

Appendix 7: Economic Assessment Report

Smooth Hill Landfill

Economic Report

19 August 2020, [\(Updated 21 May 2021\)](#)

Final Draft

m.e
consulting



Prepared for

Dunedin City Council

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1 Introduction

Dunedin City currently rely on the Green Island landfill to provide landfill services for the city. ~~Green Island operates under a Resource Consent that is due to expire in 2023. In addition, the landfill as it is currently configured will reach capacity in 2023. Green Island Landfill is envisaged to reach full capacity in the next few years. Final closure could be around 2028 depending on the closure strategy adopted by the Council-~~ To plan for this Dunedin City Council have embarked on a Waste Futures programme of projects to address a range of waste management issues including the closure of the Green Island Landfill. As part of that process, Dunedin City Council are seeking to understand the economic impacts and implications of the move to ~~develop-construct and operate the-a~~ new Class 1 landfill at Smooth Hill, south of the Dunedin urban area.

DCC lodged applications for resource consents for the construction and operation of Smooth Hill landfill with both Otago Regional Council and Dunedin City Council in August 2020. The lodged application included this Economic Assessment Report (as Appendix 7 to the Assessment of Environmental Effects). Following lodgement, the ORC and DCC considered the application and requested further information relating to the proposal under Section 92 (s92) of the Resource Management Act (RMA). This Economic Assessment Report has subsequently been updated to respond to these s92 requests, including resultant updates to the landfill design lodged in August 2020.

1.1 Background

As part of its 'Waste Futures-~~2023~~' programme, Dunedin City Council (DCC) has embarked on three projects.

- A review of Council's Waste Minimisation and Management Plan (WMMP) 2013. The updated WMMP was approved by Council in May 2020.
- Improvements to the Council's kerbside waste collection service, recycling system and waste diversion facilities to be included in the DCC 10-year plan 2021-31.
- ~~An investigation of options to reduce the amount of Dunedin's organic waste going to landfill~~
- Replacement of the Green Island landfill after 2023 with a new Class 1 landfill at Smooth Hill.
- ~~Preparation for the closure of the Green Island landfill~~

While these three projects are closely integrated, this economic assessment focuses on Councils plans and preparations to close the Green Island landfill, namely through establishing a new Class 1 landfill at Smooth Hill.

A Better Business Case (BBC) approach is being developed for the Waste Futures System¹ which includes the transition to Smooth Hill landfill.

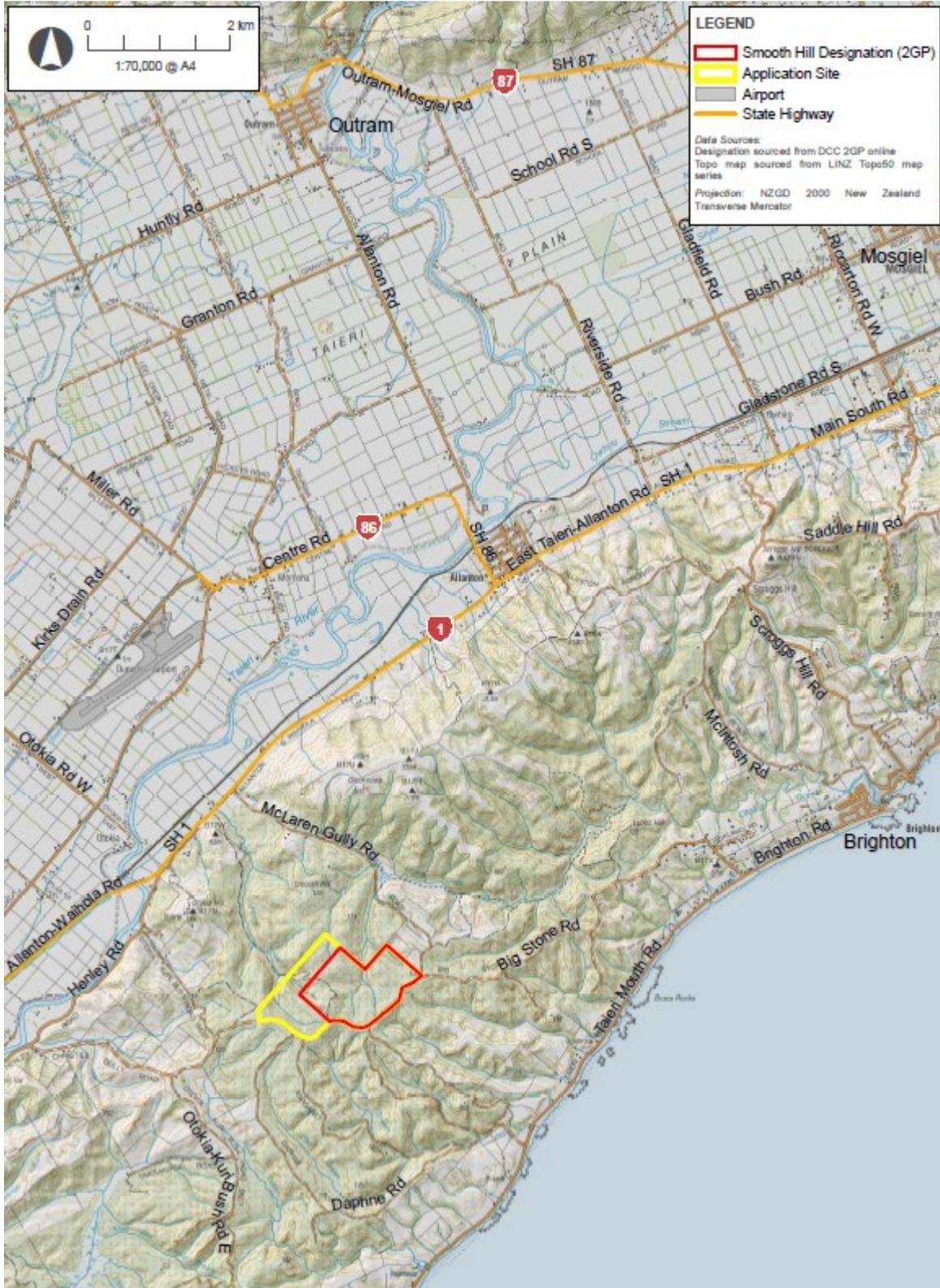
¹ Morrison Low, DRAFT Wider Waste System Detailed Business Case (~~2021~~2019), prepared for DCC



~~Green Island Landfill is envisaged to reach full capacity in the next few years and DCC is currently preparing for Green Island Landfill's closure, which could be around 2028 depending on the closure strategy adopted by the Council. While the current Green Island landfill is approaching the end of its consented usable life (2023) it will reach capacity at approximately the same time (2023). There is some scope for extending the capacity of the landfill to accommodate waste through to 2029, however while it may provide a degree of short term relief it does not address the long term landfill requirements of the city.~~

The site at Smooth Hill (see Figure 1.1 below) is designated for development and use as a landfill under Second Generation Dunedin City District Plan (2GP).

Figure 1.1: Smooth Hill Site Location



To enable the construction and operation of the landfill, several resource consents are required. [It is a resource consent application was proposed that applications for resource consents will be](#) submitted to Otago Regional Council (ORC) and DCC [in August 2020](#). The applications for those consents are required for any landfill access and supporting infrastructure and facilities that fall beyond the current 2GP landfill



designations, including the proposed realignment and widening of McLaren Gully Road and Big Stone Road. [Following lodgement, the ORC and DCC considered the application and requested further information relating to the proposal under Section 92 \(s92\) of the Resource Management Act \(RMA\). This Economic Assessment Report has subsequently been updated to respond to these s92 requests, including resultant updates to the landfill design lodged in August 2020.](#)

[The consents application period is for 235 years, which defines the period covered by this assessment. It is likely that the proposed landfill will have a longer life, so the benefits and costs associated will extend into the future. However, they will be the subject of a different consent application so are not captured in this report. Best practice is to assess the costs and benefits over the lifetime of the asset, with depreciation rates set to match the lifetime of the asset. But due to the discounting of future effects \(positive and negative\), they play a smaller and smaller part in the overall assessment and extending the timeframe is unlikely to alter the outcome.](#)

In addition to the resource consent processes, an application for an outline plan of works (OPW) is required to be submitted separately to DCC for the construction and operation of the landfill and associated infrastructure where it falls within the current landfill designation. The OPW will only be applied for following the completion of landfill detailed design.

1.2 M.E Involvement in Project

Boffa Miskell are working with GHD, Morrison Low and Anderson Lloyd on the project and are leading the engagement and resource consent processes, including the development of the Assessment of Environmental Effects (AEE) and supporting technical assessments.

M.E will provide the economic detail which will support the proposed new landfill at Smooth Hill in Dunedin. The economic report that follows will form part of the resource consent application process and outlines the economic justification and benefits of the project.

[The original report was completed in August 2020. Due to amendments to the design and coverage of the landfill, changing the costs and potential benefits, this report has been updated \(May 2021\) to reflect the new cost structures.](#)

1.3 Project Objectives and Approach

The objective of the economic report is to provide a robust analysis and assessment of the economic benefits that may arise from DCC consenting, constructing and operating a new landfill at Smooth Hill

The following steps below outline the approach taken:

- Using M.E's Economic Futures Model (EFM) developed for DCC, economic projections for DCC will be provided and illustrated with the use of graphs and tables. The model outputs outline employment, gross output and value added into the future which helps to build a picture of the Dunedin economy going forward.
- Structure capital and operating costs into cashflows that are then placed into a Multi-Regional Input Output model of the Dunedin economy within Otago and New Zealand
- Identify through the MBIO resulting contributions to GDP and Employment.
- A summary of the outcome and EIA are reported on.



The Input Output approach is well defined in economics. The fundamental steps and assumptions are presented in Appendix 1. In summary;

- An IO framework of the local regional and national economy is combined into a Multi-Regional model such that cross border transactions are fully accounted for.
- The IO framework represents a point in time so that technologies that are present at the time the IO framework was created are assumed to exist into the future. In this instance 2013.
- The IO framework assumes that there are constant returns to scale. This means that as an industries outputs increase as a result of additional demand; its input requirements increase in direct proportion.
- The IO framework assumes that an economy is operating at full potential, that there are not unused employment or capital resources available for growth. This means that as funds are diverted between activities there are compensating downturns elsewhere. In this case, Dunedin household incomes are diverted to fund the Smooth Hill development meaning they have less to spend on other goods and services.
- Sensitivity analysis has not been directly applied in this assessment as it forms a key component of distilling the options originally. Given this assessment is a direct comparison between alternatives, sensitivities would be applied to each option at the same time. This is unlikely to alter the overall outcome, while altering the absolute outcomes.

With reference to the economic impacts, the approach is broadly consistent with a CBA, with the main differences relating to how the different elements are treated. The economic impact assessment does not differentiate between costs and benefits. It looks at all the transactions and translates these into economic transactions at a sector level. Next, these transactions are modelled to estimate the flow-on impacts. The impacts are presented in Value Added and employment terms. Value Added is similar to GDP. It is important to note that the EIA does not include aspects like deadweight losses, environmental costs and so forth. In this assessment, we used an Input-Output model. These types of models have advantages and weaknesses when compared to other types of economic impact models. For example, IO models do not capture price changes and are not 'constrained'. But they are user friendly, transparent, and less 'black box' compared to other economic impact models.

1.4 Limitations and Caveats

This analysis was structured in a way that was consistent with the input data we have received. The economic report presents an initial understanding of the potential costs and benefits of constructing a new Class A landfill at Smooth Hill. The assessment in this report will need to be updated if new research/information becomes available as the process unfolds.

The following list outlines the key limitations and caveats of this economic assessment.

- **Capital and Operating Costs:** GHD provided the capital costs and operational costs. The MRIO relies on costs of economic resources used during production drawn from the Statistics New Zealand's' Supply-Use tables. Information in the most recent Supply-Use tables (and Input-Output Tables) is also used. Similarly, data from the Annual Enterprise Survey informed parts of the analysis.
- **Non-market Values:** this assessment did not include primary research. So, it was not possible to accurately estimate the non-market values associated with the proposed development. Examples



of such values include the potential environmental gains from a modern well-developed landfill controlling negative externalities and emissions. These benefits (and the potential costs) are not included in the analysis but have been canvassed extensively elsewhere for Council as part of the resource consent package submitted with the application.

- **Uncertainty/Future:** there is always uncertainty associated with future estimates and economic assessments. This report relies on capital expenditure data that covers the [consented](#) lifetime of Smooth Hill. In total the information covers ~~57-35~~ years of expenditure. Because this is a long timeframe levels of uncertainty are high about the far future. In addition, technologies within the economy will change significantly over that time period. This means that any economic modelling that relies on a static framework – such as IO modelling, will not produce reliable estimates of impact past 20 ~~or 30~~ years. However, given the impact outputs are discounted to current terms through the NPV process, the effect of far distant outcomes plays a small role in the final figures.
- **Other:** the analysis is based on several assumptions that are noted in the report. The team has used the best available data and/or applied conservative assumptions. In terms of the economic impact modelling, Appendix 1 provides a short summary of IO modelling and summarises the key limitations.
- **EIA/CBA/MCA/LSF:** this report applies commonly adopted methods for assessing the merits of the options (EIA), however it is acknowledged that Treasury has developed the living standards framework (LSF) as a new method for assessing policy. This report has not attempted to provide an analysis that matches the LSF.

1.5 Report Structure

This rest of the report is structured as follows:

- **Section Two** – summarises employment, gross output and value-added projections for the Dunedin economy extracted from the Economic Futures Model (EFM).
- **Section Three** – identifies and describes potential economic implications of the Smooth Hill landfill to Dunedin city.
- **Section Four** – details and analyses the results from the EIA.
- **Section Five** – presents key conclusions.

2 Dunedin Economy

The Economic Futures Model (EFM) is a macro-economic projection model created by Market Economics Limited (M.E). The EFM is a multi-regional input-output model, capable of holistically capturing the economic, environmental and social impacts associated with changes in economic activity over the next 30 years. The EFM model provides employment, gross output and value added by sector, projecting future levels of economic activity anticipated in Dunedin City.

2.1 Population Projections

Dunedin’s population is expected to increase from around 126,800 (2018) to 130,700 (2048) under a medium growth scenario, and from 129,400 to 152,000 over the next 30 years under a high growth outlook (Figure 2.1).

Following guidance by Statistics NZ issued in June 2019, it was recommended DCC use the medium-high projections scenario for Dunedin until 2028, and the medium growth scenario from 2028 until 2043². Subsequently DCC has recently updated their population projections, which fall largely within the medium-high population projection range, for which the EFM model is run off.

Figure 2.1: Dunedin City Population Projections

Population Projections	2018	2023	2028	2033	2038	2043	2048	2018-2028		2028-2048	
								n	%	n	%
Medium	126,820	128,430	129,740	130,560	130,870	130,670	130,725	2,920	2.3%	985	0.8%
High	129,360	133,730	137,950	141,900	145,380	148,600	151,950	8,590	6.6%	14,000	10.1%
DCC Update (2020)	130,520	135,100	138,670	141,420	142,320	142,670	142,990	8,150	6.2%	4,320	3.1%

The updated population projections anticipate Dunedin will grow by an additional 8,150 (6.2%) people from 2018-2028, and by around 4,320 (3.1%) from 2028-2048. That is equal to an annual growth rate of 0.6% in the first 10 years, which declines to 0.2% per annum for the subsequent 20 years until 2048.

2.2 Employment Projections (MECs³)

Given Dunedin’s updated population projections reflect that of a medium-high scenario, employment for Dunedin City is projected to increase by somewhere between 4,200 and 6,100 workers until 2028. That is a total of approximately 87,200 to 89,400 MECs (Figure 2.2). The next 20 years from 2028-2048 would see an additional 3,700 to 7,700 Modified Employment Counts (MECs), or total workers somewhere between 90,900 and 97,100.

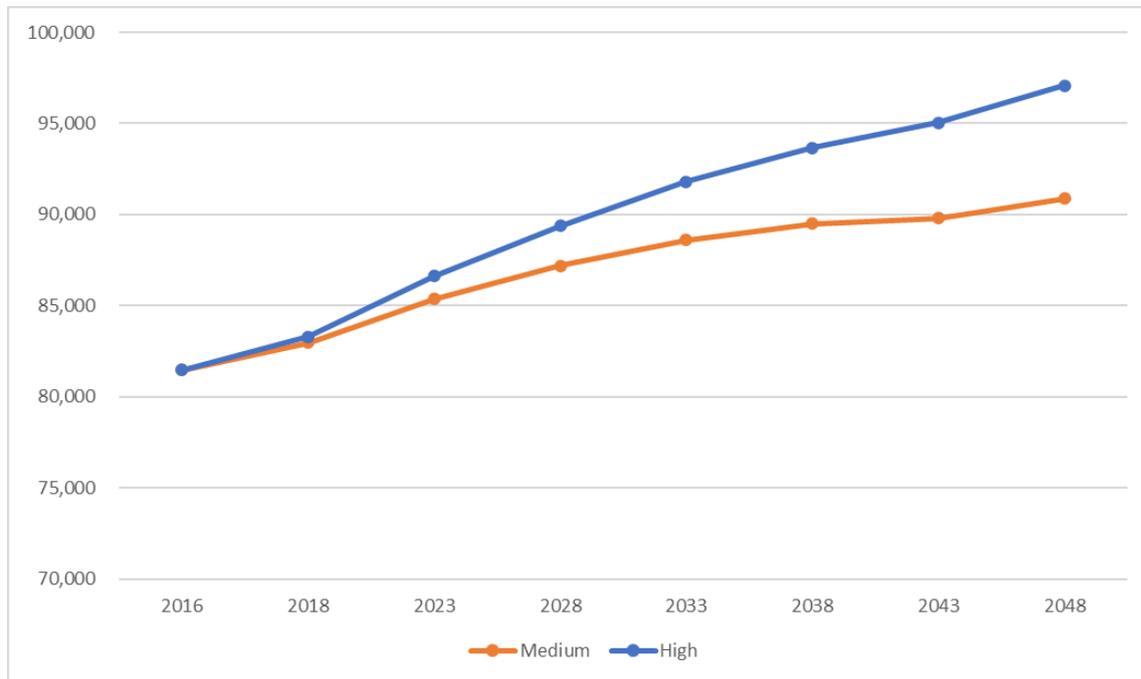
² DCC, DRAFT 2020 Updated DCC Growth Projections 2018 to 2068 (June, 2020) – prepared pre COVID-19

³ Modified Employment Counts – includes both employees and working proprietors.



The average annual growth rate for employment is slightly higher (0.5%) in the first 10 years to 2028 compared to the following 20 years from 2028 to 2048 where it is equal to 0.2%.

Figure 2.2: Employment Projections (MECs), 2016-2048

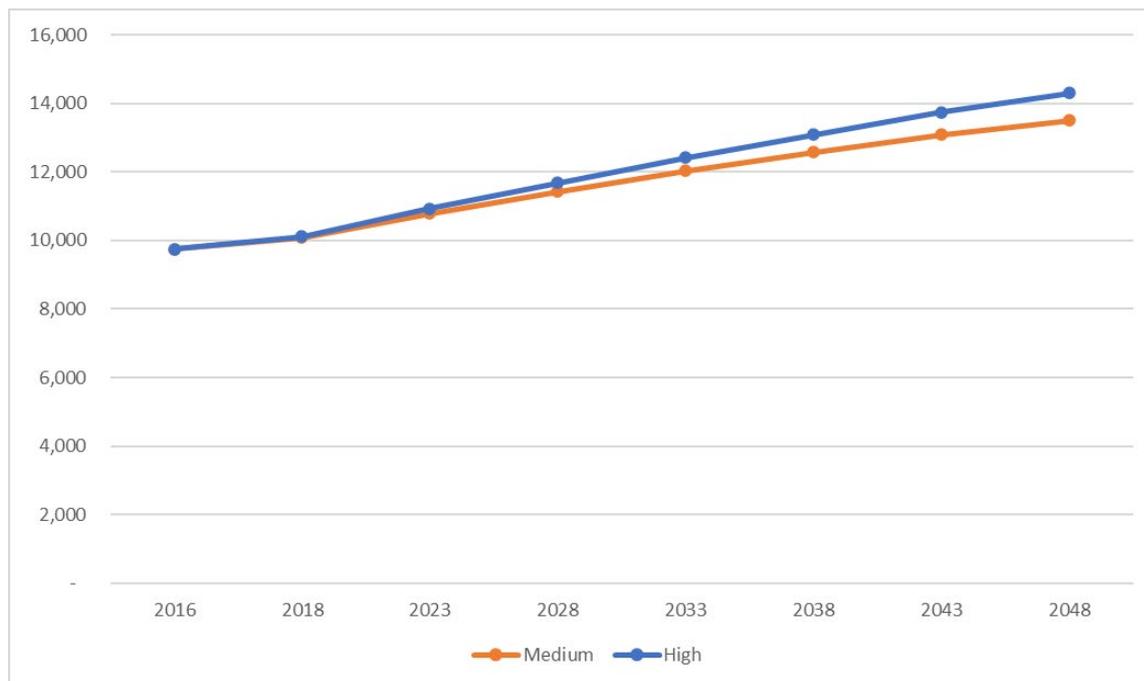


2.3 Gross Output

Figure 2.3 below illustrates gross output (in 2016 millions) under both the medium and high scenario for the Dunedin economy. Gross output is the total value of goods and services produced by an economic activity or industry. For each industry, gross output must also be equivalent to gross inputs. From 2018 to 2028 total gross output is anticipated to grow at around 1.3%-1.6% per annum, producing a total gross output somewhere between \$11.4bn and \$11.7bn in 2028.



Figure 2.3: Gross Output (\$2016millions), 2016-2048



The value of total gross output is projected to decline slightly over the subsequent 20 years (2028-2048), an average annual growth rate of 0.9%-1.4%. Overall, gross output is anticipated to increase by somewhere between 34%-42%, an additional \$3,400 and \$4,200 in total gross output for Dunedin (2018-2048).

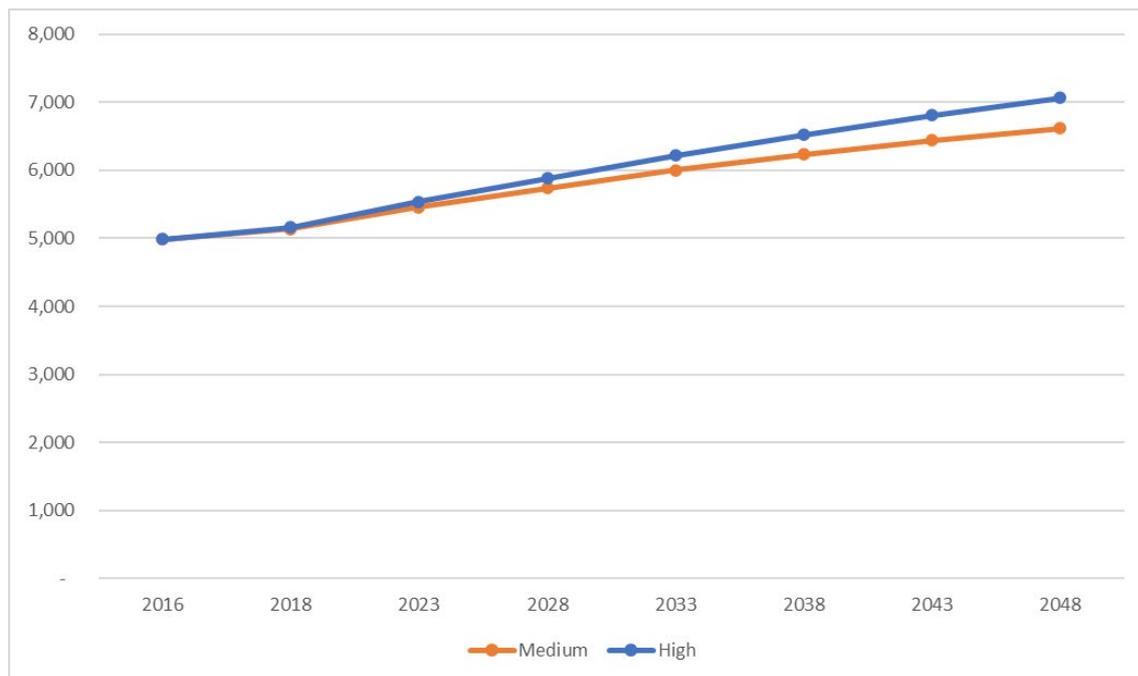
2.4 Value Added

Value added is the additional value added to goods and services by the contributions of capital and labour, i.e. the value of output after the cost of bought-in materials and services has been deducted. It includes the national accounts categories 'gross operating surplus', 'compensation of employees', 'other taxes on productions' and 'subsidies. The sum of all value added is equal to gross domestic product (GDP), excluding taxes on products and import taxes net of subsidies. Thus, in New Zealand, total value added is equal to approximately 88% of GDP.

Total value added for Dunedin is expected to increase to somewhere between \$5.7bn and \$5.9bn by 2028 and between \$6.6bn and \$7.1bn by 2048 (Figure 2.4). Overall, value added is projected to increase by an additional \$1.5bn to \$1.9bn (28%-37%), which translates to an average annual growth rate of 1.0%-1.2% over the next 30 years out to 2048.



Figure 2.4: Value Added (\$2016millions), 2016-2048



2.5 Summary

The EFM provides projections for economic activity in Dunedin for the next 30 years to 2048 and are contained in Figure 2.5. As the population, workforce, gross output and value added continue to grow overtime, Dunedin City will need additional infrastructure. The identified growth does not and will not occur at these rates unless Dunedin has a robust waste management system in place. Aspirationally, Dunedin is seeking to become a circular economy in which true waste that usually finds its way to landfill, is minimised as the vast majority of waste is either repurposed, recycled and or reused in other productive processes.

The Waste Futures Project aims to move Dunedin towards that goal. Without such a plan, the city is on target to be sending more than 290,000 tonnes of waste per annum to landfill by 2077. That is more almost 4 x the volumes sent in 2018, and significantly more than Smooth Hill or any other local landfill could accommodate.

However, even with significant shifts the city will still require landfill of some sort to facilitate the output and employment growth outlined in Figure 2.5, below.

Figure 2.5: Dunedin City Economic Projection, Medium and High Scenario EFM (2018-2043)

EFM Projections	2018	2023	2028	2033	2038	2043	2048	2018-2028		2018-2043	
								n	%	n	%
Employment (MECs)											
Medium	82,960	85,370	87,190	88,610	89,490	89,790	90,870	4,230	5.1%	7,910	9.5%
High	83,300	86,630	89,390	91,820	93,670	95,030	97,090	6,090	7.3%	13,790	16.6%
Gross Output (\$2016m)											
Medium	10,080	10,790	11,430	12,030	12,580	13,080	13,510	1,350	13.4%	3,430	34.0%
High	10,120	10,930	11,690	12,420	13,090	13,740	14,300	1,570	15.5%	4,180	41.3%
Value Added (\$2016m)											
Medium	5,140	5,460	5,740	6,000	6,230	6,440	6,620	600	11.7%	1,480	28.8%
High	5,160	5,540	5,880	6,220	6,520	6,810	7,060	720	14.0%	1,900	36.8%

3 Smooth Hill Landfill Proposal

DCC have investigated a number of options to address both the expiration of the Resource Consent that the Green Island Landfill operates under – and the end of its capacity. A number of studies have been carried out exploring a long list and subsequently a short list of options. The options have focused on different ownership and operating structures for Smooth Hill as well as extensions to Green Island and partnering with other districts to handle Dunedin’s landfill waste outside of the district. Assessing the differences between different ownership and management options is outside the scope of this report, rather the focus of this report is the development and operation of Smooth Hill to cater for Dunedin’s landfill waste.

In this section, a summary of the Smooth Hill Landfill option is presented along with an alignment of the project with Central Governments Infrastructure Ready Projects assessment criteria. In the following section, the option is assessed in terms of its direct, indirect and flow on economic effects on the Dunedin economy.

DCC embarked on the “Waste Futures Project” to investigate and assess all aspects of Dunedin’s waste collection, recycling, reuse and disposal process. As part of that study DCC developed a comprehensive business case (that follows Treasury’s recommended Better Business Case guidelines), to ensure best practice decision making.

An early stage in that process was to establish a long list of potential options for the wider waste system that can be assessed against strategic objectives and critical success criteria. The long list was then reduced to a short list that included the key options in terms of location as well as ownership and operational options including partnerships. Financial analysis and economic analysis occurred at that point such that outputs could be considered in net present value (NPV) terms. Costs and benefits were assessed and were able to be compared on a same basis to identify the final preferred option.

The purpose of this assessment is not to replicate that process, rather it is to explore the more fundamental question, what are the economic impacts and from there economic benefits from developing Smooth Hill to meet Dunedin’s ongoing land fill needs.

3.1 Waste System Options

Following identification and consultation, Council settled on 12 options for consideration as part of the long list. The options differed in terms of ownership and operational structures and included options that extended the coverage of the landfill to cater for demand from Clutha and Waitaki Districts. The list also explored the ownership extremes of 100% Council ownership to 100% private sector ownership.

The long list of options was assessed in terms of facilities required and the partnership arrangements against strategic objectives and critical success factors, based on scope, scale, service delivery, implementation and funding. From the long list of 12 options, 3 were taken through to a short list for more comprehensive evaluation.



This report does not explore the differences between the options as there are significant aspects of the operation and ownership under each that are outside the scope of evaluating the economic effects of developing Smooth Hill.

It is important to note that the analysis summarised below and presented in Section 4 and in the conclusions assumes that Council own and operate Smooth Hill landfill in its entirety.

It is also important to note that the nature of ownership and management of Smooth Hill has an impact on the outcomes of any economic impact assessment. If the facility is funded in its entirety locally, all loan repayments effectively come out of ratepayers' pockets. If, however, there is private ownership, capital can be sourced outside of the local economy – even potentially outside of New Zealand. However, in these cases, profits need to be made and they are repatriated outside of the local economy. The benefits of bringing in private investors is that they are likely to bring more efficient and more competitive management practices. While profits may end up leaving Dunedin, the prices Ratepayers face may be lower than if Council controlled the entire operation.

Therefore, the results of this assessment only represent the impacts of Council building and operating the facility themselves. Other ownership and management arrangements will have very different outcomes and would require their own assessment to quantify their effects.

3.2 Shovel Ready Infrastructure Projects

Dunedin City Council are also keen to understand how Smooth Hills development might fit with Central Governments infrastructure investment programme. By referencing Crown Infrastructure Partners Ltd ('CIP') criteria Council are seeking to align the economic benefits of Smooth Hill with national and regional economic values (as set out in the CIP criteria), in particular those relating to primary and secondary job creation (both in construction and operation of the landfill) and also the flow on effect to local suppliers.

As part of the Governments response to COVID-19, they are seeking information on 'shovel ready' infrastructure projects that have been impacted by COVID-19. In this instance, 'shovel ready' means projects that are ready for construction within a realistic 6 – 12 months. The task force established to gather and assess this information then is able to make decisions as to which projects are able to be deployed as part of a stimulatory package. In other words, provide a degree of funding to restart the project or to bring it forward (accelerate it). Included in the list of suitable projects are infrastructure projects that include maintenance and asset replacement projects.

While (at this point) DCC are not seeking to rely on central government funding for the Smooth Hill project, by aligning the impacts of the project with national and regional economic values that are being sought, helps ensure decisions made also align with those values.

The Infrastructure Industry Reference Group is supported by CIP who have been tasked with gathering the relevant project information. The group has identified 4 criteria projects must meet to be considered. They are;

- Criteria1: The extent to which the project is construction ready now or within a realistic 6-12 months – ***construction readiness***
- Criteria2: the project is of an infrastructure nature, either horizontal or vertical, and that the project is ***public or regional benefit infrastructure***.

- Criteria 3: Whether the project is of a *size and has material employment benefits* (i.e. \$10m+), and,
- Criteria 4: The *overall benefit and risks* of the project.

3.2.1 Smooth Hill Alignment to CIP Criteria

Criteria 1: Construction Readiness

The CIP classification divides shovel readiness into 3 categories;

Category A – projects that are currently under construction and have been halted due to COVID-19 (or progressing slowly)

Category B – Projects which have a high expectation of commencing construction within 6 months (by 31 October 2020),

Category C – Projects which could be expected to commence construction within 12 months (but may not or may be delayed by COVID -19.

Based on my understanding of the data provided, the construction phase of the Smooth Hill development is likely to begin within 12 months but not within 6 months. This means that regardless of the impact of COVID-19 on timetables, the project will fall into **Category C**.

Criteria 2: Public or Regional Benefit

CIP will categorise projects based on whether they have a public or regional benefit. The categories are;

- Transport, Three waters, Buildings and Structures, and other infrastructure

Infrastructure will be classified as;

- Critical infrastructure
- New infrastructure
- Replacement/refurbished infrastructure
- Repurposed infrastructure

Smooth Hill fits into the “**Other Infrastructure**” category as “**Replacement/Refurbished infrastructure**” as it replaces Green Island which is due to reach capacity sometime between 2023 – 2028.

Criteria 3: Size and Material Benefit

CIP have identified that projects of greater than \$10m are considered as having the size and material benefit to be considered. Given that the capital cost to develop Smooth Hill is expected to be over ~~\$102.175~~ [\\$102.175](#)m⁴ (with no contingency) over ~~5-3~~ [5-3](#) stages – the first of which is over ~~\$53.80m~~ [\\$53.80m \(prebuild plus Stage 1\)](#), means that the Smooth Hill project meets this criteria.

Criteria 4: Overall Benefits national and regional

Under this Criteria, CIP are seeking projects that will benefit the wider public or a particular region. Examples included that meet the criteria include transport projects, community facilities, potable water

⁴ All figures from GHD revised Capex information provided to M.E 13/05/2021 (Copy of Cost Estimate Review_Smooth Hill_Ver E_5_05_2021.xlsx).



supply, stormwater, schools, hospitals and nationally significant infrastructure such as ports and airports. In addition, they highlight infrastructure that supports key industries and tourism.

Against that backdrop, Smooth Hill matches more than one example therefore is likely to meet the threshold. Smooth Hill is designed to become Dunedin City's only landfill which can accept municipal solid waste. As such it forms a vital component of Dunedin's Waste Futures Project. This strategy aims to reduce waste from Dunedin's households and businesses and divert materials from land fill to move the city towards a truly circular economy. Regardless of how successful the diversion and reduction components of the project/strategy will be, there is no possibility that Dunedin can function without access to a landfill facility of some description. The current land fill (Green Island) is likely to reach capacity sometime between 2023 and 2029. The current plan is to have Smooth Hill operational from ~~2024-2025/26~~ (following a 2-4 years development and consenting process).

In broad terms (explored in more detail below), repayments on the loans required for Dunedin City Council to fund the facility 100%, peak at less than \$~~4.56.5~~m (in ~~20502045~~). In addition, operational costs have been estimated by GHD to be around \$~~4.9m-0m~~ annually. From a financial analysis perspective, owning and operating Smooth Hill is expected to cost Dunedin City up to \$~~9.410.5~~m annually. These costs may be reduced by investigating public/private sector partnerships which may involve capital investment and management expertise. By investigating and eventually partnering with a private sector partner, the capital costs to ratepayers will be less and commercial sector efficiencies will likely lead to lower operating costs along with the ability to cater for commercial volumes thus reducing further Dunedin City Councils exposure and cost.

Risks and Impacts of COVID-19

Having established the role the project will potentially play in the region or community, CIP will assess risks of the project not commencing within the advised timescale, or being completed on time (or at the specifications or on budget), and of the project not delivering the benefits outlined in the benefit section above. They will also seek to understand what impact COVID-19 has had on the project;

- Whether the project will commence when COVID-19 conditions allow,
- What the financial implication of COVID-19 have been or will be on the project, and,
- Whether the project will benefit from or already has benefited from any already implemented Government financial support package (e.g. the wage subsidy or business finance guarantee scheme).

Those questions are beyond the scope of this report but will be able to be addressed by the project management team and Council once a design and construction plan of works has been agreed if Council pursues central government funding. In addition, this report does not assume any central government funding occurs. However, the economic impacts and the benefits that flow to local ratepayers are improved if Central Government contribute as part of any COVID-19 stimulus package.

4 Potential Economic Implications

The existing landfill at Green Island is reaching the end of its consented useable life and an alternative landfill within the District would need to be capitalised upon to maintain the same economic benefits that the current Green Island landfill provides to Dunedin households. The potential economic implications of the proposal to consent, build and operate a new Class A landfill at Smooth Hill are estimated in this section and expressed in terms of the net additional impacts in the Dunedin City, Rest of Otago Region and Rest of New Zealand economies

The scenario being considered for this proposal is:

- A new Class 1 landfill is consented, constructed, and operated at Smooth Hill, to be owned and operated by Dunedin City Council. This will form a part of the Waste Futures Programme that includes diversion of waste through recycling and organic processing. ~~This aspect is common to both options, compared with,~~
- For comparison purposes only, a second scenario is run that allows 50% of the capital and operating costs to be covered by a private entity.

4.1 Smooth Hill Landfill General

4.1.1 Costs

Establishing a new Class 1 landfill requires a substantial investment, however this is not the only cost that will be incurred. Other economic resources will also be consumed to deliver the goods and services.

- It is our understanding that the new Class A landfill reflects the optimal design and this in turn will be reflected in the costs of construction (engineering etc).
- The landfill is located approximately 30 minutes from the city and therefore requires a network of transfer stations to consolidate waste ahead of bulk transportation of waste to the landfill.
- When the future waste and diverted materials system is delivered, there is a risk that landfill revenue will not be maintained which poses flow on effects for DCC.
- Increased truck volumes on roads in and out of Smooth Hill would require investment to upgrade side roads surrounding landfill and road widening and sealing is proposed as part of the consent applications.

GHD have provided M.E with estimates of the capital and operating costs for Smooth Hill. They are summarised in Table 4.1 below and are presented in detail in the GHD report that accompanies this consent application.

It is important to note that these costs cover the consented life of the facility (35 years, out to 2055). The facility will have a physical lifespan that extends past 2055 – but the costs and benefits of that will need to be assessed at the time the consent is reapplied for.

Table 4.1: Smooth Hill Expected Capital and Operational Costs, 2021 – ~~2077~~2055 (\$m)

	2021 - 2024 Pre-Build	2025 - 2032 Stage 1	2032 - 2045 Stage 2	2046 - 2055 Stage 3	2021 - 2044 TOTAL (\$m)
Capital Costs (\$m) - base plus 20% contingency	\$ 41.2	\$ 38.9	\$ 49.2	\$ 33.4	\$ 162.7
Operational Costs (\$m) - base	\$ -	\$ 28.4	\$ 52.2	\$ 40.2	\$ 120.8

Source: GHD

While the capital costs are ‘lumpy’ in that they vary through time, for modelling purposes they are assumed to be loan funded over 30 years from the year that the capital is required. This means that if \$10m is required in year 1, Council takes out a loan to be repaid over 30 years for \$10m and ratepayers pay the interest and principal required annually to service that loan. In Year 2 if a further \$5m is needed the same process occurs so ratepayers are now paying off the \$10m plus the \$5m in instalments. This has the effect of smoothing out the repayments over a much longer time [and is the standard way Councils consider funding and repayment of loans for infrastructure](#).

4.1.2 Benefits

As mentioned earlier, the investment in Smooth Hill Landfill is expected to address the- waste disposal issue in Dunedin and could provide waste disposal for Dunedin for ~~at least 50 years~~[approximately 40 years](#), or longer if DCC’s waste diversion targets are achieved. The Smooth Hill site is already designated for a landfill as set out in the 2GP, and therefore there is no immediate opportunity cost to using the land for waste disposal. Benefits include:

- Retaining or potentially increasing employment through jobs and supporting waste systems infrastructure that will also be required as indicated in the draft Wider Waste System Business Case.
- The costs associated with transportation of waste will be reduced by having a reasonably accessible in-district waste disposal site. An in-district waste disposal facility will reduce CO₂ emissions from the reduction in distance of transport of trips.
- Developing a new landfill at Smooth Hill will retain competition for waste disposal facilities in Dunedin once Green Island is closed.
- There are benefits associated with avoided costs that have not been assessed in this process. For example, if the alternative to developing and operating Smooth Hill is potentially trucking Dunedin’s waste out of the district to a land fill in Southland (for example). This has a range of costs associated with transporting waste over 190km (cost and environmental emissions) that are not offset by any of the economic and other benefits from developing infrastructure and employment opportunities locally.

In reality, Dunedin (like all cities) generates waste and requires landfills to meet at least a portion of that waste. The capital cost of developing a new land fill imposes a cost on ratepayers. However, with the Green Island Landfill nearing both the end of its consent and capacity, capital expenditure for Dunedin City Council is inevitable. As discussed above, capital expenditure stimulates the economy in the near term, as



the construction sector carries out the task of developing the landfill (employing staff, paying wages and making profits for owners). However repaying the costs reduces money that could be spent elsewhere.

The costs imposed on Ratepayers arise as the Council potentially increases rates to fund the development. The usual process is that Council will raise a loan that is repaid over time (usually 30 years). Councils do operate under borrowing limits which govern how indebted they can become, before the interest rates they face start to increase. It is not known if Dunedin is close to this limit, so it is assumed that there are no financial constraints on borrowing. In Dunedin (as in other relatively slow growing cities) Councils have to be careful as they cannot rely on significant growth to offset the repayments through development contributions.

While the financial information provided to M.E has included some estimates of debt and interest repayments, we have worked out a revised repayment schedule based on the timing and scale of capital requirements spread over 30 years at the provided interest rate of 5%.

4.2 Other Considerations

Another aspect of costs and benefits relates to the potential environmental benefits and costs associated with the proposed Smooth Hill Landfill. M.E note that these are assessed in the other technical reports which have been prepared to support these applications.

4.3 Modelling Assumptions

The different mixes of ownership and management translate into different levels of utilisation and waste volumes, however for the purposes of assessing Smooth Hill, M.E have relied on key assumptions that represent the most likely outcomes. M.E have not modelled diversion of waste designed to capture organics for composting and reusable materials that may enter the production process again because they are potentially able to be carried out regardless of Smooth Hill progressing. That is, if Smooth Hill is declined, and another site consented the diversion and recycling investments are likely to be the same. Key assumptions modelled include:

- Smooth Hill will receive a mix of DCC and commercial waste. For assessment purposes, this is equivalent to 60,000 tonnes annually (2019-20). 35,000 tonnes of DCC waste and 52,000 tonnes of commercial waste, creating a total of 87,000,000 tonnes per annum initially.
- Waste tonnage from all sources will grow at 2.0% per annum to a peak of 90117,600 tonnes by 2055.
- Diversion and waste reduction processes have the potential to will account for additional a significant portion of growth meaning that the values in this report may be on the high side. over and above 90,000 tonnes under both options.
- The gate rate is \$140260/tonne, including a waste levy of \$1060/tonne and ETS charges of \$2550/tonne.
- Capital and operating costs are based on the GHD Model for Smooth Hill.

Other general assumptions include:

- Analysis in NPV terms occurs over 56-35 years,

- All capital expenses are funded by way of council sourced loans that are fully repaid over 30 years.
- Given that capital expenditures occur over the life of the project (in this case [57–35](#) years), repayments [are occurring far in the future](#). In Net Present Value (NPV) terms [these distant repayments](#) make little difference to the total. Discounting the repayments past 20 or 30 years into the future reduces the nominal amounts significantly.
- Repayment of loans reduces [Council](#) spending elsewhere in the economy.

4.4 Economic Impact Model – IO Framework

Earlier work prepared in advance of this application focused on a financial assessment of different options before Council. They did not focus on the wider economic effects of the alternatives. This report does not repeat the financial assessment as it is not relevant in terms of this resource consent application. Instead, this report presents the wider economic impacts of the proposal to develop Smooth Hill

The direct profits and investments tell the financial story, but do not convey the actual economic effects the investment is likely to have on Dunedin. For this, it is necessary to analyse the development using an Input Output model framework.

Input-Output models are transactional frameworks of the local regional and national economies, that capture the financial interactions between sectors, households and the government. They reflect the technology of an economy at a point in time and while this changes, they can be used to provide an understanding of how different levels and distributions of investment flow through an economy generating;

- Additional Gross Output.
- Additional Value Added (broadly GDP)
- Additional Employment measured in full time equivalent jobs.

An IO Model allows estimation of net additional impacts if the inputs are net of spending that would otherwise have occurred. In addition, the IO framework used in this project allows changes in household spending to offset the additional spending required to establish the Smooth Hill landfill. This means that additional capital spending required to fund the development is initially sought by Council in the form of a 30 year loan. Council then applies the funds to the development and begins the process of repaying the principal and interest over 30 years. This happens from the following year as they borrow more funds for year 2 capital requirements and so on.

We have spread the repayments out over 30 years starting at the year the capital is required. This occurs across [57–35](#) years. In the absence of other information, we assume that the repayments are rates funded, with a corresponding rates increase. If Council were to readjust other expenditure, we assume that the reductions elsewhere equate to the value lost by households if they had to fund Smooth Hill.

In each year, the economy is impacted in two main ways during the development of Smooth Hill. First, money is spent in the Construction sector by Council to develop the landfill. The Construction sector purchases raw materials, pays wages and salaries, hires other specialist contractors, makes profits and pays taxes. All of these activities increase employment and GDP in Dunedin. Second, the additional rates that are required to fund the development mean that Dunedin households have less money in their pockets. This results in less spending in Dunedin and a slight reduction in employment and GDP. We have assumed that the reduction is distributed across all spend categories in proportion to the manner in which households currently spend.



The net result of both these changes (in direct spending terms) is then run through the IO Model to provide estimates of additional Gross Output, Value Add and employment, for each year for both options assessed (develop Smooth Hill and truck waste to a Southland land fill). Additional information is contained in Appendix 1 to this report.

In the sections that follow, both options are assessed through the IO Model framework and the results are aggregated in nominal and NPV terms.

4.5 ME Multi-Regional Input Output Model

ME's Multi-Regional Input Output model (MRIO) divides the economy into 48 distinct sectors and three geographies – Dunedin City, Rest of Otago Region and Rest of New Zealand. A MRIO has advantages over a single economy model as it captures the full range of effects across local authority boundaries. It is often the case that a development within the boundaries of Dunedin City will also stimulate activity across the rest of Otago Region. In addition, it is likely to be the case that reductions in Dunedin Household expenditure will reduce their spend across the rest of New Zealand.

Appended to this report is a description of the economic sector structure used in the model.

While a financial analysis captures the direct effects of investment, an IO framework allows estimates of the flow on effects of additional expenditure. As Council spends money in the construction sector, they spend money with their suppliers, who then use that to pay wages, salaries, make profits and purchase from their suppliers or raw materials. Each of these businesses then pay wages, taxes, make profits and purchase raw materials and so on.

At each step, value is added, and people are employed. An IO model allows estimates of those changes to be generated. A MRIO allows estimates of those changes to be made across the wider region and the rest of New Zealand. This is important as the majority of material suppliers are unlikely to be located within Dunedin City – or even the Otago region. Many construction materials will come from the rest of New Zealand or be imported. These transactions are recorded in the model framework and incorporated into the model outputs.

4.6 Develop Smooth Hill Landfill: IO Assessment

The development of Smooth Hill results in a net additional direct cost over the 57-35 years of \$77.9135.6m in nominal terms in Dunedin. Once this flows through the economy it translates into Total Gross Output of \$138.6111m in nominal terms or \$91.77.15m in NPV_{9%} terms. Gross Output (GO) is the broadest or widest measure of economic activity. It is simply the summation of all the transactions that have to occur within an economy to achieve a certain outcome. Because it is the sum of the total value of these transactions it makes no distinction between a transaction that might consist of mostly goods purchased overseas but might be required for the development, and transactions that involve locally generated content such as services delivered by local residents or goods made within Dunedin. It is therefore an unreliable measure of additional economic value or the benefits a development brings.

Because transactions that occur within Dunedin may result in activity being stimulated outside the district, the development of Smooth Hill leads to a further \$8.67.6m of GO in NPV terms in the rest of Otago Region and \$16.0m-\$15.6m across the Rest of New Zealand.

Table 4.2: Develop Smooth Hill Total Gross Output by Economy 35 years nominal

Location	Discounted Total NPV 9% (\$m)	Total (\$m) (35 Years nominal)
Dunedin City	\$ 77.1	\$ 110.8
Rest of Otago	\$ 7.6	-\$ 5.9
Rest of New Zealand	\$ 15.6	-\$ 20.5

There will also be economic activity stimulated internationally as firms respond to orders from Dunedin businesses as they carry out the development of Smooth Hill. This is beyond the scope so is ignored.

4.6.1 Contribution to GDP

This level of output generates a nominal ~~\$32.1~~\$14.6m in net additional Value Add in the Dunedin economy over ~~57~~35 years in nominal terms. However, once these flows are discounted at 9%, the total value added is ~~\$28.3m~~\$22.9m. The reason for the increase is the discounting effect of larger negative values in future reduce their impact on the NPV total, but not the nominal total.

Note that Total Value Added includes the direct, indirect and induced effects of the development. A full definition of these terms is contained in Appendix A. Value Add is the component of each transaction that ‘adds value’ to the local economy. It is a truer measure of the effect of the development on people's wellbeing, within this economy and is broadly synonymous with GDP. In summary it contains the effects of firms directly and indirectly impacted by the development of Smooth Hill, along with the wages and salaries they pay their employees, who then spend money in the local economy (Table 4.3).

Table 4.3: Develop Smooth Hill Total Value Added by Economy (\$) 35 years nominal

Location	Discounted Total NPV 9% (\$m)	Total (\$m) (35 Years nominal)
Dunedin City	\$ 22.9	\$ 14.6
Rest of Otago	\$ 2.7	-\$ 4.0
Rest of New Zealand	\$ 6.5	-\$ 12.1

In employment terms, the activity generated by the development and operation of Smooth Hill landfill once it flows through the economy is equivalent to over ~~2,745~~813 full time job equivalents across the ~~57~~35 years of operation, or an average of 34 full time jobs each year (within Dunedin City). Over the initial 10 years, developing Smooth Hill will stimulate the equivalent of ~~839~~616 full time jobs for 1 year (~~84~~62 on average annually). This is made up from high levels of employment through the construction phase (peaking at ~~234~~158 full time equivalent job years) to the first few years of operation (an average of 39 job years each year for the first 4 years. Employment is also stimulated across the rest of the region in the first 10 years (~~70~~56 full time equivalent jobs) and the rest of New Zealand (106 job equivalents for a year). The key stimulus is through the construction phase, as employment annually sustained shows a reduction in total over the ~~full~~5735 years covered by this study.

Table 4.4: Develop Smooth Hill Total Employment sustained over 57-35 years (MECs)

Location	Additional Employment (MECs)	Additional Emp. MECs (10 years)
Dunedin City	813	616
Rest of Otago	-39	56
Rest of New Zealand	-108	106

Table 4.4 presents the total employment effect across the different geographies. It is a combination of the positive impacts and negative effects in different sectors, translated into total employment effects. In Table 4.5 below, Construction sector direct employment effects have been isolated from the total, based on the capital expenditures to establish Smooth Hill and the timing of those provided by GHD.

Table 4.5: Construction Sector Direct Employment Effects – Smooth Hill (MECs): [based on updated design May 2021](#)

	Pre-opening construction phase	Stage 1	Stage 2	Stage 3	Total Employment (year equivalents)
Construction Sector	158	149	189	128	623

These employment estimates for the Construction sector are direct values and have not been offset by any potential reduction in activity in the Construction sector from reductions in Council spending elsewhere.

4.6.2 Sensitivity

The results presented above are sensitive to changes in assumptions made about scale timing, levels of investment and ownership. For example, by partnering with a private provider to share construction costs and operational activities is likely to increase the benefits locally. The main reason for this is that if the capital costs do not have to be sourced from the local economy, they reduce the amount Dunedin residents have to ‘pay back’. This reduces reductions in spend elsewhere in the economy raising the local impacts at the detriment of elsewhere.

In Table 4.6, 50% of capital and operating costs have been paid by a private operator from outside Dunedin City. This means less money has to be funded from rates and the total contribution to Value Added within Dunedin then increases to [\\$44m-48.9m](#) in NPV terms over the [project consented term life](#) (from the [\\$28m-32m](#) [\\$23m](#) outlined in Table 4.3).

Table 4.6: SENSITIVITY TEST: Develop Smooth Hill 50% Private Ownership, Total Value Added (\$m) 35 years nominal

Location	Discounted Total NPV 9% (\$m)	Total (\$m) (35 Years nominal)
Dunedin City	\$ 48.9	\$ 121.3
Rest of Otago	\$ 8.6	\$ 20.3
Rest of New Zealand	\$ 21.8	\$ 50.7

In employment terms this option would add the equivalent of 4,223,390 MEC equivalent jobs in total over the 57-35 years compared with 2,745,813 described in Table 4.4, above. Obviously, injections of capital and funding that do not have to be repaid by Dunedin rate payers stimulates the economy strongly.

5 Conclusion

Dunedin City's current landfill site at Green Island is nearing the end of both its consented lifetime and its physical capacity. The process of identifying what Dunedin should look at to meet the landfill and wider waste needs of its future has resulted in the Wider Waste System Detailed Business Case. This narrowed a long list of potential solutions down to 3 main alternatives based on the manner in which they met Dunedin's objectives key performance indicators. No decision has been made as to the final configuration of ownership or management.

The presence of Smooth Hill provides Council with an opportunity to cater for commercial volumes and therefore help fund investment into diversion and processing facilities required for the Circular Economy.

The economic analysis presented in Section 4, above concludes that consenting, constructing, and operating a landfill at Smooth Hill will facilitate employment and GDP effects [in the Dunedin economy](#) over ~~57-2435~~ years [\(the landfills consented lifespan\)](#).

In total the development of Smooth Hill is expected to generate a net additional contribution to GDP of ~~\$28m-23m~~ in NPV over its [usable-consented](#) lifetime. Sensitivity analysis indicates this has the potential to increase to [almost \\$50m](#)~~\$44m~~ in a 50:50 joint venture with a suitably qualified private sector partner

The analysis showed that Smooth Hill would sustain an additional ~~2,700~~[813](#) employment job years of which ~~840-616~~ occur within the first 10 years. This is dominated by employment in construction sector in the first 2 years – peaking at ~~240-98~~ job year equivalents in year 2 of construction.

Appendix 1: IO Modelling

One of the assets of Input-Output modelling is that the results it provides are easy to identify and digest, and relatively easy to use once Input-Output tables are available for a particular region. However, IO analysis is not without limitations, despite being widely applied in New Zealand and around the world. The most common limitations relate to the historical nature of IO Tables. We use IO tables derived from the latest Supply and Use Tables, derive the IO tables and update these to 2016 using available information.

With reference IO modelling in general, a key assumption is that input structures of all industries (i.e. technical relationships) are fixed. In the real world, however, technical relationships will change over time. These changes are driven by new technologies, relative price shifts, product substitutions and the emergence of new industries. For this reason, IO analysis is generally regarded as suitable for short-run analysis, where economic systems are unlikely to change greatly from the initial snapshot of data used to generate the base IO tables. In addition to the 'fixed structure' assumption, other important assumptions (and limitations) of IO models are:

- **Constant return to scale:** This means that the same quantity of inputs is needed per unit of output, regardless of the level of production. In other words, if output increases by 10 per cent, input requirements will also increase by 10 per cent.
- **No supply constraints:** IO assumes there are no restrictions to inputs requirements and assumes there is enough to produce an unlimited product.
- **The model is static:** No price changes are built in meaning that dynamic feedbacks between price and quantity (e.g. substitution between labour and capital) are not captured.

The following indicators are used to measure economic impact:

- **Value added** measures all payments to factors of production (land, labour and capital), and excludes all purchases of intermediate inputs. It broadly equates with gross domestic product (GDP) as a measure of economic activity on the national level, and gross regional product on the regional level. Components of value added include compensation of employees (salary and wages), operating surplus (company profits), consumption of fixed capital (depreciation), and subsidies.
- **Employment** is measured in Modified Employee Count years (MECs). This is the number of full-time and part-time employees as well as working proprietors on an annual basis. This provides a measure of the labour demand associated with the estimate level of economic activity. Note that additional MEC-years do not necessarily require that additional persons be actually employed. It may mean existing employees or proprietors work longer hours to complete the additional work.

Appendix 2: 48 Sector Economy

IO_48_Code	IO_48_Name
1	Horticulture and fruit growing
2	Sheep, beef cattle and grain farming
3	Dairy cattle farming
4	Poultry, deer and other livestock farming
5	Forestry and logging
6	Fishing and aquaculture
7	Agriculture, forestry and fishing support services
8	Mining, quarrying, exploration and other mining support services
9	Oil and gas extraction
10	Meat and meat product manufacturing
11	Dairy product manufacturing
12	Other food manufacturing
13	Beverage and tobacco product manufacturing
14	Textile, leather, clothing and footwear manufacturing
15	Wood product manufacturing
16	Pulp, paper and converted paper product manufacturing
17	Printing
18	Petroleum and coal product manufacturing
19	Chemical, polymer and rubber product manufacturing
20	Non-metallic mineral product manufacturing
21	Primary metal and metal product manufacturing
22	Fabricated metal product manufacturing
23	Transport equipment manufacturing
24	Machinery and equipment manufacturing
25	Furniture and other manufacturing
26	Electricity generation and supply
27	Gas supply
28	Water, sewerage, drainage and waste services
29	Construction
30	Wholesale trade
31	Retail Trade
32	Accommodation and food services
33	Road transport
34	Other transport, postal, courier, transport support and warehousing services.
35	Air and space transport
36	Information media and telecommunications
37	Finance
38	Insurance and superannuation funds
39	Auxiliary finance and insurance services
40	Rental, hiring and real estate services
41	Ownership of owner-occupied dwellings
42	Professional, scientific, technical, administrative and support services
43	Central government administration, defence and public safety
44	Local government administration
45	Education and training
46	Health care and social assistance
47	Arts and recreation services
48	Personal and other services

