Brookby Quarry – Stage 3

Economic Impact Assessment for COVID-19 Recovery (Fast-track Consenting) Act application

3 November 2022

m.e consulting

Brookby Quarry – Stage 3

Prepared for

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Executive Summary

Brookby Quarries Limited (Brookby) are planning to undertake the development of an extension to the existing Brookby quarry (Proposal) which is being applied for under the COVID-19 Recovery (Fast Track Consenting) Act 2020 (FTCA). Brookby seeks consent under the FTCA, which is designed to help to facilitate New Zealand's recovery from the economic and social impacts of COVID-19.

The development site is located in Brookby towards the south-eastern edge of the Auckland region. The site currently contains the existing quarry, as well as a processing plant and supporting infrastructure with surrounding land earmarked for further quarrying. The proposed development (Stage 3) will see the quarry extended and supporting infrastructure developed onsite.

The aim of the Proposal is to provide security of supply, and access to much needed aggregate supply to the wider Auckland region. This will sustain jobs in the wider construction market, but more directly, through activity associated with the extension and ongoing operation. Furthermore, developing the aggregate resource can help meet aggregate demand over the short and medium terms. Aggregate is a key input into concrete, supporting a range of construction applications such as residential development/housing, commercial buildings, roads, public transport networks, and other critical infrastructure (like three waters infrastructure).

Brookby has provided cost estimates across the different stages/development timelines. These were used to illustrate the economic impacts, in Value Added[1] (VA) and employment impacts over time and the analysis covers the establishment and the initial operational period. The direct, indirect and induced impacts are reported. The build is expected to begin in late 2023 and run through to 2030, with onsite construction beginning in late 2023. Budget estimates and assumptions applied indicate that around s 9(2)(b)(ii) will be spent by Brookby to carry out the extension. Once operational, the annual operational expenditure is estimated s 9(2)(b)(ii) (ongoing, per annum). These transactions flow through the economy, generating flow on impacts. These effects occur within Auckland, but there are also impacts at a national scale through supply chain linkages to supply the development and operation of the Proposal. An important consideration is that changing the development timeframes (accelerate or delay) will change the present value of future economic impacts i.e., how much future economic impacts are 'worth' in todays' terms. Understanding the temporal effects is important in the context of the FTCA.

Results

The supplied information suggests that the envisaged spend generates approximately s 9(2)(b)(ii) [2] **in direct Value Added, between 2023 and 2028**. As expenditure flows through the economy, it stimulates additional demand which contributes further economic activity. The analysis suggests that the development will generate a s 9(2)(b)(ii) in flow-on VA – this includes the effects of the capital spending as well as a period of operational activities. The combined **total value-added impact** (GDP) is estimated at **$312 million** across the assessed timeframe for the development. Importantly, these VA effects relate to the backward linkages i.e., all the inputs. The forward linkages i.e., the value to the economy from having access to the aggregate are not included in these estimates.

While VA is one measure of impact, both the construction and operation of the Proposal will sustain employment. Employment is measured using a Modified Employee Count (MEC) and is estimated at various stages of construction across the project life cycle. Employment levels fluctuate, depending on the

[1] Value Added (VA) is a measure of economic activity and is like GDP but some taxes are excluded.

[2] Present value at a 5% discount rate.

work involved and the timing of the investment. Over the long term once the proposal is fully operational, the employment impacts stabilise at the new level. Applying industry-ratios to the VA impacts, the employment supported by the additional economic activity is estimated. When the flow-on impacts are included, the total employment impact of the development will support 2,420 MECs. We have assumed the direct jobs are local, but the flow-on jobs are spread between Auckland and the rest of New Zealand.

A key feature of the fast-track consent is to remove uncertainty and to bring forward the development timeline. The fast-track consent is projected to bring forward development by 30 months, with onsite work starting in the middle of 2023, as opposed to early 2026. When the total impacts of the two scenarios are compared, the fast-track development pathway generates approximately s 9(2)(b)(ii) value added (VA, in present value terms at 5%) and sustains 367 more job (MECs) years than the standard pathway.

The key finding is that the economic impacts of the proposal are significant.

1 Introduction

Brookby Quarries Limited (Brookby) are seeking a consent under the COVID-19 Recovery (Fast Track) Consenting Act 2020 to accelerate the extension of the existing quarry. Granting fast tracked development status has the potential to be beneficial, and this is pertinent in the context of inflationary pressures associated with the Covid-recovery. Market Economics (M.E) were commissioned to assess the economic effects of bringing forward the project, that is, to quantify the economic effect granting consent under the COVID-19 Recovery (Fast-track Consenting) Act will have.

The government have recognised that the COVID-19 pandemic has caused deep economic and social disruption in New Zealand. To provide a degree of economic impetus, the government decided that the consenting and approval process as currently operated under the RMA did not provide the speed and certainty for developers to progress their plans. Government established that by speeding up the development process, benefits would flow to communities as demand for labour would increase sooner, and wages and salaries paid would sustain communities earlier. In addition, the developments themselves (commercial, residential and infrastructure) would stimulate and facilitate economic activity in communities.

To this end, the COVID-19 Recovery (Fast-track Consenting) Act came into effect in July 2020. The purpose of this Act is to promote economic activity while continuing to promote sustainable management of natural and physical resources. The Act established two pathways for projects to be fast-tracked:

- *Listed projects*: these are outlined in Schedule 2 of the Act and are eligible for the fast-track process,
- *Referred projects*: these are projects not listed in the legislation, the Minister for the Environment can refer them to an expert consenting panel for consideration.

The Act sets out the criteria a project will be assessed against to see the degree to which it supports the purpose of the Act. Before deciding whether to refer a project to an expert consenting panel under the Act, the Minister must be satisfied the project will help to achieve the purpose of the Act. The Minister will have regard to a list of matters set out in Section 19 of the Act. The relevant matters (for this assessment) are:

a) the project's economic benefits and costs for people or industries affected by COVID-19, and

b) ….

c) Whether the project would be likely to progress faster by using the processes provided by the Act than would otherwise be the case.

d) Whether the project may result in a public benefit by, for example;

i. Generating employment

ii. ….

1.1 Project aim

Brookby Quarries Limited (Brookby) is planning to extend the existing Brookby quarry in the southeast of Auckland and is progressing with an application under the FTCA. Granting fast tracked development status

to the development could generate significant positive impacts[3]. These impacts are in the context of market uncertainty, growth pressures and the inflationary environment in the local economy (Covid-related).

Figure 1.1 shows the site (yellow area). It is within the existing special purpose quarry zone.

Figure 1.1: Brookby Quarry Site

Source: Provided to M.E (Stage 3 Location. Drawing no 7-356-705-STG3)

This assessment evaluates the impacts of fast-tracking the consent and illustrates the degree to which the Proposal generates economic impacts under different temporal assumptions. The economic impacts of the Proposal and its ongoing operation are estimated using a Multi-regional Input-Output (IO) model. The modelling captures different spending patterns (capex and opex) and timelines. The results are presented

[3] An overview of the effects of COVID-19 on the Auckland Economy and Construction activity is included in Appendix A.

in terms of Value Added (VA), and the level of employment it will support. The difference in economic impacts between the two pathways (standard vs fast-tracked) is illustrated using discounted cashflow analysis. This difference is interpreted as the effect of fast-tracking the development.

The approach and findings are summarised in the next section.

2 Approach and economic impacts

The approach followed and the estimated economic impacts are presented, and the main parts are dealt with separately. This analysis relies on cashflow, and investment information provided by Brookby. The investment timelines and Dollar values are provided. M.E used this information to frame scenarios showing the different pathways.

2.1 Approach and assumptions

The analysis is based on cashflow estimates provided by Brookby Quarries. These estimates reflect the anticipated capital and operational spending associated with Stage 3. The capital spending includes the timing associated with the different development tasks and requirements, including:

- regulatory and planning costs,
- construction and development costs,
    - overburden removal,
    - plant and equipment,
    - infrastructure costs, and
    - mitigation planting and habitat restoration.
- the ongoing operations.

The construction and development costs related to all spending associated with obtaining the necessary consents and developing the land up to and including the point at which aggregate can be extracted. The ongoing operations covers the operation of the quarry such as the extraction of aggregate and supporting activities. The spending by Brookby is mostly directed to businesses within the Auckland region and is spread across a six-year assessment period (2023 to 2028).

Construction and ongoing related transactions (spending) will be with other businesses within Auckland. The balance of spending (i.e., consent, design, and development project management costs) will also be directed to businesses based in Auckland. These patterns reflect Auckland's status as New Zealand's major economic hub.

The planned spending is mapped to 106 economic sectors in the Auckland multi-regional input-output (MRIO) model. The model traces the flow of transactions through the economy and then the associated Value Added and employment are estimated form the sum of all transactions. VA arises through the spending, directly and indirectly, as the activity flows on to other sectors of the economy and businesses pay salaries/wages and generate profits.

The development timelines are expressed on a quarterly basis and then discounting is used to express future cash flows (and economic impacts) in today's terms.

The following core assumptions informed the analysis:

- The construction period is assumed to cover 5-6 years with the operational activity ramping up over time.
- All direct expenditure is received in Auckland and mirrors the development patterns of earlier development projects.

- The standard consent period is assumed to be six years and the fast-tracked approach is assumed to be three years. The different timeframes are used to programme when the different spending components occur. A scenario approach is used to show the impacts of the two timelines. Estimates by Brookby indicate that the development proceeding under a fast-track consent will result in it beginning sooner and a 2.5-year timesaving.
- Brookby have provided the development costs – it is estimated at s 9(2)(b)(ii) (excluding the operating costs), with a saving under the fast-track approach for avoided costs. The estimated construction costs provided cover overburden removal, infrastructure, plant and equipment, and mitigation planting and habitat restoration. The costs are provided for each item per quarter.
- The operational costs start as the quarry is developed i.e., a staged approach is followed, and it is not a situation where operational activity can occur once all (100%) of the capex spending has taken place. Using a quarterly timeframe means that overlapping capex-opex spending is captured. For the ongoing activity, estimates provided by Brookby are for operating costs of s 9(2)(b)(ii) per quarter.
- The 'per item' costs are generally similar across the two scenarios.
- As the estimated costs and timeline are reflective of the standard consent scenario, the fast-track scenario brings forward onsite activity by 2.5 years with the consent and planning period condensed into the first six months and applies the quarterly operating costs estimates sooner than the standard approach.
- The results are discounted (except for employment) at 5%, which is line with the discount rate recommended by Treasury NZ. Discounting is used to reflect the rate of time preference and the opportunity cost of capital, reflecting the present value of future benefits. Generally, economic activity (benefits) that happens today is worth more to the community in terms of the wages and salaries paid and the overall economic activity, than the same activity happening in 2 years.
- The analysis is based on current prices, and future expenditures are not inflated. The results are presented in 2022 Dollar terms.

The results are reported using two metrics – VA and employment.

Value Added is a portion of GDP (less GST) that a project generates. It is the value of all activity minus intermediate costs. VA is the sum of:

- Wages and salaries paid,
- Operating surpluses generated for owners,
- Consumption of fixed capital,
- Tax on production, and
- Net of subsidies.

Employment is expressed in terms of Modified Employee Counts (MEC). MEC is constructed using the annual Linked employer-employee data (LEED) and Business demography statistics (BDS) published by Stats NZ. The result is a headcount of employees (wage or salary earners) and working proprietors (the self-employed), i.e. modified employment count. Both LEED and BDS includes all workers with wages or salaries reported to Inland Revenue (PAYE data), and LEED data is augmented with self-employment data from annual tax returns to cover include working proprietors. LEED is a comprehensive database which contains data belonging to all individuals with taxable income, suggesting it does not contain sampling errors (such as may happen in a sample survey). Both these data sets cover all industries in the NZ economy.

Another commonly used measure of employment is Full-time Employment Equivalent jobs (FTE). This is the total number of full-time employees plus half the number of part-time employees, but excludes working proprietors. This data set is constructed from the Quarterly employment survey (QES) published by Stats NZ. The QES collects data from a sample of employers (approximately 3,900 enterprises) about filled jobs,

earnings, and paid hours and covers all employees on the employer's payroll, but not working proprietors. The QES does not cover all industries of NZ's economy.

In short, the LEED and BDS provides finer resolution, covering all industries and capturing the self-employed (working proprietors). This suggests, for the purposes of this assessment, MEC is an appropriate, and more robust measure of employment than FTE jobs.

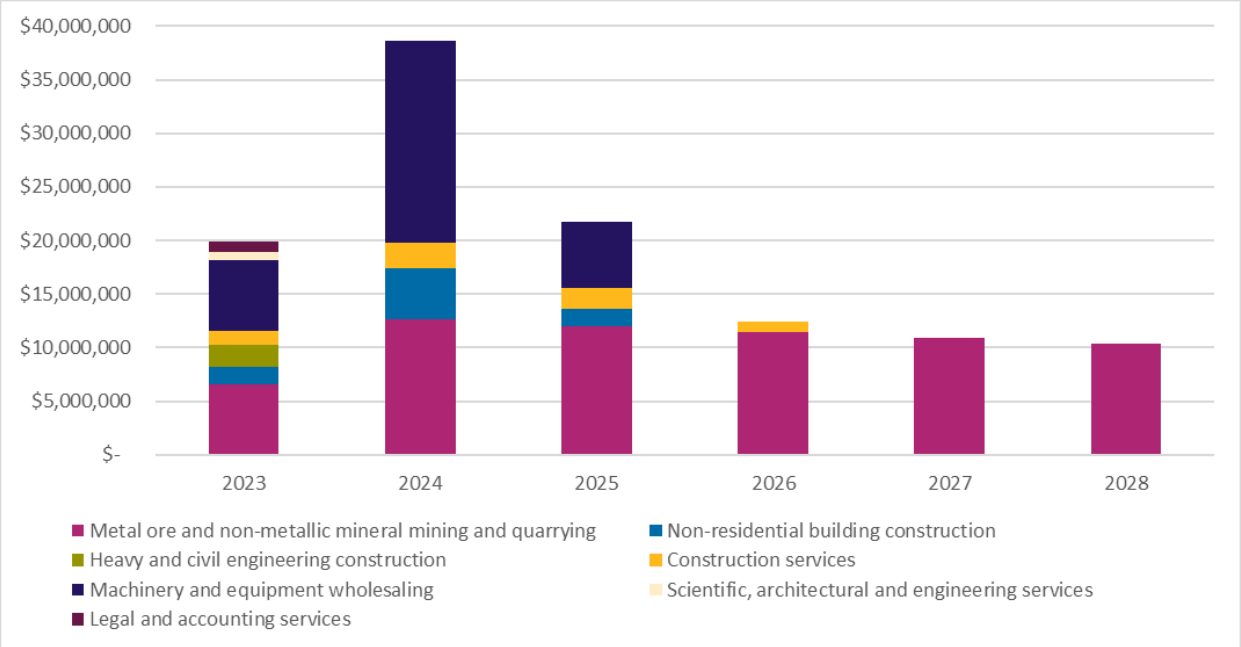
2.2 Economic impacts

The economic impacts are described for different impact stages. The direct impacts are described before the total impacts (direct, indirect, and induced) are outlined. Appendix 2 discusses the different stages and outlines the key limitations of Input-Out (IO) modelling.

2.2.1 Direct Impacts

The distribution of direct value-added impact for the establishment activity is shown in Figure 2.1. The figure shows the sectoral breakdown.

Figure 2.1: Annual Direct Value Added



The starting point is 2023, and the timeline reflects the development staging, procuring the capital equipment and the other actions. The construction and development activities associated with the establishment phases generates direct effects. Once activity shifts to the operational stages, the impacts are then ongoing spanning the life of the mine.

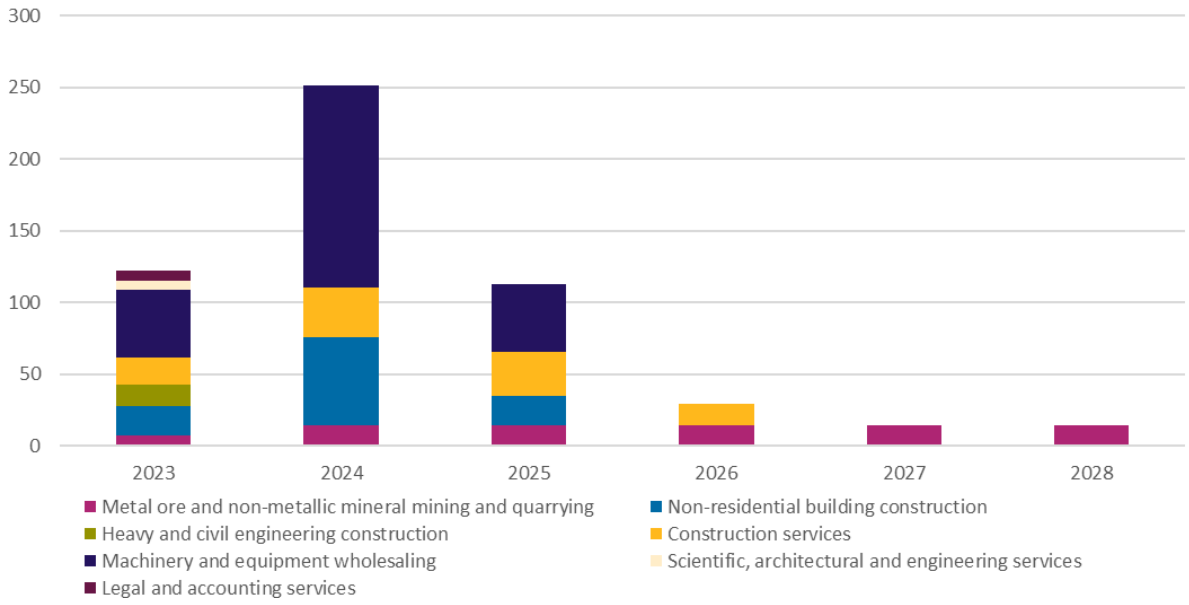
The direct VA from direct spending is projected to be around s 9(2)(b)(ii) (discounted). Breaking the results down annually, in 2023, the project will directly create s 9(2)(b)(ii) in VA arising from spending in professional services and construction, as consent and design work is conducted in conjunction with the first stages of onsite activity. In 2024, the direct VA is estimated at s 9(2)(b)(ii) reflecting on-site activity as well as the start

and growth of aggregate production. Direct VA will be s 9(2)(b)(ii) for 2025 as the extension construction is completed and reducing to an average of s 9(2)(b)(ii) per year between 2026 and 2028 as only the operating activity remains.

Figure 2.2 reports the direct employment effects associated with the development. The results report MEC-job years across the Country i.e., Auckland and the rest of NZ. Most of the direct employment effects are associated with the construction sector, and construction activity between 2023 and 2026. The jobs are not limited to on-site jobs, as the consenting and design related services precede construction at the initial stages of the project.

In 2023, the development will directly sustain around 122 MEC job years. In 2024, the employment effects peak at 251 MEC job years, as the scale of construction activity intensifies significantly, and the direct employment impact reaches its peak year. By 2025, the employment impact decreases to 113 MEC job years and reduce to 29 in 2026 as the construction activity is completed. The one-off, construction activities are substituted by durable jobs associated with the ongoing activities generating ongoing effects (beyond the initial economic impulse). In sum, the development of the quarry extension is projected to directly sustain around 544 job years during the establishment phases.

Figure 2.2: Annual Direct Employment (MECs)



It is important to note that while the development may generate several 'new jobs' and opportunities for apprentices and the like, the majority of work will be carried out by existing skilled workers in the construction sector. Therefore, the development will sustain existing jobs across the sector and potentially contribute to the generation of new jobs beyond this. This is the case with all large-scale construction activities.

2.2.2 Flow on Impacts

The total impacts are summarised below. Table 2.1 shows the distribution of total VA and employment (MECs) impacts, by location. Total impacts include the direct, indirect and induced impacts and is wider

than the impacts reported above. In contrast to the preceding section, this section uses discounting to summarise future impacts (covering 6 years, with the capex and opex period both included).

Table 2.1: Distribution of Flow on Impacts (5% Discount Rate)

	Auckland Region	Rest of North Island	Rest of New Zealand	Total
Direct Value Added ($m)	s 9(2)(b)(ii)			
Indirect Value Added ($m)				
Induced Value Added ($m)				
Total Value Added				
Direct Emplyoment	544	-	-	544
Indirect Employment	805	80	72	957
Induced Employment	686	126	106	918
Total Employment	**2,035**	**206**	**178**	**2,419**

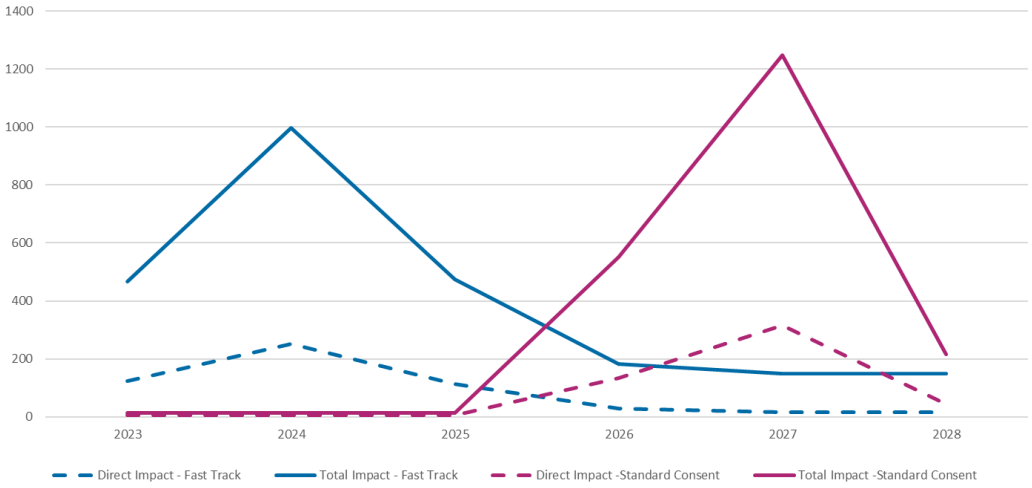
The modelling suggests that over a 6-year period, the development will generate total VA of $312m across NZ. Most of the impacts ae associated with the direct and induced impacts. The Proposal is also projected to contribute to sustaining the equivalent of 2,419 MEC years. The impacts are concentrated in Auckland with 90% of the VA impacts and 84% of the employment impacts felt locally.

2.3 Benefits of Fast Track Consent and other considerations

As mentioned, it is assumed that the proposed development will deliver its associated benefits sooner if the fast-tracked pathway is followed. Using discounting enables the net gains to the economy to be estimated. To assess the benefits of a fast-track consent in terms of the economic impacts, two scenarios are compared. Figure 2.3 and Figure 2.4 compare the two scenarios in terms of the VA and employment impacts, highlighting the temporal differences.

Figure 2.3: Comparison of – VA Impacts

Figure 2.4: Comparison – Employment (MEC) Impacts



The figures highlight the temporal differences between the two scenarios. The fast-track scenario delivers greater capacity and activity before the standard approach. This difference is expressed in Dollar terms for the different impact levels:

- Value Added
  - Direct and indirect VA s 9(2)(b)(ii)
  - Total VA s 9(2)(b)(ii).
- Employment
  - Direct employment (MECs) 204 MEC years,
  - Total employment (MECs) 367 MEC years.

The differences are due to the timing of when construction and operating activity occurs, with the values reflecting the cost of delays. Bringing forward the timelines means a lift in the present value of future benefits through discounting. Without the fast-track consenting process under the Act, the development will have to authorised through the normal consenting process. This is expected to add around 30 months onto the delivery, hence the peak construction phase is around two and a half years in the future.

When the ongoing effects are removed, the fast-track scenario still delivers greater economic impacts compared to the standard approach because the economic transactions occur sooner. The present values for the two scenarios are

s 9(2)(b)(ii)

The differences between the scenarios when the ongoing costs are excluded are driven by the timing of activity for the value impact and for the employment impacts.

Other considerations

In addition to the conventional economic effects, the project will deliver other benefits. These are associated with the wider environmental aspects, specifically avoided emissions if the Brookby resource is used, versus an alternative of supplying Auckland's aggregate demand from the Waikato. Detailed modelling of these benefits will be undertaken as part of the overall consent application. However, indicative modelling suggests that if the aggregate is supplied from the Waikato (Maramarua), then the additional annual effects will be in the order of:

- Emissions arising from additional truck movements:
    - 10,800 tonnes to 14,035 tonnes per year (additional).
- Environmental cost of additional truck movements (emissions):
    - $4.3m to $5.6m (per year).

These are annual values, that will be felt every year over the long term. The true value of these effects is therefore compounded due to the long duration over which they are felt. These estimates are based on high level assumptions and exclude other considerations, like the implications of adding additional truck movements on the roading network and other social costs (accident costs, time delays and so forth). In addition, aggregate is a low value, high volume commodity and is highly sensitive to costs. Changing the transport distances increase transport costs, and the cost per tonne (of aggregate will increase). Such increases reflect a less efficient (greater travel distances) option and will add to construction budgets, flowing to other issues, like housing affordability and infrastructure delivery.

3 Conclusion

The extension of Brookby quarry with additional infrastructure, and quarry development works and investment in plant and equipment will have a positive impact on Auckland's economy. The direct and total impacts are substantial.

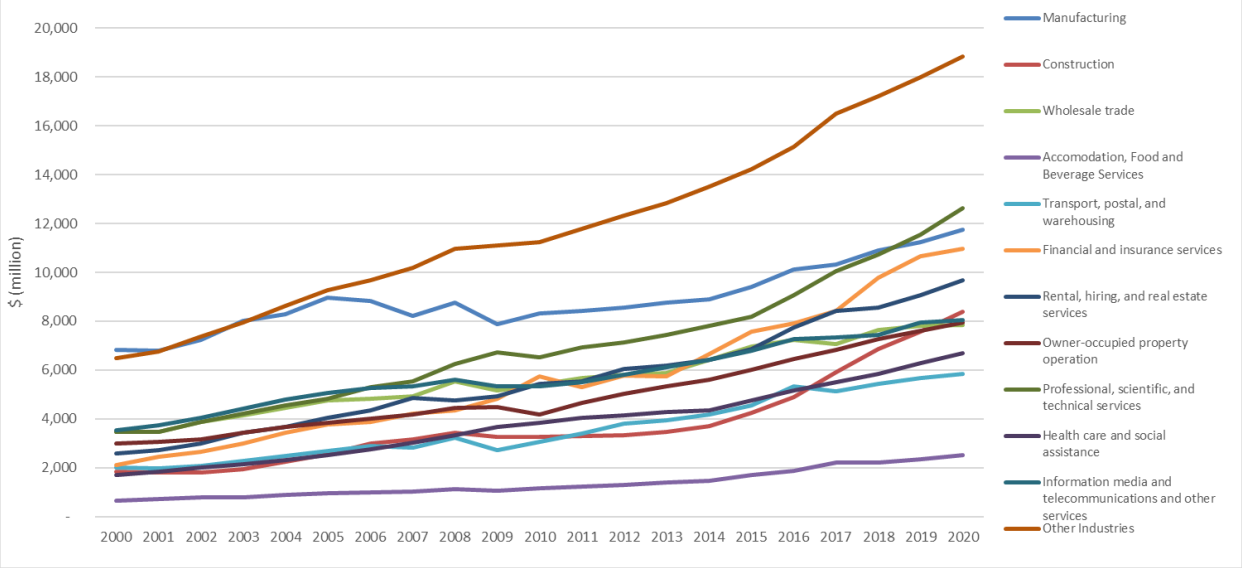
The construction and operation of the quarry will support additional employment in the local economy over the short term, but also over the long term. The modelling suggests that the development will directly generate a net contribution to VA of s 9(2)(b)(ii) in current dollar terms, over the next six years (discounted). When indirect and induced impacts included considered, this rises to s 9(2)(b)(ii). The development is estimated to sustain around 312 direct MEC years between 2023 and 2028. This is a mix of construction sector jobs in the early years and quarry operation jobs in the longer term.

Once fully developed, the quarry will provide a new source of aggregate to increase supply within the Auckland region. The development will help ensure that the Auckland has sufficient aggregate supply for potential development, in order to meet projected growth.

Appendix 1: Covid Impacts

Auckland has a diverse economy, which serves to mitigate the impact of COVID-19. Tourism and industries associated with it have been most affected by the economic downturn associated with the pandemic. While tourism still represents a significant proportion of the Auckland economy, there is less reliance on this one industry in Auckland than in other areas of New Zealand. However, across the board, all industries are impacted at some level through effects related to COVID-19, such as disrupted supply chains, trading restrictions, and general uncertainty. Regional GDP data shows the contribution to the nominal gross domestic product (GDP) of the Auckland region from the seven largest industries until March 2021.[4] While the data available does not illustrate any significant changes caused by COVID-19, it does highlight the fact that Auckland's economy is well diversified across different industries, although nominal GDP data does not adjust for the effects of inflation. The region is led by industries within the service sectors and has a strong proportion represented by secondary production in manufacturing and construction. The sectors seen to be most impacted by COVID-19, such as accommodation and food and beverage services, represent around $2,512 million in nominal GDP to the Auckland region or 2.07% of the regions nominal GDP in 2020.

Contributions to Nominal GDP in Auckland by Industry 2000-2020

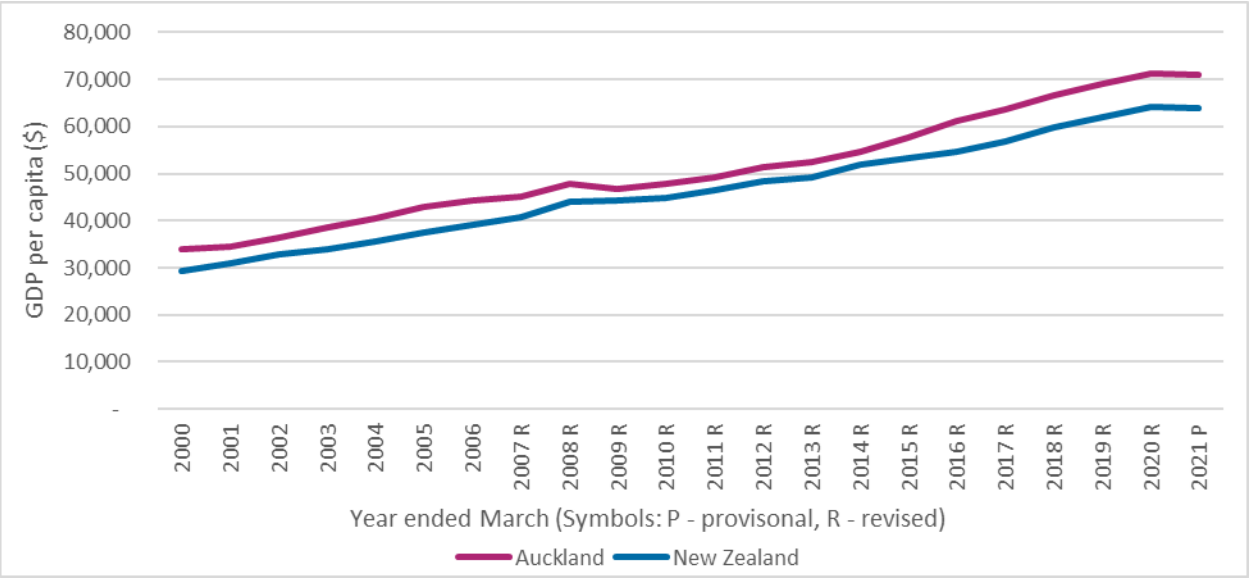


Given the wide economic impacts of COVID-19, businesses within most sectors have experienced some negative impacts on their ability to operate. This, combined with the downturn in industries directly impacted is causing further flow on effects to many in the wider community/economy at present. Over the past two years, factors such as multiple periods of restrictions, especially in Auckland, and disruptions to global supply changes have had negative impacts across most industries and the economy. This can be seen in GDP per capita figures for both the Auckland Region and New Zealand as a whole. While these figures have been trending upwards over time, the most recently available data for the year ended in March 2021 indicate that per capita GDP has marginally declined for both Auckland and New Zealand. Furthermore, Job Seeker Support data from the Ministry of Social Development (MSD) shows that numbers in Auckland are still higher than pre-COVID-19 levels. While the numbers were trending back down in the first half of 2021,

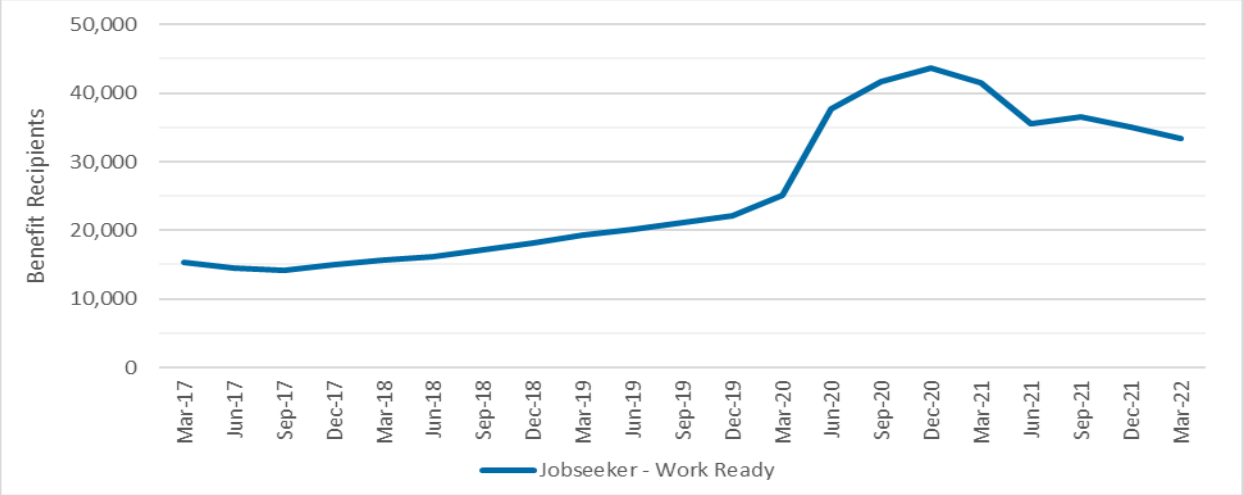
[4] Sourced from Stats NZ: Regional gross domestic product: Year ended March 2021

there has been less progress recently. While Job Seeker numbers are not the same as unemployment figures (as not all unemployed are eligible for MSD's Job Seeker Support), the numbers do help us understand how employment (and unemployment) is trending in the Auckland region.

Gross Domestic Product (GDP) per capita (Source: Stats NZ)



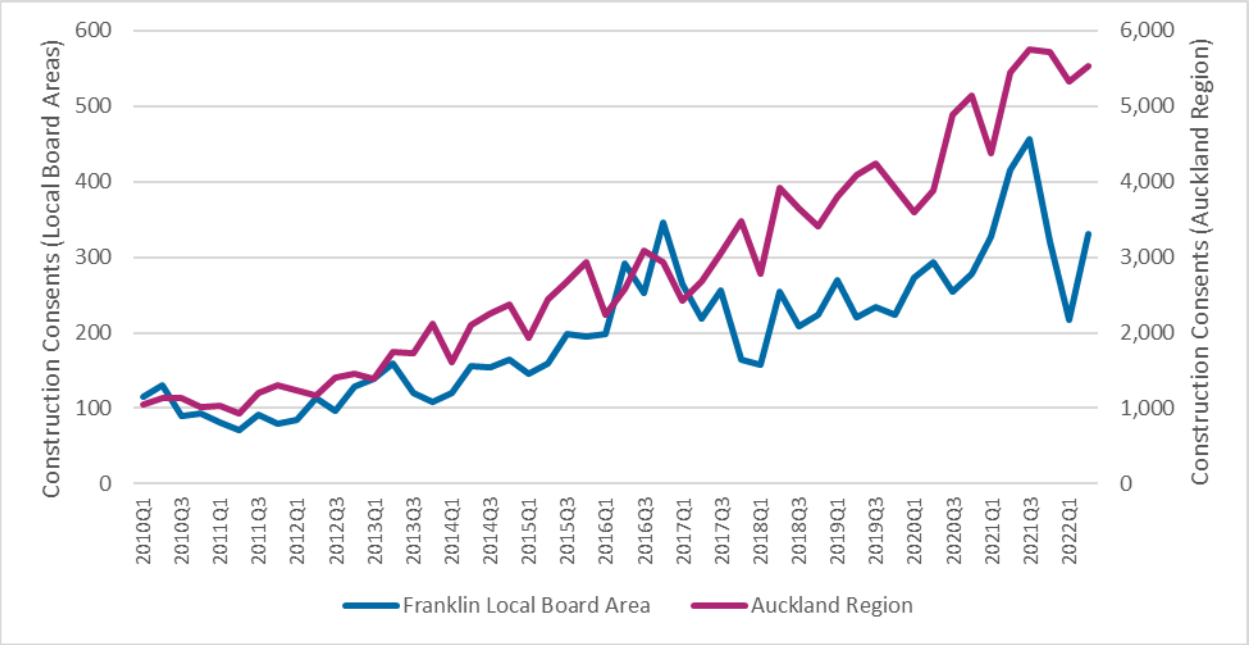
Job Seeker Support Data by Quarter for Auckland (Source: MSD)



The construction sector tends to grow commensurate with overall economic growth. As more jobs are sustained or created in central areas, more households are going to reside in the area to live and work, thus driving demand for dwelling and other commercial construction. Building consent data offers an ability to measure intended activity in the construction sector in the short-term future, particularly the next 12 months. Based on data from Stats NZ, construction consent numbers for the Auckland region have exceeded pre-COVID levels, which may have been influenced by delays causing a backlog. The data shows total construction consents by quarter for the Auckland Region and the Franklin local board area. It shows that consent numbers fluctuate between quarters, but historically the trend has been increasing. Total construction consent numbers have been generally increasing since the second quarter of 2020. This provides a positive outlook for the next 12 months of construction activity, as construction consent numbers have not been severely impacted by the COVID pandemic and construction industry has continued

to trend upward through the last two years. Furthermore, it can also be noted that this increase in construction consents will lead to a subsequent increase in construction activity over the next few years which will in turn increase the demand for aggregate within the Auckland region.

Total Construction Consents by Quarter for Franklin Local Board Area and Auckland Region



At the beginning of 2020, the construction section directly employed 62,000 employees across 25,000 businesses in the Auckland region.[5] The construction sector employs a significant proportion of the total regional workforce. It is important to keep workers in this sector employed and avoid escalating unemployment and underemployment, but also support the sector because it can provide a significant number of job opportunities, across a range of skill levels, for workers in industries adversely impacted by COVID-19. This will help ensure that there is a steady stream of projects in the development pipeline, which provide businesses and workers with surety of output and employment over longer periods, encouraging investment in plant and equipment as well as in training and hiring of new staff. In addition, the sector has strong links into a wider value chain such that additional activity in the construction sector is supported by additional activity in manufacturing and services sectors.

[5] Stats NZ: Geographic units by industry and statistical area 2000-20, based on data from the Statistics New Zealand Business Register as of February 2020.

Appendix 2: IO Modelling

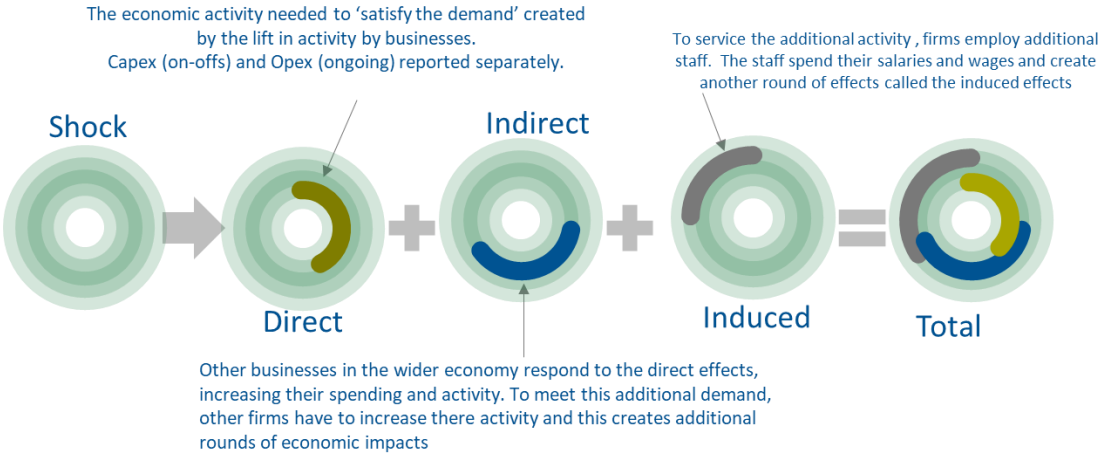
One of Input-Output modelling's strengths is that the results are easy to interpret. Similarly, IO models are easy to use and cost effective to develop for different areas. However, IO analysis is not without limitations, despite being widely applied in New Zealand and around the world. The most common limitations relate to the historical nature of IO Tables. We use IO tables derived from recent Supply and Use Tables. Therefore, they may not accurately reflect the current sectoral relationships in the economy.

With reference to 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 unlimited products.
- 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:

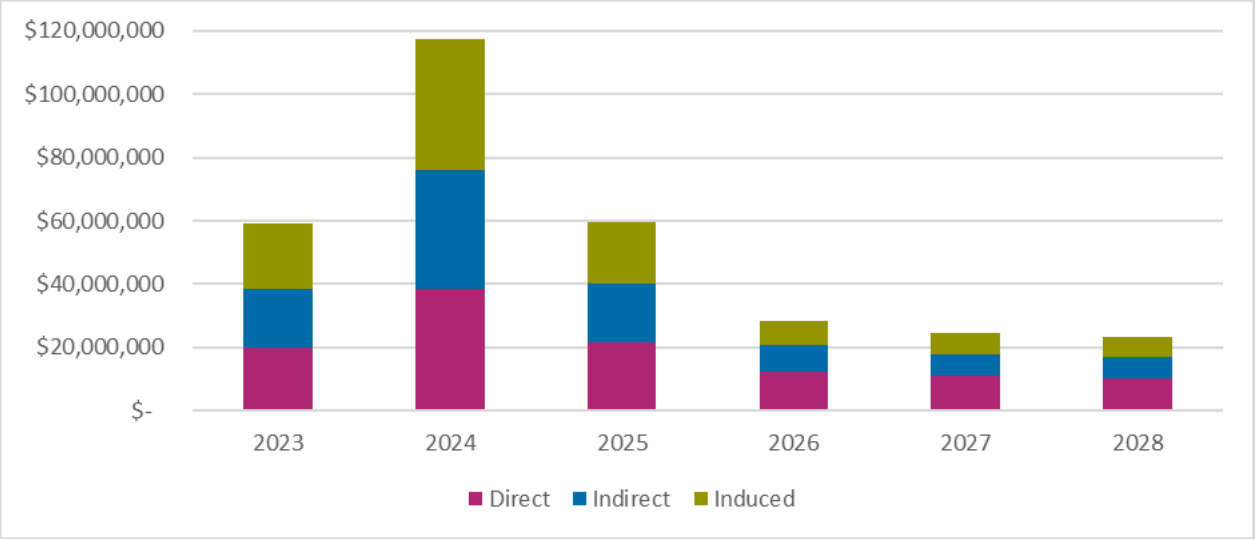
- Value added measures all payments to factors of production (land, labour and capital), and excludes all purchases of intermediate inputs. It broadly equates with gross domestic product (GDP) as a measure of economic activity on the national level, and gross regional product on the regional level.
- 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 estimated 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 3: Indirect and Induced impacts

The following graphs show the indirect and induced impacts from the IO model of yearly value added and employment total. Direct, indirect, and induced impacts are shown. Type 1 multipliers account for the direct and indirect impacts based on how goods and services are supplied within a region. Type 2 multipliers not only account for these direct and indirect impacts, but they also account for induced impacts based on the purchases made by employees.

Yearly Value-Added Impacts



Yearly Employment Impacts