

Appendix E NERA Economics Assessment

Effect on landfill gate prices of the Auckland Regional Landfill

Report for Waste Management New
Zealand

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Contents

1.	Introduction	1
1.1.	Instructions.....	1
1.2.	Conclusions.....	1
2.	The Factual	5
2.1.	Overview of market structure	5
2.2.	Barriers to entry and expansion and concentration measures.....	9
3.	The Counterfactual	12
4.	Comparing the Factual and Counterfactual.....	13
4.1.	Conceptual analysis	13
4.2.	How much would price rise?.....	16
4.2.1.	Cournot model	17
4.2.2.	Building on previous NZCC analyses	18
4.2.3.	Conclusion.....	20
5.	Alternative scenario	22
5.1.	Calibrated demand in the Alternative Counterfactual.....	22
Appendix A.	Cournot modelling of the price effect	25
A.1.	Cournot model with no capacity constraints	25
A.2.	Price when firms are capacity constrained.....	27
A.3.	Sensitivity testing.....	28
A.4.	Developing the Cournot model	28

1. Introduction

1.1. Instructions

1. Waste Management New Zealand (“**WMNZ**”) is currently developing the new Auckland Regional Landfill (“**the Project, or the ARL**”) in Wayby Valley, approximately 70km north of Auckland city.¹ For the Project to be operational and accepting waste in 2035, WMNZ is seeking consents under the Fast-track Approvals Act 2024.
2. We have been asked to estimate what the potential effect on landfill gate prices would be if the Project does not obtain consent and therefore is not operational by 2035. More specifically, we estimate the difference in landfill gate prices between two scenarios:
 - A. **The Factual:** The scenario in which WMNZ is successful in obtaining consent for the Project and is able to begin accepting waste in 2035. We refer to this as “**the Factual**”, because it is the scenario WMNZ is seeking approval for; and
 - B. **The Counterfactual:** The scenario in which the Project does not obtain consent and therefore cannot accept any waste from 2035 (for an indefinite time). We are instructed to assume that Hampton Downs would be able to absorb the Auckland waste that would otherwise have gone to the Project. We refer to this as “**the Counterfactual**”, because it is the scenario that we are instructed to assume would occur if WMNZ is not successful in obtaining a consent for the Project.
3. We are also instructed to consider the impact on landfill gate prices in a scenario in which Hampton Downs’ capacity is limited to its current volume of waste. To do this, we define an alternative factual in which Hampton Downs’ capacity for Auckland waste in 2035 is equal to the volume of waste it currently accepts. We refer to this as “**the Alternative Factual**”. We compare this to an alternative counterfactual scenario where the ARL does not obtain consent and therefore cannot accept any waste from 2035. In addition, Hampton Downs is assumed to be at capacity and therefore would only accept waste up to its current volumes, i.e., it would not be able to take any additional waste from Auckland compared to the Alternative Factual. We refer to this as “**the Alternative Counterfactual**”.
4. In our analysis, we assume the landfills that could take Auckland waste in 2035 under the:
 - A. Factual (and Alternative Factual) are the ARL, Hampton Downs, Whitford, and Puwera; and
 - B. Counterfactual (and Alternative Counterfactual) are Hampton Downs², Whitford, and Puwera.

1.2. Conclusions

5. Table 1 below summarises and compares the key features of the market in the Factual and the Counterfactual.

¹ “Auckland Regional Landfill Background: What and Why?,” Waste Management, accessed February 11, 2026, <https://www.wm.nz/my-region/auckland/auckland-regional-landfill/background-what-and-why/>

² While we assume that Hampton Downs will be able to accept waste in the Counterfactual and the Alternative Counterfactual, we use different capacity assumptions for each scenario.

Table 1: Market features under the Factual and the Counterfactual

Feature	Factual	Counterfactual
Entry and expansion	High barriers to entry and expansion.	High barriers to entry and expansion.
Market structure	<u>Four</u> landfills competing for Auckland waste (approximately 1.6m tonnes annually): - Two of these (the ARL and Hampton Downs) are large and are assumed to be annually unconstrained by consents (although they might be annually constrained by the opportunity cost of giving up future capacity and other practical considerations). - One (Whitford) is a material size but consent-limited to 350,000 tonnes per annum. - One (Puwera) is distant and has little available capacity for Auckland waste.	<u>Three</u> landfills competing for Auckland waste (approximately 1.6m tonnes annually): - One of these (Hampton Downs) is large and is assumed to be annually unconstrained by consents (although it might be annually constrained by the opportunity cost of giving up future capacity and other practical considerations). - One (Whitford) is a material size but consent-limited to 350,000 tonnes per annum. - One (Puwera) is distant and has little available capacity for Auckland waste.
Key competitive dynamic	For the bulk of Auckland waste, the main competition would be between the ARL and Hampton Downs.	For the bulk of Auckland waste, Hampton Downs would in effect be a monopolist.

6. We would expect landfill gate prices to be materially higher under the Counterfactual (i.e. if the Project does not proceed) than under the Factual, because:
 - A. The absence of the Project as a competitor in the Auckland landfill market would result in a materially higher market concentration, the effect of which would be amplified by capacity constraints on Whitford and Puwera, as well as the distance to Puwera (which is located 175km away from Auckland's CBD,³ north of the Brynderwyns⁴).
 - B. There are high barriers to building a new landfill and expanding the capacity of existing ones, particularly over the short- to medium-term, placing limits on supply-expansion.
 - C. Demand for landfills is relatively inelastic.
7. The net effect would be a new equilibrium characterised by higher landfill gate prices and lower quantities of waste dumped in landfills.⁵

³ We are advised the distance is approximately 175km.

⁴ Which involve significant elevation as well as resilience concerns until the replacement motorway, the northern corridor, is constructed.

⁵ As price rises, demand for landfill services would drop. Something else would need to be done with the excess waste. Whatever that is (be it reduction in waste-producing economic activity, more sorting, fly tipping, etc.), that would also have a cost.

8. With the information available, accurate price increases are difficult to forecast. We use two approaches to estimate a range of potential price increases in the Counterfactual compared to the Factual - that range is 10% to 30%. These results are summarised in Table 2 below.

Table 2: Estimated range of price increases

Methodology	Estimated Counterfactual market price (\$ per tonne)	Estimated Counterfactual market price increase compared to Factual price of \$176.15 per tonne
Building on previous NZCC analysis (see Section 4.2.2 below)	\$193.77 to \$202.58	10-15%
Cournot modelling (see Section 4.2.1 below)	\$ 228.77	29.9%

9. By building on previous analysis by the Commerce Commission ("**the NZCC**"), we conclude that, because of the significant increase in market concentration in the Counterfactual compared to the Factual, competition regulators such as the NZCC would consider the reduction of landfills from 4 to 3 to substantially lessen competition if they were assessing the same transaction under a merger scenario, particularly given one of the remaining landfills (Puwera) is distant and has little available capacity for Auckland waste. Therefore, using previous assumed price increases in the NZCC's merger authorisation decisions (where a substantial lessening of competition is assumed), we estimate that prices would increase by at least 10-15%.
10. We also perform Cournot modelling, in which we assume each landfill independently (and simultaneously with the other landfills) chooses the quantity that it will supply to the market.⁶ This quantity is chosen so as to maximise the landfill's profits,⁷ taking the quantity supplied by every other landfill as given. The single market price (that all landfills receive) is then determined by equating the total market supply to market demand using a calibrated demand curve, so that the market clears. Using a Cournot model, we estimate that the Project's absence from the market in the Counterfactual would result in a 29.9% price increase compared to our Factual market price.
11. For the reasons we explain in the main body of this report, we should be cautious in how much weight we place on the Cournot model results. Nevertheless, the Cournot model and other features of the market do suggest that we might expect prices to increase by more than the bottom end of our range.
12. Even the bottom end of this estimated range of price increases (10-15%) should be regarded as a material price increase. Competition regulators (including the NZCC) would generally consider a price increase of this magnitude arising from a transaction (such as a merger) as constituting a substantial lessening of competition.⁸

⁶ In the case of landfills, quantity is effectively air space to be filled with waste.

⁷ We assume all landfills are run on a profit maximising basis.

⁸ For example, footnote 37 of the Commerce Commission's May 2022 *Mergers and Acquisitions Guidelines* state: "Where the lessening of competition manifests in price increases, the High Court has indicated that a price increase

13. It might be that we would observe more demand response⁹ by the time prices get towards the top end of our range, and perhaps expansion by one or more of the landfills. However, expansion, in particular, would take time. Indeed, due to the barriers we discuss in this report, it is difficult to see expansion occurring until well into the Counterfactual period.
14. The price increases we are estimating are those at the gates of landfills that service Auckland demand, specifically the Whitford, Hampton Downs and Puwera landfills. These gate price increases (particularly those at Hampton Downs and Puwera) would likely also affect Northland, Waikato and Bay of Plenty users of landfills to some extent.
15. These price increases would result in a substantial increase in costs for the users of landfills. In 2035, we are instructed to assume that total Auckland demand for waste disposal would be just under 1.6 million tonnes. For example, if we assume a price increase of 15%, which equates to an additional \$26.42 per tonne, approximately \$42.2 million¹⁰ extra would be paid by users each year to dispose of this waste, at least until some sort of response occurred.
16. We also investigate an alternative scenario which assumes that Hampton Downs would not be able to accept any additional waste beyond its current volumes. Table 3 below summarises and compares the key market features in the Alternative Factual and Alternative Counterfactual.

of over 4–5% provides a general guide as to a price increase that would indicate a ‘substantial’ lessening of competition. The Court also noted that price increases of less than 4% can be sufficient to amount to a substantial lessening of competition. *Woolworths & Ors v Commerce Commission* (HC), above n 32 at [145] and [156].”

⁹ E.g., reduction in waste-producing economic activity, more sorting, fly tipping.

¹⁰ Note the value of \$42.2 million results from using the more precise underlying figures, rather than a value of \$42.3 million when using the rounded numbers as presented in the paragraph (1.6 million tonnes × \$26.42 per tonne).

Table 3: Market features under the Alternative Factual and the Alternative Counterfactual

Feature	Alternative Factual	Alternative Counterfactual
Entry and expansion	High barriers to entry and expansion.	High barriers to entry and expansion.
Market structure	<u>Four</u> landfills competing for Auckland waste (approximately 1.6m tonnes annually): - Two of these (the ARL and Hampton Downs) are large. The ARL is assumed to be annually unconstrained by consents (although it might be annually constrained by the opportunity cost of giving up future capacity and other practical considerations). Hampton Downs is consent-limited to 800,000 tonnes (of which 600,000 tonnes are assumed to be attributed to Auckland). - One (Whitford) is a material size but consent-limited to 350,000 tonnes per annum. - One (Puwera) is distant and has little available capacity for Auckland waste.	<u>Three</u> landfills competing for Auckland waste (approximately 1.6m tonnes annually): - One of these (Hampton Downs) is large and is consent-limited to 800,000 tonnes (of which 600,000 tonnes are assumed to be attributed to Auckland). - One (Whitford) is a material size but consent-limited to 350,000 tonnes per annum. - One (Puwera) is distant and has little available capacity for Auckland waste.
Key competitive dynamic	For the bulk of Auckland waste, the main competition would be between the ARL and Hampton Downs. Out of these two, the ARL would be the most competitive.	The most competitive landfill (the ARL) would not exist. The remaining landfills would face excess demand as they would likely be unable to accept a material portion of Auckland waste.

17. Using the calibrated demand curve from the Cournot model, we estimate the price at the Alternative Counterfactual capacity level to be approximately 103% higher than our Alternative Factual market price. There are some caveats that apply to this approach and we need to be cautious when interpreting these results (see Section 5.1). However, given the approximately 560,000 tonnes of excess waste (equal to 35% of Auckland's annual waste volume) in the Alternative Counterfactual scenario, we would still expect a very material price increase, likely greater than what we estimate under our Counterfactual scenario.
18. While the focus of our assessment is on the landfill gate price, from that perspective it is reasonable to conclude that the ARL being operational and accepting waste would have significant regional benefits for Auckland and likely also Northland, Waikato, and Bay of Plenty.

2. The Factual

2.1. Overview of market structure

19. We define the Factual as the scenario in which the Project is operational (and consented) in 2035. In this scenario, Auckland landfill waste would be received by the ARL, Whitford, and

Hampton Downs. For the reasons we explain further below, we assume Puwera would not take any waste under the Factual, but it would have some capacity to do so, meaning it would be a competitive threat up to that capacity.

20. We assume that Auckland currently produces approximately 1.45 million tonnes of landfill waste each year.¹¹ To estimate Auckland's waste volume in the year 2035, we are instructed to use a growth rate of 1% per annum. This gives us an estimate of approximately 1.6 million tonnes of landfill waste being generated by Auckland in 2035.
21. The landfills that currently accept waste from Auckland are Hampton Downs, Whitford, Puwera, and Redvale. Redvale is operated by WMNZ and currently has a consent to operate until December 2028. However, WMNZ has submitted an application through the fast-track process to extend Redvale's operations until the end of 2036, so that Redvale is able to continue operating up until the ARL Project is assumed to open.¹²
22. To anchor our analysis, we need an assumption about "market price" under the Factual in 2035, i.e., the price at which the Auckland demand for landfill services clears in 2035 under the Factual. For simplicity we assume the Factual "market price" in 2035 is equal to the current Redvale gate price inflated to 2035 using the Reserve Bank of New Zealand's CPI midpoint target of 2% per annum.¹³ In other words, we project the current Redvale gate price forward by 2% per annum, compounded annually, to obtain the market price in 2035.
23. A more detailed breakdown of assumed current and 2035 volumes, and capacity assumptions for each of the landfills receiving Auckland waste, are shown in Table 4, followed by a brief overview of each landfill.

¹¹ For other estimates see Auckland Council, Waste Minimisation and Management Plan 2024: Towards Zero Waste, 2024, ("Auckland Council 2024 Waste Management Plan"), p. 8. This Auckland Council report notes that more than 28,000 tonnes of waste is produced per week. Note that other possible values include a 2022 estimate of approximately 1.48m tonnes from the Auckland Council's 2023 waste assessment (Auckland Council, Auckland's Waste Assessment 2023, November 2023, p.39).

¹² We are instructed on this basis to assume there would be no overlap between the opening of the ARL and the closure of Redvale if the Redvale consent extension is granted.

¹³ "Inflation", Reserve Bank of New Zealand, accessed 11 February, 2026, <https://www.rbnz.govt.nz/monetary-policy/about-monetary-policy/inflation>

Table 4: Factual volumes and capacities in tonnes¹⁴

Landfill	2025 annual volume (from Auckland)	2035 annual volume (from Auckland)	2035 annual capacity available to accept Auckland waste	2035 volume market shares (%)
Redvale	577,906	Not operational	Not operational	
Whitford	217,643	350,000	350,000	22%
Hampton Downs	600,000	600,000	1,159,316 ¹⁵	38%
Puwerā	50,000	0	87,469	0%
ARL	Not operational	646,785	646,785 ¹⁶	41%
Total	1,445,549	1,596,785		

Source: See the below paragraphs for the sources of these values.

- A. **ARL:** The Project has a planned landfill facility that is currently under development. It is located in Wayby Valley, approximately 70km north of Auckland's CBD, and is expected to open in 2035 if consent is obtained. We are instructed to assume that if the ARL were to obtain consent, it would not be consent-restricted by annual capacities, only total airspace. In our Factual scenario, we assume that the Project would receive the tonnes that previously went to Redvale, the Auckland tonnes that previously went to Puwerā, and any growth in Auckland waste not accepted by Whitford.
- B. **Whitford:** This landfill is a 50:50 joint venture between Auckland Council and WMNZ.¹⁷ We understand that Whitford's current pricing decisions are made by the joint venture manager, acting independently from WMNZ and the Council. Our analysis assumes this will continue through to 2035 and therefore Whitford's pricing will be set independently of that at the ARL. Whitford is located approximately 30km southeast of Auckland's CBD.¹⁸ Whitford currently receives approximately 217,000 tonnes of waste from Auckland (15% of current market share by volume).¹⁹ Current designation conditions limit waste intake for Whitford to 350,000 tonnes a year and 155 trucks per day.²⁰ In our analysis, we assume that Whitford operates at capacity in both scenarios for the following reasons:

¹⁴ The capacity and volumes presented in this report relate to Auckland waste only.

¹⁵ We are instructed to assume that Hampton Downs will have the capacity required to take on any excess Auckland waste. We calculate Hampton Downs' total available capacity (for Auckland) as its current intake plus the residual Auckland waste remaining once Whitford and Puwerā have reached their capacities. Assuming a higher capacity (within reasonable bounds) would not affect our conclusions.

¹⁶ While the Project is not consent-restricted for its annual capacity, we assume for analytical purposes there is a limit to the amount of waste it can accept annually. This may be due to logistical factors that limit the amount of waste that the ARL would be able to accept in a day, or self-imposed limits in order to extend the lifespan of the landfill. In our HHI analysis we assume that the ARL's capacity is its volume in the Factual (i.e. the ARL operates at capacity in the Factual).

¹⁷ Auckland Council 2024 Waste Management Plan, p.45

¹⁸ Straight line distance is about 23km, and 30km via roads (<https://maps.app.goo.gl/HRzUAEFYpm1GwANp9>)

¹⁹ Waste Management, WDS 22-25 Tonnes and Rev summary.xlsx, received 18 June 2025, "WDS 22-25 Tonnes Summary", cell D15.

²⁰ Tonkin & Taylor, Assessment of Alternatives - ARL Transition Project, June 2025, ("T+T Assessment of Alternatives"), p.13.

- i. Whitford will be the closest landfill to Central Auckland once Redvale closes, regardless of whether the Project opens or not. This means that Whitford, as the nearest facility, will be the cheapest site to which waste can be transported from Central Auckland. Of course, demand for Whitford's services will also be a function of the price it charges, but we are instructed to assume it will reach capacity before any residual volumes are diverted to the more distant landfills.
 - ii. As the population of Auckland grows, total waste volumes (demand) will also increase.
- C. **Hampton Downs:** owned by Enviro NZ, this landfill is located in North Waikato, approximately 70km south of Auckland's CBD.²¹ Hampton Downs is estimated to currently take approximately 800,000 tonnes of waste a year.²² While a portion of this capacity is used to service the Waikato and Bay of Plenty regions, Hampton Downs primarily receives waste from Auckland. Information on what proportion of Hampton Downs' waste originates from Auckland is limited, but estimates show that it is likely around 600,000 tonnes of waste a year, with 200,000 tonnes assumed to originate from the Waikato and Bay of Plenty regions.²³ In the Factual scenario, we assume that Hampton Downs continues to operate at current volumes, and we are instructed to assume that it has spare capacity. In the Counterfactual, we assume that Hampton Downs could and would accept any remaining waste once Whitford and Puwera are at capacity.
- D. **Puwera:** Also known as the Northland Regional Landfill, this landfill is a 50:50 joint venture between Northland Waste and the Whangarei District Council.²⁴ Puwera is currently estimated to receive approximately 100,000 tonnes of waste per annum,²⁵ and while it is not clear what proportion originates from the Greater Auckland region, estimates by Tonkin & Taylor Ltd list the current volume to be approximately 50,000 tonnes, representing 3% of the total Auckland market volume.²⁶ Puwera is located approximately 175km away from Auckland's CBD.²⁷ Transporting waste from Auckland would likely lead to high costs, making it a less desirable destination. Compared to Puwera, the ARL would be a much closer²⁸, and less costly, alternative, with much more capacity. Therefore, we assume that in the Factual, Puwera would not take any waste from Auckland, with the waste volumes instead going to the ARL. However, under the Factual, Puwera would still have some available capacity. Puwera is estimated to have approximately 2,500,000 cubic metres of air space remaining as of June 2024, but it is unclear whether its consents contain any annual capacity constraints.²⁹ Due to its current waste intake being much smaller compared to

²¹ Straight line distance is about 64km, and 70km via roads (<https://maps.app.goo.gl/Nbau1n3uNwCdkMjW8>)

²² T+T Assessment of Alternatives, p.14.

²³ This is obtained from Tonkin+Taylor's report which references the Auckland Council's 2017 waste assessment report allocating approximately 600,000 tonnes a year to Hampton Downs from Auckland (T+T Assessment of Alternatives, p.14, footnote 9).

²⁴ Whangarei District Council, Northland Regional Landfill Limited Partnership Statement of Intent and Business Plan 2022/23, 2022, A.5.1.

²⁵ T+T Assessment of Alternatives, p.14.

²⁶ T+T Assessment of Alternatives, p.1.

²⁷ We are advised the distance is approximately 175km.

²⁸ Approximately 70km north of Auckland CBD.

²⁹ T+T Assessment of Alternatives, p.11.

other landfills, we assume that any excess annual capacity would be relatively small. As an estimate, we use analysis from WMNZ, which assumes that following Redvale's closure, Puwera would take over some of Redvale's volumes, mostly comprising of waste from Puwera's operator Northland Waste. WMNZ estimates this to be approximately 37,500 tonnes which, when added to Puwera's estimated current intake from Auckland, would lead to a total capacity of approximately 87,500 tonnes available for Auckland waste.³⁰ We assume that this additional capacity for Auckland waste remains even once the ARL is operational.

2.2. Barriers to entry and expansion and concentration measures

24. We demonstrate in this subsection that:

- A. The Auckland landfill waste market is already highly concentrated; and
- B. There are high barriers to entry and expansion; and
- C. Accordingly, the Auckland landfill waste market is likely to remain highly concentrated for a material length of time beyond 2035.

25. The high barriers to entry into landfill markets were noted by the NZCC in its 1999 merger decision between WMNZ and Waste Care Limited.³¹ The relevant market was defined within Auckland, with waste disposed at a regional level. Competitors to the merged entity were within Auckland, alongside historic Waikato landfills which have since ceased operations (we understand that Hampton Downs came into operation after the NZCC's decision). Puwera, which was in development stage, was not considered to be a competitive constraint due to its intention of accepting only regional volumes, as well as transportation constraints.

26. In its decision, the NZCC noted the following conditions of entry for the landfill market at the time:

- A. Suitable Site Location: Landfills require investment in land that is not only in a suitable location relative to where the waste is generated, but is large enough to be able to compete with other landfills. In its decision, the NZCC noted a generally held view in the industry that environmentally robust and suitably located sites were very scarce.
- B. High Capital Cost: It was recognised that the development of a landfill requires substantial capital investment. With the majority of the large establishment costs being sunk costs, the downside risk from investment in a landfill is very high and therefore serves to discourage entry into the market.
- C. Regulatory Requirements: The decision noted that a number of consents must be obtained prior to the operation of a landfill, with a high likelihood of delays and appeals adding to the length of the consent process. Given the high capital investment required to enter into the landfill market, the regulatory requirements would increase the risk of investment, and may make potential entry into the market less appealing.

³⁰ Waste Management, Redvale Tonnage disposal locations post RV.xlsx, received 18 June 2025, cell S42

³¹ NZCC, Decision 355 - Application for Acquisition Clearance - Waste Management and Waste Care, May 1999, para. 169-190.

- D. Economic Volumes: Sufficient volumes of waste are needed to economically justify the establishment of a new landfill, with the volumes in most regional markets being insufficient to justify more than one landfill, meaning entry against an incumbent would be unlikely and, if attempted, extremely difficult and risky.
 - E. Vertical Integration: Given some landfills were vertically integrated by also being present in the collections process, the NZCC noted that this could increase the difficulty of a potential entrant securing enough volumes to make entry viable.
 - F. Incumbent Response: The NZCC noted another major factor as being the threat of strategic behaviour by the incumbents. Responses may include appealing consents, the ability to formulate a counter-strategy due to the lengthy entry process, and the ability to selectively price at marginal cost to retain business. This may further discourage entry into the market.
27. These conditions of entry likely remain in place for Auckland today, and when the ARL opens in 2035.³² We understand there have not been any new entrants in the Auckland or neighbouring regions since the NZCC's 1999 decision, other than Hampton Downs.
28. While in this decision the NZCC did not explicitly reference barriers to expansion, it is likely that some of these entry conditions would also present themselves as expansion conditions. For example, regulatory requirements, such as consent applications, are likely to be a material barrier for landfills to expand their operations.³³
29. Therefore, in our analysis we assume that Whitford, Hampton Downs, and Puwera will not be able to expand their capacities sufficiently or in a timely enough way to undermine the price increases we estimate below.³⁴
30. In terms of concentration, we measure this using the Herfindahl-Hirschman Index ("**HHI**"). This is a calculation often used by competition agencies as a screening device in merger analysis. It is calculated by squaring the market share of each firm in the market and then summing the results.³⁵
31. In our HHI calculations, we use each landfill's annual capacity for Auckland waste, rather than annual volumes, to derive market shares. This is because, Puwera, one of the four competitors, does not receive any waste volumes in the Factual. Using volumes would therefore understate Puwera's potential competitive presence and effectively reduce the market to three landfills.

³² This is evident from the various appeals the ARL has faced during its planning, indicating that factors such as regulatory requirements are still substantial hurdles to overcome. See for example the Environment Court decision of *Te Rūnanga o Ngāti Whātua v Auckland Council* [2023] NZEnvC 277 was appealed to the High Court: *Te Rūnanga o Ngāti Whātua and Royal Forest and Bird Protection Society of New Zealand Incorporated v Auckland Council* [2024] NZHC 3794. Leave was subsequently sought to appeal the High Court decision to the Court of Appeal in February 2025.

³³ See for example the earlier consenting process for Redvale - *Waste Management NZ Limited v Auckland Council* [2015] NZEnvC 178; [2016] NZEnvC 043; T+T Assessment of Alternatives, p.3.

³⁴ The joint ownership of Whitford with the Council might also increase the complexity of expanding Whitford's capacity.

³⁵ For example, if the market consisted of four firms with shares of 40%, 30%, 20% and 10% then the HHI would be 3,000 ($40^2 + 30^2 + 20^2 + 10^2$).

32. As the HHI value increases, the market is considered to be more concentrated, with the maximum value of 10,000 representing a monopoly (i.e. a single firm with a market share of 100% as $100^2 = 10,000$).
33. The US Department of Justice ("**DOJ**") and Federal Trade Commission ("**FTC**") commonly use the HHI of a market when assessing mergers. In their merger guidelines, the DOJ and FTC note:
- A. Markets with an HHI greater than 1,800 are highly concentrated.³⁶
 - B. Mergers that create, or further consolidate, markets that are highly concentrated through an increase in the HHI of more than 100 points, are presumed to substantially lessen competition or tend to create a monopoly.³⁷
34. Similarly, in Australia, the Australian Competition and Consumer Commission ("**the ACCC**")³⁸
- A. Classes a highly concentrated market as a market with an HHI greater than 2,000.
 - B. Considers a change in HHI of more than 100 points as a significant increase in concentration.
35. Additionally, while the NZCC does not employ HHI thresholds as its primary screening tool, it uses a three-firm concentration ratio as a tool to assess the likelihood of a merger requiring a clearance application.³⁹ In its merger guidelines, the NZCC notes that mergers are less likely to raise competition concerns if the post-merger three-firm concentration ratio is less than 70% and the merged firm's combined market share is less than 40%, or if the post-merger three-firm concentration ratio is 70% or more and the merged firm's combined market share is less than 20%.⁴⁰
36. Table 5 shows the measures of market (capacity) concentration under the Factual.

Table 5: HHI and concentration ratio under the Factual (based on capacity-based market shares)

Concentration measure	Factual
HHI index	3,760
Three-firm concentration ratio	96%

37. These results clearly indicate that even under the Factual, there would be a high degree of market concentration in the Auckland landfill market. Therefore, we think it would be very likely that a competition regulator like the NZCC would oppose any further aggregation in this market.

³⁶ U.S. Department of Justice and the Federal Trade Commission, Merger Guidelines, December 2023, p.5.

³⁷ U.S. Department of Justice and the Federal Trade Commission, Merger Guidelines, December 2023, pp.5-6.

³⁸ ACCC, Merger assessment guidelines, June 2025, para. 1.24.

³⁹ The three-firm concentration ratio is the sum of the market shares for the three largest firms in the market. For example, in a market comprised of five firms with market shares of 30%, 10%, 20%, 5%, and 35%, the three-firm concentration ratio would be 85%.

⁴⁰ NZCC, Mergers and acquisitions guidelines, May 2022, para. 3.51

3. The Counterfactual

38. Under the Counterfactual, the ARL would not be operational in 2035 and Redvale would cease accepting waste by that date. This would mean that Auckland's almost 1.6 million tonnes of landfill waste would need to go to some combination of the three landfills that are expected to be operational and accept Auckland waste: Whitford, Hampton Downs, and Puwera, or else some other solution would need to be found (e.g., fly tipping, recycling, reducing waste, etc).
39. In the Counterfactual, we assume the following volumes for each of the landfills in the market:⁴¹
- A. **Whitford:** As explained in Section 2.1, in the Factual we assume that Whitford operates at capacity, taking 350,000 tonnes per annum. In the Counterfactual, the ARL not entering the market would not impact this assumption - we assume that Whitford would continue to take 350,000 tonnes of annual waste in the Counterfactual.
 - B. **Puwera:** In the Factual, we assume that due to its relative distance when the Project is operational, Puwera would not receive any waste from Auckland. However, in the Counterfactual, as the Project would not be in the market, we assume that Puwera would accept waste from Auckland⁴² up to its (Auckland-allocated) capacity of 87,469 tonnes per annum.
 - C. **Hampton Downs:** For the purposes of this analysis, we assume that Hampton Downs' existing consents permit it to take additional volume up to 600,000 annual tonnes, and therefore Hampton Downs could and would accept any excess waste once Whitford and Puwera reach capacity, that would have otherwise gone to the ARL in the Factual.
40. These values are summarised in Table 6 below.

Table 6: Assumed Counterfactual volumes⁴³ from Auckland (tonnes per annum)⁴⁴

Landfill	Volume	Market share (%)
ARL	-	-
Whitford	350,000	22%
Hampton Downs	1,159,316	73%
Puwera	87,469	5%
Total	1,596,785	

41. We note a caveat on the total volume estimates in the Counterfactual. Under our modelled price effects, the reduction in the number of landfills from 4 to 3 produces a new equilibrium characterised by a higher market price and a reduction in the total volume of waste. The lower volumes reflect that demand curves slope downwards, i.e., the expected behavioural response

⁴¹ Leaving aside for the moment any quantity reduction due to a higher Counterfactual price than under the Factual.

⁴² In reality this might be just from North Auckland.

⁴³ In the Counterfactual, we assume the three landfills in the market would be operating at full capacity. Therefore, the volumes presented here also equal the capacity of each landfill.

⁴⁴ Leaving aside for the moment any quantity reduction due to a higher Counterfactual price than under the Factual.

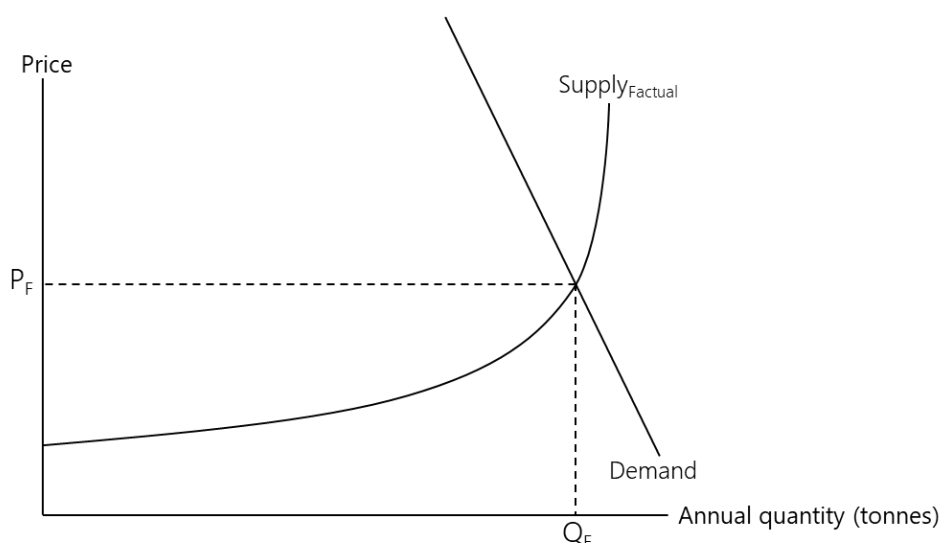
of consumers to higher prices would be a reduction in quantity demanded. For example, consumers may find alternative ways to dispose of their waste or reduce the quantity of waste produced. Therefore, the total volume of waste in the Counterfactual may in effect be lower than the volumes presented here.

42. For the purposes of our analysis, we assume that under the Counterfactual (relative to the Factual) neither Hampton Downs nor Puwera reallocate capacity from their existing regions to serve Auckland. In other words, Hampton Downs does not shift capacity away from Waikato/Bay of Plenty, and Puwera does not shift capacity away from Northland, to supply Auckland. We think a more likely outcome is that as demand for their services increases under the Counterfactual versus the Factual, Hampton Downs and Puwera would raise their prices to all customers, regardless of waste origin. In other words, if the ARL is unable to obtain consent, prices would likely increase for Northland, Waikato, and Bay of Plenty users of landfills, as well as Auckland users. Accordingly, the price increases we explain below would likely apply (at least to some degree) to Waikato, Bay of Plenty, and Northland waste as well as to Auckland waste.

4. Comparing the Factual and Counterfactual

4.1. Conceptual analysis

43. We have already mentioned our view that the NZCC would be unlikely to clear any sort of (further) aggregation within the Auckland landfill waste market. Indeed, the Counterfactual is actually worse for competition outcomes than simple aggregation (e.g., through a merger), because it would involve the ARL's capacity not existing in the market.
44. To compare the price effects under the Counterfactual compared to the Factual, we first present some conceptual analysis. Figure 1 stylistically depicts the Factual.

Figure 1: Auckland landfill market under the Factual (stylistic)

45. The supply curve represents the supply of landfill services (annual quantity) that would be offered at various prices. This curve has an increasing slope as quantity nears capacity, reflecting rising short run marginal costs (SRMC). Absent expansion or entry, once capacity is reached, the supply curve will in effect be vertical – regardless of price, no more output can be produced.
46. The relevant demand curve is that of collectors of waste – it is derived from the demand of waste creators (e.g., households and businesses).
47. There is a lack of quantitative evidence regarding the elasticities of demand for this derived demand curve. However, there are studies (and summaries of studies) of the demand elasticity of waste creators, particularly households. We outline the results in Table 7, including our brief comments on each of these sources (and noting that none of these are recent).

Table 7: Demand elasticities – estimates from the literature

Source	Elasticity Estimate	Comments
Economic Factors of Waste Minimisation in New Zealand, Prepared for the Ministry for the Environment (2012). ⁴⁵	-0.06	Only considers household waste.
ACIL Allen Consulting for the Department of Environmental Regulation and Waste Authority of Western Australia (2014). ⁴⁶	-0.11	Only considers municipal waste, includes other systems such as Pay As You Throw, which may have different elasticities.

⁴⁵ Covec, Economic Factors of Waste Minimisation in New Zealand – Final Report, November 2012.

⁴⁶ ACIL Allen Consulting, Economic Drivers of Waste, March 2014.

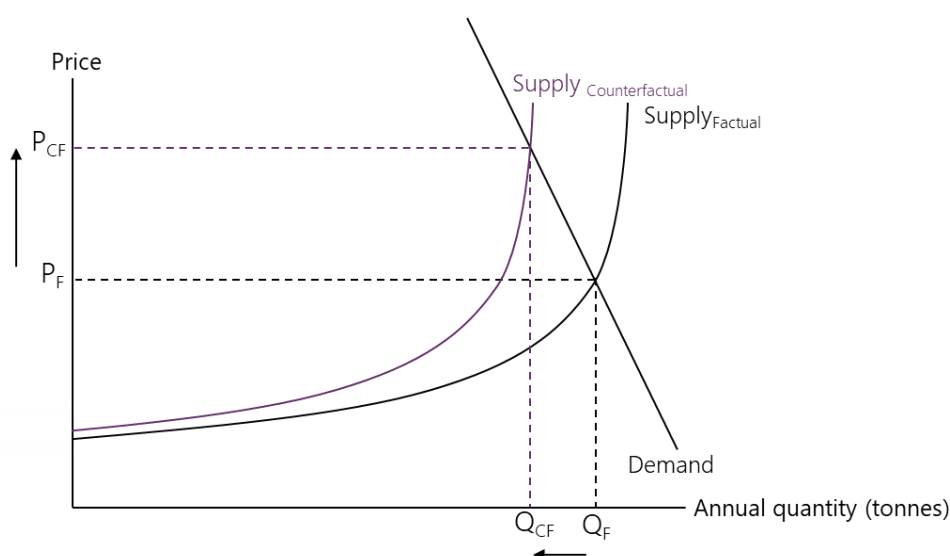
Effects of unit-based pricing on household waste collection demand: A meta-regression analysis.⁴⁷

-0.339

Only considers unit-based pricing of municipal and household waste, includes all methods of waste collection.

48. We are conscious that these elasticities are focused on households, whereas approximately 80% of Auckland waste to landfill in 2022 was from commercial, industrial, and construction and demolition sources.⁴⁸ However, we do not have elasticity estimates for these sources of demand.
49. Given the lack of relevant elasticity estimates for demand at the landfill level and for waste creators more generally, we conservatively use the most elastic estimate of -0.339 for our analysis. This is conservative in the sense that it results in lower estimates of price increases in the Counterfactual.
50. Figure 2 shows (stylistically) that, compared to the Factual scenario, under the Counterfactual the supply curve shifts inward by the size of the ARL's annual capacity.⁴⁹ The new equilibrium is characterised by the demand curve intersecting the supply curve at a steeper point, representing a higher equilibrium price and lower demand.⁵⁰

Figure 2: Auckland landfill market under the Counterfactual (stylistic)



⁴⁷ Bel, G. & R. Gradus, "Effects of unit-based pricing on household waste collection demand: A meta-regression analysis", *Resource and Energy Economics* 44 (2016).

⁴⁸ Auckland Council, "Auckland's Waste Assessment 2023", November 2023.

⁴⁹ As noted earlier, we understand that the ARL would not be consent-constrained on an annual basis. However, there may still be an effective annual capacity constraint.

⁵⁰ See [41] for an explanation why our Counterfactual volumes as shown in Table 6 do not reflect a decrease in demand/volumes.

4.2. How much would price rise?

51. When estimating potential price increases, we assume the 2035 Factual market price is Redvale's average revenue for Class 1 waste in 2025,⁵¹ increased annually by 2%, as explained in Section 2.1 above. Using data we received from WMNZ, the current average revenue at Redvale is approximately \$144.51 per tonne, which inflated to 2035 values is approximately \$176.15.⁵²
52. We note that while the current landfill gate prices factor in the recovery of the waste levy, the price increases we model below are based solely on our analysis of competitive dynamics, specifically a lessening of competition, and are independent of any prospective levy increases and changes to other external factors.
53. Figure 2 illustrates that the price increase under the Counterfactual versus the Factual depends on:
- A. The shape and steepness of the demand curve.
 - i. The demand curve is depicted as linear in Figure 2, but in reality this is unlikely to be the case. For example, there might come a price point where alternatives to landfill become more economic, such as more recycling or more sorting of Class 2 waste from Class 1. However, we do not have any information from which to estimate the price point at which these alternatives might become economic.⁵³
 - ii. Regarding steepness, we have already discussed the demand elasticity evidence that is available, in Section 4.1 above.
 - B. The shape of the supply curve. As already noted, once capacity is reached, the supply curve will become vertical, until prices rise by enough to make expansion or new entry economic, or barriers to entry are eased.
54. Accordingly, there are many unknowns, making estimation of the likely price increase difficult. However, below in Sections 4.2.1 and 4.2.2, we outline two methodologies that result in a plausible range of price increases.
55. It is also important to note that if Hampton Downs is able to take on the Project's waste in the Counterfactual, this may imply that the market in the Factual exhibits significant excess capacity. When a market exhibits significant excess capacity, we would expect this to be reflected in a relatively low market price. Then, when this excess capacity is reduced under the Counterfactual (with some sites in fact reaching their capacity), the incentive to lower prices to limit excess capacity is removed. It then follows that because excess capacity is reduced under the Counterfactual scenario, we would expect prices to be higher.
56. The ultimate capacity of a landfill is finite and so accepting a tonne of waste now means one less tonne of waste that could be accepted in the future, when prices might be higher. If

⁵¹ We return to the simplifying nature of this assumption in Section 4.2.1 below.

⁵² Because this is an estimate of the average gate price at Redvale, this price would also factor in Waste Management's recovery of variable costs such as the waste levy.

⁵³ And regarding Class 2 waste specifically, we understand that the only extra landfill capable of accepting Auckland Class 2 waste is near Huntly (operated by Green Gorilla). If more Class 2 waste was sent to this landfill, it would likely raise its price.

Hampton Downs does have spare capacity, it might not be profit maximising for it to accept any further volumes under the Factual with its status quo prices, but it might be profit maximising to accept further volumes under the Counterfactual with its higher prices.

57. Another way to conceptualise the issue is to consider that in the Counterfactual scenario, the residual demand curve facing each of the remaining three landfills would shift out. Two of those landfills (Whitford and Puwera) would be at capacity, meaning that for a material portion of the Auckland demand, Hampton Downs would in effect be a monopolist.

4.2.1. Cournot model

58. One approach to estimate the extent of the price increase from the ARL not entering the market in the Counterfactual relative to the Factual is to use a simple model of competition such as a Cournot or Bertrand model. Such models are used in merger analysis, where an economic model is calibrated to a pre-merger situation, and then the model simulates how prices would respond to having one less player in the post-merger scenario.⁵⁴
59. We use a simple Cournot model as an example. While the results of this model might give further insight into why the price would change, as well as what the price change might be, we also note the limitations of using such a model in the current context, which reduces the weight we place on its results.
60. In a Cournot model, each firm independently (and simultaneously with the other firms) chooses the quantity that it will supply to the market. This quantity is chosen so as to maximise the firm's profits from the sale of that quantity, and taking the quantity supplied by every other firm as given. The single market price (that all firms receive) is then determined by equating the total market supply to market demand, so that the market clears.
61. Cournot models are typically applied in industries where:
- A. The product is relatively homogeneous. In the present case, regarding Class 1 waste, the services offered at each landfill would likely have limited differentiation. However, there is differentiation in location, with sites such as Whitford being closer to Auckland than the other landfill sites, especially Puwera. This is an important caveat to keep in mind; and
 - B. Production capacity is relatively fixed in the short term, and prices adapt so as to sell capacity. In this regard, as stated in Section 2, landfills have a capacity at which they can take in waste, especially in the short- to medium-term where new consents are unable to be acquired (be this annual capacity, or overall airspace).
62. An important assumption underlying the Cournot model is the existence of a single market price. In practice, due to the differentiation between landfill locations, there is unlikely to be a single market price. This is because Auckland consumers may be willing to pay a higher price to send their waste to landfills closer to Central Auckland, due to the high transportation costs they would otherwise have to pay to dispose of their waste at further away landfills. However, to apply the Cournot model, we have to assume there is a single market price.

⁵⁴ New Zealand Commerce Commission, How to use quantitative analysis in your merger analysis, December 2018, paras. 75-88.

63. Another potential limitation is the elasticities used in our model. When calibrating the demand curve used in the Cournot model, an estimate of the demand elasticity is used. In the present case, the relevant elasticity would measure the changes in demand by the firms collecting the waste and delivering it to the landfills. However, as discussed above, in our research we were only able to find elasticities focusing on household demand. Therefore, these elasticities may not be reflective of the true demand elasticities that landfills face, given households only make up a part of the total demand and that households do not transact directly with landfills.
64. Keeping in mind these limitations, the results of our Cournot model estimate an approximate price increase from the Factual to the Counterfactual of 29.9%. A detailed description of our Cournot model can be found in Appendix A.
65. Additionally, due to the uncertainty surrounding the elasticities used in our analysis, we also perform sensitivity tests for the Cournot model by changing the elasticities used to calibrate the demand curve. These sensitivity tests provide a range of price increases for our Cournot model from approximately 20% to 50%, illustrating that our results are quite sensitive to the estimates for elasticity used. The full results of the sensitivity tests can be found in Appendix A.
66. It is important to note that this model does not consider capacity constraints. This results in the calculated Counterfactual quantities for Whitford and Puwera exceeding the estimated capacity at these landfills.⁵⁵ As mentioned previously, we are instructed to assume that Hampton Downs would be able to take over any excess volumes once other landfills have reached their capacity limits. Therefore, for the volumes of excess waste, Hampton Downs would in effect be a monopolist, which might potentially result in greater price increases than modelled.

4.2.2. Building on previous NZCC analyses

67. Our second approach is to compare the structural change between the Factual and the Counterfactual against the sorts of structural changes that concern competition regulators such as the NZCC.
68. Competition regulators generally consider that an increase in price in the order of 5% is sufficient to constitute a significant loss of competition arising from a merger.⁵⁶ Accordingly, the concentration thresholds referred to in Section 2.2 above (i.e., an increase in the HHI of more than 100 points) might indicate the merger could result in a 5% (or higher) price increase.⁵⁷
69. Accordingly, if we think the structural change between the Factual and the Counterfactual would be greater than the sort of merger structural change that might result in the NZCC

⁵⁵ Calculated quantities can be found in Table 13 in Appendix A.

⁵⁶ For example, *Woolworths & Ors v Commerce Commission* (HC). This case is also mentioned in the NZCC merger guidelines (NZCC, Mergers and acquisitions guidelines, May 2022, footnote 37). For examples from international competition agencies see: US DOJ and Federal Trade Commission (2023), Merger Guidelines, August 19, section 4.3.B. While the ACCC has since gone away from outlining a specific price increase in its 2025 guidelines, it referenced a 5% price increase in its 2017 guidelines. ACCC (2017), Merger Guidelines, November, at paragraph 4.21.

⁵⁷ However, we note that the thresholds are just screening devices, and in some cases further analysis might suggest no competition problems.

declining the clearance, we might conclude we could expect at least a 5% price increase. This is particularly relevant to the Auckland landfill market given we have established that the market in the Factual is already highly concentrated. Therefore, we might expect that any transaction in the Auckland landfill market that could further increase market concentration would be under significant scrutiny by the NZCC.

70. Table 8 below shows the HHI and concentration ratios under the Factual and Counterfactual scenarios outlined in Sections 2 and 3 respectively.⁵⁸

Table 8: Factual and Counterfactual HHI and Concentration ratios (based on capacity-based market shares)

	Factual	Counterfactual
HHI index	3,760	5,782
Concentration ratio	96%	100%

71. The jump in the HHI between the Factual and Counterfactual would be 2,022 points.⁵⁹

72. To put this into perspective, as outlined previously, the DOJ and FTC note in their merger guidelines that mergers that create, or further consolidate markets that are highly concentrated, through an increase in the HHI of more than 100 points, are presumed to substantially lessen competition or tend to create a monopoly.⁶⁰ Similarly, the ACCC considers a change in HHI of more than 100 points as a significant increase in concentration.⁶¹

73. Under the Factual, the three-firm concentration ratio is 96%, and under the Counterfactual, it increases even further to 100%, significantly above the post-merger concentration indicators of around 70% outlined by the NZCC.

74. This illustrates the idea that it is highly likely that the NZCC would consider the Counterfactual to lead to a substantial lessening of competition compared to the Factual. Indeed, the primary competition to Hampton Downs under the Factual, the ARL, would not exist under the Counterfactual. Therefore, we would expect the change in the market structure to have a material effect on prices, probably materially more than 5%.

75. Therefore, it would be more appropriate to use the NZCC's assumed price increases when assessing merger authorisations. An authorisation framework is applied for mergers where it

⁵⁸ The HHI for the Counterfactual is calculated using the following equation using the market shares found in Table 6: $22^2 + 73^2 + 5^2 = 5,782$ (note this example of market shares is rounded to the nearest whole number).

⁵⁹ As noted earlier, assuming higher capacities for the ARL and Hampton Downs would not alter our conclusions. For example, if Hampton Downs' annual capacity for Auckland waste is assumed to be 1.3 million tonnes, the increase in HHI between the Factual and the Counterfactual would be 2,092. If, in addition, the ARL's capacity is also assumed to be higher (for example, 1 million tonnes), the increase in HHI is 2,266. In both cases, while the HHI values change, the overall conclusion that the ARL's absence in the Counterfactual would constitute a substantial lessening of competition remains unchanged.

⁶⁰ Department of Justice and the Federal Trade Commission, Merger Guidelines, December 2023, pp.5-6.

⁶¹ ACCC, Merger assessment guidelines, June 2025, para. 1.24.

has already been established that the transaction would lead to a substantial lessening of competition but may lead to sufficient public benefits that outweigh any competitive harms.⁶²

76. As part of its assessment, the NZCC estimates the detriments associated with a decrease in allocative inefficiency, which requires an assumed price increase. Given that this analysis requires the NZCC to estimate what a plausible price increase may be following a substantial lessening of competition, this may give insight to a more appropriate range of price increases.⁶³ The price increases in previous authorisations are summarised in Table 9 below.

Table 9: Price increases in previous NZCC authorisations

Authorisation	Assumed price increase
Ruapehu Alpine Lifts Limited and Turoa Ski Resorts Limited (2000)	1% to 20%
Southern Cross Hospitals and Aorangi Hospital (2011)	10% to 50%
Cavalier Wool Holdings and New Zealand Wool Services International (2011 and 2015)	5% to 15%
Cavalier Wool Holdings and New Zealand Wool Services International (2015)	5% to 15%
NZME and Fairfax (2017)	5% to 10%
Tennex Capital and San-i-pak (2018)	Redacted from the NZCC's public decision

Source: NZCC

77. Given the significantly higher concentration in the Auckland landfill market if the Project is unable to obtain the required consents, and the previously discussed likelihood that there would be a substantial lessening of competition moving from the Factual to the Counterfactual, it is likely that if the Counterfactual was instead a merger, an authorisation would be required rather than a clearance. If this were the case, then rather than the 5% price increase to gate prices as noted above, an estimate of a 10-15% price increase may be more appropriate.

4.2.3. Conclusion

78. The two approaches outlined above give a range of potential price increases in the Counterfactual compared to the Factual - that range is 10% to 30%.⁶⁴ These results are summarised in Table 10 below.

⁶² NZCC, Authorisation Guidelines, June 2023, paras. 4-5.

⁶³ One caveat is that previous authorisations mostly involved a merger resulting in a monopoly in the relevant markets. Therefore, while the assumed price increases are for the entire market, this was essentially the price increase for the merged entity. In our context, while the market will be very concentrated, three firms will remain in the market in the Counterfactual. Having said that, two of the remaining landfills would be capacity constrained, and for the bulk of Auckland waste, Hampton Downs would in effect be a monopolist.

⁶⁴ An argument might be made that WMNZ's vertical integration at Whitford means a reduced level of competition at the landfill level would not affect WMNZ's internal transfer price at Whitford, and accordingly WMNZ's downstream prices would be unaffected. However, this argument would not be correct. The capacity of a landfill is finite, and so if WMNZ dumps a tonne of its own waste at Whitford, that is a tonne of space WMNZ cannot sell to a third-party customer – hence WMNZ's marginal (opportunity) cost at Whitford is the third-party gate price.

Table 10: Estimated range of price increases

Methodology	Estimated Counterfactual market price (\$ per tonne)	Estimated Counterfactual market price increase compared to the Factual price of \$176.15 per tonne
Building on previous NZCC analysis	\$193.77 to \$202.58	10-15%
Cournot modelling	\$228.77	29.9%

79. For the reasons explained above, we should be cautious in how much weight we place on the Cournot model results. Nevertheless, the Cournot model and other features of the market do suggest that we might expect price to increase by more than the bottom end of our range.
80. Even the bottom end of this estimated range of price increases (10-15%) should be regarded as a material price increase. Competition regulators (including the NZCC) would generally consider a price increase of this magnitude arising from a transaction (such as a merger) as constituting a substantial lessening of competition.⁶⁵
81. It might be that we would observe more demand response by the time prices get towards the top end of our range, and perhaps expansion by one or more of the landfills. However, both demand response and expansion would take time. Indeed, due to the barriers already discussed, it is difficult to see expansion occurring until well into the Counterfactual period.
82. The price increases we are estimating are those at the gates of landfills that service Auckland demand, specifically the Whitford, Hampton Downs, and Puwera landfills. These gate price increases (particularly those at Hampton Downs and Puwera) would likely also affect Northland, Waikato, and Bay of Plenty users of landfills to some extent.
83. These price increases would result in a substantial increase in costs for the users of the three remaining landfills under the Counterfactual. In 2035, we are instructed to assume that total Auckland demand for waste disposal would be just under 1.6 million tonnes. For example, if we assume a price increase of 15%, which equates to an additional \$26.42 per tonne, approximately \$42.2 million⁶⁶ extra would be paid by users, each year, to dispose of this waste, at least until some sort of response occurred.
84. We understand other experts are contributing to this Fast Track referral application. Our focus is just on the landfill gate price and quantity effects. Certainly, from that perspective, it is reasonable to conclude that providing the ARL with the required consents to operate would have significant regional benefits for Auckland, and likely Northland and Waikato as well,

⁶⁵ For example, footnote 37 of the Commerce Commission's May 2022 *Mergers and Acquisitions Guidelines* state: "Where the lessening of competition manifests in price increases, the High Court has indicated that a price increase of over 4–5% provides a general guide as to a price increase that would indicate a 'substantial' lessening of competition. The Court also noted that price increases of less than 4% can be sufficient to amount to a substantial lessening of competition. *Woolworths & Ors v Commerce Commission* (HC), above n 32 at [145] and [156]."

⁶⁶ Note the value of \$42.2 million results from using the more precise underlying figures, rather than a value of \$42.3 million when using the rounded numbers as presented in the paragraph (1.6 million tonnes × \$26.42 per tonne).

because it would result in materially lower landfill gate prices in those regions than would occur under the Counterfactual.

5. Alternative scenario

85. To estimate the likely price increase if Hampton Downs' ability to accept Auckland waste is constrained (based on its current consented limit), we compare prices across the following scenarios:

- A. **The Alternative Factual:** The scenario in which WMNZ is successful in obtaining consent for the Project and is able to begin accepting waste in 2035. This scenario is the same as the Factual scenario, except Hampton Downs' capacity to accept Auckland waste is limited to 600,000 tonnes per annum; and
- B. **The Alternative Counterfactual:** The scenario in which the ARL does not obtain consent and therefore cannot accept any waste from 2035 (for an indefinite time). This scenario is the same as the Counterfactual scenario, but with Hampton Downs' capacity for Auckland waste being limited to 600,000 tonnes per annum.

86. Table 11 below shows the volumes and capacities in the Alternative Factual and the Alternative Counterfactual. In the Alternative Counterfactual, ARL is not in the market in 2035, and the remaining landfills are constrained by their capacities to accept Auckland waste. This would lead to significant excess waste in the Auckland landfill market.

Table 11: Volumes and capacities in the Alternative Factual and Alternative Counterfactual in 2035, tonnes

Landfill	Alternative Factual		Alternative Counterfactual	
	Annual volume	Annual capacity	Annual volume	Annual capacity
ARL	646,785	646,785	Not operational	Not operational
Whitford	350,000	350,000	350,000	350,000
Hampton Downs	600,000	600,000	600,000	600,000
Puwera	0	87,469	87,469	87,469
Excess waste	0		559,316	
Total	1,596,785	1,684,254	1,596,785	1,037,469

5.1. Calibrated demand in the Alternative Counterfactual

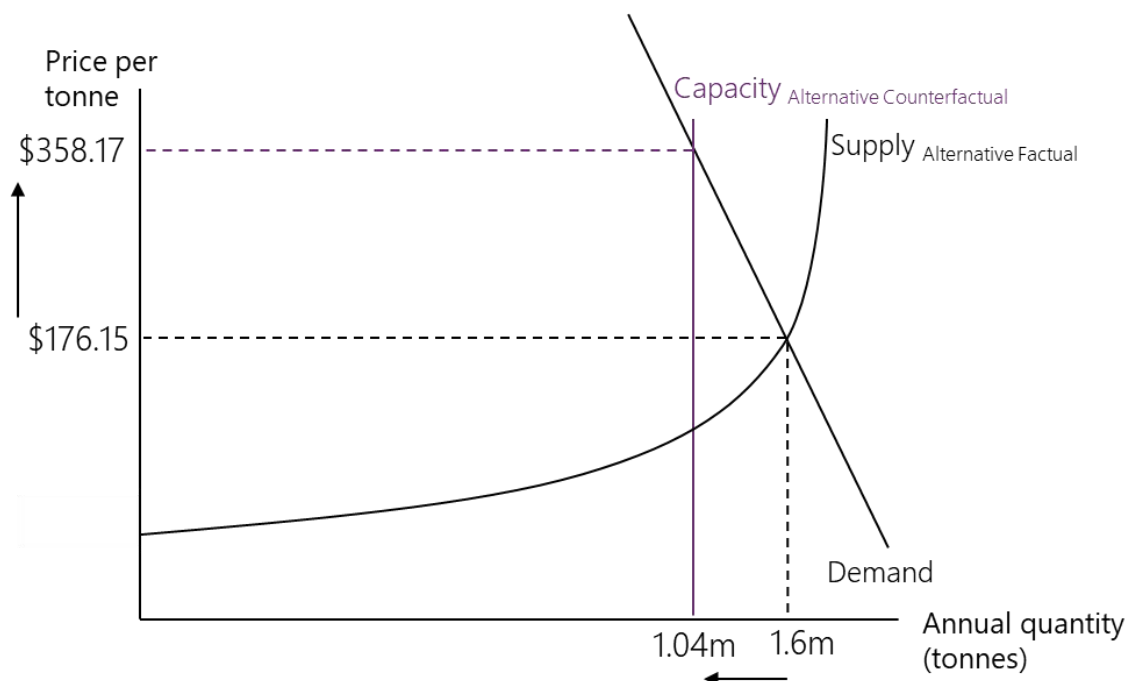
87. Table 11 above shows that in the Alternative Counterfactual, where Hampton Downs would not be able to accept any additional waste, we assume its volume would stay at the Factual (and Alternative Factual) level. If ARL did not open in 2035, this would lead to significant excess volumes of waste of approximately 560,000 tonnes based on our estimated total Auckland demand in 2035.

88. Something else would need to be done with the approximately 560,000 tonnes of annual excess waste. Any such response (be it reduction in waste-producing economic activity, more

sorting, fly tipping, sending the waste to a different region or even offshore, etc), would also have a cost. Given the magnitude of the tonnes (approximately 35% of Auckland's annual tonnes), that cost would likely be material.

89. Our approach to estimating the market price in the Alternative Counterfactual is to use the demand curve calibrated as an input to the Cournot modelling. In particular, we identify where this demand curve would intersect with available capacity under the Factual.
90. We assume in the Alternative Factual:
 - A. Market price is \$176.15 per tonne;⁶⁷ and
 - B. Market quantity is 1.6 million tonnes.
91. Accordingly, in Figure 3 we depict this coordinate as the intersection of the demand and supply curves in the Alternative Factual.
92. We then:
 - A. Draw a vertical line at the total capacity under the Alternative Counterfactual, being 1.04 million tonnes (as calculated in Table 11); and
 - B. Calculate where the demand curve would intersect this capacity line using the assumed elasticity of -0.339. This is at a market price of \$358.17 per tonne, which is an increase of 103.33% compared to the Alternative Factual price.

Figure 3: Auckland landfill market producing at capacity under the Alternative Counterfactual (stylistic and not to scale)



⁶⁷ For simplicity, we assume that the market price in the Alternative Factual scenario is the same as the market price in the Factual scenario. Our assumption of an equal market price does not affect our conclusions because our analysis of outcomes in the counterfactual scenarios is primarily presented in terms of relative price increases (percentage increases to a baseline price).

93. As with our other approaches, it is worth noting that this method also has caveats. While this approach does consider the capacity constraints faced by the landfills, it still faces the same limitations as the Cournot model regarding the elasticities used in the model, and the assumption of a single market price. It also assumes a linear demand curve over a very large price range, which might not be reflective of reality.
94. Therefore, like the Cournot model, we also conduct a sensitivity test to obtain a range of potential price increases. Shown in Table 15 in Appendix A, the results of our sensitivity test estimate a price increase of between 70.1% and 175.1%.
95. Additionally, as shown in Table 12, like the Counterfactual, the Alternative Counterfactual still leads to a significant increase in market concentration compared to the Alternative Factual. The HHI increases by 1,351 to 4,554 between the Alternative Factual and the Alternative Counterfactual. Again, this is far above the thresholds outlined by competition regulators, implying a price increase of at least 10-15%.

Table 12: Market concentration measures in the Alternative Factual and Alternative Counterfactual (based on capacity-based market shares)

Concentration measure	Alternative Factual	Alternative Counterfactual
HHI	3,203	4,554
Three-firm concentration ratio	95%	100%

Appendix A. Cournot modelling of the price effect

A.1. Cournot model with no capacity constraints

96. As we set out in Section 4, under the Counterfactual where the ARL does not enter the market, we would expect substantially less competition in the landfill market which would lead to a materially higher market price.
97. To estimate the extent of the price increase in the Counterfactual relative to the Factual, we use a simple model of competition. Such models are sometimes used in merger analysis, where an economic model is calibrated to a pre-merger situation, and then the model simulates how prices would respond to having one less player in the post-merger scenario.⁶⁸
98. We use a model known as a "Cournot" model. Cournot models are typically applied in industries where:
 - A. The product is relatively homogeneous. In the present case, regarding Class 1 waste, the services offered at each landfill would likely have limited differentiation. However, there is differentiation in location, with sites such as Whitford being closer to Auckland than the other landfill sites, especially Puwera. This is an important caveat to keep in mind; and
 - B. Production capacity is relatively fixed in the short term, and prices adapt so as to sell capacity. In this regard, as stated in Section 2, landfills have a capacity at which they can take in waste, especially in the short term where new consents are unable to be acquired.
99. In a Cournot model, each producer independently (and simultaneously with the other producers) chooses the quantity that it will supply to the market. This quantity is chosen so as to maximise the producer's profits from the sale of that quantity, and taking the quantity supplied by every other producer as given.
100. The single market price (that all producers receive) is then determined by equating the total market supply to market demand, so that the market clears. However, the fact the Cournot model assumes a single market price may limit its suitability for the landfill market. In practice, due to the differentiation between landfill locations, there is unlikely to be a single market price. This is because Auckland consumers may be willing to pay a higher price to send their waste to landfills closer to Central Auckland, due to the high transport costs they would otherwise have to pay to dispose of their waste at further away landfills. However, to apply the Cournot model, we assume there is a single market price.
101. To calibrate the Cournot model in the Factual, we use the following data:
 - A. Quantities as specified in Table 4. This equates to a total market size of approximately 1.6 million tonnes per year from Greater Auckland.⁶⁹
 - B. A market price of \$176.15 per tonne. This is based on Redvale's current average Class 1 revenue per tonne for 2025, which was calculated by taking Redvale's total revenue, and

⁶⁸ New Zealand Commerce Commission, How to use quantitative analysis in your merger analysis, December 2018, paras. 75-88.

⁶⁹ For sources, see Table 4at (A)-(D).

dividing it by the total quantity in tonnes. We then inflated this value to 2035 using a 2% per annum inflation rate.

- C. An assumed market elasticity of demand of -0.339. This estimate is based on a meta-analysis which took the average elasticity of 25 studies.⁷⁰ However, it should be noted that this estimate is based on household demand, and may not be reflective of the true demand elasticities that landfills face given households only make up a part of the total demand and that households do not transact directly with landfills.⁷¹
102. Using that data, we can calibrate an “equilibrium” in the Factual scenario Cournot model (see Appendix A.4 for a detailed description of how this is done).
 103. In a Cournot model, this calibration essentially involves calculating each firm’s marginal cost as being inversely proportional to market share (i.e., firms with a larger market share will have a lower marginal cost). That is, based on the output that each firm sells and the market price, we can determine what marginal cost each firm would have.
 104. Note that when calibrating the model using the elasticity of -0.339, we have negative marginal costs for the ARL and Hampton Downs.⁷² This is another reason for us to be cautious about the weight we place on the results. If we constrain marginal costs to prevent them being negative, the price increase calculated by the model would be even higher than in our base case.
 105. Having calibrated the Factual Cournot equilibrium, we then remove the ARL as a player in the market, and solve the model for a new Counterfactual equilibrium. This involves the following:
 - A. Taking each firm’s marginal cost as calibrated in the Factual equilibrium;
 - B. Assuming that each firm maximises profits, determining the quantity that each firm would sell under the Counterfactual based on these marginal costs, and taking the quantities of all other firms as given; and
 - C. Aggregating each firm’s quantity to determine the overall Counterfactual equilibrium market quantity and using the elasticity to determine the resulting Counterfactual equilibrium market price. This allows us to estimate the impact that the ARL’s absence has on the price, by comparing the Factual and Counterfactual market prices.
 106. In Table 13 we set out the results of our model. When the ARL is absent, the remaining landfills each take 161,696.25 tonnes of the ARL’s volumes, with the total market volume also decreasing by 161,696.25 tonnes. While potentially unintuitive, this is a feature of the Cournot

⁷⁰ Bel, G. & R. Gradus, “Effects of unit-based pricing on household waste collection demand: A meta-regression analysis”, *Resource and Energy Economics* 44 (2016): 169-182.

⁷¹ We were unable to find total market elasticities for landfills. Other estimates for household demand elasticities include -0.06 to -0.47 (Dijkgraaf E. & Gradus R, “Cost Savings of Unit-based Pricing of Household waste, the case of the Netherlands”, *Resource and Energy Economics* 26, no. 4 (2004): 353-371.), and -0.076 to -0.226 (Fullerton D. & T.C. Kinnaman “Household Demand for Garbage and Recycling Collection with the Start of a Price per Bag.” *National Bureau of Economic Research Working Paper* No. 4670(1994)).

⁷² Based on the algebra set out in Appendix A.4, it can be shown that marginal costs are positive for firm i provided $e < -q_i/Q$, which using the inputs to our model yields a value of $e < -0.405$ to ensure this is the case for all firms. If we do not allow negative marginal costs, and instead make them equal to zero, we get an estimated price increase of 32.6% instead of 29.9% as shown below.

modelling framework, in that each firm adjusts its quantity equally in response to a firm leaving the market.

107. As a result of the ARL's absence from the market, the overall market price is higher in the Counterfactual as the total supply of the market is lower. That is, the Counterfactual market price is \$228.77/tonne, which is 29.9% higher than the Factual price of \$176.15/tonne.

Table 13: Quantity and price changes under Cournot model with no capacity constraints

Landfill	Factual	Counterfactual	Change
ARL	646,785	-	
Whitford	350,000	511,696.25	161,696.25
Hampton Downs	600,000	761,696.25	161,696.25
Puwerā	-	161,696.25	161,696.25
Total	1,596,785	1,435,089	-161,696.25
Price	\$176.15	\$ 228.77	\$52.62 (29.9%)

108. It is important to note that, the calculated Cournot Counterfactual quantities exceed the likely capacity for Whitford and Puwerā, as outlined in Table 13. Accordingly, the analysis above likely underestimates the price increase from the Factual to the Counterfactual.

A.2. Price when firms are capacity constrained

109. In the Alternative Counterfactual, we assume that Hampton Downs cannot expand its volume beyond its Alternative Factual level, meaning each landfill operates at capacity. To estimate what the price would be at this volume, we use the demand function calibrated as an input to the Cournot model in Section A.1 above.
110. Table 14 below shows the results of this analysis, estimating that operating at a capacity of 1,037,469 tonnes would lead to a price of \$348.17 in the Counterfactual, an increase of 103.3% from the Factual price of \$176.15.

Table 14: Quantity and price changes when firms are capacity constrained

Landfill	Alternative Factual	Alternative Counterfactual	Change
ARL	646,785	-	(646,785)
Whitford	350,000	350,000	-
Hampton Downs	600,000	600,000	-
Puwerā	-	87,469	87,469
Total	1,445,549	1,037,469	(559,316)
Price	\$176.15	\$348.17	\$182.01 (103.3%)

A.3. Sensitivity testing

111. Lastly, we also undertake sensitivity testing for the elasticities we use in our analysis. As mentioned in Section 4.1, while we are unable to find more appropriate elasticity estimates, we note there are issues with the elasticity estimates we use in our approaches.
112. Therefore, we conduct sensitivity analysis using different elasticity values to provide a range of estimates for our models. In our approaches, we use a demand elasticity of -0.339. We expand this to a range of -0.2 to -0.5 for our sensitivity testing.
113. Table 15 below shows the results of these sensitivity tests, with the Cournot model results resulting in a price increase between 20.3% and 50.6%, and a price increase of between 70.1% and 175.1% when we assume firms produce at capacity.

Table 15: Sensitivity tests for modelling approaches

	Elasticity	
	-0.2	-0.5
Cournot model		
Factual price	\$176.15	\$176.15
Counterfactual price	\$265.34	\$211.83
Change	\$89.19 (50.6%)	\$35.68 (20.3%)
Firms are capacity constrained		
Factual price	\$176.15	\$176.15
Counterfactual price	\$484.66	\$299.56
Change	\$308.51 (175.1%)	\$123.40 (70.1%)

A.4. Developing the Cournot model

114. In this Appendix we set out the steps taken to developing the Cournot model.

Step 1: calibrate pre-exit market demand

115. We start by calibrating the market demand curve. Using data and assumptions from sources such as WMNZ, Auckland Council, and academic literature, we have the market price, P , market quantity, Q , and we have market demand elasticity, e . We assume a linear demand curve given by:

$$P = a + bQ, b < 0$$

116. The market elasticity is given by:

$$e = \frac{\partial Q}{\partial P} \frac{P}{Q}, e < 0$$

117. The market elasticity equation can be re-arranged to:

$$\frac{\partial P}{\partial Q} = \frac{P}{eQ}$$

118. Since we know also that the slope of the demand curve is given by $b = \frac{\partial P}{\partial Q}$, we can use the values of P , Q , and e to calculate the value for b :

$$b = \frac{P}{eQ}$$

119. We can then also use values for P , Q , and now b to get the value of a by solving:

$$a = P - bQ$$

Step 2: calibrate Factual marginal costs

120. In a Cournot model, each firm i chooses quantities to maximise profits, as given by:

$$\pi_i = q_i(P(Q) - mc_i)$$

121. Assuming constant marginal costs, the first-order condition for profit maximisation is found by:

$$\frac{\partial \pi_i}{\partial q_i} = P(Q) + q_i \frac{\partial P}{\partial q_i} - mc_i = 0$$

122. We re-arrange this equation to calculate each firm's marginal cost as:

$$mc_i = P(Q) + q_i \frac{\partial P}{\partial q_i}$$

123. Since the total market demand (Q) is the sum of each firm's individual market demand (q_i), we can write the linear demand curve as:

$$P = a + bQ = a + b \sum_{i=1}^n q_i$$

124. From this demand curve we can determine that $\frac{\partial P}{\partial q_i} = b$. Substituting this into the above equation for each firm's marginal cost, we calculate each firm's marginal cost using:

$$mc_i = P + q_i b$$

Step 3: calculate Counterfactual quantities and prices

125. Without entry we have one less player in the market. We would therefore have first-order conditions for each market player given by:

$$P + q_i b - mc_i = 0$$

126. Using the equation for P , we can re-write this as:

$$a + b \left(\sum_{i=1}^n q_i \right) + q_i b - mc_i = 0$$

127. To illustrate how this equation is solved, consider the case where we have three firms in the market without the ARL's entry i.e., for each firm $i=1, 2$, and 3. Expanding out the above equation (and re-arranging) would give the following three equations:

$$-2bq_1 - bq_2 - bq_3 = a - mc_1$$

$$-bq_1 - 2bq_2 - bq_3 = a - mc_2$$

$$-bq_1 - bq_2 - 2bq_3 = a - mc_3$$

128. We know the values of a and b (the pre-entry values calibrated above). We also know mc_i for the 3 remaining firms, as calibrated above. We therefore require a solution to the above three equations in three unknowns (the q_i 's).

129. We solve these equations in *Excel*, based on the matrix algebra specification of the equations as follows:

$$\begin{pmatrix} -2b & -b & -b \\ -b & -2b & -b \\ -b & -b & -2b \end{pmatrix} \begin{pmatrix} q_1 \\ q_2 \\ q_3 \end{pmatrix} = \begin{pmatrix} a - mc_1 \\ a - mc_2 \\ a - mc_3 \end{pmatrix}$$

130. Once we have determined the values for q_1 , q_2 , and q_3 , we calculate the post-exit market quantity as $Q = \sum q_i$ and then the post-entry market price as $P = a + bQ$. We then compare the Factual and Counterfactual market prices to determine the change in price due to the ARL not entering the market.



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