ATTACHMENT EIGHTEEN

Assessment of Economic Effects (M.E Consulting)

McCALLUM BROS LTD

Established 1904

Te Ākau Bream Bay Sand Extraction:

Economic Assessment

December 2025

m.e consulting

Te Ākau Bream Bay Sand Extraction

Assessment of Economic Effects

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Executive Summary

1. Auckland is New Zealand's largest economic region and is a key driver of New Zealand's economy. The region's economic performance is crucial to support the economic wellbeing of New Zealanders. Despite the challenging economic conditions, the lowering of interest rates is likely to support a turn in economic growth activity.

2. Like many parts of New Zealand, Auckland is facing significant infrastructure pressures – some pressures are associated with legacy issues, and others are due to growth. Addressing these infrastructure deficits requires responsive supply chains across the economy, especially construction. It is essential to view the current infrastructure pressures in the context of the Fast Track Approvals Act (2024) that is designed (the purpose of the Act) to facilitate the delivery of infrastructure and development projects with significant regional and national benefits. The entire infrastructure supply chain must be efficient to ensure successful infrastructure delivery while avoiding unnecessary costs and delays.

3. Concrete is a key part of infrastructure investment, and Auckland's built future relies on access to cost-effective and high-quality sand that is suitable for concrete manufacture. Sand is essential to support economic activity being a key ingredient in concrete production which is critical for all infrastructure investment projects, as well as other applications. The Critical Minerals List acknowledges the broader importance of sand.

4. This assessment shows that enabling sand extraction at Te Ākau Bream Bay would facilitate infrastructure development and support significant activities in the Auckland region. Further, enabling extraction at Te Ākau Bream Bay, will support construction sector by alleviate uncertainty regarding the availability and supply of natural sand to infrastructure investment sector.

5. Sand is a high-volume, low-value commodity, and transporting it is expensive, and distance from the source significantly affects the total cost of sand. Access to suitable, and sufficient volumes of high-quality sand from appropriate locations is critical. Beyond the direct transport costs, environmental externalities also arise from transporting sand.

Infrastructure investment outlook

6. New Zealand and Auckland's infrastructure challenges are well-documented. Reports by the New Zealand Transport Agency (NZTA), the Ministry for Business, Innovation and Employment (MBIE) and the Infrastructure Commission highlight the scale of the task. The infrastructure challenges are compounded by historic investment nearing the end of useful/economic life. Cost considerations and budget constraints are likely to be key factors that will influence investment decisions.

7. Total[1] construction activity in the Auckland region during 2023 was valued at $23.1bn. While activity is expected to remain subdued through 2025, the recovery will see activity gradually increase to $24.2bn by 2029. Infrastructure is an important part of construction and infrastructure investment is expected

[1] All construction activity.

to increase from $4.4bn (2023) to $5.1bn in 2029 – 14.3% higher than 2023 levels[2]. Infrastructure covers a wide range of activities, including water, transport, community facilities and energy.

8. The identified projects illustrate the breadth of investment – ranging from investment at Auckland Airport to residential development by the private and public sectors, roads and motorway projects, flood/storm recovery as well as social infrastructure (e.g., libraries and schools).

9. Many infrastructure projects, especially roading, bridges, three waters[3] as well as large commercial, industrial and residential buildings require high strength concrete. The need for high strength concrete is based on the whole-of-life asset management perspectives, and concrete mixes are engineered to achieve the required compressive strengths needed for the application. Durability and costs are key factors that are considered during project design. High-strength concrete requires consistent, clean, and well-graded fine aggregate (sand) to ensure that the right specifications are achieved.

10. In Auckland, high-strength concrete makes up about 60% of the concrete that is poured. This specific share changes over time based on the infrastructure investment and business cycles. Auckland's marine sands are particularly suitable for high-performance concrete applications, and their use is crucial for the Auckland concrete market. Marine sand is an essential input into the infrastructure investment landscape.

Demand outlook

11. Demand for sand is derived i.e., it is used as input into other goods. Stats NZ publishes ready-mix concrete data, making it possible to estimate sand that is demanded for ready-mix concrete. Sand is also used for non-concrete applications[4]. On a per capita basis, demand for sand (all sand) is between 0.50 tonnes per capita and 0.54 tonnes per capita. Based on population data, baseline demand for all sand is in the order of 864,650 tonnes to 947,325 tonnes per year. Current demand levels are below expected levels and reflect the economic downturn. Demand is in line with levels seen in the 2015/16 and 2016/17 periods when the economy was growing, but before the very strong growth period seen immediately before Covid (2018/19). As the economy starts to grow again, and as projects consented under the Fast Track Approvals Act (2024) start implementation, demand for sand will increase.

12. A scenario approach is used to estimate future demand for sand in Auckland. The scenarios reflect different population growth rates out to 2054. The net change in sand demand (per year) for 2054 is shown (see table):

    a. Under scenario 1[5], the additional sand (all purposes) that will be in demand for Auckland (per year over the long term), is estimated at between 260,575 tonnes and 335,625 tonnes,

    b. Under scenario 2[6] Auckland will require additional sand (all purposes) of between 373,000 tonnes and 460,200 tonnes (per year).

[2] National Construction Pipeline Report 2024: Ministry of Business, Innovation and Employment (MBIE). (2024, December 17). *National Construction Pipeline Report 2024*.
[3] Wastewater, stormwater, drinking water
[4] Other, non-concrete uses, include turf, industrial and sport (e.g., equestrian).
[5] This scenario is based on the medium growth projections for Auckland.
[6] High population growth projections for Auckland.

	Baseline demand (2024; Tonnes)	Demand (tonnes) per year by 2054	
		Scenario 1	Scenario 2
Total Sand	872,775 –944,025	1.1m – 1.2m (Change 260,575 – 335,625)	1.3m – 1.4m (Change 373,000 – 460,200)
Sand for all concrete	596,075 – 663,325	774,050 -849,100 (Change 177,975 – 253,000)	899,500 – 986,700 (Change 236,175 – 323,375)
Sand for High Strength concrete	357,650 – 398,000	464,425 – 509,450 Change 106,775 – 151,800)	539,700 – 592,025 (Change 141,700 – 194,025)

13. The future demand (2054, total) for concrete sand is substantial and is estimated at between 774,050 tonnes and 849,100 tonnes per year for scenario 1, and between 899,500 tonnes per year and 986,700 tonnes per year for scenario 2

14. These changes are substantial, and production levels will need to increase by, on average, more than a third (34%) under scenario 1 and 44% under scenario 2.

Supply situation

15. Currently, Auckland's sand supply is highly concentrated, with most sand now sourced from the Kaipara Harbour after accessing sand from the Mangawhai-Pākiri ceased. The loss of sand from the Mangawhai-Pākiri has resulted in a significant reduction in the availability of proven, locally available, sand that can be used in the Auckland sand market.

16. Total consented volume of sand provides an indication of the *theoretical* supply. However, practical considerations, such as quality/attributes, logistics and location relative to the end-users temper the total availability. Auckland's sand resources reveal the following key dimensions:

    - While consented volumes in the Auckland sand market appear significant (1.65 million tonnes), actual available[7] volumes are materially less than this volume.
    - Marine sand is a key source, with a substantial share of available natural sand linked to one resource (Kaipara harbour sand). The Kaipara accounts for 65% of consented[8] sand volume.
    - The Kaipara consents expire in May 2027. While there is uncertainty about the likely outcome of any consent renewal process and the timing, if these consents are not renewed, then the market will lose access to 1.08m tonnes of sand (consented volume), leaving a balance of 366,700 tonnes of available sand and a maximum (consented volume) of 570,720 tonnes – relative to an average baseline demand of between 911,540 tonne and 1m tonnes (in 2028). At these levels, the deficit is estimated at between 409,540 tonnes and 503,360 tonnes (in 2028).

17. While the Kaipara sand resource is identified as one of the most important (largest) sources for the Auckland region, renewal of the Kaipara consents is not guaranteed. Auckland's sand market is heavily reliant on the Kaipara resource, and there are significant concentration risks and supply chain

[7] Available sand is the portion of consented sand that the market can access after considering technical and other issues.
[8] Including Sand Glass Corporation consented volumes.

resilience[9] issues associated with relying on one source for a large portion of supply. From an economic perspective, it is highly desirable that additional sources be developed to ensure sufficient supply, reduce concentration risks and to improve supply chain resilience. Avoiding disruptions has significant economic benefits associated with delivering development projects with significant regional and national benefits as well as construction in general.

18. The current supply position shows that the sand market is tight – with the available sand volumes in line with demand levels – this is because the current economic slowdown is also felt in the construction sector, with below-average activity. Significant pressures on sand supply can be expected as the economy returns to 'normal growth' and as construction increases from current low levels.

19. Options to address sand supply constraints should be explored. Potential responses could include:

    a. Natural sand:

        i. imported from other regions,

        ii. existing operations increase production levels, and/or

        iii. establish newly consented sand extraction operations.

    b. Partial substitutes:

        i. crushed recycled concrete[10],

        ii. crushed glass[11],

        iii. manufacturing sand.

20. As is discussed in more detail in the body of this statement, the economically efficient solution to Auckland's supply problems is to enable the development of a substantial new source of marine sand such as the Te Ākau Bream Bay resource. The potential contribution of the Te Ākau Bream Bay resource to providing secure access to high-quality sand is significant. Enabling Te Ākau Bream Bay sand extraction will add a sizable resource to the Auckland sand market. The amount will be immediately available in the market, alleviating pressures on the supply chain. Providing additional capacity and avoiding shortfalls will deliver a range of important economic benefits, enabling the construction sector to deliver infrastructure and development projects of regional and national significance. The suitability of Te Ākau Bream Bay sand for making high strength concrete is particularly significant in this respect.

21. Manufactured sand is often raised as a potential alternative to natural sand. However, there are several key issues and considerations limiting its uptake, including:

    a. It is a new technology in the New Zealand context, and the current uptake is low.

    b. There are technical considerations that limit its use:

        i. The comparative costs put it at a disadvantage,

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[9] Concentration risk and supply chain resilience are related. Concentration risk is the cause of the vulnerability and supply chain resilience is the response. Concentration risk in this context relate to the small number of potential suppliers of sand (from the Kaipara resource) as well as the geographic concentration of supply (both Kaipara Harbour consents are in one location).

[10] Mr Donoghue dismisses these options due to availability issues and points to the limited usability beyond low-grade concrete mixes. Supporting statement by Mr Donoghue: para 55.

[11] Supporting statement by Mr Donoghue: para 56. Mr Donoghue outlines the issues and constraints limiting the use of recycled glass as a substitute.

ii. Its limits as a total replacement for natural sand in high-strength applications,

iii. The substitutability for other uses (e.g., turf and industrial applications) is unknown.

c. To produce manufactured sand, a suitable feedstock (parent rock) is needed, and Auckland already imports aggregate from the Waikato and Northland. If Auckland rock or aggregate is used as the input, then that portion displaces aggregate away from other uses.

22. Mr Donoghue states[12] that manufactured sand is **not** a complete replacement for natural sands in concrete production, especially high strength concrete (>30MPa). If manufactured sand were to have a wider use in concrete production, then it appears to be largely a replacement for the PAP7 portion of the fine aggregate required in concrete mixes.

23. Therefore, manufactured sand's potential contribution to addressing market pressures is limited.

Sufficiency position

24. This assessment integrates the supply position with the demand outlook to determine the supply-sufficiency position over time. Auckland is expected to see pressures around supply and an ability to secure sand, particularly for concrete manufacture. The current economic slowdown and below-trend construction and investment are masking the magnitude of the pressures, but these will become more acute as economic growth returns.

25. The sufficiency position is assessed using different growth scenarios that are based on alternative views about Auckland's population growth.

26. The fundamental observation is that Te Ākau Bream Bay sand will be needed regardless of the outcome of any Kaipara consents renewal processes.

27. Enabling Te Ākau Bream Bay extraction will ensure that there is sufficient capacity in the sand supply market to provide supply chain resilience while supporting efficient market operation and avoiding adverse economic effects. Examples of these effects include:

    a. Price increases,

    b. Rationing, and

    c. Shifting demand patterns (to sub-optimal/less efficient options).

28. Auckland needs access to multiple sand sources to ensure that the sand industry can respond to future growth pressures, especially during periods of high growth. Ensuring that there is access to multiple sources enhances supply chain resilience and reduces concentration risks, and enables competition in the market. In turn, this provides confidence to the market that essential inputs will be available when delivering infrastructure projects. A constrained market will make it more difficult to deliver infrastructure projects, adding costs, uncertainty, and time. The direct consequences for infrastructure investment and development of insufficient high-quality sand for high-strength concrete include:

    a. Sourcing sand from more distant sources, increasing economic and environmental costs.

[12] Supporting statement by Mr Donoghue: para 43 and 76.

b. Increasing cost due to higher cement requirements if another sand source (e.g., Waikato sand) is used.

c. Changing to an inferior sand input means that the cement specifications change. In turn, this will increase input costs and potentially impact the whole-of-life costs.

29. The sand market, and its functioning in the context of construction and infrastructure delivery, is regionally significant.

Avoided costs are benefits

30. Enabling sand to be extracted from Te Ākau Bream Bay to support the Auckland sand market will have direct benefits associated with the construction sector.

31. In this assessment, the sand resource from the Kaipara is used as the appropriate counterfactual. The counterfactual is used to assess the relative position of supplying the Auckland sand market from Te Ākau Bream Bay. The Kaipara sources are viewed as the appropriate counterfactual due to being a high-quality marine sand that is available to the Auckland market. The counterfactual is used as a benchmark against which to illustrate the relative costs and benefits. It is acknowledged that consents for this resource expire in 2027, and renewal is not guaranteed. If the consents are not granted and the sand is sourced from more distant locations, then the benefits identified in this assessment will understate the benefits associated with the Te Ākau Bream Bay opportunity.

32. The benefits associated with adding Te Ākau Bream Bay sand to Auckland's supply network will be felt over multiple years. The annual values can be expressed in present value terms by discounting future values. Essentially, the discounting process reduces the relative importance of future benefits (or costs) relative to short-term benefits. The discount rate that is used for the assessment is consistent with New Zealand Treasury's guidance i.e., using a rate of 2% for the first thirty years and 1.5% for the remaining period. The estimated present values of the benefits (avoided costs) associated with Te Ākau Bream Bay are:

a.	Direct transport costs	$258.2m
b.	Environmental costs	$104.0m
	o *Shadow price of Carbon*	*$34.4m*
	o *Health-related costs*	*$78.2m*
c.	Social costs	$12.2m
d.	**Total**	**$383.1m.**

33. Based on the above transport, environmental and social costs that would be avoided by enabling Te Ākau Bream Bay extraction are estimated at $383.1m.

34. The avoided cost represents a significant economic benefit that will accrue to Auckland's economy and, ultimately, households.

35. The specific size of the effects associated with the higher costs (direct transport) is a function of how the market responds, especially which sources are accessed to supply the Auckland sand market. If

sand is sourced from another source that is located further away (than the Kaipara sand), then the transport costs would be greater.

36. The analysis shows that even using manufactured sand (based on a hypothetical scenario) and blending it with natural sand for concrete purposes generates more costs than a scenario using natural sand sourced from Te Ākau Bream Bay. Enabling Te Ākau Bream Bay sand extraction is more cost-effective (and avoids significant costs) relative to the counterfactual (Kaipara Harbour) and/or an assumed supply of manufactured sand if it were to become available and acceptable to concrete manufacturers.

Cultural Impact Assessments

37. As part of preparing the substantive application, the potential cultural impacts were assessed. These separate assessments are presented in the Cultural Impact Assessment (CIA) Reports prepared for:

    - Patuharakeke Te Iwi Trust (December 2025, version for approval),
    - Ngātiwai Trust Board (14 December 2025),
    - Te Pouwhenua o Tiakiriri Kūkupa Trust t/a Te Parawhau ki Tai (4 December 2025, revision 11).

38. The Cultural Impact Assessments were reviewed, and one included a dedicated economic memo. The memo was reviewed and the points raised within it addressed. The key points that could have materially altered the findings of the economic assessment related to the selection of the discount rate used in the economic assessment. The selection of a discount rate can be controversial; however, an alternative rate would be relevant if the project was about central government assessing its options to establish a commercial venture to extract sand. This is not the case, and the appropriate discount rate was used.

39. The memo provides additional information, but it does not change the economic assessment, or the assumptions underpinning it. It adds some information about the potential cultural losses even though there are questions around the input assumptions.

Concluding remarks

40. Access to high-quality and sufficient sand is essential to the infrastructure investment process. The location of the sand resource relative to end users is crucial because transport distance and mode combine to influence the cost of delivered sand. Input costs influence concrete prices that flow through the supply chain and impact infrastructure costs. Investment in roads, buildings, infrastructure and other assets becomes more expensive, leading to difficult trade-offs.

41. Without enough high-quality sand, there will be delays in delivering the concrete used to complete such projects. Limited sand supply will mean that sand is rationed across concrete suppliers, and investments in infrastructure will compete for concrete and other resources, meaning that delivery timeframes will be pushed out thereby delaying when the benefits associated with the infrastructure manifests.

42. Enabling sand extraction at Te Ākau Bream Bay will provide a range of regional benefits associated with facilitating the delivery of infrastructure and development projects. The benefits include:

a. Improving the resilience to the sand supply network and providing additional flexibility to the concrete supply chain – a key element of any infrastructure and climate change resilience programme (before or after extreme weather events).

b. Enabling the sand supply chain to avoid significant direct and indirect costs that will be borne by the construction sector, and ultimately Aucklanders.

c. Contributing positively to enabling a well-functioning construction sector that can deliver infrastructure in a time- and cost-efficient manner.

43. Sand is an essential input into concrete. Enabling sand extracting at Te Ākau Bream Bay will contribute towards, and facilitate, the delivery of infrastructure and development projects including those of regional and national significance.

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Figures, Tables and Appendices

1 Introduction

1. Auckland is New Zealand's main economic service centre. The region is experiencing strong population growth and despite challenging economic conditions, investment in buildings and infrastructure is ongoing. The Reserve Bank of New Zealand is loosening restrictive policy settings by lowering the Official Cash Rate.[13] In addition to demands associated with the population and economic growth, Auckland faces significant infrastructure deficits. The Infrastructure Commission highlights the shortfall and suggests that a business-as-usual (BAU) approach to renewals and investment will see existing deficits grow. The historical deficit arose out of an investment slump during the 1980s and 1990s and the observation that investment during the 2000s has not been sufficient to meet infrastructure demands.

2. Construction is an essential part of infrastructure investment, and the entire construction supply chain must be efficient to ensure that infrastructure delivery can occur in a timely and cost-efficient manner. A central message relating to addressing the infrastructure deficit is that a simplistic approach to building our way out of the deficit is unlikely to succeed. Infrastructure efficiency and maximising the return on infrastructure spending are critical considerations. The Infrastructure Commission's estimates suggest that New Zealand's infrastructure spending would need to increase from 5.5% of GDP to 9.6% of GDP to deliver the infrastructure we need – a significant increase. This type of increase cannot occur in isolation. Limited financial resources mean that difficult trade-offs will be needed, reflecting decisions associated with hospitals, schools, and other areas such as transport, residential and environmental infrastructure.

3. Concrete is an essential part of infrastructure projects and is used throughout the urban environment. The importance of sand[14] to the New Zealand economy is acknowledged by its inclusion in the Critical Minerals List. A mineral is included in the list if it is:

    a. Essential to New Zealand's economy, national security, and technology needs, and/or equally important to New Zealand's international partners, and

    b. Susceptible to supply disruptions domestically and internationally.

4. 'Essential' is defined as critical to maintaining New Zealand's economy today and into the future and not readily substitutable. The regulatory constraints limiting new supply and the significantly higher cost of sourcing alternatives are noted in the assessment.

5. Sand is an essential ingredient in concrete, and high-quality sand with the right mineralogical properties is required for high-strength concrete applications[15], which are particularly relevant to infrastructure (such as the Waterview Tunnel and the Central Rail Link projects[16]). Sand is a key component in the production of ready-mix concrete, with between 400 and 450 kilograms of sand in each cubic metre of concrete for standard mixes. In the context of the infrastructure investment programme for private and public entities, the availability of quality inputs and the ability to source cost-effective high-strength concrete is essential – this includes quality sand.

[13] The OCR was at 5.5% in June 2024 and has been lowered several times since. It currently (early October 2025) sits at 2.5%.
[14] Wood Mackenzie. (2024, December). *Final Wood Mackenzie report on the development of a Critical Minerals List for New Zealand* (Prepared for the New Zealand Ministry of Business, Innovation & Employment). Link to MBIE.
[15] Supporting statement by Mr Donoghue: para 24.
[16] Supporting statement by Mr Donoghue: para 6.

6. Given the importance of concrete for Auckland's economy, Auckland's built future is effectively reliant upon maintaining access to cost-effective and high-quality sources of sand. Because sand is a key component in a range of different building applications, much of New Zealand's future productive growth is reliant on sand in one form or another. This means that the impact of sand extends significantly further than just the construction sector.

1.1 Objectives

7. Auckland's sand market is concentrated, with most of the sand supplied from a small number of extraction operations. This concentrated nature presents several risks to a reliable supply chain and warrants consideration as to the ability to source sufficient sand from multiple suitable locations to provide for future productive growth. This economic assessment considers the Te Ākau Bream Bay sand extraction application in the context of Auckland's future growth and infrastructure investment requirements. The assessment is in the context of the purpose of the Act, i.e., the potential regional or national benefits that enabling sand extraction at Te Ākau Bream Bay would facilitate or support are identified and assessed.

8. It is critical to access suitable and sufficient volumes of high-quality sand from appropriate locations. Sand is a high-volume, low-value commodity – transporting it from the source to where it is used is expensive. Beyond the financial costs, environmental externalities also arise from transporting sand.

9. This economic assessment has been prepared in support of McCallum Bros Limited (MBL) Bream Bay Application under the Fast Track Approvals Act (2024). The application is listed as a fast track project[17]. The purpose of the Act is to:

"facilitate the delivery of infrastructure and development projects with significant regional or national benefits"

10. The two key terms guiding this assessment are 'facilitate' and 'benefits". Facilitate is defined[18] as:
    a. "To make (something) easier",
    b. "To help bring (something) about", and
    c. "To help (something) run more smoothly and/or effectively".

11. In simple terms, a 'benefit' is defined[19] as something that produces good or helpful results, or an effect that promotes wellbeing. Section 81(4) indicates that the extent of a project's regional or national benefits must be considered when assessing a project. The Act does not outline what benefits are or how they should be identified and assessed. In economic terms, benefits can include an array of outcomes, including:
    a. Increased employment,
    b. Higher productivity,

[17] Listed in Schedule 2 of the Fast-track Approvals Act (2024). Link to the Fast-track website: Bream Bay Sand Extraction Project
[18] Merriam-Webster. (n.d.). *Facilitate*. In *Merriam-Webster.com dictionary*. Retrieved July 22, 2025, from https://www.merriam-webster.com/dictionary
[19] Merriam-Webster. (n.d.). *Benefit*. In *Merriam-Webster.com dictionary*. Retrieved July 22, 2025, from https://www.merriam-webster.com/

c. Income growth,

d. Business growth,

e. Improved infrastructure,

f. Greater economic resilience,

g. Innovation and research and development (R&D) spillovers,

h. Improved supply chain performance,

i. Reduced travel times,

j. Increased export earnings, and

k. Improve social returns on investment.

12. This economic analysis describes:

    a. The infrastructure investment outlook of regional Auckland and the role of sand in enabling infrastructure investment and development projects.

    b. The potential benefits associated with enabling sand extraction at Te Ākau Bream Bay in terms of the supply of sand covering availability, location, and attributes.

13. The economic effects are explained in terms of the change in transport costs and externalities associated with the transport load. In addition, other considerations associated with the Te Ākau Bream Bay opportunity are outlined.

1.2 Code of conduct

14. I have been provided with a copy of the Code of Conduct for Expert Witnesses contained in the Environment Court's 2023 Practice Note. While this is not an Environment Court hearing, I have read and agree to comply with that Code. This evidence is within my area of expertise, except where I state that I am relying upon the specified evidence of another person. I have not omitted to consider material facts known to me that might alter or detract from the opinions that I express.

1.3 Information sources

15. Several sources were consulted and reviewed as part of undertaking this economic assessment, including:

    a. Information provided by MBL,

    b. Market Economics Limited in-house regional economic datasets and models,

    c. Auckland Council information and data,

    d. Central government guidance and datasets:

        i. Ministry of Transport,

        ii. New Zealand Transport Agency,

        iii. Ministry for the Environment,

iv. Ministry for Business, Innovation and Employment, and

v. Stats NZ.

e. Industry interviews, sources and releases.

16. The information used in this assessment might differ from that reported in earlier assessments due to more recent information and updated values informing the analysis.

1.4 Structure

17. The rest of this report is structured as follows:

a. Section 2 describes Auckland's infrastructure investment landscape and highlights the essential role of sand in infrastructure.

b. Section 3 discusses the regional sand market and outlook, covering the demand for sand and the supply situation. The net sufficiency position of the Auckland sand market is highlighted using a scenario approach.

c. Section 4 draws on the analysis and summarises the potential economic costs of a sand-supply deficit and the flow-on implications. This section addresses the externalities and wider economic considerations.

d. Section 5 outlines the response to the information in the Cultural Impact Assessment (only the relevant parts are dealt with).

e. Section 6 offers concluding remarks.

2 Auckland's significance

18. Auckland is New Zealand's largest population centre and is the country's main economic centre. Most of New Zealand's economic and population growth is expected to occur in the Auckland region. Building and construction are key parts of Auckland's growth story. Crucially, population and economic growth generate pressure, and investment is needed in response to new and existing pressures. Auckland is facing legacy issues[20] that require ongoing investment. Central government, and Auckland Council are both undertaking significant investment to address these pressures. Sand is a key input into concrete that is used in projects that are designed to address these issues.

19. As mentioned, the Auckland region is New Zealand's largest population centre and hosts 1.8m people – a third (34%) of the country's population. Over the past decade or so (2014 to 2024), Auckland's population grew by 18%. Looking ahead, the five-year period to 2028 will see another[21] 5% increase. Over the longer term (2029-2048) the population is expected to expand by +18%. In contrast, New Zealand's total population is expected to increase by 13%. This outlook underlines Auckland's significance in the New Zealand context. The region is a key destination for population growth and economic activity, and will continue to act as New Zealand's premier population and investment destination.

20. Over the past decade or so, Auckland has experienced strong growth[22], and GDP is estimated at $159.7bn (in 2024). Auckland's growth rate has surpassed that of New Zealand as a whole, with a 3.5% compound annual increase, compared to the 2.9% national rate (real terms).

21. From 2001 to 2024, Auckland generated 43% of New Zealand's overall GDP growth. The growth translates into investment requirements associated with:

    a. Housing and residential areas,

    b. Roads, and transport infrastructure (bridges, tunnels etc),

    c. Three waters infrastructure,

    d. Establishing new business locations,

    e. Commercial and industrial buildings, and

    f. Social and civic amenities and buildings.

22. In terms of productivity (based on GDP per employee), Auckland is outperforming the rest of New Zealand. Auckland's GDP per employee is higher than the national average. Over the past decade or so, Auckland's GDP per capita grew broadly in line with the rest of the economy. This reflects Auckland's economic structure and composition. Again, this underlines Auckland's role in the national economy, as well as a direct requirement to ensure that the infrastructure and investment activities support the region's economic and social activities as well as growth. Spending on infrastructure is crucial, encompassing both the acquisition of new assets and the upkeep of existing ones.

[20] The legacy issues relate to the historic infrastructure pressures and addressing infrastructure deficits.
[21] This is based on the medium projections (Stats NZ).
[22] Sourced from Infometrics.

2.1 Infrastructure investment

23. New Zealand's infrastructure challenges are well-documented. Auckland, as well as other regions (including the Waikato, Northland, and Bay of Plenty) are no exception, and the 2023 flooding events highlighted infrastructure deficiencies, caused widespread damage, and initiated a renewed interest in the region's infrastructure resilience and risk exposure. Supporting population and economic growth will require ongoing investment to cater for that growth. At the same time, legacy issues must be addressed, and resilience must be built into the infrastructure landscape.

24. There are several sources outlining the anticipated construction and infrastructure spending. While there is some overlap between the sources, the breadth and depth of construction and infrastructure spending are significant, covering a wide range of areas. The infrastructure spending reflects the response to growth pressures as well as efforts to address legacy issues (infrastructure backlogs).

25. A NZTA report noted there has been a deficit in infrastructure re-investment for the medium term which, when coupled with strong population growth, means that public infrastructure associated with historic investment is coming to the end of its useful/economic life[23]. Combining the historic shortfalls with growth means that the demands for infrastructure investment are likely to become even more acute over the short to medium term. Budget pressures are likely to play a key role in investment decisions.

26. The National Construction Pipeline report (MBIE)[24] highlights Auckland's construction outlook and shows the size of the infrastructure challenge. There are several large-scale infrastructure projects that will generate considerable demand for concrete, and therefore sand.

27. According to the MBIE report, total construction activity in Auckland is expected to remain subdued through 2025 before recovering and growing to $24.2bn by the end of 2029, a rise of 4.2% compared with 2023. Infrastructure and non-residential building are forecast to remain relatively consistent, with infrastructure increasing toward the end of the period.

28. The Infrastructure Commission identifies several large projects in the Auckland region that will also generate significant demand for concrete and sand. Drawing on the Infrastructure Commission's Pipeline dataset, the scale of Auckland's investment task over the foreseeable future is clear. The identified projects in the pipeline are, however, not a complete picture of all investment intentions because only a portion of the private sector's projects are captured. The identified infrastructure spending is reported as (figures are rounded):

a.	Water	$642m,
b.	Transport	$110m,
c.	Community facilities	$31m,
d.	Other	$26m,
e.	Defence	$7.5m,
f.	Energy	$38m, and
g.	**TOTAL**	**$859m.**

[23] https://www.nzta.govt.nz/assets/resources/research/reports/693/693-aggregate-supply-and-demand-in-new-zealand.pdf
[24] Ministry of Business, Innovation and Employment (MBIE). (2024, December 17). *National Construction Pipeline Report 2024*. Wellington: MBIE. Retrieved from https://www.mbie.govt.nz/dmsdocument/29978

29. The size of the investment task is significant and 83% of the identified spending is associated with the next decade. Crucially, the investment will require significant inputs, including concrete. For example, the water related projects cover investment aimed at supporting Auckland's growth, as well as addressing infrastructure backlogs and dealing with flooding-related issues. The projects include the replacement/rehabilitation of reservoirs, water main replacements, upgrading local networks as well as delivering stormwater conveyance and several are large projects with budgets of more than $250m. The scale of the three waters[25] related infrastructure spending is evident. The projects also include the wider investments in water-network projects that link into the Central Interceptor. These projects include upgrading pumpstations and modifying control chambers and shafts, as well as extensions.

30. Investment in the roading and transport network is another core element that requires significant budgets. Substantial projects that are currently in the pipeline are a mix of private and public sector investments. On the private sector component, the investments at Auckland Airport are material and are programmed to continue over the next 3-4 years. The airport is a crucial component of New Zealand's domestic and international economy. The investment in the airport and associated facilities is a $3.9bn programme spanning the next 6 years. Some of the announced projects were put on hold due to the uncertainty introduced by Covid-19, but these are now progressing. Work on some of the taxiways is underway, and the key developments over the next three years (2025 to 2028) include:

    a. Construction of the integrated domestic and international operation location,

    b. Domestic jet terminal pier A1 (12 new jet stands for domestic destinations),

    c. Pier B Northern Stands (six new non-contact stands, extra taxiways to facilitate aircraft movement).

31. The scale of investment at the Airport and associated projects is substantial. The concrete demand[26] for different components is extensive and information published by concrete producers illustrate the scale of the concrete demand.

    a. Taxiway Mike 85,000m^3

    b. Pavement renewals 9,000m^3

    c. New Air New Zealand Hangar 4 18,000m^3

    d. Domestic Processor Project 6,000m^3

    e. Mawana Bay Shopping Centre 4,500m^3

    f. Auckland International Transport Hub 20,000m^3.

32. In addition to these abovementioned developments, the Airport's masterplan also outlines the intended developments/vision to 2047.

33. Auckland Transport facilitates and oversees a large budget associated with Auckland's roading infrastructure. The organisation has a large work programme with several projects with budgets in the $100m to $250m range, and some are even greater. Examples of the large projects include:

    a. Northwestern Busway and Northern Busway Extension Stations (Rosedale and Constellation).

[25] Wastewater, stormwater or drinking water.

[26] Firth Concrete - Firth's capability bolstered at Auckland Airport

b. Eastern Busway (EB) Alliance: This project includes delivery of the Rapid Transit Busway and includes the Reeves Road flyover, new bus interchanges at Pakuranga and Botany and associated safety and cycling works which will create faster, more reliable transport options for communities in East and South Auckland.

c. UCP – Glen Innes to Tāmaki Drive Scheme Cycleway: The project is to provide an off road cycle highway (shared path) from Glen Innes Rail Station to Tamaki Drive. Section 4 is a shared path (includes bridges and a boardwalk) between Ōrākei Train Station and Tāmaki Drive. The project is part of a 7km cycle highway (shared path) from Glen Innes Rail Station to Tāmaki Drive.

d. CRL Day One – Level Crossing Programme: This work programme includes works to address rail level crossing issues, either through road closures or grade separation. The programme will deliver several standalone pedestrian-level crossings.

e. Flood/Storm Recovery: The estimated project value to address investment in this area is put at between $100 and $250m.

f. Carrington Road Corridor: The project is at a 'Detailed Business Case (DBC)-stage' and will deliver the preferred long-term option and preliminary design for the Carrington Road corridor upgrade. The purpose of the DBC is to provide a sufficient level of investigation and design to inform negotiations with the developers of a significant residential development in the adjacent Wairaka Precinct to identify costs and risks.

34. In addition to Auckland Transport, the New Zealand Transport Agency Waka Kotahi also delivers infrastructure investment. Identified projects cover a range of additional investments throughout Auckland. Some of the projects are also part of the Roads of National Significance workstream. As part of the investments, NZTA has signalled a substantial investment in projects including:

a. RoNS[27] East West Link: The East West Link project was proposed to provide a new transport connection on the northern side of the Māngere Inlet to link SH20 and SH1. One of the aims is to reduce congestion on Neilson Street and improve conditions for freight movements around the Onehunga area. Other opportunities include addressing historic water quality issues and providing improved walking and cycling connectivity to the foreshore. The anticipated budget is +$1bn.

b. Northern Corridor Improvements: This programme of works includes a package of capacity and safety improvement projects on the Northern Motorway between Upper Harbour Highway and Greville Road. This project is scheduled to conclude circa 2028.

c. RoRS[28] SH1 Papakura to Drury: The Papakura to Drury project builds on the Southern Corridor Improvements and will provide improved journey reliability along SH1, as well as improved walking and cycling facilities. The project consists of several upgrades, including new lanes, bridges, underpasses and a shared-use path. The project also allows for future-proofing the SH1 North Island Main Trunk (NIMT) bridges at Drury for additional lines (four-tracking) and improves the resilience to flooding for the Papakura to Pukekohe electrification project.

[27] Roads of National Significance.
[28] Roads of Regional Significance.

d. RoRS Waihoehoe Road (Drury) Upgrade: The Waihoehoe Road upgrade includes road widening and a new bridge over the NIMT Line to accommodate walking, cycling, and future bus lanes. The Waihoehoe Road/Great South Road intersection will be changed from a roundabout to an urban signalised intersection with active mode crossings. The adjacent Kath Henry Lane/Waihoehoe Road intersection to a signalised intersection scope is transferred from Kiwirail to this project. These changes will enable the final layout of Drury Central Station (Maketuu Station), create better access from Waihoehoe Road and provide for improved multimodal access to the Drury Central Station from new housing developments.

e. SH22 (Drury) Corridor Upgrade: The SH22 upgrade project will urbanise the SH22 road corridor between SH1 and Jesmond Road. The project will deliver corridor widening over approximately 2km to accommodate walking and cycling facilities on both sides and increase the number of traffic lanes from two to four. The bridge at Ngakoroa Stream will be replaced to allow for extra lanes, projected sea level rise and to tie into the Papakura to Drury Interchange upgrade. The SH22 upgrade will deliver improved multimodal access for new housing along SH22 to the new Drury West rail station and proposed community centres, as well as reduce congestion.

f. SH1 Additional Waitemata Harbour Connect: The development and delivery of a second Waitemata Harbour crossing, one of New Zealand's most significant city-shaping projects, will take place in the coming decades. It will provide for a well-connected, efficient transport system and greater long-term resilience of the wider transport network. The specific timing of construction and the associated budgets are currently unknown, but they are likely to be significant. The Waitematā Harbour Connections project will provide for a fully multi-modal solution for people wanting to walk, cycle, take the bus, travel by light rail, drive, or transport freight across the Waitematā Harbour, connecting people to transport options across the region and beyond.

g. North West Rapid Transit Improvements: This project is investigating options to provide fast, frequent and reliable public transport for people to get around the northwest of Auckland – from Brigham Creek to the city centre, alongside SH16.

h. RoNS Mill Road Stage 1: The Mill Road project involves developing a new 21.5km road corridor, running parallel to State Highway 1 (SH1), providing residents with a safer way to move between the communities of Manukau, Manurewa, Papakura and Drury.

35. Examples of current, and funded (or funding sources confirmed) non-transport projects include:

a. Kainga Ora projects (the budgets are shown in brackets):

i. Mt Roskill Precinct Project Bundles 1- 3, stormwater and utilities ($25m-$50m),

ii. Mangere Precinct Projects and rail station upgrades ($50m-$100m), and

iii. Tamaki Precinct Projects Bundles 1 and 2, and stormwater and water supply projects ($25m-$50m).

b. Ministry of Education:

i. 24 projects ranging from new schools to expanding facilities in response to roll growth.

c. Eke Panuku projects:

i. Including Osterley and Amersham Way Streetscape works.

d. Other projects:

i. O Mahurangi – Penlink,

ii. Several residential/land developments (e.g., Beachlands South, NEIL Fairview Heights).

36. The Central Rail Link is a large project that will transform Auckland's urban form. Using basic facts about this project highlights the critical nature of high-quality sand in supporting infrastructure investment (see below example).

Example project: Central Rail Link

Over the course of the project[29], more than 20,000 truckloads of concrete have been delivered to site, nearly 100,000 cubic metres of concrete has been poured and over a dozen concrete mixes have been used – including some unique mix designs. The sand component associated with this volume of concrete is 42,500 – 45,000 tonnes. The sand used in this project was supplied from the Mangawhai-Pākiri and equates to approximately 10% of the Kaipara resource's annual production capability.

37. In addition to the substantial projects listed above, NZTA, Auckland Transport and various other public bodies and agencies have numerous ongoing and planned projects to improve the region. The fast-track projects will add to the overall construction sector pipeline. While these projects still need to be consented, and progress is not guaranteed, the list of projects shows the scale of the development intentions and ambitions, as well as the spatial spread and diversity of projects.

38. The recent (21 August 2025) approval relating to the Bledisloe North Wharf and Fergusson North Berth Extension[30] under the Fast-track Applications Act (2024) can be seen as the early stage of the lift in infrastructure investment facilitated by the Act. The infrastructure spending will require concrete and consequently sand. The project will see the development of a new 330m long and 27.5m wide wharf at the northern end of the Bledisloe Terminal and extend the Fergusson North Berth by an area of 45m by 34m.

39. Infrastructure spending is often designed to support economic productivity and urban form outcomes. Infrastructure spending is normally subjected to extensive cost-benefit analysis. Such evaluation processes consider all costs and all benefits – direct, indirect, and consequential. It is essential to have enough natural resources, including sand, to support any infrastructure delivery programme.

[29] CRL information on Allied Concrete website

[30] M.E prepared the economic assessment in support of the Fast-track application.

2.2 Sand and high-strength concrete

40. The construction sector draws on a wide range of inputs depending on the type of project. This includes concrete. Many infrastructure projects, especially roading, bridges, three waters[31] as well as some building-types require high strength concrete. The need for high strength concrete is based on the whole-of-life management perspectives, and concrete mixes are engineered to achieve the required compressive strengths needed for the application. Durability and costs are key factors that are considered during project design. High strength concrete can achieve higher earlier strengths (based on mix design) that in turn shorten formwork cycles, thereby reducing the construction timelines.

41. High-strength concrete requires consistent, clean, and well-graded fine aggregate to ensure that the right specifications are achieved. Consistency is important to reduce variability in performance. High strength concrete relies on high-quality aggregates with specific attributes i.e., shape, and cleanliness affect water demand and workability. Factors such as mineralogy and shape are important for high performance concrete applications[32].

42. Estimating the specific share of concrete poured in Auckland that is classified as high strength is difficult because confidentiality limits the willingness of concrete producers to provide this type of information. Nevertheless, interviews[33] suggest that high strength concrete accounts for around half (50% to 60%) of concrete poured in Auckland. This level varies according to infrastructure investment cycles.

43. According to Mr Donoghue,[34] Auckland's marine sands are particularly suitable in this respect and their use has been proven over a long period of time. For high performance concrete applications in the Auckland region, there is a functional need to maintain marine sands as a constituent in making concrete. It is critical to acknowledge the key point relating the functional need of marine sand to Auckland's concrete market, as well as the direct relationship between high strength concrete and infrastructure investment.

44. The high-quality sand of Mangawhai-Pākiri was used across many high-profile projects in Auckland as well as the upper North Island. The spread of projects illustrates the preference for Auckland's marine sand and the fact that it is used in situations where the whole-of-life costs (i.e., due to improved durability and workability considerations) are critical.

45. Appendix 1 lists examples where sand from the Mangawhai-Pākiri embayment was used.

2.3 Concentration risk/supply chain resilience

46. Having access to sufficient, high-quality sand is crucial, but supply chain resilience and location are also key considerations. Currently, a significant share (67%) of Auckland's available[35] sand is in the Kaipara Harbour and is supplied from two consents extracting from the same resource. Supplying sand using sources from multiple locations adds resilience to the supply side of the market. Relying on only one

[31] In infrastructure, three waters refer to the three types of water services that are essential for public health, urban development and environmental management. It includes drinking water, wastewater and stormwater.
[32] Supporting statement by Mr Donoghue: para 24.
[33] Completed by MBL in Q2 2025.
[34] Supporting statement by Mr Donoghue: para 13 and 24.
[35] Available sand reflects the portion of consented volumes that is available to the regional sand market after accounting for matters that influence delivering the sand to the market e.g., infrastructure limits, vessel capacity and technical matters.

resource for a significant portion of supply means that the concrete supply system is at risk due to the limited redundancy available to cope with a failure of an individual component or critical piece of the supply chain.

47. Considering the comparative size of the Kaipara sandbank as source, if delivery from this source is disrupted[36], then the wider construction supply chain will face significant delays and disruptions. These disruptions have direct economic consequences, add costs, and generate adverse economic impacts. The importance of having resources on Auckland's west and east coast is further highlighted when considering Waikato sand as a potential replacement source. Waikato sand sources that are located near Auckland[37] are nearly fully allocated to existing users, so reallocating Waikato sand to Auckland users will create a shortfall elsewhere. But crucially, Waikato sand is less suitable for high strength concrete due to the alkali silica[38] risks it presents. This limitation is in addition to the transport costs that are likely to be prohibitive. Other sources to the north of Auckland, such as Tomarata sources, could be used to contribute to sand supply. However, distance considerations mean that the cost of delivering this resource to concrete plants will reduce its relative cost attractiveness.

48. While manufactured sand opportunities are becoming available, the rate of uptake is expected to remain low due to challenges in addressing workability, lower confidence and knowledge about the product, and importantly the cost differences compared to natural sand. In terms of using manufactured sand for high strength applications, Mr Donoghue[39] indicates that natural sand is needed to produce good quality, high strength concrete. Internationally, natural sand is used in situations where high strength concrete, specialist mixes and where pumpability and self-compaction characteristics are required. In these instances, natural sand is preferred even when manufactured sand options are available.

2.4 Section highlights

49. The Auckland region is New Zealand's largest urban centre and Auckland's economic success has a direct bearing on New Zealand's economic wellbeing. Historically, the region's economy and population have outperformed the rest of New Zealand. Managing growth requires significant investment in infrastructure in response to emerging and legacy pressures. The broad range of infrastructure projects signals clear intent and commitment to addressing infrastructure issues.

50. Concrete, a key input into the infrastructure investment process, is used across many different projects like roading, bridges, tunnels, and buildings. High strength concrete is essential for durability and cost-effectiveness and is an important subset of concrete. In Auckland, high strength concrete accounts for around circa 60%[40] of concrete poured but this share varies according to the infrastructure investment cycles. Auckland's marine sands are particularly suitable for high-performance concrete applications[41],

[36] This could include mechanical issues, logistic issues, weather events or related disruptions.
[37] Specifically, the resource located at Tuakau and Pukekawa.
[38] Some aggregates containing reactive silica will react with the alkalis in cement - sodium and potassium oxides - to form an alkali-silica gel which takes up water and swells. This causes abnormal expansion and map-cracking of the concrete (source: https://concretenz.org.nz)
[39] Supporting statement by Mr Donoghue: para 24 and 72
[40] Information provided by MBL.
[41] Supporting statement by Mr Donoghue: para 13 and 24.

and their use is crucial for the Auckland concrete market. Marine sand is an essential input into the infrastructure investment landscape.

51. It is also worth highlighting that building on the Fast Track Approvals Act (2024), the current government is working to further accelerate infrastructure delivery and streamline consenting processes. This means that the streamlined consenting and implementation process will see infrastructure investments brought forward (i.e., the pipeline is accelerated) and more projects can be expected at the same time.

3 Sand market and outlook

52. Economic growth is associated with urban development and expansion, meaning that the ability to cater for increases in population and economic activity relies on an ability to respond to growth. Infrastructure investment, through construction, is one important way through which the response occurs. In turn, construction requires access to key inputs, including sand, to support market functioning and to ensure that the sector can operate efficiently and in a cost-effective way.

53. This section starts with an overview of key ratios and the demand outlook for Auckland. Next, the supply situation is summarised. The demand and supply situations are then reconciled to present the overall sufficiency position. The section includes brief commentary about sand markets in the Waikato and Northland as well as manufactured sand and other opportunities.

3.1 Demand patterns

54. Official information about the volume of sand used or extracted in New Zealand (or regionally) is not available. There is a statistically significant relationship between ready-mix concrete poured and sand used in the concrete. In addition, there are statistical relationships between economic activity, population growth and ready-mix concrete poured. Sand also has other uses in landscaping, industrial applications, turf and golf, equestrian activities, and beach replenishment. The demand for sand is the combined effect of construction demand as well as demand arising from these other uses.

55. The relationship between sand and concrete is rangebound and can be used to express sand demand (associated with ready-mix concrete) on a per capita basis. The revealed per capita demand for concrete sand can be estimated by combining historic ready-mix concrete data and population information. Importantly, the Covid period and the high economic activity immediately after the Covid disruptions mean that caution is needed when analysing historic patterns. This caution is warranted because economic data during the Covid disruptions and subsequent economic recovery fall outside normal business cycle movements.

56. In Auckland, the per capita demand for concrete[42] has fluctuated over the past two decades with total use in line with business cycles. The Global Financial Crisis (GFC)-period[43] saw a period of low investment in infrastructure and assets and consequently, demand for concrete slowed down. During this period, Auckland's per capita demand for concrete sand dropped to a ratio of 0.26 tonnes per capita (2009, when construction investment was very low). Post GFC, demand for concrete remained relatively flat until 2013 when a clear upswing emerged. The significant disruptions during Covid are evident in ready-mix concrete data. The effects of disruptions associated with shocks such as the GFC and the Covid-lockdowns are clear. Currently, low levels of business activity are suppressing demand, but the long-term construction pipeline[44] remains positive looking forward even if investment confidence remains below benchmark levels. The Reserve Bank has embarked on a loosening pathway, with the Official Cash

[42] Calculated using Stats NZ data for ready-mix concrete poured and population estimates (going back to 2000).
[43] Circa 2007-2009.
[44] MBIE construction pipeline report.

Rate being reduced from 5.5% in mid-June 2024 to 2.5% in October 2025. A lower interest environment will underpin a recovery and upswing in confidence. In turn, economic growth generally follows.

57. Global developments, such as the announcement and changes in international tariffs as well as geopolitical developments in the Middle East are driving volatility and uncertainty. According to ANZ's economic confidence survey[45], indicators are up from recent lows. While employment intentions continue to lag other metrics, the business outlook survey suggests that the New Zealand economy is recovering, but trading conditions remain difficult. ANZ's economic forecasts[46] suggest that the bottom part of the business cycle has passed even if households do not feel positive about the outlook.

58. Using the relationship between sand and ready-mix concrete, as well as population data provides an ability to estimate annual demand for sand on a per capita basis for Auckland.[47] The following ratios are observed:

- Average over different 5 year periods:
    - 2015-2019 0.38 tonnes per capita
    - 2018-2023 0.32 tonnes per capita
    - 2019-2024 0.30 tonnes per capita
- Average over different 10 year periods:
    - 2010-2019 0.33 tonnes per capita
    - 2014-2023 0.34 tonnes per capita
    - 2015-2024 0.34 tonnes per capita
- Average over different 20 year periods:
    - 2000-2019 0.32 tonnes per capita
    - 2004-2023 0.34 tonnes per capita
    - 2005-2024 0.33 tonnes per capita.
- Median over 20 years, excluding the Covid disruptions.
    - 0.34 tonnes per capita.

59. The future demand for construction inputs, including ready-mix concrete is therefore expected to return to a growth situation. Ready-mix concrete is a key part of the construction sector, and sand is an essential input into ready-mix concrete. Anecdotal evidence suggests that Stats NZ's ready-mix concrete volumes are under-estimated[48] by between 10% – 20% because some firms are under reporting totals because they do not want to reveal their market share. However, without firm data to enable adjustments, the StatsNZ ready-mix concrete information is used as reported. High strength concrete accounts for more than half (circa 60%) of the concrete market and the share increases during periods

[45] ANZ. New Zealand Business Outlook. 29 May 2025.
[46] ANZ Quarterly Economic Outlook. May 2025.
[47] The ratios are estimated using official information about ready-mix concrete poured. Stats NZ data. Secondary Production. Table reference SEP067AA.
[48] The information collected by StatsNZ is supplied on a voluntary basis and several concrete companies are known to underreport volumes because they don't want other companies to be able to estimate their market share.

with high infrastructure investment and can be higher. This suggests that the annual demand for high quality sand to enable high strength concrete production is between 0.17 tonnes per capita and 0.22 tonnes per capita.

60. In addition to ready-mix concrete, sand is also used in other industries, such as landscaping, sports turf and golf course replenishments and industrial applications. MBL information indicates that these other uses account for 25% to 30% of total demand. This ratio is in line with MBL's knowledge of supply patterns (of concrete uses vs non-concrete uses). Expressing this portion on a per capita basis suggests that the observed per capita use for these other applications is in the order of 0.16 tonnes per capita.

61. The overall demand per capita from all applications used in the assessment is expressed as a range. The range includes ready-mix concrete and other applications and is:

    a. Mid (average) of range 0.50 tonnes per capita,

    b. Upper end of the range 0.54 tonnes per capita.

62. These demand ratios provide a robust way to estimate current demand and the outlook for sand demand. Auckland Council has adopted a March 2023 set of population projections to inform its planning processes, specifically the intensification plan change workstream and the Future Development Strategy work. The medium projection series is the preferred option underpinning that work. Combining Auckland Council's projections and the per capita ratios returns a range of estimates that reflect the baseline demand situation:

    a. Ready-mix concrete sand:

        i. All strength concrete – estimated at between 596,075 tonnes and 663,325 tonnes.

        ii. High strength concrete[49] – estimated at between 357,650 tonnes and 398,000 tonnes.

    b. Other applications:

        i. Estimated at between 276,700 tonnes and 280,700 tonnes.

63. These estimates suggest that the annual (baseline) demand for sand in the Auckland market is in the order of 872,775 to 944,025 tonnes per year. These estimates show the potential demand levels based on population and historic use patterns. The currently suppressed economy means that construction activity is below historic average levels. Comparing historic sand demand against actual (estimated based on poured ready-mix concrete) suggests that current demand levels are more than 10% down on baseline levels. As the economy returns to growth, investment activity will return, and demand levels will increase off the currently low base.

64. Estimates of the current demand are broadly in line with patterns experienced in the 2015/16 and 2016/17 periods when the economy was growing, but less than the very strong growth period seen immediately before Covid (2018/19), as well as the post-Covid period. The current economic conditions mean that investment and construction activities are below historic levels.

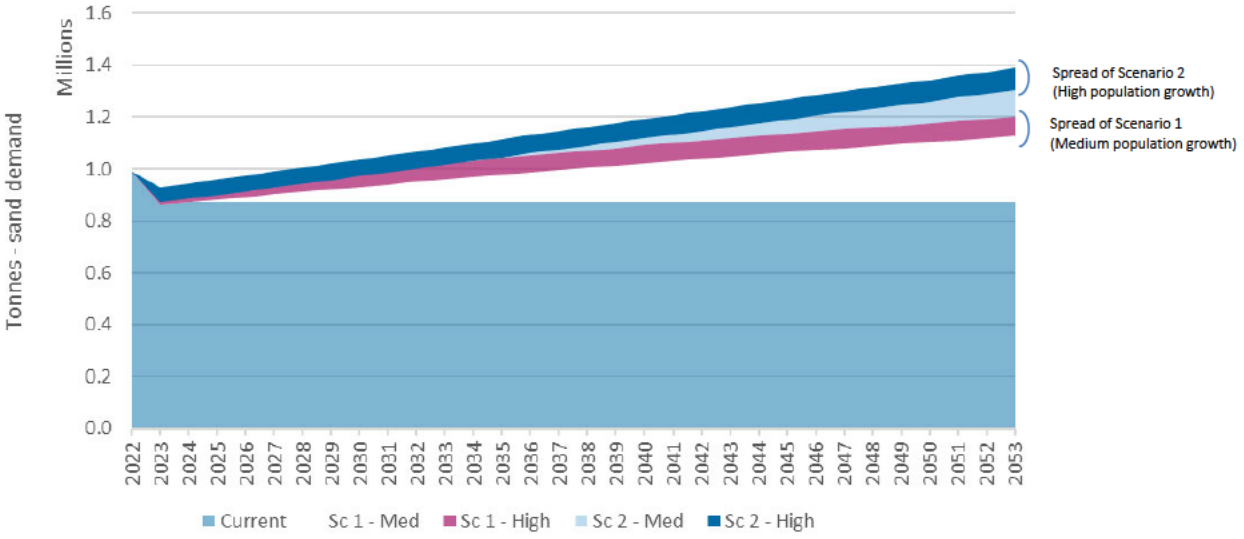
[49] Based on a 60% share.

65. The growth outlook is presented using two scenarios and the results are shown in Figure 3-1. The scenarios reflect[50]:

- The medium population projections,
- The high population growth settings.

66. The scenarios are combined with the average and upper-end ratios (for tonnes per capita) to illustrate the potential spread. The scenarios are also used to deal with uncertainty. The anticipated increase in demand for sand is illustrated in Figure 3-1.

Figure 3-1: Demand for sand (total) – outlook



67. The demand outlook for sand in the Auckland market is positive and is projected to grow under all scenarios. The shift in demand is considerable, and by 2054, the annual increase in demand is estimated as follows:

    a. Under scenario 1, the additional annual sand demand, is estimated at between 260,575 tonnes and 335,625 tonnes.

    b. Using the high population growth suggests that Auckland will require an additional 373,000 tonnes to 460,200 tonnes of extra sand (per year).

68. In terms of the demand for concrete-related sand, the future demand (in year 2054) is estimated at:

    a. Scenario 1: Medium population growth

        i. Concrete sand (all) 774,050 tonnes to 849,100 tonnes,

        ii. High strength concrete 464,425 tonnes to 509,450 tonnes.

    b. Scenario 2: High population growth

[50] Based on Stats NZ population projections.

i. Concrete sand (all) 899,500 tonnes to 986,700 tonnes,

ii. High-strength concrete 539,700 tonnes to 592,025 tonnes.

69. These changes are substantial, representing a percentage change from current levels of between +30% to 38% under the medium growth scenario, and between +40% to +49% under the high growth scenario. The change reflects the anticipated change in population[51] and sand use patterns. The demand outlook for sand is positive and access to quality sand, from well-located sources will be key to ensure that the market can respond to demand growth.

3.2 Supply patterns – natural sand

70. Sand is one of the world's most consumed raw materials. Globally, 47bn to 59bn tonnes of crushed rock[52], sand and gravel are extracted per year for use in construction. Globally, sand use has tripled over the last two decades in response to urbanisation and growth. Most sand used in concrete manufacturing needs to be sourced from the sea, rivers, or from relict river or dune deposits. This is because the grains do not have all their edges eroded away, meaning that the sand binds better with aggregates and cement to make stronger concrete. Sand that is wind eroded – such as that found in deserts – has a much rounder profile, meaning it is not suitable for making concrete.

71. Sand sources that can be used in the upper North Island are limited. River sand from Taupo to Waikato has high levels of alkali reactive minerals[53] that makes sand from these sources less desirable for concrete manufacture and civil construction. The attributes (shapes) and alkali reactive minerals necessitate the use of additional cement and admixtures when making concrete for high-strength applications which has a substantial impact on cost[54]. Within the Auckland market there are three source typologies for sand:

    a. Land-based sources,

    b. River based sources, and

    c. Marine sourced sand

72. There are existing sand extraction sites within Northland, Auckland, Bay of Plenty and the Waikato that supply the sub-markets[55] in the upper North Island. Most of the consented volumes – as well as extraction sites – are located within the Auckland Region, near the destinations. However, current sand supply is highly concentrated with most sand now sourced from the Taporapora sandbank in the Kaipara Harbour – since off-shore sand extraction at Mangawhai-Pākiri has been suspended with the consents surrendered. The surrender means that there has been a major reduction in the volume of proven local sand that be provided to the Auckland sand market.

73. Prior to any surrender and the Environment Court declining consents, the Mangawhai-Pākiri inshore and offshore consents accounted for circa 38% of Auckland's sand sales (346,600 tonnes). MBL is no longer

[51] Auckland's population is projected to increase by between 500,000 and 820,000 people by 2053 – up from current estimates of over 1.7m people.
[52] United Nations Global Environmental Alert Services. Sand, rarer than one thinks (March 2024).
[53] This is due to the eruptions from the silica rich andesitic volcanoes of the central North Island.
[54] Supporting statement by Mr Donoghue: Para 26 and 50.
[55] The sub-markets relate to the Auckland market, the Northland market, the Waikato market and the Bay of Plenty market.

extracting sand from Mangawhai-Pākiri. Excluding the Mangawhai-Pākiri sand as a potential source represents a significant decline in the availability of sand – particularly high-quality marine sand for concrete manufacturing and high strength concrete applications. Limited supply has been stockpiled with circa 6 months of Pākiri sand available.

74. Industry feedback suggests that during December 2023 and several times during 2024 (during these periods, the economy was expanding), the local sand market experienced critical sand shortages, whereby demand exceeded supply of sand for concrete production, and some concrete plants had to limit production.

75. Total consented volume of sand provides an indication of the *theoretical* market supply, but actual sand availability is a function of:

- Sand quality,
- Logistical considerations,
- Existing allocations,
- Location relative to the end-users (i.e., transport distances).

Table 3-1 offers a basic summary of Auckland's current and consented sand sources, and additional information is provided in Appendix 1.

Table 3-1: Auckland Sand Sources (natural sand)

Source	Operator	Consented Volume (tonnes per annum)	Available Volume (tonnes per annum)	Expiry
Kaipara Harbour	Winstone Aggregate	475,200	**387,500**	2027
	Atlas	604,800	**362,500**	2027
Tomarata*	Semenoff Group	96,721	**75,000***	
Pukekawa**	Winstone Aggregate	192,000	**116,400****	2046
Tuakau**	Fulton Hogan	194,400	**174,600****	2038

* Sand Glass Corporation also has consented volume of 150,000 tonnes from the Tomarata resource. However, substantial investment in equipment is needed before this resource can be accessed. It is also located a considerable distance from Auckland.

** The estimated available sand is the total available sand, and does not differentiate between sand for concrete purposes of another use (e.g., turf). The estimate considers the processing (washing) of sand during which a portion of the input material is removed and used for other uses. In addition, the estimated value reflects the reality that some of the sand from the resource is used outside Auckland. Importantly, this sand is not exclusively used in the concrete market.

Source: Information supplied by McCallum Bros Limited.

76. Auckland's natural sand resources reveal the following key dimensions:

- The relative importance of marine sand to Auckland's market is evident, as shown by the contribution of the Kaipara resource:

- 65% of consented volume (natural sand, 1.08m tonnes) is associated with the Kaipara resource[56],
- 67% of available natural sand (0.75m tonnes) is associated with the Kaipara sand,

- Total consented volume is estimated at 1.65 million[57] tonnes, but the estimated available volume is significantly lower, estimated at 1.1 million tonnes for all sand requirements. These figures include the Pukekawa and Tuakau resources but some of this sand is used to supply other, non-Auckland users in the concrete and non-concrete markets. Only a portion of sand from these resources is used in concrete production due to alkali silica reactive issues. Therefore, the volume of sand that is available to the Auckland market is lower.
- The available volume reflects adjustments for matters such as sand processing (to meet product specifications), infrastructure and logistic constraints and market realities. This adjustment process removes around a third (30%) of the consented volumes.
- The total consented and available volumes as reported in the preceding points exclude the volumes associated with the Mangawhai-Pākiri temporary consent that are no longer being access by MBL.

77. Auckland's sand market is heavily reliant on the Kaipara Harbour resource. There is significant concentration risk associated with such reliance. Other sources must be developed to reduce concentration risks and to improve supply chain resilience. The Kaipara Harbour consents are due to expire in 2027. While the Kaipara sand resource is identified as one of the most important (largest) sources for Auckland, renewing the consent is not guaranteed. There is uncertainty around the likely outcome of the consent renewals and the associated timelines. Considering the size of the Kaipara resource, the potential loss of access to this resource would generate significant supply chain uncertainty. The consented maximums and available sand are crucial, forming a constraint on the supply chain. Figure 3-2 illustrates the spread between the maximum volume and available sand and highlights the uncertainty in the Auckland regional sand market over the short term in the face of the Kaipara consent expiring. The figure highlights the size of the 'at risk' sand supply associated with the Kaipara consents – both the theoretical and available volumes are illustrated.

78. The figure shows:

    a. There is a significant difference between the consented volumes and available volumes. This reflects the well-known operational and technical constraints and limits associated with scaling operations associated with the Kaipara resource, such as operating barges on the Helensville River, tidal limitations, vessel size and vessel draught constraints.

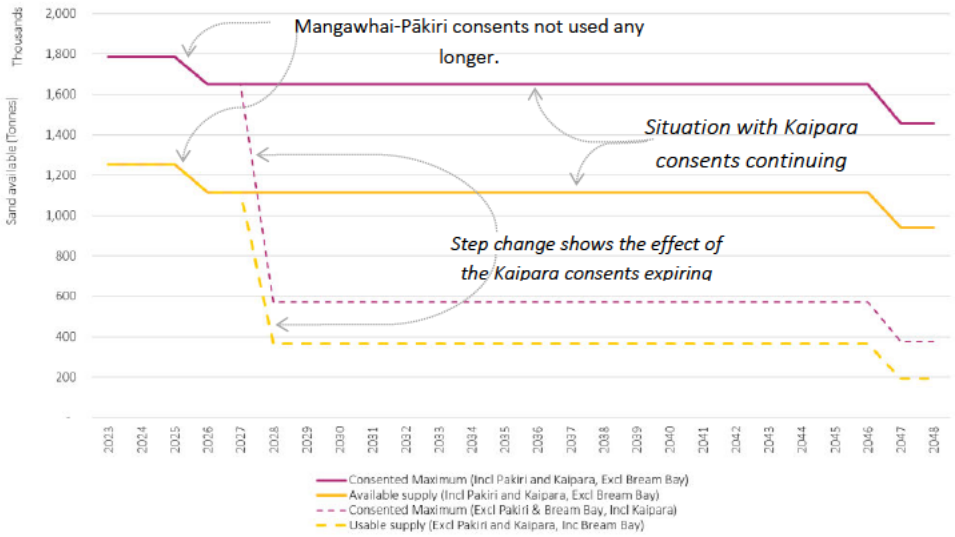
    b. The downward step change in available sand supply that is associated with the loss of the Mangawhai-Pākiri resource.

79. As mentioned above, the current baseline annual demand for sand in the Auckland market is in the order of 872,775 tonnes to 944,025 tonnes. The current supply position, in the slow economy, shows that there is capacity in the sand market – with the available sand volumes above baseline demand levels – this is because the current economic slowdown is also felt in the construction sector, with below average activity. Pressures on sand supply can be expected as the economy returns to 'normal growth' and as

[56] The percentage calculation includes the consented volumes of Sand Glass Corporation.
[57] Including the Sand Glass Corporation volumes.

construction increases from low levels. Crucially, the expiry of the Kaipara consents will add a high degree of uncertainty to the sand supply market.

Figure 3-2: Maximum and available sand (Auckland sources) – outlook

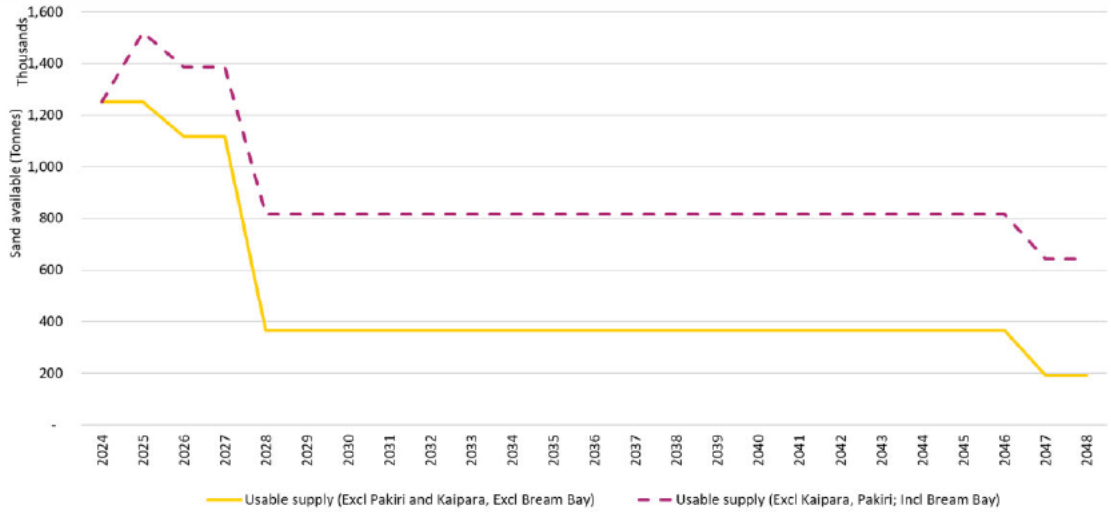


Note: The figure includes the Tuakau and Pukekawa resource even though it is fully subscribed and allocated to other users.

80. Figure 3-3 illustrates the potential contribution of the Te Ākau Bream Bay resource in providing secure access to high-quality sand to the regional sand market. The figure shows the available sand volume with Te Ākau Bream Bay included (dotted line) and without Te Ākau Bream Bay (solid line). M.E understands that the annual volume of sand that could be used (i.e., available sand) is estimated at 150,000 m^3/year for the first three years, before scaling up to 250,000 m^3/year for the balance of the period. These volumes translate into the following weights (tonnes):

- 270,000 tonnes for years 1 through 3,
- 450,000 tonnes for the balance of the consent period.

Figure 3-3: Contribution of Te Ākau Bream Bay (natural sand)



81. Enabling Te Ākau Bream Bay sand extraction will add a sizable resource to the Auckland natural sand market. The amount will be immediately available to the market with no need to invest in capital equipment to extract or process (wash) the sand before making it available to the market. Adding the sand to the market will alleviate expected supply pressures, increase competition and deliver a range of economic benefits. The addition will provide immediate relief to the constrained sand market and ensure that sand shortages do not inhibit investment and growth activities.

3.3 Potential Alternatives

82. As part of this assessment, a report prepared by BECA for Bream Bay Guardians into alternative sand sources was reviewed and considered. The BECA review is an update of an earlier report[58] that was prepared as part of the Pākiri Environment Court proceedings.

83. The report lists a range of sources located in Northland, the Waikato as well as in Auckland. The report ranks the identified alternatives based on the characteristics and properties of the sand, the consents that are available, the volumes that are available as well as transportation options. It is however unclear how the transportation options were considered. It appears that the potential availability of different transport modes was considered, but that the cost of transportation was not included in this ranking process (that is the distance or transportation costs or the practicalities).

84. Several sources in the Waikato and Bay of Plenty are listed as 'probable', including:

    a. Waikato

        i. Revital Sand

        ii. Monavale Sand

        iii. Tirau Sands - Bower Brothers

    b. Bay of Plenty

        i. Bell Rd - Fulton Hogan

        ii. Paengaroa Sand

85. These sources are all located more than 150km from Auckland and transportation costs are likely to render these uneconomical. According to the Commerce Commission[59], the effective transport/distance limit for sand (maximum distance) is 50km. The above examples are three times that distance and unlikely to be viable source to service the Auckland market. Other listed probable sources are also further than the 50km threshold. The transport distance influences the viability (price) of using a source to service a market because transportation costs as portion of total costs increase significantly with distance.

[58] The original report was prepared for Friends of Pākiri Beach Inc).

[59] Fletcher Building Limited and Waikato Aggregates Limited Clearance Determination [15 February 2019] NZCC 2, Commerce Commission Project No 11.04/PRJ0043576.

86. In addition, these resources are already used by Waikato and Bay of Plenty and diverting the resource away from local markets is likely to cause adverse economic effects in those markets.

87. An important point is that the BECA report identified the Kaipara sand resource as the most probable alternative resource. While the report notes that the Kaipara consents will expire in 2027, it does not discuss the implication of such expiry i.e., that more than half of the identified consented volume (where the volume is known, and classified as 'probable'), will need to be renewed. Further, in the absence of the Kaipara consents, all the other identified consents (classified as probable, and with known volumes) would be needed to fill the supply gap left by the Kaipara consents expiring. This is despite these resources already being used and committed. The potential implications for the supply situation are illustrated by the BECA report:

    a. There is uncertainty around the short term supply situation with consents for a large portion of the available sand expiring in the near term.

    b. There is limited availability within Auckland to respond to sand supply pressures.

    c. Sourcing sand from the potential alternatives will necessitate a substantial increase in the transport distance. Using the information in the BECA report, and using the 'probable' sources shows that in the absence of the Kaipara resource, the weighted average distance will increase by at least +45% (vs the with Kaipara resource situation).

88. These implications, identified from the BECA report, underscores the importance of enabling additional resources near Auckland to minimise the transport distance. The BECA report highlights the potential role of manufactured sand by drawing on public information about Brookby Quarries. Manufactured sand is dealt with in the next section.

3.4 Manufactured sand

89. Manufactured sand is emerging as an additional resource that can be used together with natural sand in concrete production. Manufactured sand is still a relatively new product offering in Auckland and New Zealand. Some proponents of manufactured sand are active in selling the capital equipment used to produce manufactured sand[60]. Other proponents are aggregate quarry operators who are either undertaking trials or have in one case started manufacturing some sand.

90. Manufactured sand is produced by either using virgin rock from quarries or by using crusher dust. This crusher dust is currently washed and supplied to concrete plants as part of their fine aggregate blend and typically called PAP7 (Premium all Passing a 7mm screen). This crusher dust, a byproduct of rock crushing can also be used as an input into manufactured sand. Importantly, the crusher dust needs further processing to further crush and then remove a lot of the fines before it can be used as an input and be called a manufactured sand.

[60] In both domestic/New Zealand and international markets.

91. Available information is showing that manufactured sand is being used by one concrete manufacturer as a partial replacement for natural sand and a whole or partial replacement for the PAP7 portion of the concrete mix.[61]

92. PAP7 is used as part of the fine portion of a concrete mix[62], so crushing it further to make a manufactured sand means a portion of the manufactured sand is replacing the PAP7 that has traditionally been used. This portion should not be confused with the fines portion that is associated with natural sand. Where manufactured sand is used as a replacement for PAP7, natural sand is still required in specialist and high strength concrete.[63]

93. As part of the assessment, interviews were conducted[64] to attempt to verify and triangulate available information. Confidentiality constraints and other considerations limited the response rate. Nevertheless, the following key points were noted during the discussions:

    a. There is a strong preference for natural sand relative to manufactured sand by concrete producers and their clients due to workability considerations.

    b. Cost is a significant challenge, and beyond technical considerations, cost is limiting the uptake of manufactured sand. The cost covers all aspects, including the cost of the product and transport costs, as well as other elements (such as cement requirements).

    c. Natural sand, even if it must be sourced across much greater distances and at a comparative price premium over manufactured sand, is preferred over manufactured sand.

94. These observations are consistent with the points made by Mr Donoghue, where he states:

    a. The pumpability and workability of concrete using manufactured sand is lower than that of concrete made using natural sand. These are important factors when considering that high strength concrete is normally pumped[65].

    b. The challenges faced when using manufactured sand[66].

95. Early indications from the market suggested that more work was needed to understand how to incorporate manufactured sand into normal, everyday concrete applications. Due to the limited volumes of sand available to the market over the last couple of years, most concrete manufacturers have trialled to a greater or lesser degree various forms of manufactured sand. This has been either as a complete replacement for the PAP7 fines and natural sand or as partial replacements of one or both fine components. The relative shares[67] of these components in a cubic metre of 30MPa concrete are approximately:

    a. Coarse aggregate 40%

    b. Finer aggregate (PAP7) 21%

    c. Natural sand 17%

[61] Supporting statement by Mr Donoghue: para 43.
[62] Supporting statement by Mr Donoghue. Figure 1: Proportions of a Typical 30MPa Concrete Mix
[63] Supporting statement by Mr Donoghue: para 43
[64] The interviews were conducted by Mr McIlrath in the first half of 2025 and involved concrete producers.
[65] Supporting statement by Mr Donoghue: para 58, para 72.
[66] Supporting statement by Mr Donoghue: para 74.
[67] Supporting statement by Mr Donoghue: Figure 1: Proportions of a Typical 30MPa Concrete Mix.

d. Cement 14%

e. Water and admixture 8%.

96. What has been demonstrated consistently, however, is that for highly specialised and technical concrete mixes that require self-compacting or pumpable characteristics, a natural sand is still required. The analysis by Mr Donoghue shows that natural sand is required to deliver concrete that complies with the required design criteria. The right blend is essential to ensure that pumpability and workability are maintained/achieved and that compressive and flexural strengths are achieved.

97. Mr Donoghue states that natural sand remains a requirement, and his evidence is clear (para 76):

*"…manufactured sand is **not a complete replacement** for natural sands. Instead, the manufactured sand largely becomes a replacement for the PAP7 portion of the fine aggregate while the percentage of the **natural sand required reduces or remains largely the same depending** on the concrete design criteria".* (Emphasis added)

98. Further, Auckland is already in an aggregate deficit – Auckland imports aggregate from the Waikato and Northland every year. Auckland's aggregate supply is concentrated in a small number of large quarries. Production across these quarries is estimated to be in the order of 11.3m tonnes per year. Using locally sourced aggregate as feed for manufactured sand must be seen in the context of Auckland's local aggregate supply. Auckland imports aggregate from Northland and the Waikato because local supply is insufficient to supply the regional market. If Auckland's aggregate is used to produce manufactured sand, then it could lead to a lift in aggregate imports from other regions because there is limited opportunity to expand Auckland quarries to accommodate additional growth or to divert resources away from aggregate to sand production. Greater importation of aggregate from the Waikato or Northland generates more adverse economic effects (dis-benefits), such as transport costs, emissions and social costs (accidents). Supplying manufactured sand from these regions will also generate adverse effects.

3.5 Sufficiency position

99. The supply position and demand outlook are combined to identify the supply-sufficiency position over the period to 2048. If demand exceeds supply, then a deficit is expected. Figure 3-4 shows the position of the Auckland market based on the Kaipara sand expiry (acknowledging that RMA section 124 run on rights would change the date). The sufficiency assessment is based on the sand volumes available to the market, not theoretical maximums.

100. The potential contribution of manufactured sand is also reflected in the sufficiency assessment (separately, Figure 3-5). This speculative scenario is included to assess the sufficiency position for natural sand with manufactured sand considered as a potential option.

101. Based on historic sand demand levels and patterns, Auckland is expected to see pressures around supply and its ability to secure sand. The current economic slowdown and below trend construction and investment are masking the potential magnitude of Auckland sand supply issues. As the economy recovers, price inflation normalises (returns to the Reserve Bank's target range) and interest rates are lowered, an upswing in construction and investment will occur. However, as demand for sand picks up, pressures due to imbalances between sand demand and supply (i.e., a constrained situation) are expected to emerge. There is limited capacity in the sand market to address growth pressures. Similarly,

the available information suggests that there is inadequate flexibility to respond to short-term issues. Looking at the long term, without a new sand supply, a significant shift to alternatives, or a lift in production volumes, the deficit position will increase.

Figure 3-4: Sufficiency Position (natural sand)

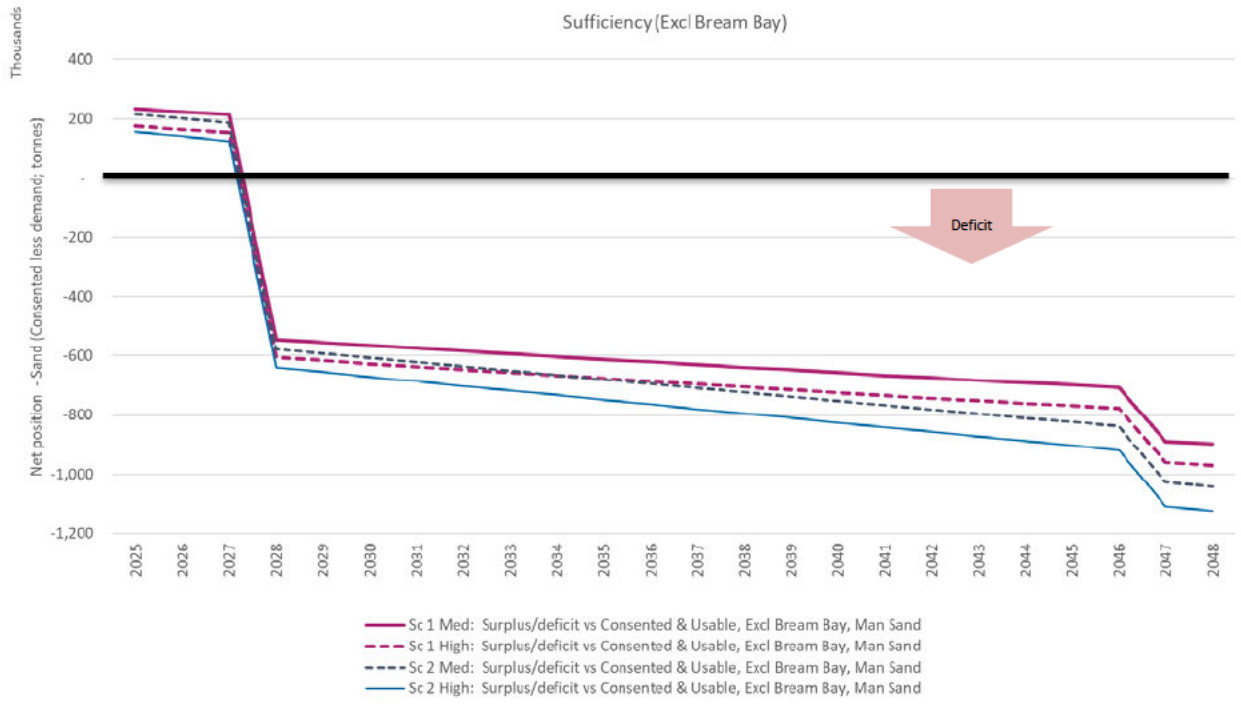
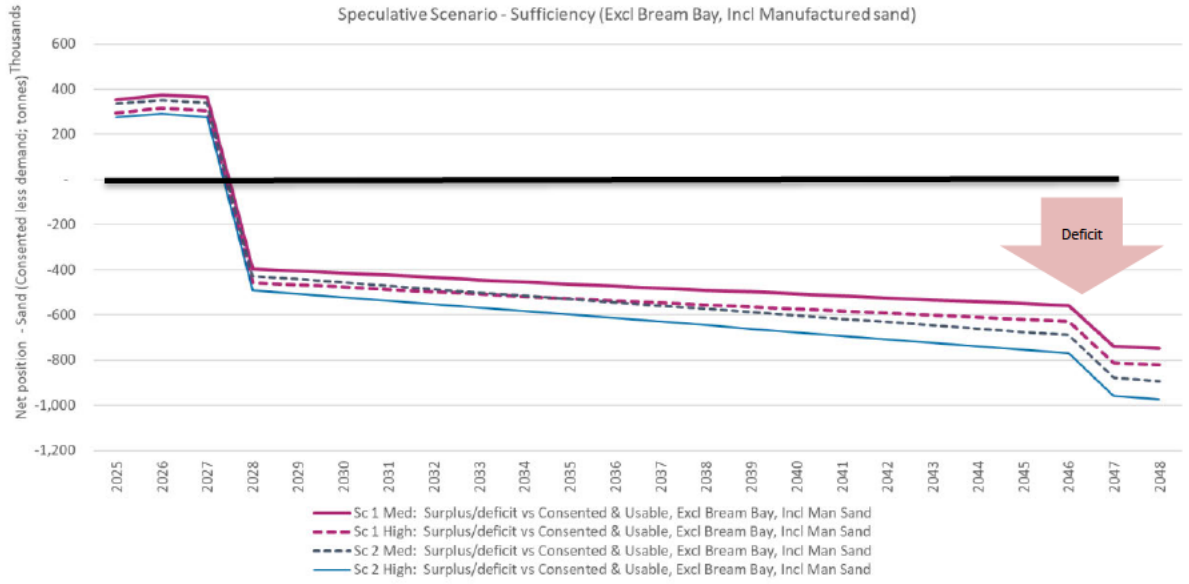


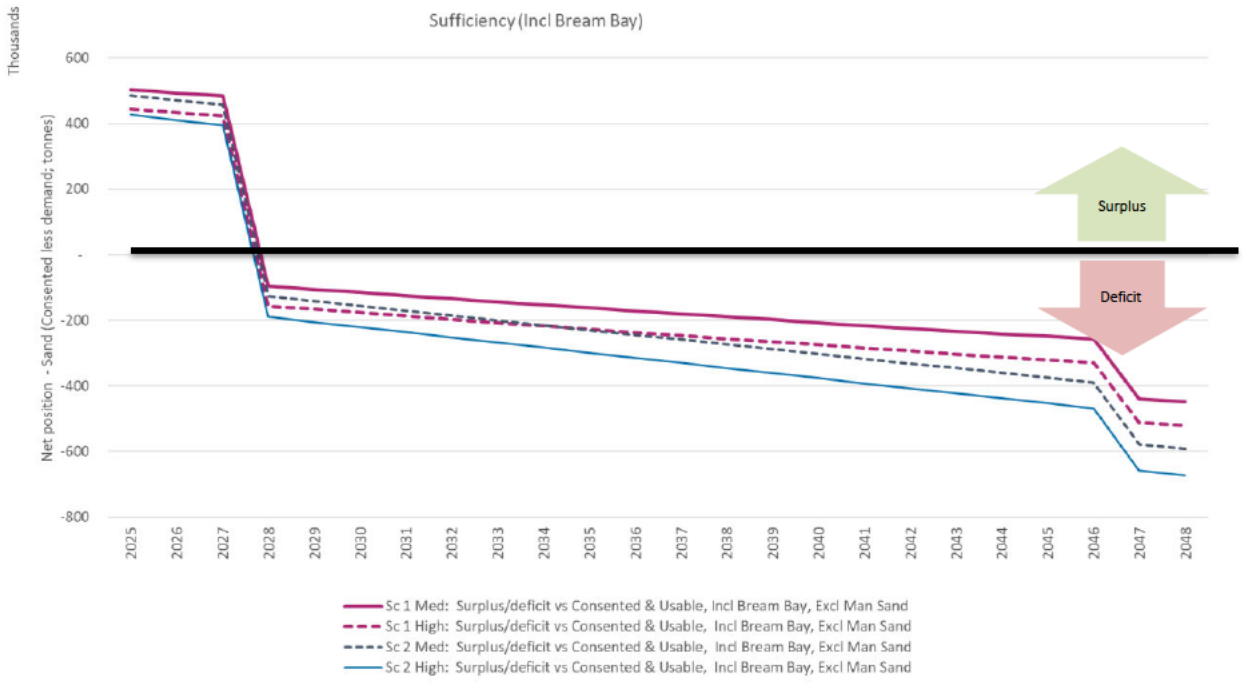
Figure 3-5: Sufficiency Position (speculative scenario with manufactured sand)



102. With reference to the speculative scenario (Figure 3-5), this scenario is based on 150,000 tonnes of manufactured sand being used by the sand market. It reflects the anticipated scale of use (demand[68]) of manufactured sand over the next five years. The availability of manufactured sand is expected to provide some additional capacity to the sand market. However, the regional sand market is projected to experience pressures over the short term as the economy recovers (with demand increasing) and sand from the Mangawhai-Pākiri consent no longer available due to being surrendered. A deficit position is expected from around 2027/8 as the Kaipara consents expire (and ongoing operation ceases post section 124, again the uncertainty associated with the likelihood or timing of the consents being renewed is acknowledged). Importantly, even assuming an increased supply of manufactured sand, a deficit position is expected in line with the Kaipara consents expiring and then the deficit will continue to widen as demand grows (based on current consents).

103. Enabling Te Ākau Bream Bay extraction will ensure that there is sufficient capacity in the sand supply market to provide supply chain resilience while supporting efficient market operation and avoiding concentration risks. Figure 3-6 illustrates the sufficiency situation with Te Ākau Bream Bay included as a source.

Figure 3-6: Sufficiency of natural sand with Te Ākau Bream Bay enabled



104. Enabling Te Ākau Bream Bay extraction will add to the Auckland market's sand supply options, with an immediate lift in total supply to above baseline demand levels. This immediate response is because no additional investment in supporting infrastructure is required. In addition, enabling Te Ākau Bream Bay will assist in reducing the uncertainty in the market associated with the Kaipara consents. Despite the additional resource that Te Ākau Bream Bay adds, a deficit is anticipated in the short term. The positive

[68] Supporting statement by Mr Donoghue in para 72.

contribution that enabling Te Ākau Bream Bay extraction will make is clear because it will help to avoid a deficit position over the short term.

105. Supporting Auckland's ability to grow and deliver infrastructure means that a situation with adequate sand from multiple sources must be maintained. A sand deficit situation must be avoided because constraining growth would have significant adverse economic effects.

106. Enabling access to the Te Ākau Bream Bay sand is a suitable option to avoid the adverse economic effects associated with insufficient supply. Examples of the wider market response associated with constrained supply situations include:

    a. Price increases: A common effect of a supply-constrained market is price increases. Sellers can increase prices in response to demand because normal competitive pressures are overridden by demand pressures. These price increases then flow into related goods and services, generating price pressures elsewhere in the overall value chain. In the sand market context, any price increase will be embedded in the construction costs, including all infrastructure-related spending. Consequently, the price increases mean that available budgets are even more constrained.

    b. Rationing: One way in which sellers could manage supply constraints is through rationing sand across clients. This could mean that higher-value or priority clients receive preferential treatment. In such situations, some clients might miss out and be forced to change their behaviour, accept higher prices, or use inferior products.

    c. Shifting demand patterns: If shortages persist, then alternatives are explored, and demand patterns shift. For sand, the shift could include accessing suppliers that are located outside of Auckland in the Waikato or Northland[69]. However, specialist applications have strict requirements and a simple switch between suppliers is not always possible and pricing can prohibit change (transporting sand is expensive, with direct implications for the delivered price).

    d. Opportunity for new suppliers: High demand relative to supply can signal market opportunities. Expanding existing operations, investing in additional equipment to lift output, or establishing new operations are all potential responses. These responses are, however, difficult to implement and take time to implement. The regulatory processes around sand quarrying or extraction present high barriers to entry, and the time to respond to such opportunities can be slow. Nevertheless, this can lead to increased competition in the long run, which may help to alleviate the shortage. MBL's efforts to establish the Te Ākau Bream Bay resource are evidence of this market effect.

3.6 Section highlights

107. Sand is an essential input into a wide range of applications that are critically important to everyday life. The current economic slowdown and the low investment and construction activity are masking supply

[69] With the constraints associated with the declining volumes due to the Mangawhai-Pākiri consents falling away, sand is imported to Auckland from as far as Ruakākā using trucks.

pressures and the limits around the availability of natural sand. Notwithstanding the current economic slowdown, population growth and legacy issues form a baseline position for infrastructure investments, and therefore concrete and sand.

108. The sand market relies heavily on a small number of extraction or mining consents, with the Kaipara consents playing a key role. However, despite access to a large volume of sand in the Kaipara Harbour, technical and operational considerations act as a natural limit on the volume of sand that can be extracted and made available to the market.

109. Historically, Auckland had two main sources of marine sand – the Kaipara Harbour and Mangawhai-Pākiri embayment. However, the Mangawhai-Pākiri resource is no longer available to the market, leaving only the Kaipara resource. Sixty seven (67%) of Auckland's available sand supply's consent expire in less than 18 months[70] - the Kaipara consents expire in 2027 and renewal is not guaranteed. Natural sand is an essential input into high strength concrete and multiple sources, in different locations, are needed to ensure that the supply chain is resilient. Auckland's marine sand is a direct input into the Auckland concrete market, especially the important infrastructure investment pipeline through the reliance on high strength concrete.

110. A deficit in sand will undermine the construction supply chain, introducing uncertainty, raising costs, and increasing risk. A sufficient supply of high-quality sand is necessary to facilitate investment, as it instils confidence and predictability in the investment programmes. Without predictability, infrastructure investment programmes are more difficult to deliver, i.e., the opposite of facilitating or 'making easier' – the purpose of the Fast Track Approvals Act (2024).

[70] If the consented maximums are used, then 65% of the consented volumes expire in the next 2 years.

4 Avoided cost and benefits

111. As New Zealand's primary economic centre – 38% of national GDP – the Auckland region generates a significant share of New Zealand's economic activity and growth. Auckland is nationally significant. Catering for growth requires investment in infrastructure. The construction sector is regionally significant and generates $10.0bn of GDP[71] – 6.3% of Auckland's total GDP. Further, construction is a significant employer, accounting for 10.7% of Auckland's total employment.

112. Enabling sand to be extracted from Te Ākau Bream Bay to support the regional sand market will have direct benefits associated with construction. Sand is a direct input into Auckland's construction sector, enabling investment in projects that deliver significant regional benefits.

113. As indicated in the preceding section, the Auckland sand market is under pressure, with uncertainty around the long-term supply situation undermining confidence. Looking forward, these pressures are projected to intensify as economic growth returns and the need to have access to high-quality sand is needed to avoid uncertainty and to contain price rises. Enabling an efficient supply chain facilitates infrastructure investment and delivery.

114. Using the Te Ākau Bream Bay resources offers a unique opportunity to deliver sand to the Auckland market. Using this resource offers an ability to supply sand to the Auckland market in a way that satisfies demand and delivers a range of regionally significant economic benefits.

115. The section starts by highlighting the essentiality of natural sand in the context of infrastructure, growth, and concrete (and sand). Next, the section summarises the estimated size/value of avoided costs.

116. High-level comments about the potential implications of manufactured sand are presented. The section concludes with an outline of other, secondary benefits and considerations.

4.1 Essentiality of natural sand

117. The benefits of enabling sand extraction from Te Ākau Bream Bay relate to the facilitated effects and avoided costs. The facilitated effects are derived through the investment that is supported and relate to an array of effects, including:

    a. Investment in physical infrastructure requires concrete. Hard infrastructure includes economic assets such as roads, bridges, tunnels, ports, three waters networks, network infrastructure (energy) and railways. It is critically important to ensure that the infrastructure supports and improves the efficiency of moving goods, people, and information to support economic activity and the functioning of society. If sand is not available and infrastructure cannot be delivered in a cost-efficient or timely manner, then economic costs arise. These impacts include increases in costs and budgets, trade-offs leading to sub-optimal spending, travel delays and disruptions, as well as productivity losses for both individuals and businesses. Overall, these impacts reduce welfare levels and are seen as economic disbenefits.

[71] Based on Auckland Regional Economic Monitor (Auckland Council and Infometrics). Year to March 2024

b. Infrastructure investments can enhance resilience to natural disasters and mitigate the effects of climate change and other shocks. For example, flood defences can reduce the economic costs associated with disruptions and damage arising from extreme events. In addition, addressing damage after an event requires a resilient and flexible supply chain, with an ability to access raw materials and processing capacity from diverse sources to reduce concentration risks.

c. Infrastructure enables trade by reducing transaction costs between locations, across Auckland, and with other regions. These connections stimulate activity and support growth that deliver benefits to New Zealanders.

d. Well-developed infrastructure attracts domestic and foreign investment. The investment case is stronger for regions with reliable and robust infrastructure, such as transportation, communication, and energy networks.

e. Infrastructure investments in areas such as healthcare, education, and three waters contribute to improving the quality of life. This, in turn, enhances productivity, innovation, and economic competitiveness.

f. Infrastructure projects typically have long-term benefits that extend beyond immediate economic gains associated with the construction impulse.

118. The sand market, and its functioning in the context of construction and infrastructure delivery, is regionally significant. Without sufficient sand, the concrete market cannot operate efficiently, and infrastructure delivery will be constrained with adverse flow-on effects.

4.2 Avoided costs are benefits

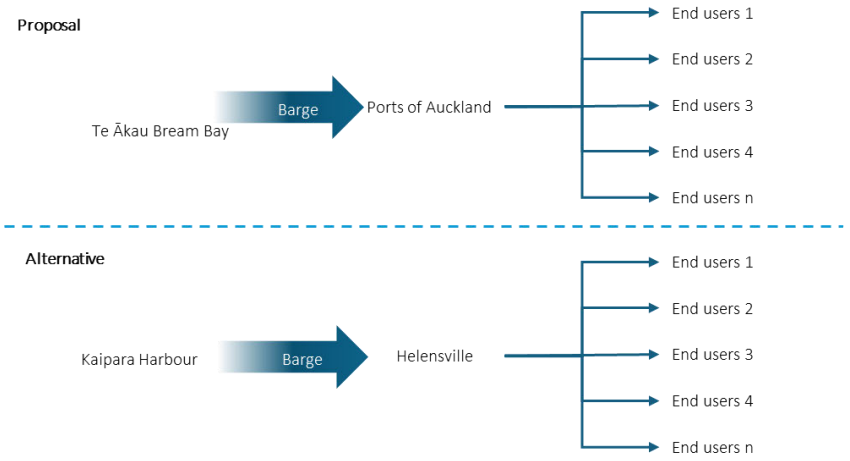
119. The locations from where sand is sourced are important because they determine the delivered cost of sand. Sand is a low-value, high-volume good, and transporting it has a direct influence on cost. The transport function adds direct and indirect costs. The direct cost is determined by the transport distance cost, and the indirect costs are associated with externalities such as emissions and the social cost of accidents and so forth.

120. When assessing the economic costs or benefits of a proposal, the change must be assessed against a 'without' (or a do minimum) situation. In this assessment, the proposal relates to barging sand from Te Ākau Bream Bay to Ports of Auckland and to then distribute it to end-users. That is, MBL's proposed operation at Bream Bay is the extraction of sand by motorised trailing suction dredge (using the *William Fraser*[72]) that is then transported by sea directly to the Port of Auckland. The sand will then be distributed by truck from this central location to concrete plants in the Auckland market.

121. The alternative is to barge sand to Helensville from the Taporapora Sand resource (in the Kaipara Harbour) and to then truck the sand directly to end-users in Auckland (see Figure 4-1). Importantly, under the alternative, sand is trucked directly from Helensville to end-users.

[72] The *William Fraser can transport 1,600 tonnes of sand, equal to 48 truck and trailer loads of 33 tonnes.*

Figure 4-1: Distribution patterns



122. If costs are avoided, then a benefit arises. The relative benefits of using the Te Ākau Bream Bay resource are based around avoiding costs, specifically transport costs, avoiding emissions and other costs relative to the counterfactual (or principal alternative).

123. These costs can be quantified and expressed in monetary terms using approaches outlined in official guidance documents such as the Monetised Benefits and Costs Manual and drawing relevant parameters from a range of datasets, including:

a. Vehicle Emissions Prediction Model 7.1 (NZTA)

b. Project Emissions Estimation Tool (NZTA)

c. Ministry for the Environment[73]

d. Real-life fuel consumption information from the industry (e.g., fuel used per kilometre[74]).

124. In addition, information from New Zealand Treasury information[75] is used. The approach to calculating the emission and social costs is consistent with the methodologies applied by New Zealand Transport Agency (NZTA), and using emissions factors published by the likes of NZTA[76].

125. Despite the Kaipara sand resource's technical/operational challenges, requirement to renew consents in 2027, and considerations around increasing production, this resource is used as a counterfactual (or principal alternative) because:

a. It has theoretical capacity to accommodate growth and to supply the market, and

b. It is of a quality that can be used in concrete production, and

[73] Ministry for the Environment. 2020. Measuring Emissions: A Guide for Organisations: 2020 Detailed Guide. Wellington: Ministry for the Environment.
[74] Provided by MBL; the fuel efficiency information is broadly consistent with that outlined in the MfE data albeit towards the lower end of the spectrum reflecting actual routes, fleet characteristics and use patterns. The MfE data reflects the entire fleet, regardless of location in New Zealand, type of freight and routes.
[75] Including data from CBAx, and guidance documents relating to discount rates.
[76] In the Vehicle Emissions Prediction Model 7.1. (NZTA)

c. Is a known resource (i.e., the technical attributes are understood), and

d. It is located closer to the Auckland market than the alternatives.

126. Using the Kaipara sand resource as the counterfactual means that the estimated costs are treated as the 'at least' cost. All other natural sand options face greater transport distances that will generate greater externalities and higher costs.

127. Industry information indicates that the medium-term average cost to move a tonne of sand 1km along the road network is between 30 cents and 40 cents[77] (excluding GST). There is some variability in this rate that arises from contracting negotiations, backhauling/backloading opportunities, contract volumes, and the business cycle. Prices tend to move up during periods of high demand and down when demand is low. Inflationary pressures also influence pricing. For this assessment, a balanced position is maintained, and a rate of 30 cents is used to align with the average price position as observed over the recent past. As prices increase, which is expected over the medium to long term, the rate will also rise. This means that the long term transports costs are likely under reported.

128. The transport function plays a substantial role in the delivered price of sand and the following example shows the scale of this effect:

a. If the extra road transport distance needed to deliver the sand from another source is 40km (one way)[78],

b. The cost to transport one tonne of sand for one kilometre is 0.30c/km,

c. A 33 tonne payload in the truck and trailer is used,

d. Then the additional transport cost is $396 (for truck and trailer load).

129. The medium-term average price for delivered sand is between $35/tonne and $45/tonne and the additional transport cost (from the example) is $12/tonne – an increase of between 27% and 34% due to the greater distances of 40km.

130. If suitable backloads are not available, then this transport cost will be even higher because the truck needs to return to the depot. Because MBL uses a barge for dredging and transport, they can deliver sand to Auckland CBD (and then to concrete plants in Auckland via truck) at a significantly lower rate than carting sand (by truck) from distant sources i.e., the overall transport function is more efficient.

131. To put this direct cost into context and using the above example, the Central Rail Link used more than 20,000 truckloads of concrete. Using this quantum and applying it to the cost difference shown above to the sand movements illustrate the cumulative effects that using sand from a more distant source has. In this example, the (additional) direct transport cost would have been approximately $546,000[79].

132. Auckland uses concrete throughout the region, and sand is delivered to concrete plants that are located throughout the region at key points near the end-users of concrete, forming a network. The transport

[77] These rates exclude any backload rates that can reduce the costs. A backload (or backloading) refers to the practice of using the return journey to carry goods. This helps avoid the vehicle returning empty and improves efficiency. The ability to integrate backloading into transport pricing is influenced by the potential to transport an alternative good between locations to avoid empty truck movements.

[78] For reference and as an example, the distance from Ports of Auckland to the concrete batching plant in Penrose is around 10km and the distance to the same plant from the Atlas depot near Helensville is circa 55km.

[79] Concrete per truck (5.2m^3) of which between 425kg and 450kg is sand/m^3 so sand per load is between 2.2 tonne and 2.3 tonnes/truck. The additional transport cost per tonne used is $12/tonne.

costs are a function of the origin-destination mix across the network. The spatial distribution of sand is modelled based on the distances from the Ports of Auckland to concrete batching plants around central and southern Auckland and includes plants in:

a. Avondale,
b. Penrose,
c. East Tamaki,
d. Papakura, and
e. Manukau.

133. Concrete plants in the northern and western parts of Auckland are excluded from the analysis because those plants are serviced using sand from the Kaipara Harbour. The analysis also considers other users, such as:

a. Precast applications,
b. Turf,
c. Landscaping, and
d. Industrial (e.g., block plants).

134. The distances to the individual plants underpin the analysis, and the weighted average distance across the supply network is used to estimate the turf and landscape applications. The volume of sand allocated to the concrete plants and other users is informed by industry knowledge.[80] Most of the sand is assumed to be allocated to concrete production (80-90%) and the balance to non-concrete applications.

135. Distances and volumes (tonnes) are combined to estimate the total transport function, i.e., the number of truck movements to transport sand to different locations. The change in the transport function is compared against the transport costs of supplying end users using sand from the Kaipara Harbour (based on the distance from the Mt Rex depot near Helensville to end users).

136. In addition to the direct transport costs that flow through to end users, other costs can be distinguished, including the cost of emissions and social costs (cost of accidents).

4.2.1 Direct transport cost savings

137. The distance sand is transported has a direct bearing on the delivered price. Using the Te Ākau Bream Bay resources, instead of Kaipara sand, to meet demand in central and southern Auckland will avoid direct transport costs estimated at $6.3m per year for the first three years, before increasing by a further $10.5m per year as tonnages increase. This represents a significant increase in the transport cost – high transport costs are recovered via prices. As mentioned, the medium-term price for sand is between $35 and $45 per tonne (delivered, excluding GST). Therefore, delivering sand via the alternative and recovering the additional transport costs will see prices increase to between $58/tonne and $68/tonne.

[80] Specifically, MBL insights based on market share intelligence and sales patterns across concrete plants as well as a small portion of sand used for non-concrete applications.

This estimate reflects the additional transport cost associated with transporting sand over greater road distances than would be the case i.e., the distance from Ports of Auckland to end-users vs the distance from the Mt Rex depot near Helensville directly to end-users. The exact increase is subject to the final contract details around quantity, quality, timing, backloading opportunities, and so forth. The potential cost saving relates to the avoided costs and reflects the change in the transport costs – these are substantial and ongoing in nature.

138. On a cost per tonne basis, the additional transport drives the price up by 52% to 66% – a significant price increase that will have an inflationary impact on construction, including residential developments, infrastructure, social amenities, and other sand applications. Even if sufficient backhauling opportunities were available, the cost increase would be between 26% and 33% per delivered tonne. In addition, the availability of backhauling opportunity is not necessarily linear to sand supply volumes and other factors determine these opportunities (e.g., origin and destination considerations of alternative goods).

139. Clearly, enabling Te Ākau Bream Bay sand extraction will generate direct transport cost savings relative to the principal alternative. These savings arise because the need to transport sand over land is reduced, i.e., a more efficient transport mode is used for a part of the trip to supply sand to end-users. Other benefits that arise from enabling a lower-cost provider include:

    a. Lower sand prices that reduce, or at least suppress, the concrete price component of infrastructure project budgets.

    b. Extra competition ensures that the market remains efficient.

    c. End users have wider choices in terms of sand supply options. This supports competition, which helps to keep prices low.

4.2.2 Environmental Costs

140. The role of transport in generating emissions is well documented and undisputed. The value of emissions is based on the estimated emissions (pollutants) that are then translated into health effects as well as the social cost of carbon. Both aspects are consistent with the NZTA guidance.[81] The calculation reflects the dollar value of the emissions externalities and differs from the market traded prices in the Emissions Trading Scheme (ETS). The ETS values do not currently reflect the full marginal cost of achieving New Zealand's emission targets. An ETS is typically only one of the many policies that governments implement to meet their climate targets.[82]

141. The environmental costs show the effect associated with increasing the transport function (distance and volume). If the transport function of one option is smaller than another, then it means that the smaller option is more efficient. A byproduct of reducing transportation distances and cost is that total emissions is reduced, thereby helping New Zealand to meet its emissions obligations[83].

[81] Monetised benefits and costs manual. NZ Transport Agency Waka Kotahi.
[82] Monetised Benefits and Costs Manual – Volume 1: Procedures (v2.7.3) from Waka Kotahi NZ Transport Agency, published May 26, 2025.
[83] Such as New Zealand's international obligations under the Paris Agreement (2015) as well as domestic legislation (Climate Change Response Act 2002).

142. Total emissions include all transport modes, including the barges associated with delivering the sand from the marine sources, i.e., Taporapora (Kaipara) or Te Ākau Bream Bay. The emission calculation captures barge movements and road movements and is based on volumes and distances.

143. The Te Ākau Bream Bay operation would enable significant emission savings. Delivering sand (directly) from Helensville to central and southern Auckland's sand users generates considerably more emissions than a Te Ākau Bream Bay approach. As vehicles travel, they use energy and generate emissions. The quantity of emissions is calculated by estimating the total distance (sea and road) and applying appropriate emissions factors. The emissions factor shows the quantity of emissions for every kilometre travelled. Several sources were consulted to obtain the emissions factors[84].

144. When applied to the additional distance required to meet MBL's client needs, there are an additional 3,300 tonnes of carbon dioxide generated annually over the short term (3 years, per year), before increasing to 5,500 tonnes from year 4 onwards. This estimate includes emissions associated with barging the sand to Helensville or Auckland CBD as well as truck movements. It does not include any flow-on emissions arising from congestion on the road network due to extra trucking movements. In percentage terms, the change in emissions is 106% (more than double) if sand from the Kaipara is used instead of Te Ākau Bream Bay sand.

145. Emissions are valued using official, whole-of-government parameters[85] and we considered the shadow price of emissions. The official shadow price is reported as a range (low, mid[86] and high) and the annual value is expected to increase over time. The estimates for 2025 are:

    a. Low $80/t,

    b. Mid $120/t,

    c. High $161/t.

146. The midpoint value of $120/tonne is used in the analysis. The long-term value (2054) for the shadow price of carbon is $361/tonne. This increase underscores the critical importance of reducing emissions. The estimated value of the additional cost associated with the shadow price of carbon starts at $396,000 before increasing over the long term to more than $2m (per year from 2055).

147. Based on estimated transport distances, associated emissions and the value of carbon, the potential annual environmental saving is estimated at $2.3m, increasing to $5.5m by 2058.

4.2.3 Social Costs

148. The social costs associated with injuries and deaths are in addition to the direct transport and environmental costs. For every extra truck kilometre travelled, there is an increase in the likelihood of accidents resulting in injuries, serious injuries, and deaths.

149. Using official valuation approaches and parameters, the risks associated with travel distances are translated into social costs, specifically deaths, serious injuries and minor injuries. Applying the Ministry

[84] Sources include: NZTA (VEPM), MfE, HAPINZ and Industry information (Winstones and MBL data).
[85] As reported by NZTA and Treasury with updates to the relevant base year.
[86] The mid value is not the 'average', or in the middle between the low and high values. It reflects the mid-estimate.

of Transport's[87] metrics suggests that avoiding the additional transport function would generate savings. Considering that the Value of a Statistical Life (VoSL) is estimated at $14.9m, a serious injury is valued at around $1.2m and a minor injury is $280,400, then there is value in removing/mitigating the risk of injuries.

150. Annual avoided cost is estimated at $296,850 in the first three years, increasing to $494,750 as tonnages increase, if Te Ākau Bream Bay sand can be used for the Auckland sand market. As with the environmental costs, these are likely to rise as the Value of Statistical Life, and other social cost metrics increase over time, but in the absence of specified growth/adjustment factors, the per-injury costs are not grown over time. Therefore, a conservative position is used in the assessment.

4.2.4 Total avoided costs (benefits)

151. The benefits associated with adding Te Ākau Bream Bay sand to Auckland's supply network will be felt over multiple years. The annual values can be expressed in present value terms by discounting future values. Essentially, the discounting process reduces the relative importance of future benefits (or costs) relative to short-term benefits. The discount rate that is used for the assessment is consistent with New Zealand Treasury's guidance, i.e., using a rate of 2% for the first thirty years and 1.5% for the remaining period. The present values of the avoided costs are estimated as follows:

a.	Direct transport costs	$258.2m
b.	Environmental costs	$104.0m
	i. Shadow price of Carbon	*$34.4m*
	ii. Health-related costs	*$78.2m*
c.	Social costs	$12.2m
d.	**Total**	**$383.1m**

152. Based on the above, transport, environmental and social costs that would be avoided by enabling Te Ākau Bream Bay extraction are estimated at $383.1m (in discounted terms).

153. This is based on the costs required to transport 270,000 tonnes (for three years) growing to 450,000 tonnes of sand from Te Ākau Bream Bay to end users in central and southern Auckland. The estimates are based on supplying the market from the principal alternative, i.e., the sand resource in the Kaipara Harbour, to end users in central and southern Auckland (directly) versus barging sand to Ports of Auckland and then trucking the sand to end users in central and southern Auckland (Te Ākau Bream Bay option). The dollar value represents the economic benefit (in the form of avoided costs) that will accrue to Auckland's economy – and ultimately households. The estimates are likely to be conservative, as it assumes that the Helensville plants can meet Auckland's growing appetite for sand, as well as the assumption that the resource would be available for use post 2027. If sand is sourced from further away than the Helensville option, then the costs would be greater.

[87] Te Manatū Waka – Ministry of Transport. (2023, April). *Social cost of road crashes and injuries: Methodology and user guide* [PDF]. Wellington: Te Manatū Waka – Ministry of Transport, as well as the Social Cost of Road Crashes and Injuries dataset from the Ministry of Transport.

154. The transport costs are likely to be significantly higher if sand is transported from other sources that are located further from Auckland than the Kaipara sand resource (e.g., from Northland and Waikato).

4.2.5 Manufactured sand

155. As highlighted in Mr Donoghues' evidence, manufactured sand is not a complete replacement for natural sand. Using the speculative scenario outlined earlier (section 3.5, with 150,000 tonnes) manufactured sand must be blended with natural sand to achieve the necessary attributes. The total cost of using manufactured sand as part of the supply picture is estimated. The speculative scenario is structured as follows:

    a. Manufactured sand is sourced from Brookby Quarries,

    b. The natural sand component is sourced from the Kaipara Harbour.

156. The distribution patterns reflect transporting the manufactured sand from Brookby Quarries (as the current only source known to produce any commercial quantity of manufactured sand) to the individual end-users and natural sand from the Kaipara Harbour directly to end-users. The cost is compared against the costs of using Te Ākau Bream Bay sand.

157. To enable comparison with the Te Ākau Bream Bay proposal, the annual values are applied over the consent period and discounted. Blending manufactured sand with natural sand yields an equivalent sand volume of 223,881 tonnes[88], which is less than the starting maximum of the Te Ākau Bream Bay application. The costs associated with the manufactured sand option are scaled to enable a direct comparison. The difference (over time and discounted over 35 years) between the blended manufactured sand and Te Ākau Bream Bay sand is $85.4m.

158. The analysis shows that even using manufactured sand and blending it with natural sand for concrete purposes generates more costs than a scenario using natural sand sourced from Te Ākau Bream Bay. Enabling Te Ākau Bream Bay sand extraction is the most cost-effective option relative to the principal alternative (Kaipara) as well as a manufactured sand option.

159. The scenario is hypothetical because it assumes that there will be a widespread and immediate shift to use all known manufactured sand capacity. This is unrealistic considering the issues with manufactured sand referred to above (see para 93) as well as Mr Donoghue's findings.[89]

160. As mentioned earlier, Auckland is a net importer of aggregate[90], and the growth in demand for aggregate to support infrastructure investment as well as baseline use will see demand for aggregate increase. Without additional resources the shortfall in aggregate in the Auckland market is projected to increase. Based on the mentioned report, the scale of the deficit is projected to fall at between 3.0m tonnes (currently), increasing to 17.3m tonnes by 2048. Even at the conservative end, the deficit is substantial with significant costs. Producing manufactured sand required feedstock (inputs) and if existing aggregate stock is used, then it displaces locally available aggregate, and additional aggregate must then be imported to satisfy demand. Such importation from the Waikato or Northland will

[88] Based on a blending ratio of 33% fines content as outlined in the supporting statement of Mr Donoghue: para 39
[89] Supporting statement by Mr Donoghue: para 57 to 76.
[90] Market Economics report in support of Brookby Quarry Stage 3 Fast Track application (2023). Environmental Protection Authority (EPA). (2023). *Brookby Quarry: Stage 3 – Appendix 21: Assessment of Economic Effects* [PDF]. on EPA website.

generate additional economic and environmental costs that are not reflected in the above cost estimates.

4.3 Other considerations

161. Other secondary considerations that also illustrate the benefits that enabling Te Ākau Bream Bay would deliver include:

    a. Reducing the trade-offs and opportunity costs,

    b. Supporting wider markets via the use of coastal shipping to distribute sand to regional ports, and

    c. Supporting activity in Northland.

4.3.1 Reducing the trade-offs and opportunity costs

162. A flow-on effect of servicing the Auckland sand market from the principal alternative (vs Te Ākau Bream Bay) is that the cost of sand increases due to higher transport costs. If sand is sourced from a source that is located further away from Auckland (and the end users/concrete plants) then the total costs would be even higher than the reported estimates. Higher cost leads to difficult trade-offs in terms of funding with several pathways available:

    a. The higher costs can lead to fewer infrastructure projects because project budgets remain constant (capped),

    b. Entities, such as Auckland Council, could pass on higher costs via rates increases to maintain project investment levels.

163. These responses have other consequential effects. In the case of fewer, or delayed projects, the costs are associated with a postponement in when the benefits associated with the purpose of those projects arise, and the community is worse off because those benefits are now felt further in the future. If costs are passed on, then discretionary funds reduce with ratepayers worse off. In addition, there are deadweight losses. These are economic concepts that refers to the loss of total welfare when the market is distorted, as would be the case if the additional costs are passed on in ways that change how the market behaves (e.g., changing housing choices, avoiding renovations, reduce mobility). Using New Zealand Treasury guidance[91], suggests that the deadweight loss would be in the order of $51.6m. In addition, that spending would have flowed through the economy, with that spending then foregone. The foregone spending also means that economic activity is lost.

164. The specific size of the effects associated with the higher costs (direct transport) is a function of how the market responds, especially which sources are used to supply the Auckland sand market. However, considering that the Kaipara Harbour source is the main principal alternative based on the quality, quantity and location of destination markets, then if sand is sourced from another source that is located further away, the costs would be greater.

[91] New Zealand Treasury. *Guide to Social Cost–Benefit Analysis*. July 2015. New Zealand Treasury, Wellington.

165. The scale of the consequential effects illustrates the flow-on economic impacts that the cost increases would have on economic activity. Constraining supply would have adverse economic effects, undermining the construction sector's ability to respond to growth and investment.

4.3.2 Supporting wider markets

166. While the analysis focuses on the Auckland sand market, enabling sand extraction at Te Ākau Bream Bay will also support sand markets in other regions. If required, sand extracted from Te Ākau Bream Bay could be shipped directly to ports in other regions such as Tauranga in the Bay of Plenty, and Kopu near Thames, as well as Port Nikau in Whangārei Harbour. There is strategic value (option value) in having the ability to access the high quality sand of Bream Bay in extraordinary situations across the North Island. Transporting the sand to these markets by direct coastal shipping reduces economic and environmental costs versus road transport. While these markets are not the core focus of the proposal, there are limited high quality sand sources in the Waikato and Bay of Plenty. Consequently, the issues associated with the Waikato sand sources also apply and using high quality marine sand will address these issues i.e., alkali reactive materials requiring additional additives to achieve high strength requirements – increasing costs up. This was the case for several infrastructure projects that required very high quality sand (e.g., bridge and port infrastructure in Tauranga).[92] Another example was when Pākiri sand was trucked to the Hawke's Bay when there were issues in extracting sufficient volumes from local riverine sources.

167. Enabling the Te Ākau Bream Bay sand resource will provide capacity in the Auckland market to specifically meet these specialist requirements. While the primary focus of the application is to supply the Auckland sand market, the attributes of Te Ākau Bream Bay sand mean that it could also be used to support high-strength concrete producers in other markets.

168. As mentioned earlier, there are limited high quality sand sources in the Bay of Plenty, and Waikato sands are used to service this market. Waikato sand requires additional cement content (vs marine sourced sand) to achieve high strength requirements – this increases costs. According to Mr Donoghue, using Waikato sand in concrete production uses 25kg per tonne more cement than marine sand[93]. Using a hypothetical situation/project that requires 10,000 tonnes of sand shows that using Te Ākau Bream Bay sand instead of Waikato sand would generate a cost saving of between $150,000 and $155,880 for that project. This estimate is based on cement cost of $255/tonne to $265/tonne. Using the above example and applying the cost over the consenting period (i.e., reflecting a situation where the annual demand for sand is 10,000 tonnes and the project is delivered using Waikato sand instead of Te Ākau Bream Bay sand) shows that the present value of the associated emissions is between $3.9m and $4.0m (present value over 35 years).

169. In addition, to the direct cost associated with using more cement, there are environmental costs to consider. These costs relate to the emissions associated with cement production. On average, 0.9 tonnes of CO_2 is emitted for every tonne of cement that is produced. Reducing the need for cement

[92] Pākiri sand was used for infrastructure in Tauranga, specifically extensions to Tauranga Port investments in the Tauranga-Mt. Maunganui Bridge. It was also used for projects in Napier that required very high quality sand for high strength concrete.
[93] Para 77 in Mr Donoghue's statement.

therefore lowers CO_2 emissions. Applying the shadow price of carbon to the avoided emissions, suggests that the present value of the emissions costs is $3.3m (present value over 35 years).

4.3.2.1 Waikato

170. Waikato sand has technical attributes that restricts its use in certain applications, requiring processing before it becomes suitable for those purposes. Processing includes removing impurities to alter the physical attributes and to ensure that a homogenous product is delivered. This means that the amount of sand that is quarried is greater than the sand used in concrete production. The general ratio that is used suggests that for every 1 tonne of (available) concrete sand, circa 1.25 tonne of sand must be quarried and processed[94]. The balance is used as part of fill sand, drainage and forms part of overall fill sand supply (that is often used to make blocks and in gardening mixes).

171. Waikato sand is already exported (interregionally) to the Bay of Plenty due to sand constraints in that market. The Waikato-Bay of Plenty sand market is projected to increase over the next three decades in response to growth. However, based on M.E' analysis[95] of existing supply patterns (consented volumes) and operations (location, consented volumes, and operations), sand demand in the Waikato is expected to outstrip supply within the next decade. This is because several large consents will expire in this time. In addition, consents in the Bay of Plenty will also expire in the short term, meaning that the local (Waikato and Bay of Plenty) sand market will see significant changes and pressures. Two Waikato resources (Tuakau and Pukekawa) are located near the Waikato-Auckland border and supply sand to concrete batching plants in the south of Auckland.

172. If a portion of Auckland's sand demand is serviced using Waikato sand, then additional pressures can be expected on Waikato sand. However, the wider costs of servicing Auckland with sand from the Waikato are significant. For example, if 50,000 tonnes is sourced from a hypothetical source in the Waikato and the transport distance adds 75km to the average transport distance[96] (of Te Ākau Bream Bay patterns) then the *additional* costs are (present value over 35 years)[97]:

    a. Transport costs $31.9m,
    b. Social costs $1.4m,
    c. Emissions (health costs) $14.6m,
    d. Cost of carbon $10.9m.
    e. **Total** **$58.8m.**

173. The largest cost element is associated with the direct transport cost, i.e., cartage to Auckland. The health costs associated with emissions costs are (comparatively) low because most (circa 80%) of the transport is through rural areas with low population numbers and consequently limited health effects. However, the cost of carbon is notable and associated with transport distance. In addition, there are increases in the accident risks (with more transport distances).

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[94] M.E report in support of *77 Newcombe Road Resource Consent Application* Waipa District Council. Retrieved from Link to report
[95] M.E report in support of *77 Newcombe Road Resource Consent Application* Waipa District Council.
[96] This is the distance from Ngāruawāhia to Drury and is a proxy to show the additional distance travelled, and the extra costs.
[97] The discount rate used aligns with the New Zealand Treasury's guidance in CBAx re discount rates i.e., 2% for the first 30 years, and then 1.5% for the subsequent years.

174. The above illustrates the importance of having sand near where it is used and the effects of distance on price. Using the above example with the extra cost shows the additional cost per tonne of using Waikato sand.

4.3.2.2 Northland

175. The sand market in Northland is small and aligned with local economic and population activities. Northland's economy and population are concentrated around a small number of urban centres, and most of the growth is anticipated around these locations (e.g., Whangārei). Several large infrastructure projects will unlock the region's growth prospects and see an increase in demand for concrete and sand. These include projects associated with rail, the port, and roading infrastructure.

176. Using the same methodology as outlined in section 3.1 and applying the Northland-specific ratios suggests that the outlook for sand demand over the next 35 years will change as follows (the range reflects the difference between the medium and high population growth scenarios):

    a. For Northland – increases by between 20,715t and 38,135t (additional per year),

    b. For Whangārei – increases by between 11,480 and 20,405t (additional per year).

177. Over the long term, the total annual demand for sand is expected to reach 108,920t to 128,280t for Northland and between 55,450t and 65,370t for Whangārei.

178. The Northland and Whangarei sand markets are significantly smaller than the Auckland market. Delivering Te Ākau Bream Bay sand to the local market is likely to have positive market effects that are associated with increased competition and the effects on containing market pricing. Sand can be delivered from Te Ākau Bream Bay to Northport and Port Nikau (Whangārei Harbour) (for example) from where it would be trucked to end-users. However, this opportunity is likely to be comparatively small and only viable for the high-strength concrete applications.

179. In terms of using Northland and Whangārei sand sources to supply the Auckland market, the additional cost associated with transporting sand to Auckland is a key factor. Regardless, the total scale (quantum) of sand that can realistically be transported from Whangārei/Northland to Auckland is limited due to the transport costs and the local availability of supporting infrastructure. The transport costs form the key challenge – as outlined in the case of transporting sand from the Waikato, increasing transport distances translate into higher overall costs – transport costs, emissions costs as well as social costs.

4.3.3 Other effects

180. The vessel that is used to extract the sand and to deliver it to Ports of Auckland, the *William Fraser*, falls under the Maritime Transport Act (1994) and is overseen by Maritime New Zealand (MNZ). Commercial barges must hold a Certificate of Survey that is issued by an MNZ-recognised surveyor. The surveys verify that barges are seaworthy, structurally sound and suitable for the intended use. In addition to the surveying process, the *William Fraser* undergoes periodic maintenance using the facilities near Whangārei (not at Northport).

181. The direct spending associated with MBL operations in Whangārei is estimated at $1.4m to $1.5m. The sand-related portion of the spending is estimated at between $400,000 and $500,000 and excludes

salaries and wages paid directly to Northland residents. This spending is direct and into the Northland economy and supports a range of businesses associated with:

a. Transport support services,

b. Transport equipment manufacturing,

c. Scientific, architectural, and engineering services,

d. Accommodation,

e. Food and beverage providers.

182. The transactions flow through the economy, generating GDP and supporting jobs. The total GDP impact associated with the sand-related spending in the Northland economy is estimated at $3.1m (over 35 years, discounted). The total number of job-years supported by the activity is estimated at 51.

5 Considerations raised in CIAs

183. As part of preparing the substantive application, the potential cultural impacts were assessed. These separate assessments are presented in the Cultural Impact Assessment (CIA) Reports prepared for:

- Patuharakeke Te Iwi Trust (December 2025, version for approval),
- Ngātiwai Trust Board (14 December 2025),
- Te Pouwhenua o Tiakiriri Kūkupa Trust t/a Te Parawhau ki Tai (4 December 2025, revision 11).

184. The Patuharakeke CIA includes a specialist memo dealing with economics[98]. The Ngātiwai and Te Parawhau ki Tai CIA's do not include dedicated economic information or assessments. The Cognitus memo makes several assertions and presents new analysis that warrant a response.

5.1 Patuharakeke CIA – Economic points

185. Cognitus was asked by Te Pou Taiao o Patuharakeke Te Iwi Trust Board to review the economic assessment as part of the CIA process. Dr Meade outlines[99] the scope of his review as covering:

- whether the project will result in significant regional or national benefits, and
- whether there are material adverse effects arising from the project and if so, if these have been adequately accounted for.

186. These points are consistent with the one part of the purpose of the FTAA. However, the scope does not reflect the part of the purpose that relates to facilitating investment (see para 10). This is an important gap, and it appears that Dr Meade does not assess or consider this part of the FTAA's purpose.

187. The response[100] to Dr Meade's memo is structured using the general structure of his memo and is structured into the following headings:

a. Overstating the importance of concrete,
b. Critiquing the analysis,
c. Size of benefits,
d. Additional considerations.

5.1.1 Overstating the importance of concrete

188. The use of concrete and the derived demand for sand is used to estimate Auckland's sand demand. Dr Meade asserts that the importance of concrete to meet Auckland's growth and development needs is overstated. He indicates that this is because future concrete intensity differs from historic patterns. That is, when investing for growth, the per capita concrete use will be lower than current patterns. He lists potential drivers of the change[101] and quotes entities such as Infrastructure Commission. There are several weaknesses with this view and the arguments he presents:

[98] prepared by Cognitus Economic Insight (Dr Meade).
[99] Dr Meade's memo - para 2.
[100] Not every point is responded to. If a point is not responded to, does not mean that it is accepted or agreed to.
[101] Dr Meade's memo - para 15-20.

a. The analysis estimated the per capita ratio looking back more than 20 years. The population growth, and the per capita ratio, both determine the demand situation. There is no evidence of the ratio dropping away. Dr Meade suggests that increasing housing densities would lower per capita concrete demand. He does not present a source for this statement. If this was the case, then the shifts in housing typologies seen post the adoptions of the Auckland Unitary Plan towards more attached dwellings would have seen the per capita rate shift. This has not been the case. Looking forwards, there are material changes on the horizon for Auckland's residential construction market and spatial changes). Changes in Auckland's land use planning (e.g., Plan Change 120) are relevant. PC120 has been notified and submissions closed on the 19th of December. While the final decision is only expected in 2027, a relevant aspect relates to the intensification is height. The notified version of PC120 is clear around height limits – enabling a substantial increase in heights to 6 storeys in some locations, and up to 10-15 storeys around transport-node linked locations. The typology shift is expected to see an increase in concrete demand. In addition, the potential effects of addressing legacy issues, and infrastructure backlog are likely to add to demand, and lift per capita ratios.

b. Emissions reduction and a need to reduce emissions is mentioned as a reason for reduced use. A report by the Infrastructure Commission is held up in support of this view. Dr Meade points to the amount of concrete used in roading as a way to reduce emissions. However, the referenced report does not portray this position, in fact "concrete" is not mentioned in the referenced report[102]. The referenced page discusses the decline in investment but the metric, share of GDP, shows a decline. This does not translate into lower investment overall.

c. With reference to the need to use less carbon-intensive concrete, as well as using less concrete overall, Dr Meade[103] points to industry bodies' ambitions to reduce emissions. The Global Cement and Concrete Association's drive to net zero is specifically focused on reducing emissions and the relevant point is efforts to enhance efficiencies in concrete production. Likewise, ConcreteNZ's Net-Carbon roadmap also points to "efficiency in design and construction" around concrete use. This efficiency is explained as covering matters such as design optimisation (using appropriate class specification), project scheduling to allow use of lower carbon concretes and revising standards to allow for slower strength development. Two points are relevant:

    i. Crucially, the ConcreteNZ roadmap states[104] that:

    "Unlike in many other countries, there is little potential for reducing the volume of concrete in construction in New Zealand due to seismic risks"

    The use of concrete is projected to continue to increase, not decrease as Dr Meade suggests.[105]

[102] New Zealand Infrastructure Commission. (2025). *The Infrastructure Needs Analysis Forecast: Results and Modelling Technical Report*. Wellington: New Zealand Infrastructure Commission / Te Waihanga. From: Link
[103] Dr Meade's memo para 17.
[104] Concrete NZ. (2023). *A Net-Zero Carbon Concrete Industry for Aotearoa New Zealand: Roadmap to 2050* (28 pp.). Concrete NZ. Link (information on page 13)
[105] Concrete NZ. (2023). *A Net-Zero Carbon Concrete Industry for Aotearoa New Zealand: Roadmap to 2050* (28 pp.). Concrete NZ. Link (figure on page 25, black dotted line).

ii. The emissions assessment in the ConcreteNZ roadmap considers a wide[106] approach to illustrate the change that is required meet the emissions ambitions. ConcreteNZ reports the requirements using Environmental Product Declaration (EDPs) and is based on Scope 3 emissions. Scope 3 emissions include the full life cycle of cement, including transport functions, not solely direct process and fuel related emissions and electricity emissions. Therefore, enabling Bream Bay sand to be used in the concrete sector is consistent with the roadmap and the ambition to reduce emissions.

d. Dr Meade presents other reasons to support his view that concrete use would decline.[107] This position conflicts with information in the ConcreteNZ road map that indicates increased demand for concrete.

189. The demand analysis considers the reported (officially from Stats NZ) concrete production in the Auckland region and the per capita ratios. Historic patterns, going back more than 20-years, informed the analysis and a conservative position is used to estimate the outlook. Dr Meade's assertion that the demand analysis is based on "strong BAU bias" is unfounded.

5.1.2 Critique of the analysis

190. The scope of the assessment is critiqued, and Dr Meade contends that a full CBA is needed, and that the analysis is only partial because it omits environmental, community and cultural costs[108]. This is the same position Dr Meade presented to the Panel[109] in the Waihi North Project FTAA. The Waihi North Project Panel disagreed and did not accept that adverse environmental impacts must be monetised and factored directly into the assessment of economic benefits. In fairness to Dr Meade, the Panel's decision was released (18 December 2025) after he prepared his assessment (5 December 2025).

191. In an assessment such as the current one, environmental and other matters are assessed separately by relevant experts, so those subject areas are assessed and presented to decision-makers ensuring that all relevant matters are considered.

192. The discount rate used in the economic assessment is criticized and Dr Meade claims that a higher (8%) rate is more appropriate. For the higher discount rate to be applicable, the proposal would need to be one where central government is considering the merits of investing public money into a commercial venture to extract sand from Bream Bay. That is, the project must compete with the private sector and commercialise risk. This is not the scenario being considered – the project is not about a central government department considering whether to establish a commercial enterprise or not.

193. It appears that Dr Meade is considering the sand extraction activity as whole and therefore viewing the project as a business i.e., a commercial project. The economic assessment is careful to exclude the 'business part' and only focus on the additional costs associated with the transport component (and the associate resource use).

[106] This is wider than the approach used by the Global Cement and Concrete Association approach that focusses on Scope 1 emissions.
[107] Dr Meade's memo para 17.3 to 17.5.
[108] Dr Meade's memo para 24.2.
[109] Expert Panel under the Fast-track Approvals Act 2024. (2025). *Waihi North Final Decision Report* (Report No. FTAA-2504-1046). Fast-track Approvals Act 2024. Link highlighted at para 782.

194. The avoided transport cost is a function of vehicle operation costs and travel time, as well as transport distance. These costs represent real resource costs to society. These costs are discounted at the real social rate of time preference (2%).

195. Consequently, the discount rate using the economic assessment is valid, and the results are not overstated as Dr Meade suggests.

196. Even if the 8% rate is valid, it would only apply to the transport benefits (avoided cost) and the present value of all the benefits would be remain significant ($175m).

5.1.3 Size of benefits

197. In commenting on the size of the benefits, Dr Meade concentrates on the avoided benefits relative to the size of the economy[110]. He uses Auckland's and New Zealand's GDP as denominator (benefits divided by GDP) and interprets the results accordingly. He suggests that because this resulting percentage number is small, that the potential benefits are not significant.

198. Expressing the anticipated benefits as a share of GDP is unhelpful. Construction accounts for circa 10% of Auckland's GDP and sand plays an essential role in this industry. Dr Meade's approach (using GDP as metric) does not reflect the purpose of the Act, especially to *"facilitate the delivery of infrastructure and development projects…".*

199. The economic assessment estimates the benefits of enabling Bream Bay at $383.1m. To put this into context, a recently approved Fast Track Application for Kings Quarry reported the avoided costs (benefits) associated with the transport costs as $382m, and the emissions cost savings as $44m – these benefits are over 45 years. Expressing these values in terms of a 35 year period returns $331m suggesting that Bream Bay's potential contribution is of a similar order of magnitude (albeit slightly greater).

200. With reference to manufactured sand, the economic assessment is based on information provided by Mr Donoghue, a concrete specialist. It is unclear how, or if, Dr Meade integrated Mr Donoghue's, or another concrete expert's views about the substitutability of natural sand with manufactured sand into his analysis. Dr Meade proclaims that 21% of concrete constituted by PAP7 can be replaced by manufactured sand[111]. The relevance of this is unclear. PAP7 and natural sand are two entirely different parts of the concrete mix – PAP7 is not a replacement for natural sand[112]. Manufactured sand is already used as PAP7 but the assessment relates to natural sand.

201. Dr Meade claims that natural sand can be substituted with manufactured sand beyond what is presented in the analysis. However, he does not present any information about uptake rates or market shifts seen in NZ. The economic analysis draws on work by Mr Donaghue as well as direct sector engagements.

202. Dr Meade indicates that the deadweight losses should be excluded from the analysis and quotes the NZ Treasury about "general taxation" – the quoted words are from the text box. It appears that Dr Meade's position is that the deadweight losses would only apply to central government funding (taxation). He states that property rates are not distortionary like income or consumption taxes[113]. The key issue is

[110] Dr Meade's memo para 26 to 28.
[111] Dr Meade's memo para 33.3.
[112] Refer to para 95 that quotes Mr Donoghue.
[113] Dr Meade's memo para 35.2.1.

that changing the property rates to reflect the higher costs that are recovered could shift behaviour – the effects are about changes in household choices (e.g., smaller houses), avoided renovations, or changing household's mobility. I concur with Dr Meade that these effects are likely to be small.

5.1.4 Additional considerations

203. As part of the CIA, Dr Meade provides his estimates of other, non-economic effects, covering:

    a. Possible environmental costs and lost amenity,

    b. Cultural costs.

5.1.4.1 Environmental costs and lost amenity

204. The environmental costs and risks that Dr Meade identifies and includes relate to negative impacts on the benthic ecology[114]. These are non-economic matters and beyond the scope of the economic assessment.

205. Dr Meade points to the potential effects arising from damage to the extraction vessel. While this risk is valid, the economic values associated with this are expected to be small. As indicated[115], the *William Fraser* is subject to Martine NZ laws and undergoes surveying to ensure seaworthiness (and reliability). While there is a risk of an adverse event, maritime accidents in New Zealand are limited. No specific (relevant) information that could be used to provide an indication of the relative risk due to the sand dredging could be found. Measures to respond to maritime events are however, in place. For example, the ability to respond to an adverse event is guided by New Zealand's Oil Spill Readiness and Response Strategy (2022-2026) which outlines the tiered approach. Tier 3 is the highest level and consists of a nationally led response, coordinated by Maritime NZ. Tier 1 is the lowest level, undertaken by the operators responsible for the spill. The proximity of Ports of Auckland and NorthPort means that the response time (during an adverse event) is likely to be short, minimising damage and environmental effects.

206. To assess the loss of amenity values, Dr Meade presents information from a report titled: The Price of Aesthetic Externalities[116]. He equates the loss of value outlined in that report to the effects local households would experience due to "further degradation to Te Ākau Bream Bay coastal marine environment, even if this arises just to residents' knowledge of trawling activities being undertaken on a regular and consistent basis".

207. The report considers three externalities to estimate the price of aesthetic externalities:

    a. Presence of a water view,

    b. Appearance of surrounding improvements,

    c. Quality of landscaping in the neighbourhood.

208. The relevance of these externalities and transferability to the Bream Bay case is unclear. As mentioned, Dr Meade draws on the mentioned report to value "residents' knowledge of trawling activities" but the technical appropriateness of this transfer is questionable. The report assesses visual aspects and Dr

[114] Dr Meade's memo para 48.1.
[115] Para 180
[116] Bourassa, S. C., Hoesli, M., & Sun, J. (2003). *The price of aesthetic externalities*. FAME Research Paper Series, rp98, International Center for Financial Asset Management and Engineering. Link

Meade's calculation uses a "knowledge of" basis – that is the report measures something that can be seen, and Dr Meade allies this to something the a person is aware of.

209. Even if the stated values are used to estimate the potential visual impact of the MBL activities, the values should be applied with caution. The extraction area is near NorthPort and is already affected by maritime traffic and applying the ratios to the MBL operation without reflecting existing activities will overstate the effects.

5.1.4.2 Cultural loss

210. In terms of the cultural costs/losses,[117] these are appropriately reflected in the CIA. Dr Meade draws on finance literature to provide a sense of the scale of loss and uses "equity control premium" to present the value of the lost control[118]. However, the input data needed to undertake this type of analysis is not available.

211. Therefore, Dr Meade takes another approach and applies 1% of the cost per minor injury to the number of Māori residents in Te Akāu Bream Bay – suggesting that the per person loss is $2,804. The basis for 1% is unclear. However, the parameter must be adjusted to reflect costs such as vehicle damage to better reflect the intended application. After making these adjustments and the applying Dr Meade's approach, the cultural loss would be in the order of $37.6m. A Willingness-to-Pay (WTP) type estimate to understand the effects of the cultural loss would be more appropriate. A literature search did not uncover any New Zealand specific metrics to use.

212. It is important to note cultural contribution (offered on an *augier* basis) that the consent holder must a pay separately to:

    a. Te Parawhau ki Tai,

    b. Ngātiwai Trust Board, and

    c. Patuharaheke Te Iwi Trust Board (or their nominated entities)

213. The contribution is set at $0.30+GST/m^2 of sand extracted. This condition is intended to recognize the cultural relationship of iwi with the moana and sand resources, and to support ongoing kaitiakitanga and iwi wellbeing initiatives. The present value of this contribution (incl GST) is $5.5m.

5.2 Concluding remarks

214. The CIAs relating to the economic assessment included a memorandum relating to the economic assessment. None of the points raised in the memorandum changes the conclusion of the economic assessment. The issue that could make the largest impact on the results is the discount rate – the economic assessment uses the appropriate rate. The higher rate is for situations where a new business is established, and public funds are used to establish it.

215. The findings of the economic assessment remain valid and the additional information that Dr Meade provides remains valid. The scale of the anticipated benefits is significant and are greater than those

[117] Dr Meade's memo para 50 to 60.
[118] Dr Meade's memo para 52.

identified in a recently approved FTAA application for a quarry north of Auckland. That assessment used a similar analysis structure as the one used in the economic assessment.

6 Conclusions

216. Access to sufficient sand is essential to facilitate Auckland's economic growth aspirations by enabling cost effective infrastructure investment. The location of the sand resource relative to end users is important because transport distance and mode combine to influence the delivered cost of sand. In turn, concrete prices increase in line with input costs thereby influencing infrastructure delivery. Investment in things such as roads, buildings, three waters[119] and other assets become more expensive leading to difficult trade-offs. The direct benefit (avoided cost) associated with enabling sand extraction at Te Ākau Bream Bay is estimated at $383.1m. This includes costs associated with the environmental and social externalities that are estimated at $124.9m. Clearly, these are significant costs and avoiding them will deliver significant regional benefits.

217. A portion of the costs relate to avoiding emissions. While the assessment expresses the avoided emissions in dollar terms, it is important to note that the calculation uses the shadow price of carbon – it does not reflect the damage associated with weather and extreme natural events associated with climate change. Reducing New Zealand's overall emissions is critical.

218. Auckland's primary source of sand, located at the Taporapora banks in the Kaipara Harbour, has consents that will expire in 2027, and obtaining new consents is not guaranteed and there is uncertainty around the future availability of high quality sand. This makes Auckland's sand supply vulnerable, so additional sources of high quality sand, such as that found in Te Ākau Bream Bay, are essential to increase Auckland's sand supply's resilience.

219. Enabling sand extraction at Te Ākau Bream Bay will provide resilience to the sand supply network and provide additional flexibility to the concrete supply chain. A strong supply network is needed to ensure that the construction sector can respond to investment activity associated with growth as well as demand impulses associated with activity arising from extreme weather events. Further, enabling Te Ākau Bream Bay will add a second source of high quality sand to the Auckland sand market thereby lowering concentration risks associated with sourcing a substantial share of sand from one resource.

220. In addition to the avoided costs, enabling sand extraction at Te Ākau Bream Bay will deliver significant benefits to regional Auckland by supporting the construction sector, thereby contributing to, and facilitating, the delivery of infrastructure and development costs.

221. Without enough high-quality sand, there will be delays in delivering the concrete used to complete such projects. Limited sand supply will mean that sand will be rationed across concrete suppliers, and investments in environmental infrastructure will compete for concrete and other resources, meaning that delivery timeframes will be pushed out.

222. As the economy returns to a growth pathway, pressures on the sand supply market are expected to emerge. These pressures could constrain construction's ability to respond to future growth (i.e., the change in activity levels) as well as any demand impulse arising from projects associated with the Fast Track Approvals Act (2024).

[119] Stormwater, wastewater and drinking water.

223. Enabling sand extraction in Te Ākau Bream Bay will provide supply chain resilience and avoid concentration risks associated with having a significant share of Auckland sand originate from one source. Diversifying supply options across multiple sources locations helps to address these risks. Te Ākau Bream Bay is a high quality sand that is essential for high strength applications associated with infrastructure investment. Infrastructure delivery is a key focus of the Fast-track Applications Act and enabling Te Ākau Bream Bay aligns directly with the purpose of the Act.

Appendix 1: Historic projects using Auckland Marine sand

The high-quality sand of Mangawhai-Pākiri was used across many high-profile projects in Auckland as well as the upper North Island. The quality of the resource meant that it was preferred to other sources because it lowered the whole-of-life costs (i.e., due to improved durability and workability considerations). Due to Bream Bay sand being a similar particle size distribution and of similar source origins it is considered that it could have been substituted for Pākiri sand in any of these projects.

The following list provides examples of some of the essential infrastructural projects that have been historically constructed using Mangawhai-Pākiri sand:

- Ports of Auckland wharves
- Central interceptor
- Central Rail Link
- Port of Auckland wharves
- Auckland War Memorial Museum
- Auckland Harbour Bridge
- Auckland University
- Sky Tower and Sky City
- Newmarket viaducts (2)
- Greenhithe Upper Harbour Bridge
- Auckland Motorway System
- Waterview Tunnel
- Puhoi Tunnels
- Vector Tunnels
- Eden Park stands etc
- New Tauranga Harbour Crossing
- Port of Napier wharf development.

Source: MBL

Appendix 2: Sand extraction operations – key facts

Region	Region Supplied	Owner	Operator	Consent expiry	Max. Annual Volume	Converted Saleable Tonnes	Estimated available Tonnes	Comment
Taporapora Sand Bank Kaipara	Auckland	Winstone Aggregates	Winstone Aggregates	21/05/2027	264,000	475,200	387,500	Extracted by Mt Rex Shipping. They are currently unable to supply any further volume due to operational constraints.
	Auckland	Atlas	Mt Rex Shipping	21/05/2027	336,000	604,800	362,500	Extracted by Mt Rex Shipping. They are currently unable to supply any further volume to customers due to operational constraints.
Tomarata	Auckland/Northland	Semenoff Group	Semenoff Group		53,734	96,721	75,000	Volume sold into at least four concrete plants in Auckland (Holcim and Bridgeman). Volume going into some Northland plants but spare capacity for Holcim created by start of Ruakākā sands and supply to Firth Whangārei block and concrete plant
		Tomarata Sand Glass Corporation	NA		80,000	150,000		Small volumes going locally. There is no processing plant on site, so it is not a finished product
Pukekawa Sand Plant	Auckland / Waikato	Winstone Aggregates Ltd	Winstone Aggregates	30/06/2046	120,000	129,600	129,600*	Volume not sold into Auckland ready-mix concrete plants. There is limited spare capacity assumed as an operational issue
Tuakau sand Plant	Auckland / Waikato	Fulton Hogan	Fulton Hogan	7/02/2038	180,000	194,400	194,400*	Volume sold into some Auckland concrete plants. They also supply some Waikato plants and a lot of the turf customers now. Yield of No.1 sand is 60% as per Winstone Aggregates sand extraction in Pokeno. The ability to expand production is limited.

* Only a portion of these volumes are available for use in the Auckland market with a portion used in the Waikato market. In addition, only a portion of the resource is available for use in the concrete market.
Source: MBL