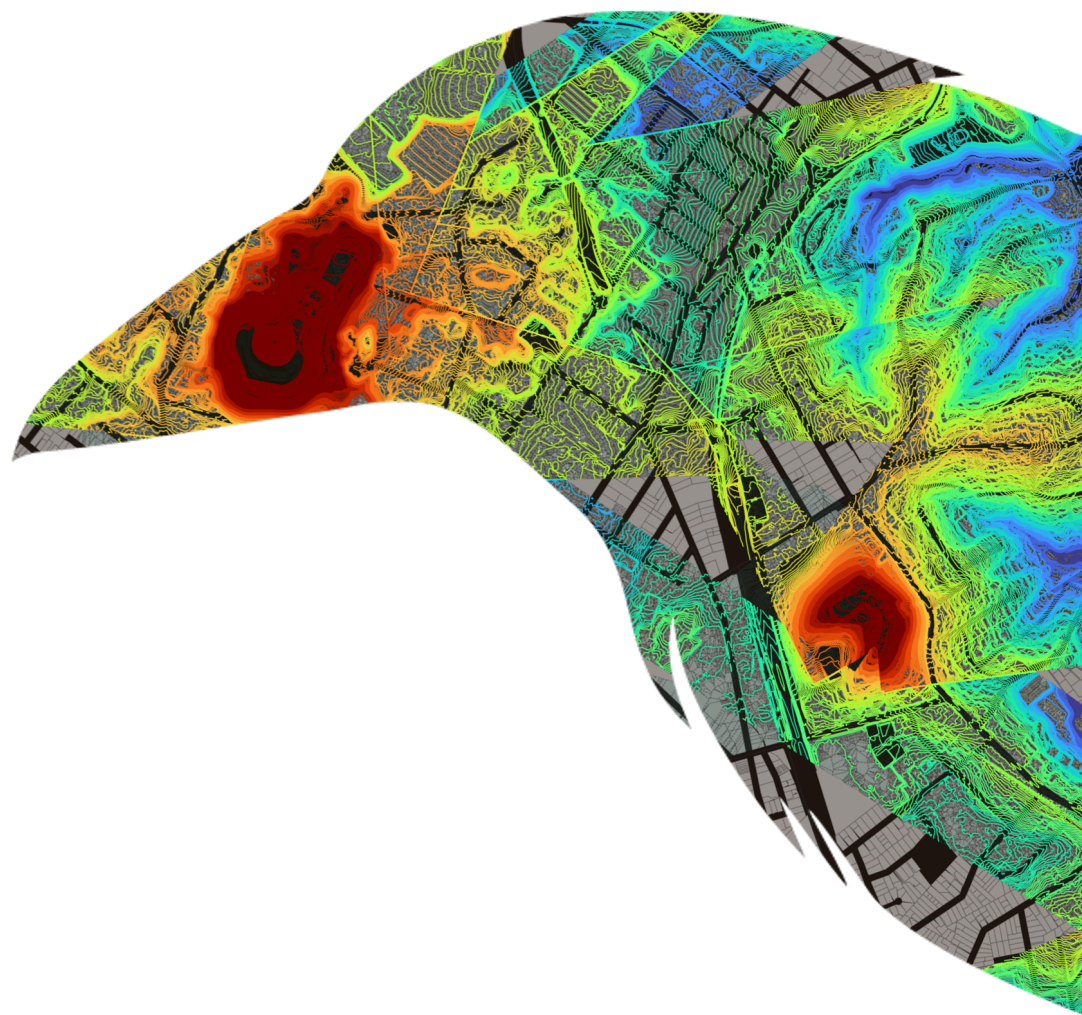




Economic Effects of Maunga Viewshafts

*A spatial equilibrium estimate of the economic costs
of Auckland's protected views*

Ministry of Housing and
Urban Development

May 2026



CROW
ADVISORY

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Executive summary

Auckland's volcanic maunga are landmarks of deep cultural and civic significance. To preserve views of these features from a few selected vantage points, the Auckland Unitary Plan designates 79 protected Maunga Viewshaft planes and 10 Height Sensitive Areas (HSAs) that limit building heights on affected properties. These restrictions constrain the supply of floor area on some of the most centrally located and highest-value land in the city.

This report estimates the economic cost of those constraints to land, housing, and labour markets. It does not seek to assess the cultural value of the protected views, which is a separate and important question. However, the research and modelling for this report has revealed some relevant factors that bear comment here. In the discussion on unmodelled effects, we note that Maunga Viewshaft restrictions reduce the number and raise the price of dwellings that can be built within close proximity of the maunga. This raises barriers to the number of people who can access these green and cultural spaces via walking, and potentially decreases the connection to these cultural locations that the viewshaft policy seeks to enable. Additionally, some existing restrictions remain in place while the views they protect are already blocked. This raises questions about the extent to which the policy is achieving its intended purpose, and whether the costs of the restrictions are justified by the benefits.

We estimate the economic effects of Maunga Viewshafts using an Alonso-Muth-Mills (AMM) spatial equilibrium model calibrated to Auckland's land market and urban geography. The model is calibrated to align with the observed land values, floor area demand, and population distribution under existing zoning and Maunga Viewshaft regulations. We then remove zoning for viewshaft-affected parcels—so that building heights on those parcels are determined by market forces and the Maunga Viewshaft height limits alone—while all other parcels retain their existing zoning. The marginal effect of the restrictions is then isolated by comparing scenarios in which constraints are retained or selectively removed.

The removal of zoning on affected parcels is a deliberate counterfactual that reveals the latent cost of the Maunga Viewshaft restrictions that existing regulations would otherwise mask. In many cases, it is likely that the viewshaft height limits are not the binding constraint on development because zone-based height limits have taken the Maunga Viewshafts into account. By removing zoning, we reveal the economic effects of the restrictions in isolation from other regulatory constraints. This carries an important implication for potential policy reform: if the restrictions are removed, zoning in affected areas would also need to be reconsidered in order to enable the full economic effects.

We apply two complementary versions of the model. In the **closed-city** version, Auckland's total population is fixed and the model determines how the housing market adjusts internally when supply constraints are relaxed—capturing effects on house prices, land values, and household welfare. In the **open-city** version, population responds to improved conditions: removing Maunga Viewshafts makes Auckland more attractive by lowering housing and transport costs, drawing in additional households, raising wages through economies of agglomeration,¹ and expanding economic output. Neither version captures reality in isolation. The closed-city model captures the embedded land market distortion and its welfare effects for existing residents but assumes away any migration and growth response. This version is the most faithful representation of costs to existing residents. The open-city model reveals the economic upside of a reality without Maunga Viewshafts but also overstates it via the perfect mobility assumption—locational preferences, idiosyncratic frictions, and perceptions prevent perfect mobility between cities even in the long run.² Together, the two versions bracket the plausible range of effects and expose the channels through which height restrictions impose costs on households and distort the urban economy. If Maunga Viewshafts were removed, the urban reality would respond in bursts and lulls over decades, and we should expect directions and magnitudes somewhere between the two versions.

Closed-city findings

Under the closed-city model, removing all Maunga Viewshaft constraints enables the land to be used more intensely for housing in locations closer to the city centre with lower transport costs. Greater density means that less land is needed per dwelling, houses are produced more efficiently, and house prices drop across the city. While land prices rise in previously constrained locations, this is offset by a general decrease city wide, as less land is needed to house the same number of people. This reduces the radius of the city, resulting in a more compact urban form, and reducing aggregate travel costs. This would also have distributional effects: the increase in land values on released parcels would be a windfall gain for those landowners, while both the decrease in land

¹ Agglomeration economies arise from the proximity of workers and firms; a larger, denser city supports higher productivity. The model follows Greenaway-McGrevy and Jones (2024) in specifying $W = BN^\delta$ and Donovan et al. (2024) in selecting $\delta = 0.035$, giving a wage elasticity of 3.5% with respect to population.

² Other work (e.g. Ahlfeldt et al., 2023; Greenaway-McGrevy, 2025) has used migration elasticities to allow utility and population to be endogenously determined. This may be explored further in subsequent iterations of this work.



values elsewhere and the greater intensity in high-demand areas would be a gain for households as land becomes a more affordable input to housing. The net effect is an easing of the scarcity of well-located land, reducing the monopoly-like effects of that scarcity and transferring value from landowners back to households. This leads to an increase in household welfare as housing and transport costs fall relative to income. The enablement of a more compact city also reduces the costs of network infrastructure per household, but those effects are not quantified here.

Quantitatively, removing all Maunga Viewshaft constraints under closed-city assumptions would:

- reduce house prices citywide, with the greatest reduction in the highest value areas. We estimate a 7.5% reduction at a reference distance³ of 12 minutes from the City Centre;
- generate \$95.1B in direct land value gains on the 38,830 parcels where Maunga Viewshaft constraints have been removed, offset by \$162.3B in indirect land value reductions elsewhere as displaced demand shifts back to the released capacity in high-value areas and land becomes a more affordable input to housing citywide. This represents a net value transfer of about \$67B from landowners back to households;
- increase location-adjusted wages⁴ by \$2,548 per household per year as the more compact city reduces average commuting distances and overall transport costs fall by 5.3%. The location-adjusted wage increase at the city-edge where transport costs are the highest amounts to \$1,588 per household per year.

The welfare effect is unambiguously positive: households are better off because housing costs fall relative to income. The net decline in aggregate land values is a transfer rather than a welfare loss—the reversal of a distortion. Maunga Viewshafts displace demand from high-value central locations to the periphery, creating artificial scarcity that transfers surplus from households to landowners and distorts the spatial distribution of the tax burden on ratepayers to the extent that rates are driven by land value assessments. Removing the restrictions unwinds these effects.

Open-city findings

In the open-city version, household welfare is held constant—as migration under the assumption of perfect mobility equalises welfare across cities—so the gains from removing constraints materialise not through lower prices but through a larger, more productive city. Removing all Maunga Viewshafts would:

- attract approximately 54,000 additional households (8.6% growth);
- raise wages by \$446/year per household through economies of agglomeration;
- increase Auckland’s total economic output by \$8.6B annually;
- increase average dwelling density by 14.5%, producing an even more compact urban form than under the closed-city case despite the larger population;
- increase mean location-adjusted income by \$2,673 per household per year (city-edge income is held constant). Per-household transport costs fall \$2,227 per year while total transport expenditures rise as congestion from the larger population partially offsets the lower transport costs from the more compact city;
- generate a direct land value gain of \$94.9B for released parcels, nearly the same as the closed city case. This is partly offset by \$39.9B in reductions where displaced demand had otherwise inflated land costs. The net effect is a gain in aggregate land values of \$55B. At the 2026 level for the Urban Residential General Rate, this would amount to over \$122 million in additional rates income annually for the city, without considering targeted rates or induced increases in improvement values.

Maunga-level and individual Maunga Viewshaft effects

At the maunga level, we model six specific scenarios of Maunga Viewshaft removal combinations. The Maungawhau / Mt Eden and Ōhinerau / Mt Hobson group accounts for the largest share of the aggregate effect among the selected scenarios, followed by Maungarei / Mt Wellington and Ōwairaka / Mt Albert. Effects are concentrated in the inner isthmus, where viewshaft planes overlap with the highest-value land. We also analyse each of the 79 individual Maunga Viewshaft schedules in isolation, removing each one while all others remain. The most costly single schedule is E11 (Maungawhau / Mt Eden toward Ōwairaka / Mt Albert), which alone

³ The reference distance is a fixed benchmark location used to compare price levels across scenarios on a like-for-like basis. It is not a summary of effects at all distances; see Section 6 for the full price-gradient comparison.

⁴ Wages net of transport costs. In the model, all workers commute to the city centre and earn the same wage, so transport costs define the net wage. In reality, wages are earned across the city, but jobs farther away from the centre pay less on average. This produces a “wage gradient” that has been shown to be well proxied by the wage minus transport cost gradient in this model (e.g., Glaeser (2008), Liotta and co-authors (2021), Greenaway-McGrevy and Jones (2025))

produces \$4.8B in direct and \$8.2B in indirect land value effects—approximately 5.1% of the total distortion from a single sight line. Table 1 lists the fifteen most distortive schedules by this measure.

The famed Schedule E10 viewshaft of Cooper and Namit’s much-quoted “Billion dollar view” study comes in at a direct distortion of about \$2B—comparable to the estimates of the 2021 paper plus inflation (Cooper and Namit 2021). The corresponding indirect demand inflation across the city is estimated at around \$3.6B, ranking only 8th among all schedules by absolute distortion effect.

Table 1: Top 15 individual viewshaft schedules by absolute land value distortion

Schedule	Maunga	Direct (\$M)	Indirect (\$M)	Direct + Indirect (\$M)	Share (%)
E11	Maungawhau / Mt Eden	4,826	−8,212	13,038	5.1
E6	Maungawhau / Mt Eden	2,455	−5,173	7,628	3
W26	Maungarei / Mt Wellington	2,613	−4,613	7,226	2.8
A13	Ōwairaka / Mt Albert	2,208	−4,645	6,853	2.7
O11	Maungakiekie / One Tree Hill	2,226	−4,174	6,400	2.5
O12	Maungakiekie / One Tree Hill	1,814	−4,526	6,340	2.5
O1	Maungakiekie / One Tree Hill	1,892	−4,274	6,166	2.4
E10	Maungawhau / Mt Eden	2,007	−3,562	5,568	2.2
W12	Maungarei / Mt Wellington	1,746	−3,793	5,539	2.2
T3	Rangitoto Island	1,277	−3,921	5,198	2
O2	Maungakiekie / One Tree Hill	2,318	−2,812	5,130	2
T1	Rangitoto Island	1,432	−2,708	4,140	1.6
W19	Maungarei / Mt Wellington	979	−2,217	3,197	1.2
B6	Motukorea / Browns Island	614	−2,196	2,810	1.1
E3	Maungawhau / Mt Eden	1,139	−1,509	2,648	1

Source: Crow Advisory analysis. Each schedule is removed individually while all other viewshafts remain in place; effects estimated under the closed-city model. Share is computed as $\frac{|Direct| + |Indirect|}{|Direct_{all}| + |Indirect_{all}|}$.

The percentage share of the total distortion effect is calculated as the sum of the absolute values of the direct and indirect land value effects for the schedule, divided by the corresponding sum for the remove-all scenario. Using absolute values avoids the obscuring effect of large but nearly offsetting positive and negative distortions: the direct gain and indirect loss are both real economic shifts, and their sum of magnitudes better captures the total scale of market distortion than the net effect alone.

The distribution of effects across the 79 schedules is highly skewed: a small number of central-isthmus Maunga Viewshafts account for the bulk of the aggregate cost, while a long tail of schedules impose negligible distortion. To identify which protections are genuinely harmless rather than merely redundant given other overlapping protections, Table 2 ranks the least distortive schedules using a keep-one method: each schedule is retained in isolation while all other viewshafts are removed, and its absolute land value effect is measured against the remove-all scenario. This avoids labelling a schedule harmless under the remove-one ranking when its effect is blocked by another viewshaft that already binds the same parcels. Five schedules—the four Motukorea / Browns



Island viewshafts (B1, B2, B3, B5) and one Rangitoto Island schedule (T2)—produce no measurable land value effect even when retained alone, because the protected sight lines pass over land that is either undevelopable or peripheral enough that the height plane sits well above the market-implied building envelope. The remaining ten schedules in the bottom fifteen each impose less than 0.25% of the total distortion of the full Maunga Viewshaft regime when retained on their own.

This pattern helps inform where reform would be most and least worthwhile. Schedules in Table 2 are harmless in the narrow economic sense used in this report: retaining them imposes no meaningful cost for market signals, housing affordability, or household welfare. The cultural, civic, and visual values that motivated their original designation can therefore be preserved at essentially no economic price. Conversely, the schedules in Table 1 are where the economic case for review is strongest, and where any reform effort focused on a small number of high-leverage changes would deliver the largest share of the gains identified in this report. A targeted policy that retained the harmless protections while reconsidering the most distortive few could capture most of the available economic benefit while leaving many of the existing protected Maunga Viewshafts untouched.

Table 2: Bottom 15 individual viewshaft schedules by absolute land value distortion

Schedule	Maunga	Direct (\$M)	Indirect (\$M)	Direct + Indirect (\$M)	Share (%)
B1	Motukorea / Browns Island	0	–1	1	0
B2	Motukorea / Browns Island	0	–1	1	0
B3	Motukorea / Browns Island	0	–1	1	0
B5	Motukorea / Browns Island	0	–1	1	0
T2	Rangitoto Island	0	–1	1	0
T10	Rangitoto Island	–1	–1	2	0
W8	Maungarei / Mt Wellington	–25	3	28	0.01
R1	Puketāpapa / Mt Roskill	–203	–1	205	0.08
T4	Rangitoto Island	–11	262	272	0.11
T9	Rangitoto Island	–3	274	277	0.11
V1	Takarunga / Mt Victoria	–262	–54	316	0.12
W5	Maungarei / Mt Wellington	–213	213	426	0.17
T8	Rangitoto Island	–205	305	510	0.2
O9	Maungakiekie / One Tree Hill	–217	333	550	0.21
V2	Takarunga / Mt Victoria	–262	331	593	0.23

Source: Crow Advisory analysis. Each schedule is retained individually while all other viewshafts are removed; effects estimated under the closed-city model. Share is computed as $\frac{|Direct| + |Indirect|}{|Direct_{all}| + |Indirect_{all}|}$, where the denominator is the absolute total distortion under the remove-all scenario. A small share indicates that retaining only this schedule produces an outcome close to the no-viewshafts world—i.e. the schedule binds little incremental development on its own.

Caveats

- The model solves for a **time-agnostic spatial equilibrium**: results represent the effect of full market adjustment, not a forecast. A better interpretation of these counterfactual scenarios is as alternate realities that the Maunga Viewshaft policies prevented (see Section 7 for further discussion).



- **This analysis covers residential development only;** economic effects on commercial and other non-residential development are not captured and would represent additional benefits of removing the constraints.
- **Our agglomeration estimates are conservative.** Estimated agglomeration effects are based on a standard elasticity of wages with respect to population, which is a common approach in the literature but may not capture all the nuances of how productivity responds to changes in urban form and density. We believe this results in understating the potential agglomeration benefits of enabling greater density in many of the city's most central and high-value locations. Well-tested models for spatialising estimates of agglomeration effects already exist, and further study could apply these to the question of Maunga Viewshaft effects.

1. Introduction

Auckland's volcanic maunga are of deep cultural significance to Mana Whenua and hold an iconic place in the city's identity. To preserve the visual connection between key public vantage points and these landmarks, Auckland's urban and spatial plans have for decades imposed protected Maunga Viewshaft overlays—building height limits on properties that fall within designated sight lines toward and across the maunga.

These height restrictions carry economic costs. By curtailing development intensity below what the market would otherwise support, Maunga Viewshaft overlays reduce the potential supply of floor area on some of the city's most centrally located and highest-value land. This influences land values, housing supply, affordability, and the spatial structure of the city. The cultural value of the protected views is not well quantified, and this report does not attempt that assessment. Instead, we estimate the economic cost of the restrictions as a contribution to the broader conversation about whether the Maunga Viewshafts as currently configured are the most efficient means of achieving their cultural goals.

We estimate these effects using an Alonso-Muth-Mills (AMM) spatial equilibrium model, extended to handle the fine-grained spatial structure of Auckland's geography, zoning and Maunga Viewshaft topography, and to account for agglomeration and congestion forces. We apply the model in two complementary versions—a closed-city version where Auckland's population is fixed, and an open-city version where population and wages respond endogenously—and compare counterfactual scenarios in which some or all Maunga Viewshaft constraints are removed against a baseline where affected parcels are unconstrained by zoning but all Maunga Viewshaft constraints remain.

Our approach proceeds in two main stages:

1. **Calibration under current constraints.** We calibrate the model so that it reproduces key observable features of Auckland's housing market—including approximate land value gradients, house price levels, and the distribution of population and built intensity across the city—under the existing zoning and Maunga Viewshaft regime. This ensures that the model's parameters are anchored to empirical reality before any policy counterfactual is simulated.
2. **Counterfactual simulation without zoning.** With those calibrated parameters held fixed, we remove all zoning constraints for Maunga Viewshaft-affected parcels (allowing the free-market equilibrium to determine building density under the Maunga Viewshaft constraints) and then compare scenarios where Maunga Viewshaft height limits are either retained or removed. By stripping away zoning, we isolate the marginal effect of the Maunga Viewshaft overlays themselves on land values, floor area supply, and housing costs.

The scenarios we examine include removing all Maunga Viewshafts, removing those associated with specific maunga (such as Maungawhau / Mt Eden, Maungarei / Mt Wellington, and Ōwairaka / Mt Albert), and retaining various subsets. This allows us to assess both the aggregate citywide cost and the contribution of individual Maunga Viewshaft groups.

The report is structured as follows. Section 2 provides background on Auckland's Maunga Viewshaft overlays and the policy context. Section 3 reviews the relevant economic literature. Section 4 describes the data sources and the substantial processing pipeline required to translate marginal changes in Maunga Viewshaft policies into parcel-level effects on density constraints. Section 5 presents the AMM spatial equilibrium model, its calibration, and the scenario design. Section 6 presents the results of our counterfactual simulations. Section 7 discusses the key limitations and assumptions. Section 8 offers conclusions.

2. Background

2.1. Auckland's Maunga Viewshaft overlays

The Auckland Unitary Plan (AUP), made operative in part in November 2016, includes a set of regulatory overlays designed to protect views of selected volcanic cones from designated public vantage points. These are defined in Chapter D14 of the AUP as “volcanic viewshafts and height sensitive areas” and place restrictions on maximum building height for properties within each designated sight line. Plan Change 120 (PC120) proposed renaming these overlays as “Maunga Viewshafts” to better reflect their purpose; this report follows that direction.

There are 79 individual Maunga Viewshaft planes defined in Schedule 9 of the AUP, grouped by the maunga they protect. The major groups include:



Table 3: Maunga Viewshaft groups

Maunga	Schedule codes	Viewshaft count
Maungawhau / Mt Eden	E1–E20	15
Maungarei / Mt Wellington	W1–W26	15
Maungakiekie / One Tree Hill	O1–O12	12
Ōwairaka / Mt Albert	A1–A13	8
Ōhinerau / Mt Hobson	H1–H7	7
Te Tātua-a-Riukiuta / Big King (Three Kings)	K1–K2	2
Rangitoto Island	T1–T10	7
Motukorea / Browns Island	B1–B6	5
Puketāpapa / Mt Roskill	R1–R2	2
Takarunga / Mt Victoria (Devonport)	V1–V3	3
Te Pane-o-Mataoho / Mt Mangere	M4–M6	3

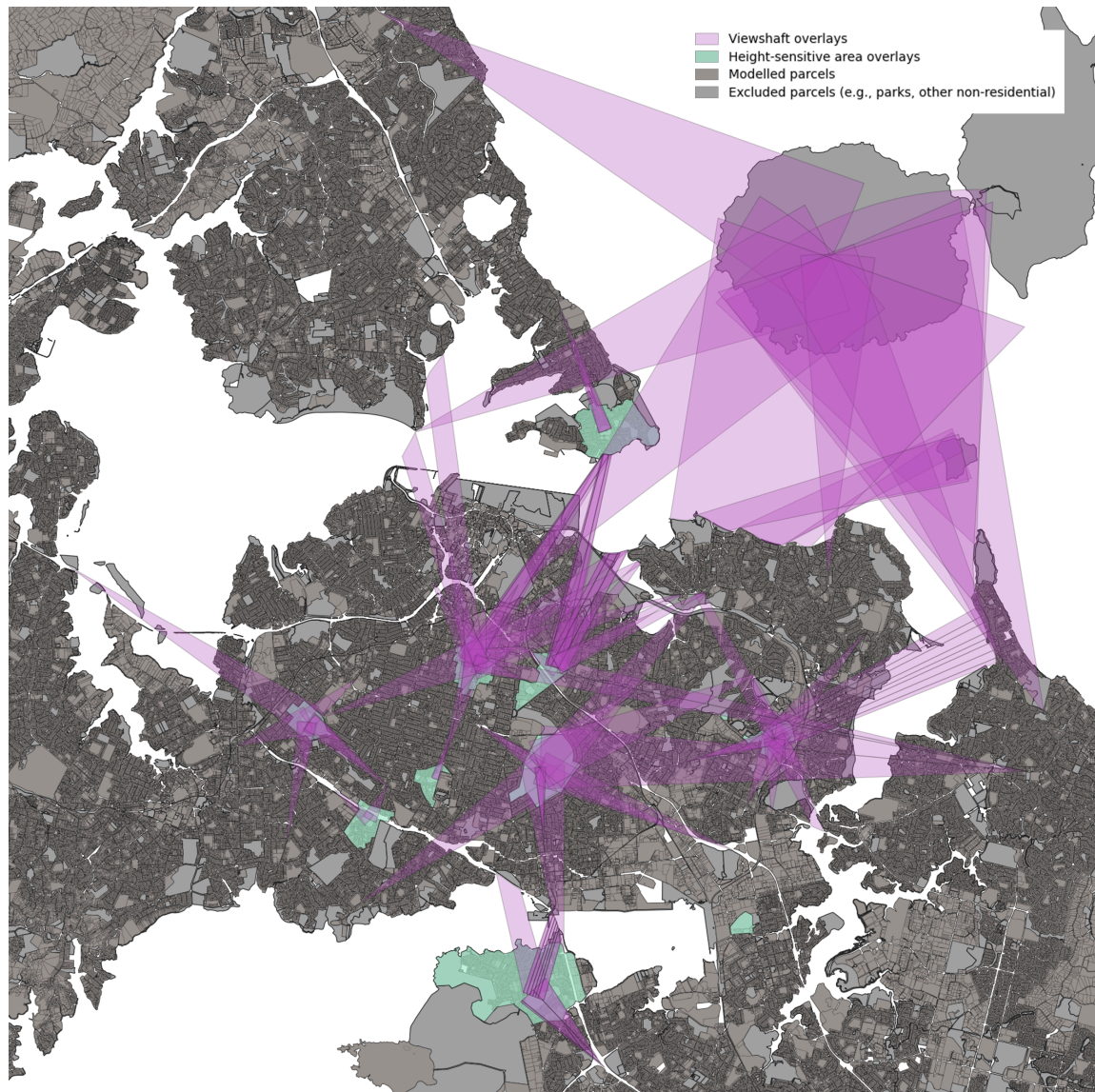
Source: Auckland Unitary Plan, Schedule 9 and Appendix 20

Each Maunga Viewshaft is defined as a finite plane originating from a public vantage point, typically a road or public space, and projecting toward and beyond the maunga. The height limit at any point within the viewshaft is determined by the plane at that location—properties closer to the vantage point (and farther from the maunga) face more restrictive height limits, while those beyond the maunga may face less severe or no practical constraint.

In addition to the Maunga Viewshaft planes themselves, the AUP designates Height Sensitive Areas (HSAs)—zones around the base of each protected maunga where a fixed height limit of 9 metres applies regardless of the viewshaft planes (with minor exceptions). There are 10 HSAs, each associated with a specific maunga.



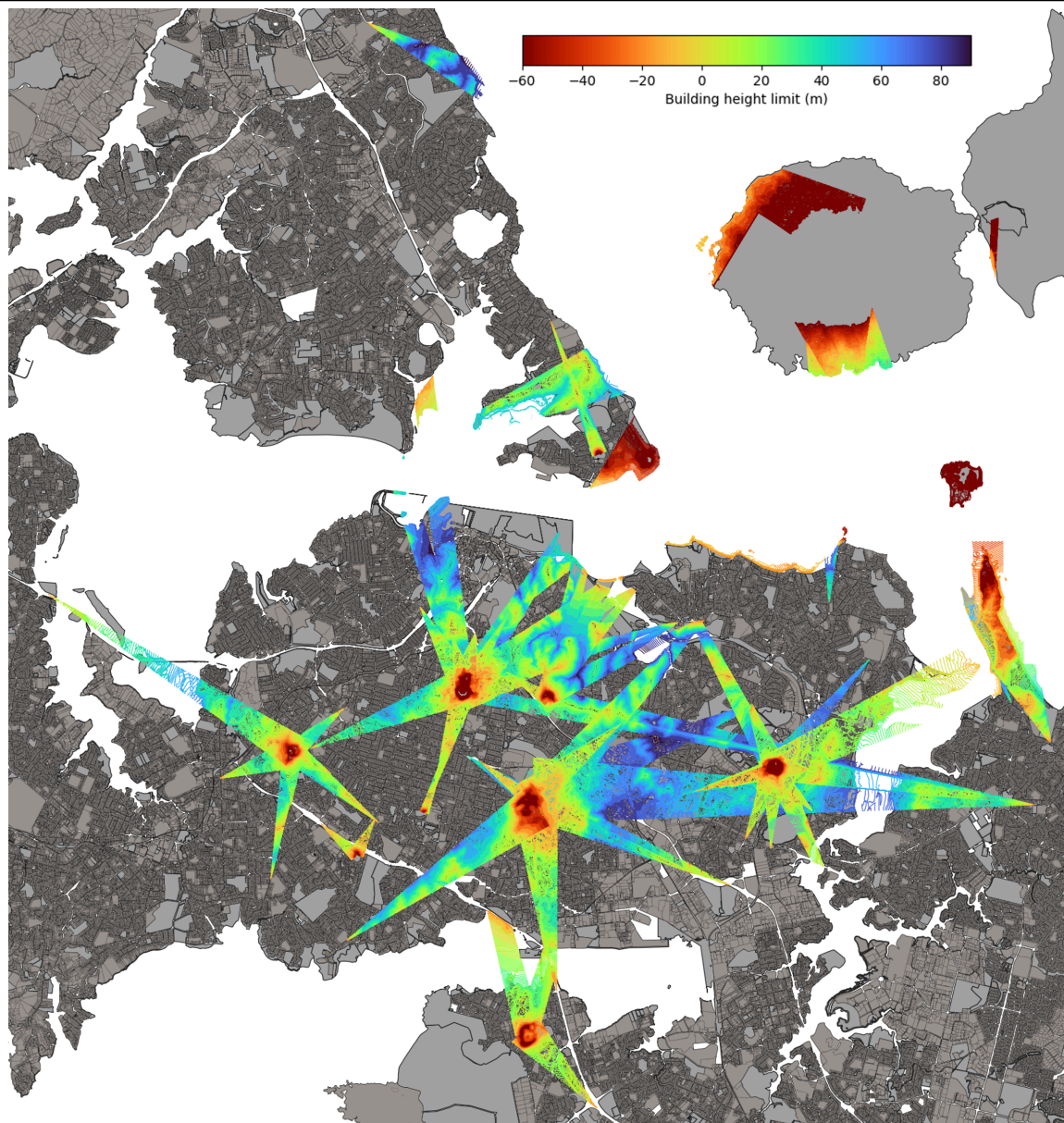
Figure 1: Maunga Viewshaft overlay footprints and Height Sensitive Areas across Auckland



Source: Auckland Council data. Viewshaft planes shown in purple, HSAs in teal.

The set of distinct height and density restrictions introduced by the interplay between topography and the Maunga Viewshaft planes is complex. Some parcels are affected by multiple overlapping viewshafts, and the most restrictive height limit applies. Figure 2 illustrates the variation in height limits created by the viewshaft geometries and underlying topography.

Figure 2: Overview of Maunga Viewshaft height limits



Source: Auckland Council data. Negative values represent areas where the landscape sits above the Maunga Viewshaft plane.

The spatial distribution of these constraints is highly heterogeneous, with the greatest concentration of affected parcels in the inner city isthmus where the Maunga Viewshaft planes intersect with high-value land.

2.2. The economic question

Maunga Viewshaft overlays impose building height limits that may be more restrictive than the underlying demand for floor area. Where the viewshaft limit binds—constraining density below what the market would supply—there is an economic cost in the form of:

- **Reduced housing supply:** fewer dwellings can be built per unit of land, reducing the housing stock the city can support.
- **Higher housing costs:** constrained supply in desirable central areas pushes up prices and rents, reducing consumer surplus and generating broader welfare losses.
- **Distorted land values:** affected parcels lose value while unaffected parcels absorb displaced demand at higher prices.

- **Altered city structure:** development that would have occurred under Maunga Viewshaft planes is displaced to less efficient peripheral locations.
- **Foregone agglomeration benefits:** limiting development in central locations may reduce the productivity gains that arise from dense proximity between jobs, amenities, and infrastructure.

The magnitude of these effects depends on where Maunga Viewshafts bind, how severely they bind, and how the broader market adjusts. A spatial equilibrium model captures these interactions because it represents the city as an interconnected system where changes in one location ripple through land markets, housing supply, and residential choices everywhere.

3. Literature review

3.1. Spatial equilibrium and the Alonso-Muth-Mills framework

Our model's theoretical foundation is the Alonso-Muth-Mills (AMM) monocentric city model, developed independently by Alonso (1964), Muth (1969), and Mills (1972). Households choose locations by trading off housing costs against commuting costs to a central employment centre. In equilibrium, utility is equalised across locations: households closer to the centre pay more for housing but spend less on commuting. This generates a downward-sloping land rent gradient, an endogenous city boundary where urban rent equals the opportunity cost of rural land, and declining densities with distance from the centre.

The AMM model predicts that binding height or density restrictions will raise housing prices in constrained locations, reduce the housing stock, push development outward, and generate deadweight losses. Brueckner (2011) provides a comprehensive treatment of these comparative statics. Bertaud and Brueckner (2005) extend the framework specifically to building height restrictions, deriving impacts on city size, density profiles, and welfare. Our model builds on this version of the AMM framework, extending it to handle the complex spatial structure of Auckland's Maunga Viewshaft overlays and to incorporate agglomeration and congestion effects.

3.2. Zoning reform and housing supply in spatial equilibrium models

A growing empirical literature applies AMM-style models to evaluate specific land use regulations. Greenaway-McGrevy (2025a) develops an AMM-based framework for Auckland's 2016 upzoning under the Auckland Unitary Plan, showing how changes in land price gradients and FAR capacities can be mapped into welfare changes using spatial equilibrium identities—the same logic we apply to Maunga Viewshaft constraints, treating them as spatially targeted downzoning.

In a closely related study, Greenaway-McGrevy and Jones (2025) apply an annular sector AMM model to Auckland's Special Character Areas (SCAs), finding that the welfare cost of development restrictions dominates the amenity value, yielding a net loss equivalent to 0.32–1.32% of household income. Their annular sector discretisation—dividing the monocentric disk into distance rings and angular sectors with heterogeneous zoning—provides the direct template for our spatial representation of Auckland's Maunga Viewshaft overlays. That paper also included an empirical analysis that showed that Auckland exhibits a commuting pattern and wage gradient that make it suitable for approximation by a monocentric city Model, particularly when distances are measured by commute time as we have done here.

Cooper et al. (2026) propose the Land Cost to Floor Area (LCFA) ratio—land price divided by permitted FAR—as an indicator that captures the combined effect of regulatory changes on land prices and development intensity. Using Auckland's 2016 upzoning, they show that while land prices rose in upzoned areas, the LCFA fell because permitted floor area increased by more, and that zones with the lowest LCFA subsequently saw the highest rates of housing starts. We estimate the LCFA for each scenario under both closed- and open-city assumptions, expressing the effect of viewshaft removal in terms of the cost of the land input per unit of housing that can be built.

3.3. Agglomeration economies and city size

The open-city extension relies on agglomeration economies to link city size to productivity. Donovan et al. (2024) provide a meta-analysis of 4,068 elasticity estimates across 68 countries, finding a mean of approximately 4% with substantial variation. For New Zealand, Donovan et al. (2022) estimate that doubling effective density raises wages by 3–7%, depending on the sector and the historical timing. These estimates inform our choice of $\delta = 0.035$ in the agglomeration wage function $W = BN^\delta$. The form of the agglomeration function is taken from Greenaway-McGrevy and Jones (2024).



Agglomeration benefits must also be balanced against congestion costs, which we model as a function of the city's total population and the capacity of its cross-modal transport network, following Greenaway-McGrevy and Jones (2024) and Hazledine et al. (2017).

3.4. Empirical evidence on heritage and view protections

A parallel literature examines property value effects of heritage and view protections. Coulson and Leichenko (2001) and Noonan (2007) find that proximity to heritage designations is generally associated with higher property values, but Noonan and Krupka (2011) and Heintzelman and Altieri (2013) show that these estimates are sensitive to endogeneity: protections tend to be applied to areas that are already valued, overstating the amenity premium. Been et al. (2016), studying New York's historic districts, find that the value premium diminishes substantially—and can turn negative—once the estimate controls for selection effects.

In the Auckland context, Cooper and Namit (2021) estimate that the volcanic viewshaft cutting through the central business district reduced affected land values by approximately 40% at the margin, representing NZ\$1.552 billion in foregone value for a single maunga viewshaft. Their hedonic approach captures the partial equilibrium effect on directly affected parcels but does not model the general equilibrium adjustments—the citywide reallocation of development, population, and prices—that a spatial equilibrium framework can capture.

3.5. Auckland's Maunga Viewshafts in the policy context

Nunns (2015) provides an earlier assessment of maunga viewshaft effects on development capacity, mapping where viewshafts bind and estimating foregone floor area—stopping short of a full welfare analysis, but establishing that viewshafts restrict a non-trivial amount of inner-city capacity. The New Zealand Initiative (2025) argue that the opportunity cost has “likely significantly increased” since the Unitary Plan was adopted, because higher underlying zoned heights mean the viewshaft constraints now bind more severely.

The Plan Change 78 (PC78) and Plan Change 120 (PC120) processes have also engaged with whether viewshaft protections should be retained, narrowed, or removed under intensification requirements from the National Policy Statement on Urban Development. The policy material frames maunga viewshafts as giving effect to Section 6 of the Resource Management Act—matters including the protection of outstanding natural features and the relationship of Māori with their ancestral lands—while emphasising the need to weigh “the importance of the landscape” against “the extent to which the viewshaft will affect future development otherwise enabled by this Plan.” Balderston et al. (2025) provide the housing capacity modelling underpinning PC120's “same or more” capacity test, treating viewshafts as one of several qualifying matters that constrain plan-enabled dwelling capacity. Our analysis contributes to meeting this assessment mandate by quantifying the economic costs of viewshaft-induced restrictions.

4. Data

This analysis draws together several spatial datasets and requires substantial processing to translate the viewshaft geometry defined in the AUP into parcel-level height constraints, and then to integrate aggregations of parcel area grouped by congested travel times to the city centre into a format suitable for the spatial equilibrium model. This section describes the key datasets and the processing pipeline.

4.1. Data sources

Our primary data sources are:

1. **LINZ primary parcels:** Parcel boundaries for the Auckland region from Land Information New Zealand (LINZ), providing the spatial unit of analysis. We use approximately 440,000 parcels within the Auckland urban area.
2. **Auckland Unitary Plan viewshaft data:** The three-dimensional viewshaft geometry is defined in an XML-based format provided by Auckland Council. Each viewshaft consists of a set of vertices (latitude, longitude, altitude) defining the viewshaft plane. A most-binding-height contour layer was also provided by Auckland Council, as well as a flat polygon layer for viewshaft and HSA-affected areas.
3. **District Valuation Roll (DVR):** Unit-level rating valuations from Auckland Council as of 2024, including land values, improvement values, and property characteristics. These are used as calibration targets for deriving land value gradients.
4. **Auckland Council capacity modelling spatial layers:** Modelling by the Land Use Research and Evaluation team provides the spatial layers that describe zoning regulations, various exceptions and overlays, and associated floor area ratio (FAR) provisions. The data provided is from PC78 as notified in August 2022, with the Auckland Light Rail corridor and Special Housing Areas modelled under the operative Auckland



Unitary Plan (AUP(OIP)). The version used for this model excludes updates to the city centre zone under PC78 made operative in June 2025. These spatial layers are used to determine permitted development intensity per parcel. This vintage of the zoning plan is selected to align with the 2024 district valuation roll data described below. Plan Change 120 (PC120), which introduces further intensification, had not been confirmed at the time the 2024 land values were collected. Combining PC120 zoning with pre-PC120 calibration targets would be unsound, because the land values to which the model is calibrated predate the details of PC120. The modelled baseline therefore understates the total development capacity that will ultimately be in place under PC120.

5. **Auckland Forecasting Centre Macro-Strategic Model (MSM) outputs:** The MSM is an integrated land-use and transport model used to analyse traffic, accessibility, and economic geography dynamics to serve multiple planning purposes. We use AM-peak congested travel times (at “MSM zone” level—a bespoke spatial grouping based on trip origin-destination patterns) from this model to group our parcels into “distances” from the city centre.
6. **OpenStreetMap road network:** A complete road network graph for Auckland, used to compute free-flow travel distances from each parcel to the CBD. These parcel-level distances are used in combination with MSM zone-level congested times to arrive at a per parcel estimate of actual travel times.

4.2. Maunga Viewshaft geometry processing

The Maunga Viewshaft overlays are defined in the AUP as three-dimensional planes that interact with topography contours to arrive at specific height limits at each location. Converting these into usable height limits for each parcel is a multi-step process.

4.2.1. Parsing and reprojection

The viewshaft XML file is parsed using the BeautifulSoup python library to extract, for each named viewshaft, its vertices as latitude-longitude-altitude triplets. Non-AUP viewshafts are filtered out during this step. All coordinates are reprojected from WGS84 (EPSG:4326) to the New Zealand Transverse Mercator projection (NZGD2000, EPSG:2193) to enable distance and area calculations in metres.

4.2.2. Plane equation fitting

Each viewshaft is approximated as a plane in three-dimensional space. Using the first three vertices of each viewshaft polygon, we compute two edge vectors and take their cross product to obtain the four constants that define each plane (a, b, c, d). The plane equation takes the form:

$$ax + by + cz = d \quad (1)$$

The height z of the viewshaft plane at any point (x, y) within the footprint is then:

$$z(x, y) = \frac{d - ax - by}{c} \quad (2)$$

This allows us to compute the sequence of height limits imposed by any combination of viewshafts at any location within their overlapping footprints by evaluating the plane equations there and subtracting the ground elevation.

4.2.3. Spatial overlay and height assignment

To assign height limits to parcels, we follow a pipeline of spatial operations:

1. **Contour sampling:** Points are sampled within each viewshaft polygon at a density of approximately 0.5 points per metre along contour lines, then snapped to a 2-metre grid to reduce redundancy while maintaining spatial resolution.
2. **Spatial join:** A spatial join identifies which sampled contour points fall within which viewshaft polygons. A single point may fall within multiple overlapping viewshafts.
3. **Height evaluation:** At each contour point, we evaluate Equation 2 to compute the viewshaft plane altitude, then subtract the ground elevation to obtain the height limit at that point.
4. **Parcel aggregation:** For parcels overlapping with one or more viewshafts, we compute all potential height limits but assign the **minimum** height limit on a scenario basis across all overlapping viewshafts—that is, the most restrictive constraint prevails. Only parcels with at least 50% of their area within a viewshaft overlay are considered affected by that viewshaft.
5. **Lateral averaging:** Any given parcel may have hundreds of sampled contour points overlapping it, with a range of associated height limits, especially in steeply sloped areas or areas where different viewshafts overlap. A simple average of point heights would distort the effective constraint for the parcel because points

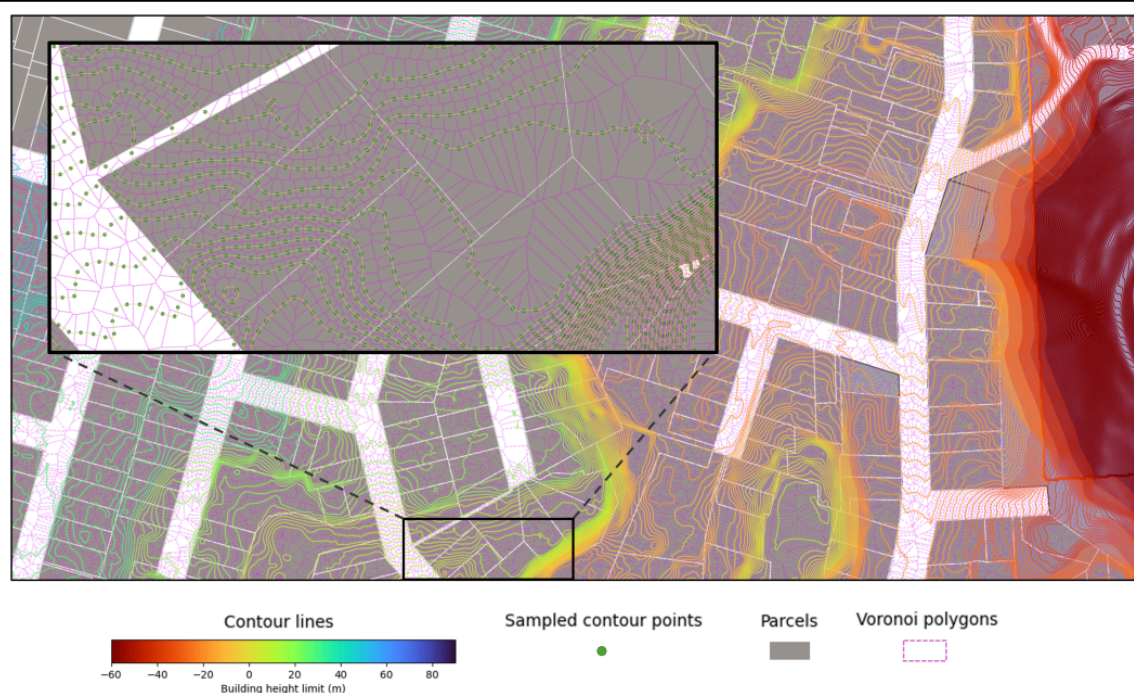


are more numerous where heights change rapidly. To address this, we generate a Voronoi polygon⁵ layer from the sampled contour points, then compute an area-weighted average of the height limits for each parcel based on the intersection of the parcel with the Voronoi polygons. This preserves the spatial variation in height limits while avoiding distortion from point density.

6. **HSA corrections:** For parcels within a Height Sensitive Area, a fixed height limit of 9 metres is applied, overriding any less restrictive viewshaft-derived limit. The small minority of parcels where the HSA regulations permit a different limit are assumed subject to 9 metres as well, as the differences are not spatially quantified in the source materials and nearly always result in the same 2-storey maximum in practice.

The output is a parcel-level dataset of binding height limits under each viewshaft, which is then converted to an effective floor area ratio (FAR) constraint using a standard conversion of 3.6 metres per storey and a site coverage assumption of 50%.

Figure 3: Using Voronoi polygons for height limit averaging



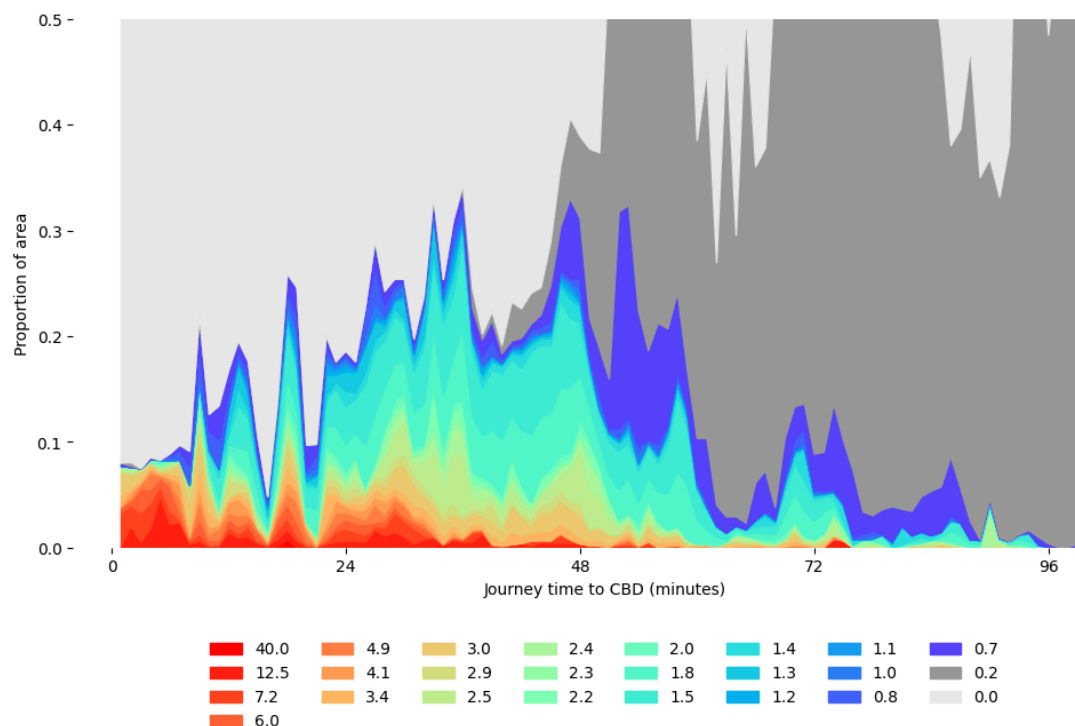
Source: Auckland Council data. Crow Advisory analysis.

4.3. Zone and FAR processing

The allowable FAR for a given parcel in practice is the result of several layers of permissions and restrictions. The AUP defines a variety of base zones, which apply to broad areas of the city. The plan then overlays a series of exceptions or additional restrictions related to natural hazards, flight paths, special character, outstanding natural features, etc. Many of these include height restrictions that override the base zone. Further, the building envelope is also restricted by setback and height-in-relation-to-boundary rules that apply to part of a parcel but not all of it, depending on its shape and size. The Land-Use Research and Evaluation (LURE) team at Auckland Council models the combined effect of these various rules to derive an effective FAR for each parcel, which is the maximum floor area relative to land area that could be built on that parcel under the current regulatory regime. We use this effective FAR per parcel to derive our status-quo scenario before making counterfactual changes for analysis, but the resulting set of FAR constraints is a near-continuous distribution with too many unique values to model each one individually. Instead we create a set of FAR bins based on observed percentile values and hold these constant across scenarios. We also add an arbitrarily high “unconstrained” FAR bin at a ratio of 40 to provide the unconstrained case in our scenarios. Figure 4 shows the distribution of parcel land area across these FAR bins, which are used to construct the supply side of the model.

⁵ Voronoi polygons are used to partition space based on the shortest distances to a set of seed points from all other points (Voronoi 1908).

Figure 4: Parcel land area distribution by effective FAR zone



Source: Auckland Council plan-enabled capacity data and Crow Advisory analysis. FAR of zero means open water or undevelopable land. FAR of 0.2 and below captures rural areas and lifestyle blocks.

Where a viewshaft imposes a height limit below what the zone would otherwise allow, the effective FAR for that parcel is reduced to reflect the binding viewshaft constraint. This is the mechanism through which viewshafts enter the model—they override the zone-based or unconstrained FAR with a lower value where the viewshaft binds. When we remove the zoning limits or a viewshaft for a given scenario, we recalculate FAR based on the average height limit of the next-most-binding viewshaft, the site-coverage ratio, and the average storey height. If no viewshafts remain, we apply the unconstrained FAR of 40. For business zones that allow mixed-use, a residential use proportion of 50% is applied to FAR limits to reflect mixed-use development patterns.

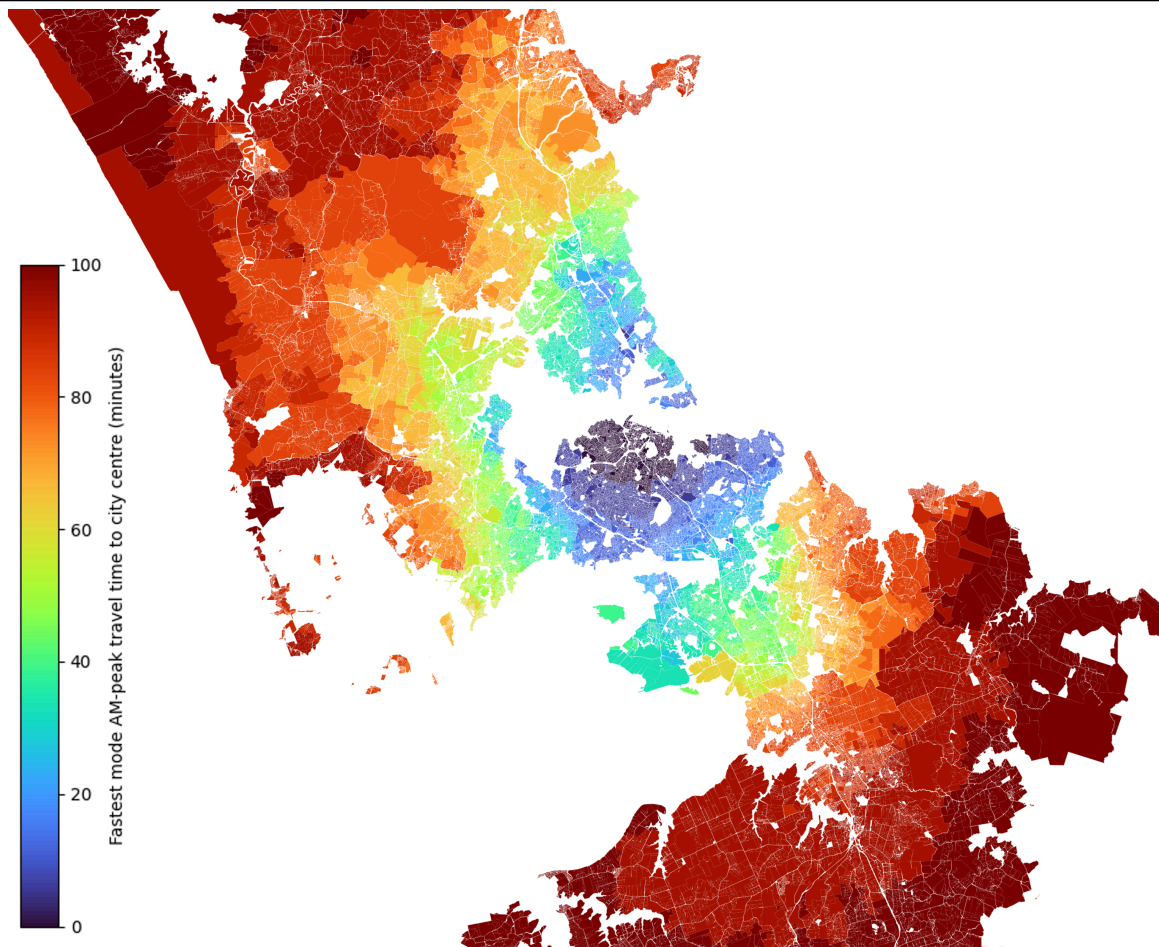
4.4. Travel distance computation

The model requires a measure of travel cost from each location to the CBD. We compute road network distances from parcel centroids to a central reference point (the AC Building in downtown Auckland, at approximately 174.76°E, 36.85°S) using Dijkstra's shortest-path algorithm on an OpenStreetMap road network graph loaded and processed with the *osmnx* Python library (Boeing 2017).

These distances serve two purposes: they position parcels within the annular model structure, and they provide the distance dimension along which land value gradients and calibration targets are evaluated. The model supports both road-network distance in kilometres and a conversion from congested travel time in minutes using a configurable conversion speed (default 25 km/h).

Congested travel time estimates at a coarser zone-to-zone level are derived from a separate travel time matrix on the MSM zone geography (provided by Auckland Forecasting Centre), which is used alongside parcel area sums grouped by zone and distance to construct the spatial structure of the model. Figure 5 shows parcels coloured by their AM-peak congested travel time to the city centre. The distribution of parcels by congested travel time is used to assign parcel area to distances in the supply side of the model, while the conversion back to distance is used to construct the distance-based travel cost dimension of the model.

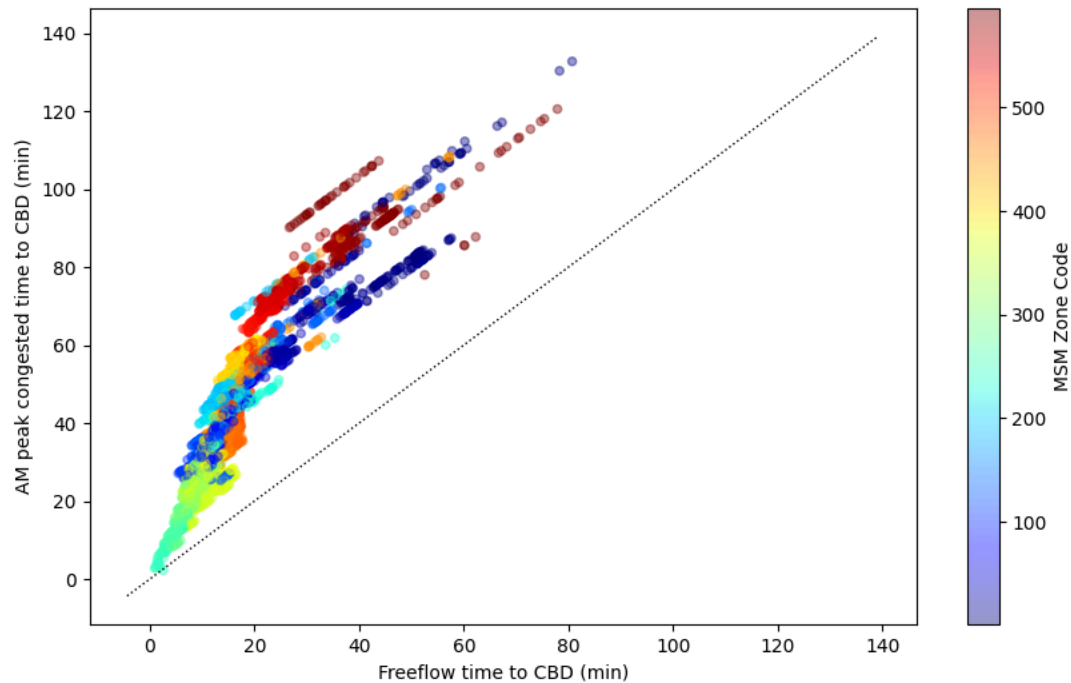
Figure 5: Parcel distribution by journey time to CBD



Source: OpenStreetMap network data, processed by Crow Advisory.

Figure 6 shows the relationship between average congested and free-flow travel times for each MSM zone. Notice that the divergence between the two occurs within the first few thousand seconds of free-flow time, where congestion approximately halves the speed of travel. Beyond about 30 minutes of free-flow time, the relationship resumes a one-to-one pattern as congestion effects diminish and disappear.

Figure 6: Congested versus freeflow travel time from meshblock centroids to the CBD

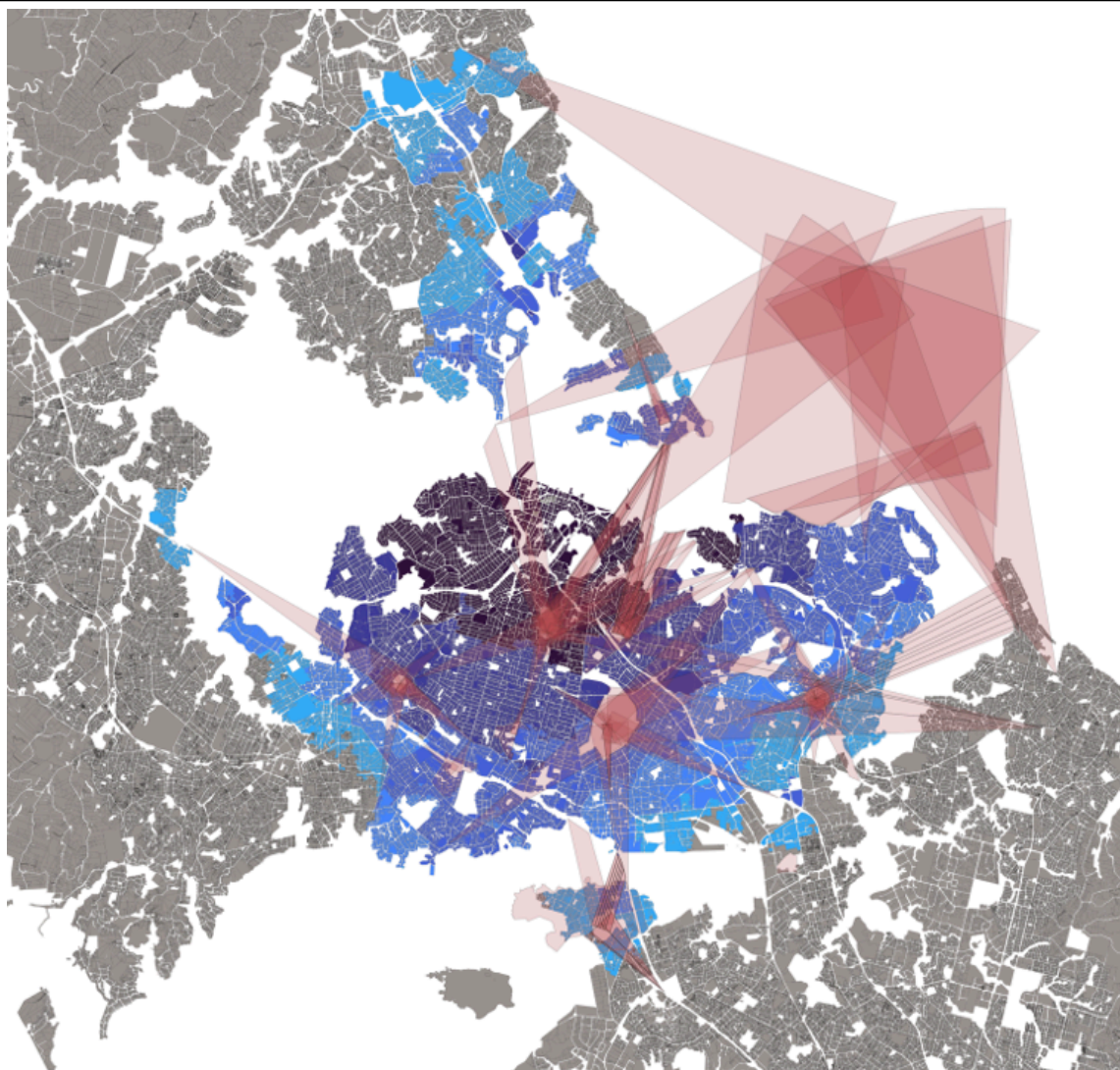


Source: Auckland Forecasting Centre travel time matrix and OpenStreetMap freeflow distances. Random sample of 5,000 parcels. Note that MSM zone codes are approximately ascending from North to South. Central isthmus zones are toward the centre of the colormap.

Auckland's viewshaft-affected parcels are almost entirely located within this inner area where congestion materially slows travel time (see Figure 7 below). This has important implications for the calibration of the model, as it means that using free-flow distance as the distance dimension would misrepresent the actual travel costs faced by households in these areas. By using congested travel time, we ensure that the model's distance-based land value gradient and population distribution targets are evaluated against a measure of distance that reflects actual travel costs in the inner city rather than just physical distance.

Using congested travel time to assign buildable land to distance bins has the effect of better accounting for the higher cost of travel in the congested areas where viewshaft constraints are most prevalent. However, this also has implications for interpreting the results, as discussed further below.

Figure 7: Most viewshaft-affected parcels are within 30 minutes of the City Centre



Source: Auckland Council Unitary Plan viewshaft data, processed by Crow Advisory.

5. Methods

This section describes the spatial equilibrium model used to estimate the economic effects of viewshaft overlays, the calibration approach, and the scenario design. A full mathematical specification of the model is provided in Section 9.

5.1. The spatial equilibrium model

Our analysis uses an Alonso-Muth-Mills (AMM) spatial equilibrium model—the standard framework in urban economics for analysing how land use, housing prices, and city structure emerge from the interaction of household location choices, housing production, and land markets—following the annular sector approach of Greenaway-McGrevy and Jones (2025).

The model describes a city where households balance two forces: the desire to live close to employment and the cost of housing. In equilibrium, no household can improve its situation by moving—those closer to the centre pay more for housing but save on commuting. This trade-off produces gradients in house and land prices driven by travel costs that increase with distance. When calibrated, the model replicates the characteristic pattern of declining land values and densities with distance from the centre that is clearly observable in Auckland's data.

On the supply side, developers choose how intensively to build based on achievable prices. Where prices are high—close to the centre—they build taller and denser. Zoning rules and viewshaft height limits cap this response: where a restriction binds, the developer cannot build as much floor area as would otherwise be optimal.

The model solves for equilibrium in which housing supply meets demand at every distance, total population matches the observed total, and the city boundary—the distance at which urban development ceases to be more profitable than rural land use—is determined endogenously. This boundary is an economic concept, not a regulatory urban-growth boundary or metropolitan urban limit. When it contracts in a scenario, this reflects greater capacity absorbed centrally rather than a prediction that Auckland will literally shrink. Key outputs include house prices and land values by distance, development intensity, gradients of dwelling densities, and expenditures on housing and transport.

5.2. Closed-city and open-city variants

We estimate effects under two complementary versions of the model, each embodying a different assumption about population response.

In the **closed-city** version, Auckland’s household count is held fixed. When viewshaft constraints are relaxed, the model adjusts prices, land values, and spatial distribution to restore equilibrium. The welfare gain accrues through lower housing costs and improved consumption for existing residents.

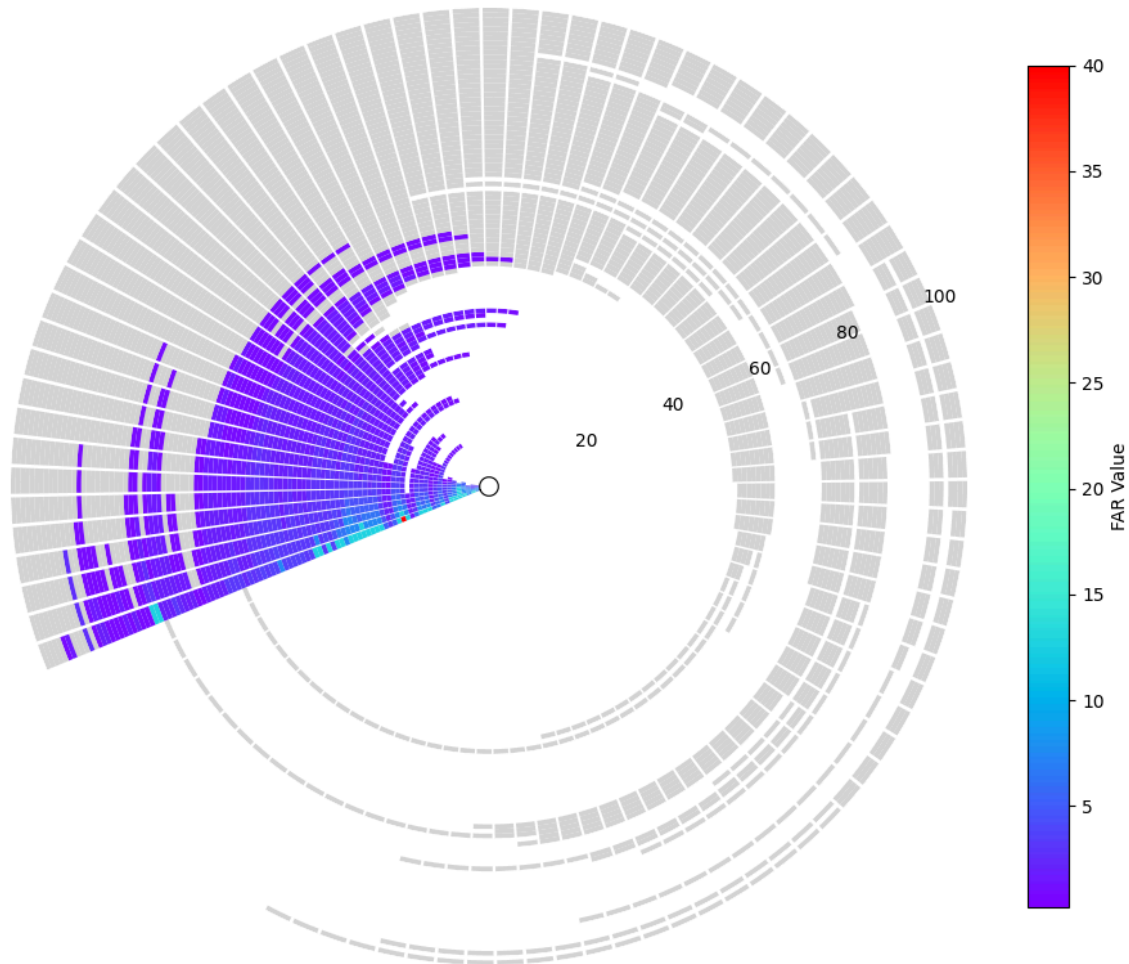
In the **open-city** version, population adjusts. Wages follow an agglomeration relationship $W = BN^\delta$ ($\delta = 0.035$), where a larger, denser city supports higher productivity. Travel costs rise with population through a congestion function, partially offsetting agglomeration benefits. The model pins household welfare to the closed-city baseline—representing the national reservation level—and solves for the population at which Auckland just remains attractive. When viewshafts are removed, the increased supply draws additional households until wages, congestion, and housing costs reach a new balance. The welfare gain does not accrue to individual households (who remain at the reservation level) but materialises through a larger, more productive city: more people employed at higher wages, generating greater total economic output.

5.3. Representing Auckland’s spatial structure

Rather than treating Auckland as a simple disk, we discretise the city into 100 concentric distance rings (“annuli”) and 100 angular sectors, following Greenaway-McGrevy and Jones (2025). Each annulus represents a distance band from the city centre. Each sector within an annulus represents a uniform proportion of the total parcel area at that distance. FAR limits are assigned to each sector based on the proportion of total parcel area modelled to fall within each FAR bin. An angular allocation vector accounts for Auckland’s irregular coastline and non-urban land, reducing the total sector count available in proportion with the area at that distance covered by water and non-residential land. This annuli-specific adjustment is an innovation over the approach of Greenaway-McGrevy and Jones (2025), which applied a uniform angular adjustment across all distances. The resulting structure captures the variation in total land available at each distance more accurately.



Figure 8: Annular sector discretisation of Auckland’s spatial zoning structure



Source: Crow Advisory. The city is divided into 100 congested-travel-time rings, or annuli (one minute per annulus). Each annulus is then divided into 100 angular sectors including water and non-urban land, with FAR caps assigned based on the underlying parcel-level constraints. Colour represents the FAR bin under status quo zoning and viewshaft constraints. Grey cells represent rural and lifestyle zoned areas, white space where cells would be represents non-urban land or water.

This structure represents Auckland’s heterogeneous zoning at fine spatial resolution while remaining computationally tractable. When a counterfactual scenario removes a viewshaft, the FAR cap at affected locations reverts to the next binding constraint (another viewshaft, or the unconstrained market optimum), releasing additional capacity. The model then re-solves, revealing how the change ripples through land values, housing prices, and population distribution citywide.

5.4. Calibration

The model is calibrated to reproduce key features of Auckland’s current housing market, ensuring that its parameters are grounded in empirical reality before any counterfactual scenario is simulated. Following Greenaway-McGrevy (2025b), the calibration uses Evolution Strategy with Covariance Matrix Adaptation (CMA-ES), a stochastic optimisation algorithm for difficult optimisation problems (Hansen 2016). CMA-ES can handle highly non-linear, non-convex, non-smooth, and noisy objective landscapes (Hansen 2006) and exhibits strong invariance properties (Hansen et al. 2011). The algorithm has been applied to econometrics to address ill-conditioned optimisation problems (Jones 2021), and is considered a state-of-the-art evolutionary optimiser (Li et al. 2020). Further description of the calibration algorithm and approach is provided in Section 9.

The calibration targets three objectives simultaneously:

1. **Population:** the model’s estimated total dwellings should closely approximate the observed 616,800.
2. **Built intensity:** the predicted floor area ratios should align with the observed FAR caps at the distances where zoning constraints bind.

3. **Land values:** the predicted land value gradient should align closely with observed median land values per square metre from the District Valuation Roll across the 100 distance nodes.

The resulting calibrated parameters are shown in Table 4. These reflect a joint fit across all three objectives, with a composite calibration residual of 11.2.

Table 4: Calibrated parameter values

Parameter	Calibrated value	Description
$\bar{x}$	99 minutes congested travel time	City boundary radius
α	0.4	Housing expenditure share
γ	0.539	Capital share in construction
A	0.0002	Construction productivity
W	\$154,000/year	CBD household net income
t	\$2,500/km	Annual commuting cost per km
r_a	\$1,329,920/km ² /year	Rural land rent - opportunity cost of urban land
p_K	1	Cost of capital index
Discount rate	2.5%	Capitalisation rate
δ	0.035	Agglomeration elasticity (open city)
γ_c	0.15	Congestion capacity constant (open city)
β_c	2	Congestion exponent (open city)

The calibrated values (apart from the discount rate and the open city parameters) in Table 4 are not assumed *a priori*; they emerge from a joint optimisation that searches within bounds drawn from the empirical literature and observed Auckland data and benchmarks. A full discussion of the parameter ranges, literature sources, and selection rationale is provided in Section 9. The open city parameters are informed by the literature on agglomeration economies and congestion effects. We use the same value for γ as in Greenaway-McGrevy and Jones (2024), but that paper modelled each transport mode separately, so our selection of the β_c parameter sits between their road and public transport parameter values.

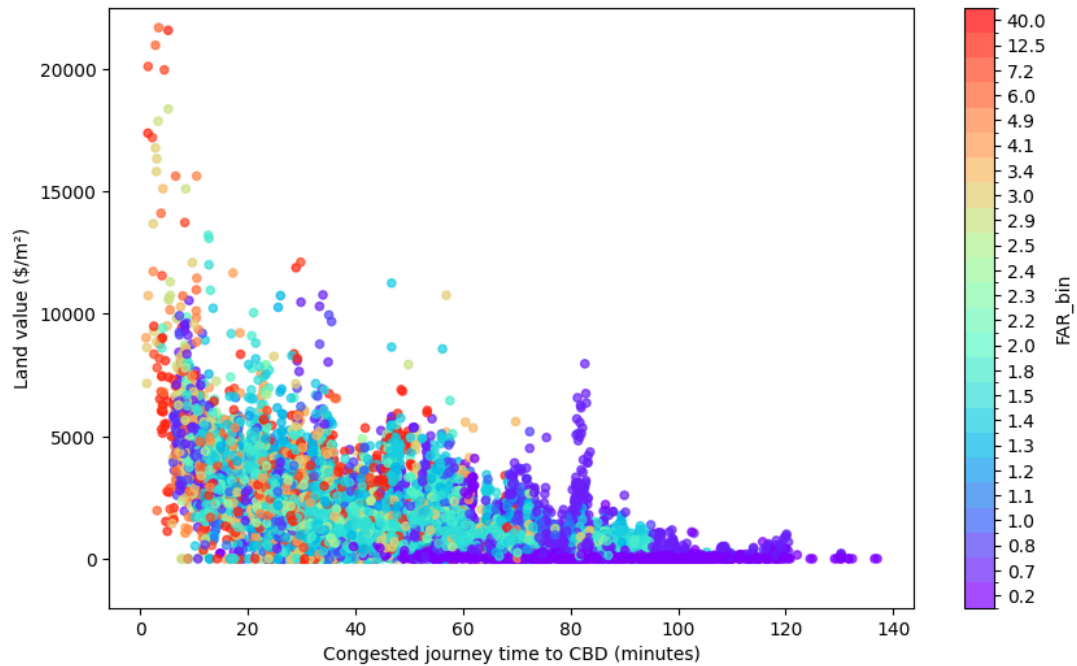
This approach yields a calibrated “status quo” scenario that closely matches observed land values, housing expenditure shares, and built intensity. In this modelled scenario, the average weekly housing expenditure is \$812, comparable to a typical mortgage. Built density overall lands at 115 dwellings per km². The 2023 census put the average number of private dwellings per km² at 120.6 (Stats NZ 2025a). The model’s estimated city boundary is at 99 minutes of congested travel time. Our parcel-level estimates put 97.5% of parcel area in the Auckland region at 99 minutes from the CBD or less during AM peak.

The calibration is not perfect but it provides a reasonable fit to the key features of Auckland’s housing market, giving us confidence that the model can be used to simulate counterfactual scenarios in the right order of magnitude.

The two figures below compare the calibrated model’s land value predictions with observed values from the DVR. The model captures the characteristic steep inner-city gradient and the gradual decline toward the urban fringe. Figure 9 shows a random sample of actual parcel land values. Figure 10 shows the calibrated model’s predictions of the land value gradient for each FAR bin. The predicted land value gradient is steeper for higher FAR bins, reflecting that parcels with higher development potential are more valuable, especially in the inner city where demand is highest.



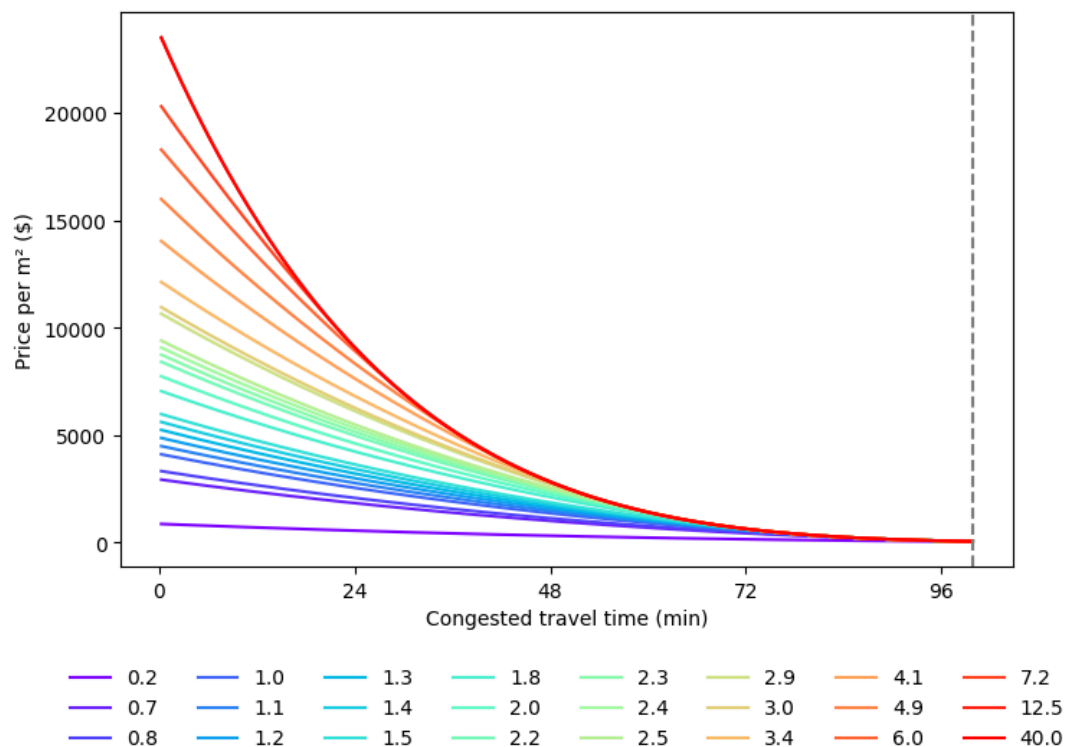
Figure 9: Observed land value sample by FAR bin



Source: Auckland Council DVR data and Crow Advisory model estimates. Random sample of 20,000 parcels.

Some fine-grained spatial variation—reflecting neighbourhood amenities and localised zoning features not represented in the annular model—is smoothed over, but the model provides a good fit to the overall shape and level of the gradient.

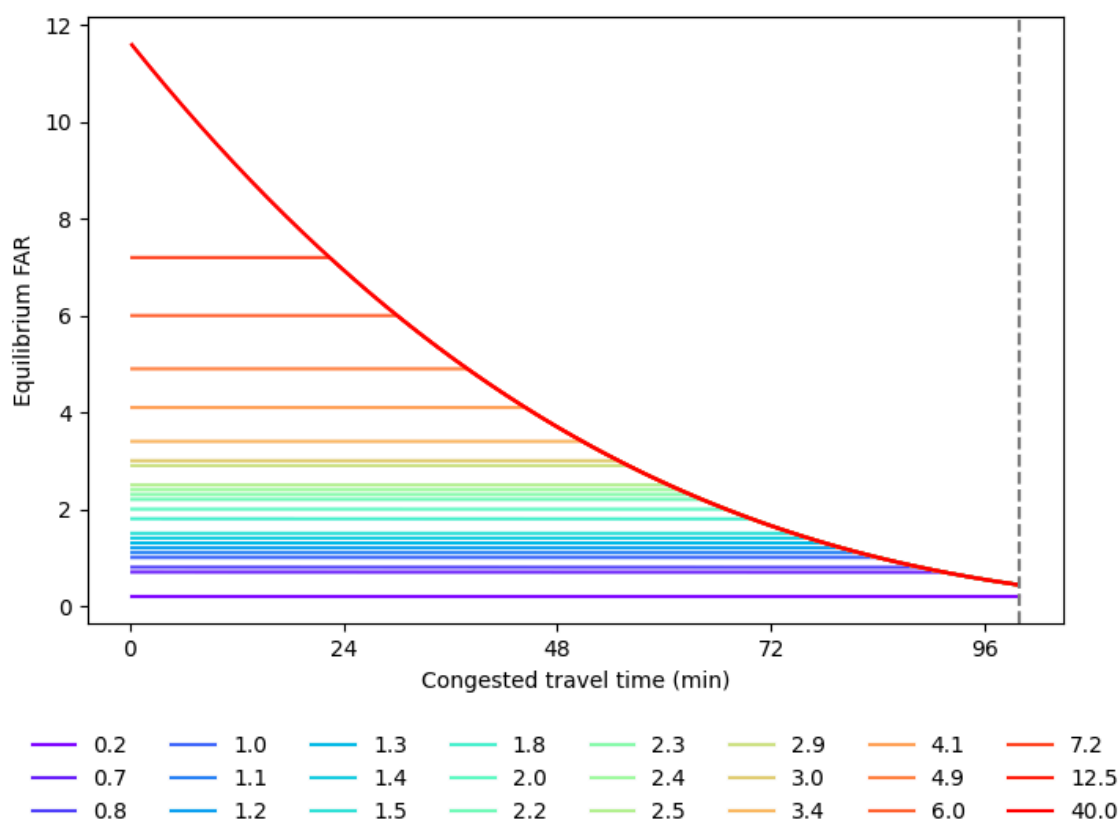
Figure 10: Calibration fit – predicted land value gradient by FAR bin



Source: Auckland Council DVR data and Crow Advisory model estimates.

Figure 11 shows the floor area ratio profile under the calibrated baseline. In the inner isthmus, FARs are capped by viewshaft height limits, creating visible plateaus at several distance bands. Beyond approximately 15 km, viewshafts no longer bind and FARs follow the unconstrained market pattern. Figure 12 shows the corresponding house price profile, declining smoothly with distance. Figure 13 shows the population density distribution, with the highest concentrations within 10 km of the centre.

Figure 11: Predicted binding distances for FAR restrictions under the status quo



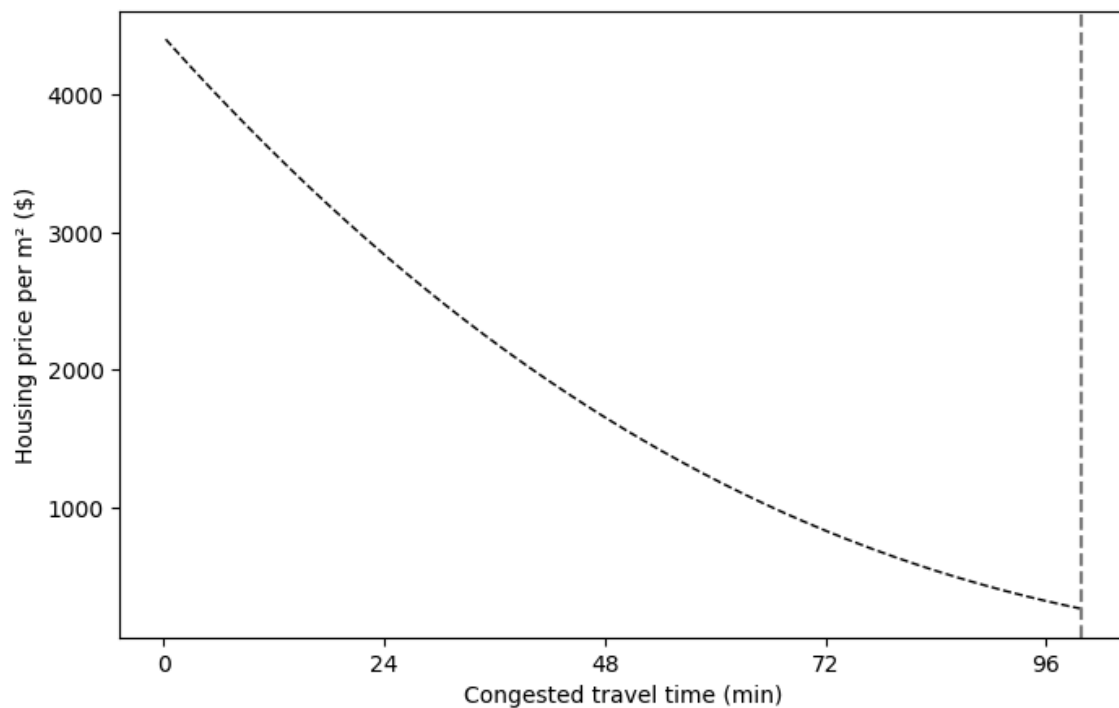
Source: Crow Advisory model estimates.

There are two features to note about Figure 11. First, the curve marked in red shows the unconstrained market FAR profile under the current modelled FAR restrictions, not the fully unconstrained profile. This is because the model solves for equilibrium given the current constraints, so the profile incorporates displaced demand from the constrained areas of the city.

Second, the FAR profiles converge with the unconstrained profile beyond the binding distance of each constraint—the model assigns each location to a bin based on its effective FAR constraint, so there are jumps in the profile where the constraint changes from one bin to another, but only within each constraint’s binding distance. Beyond the binding distance, further increases in zoned capacity have no influence on the modelled outcomes. This reflects a core concept of spatial equilibrium that is often overlooked in the public debate about zone-enabled capacity: the effect of a zoning change is not just about how much capacity it adds, but also where that capacity is added relative to the city centre. A change that adds capacity in the inner city—where demand is highest and travel costs are lowest—has a much larger effect on prices and welfare than an equivalent change in the outer suburbs, because it allows more households to access the benefits of central locations. This is why removing viewshaft constraints in the inner city has a disproportionate effect compared to adding capacity further out.

Figure 12 shows the housing price profile under the calibrated status quo scenario. The price gradient is not differentiated by FAR limit areas because the model treats housing as a homogeneous good regardless of its surrounding building constraints. Prices only vary with distance because transport costs reduce the location-adjusted wages that households can spend on housing.

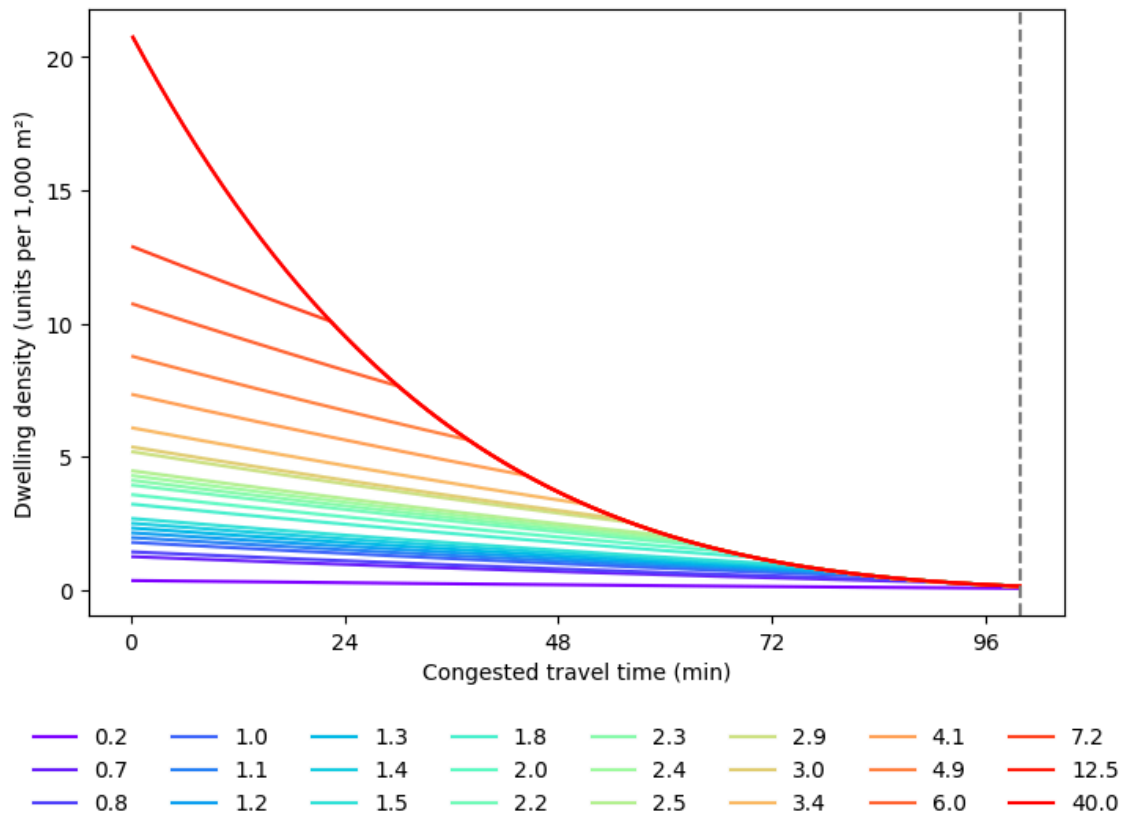
Figure 12: Baseline house price profile



Source: Crow Advisory model estimates.

The way the model determines the quantity of housing consumed by each household is a simplification. Each household spends a fixed share of its income after subtracting commuting costs on housing, and the density of housing is determined by dividing the total capacity by the price of housing. Since housing in floor area terms is treated as a fungible commodity good, nuances of housing quality and amenity differences across locations are not explicitly modelled. The price profile in Figure 12 should be interpreted as the price of a base-level-quality “housing good” that represents anything valued as part of a dwelling, including the built floor area. Having more of this good may mean a bigger house, or a nicer one. This interpretation guides our calibration approach, leading to a lower price curve and higher quantity of consumption overall than occurs in pure floor area terms. This is a homogenised way to account for the many features that homebuyers and renters are willing to pay for.

Figure 13: Baseline population density by distance and zone

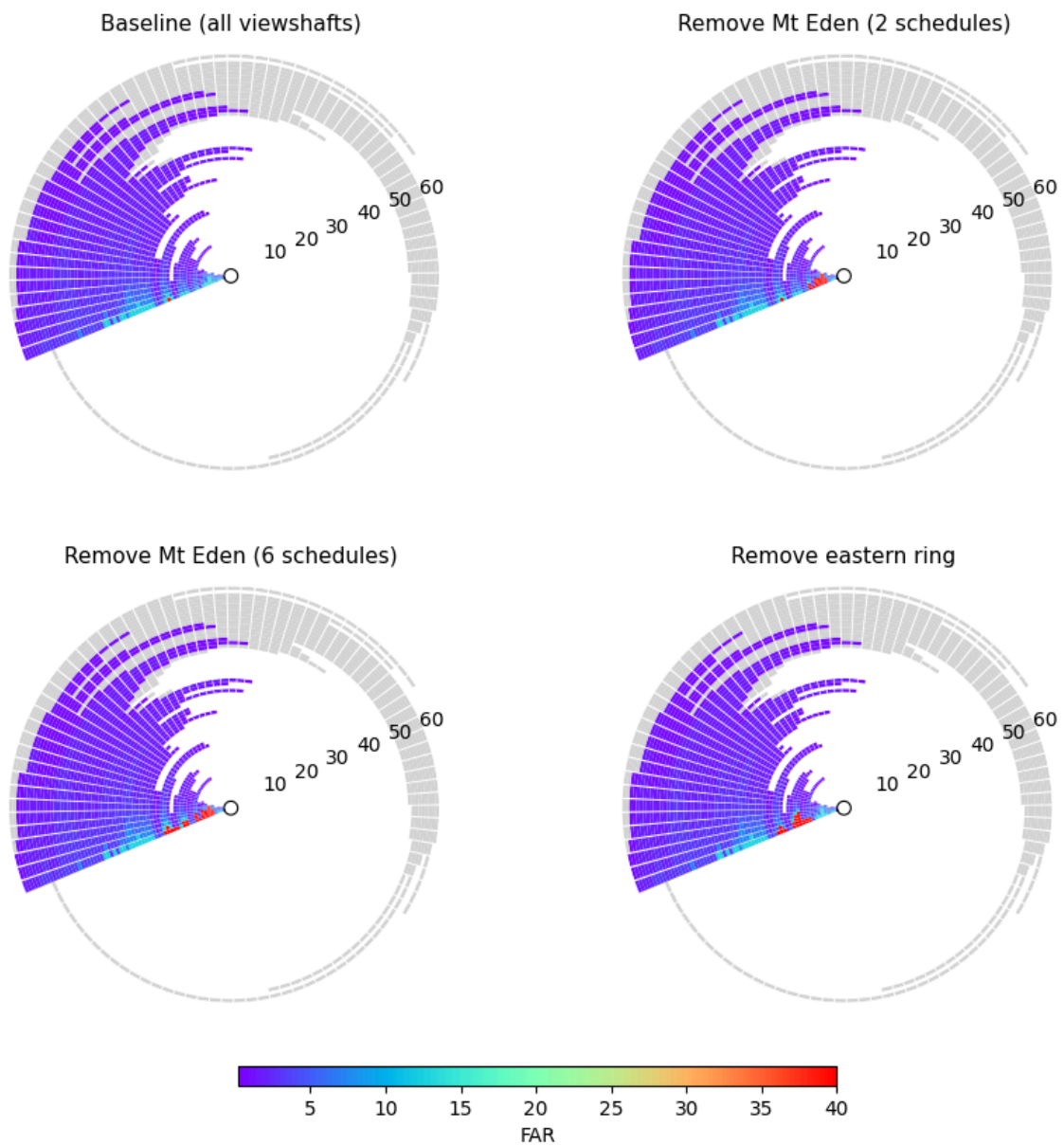


Source: Crow Advisory model estimates.

Under the calibrated baseline (all viewshafts retained, no zoning restraints for viewshaft-affected parcels), the model estimates a city boundary at 99.51 minutes from the centre and a welfare index of 48. For comparison, the **status quo** scenario—which retains both zoning and viewshafts—yields a city boundary of 99.84 and a lower welfare index of 47.6. The gap between these two reflects the difference between the viewshaft constraints and the more binding restrictions in place for viewshaft-affected parcels, and demonstrates why removing zoning for affected parcels is necessary to isolate the viewshaft contribution.

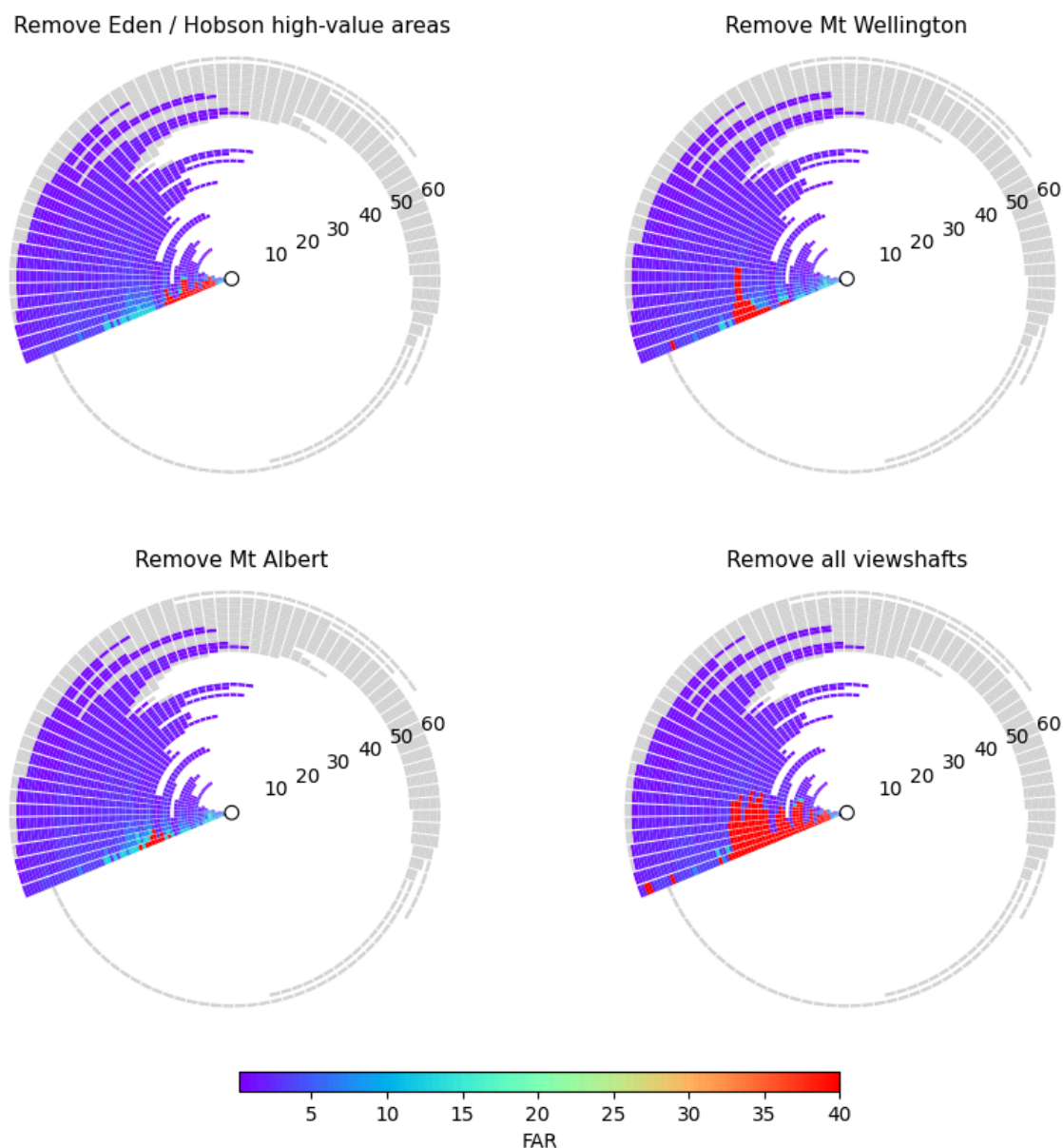
The model’s annular sector discretisation can be visualised directly for a given scenario. Figure 14 and Figure 15 map each sector-annulus cell by its assigned FAR zone under our eight scenarios (introduced in the following section), revealing the distances and parcel area proportions affected by each combination of removed viewshafts across the inner isthmus. The plots are zoomed in to the innermost 60 minutes of congested travel time, where the viewshaft constraints are most prevalent. The colour gradient represents the FAR bin assigned to each cell. The baseline scenario shows a patchwork of FAR restrictions across the inner city ranging from less than 1 to around 15, while the “remove all viewshafts” scenario shows a much larger area with higher FARs, illustrating the volume and extent of development capacity released by removing the viewshaft constraints in the absence of zoning.

Figure 14: Annular sector zone assignments under baseline scenario



Source: Crow Advisory.

Figure 15: Annular sector FAR comparison – baseline vs no viewshafts



Source: Crow Advisory.

5.5. Scenario design

To isolate the economic effect of Maunga Viewshafts, we remove all zoning constraints for affected parcels and compare scenarios in which viewshaft height limits are retained or selectively removed. If zoning were left in place, it would mask much of the viewshaft effect because zone-based limits already constrain development in most locations. As mentioned above, these zone-based limits are often chosen to explicitly mirror the viewshaft constraint. A world where the viewshafts never existed would have different zoning than the current one, so including zoning confounds the counterfactual analysis. Setting the unconstrained FAR ceiling to 40 (effectively unlimited) ensures that any remaining constraints come only from viewshaft overlays, revealing their marginal cost.

The model could also support removing all constraints for all parcels, but this would be less relevant because the resulting enormous departure from the current regulatory environment would dwarf the Maunga Viewshaft effects. By retaining zoning for non-viewshaft parcels, we maintain a realistic baseline for measuring the incremental cost of viewshaft constraints.

We examine the following scenarios:



Table 5: Maunga Viewshaft scenarios

Scenario	Schedules excluded	Description
Baseline (all Maunga Viewshafts)	None	No zoning for viewshaft-affected parcels; all viewshaft height limits and HSAs retained
Remove Maungawhau / Mt Eden (2)	E10, E16	Remove the two Maungawhau / Mt Eden viewshaft schedules that cut across the city centre
Remove Maungawhau / Mt Eden (6)	E6, E8, E10, E16, E19, E20	Remove six Maungawhau / Mt Eden viewshaft schedules
Remove eastern ring	E8, E11–E14, E19, H1–H6	Remove viewshafts in the eastern isthmus ring (Maungawhau eastern + Ōhinerau / Mt Hobson)
Remove Maungawhau & Ōhinerau high-value	E6, E8, E10–E14, E16, E19, E20, H1–H6	Remove selected Maungawhau / Mt Eden and Ōhinerau / Mt Hobson viewshafts in high-value areas
Remove Maungarei / Mt Wellington	W1–W26 (16 schedules)	Remove all Maungarei / Mt Wellington viewshafts and HSAs
Remove Ōwairaka / Mt Albert	A1–A13 (8 schedules)	Remove all Ōwairaka / Mt Albert viewshafts and HSAs
Remove all viewshafts	All	All viewshaft height limits and HSAs removed

In addition, a **status quo** scenario retains all zoning constraints alongside the Maunga Viewshaft policies, providing a reference point corresponding to the current regulatory environment.

For each scenario, the model is re-solved to equilibrium with all economic parameters held fixed, under both the closed-city and open-city versions. The comparison reveals changes in the city boundary and area, land values and house prices by distance, FAR and population density profiles, total housing supply, household welfare, and—in the open-city case—population, wages, and economic output.



6. Results

All scenarios are evaluated against the local no-zoning baseline described in Section 5, isolating the marginal effect of Maunga Viewshaft overlays on housing supply, land values, house prices, and city structure. For each analytical dimension we present the closed-city and open-city results side by side, allowing direct comparison of how the two modelling assumptions shape the estimated effects.

6.1. Direct and indirect land value effects

Removing all Maunga Viewshaft constraints while holding the calibrated parameters fixed produces a substantial shift in the housing market equilibrium. In the closed-city model, house prices at 12 minutes (5km) from the centre fall by 7.5%, household welfare improves by 3.2%, and the modelled city boundary contracts by 1.52 minutes. These three effects are logically linked: the release of development capacity in the inner city increases housing supply, lowering prices and improving household welfare; as central locations become more affordable, there is less pressure to develop at the urban fringe, and the modelled city boundary moves inward, reflecting a more compact urban form rather than any literal reduction in Auckland's geographic extent.

The aggregate land value effect is a net decline of \$67.1B. This headline figure obscures a more revealing decomposition. The **direct effect**—the change on parcels where Maunga Viewshafts were binding—is a gain of \$95.1B: these parcels can now be developed more intensively, and their land values rise accordingly. The **indirect effect** is a decline of \$162.3B. Maunga Viewshaft restrictions currently force development away from the highest-value inner-city locations, making those development opportunities artificially scarce and inflating land values on unconstrained sites. Removing the restrictions allows demand to return to the released capacity, unwinding this scarcity premium. The indirect effect dominates because the displaced demand was spread across far more parcels than the direct capacity release.

The net decline in aggregate land values does not indicate a welfare loss. The household welfare improvement is unambiguous: households consume more housing at lower cost. The land value decline is the reversal of a distortion—Maunga Viewshaft restrictions create a monopoly-like scarcity that transfers surplus from households to landowners. Removing them unwinds that transfer.

Figure 16 shows the aggregate land value effect decomposed into direct and indirect components for the “remove all” scenario. Figure 17 shows the parcel-level land value per m² modelled effects in the closed-city case for the baseline alongside the impact of Maunga Viewshaft removal for selected scenarios, illustrating the two-tone pattern of gains on constrained parcels and losses on unconstrained parcels across the city. Figure 18 shows the remaining scenarios, which produce the same characteristic pattern. The spatial distribution of these effects is explored in the next section.

