability of the proposed WtE plant to source sufficient feedstock. The strategic location, efficiency of operation and changes in policy, suggests that the proposed WtE plant may be expected to generate improved outcomes for the economy.
- The energy outputs (electricity and heat energy) will be relatively small compared to the wider energy market, representing less than 0.2% of the entire energy market. Locally, the energy output would represent less than 0.5% of the regional installed power capacity, however it is capable of supplying 33% of the energy that would be consumed in Waipa District.

4 WtE Role in the Economy

The proposed WtE plant will generate economic activity within the local and regional economies. This will include not only the activity associated directly with the construction and operation of the plant, but also flow-on activity that is sustained in businesses that supply the plant (indirect) and the spending by the staff that work within the plant (induced).

There will also be efficiency gains from better handling of MSW, which benefits businesses and the community (cheaper disposal) and local government (reduced need for new landfills). There are also expected to be benefits in terms of energy generated by the plant, which will enable the network to operate more efficiently.

Finally, the proposed WtE plant is expected to generate additional benefits to the wider economy because of auxiliary outcomes associated with the plant. While these aspects of the proposed WtE plant role are expected to provide economic benefits, these are not quantified and are discussed in qualitative terms. The wider economic benefits include:

- improvement in circular use of resources in the economy,
- transport efficiency from reduced transportation of waste,
- competition improvements from having an additional competitor,
- opportunity benefits from reduced need to use land for landfill, and
- tourism activity associated with the education and information centre.

4.1 Economic Assessment Method

The economic role of the proposed WtE plant has been quantified in this report using Formative's proprietary Economic Linkages Model (ELM), an economic model that measures the flows of money and goods through the economy, at both local and regional levels. The ELM records the interactions and relationships between actors in the economy, including businesses, households, government, exporters, and importers. At its essence, the interactions in the ELM describe how each industry responds to changes in the economy, which ripples out to influence a range of other outcomes (e.g. household decisions).

The ELM measures the economy using a range of standard economic metrics, which includes Gross Output[31], GDP[32], Employment[33], Incomes[34] and Tax. The ELM is explained in more detail in Appendix A.

The first steps in the economic assessment method are to establish the direct economic activity that will be generated or influenced by the proposed WtE plant, and then to map this activity into economic sectors (65 sectors) and locations (39 geographies). The mapped activity is fed into the ELM, which then measures the additional economic activity that can be expected to occur within the economy.

Specifically, other businesses and households in the community will respond to the changes in the economy. First, businesses within the economy will need to change their activity to provide additional goods and services to match the changing demands. This business-to-business interaction is called indirect activity. Second, the incomes received by households will change and consequently household spending will change. Changes in household incomes will generate more demand for goods and services. This household-to-business interaction is called induced activity.

The ELM quantifies the economic role of the plant, which includes the direct, indirect and induced activity.

4.2 Economic Role of the Plant

As discussed above, this report quantifies the economic activity associated with the construction, operation and facilitated gains associated with the proposed WtE plant. Specifically, the economic role of the plant is confined to the direct, indirect, and induced activity associated with these three aspects of the proposed plant.

While the other aspects of the proposed WtE plant (energy generated and the wider economic benefits), are likely to directly influence the economy, there has been insufficient information to robustly establish the direct economic activity that will be affected. Therefore, these other aspects of the proposed WtE plant have not been assessed within ELM and are addressed only in qualitative terms.

4.2.1 Construction Activity

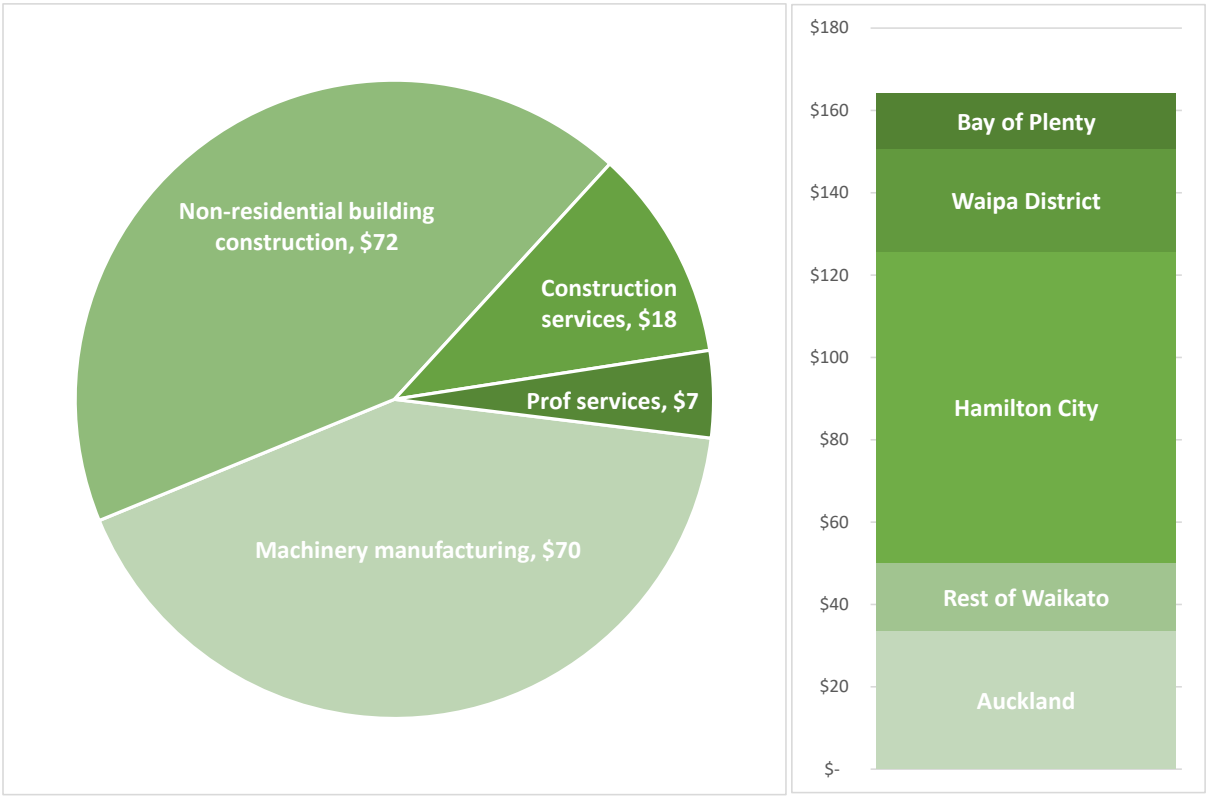
This capital expenditure covers the initial planning and consenting phase, plant equipment fabrication, ground works on the building site, construction of the buildings and final fit out. At this time a detailed costing has not been completed, so we have mapped the costs broadly into the following four

[31] Similar to revenue.
[32] Note GDP is broadly synonymous to Value Added.
[33] Formative uses BED measure of employment which includes both employment count and working proprietors.
[34] Includes salaries, wages and profits.

industries based on the available information: machinery manufacturing ($70 million)[35], non-residential building construction ($72 million), construction services ($18 million) and other professional services ($7 million).

The capital expenditure has been distributed based on the nature of the industry, for example plant manufacturing is distributed to major urban areas where there are specialist firms that will be able to provide the services required (Auckland, Hamilton, Tauranga). Conversely, the building and construction services are distributed mostly to the Waipa and Waikato region economies. In total $25 million of the capital expenditure is located in Waipa District and $92 million in the rest of the Waikato Region. The remainder of the capital expenditure is distributed to Auckland ($33 million) and Bay of Plenty ($13 million). The spatial distribution of capital expenditure will not be known until GCS signs contracts for the works, as such there may be greater regional activity if the company actively uses local suppliers in the region.

Figure 4.1: Proposed WtE Plant Capital Expenditure by sector and location - $ million



The direct expenditure will flow through the economy generating indirect activity and induced demand. The results from the ELM show that the proposed WtE plant will generate significant positive benefits to the local and regional economy during the construction phase.

[35] Based on discussions with GCS it is expected that 70% of the machinery is expected to be manufactured in New Zealand.

Based on the ELM assessment we estimate that $14.1 million in GDP could accrue to the local Waipa economy, which would be equivalent to over 140 jobs. The regional economy would receive economic activity of $75.7 million GDP and a total of 760 jobs. This economic activity will be spread over the three year planning and construction phase.

Figure 4.2: Proposed WtE Plant Capital Expenditure Economic Activity

Capital Activity	Direct ($m)	Value Added ($m)	Employment (AW)
Waipa District	$ 25.1	$ 14.1	140
Rest of Waikato	$ 92.1	$ 61.7	620
Total Waikato	**$ 117.2**	**$ 75.7**	**760**

4.2.2 Direct Operation Activity

This operational activity covers the on-site operations. The plant will directly employ about 60 skilled people, who will mostly live within the district. The plant will also purchase goods and services from other business in the District and the rest of the region. The operational expenditure in the financial projections has been mapped to industry and location. The details of the mapping are not presented in this report because they are commercially confidential. However, we note that most of the direct operational activity will occur in the district and will affect a number of industries.

In summary, the proposed WtE plant will generate ongoing sustained positive benefits to the local and regional economy. Based on the ELM assessment, it is considered that $18.9 million in GDP could accrue to the local Waipa economy, which would be equivalent to over 210 jobs or 1% of the employment in the district. The regional economy would receive economic activity of $37.6 million GDP and a total of 420 jobs. This economic activity will occur in every year of operation, starting in 2024.

Figure 4.3: Proposed WtE Plant Operational Expenditure Economic Activity

Operational Activity	Direct ($m)	Value Added ($m)	Employment (AW)
Waipa District	conf	$ 18.9	210
Rest of Waikato		$ 18.7	210
Total Waikato		**$ 37.6**	**420**

4.2.3 Waste Management Efficiency

Finally, the proposed WtE plant is expected to handle waste more efficiently than landfill, which enables the plant to charge a lower price for waste handling than the existing alternatives. Based on GCS gate rates and their market research, it is considered likely that community and businesses will benefit from reduction in waste management costs, in the order of $24 million per annum.

The cost savings are distributed to businesses and residential consumers across the region, pro rata according to how much the business relies upon waste management services for their operation. This will mean that businesses in the region can operate more efficiently, and households will have additional disposable income.

The ELM assessment shows that the direct efficiency gain can be expected to result in an increase of $19.1 million GDP and a further 240 jobs for the region. A small share of this benefit will accrue to Waipa District economy.

4.3 Energy Generation

The proposed WtE plant will generate electricity that is expected to be about half the price of the alternative baseload thermal plants.[36] At a network level the cost of providing power to customers is expected to be improved as a result of the proposed WtE plant. This means that the retail price is also likely to be improved by the plant, albeit a marginal improvement, as this plant is relatively small compared to the entire market.

The national level benefit may be in the order of several million dollars per annum, however this is yet to be confirmed. The proposed WtE plant is also expected to improve the reliability and resilience of power supply within the Waipa District.

4.4 Wider Economic Benefits

Finally, the proposed WtE plant is expected to generate other benefits in the wider economy. The role of the proposed WtE plant will expand beyond the economic activity that it will generate via the construction and on-site operations. We consider that the proposed WtE plant will have a wider role in the economy, which is discussed qualitatively in the following points:

- **Circular Economy**: the proposed WtE plant will result in a greater proportion of resources being recovered from waste and recycled back into the economy. The proposed WtE plant includes filtering steps before and after the power generation process, which will yield up to 60,000 tonnes of metals and other recyclables.

  This recapture and recovery of resources will benefit the New Zealand economy by reducing the reliance on imports of resources or the production of new resources. The increase in circular use of resources may generate additional benefits in the economy.

  The applicant has not assessed the financial value of the recycled resources or how these may be utilised, as such it is not possible to quantify the economic role of these resources within this research.

[36] Global Contacting Solutions (2021) Energy Assessment of Proposed Waste to Energy Plant - memo.

- **Transport Efficiency**: the location of the proposed WtE plant in the central North Island near a main road and rail lines, means that the Site is potentially more accessible than existing landfills.

  The landfills in the region are located in rural areas to the north and eastern edges of the region, which are further away from the transfer stations, populations and businesses in the region. This means that the costs associated with transporting waste are expected to be lower if the proposed plant handles some of the regional waste. The potential improvement in transport efficiency is expected to generate additional benefits in the economy.

  Commute is conducting research on the transport implications of the proposed WtE plant, which is expected to include some assessment of this transport savings.[37] At this point we are unable to quantify the potential benefits associated with the changes in transport efficiency.

- **Competition**: while not part of the resource consent application, GCS is considering alternative methods for waste collection, both MSW (via efficient single truck) and/or using a network of existing scrap metal dealers to establish efficient waste collection.

  At the moment there is a duopoly of waste management companies, which control most of the market. If GCS entered the waste collection market it would increase competition, which may generate benefits for the community and businesses.

  While this economic assessment has focussed on the economic role of the proposed WtE plant, there is potential for additional economic benefits if the WtE plant enabled GCS to enter the waste collection business.

- **Opportunity Benefits**: the proposed WtE plant will reduce the amount of waste going to landfill. This reduction in demand may result in less land being needed for landfills in the future, which opens opportunity for other activities to occur on this land. Also, the plant presents the opportunity to remediate existing landfills, which may release land for other alternative uses.

- **Education and Tourism**: the plant will include an education and information centre, which will be used by the local community and some visitors. This drawing of people to the area is expected to generate some additional benefits in the local economy.

  At this stage, there is little information on the nature of the centre. We consider that it would be speculative to try to quantify the potential tourism activity that could be drawn to the area.

[37] Commute (2021) Industrial Plant Development 401 Racecourse Road, Te Awamutu Transportation Assessment Report.

4.5 Economic Wellbeing of the Plant

A final consideration is the concept of wellbeing, which is central to the purpose of the RMA. Although the RMA does not specify a method for economic assessment, the economic method adopted in this report is one that is commonly adopted, as it provides an understanding of the market value of activity in the economy which is associated with the proposal.

However, 'economic wellbeing' of the community extends beyond the market values, which includes non-market impacts that accrue to the community. This includes positive and negative externalities associated with resource use. In the case of this consent application there are a range of other experts that quantify and address the externalities associated with the proposed WtE plant. We consider that the decision makers have been given sufficient information on these values and have not undertaken a non-market valuation.

The externalities associated with the proposed WtE plant should be considered, which includes air emissions[38], noise[39], transport[40], earthworks[41], flooding[42], visual[43], greenhouse gas[44], geotechnical[45] and hazardous substances[46]. These values are each important and should be considered alongside the market values discussed in this report.

4.6 Findings of Economic Assessment

The economic assessment shows that the proposed WtE plant will generate the following economic benefits:

- Construction of the plant will generate $14.1 million in GDP in the local Waipa economy, which would be equivalent to over 140 jobs. The regional economy would receive economic activity of $75.7 million GDP and a total of 760 jobs. This economic activity will be spread over the three year planning and construction phase.
- Operation of the plant will generate $18.9 million in GDP to the local Waipa economy, which would be equivalent to over 210 jobs or 1% of the employment in the district. The regional economy would receive economic activity of $37.6 million GDP and a total of 420 jobs. This economic activity will occur in every year of operation, starting in 2024.

[38] Terry Brady Consulting (2021) Assessment of the Effects of Discharges to Air from an RDF Energy Plant.
[39] SLR Consulting (2021) Kaupapa Paewira Waste to Energy Facility Acoustic Assessment.
[40] Commute (2021) Industrial Plant Development 401 Racecourse Road, Te Awamutu Transportation Assessment Report.
[41] Terra Consultants (2021) Infrastructure Assessment Report.
[42] Golovin (2021) Floodplain Assessment Project Paewiri, Te Awamutu.
[43] Terra Consultants (2021) Architectural Designs.
[44] Formative (2021) GCS Waste to Energy Plant Greenhouse Gas Profile.
[45] HD Geo (2021) 401 Racecourse Road, Te Awamutu Preliminary Geotechnical Report.
[46] HD Geo (2021) Paewira Hazardous Facilities – Hazardous Substances Consent Requirements Evaluation.

- Waste management efficiency gain can be expected to result in an increase of $19.1 million GDP and a further 240 jobs for the region. A small share of this benefit will accrue to Waipa District economy.
- Electricity generation benefits at the national level benefit may be in the order of several million dollars per annum, however this is yet to be confirmed.
- Wider economic benefits from the project are expected to include:
    - improvement in circular use of resources in the economy,
    - transport efficiency from reduces transportation of waste,
    - competition improvements from having an additional competitor,
    - opportunity benefits from reduced need to use land for landfill, and
    - tourism activity associated with the education and information centre.

5 Conclusion

In conclusion, we consider that the proposed WtE plant will generate a range of economic benefits for the local and regional economy. Most significant will be the activity during the construction and operation of the plant itself. There will also be benefits to the wider economy via improved waste handling efficiency and power generation.

The construction of the proposed plant will generate $14.1 million in GDP in the local Waipa economy, equivalent to over 140 jobs. The regional economy would receive economic activity of $75.7 million GDP and a total of 760 jobs. This economic activity will be spread over the three year planning and construction phase.

The operation of the proposed WtE plant will generate $18.9 million in GDP to the local Waipa economy, which would be equivalent to over 210 jobs or 1% of the employment in the district. The regional economy would receive economic activity of $37.6 million GDP and a total of 420 jobs. This economic activity will occur in every year of operation, starting in 2024.

Waste management efficiency gain can be expected to result in an increase of $19.1 million GDP and a further 240 jobs for the region. A small share of this benefit will accrue to the Waipa District economy.

We also note that there will be other additional economic benefits, which are not quantified and are expected to be smaller than the other benefits. The wider economic benefits include:

- improvement in circular use of resources in the economy,
- transport efficiency from reduces transportation of waste,
- competition improvements from having an additional competitor,
- opportunity benefits from reduced need to use land for landfill, and
- tourism activity associated with the education and information centre.

The project will also result in non-market impacts which are covered by other experts in their report. We consider that the decision makers have been given sufficient information on these values and have not undertaken a non-market valuation.

Appendix 1 Economic Linkages Model

The Economic Linkages Model (ELM) is a proprietary model that has been developed to quantify and measure the economic activity and relationships within the New Zealand economy. In summary, the ELM measures the flows of money and goods through the economy, at a sector and subnational level.

The model records the interactions and relationships between actors in the economy, including businesses, households, government, exporters, and importers. At its essence, the interactions in the model describe how each industry responds to changes in the economy, which ripples out to influence a range of other outcomes (e.g. household decisions).

The ELM measures the economy using a range of standard economic metrics, which includes gross output[47], GDP[48], value added, employment[49], incomes[50], consumption[51], tax[52], and trade. The model uses a subnational Input-Output Table that has been regionalised by Formative. This appendix outlines the nature of the Input-Output table, the underlying assumptions within the ELM and the key modelling steps.

A1.1 Input-Output Table

The Subnational Input-Output Table (SIOT) has been developed by Formative to provide detail on the economic linkages between sectors and geographies within New Zealand. The table has been defined to include 65 economic sectors and 39 geographies.

The 65 'sectors' have been defined using standard industry classification (ANZSIC06), with each sector being defined by a grouping of industries based on cluster analysis of their supply chains and economic rationale. The 39 'geographies' have been defined according to either territorial or regional authority boundaries, with more disaggregation provided where there is more economic activity (e.g. upper North Island) and aggregation where there is less economic activity (e.g. West Coast of the South Island).

The SIOT has a base year of 2019. All transactions in the table are in 2019 dollars, and all economic impacts (for instance GDP, gross output, consumption, taxes) are also in 2019 dollars. The SIOT is

[47] Similar to company revenue.
[48] There is a key difference between GDP and value added. The value added of a sector is measured net of taxes (for instance GST) and subsidies on products. In the GDP in the national accounts for New Zealand product taxes (minus subsidies) are recorded for the economy as a whole and includes as part of the value added.
[49] Formative uses BED measure of Total Employment Count (TEC) which includes both employment count and working proprietors.
[50] Includes salaries, wages and profits.
[51] Including household and government.
[52] Including income taxes, GST, government transfers and subsidies.

based on a national level 2013 Input-Output table released by Statistics New Zealand which has been converted to 2019 based on Statistics New Zealand national account data for 2019[53]

The national level table has been regionalised using a hybrid approach. The hybrid approach of combining survey and non-survey (i.e. modelled) methods to regionalise an IO table which is considered the gold standard when an official SIOT is not available. The survey data sources used in generation of the SIOT include a range of customised datasets that Formative have purchased and developed:

- **Total Employment**: Formative maintains a detailed database of employment, by geographies and industry (Business Employment Database - BED), which records the total employment in each of 506 ANZISC06 industry classes and for Statistics New Zealand's Statistical Areas, including both employees and working proprietors.[54]
- **Electronic Card Transactions**: Formative has purchased detailed electronic card transaction data from Marketview, which records the origin and destination of four retail and services spend types by the 39 geographies. [55]
- **Subnational Economic Data**: a range of information that provides valuable insight into the scale of economic activity that is located within each geography. This includes regional GDP, Gross Output and household income.

The above datasets have been combined along with non-survey regionalisation techniques to allocate the national economic activity into each of the geographies. The key method used to accomplish this is the Industry-Specific Flegg's Location Quotient (SFLQ)[56]. This method employs location quotients (LQ) to understand the specialisations and structure of regional economies compared to the national economy. The use of LQ's has been known to understate the amount of regional trade, however the SFLQ approach combats this by allowing for industry specific rates of cross hauling (where regions both import and export a product or service).

This approach has been shown to create accurate estimations of regional multipliers and outperform other non-survey approaches[57]. The SFLQ method was supplemented by a gravity model to help inform regional flows. The SIOT has been calibrated to better match the relationships in the national Input-Output table and has been balanced using an iterative proportional fitting procedure to ensure

[53] This includes gross output by sector, and national subsidies, exports, imports, change in inventories, gross fixed capital formation, consumption spending (includes households, local and central government and non-profit expenditure), compensation of employees, taxes, consumption of fixed capital and operating surplus.
[54] Formative (2021) Business and Employment Database – Employment Count, Working Proprietors, Total Employment.
[55] Marketview (2021) Card transaction data – four spend types and 39 geographies for the 2019 calendar year.
[56] Julia Kowalewksi (2015) Regionalization of National Input–Output Tables: Empirical Evidence on the Use of the FLQ Formula, Regional Studies, 49:2, 240-250.
[57] Anthony T. Flegg, Leonardo J. Mastronardi & Carlos A. Romero (2016) Evaluating the FLQ and AFLQ formulae for estimating regional input coefficients: empirical evidence for the province of Córdoba, Argentina, Economic Systems Research, 28:1, 21-37.; Zhao, X., Choi, SG. On the regionalization of input–output tables with an industry-specific location quotient. Ann Reg Sci 54, 901–926 (2015).

that the table reflects regional gross out and input. The resulting SIOT table provides a modelled estimate of the relationships within the economy. This means that the economic linkages between sector-geography combinations as of 2019 are captured in the SIOT.

The ELM uses the SIOT to estimate the potential economic activity that can be expected from changes in the economy. All economic models apply assumptions because an economy and community is too complex to replicate exactly in a mathematical system. The structure of the ELM utilises the following assumptions:

- Leontief production function, which assume linear relationships between the production and inputs. This means change in the output for an industry will translate into a proportional change in demands for inputs.
- No supply constraints, which assumes that businesses can source sufficient resources (labour, capital, land, etc) to meet new demands.
- Constant returns to scale, which means that there are no economics of scale or diminishing returns in the model.
- Static prices, which assumes that prices remain at 2019 values. The model does not account for substitution effect or dynamic feedback from changes in demand and prices.

A1.2 Key Modelling Steps

The first step in the ELM is to establish the direct economic activity that will be generated or influenced by the proposed policy, investment, or activity. This estimation of the direct economic activity is generally conducted using financial information or developed via a first principles understanding of how businesses or households may change their behaviour or be impacted as a result of the proposed policy, investment or activity.

The next step is to map this activity into the 65 economic sectors and 39 geographies. In most cases the direct economic activity will occur across a range of economic sectors, commonly this can be drawn from either operational or capital budgets. Similarly, in most cases the direct economic activity will accrue across multiple geographies. Therefore, the activity must be mapped into to each geography to ensure that the modelling reflects likely pattern of activity.

Finally, the mapped activity is then fed into the ELM which measures the additional economic activity that can be expected to occur within the economy as a result of the new activity. In summary, other businesses and households in the community will respond to the changes in the economy.

There are three types of economic impact the ELM calculates, direct, indirect, and induced:

- Direct impacts are the initial changes in the economy due to an economic shock (often new expenditure). The direct GDP effect is calculated based on the value of the shock and the direct employment effect is the number of jobs created by the shock itself.
- Indirect impacts arise as the firms that initially change their output as a result of an economic shock (i.e. the direct effects), purchase required inputs from their supply chain. These business-to-business transaction changes are known as the indirect impacts.
- Induced impacts flow from the direct and indirect impacts which generate wages, salaries, and profits for the households. The changed household incomes will generate more spending on goods and services. This household-to-business interaction is called induced activity.

The ELM quantifies the economic activity in each geography and sector, which includes the direct, indirect, and induced activity. The associated employment impacts are calculated assuming constant productivity – that is, each sector-geography combination produces the same amount of output per employee.