Significant Natural Areas

Section 32 Economic Assessment Indigenous Biodiversity

Wellington City Council

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→ **The Power of Commitment**

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Executive Summary

Wellington City Council (WCC) wishes to assess and understand the economic implications of Significant Natural Areas (SNAs) in the district plan. The Council notified a Proposed District Plan with SNAs identified on private and publicly owned land, but not on land zoned residential. The Council wants to understand the economic implications of the notified proposal, and a scenario in which residentially zoned land is also included.

A total of 157 potential SNAs have been identified, covering around 18% of the city's land area (5,240 hectares).

Around 69% of the area covered by the proposed SNAs is publicly-owned, including around 3,368 hectares of publicly-owned natural open space land of various forms, and 239 hectares of publicly-owned land zoned rural. A further 1,230 hectares are privately owned rural and another 283 hectares are privately-owned residential or future urban zoned.

WCC has commissioned GHD to complete an analysis of the economic implications to support the options evaluation assessment.[1] This analysis includes, primarily, estimating the potential land value losses to affected properties through reduced useability or development potential (costs of the policy), and comparing these with the society-wide benefits gained from preserving indigenous biodiversity (benefits).

Reduced land values are expected to form the bulk of the costs imposed, as some landowners will face reduced useability or development capability of properties. On the benefits side, there are a number of elements of value to communities that are captured in people's willingness to pay to preserve indigenous biodiversity and green space. Many studies have demonstrated the value communities place on preserving green space and biodiversity.

There is no perfect way to calculate the likely benefits and costs of the proposed SNAs. There is no single study in New Zealand, for instance, that measures people's willingness to pay specifically to maintain biodiversity. Consequently, estimates need to be formed based on the best comparative studies here and abroad, accounting for variations in scope or any obvious biases in the analysis.

The main or base scenario modelled assumes that SNAs are introduced as proposed on natural open space zoned, residential and rural land, with land value reductions for privately-held rural or residential zoned land. The partial[2] benefit-cost ratio (BCR) for this scenario ranges from 0.29 to 0.71, depending on the assumptions adopted.[3]

Scenario	Willingness to pay benefits ($m)	Costs to landowners ($m)	Net benefit ($m)	Partial Benefit-Cost Ratio (BCR)
Base case: SNAs on natural open space, residential and rural land; land value loss to private land only				
High benefits estimate	*$47.5*	*$66.5*	*-$18.9*	*0.71*
Low benefits estimate	*$19.0*	*$66.5*	*-$47.5*	*0.29*
Sensitivity 1: SNAs on natural open space and rural land; land value loss to private land only				
High benefits estimate	*$40.0*	*$19.2*	*$20.8*	*2.08*
Low benefits estimate	*$16.0*	*$19.2*	*-$3.2*	*0.83*
Sensitivity 2: SNAs on natural open space and rural land; land value loss to private and public land				
High benefits estimate	*$40.0*	*$23.0*	*$17.0*	*1.74*
Low benefits estimate	*$16.0*	*$23.0*	*-$7.0*	*0.70*
Sensitivity 3: SNAs on natural open space, residential and rural land; land value loss to private and public land				
High benefits estimate	*$47.5*	*$74.4*	*-$26.9*	*0.64*
Low benefits estimate	*$19.0*	*$74.4*	*-$55.4*	*0.26*

[1] Resource Management Act 1991. Section 32(2)(a) and (b).
[2] We use the term "partial" BCR to emphasise that there are a limited number of other benefits and costs not captured in this quantified analysis that need to be borne in mind in decision-making over and above the quantified benefits and costs.
[3] It is important to note that this model, because it does not allow for a range of other explanatory variables for property values, for the sake of simplicity and budget, means that the estimates of total impact on land values of SNAs should be considered on aggregate. They should not be considered at the individual property level, where the model will be far less accurate. It may be useful to undertake a more comprehensive property by property analysis, but the purpose of this work was to provide an overall estimate of the likely impact of SNAs on land values, not detailed policy impacts on individual properties.

Three sensitivity tests were run. The first assumed the same as the base scenario except SNAs were ***not*** established on residential land. The partial BCR ranged between 0.83 and 2.08.

The second sensitivity test assumed the same as the first sensitivity test except land value reductions were estimated on both private and public land. The partial BCR ranged from 0.70 to 1.74.

The third sensitivity test assumed that SNAs are introduced as proposed on natural open space zoned, residential and rural land, with land value reductions for privately-held and publicly-held rural and residential land. The partial BCR ranged from 0.26 to 0.64 depending on the assumptions adopted.

This report is subject to, and must be read in conjunction with, the limitations set out in section 1.2 and the assumptions and qualifications contained throughout the Report.

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1. Introduction

Wellington City Council (WCC) wishes to assess and understand the economic implications of Significant Natural Areas (SNAs) in the district plan. The Council notified a Proposed District Plan with SNAs identified on private and publicly owned land, but not on land zoned residential. The Council wants to understand the economic implications of the notified proposal, and a scenario in which residentially zoned land is also included.

A total of 157 potential SNAs have been identified, covering around 18% of the city's land area (5,240 hectares)..

1.1 Purpose of this report

WCC has commissioned GHD to complete an analysis of the economic implications to support the options evaluation assessment. This analysis includes, primarily, estimating the potential land value losses to affected properties through reduced useability or development potential, and comparing these with the society-wide benefits gained from preserving indigenous biodiversity.

1.2 Scope and limitations

This report: has been prepared by GHD for Wellington City Council and may only be used and relied on by Wellington City Council for the purpose agreed between GHD and Wellington City Council as set out in this report.

GHD otherwise disclaims responsibility to any person other than Wellington City Council arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

1.3 Assumptions

Data on the number of SNAs, their size, and distribution across public and privately held properties was provided by WCC. Similarly, information on the developability of properties in the City, and how SNAs may affect that developability, was provided by WCC. While GHD undertook some tests to confirm the relative accuracy of the data where possible, we did not undertake a line-by-line review of the source data. We did not independently verify this data.

2. Introducing the SNAs

This section provides some broad introductory information on the extent of the SNAs, where they affect public and private land, and whether they fall in urban or rural environments. In summary:

- A total of 157 SNAs are proposed.
- The total area of these SNAs is estimated at 5,240 hectares, or 18.1% of the estimated 28,991 hectares of land area in Wellington City.
- Around 510 hectares (10% of this total) falls into natural open zoned and open zoned areas of the City that are not divided up into rated parcels. A further 1,620 hectares (31% of the total) are estimated to be on privately-held land and 3,110 hectares (59% of the total) on publicly held land.

Properties with ***public*** ownership and zoning as residential/future urban, rural or natural space are shown in shades of blue in Figure 1, while those with ***private*** ownership that are residential/future urban, rural, or natural space are shown in shades of red or pink.

Figure 1 Land included in SNAs, by zoning and ownership

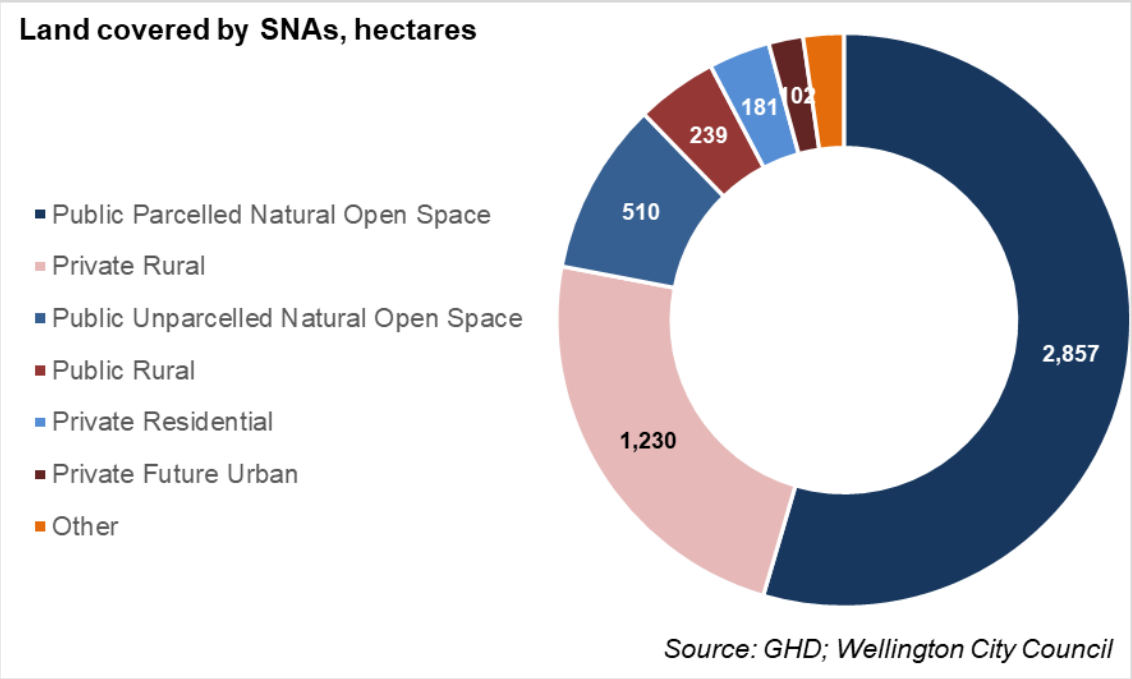


Figure 2 shows the number of affected properties where at least 0.5 m2 of an SNA is identified to be on a property.

- The SNAs that fall across public and privately held land other than unparcelled natural open zoned and open zoned areas affect 1,815 property parcels.[4]
- Of these 1,815 parcels affected by SNAs, 1,343 are privately-owned residential/future urban properties, 194 are publicly-owned parcelled natural open space properties, 169 are private rural properties, 40 are private natural open spaces, while a further 53 are zoned public residential/future urban or rural. Sixteen properties carry various types of commercial or industrial zonings and are excluded further from the analysis in this project, as the focus here is rural and residential. However, these 16 properties account for only 0.4% of all land covered by SNAs.

[4] Only properties with at least 0.5 m^2 of their land estimated to be included in an SNA are counted, so as to exclude properties that may have been highlighted by a GIS analysis but that are not genuinely included in an SNA.

Figure 2 Affected properties by zoning and ownership

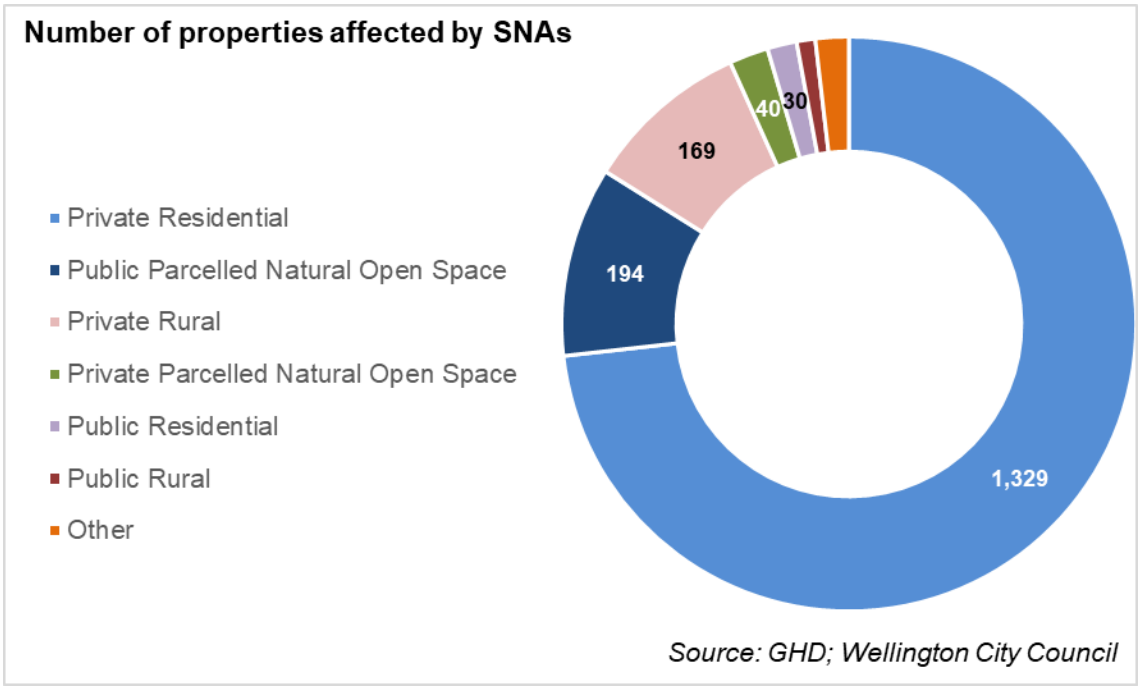
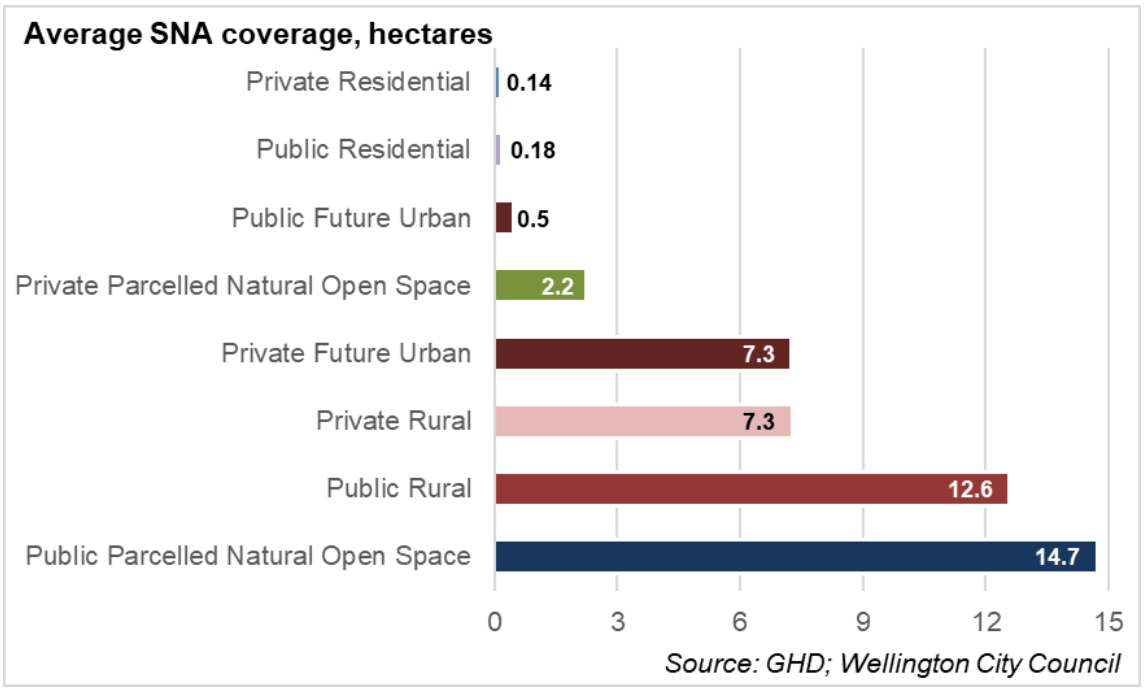


Figure 3 shows the average site coverage per affected property by zoning and ownership for the eight types of properties that are zoned and parcelled covered in this study. The average size of SNA coverage on an affected property covered in this study ranges from 0.14 hectares per affected property for private residential properties (noting that for many properties in this category, the impact of SNAs will be far smaller), to nearly 15 hectares per publicly-held parcelled natural open space property.

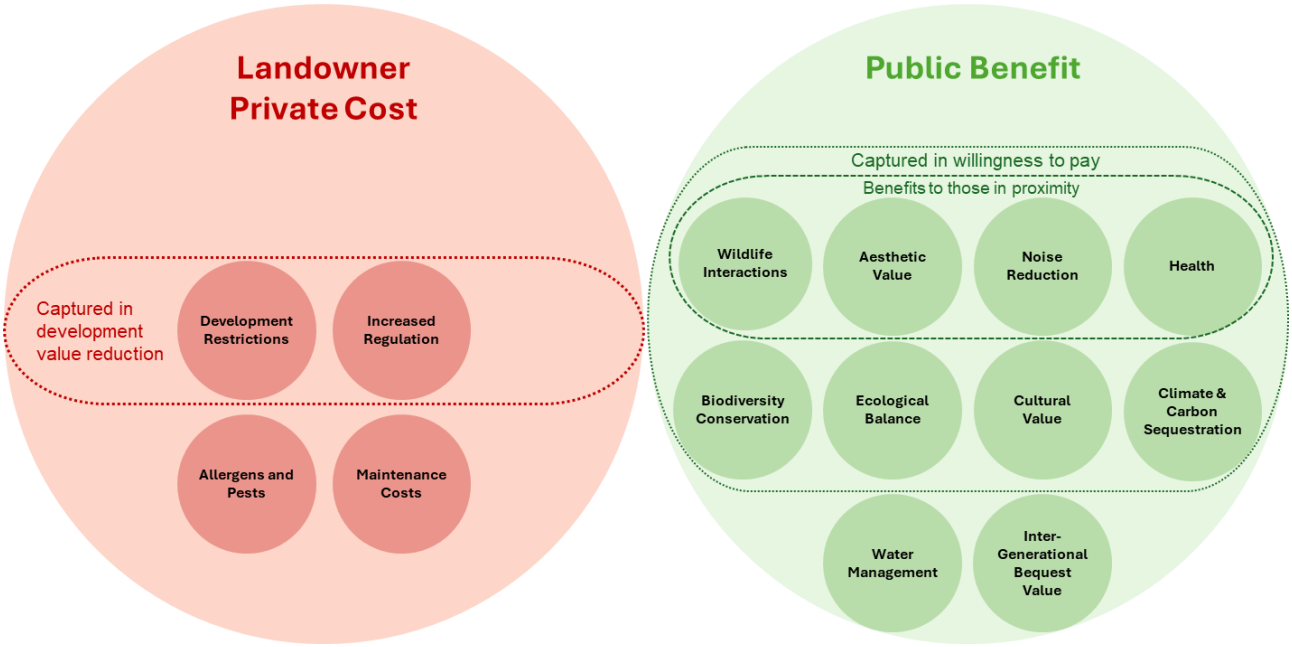
Figure 3 Average SNA coverage per affected property by zoning and ownership



3. Introducing policy costs and benefits

This section identifies the costs and benefits associated with the establishment of SNAs on property. These costs and benefits are summarised in Figure 4 and discussed further below.

Figure 4 Costs and Benefits Summary



3.1 Costs of SNAs

The cost of SNAs falls predominantly on affected landowners. Four major costs have been identified.

Two of these costs are captured within development value reduction, these being:

– ***Development restrictions*:** The ability to develop on, or subdivide land adds significant value to a property. The implementation of SNAs on private land is expected to have economic implications on private landowners,[5] limiting their ability to develop, and subsequently reducing their potential property value.

– ***Increased regulation***: Similarly, the SNAs are expected to restrict landowners' ability to modify the protected areas. The additional regulations and limitations may negatively impact property values.

Two additional potential costs to landowners are:

– ***Allergens and pests***: Natural green spaces expose people to allergens such as pollen and can potentially harbour harmful pests. The increase allergy risk may impact the health and wellbeing of landowners, particularly those with severe allergy sensitivity. The presence of pests can in the SNAs may also pose risks to landowners.

– ***Maintenance costs***: The SNAs may come at a cost to landowners through increased maintenance that comes with natural environments.

3.2 Benefits of SNAs

SNAs also provide benefits. These benefits accrue in some instance perhaps even to the affected landowner, but primarily to the community at large. The majority of these benefits are captured within the willingness to pay analysis later in this study. Several of these benefits accrue only to those within proximity of the SNAs, who are likely to experience these benefits first-hand:

[5] We also undertake a sensitivity analysis that assumes publicly-held land also reduces in value due to restrictions placed on it although it is less likely that publicly-held land with indigenous biodiversity on it would ever realistically be developed.

- ***Wildlife interactions***: A 2021 Department of Conservation survey found bird and wildlife watching was the seventh most popular outdoor activity in New Zealand. It is expected those living within the vicinity of SNAs will derive benefit from the presence of wildlife, flora, and fauna through the protection of biodiversity.[6]
- ***Aesthetic value***: SNAs and green space can enhance the visual appeal of communities, particularly in intensifying residential areas. Those within the proximity of SNAs may derive benefit from the visual appeal and biodiversity of those locations being protected.
- ***Noise reduction***: Greenspace can mitigate noise in urban environments. A dense tree environment can act as a 'noise buffer' with studies suggesting 'every 30m of woodland can reduce noise by five to ten decibels'.[7] SNAs may help keep noise pollution down for those in proximity to one.
- ***Health***: The presence of greenspace can have physical impacts on health (improved air quality) and mental impacts (improved wellbeing). A local Wellington City study found that during COVID-19 lockdowns "urban residents did actively seek out green space for restorative mental wellbeing benefits".[8] While lockdowns are an extreme example of stress to a community, this research affirms the notion that the presence of, and access to, green space is valued for mental and physical wellbeing. SNAs on private land are unlikely to include access, but those on public land potentially will, meaning benefits for those with access. There will be broader health benefits to residents across the city.

But there are also ***other benefits still captured*** in willingness to pay analysis that extend to all residents, whether they are in close proximity or not. These include:

- ***Biodiversity conservation***: The preservation of biodiversity within SNAs is expected to support wildlife, notably flora and fauna, by maintaining habitats, shelter, and food. This has explicit value to the public, who place a value on existing species of fauna and flora continuing to exist for their enjoyment.
- ***Cultural value***: SNAs will preserve biodiversity. This includes the cultural value derived from knowing that biodiversity is being treasured in line with *Kaitiakitanga* values.
- ***Ecological balance***: New Zealand has thousands of native species, with some under threat due to various human and natural factors. SNAs can help ecosystems remain in balance more than would otherwise be the case, reducing the impacts of human activity on ecosystems.
- ***Climate and carbon sequestration***: Trees play a vital role in carbon sequestration, the process of capturing and storing carbon dioxide in biomass (roots, trunks, branches, foliage). Carbon sequestration can help mitigate the effects of climate change through reducing the presence of carbon dioxide in the atmosphere.

Two further public benefits, unlikely to be meaningfully included in the public's willingness to pay, is:

- ***Water management***: Maintaining green space in urban areas has many benefits to manage water resources. Natural areas can enhance water infiltration, reduce soil erosion, and improve stormwater control and improve flood protection. This can benefit the wider community through increased resilience.[9] Given the technical knowledge of stormwater management likely to be needed to appreciate the role SNAs could play in managing water, it is unlikely that this benefit is fully captured in the public's stated willingness to pay to preserve biodiversity. This assumption is supported by a UK study that specifically identified how important the public thought water management was in preserving greenspace.[10] The study showed that water management was relatively unknown among the public as an important reason for greenspace.
- ***Inter-generational bequest value***: Maintaining biodiversity will be of value to people who have not even been born yet, and not only to those already living as captured in "biodiversity conservation above. To some extent,

[6] Department of Conservation. (2021). *New Zealanders and the environment: Domestic customer segmentation research: New Zealanders engaging with the environment, biodiversity and conservation.* https://www.doc.govt.nz/globalassets/documents/about-doc/role/visitor-research/new-zealanders-and-the-environment.pdf

[7] Forest Research (2024). *Noise abatement.* https://www.forestresearch.gov.uk/tools-and-resources/fthr/urban-regeneration-and-greenspace-partnership/greenspace-in-practice/benefits-of-greenspace/noise-abatement/#:~:text=Greenspace%20has%20the%20ability%20to%20mitigate%20noise%20in,noise%20to%20the%20human%20ear%20by%20approximately%2050%25.

[8] MacKinnon M, MacKinnon R, Pedersen Zari M, Glensor K, Park T. *Urgent Biophilia: Green Space Visits in Wellington, New Zealand, during the COVID-19 Lockdowns.* Land. 2022; 11(6):793. https://doi.org/10.3390/land11060793

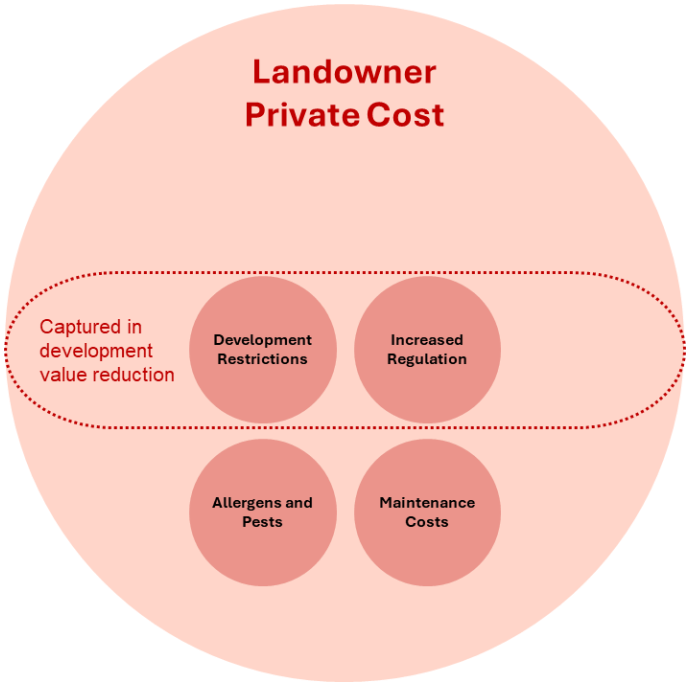
[9] World Resources Institute (2020). *How Forests Near or Far Can Protect Water for Cities*. https://www.wri.org/insights/forests-near-or-far-can-protect-water-cities#:~:text=How%20Forests%20Near%20or%20Far%20Can%20Protect%20Water,Improving%20Water%20and%20Cities%20By%20Protecting%20Forests%20

[10] Fields in Trust. (2018). *Revaluing parks and green spaces: Measuring their economic and wellbeing value to individuals*. http://www.fieldsintrust.org/Upload/file/research/Revaluing-Parks-and-Green-Spaces-Report.pdf

the public's willingness to pay to preserve green space or biodiversity will include the value that they place on biodiversity conservation as referenced above. However, the evidence of decision-making around the world when it comes to inter-generational trade-offs suggests that that often this decision-making does not capture the value to people multiple generations later from having biodiversity preserved. This value is hard to quantify but should remain a consideration.

4. Methodology: Costs

The bulk of the costs associated with establishing SNAs, where they are identified on private land, will accrue to the owner of that land. The bulk of these costs will be captured by changes in land value due to the new development restrictions and increased regulation of land owned by private parties. There will also be other potential costs, likely to be smaller in scale, such as any costs of maintaining the SNAs or dealing with allergens or pests associated with the SNA.



Given the likely scale of the costs captured in land values relative to others, this section focuses largely on the methodology used to estimate how SNAs may affect land values, for both residential and rural properties.

We note that in the main scenario presented in this report, it is assumed that only privately-held (and not publicly-held) rural and residential properties are likely to experience real land value reduction due to SNAs. However, three sensitivity tests are run, that take account of the historical debate on whether or not residential properties should be subject to SNAs, and to account for any potential loss in land value on publicly-owned residential and rural land. The three sensitivity tests are:

- All privately-held ***and*** publicly residential and rural properties are subject to land value reductions due to reduced development or use potential
- SNAs are only established on rural and open space-zoned land, and land value reductions are ***only*** assumed to eventuate on privately-held land
- SNAs are only established on rural and open space-zoned land, and land value reductions are assumed to eventuate on privately-held ***and*** publicly-held land.

4.1 Residential land value reduction

The goal is to identify the relationship between land size and price for a section where it is anticipated only one dwelling can be legally or realistically developed.

The reason for this approach is that when properties with proposed SNAs covering part of them are evaluated, we will determine whether those SNAs prevent further development of those properties, and how they reduce the useability of the property for alternatives such as a garden or play area for owners of the land. By comparing a no-SNA world to the SNA world, we can estimate the total yield in dollars from residential land with and without SNAs based on the development potential of that property and reduced effective size of a useable property due to SNAs.

Economic theory would suggest that land values are a function of their potential use or yield (not necessarily current use). Therefore an 800 m^2 section that can only support one house will be worth less than an 800 m^2 section that can support two houses, for example, because the value of the land is in the accommodation it can provide for living.

By comparing how much development is possible on an SNA-affected section with and without the proposed SNAs, we can determine the impact of SNAs on its value, as long as we have a model that explains land values for different section sizes based on single dwelling use. This is why a model explaining residential land values by section size was needed.

4.1.1 Build a sample

Sales listings for sections with no dwellings on them were sourced from Trademe.co.nz. The reason for using listings rather than recent actual sales data was because listings allowed us to interrogate the details of each section. Elements such as its slope, any covenants on the property preventing the construction of multiple dwellings, or approved building consents or resource consents for multiple dwellings that came with the listed property were crucial to building a model. This information is lacking in other sources such as the Council's database of property sales in the City.

An initial search yielded 60 sections for sale. Each listing was screened for details such as whether it was being sold as part of a larger developable area, where the expectation was that multiple dwellings would be developed, or whether an advertisement actually included more than one section for sale at different prices within a development. By excluding land sales for large-scale redevelopment, the total sample size reduced to 40. Among single, smaller sections for sale, a further five were eliminated because they already had proposed developments on them that would consist of two or more dwellings.

This process resulted in a sample of 35 sections that, as far as can be reasonably determined, are likely to be single-dwelling sections either because of covenants, section size, location, slope or other newbuilds in close proximity. These sections ranged in price from $250,000 to $1.4 million and in size from 183 m^2 to 10,052 m^2.

4.1.2 Analyse and observe patterns in the sample data

Some basic analysis of the sample data highlighted factors that were going to be important in developing a model to explain land values by size.

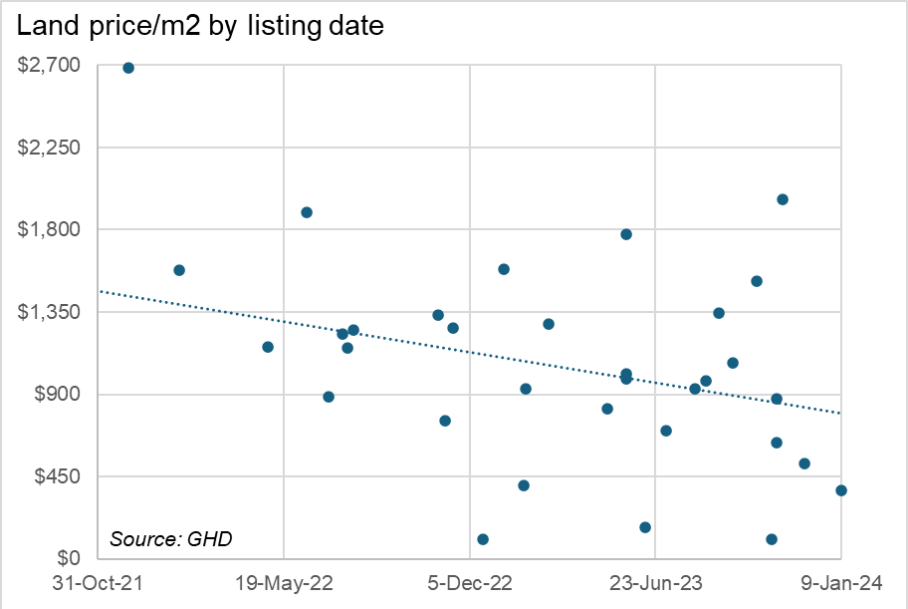
Figure 5 demonstrates the relationship between section size and price for the sample properties using absolute price and price/m^2. Unsurprisingly, as the size of land rises, the value of each additional m^2 falls as the land will only accommodate a single dwelling. We call this the law of diminishing marginal returns. One m^2 more on a section of 150 m^2 is more valuable than one m^2 added to a section of 750 m^2. This is an important consideration for model-building for residential properties (noting that outcomes are different for rural properties covered below).

Figure 5 Price/m^2 falls as section size rises for single-unit sections[11]

We also noted that because we were using listing prices and not actual sale prices, the sample could be distorted because sale prices can often be different to listing prices. If a property has been listed for six months or a year, and still has not sold, it is likely that it has not met the market in terms of price expectations. Figure 6 shows that older listings typically have higher prices/m2, which helps explain why they have not sold.

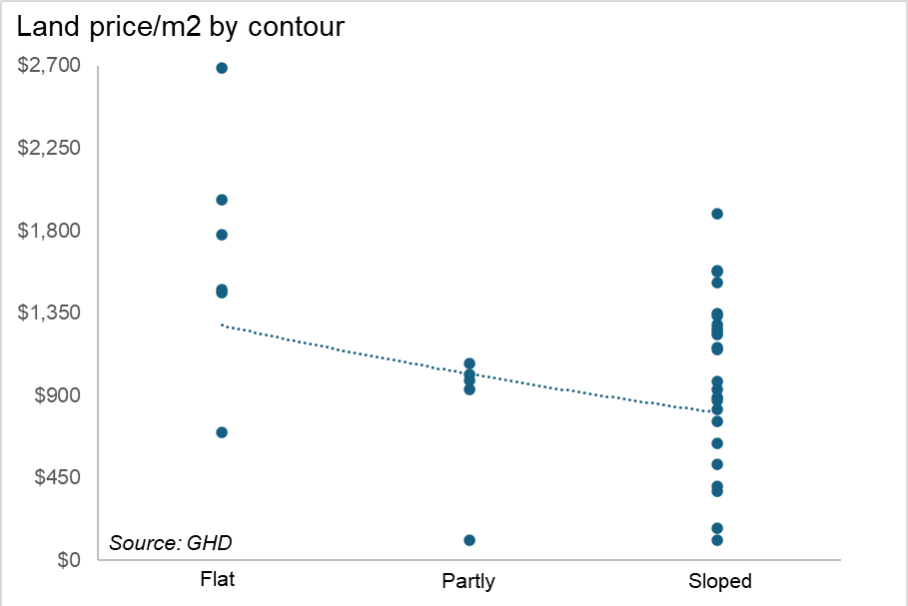
[11] Note that the graphs are truncated to exclude outliers throughout this report, but that the trendlines shown include the outliers not shown on the graph.

Figure 6 Long-listed properties likely have unrealistic sale price expectations



Finally, and particularly important in the Wellington market, is the role of slope in land value. Sloped sections are much more expensive to build on because of the earthworks and engineering often required, or special damp treatments needed if digging a dwelling into the ground. We assigned each property in the sample to a "flat", "partly sloped" or "sloped" category. There was a wide range of prices across the different levels of contour, but a clear pattern of sloped sections having lower prices on average emerges. This trend is demonstrated in Figure 7.

Figure 7 Sloped land is cheaper because it is harder to build on



One other factor that has been shown to influence prices elsewhere in New Zealand[12] is proximity to the city centre. We gathered data for each of the 35 locations in the sample but found no strong correlation between travel time to the city centre and price. This is likely because worst-case travel times in peak hours varied in a relatively narrow range of around 16 to 50 minutes, far lower than observed in Auckland for instance.

[12] See https://www.aucklandcouncil.govt.nz/about-auckland-council/business-in-auckland/Reports/does-the-rub-impose-a-price-premium-on-land-inside-it-20-Feb-2020.pdf p. 23.

4.1.3 Model an explanation of residential land values

We built a regression model that expresses price/m^2 as a function of:

- List date normalised by the listing date of the most recent property in the sample (9 Jan 2024)
- Land size
- Contour ratio (flat=0, partly = 1, sloped = 2)

The results of the analysis are shown in Figure 8. All variables are statistically significant at the 90% confidence level, and land size and contour are significant at the 95% confidence level. The model explains 45% of all variation in property values in the sample. Naturally there are other variables such as sea views or proximity to particular amenities that would add more to particular properties, while their absence subtracts value from other properties. But as a general explanation of land prices, this model works well. It will provide a fair estimate of the change in land value associated with less development potential and use value, assuming a roughly equal distribution of properties across these other factors that influence price.[13]

Figure 8 Strong empirical model results emerge from the analysis

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.705278
R Square	0.497417
Adjusted R Square	0.44878
Standard Error	410.9576
Observations	35

ANOVA

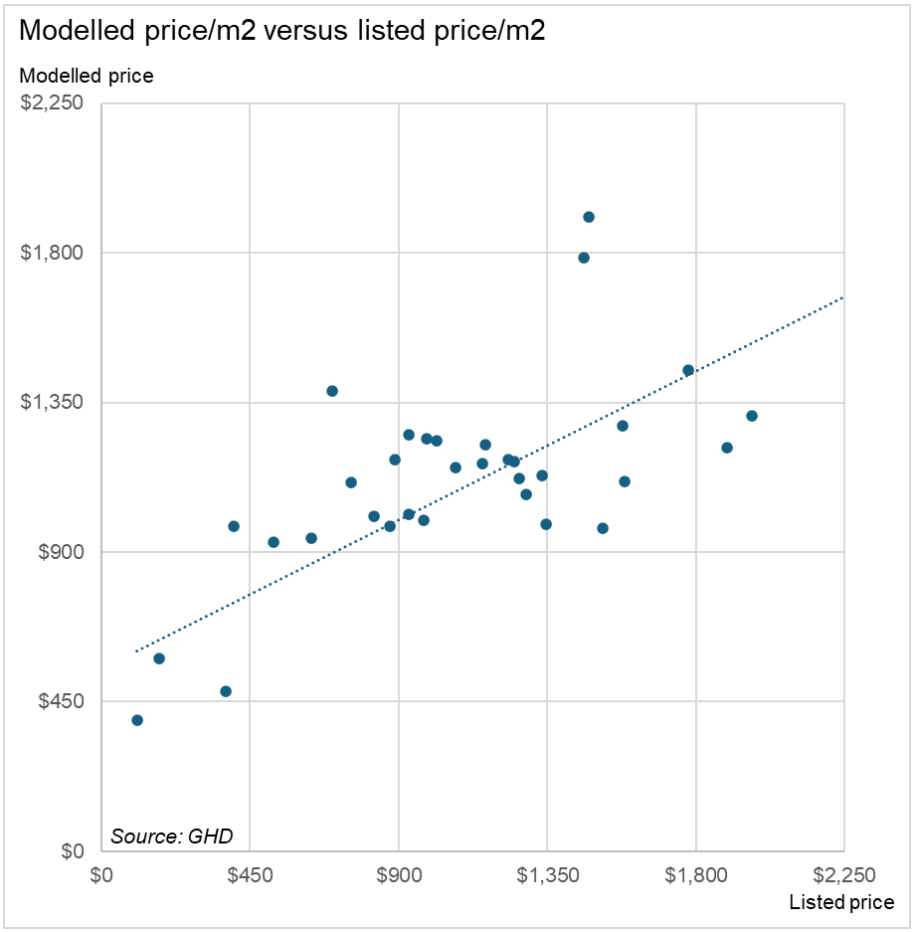
	df	*SS*	*MS*	*F*	*gnificance F*
Regression	3	5181658	1727219	10.22712	7.72E-05
Residual	31	5235470	168886.1		
Total	34	10417129			

	Coefficients	*andard Err*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95.0%*	*pper 95.0%*
Intercept	1365.24	213.09	6.41	0.00	930.64	1799.83	930.64	1799.83
List date Norm High	-0.464	0.26	-1.75	0.09	-1.00	0.08	-1.00	0.08
Land size	-0.135	0.04	-3.85	0.00	-0.21	-0.06	-0.21	-0.06
Contour Ratio	-190.82	95.01	-2.01	0.05	-384.60	2.96	-384.60	2.96

The model yields the results compared to listing prices shown in Figure 9. There are some clear outliers, but the bulk of results are clustered along the middle of the trend line.

[13] It is important to note that this model, because it does not allow for a range of other explanatory variables for property values, for the sake of simplicity and budget, means that the estimates of total impact on land values of SNAs should be considered on aggregate. They should not be considered at the individual property level, where the model will be far less accurate. It may be useful to undertake a more comprehensive property by property analysis, but the purpose of this work was to provide an overall estimate of the likely impact of SNAs on land values, not detailed policy impacts on individual properties.

Figure 9 The model explains a significant proportion of variation in prices across the City

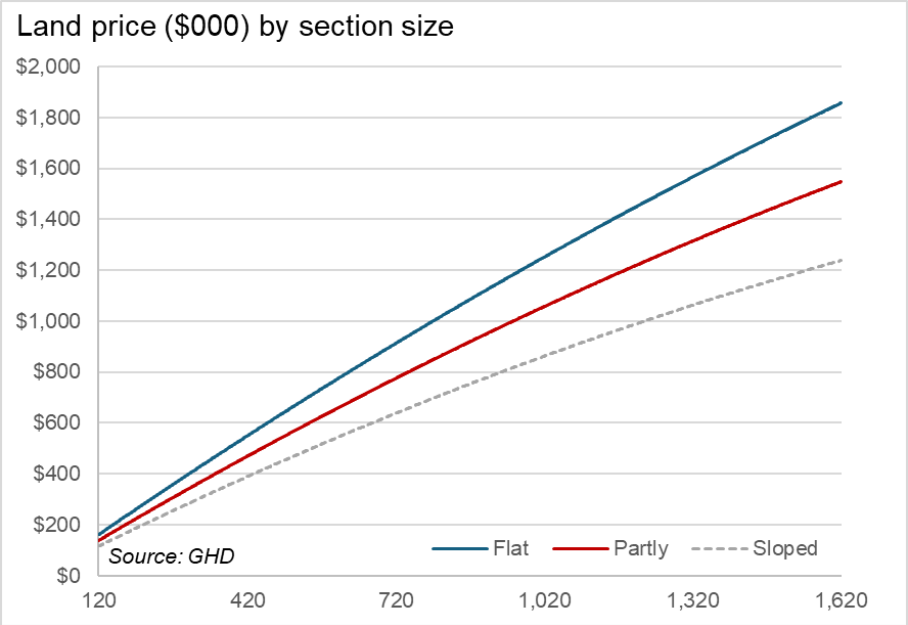


4.1.4 Express land values by size and contour

Having modelled the list prices of real sections for sale, we can build a generalised model to estimate land value by size and contour. Figure 10 shows the modelled land values by contour and section size as at 9 January 2024.[14]

[14] Again, this model provides a generalised estimate of the impact of slope on land values. Some areas will have higher or lower land values than this based on views, other amenities and so on.

Figure 10 Modelled value of land by contour and section size as at 9 January 2024



Having built these explanatory equations, we are able to estimate how an SNA may affect the value of a residential property (whether it has a dwelling on it or not at present) based on whether it affects the developability of land.

4.1.5 Apply the residential model

We use an example to show how the estimate of the land value is affected. Suppose an 800 m^2 partly sloped property exists (with or without an existing dwelling, as our interest is only in the land value). It can be subdivided into two sections. In the model, the land on such a property would be worth, on average, $896,282 (made up of two possible 400m^2 sections).

Now an SNA is identified across 100 m^2 of the property, and its developability reduces to a single dwelling because in this fictional example it no longer meets subdivision rules. Under current zoning rules in this example, the property will always remain a single 800 m^2 section. The model estimates that this land is now worth $853,034, or $43,248 less than without the SNA. This demonstrates the marginal value of being able to split the one property into two, smaller sections.

WCC estimated that just 142 residential parcels could be subject to a reduction in how many units could be delivered in that property through the introduction of SNAs, with a total reduction in potential new dwellings of 1,332. By applying the model to each affected residential property, we could build an estimate of the total estimated impact on property values of the proposed SNAs.

The total loss in development potential across all privately-held residential properties affected by SNAs on their land is estimated, based on WCC developability impact estimates, at $47.3 million. If publicly-held rural properties were also subject to land value reductions (as per the sensitivity tests) due to diminished useability, this figure would rise to $51.5 million.

4.2 Rural land value reduction

As with residential land, the goal is to identify the impact of SNAs on land values. But unlike with residential land, given the significant minimum size of a rural subdivision already, any impact of an SNA is likely to be on ***useability*** of the land for farming purposes rather than reduced development capacity under existing zoning rules. By comparing a no-SNA world to the SNA world, we can estimate the value of rural land with and without SNAs based on the reduced effective size of a useable property due to SNAs.

4.2.1 Build a sample

There are very few rural properties on the market at any one time in Wellington City. This makes model-building using Wellington data impractical. However, patterns from nearby areas can be used to determine the main factors driving rural land prices, and then scaled appropriately for Wellington City.

Sales listings for rural properties for sale in the Manawatū-Whanganui region were sourced from Trademe.co.nz. Again, the reason for using listings rather than recent actual sales data was because listings allowed us to interrogate the details of each property. Elements such as its slope, and the state of improvements such as dwellings on each property are important for building a credible model. This information is lacking in other sources such as the Council's database of property sales in the City.

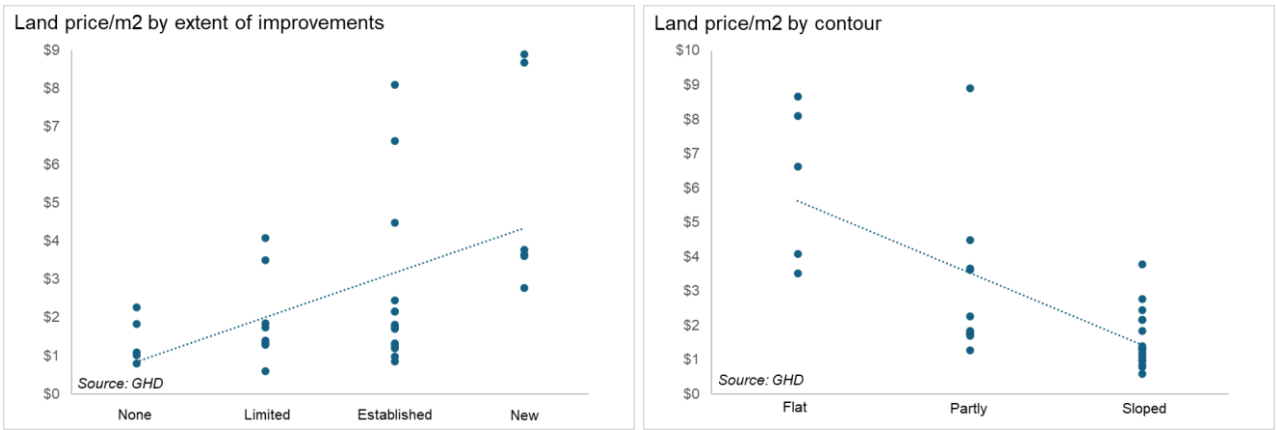
The analysis yielded 33 rural properties for sale where a list price or approximate list price could be accurately determined. These properties ranged in price from $730,000 to $3.2 million and in size from 16 hectares to 379 hectares. Properties varied in slope from overwhelmingly flat to partly sloped, to overwhelmingly sloped. Improvements on the property, which cannot be stripped out of the sample as with residential sections without dwellings, and thus have to be allowed for, varied from none, to limited (some barns, yards and very limited accommodation if any), to established (typically including homes in good condition), to new (typically homes under 10 years old or with recent refurbishment).

4.2.2 Analyse and observe patterns in the sample data

Some basic analysis of the sample data highlighted factors that were going to be important in developing a model to explain rural property values.

Figure 11 demonstrates the relationship between price/m^2 and two important factors in rural property values – slope and the extent of improvements on the land. Unsurprisingly, sloped rural properties are worth less per m^2 than flat land. Similarly, properties with better improvements (yards, barns, housing and so on) are worth more because of the improvements on that land.

Figure 11 Price/m^2 rises as improvements increase and as slop flattens



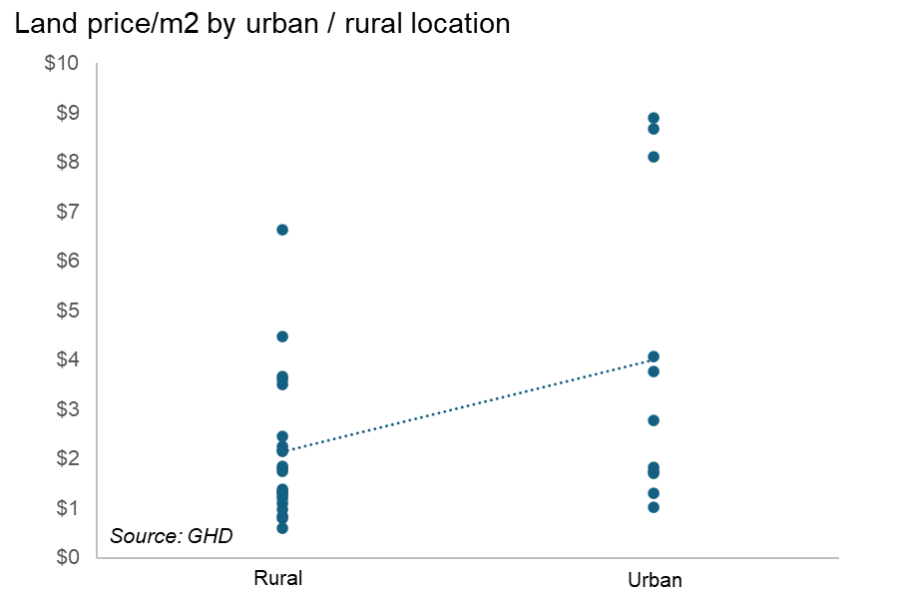
We tested whether prices were distorted by listing date as in residential sales, but there was no statistically significant evidence of this.

One other factor that has been shown to influence prices elsewhere in New Zealand[15] is proximity to an urban centre. Because land prices were being sourced from the Manawatū-Whanganui region rather than the far more urban Wellington City, it was important to determine whether land prices in the Manawatū-Whanganui region were affected by proximity to an urban centre of any meaningful size. This matters for calibrating the results of the analysis for the Manawatū-Whanganui region to those for Wellington City. Population density by district or city in the case of Palmerston North was used, with a district or city with a population density of over 20 people per km2 (i.e. above the New Zealand average) classified as urban. This resulted in rural properties in Whanganui,

[15] See https://www.aucklandcouncil.govt.nz/about-auckland-council/business-in-auckland/Reports/does-the-rub-impose-a-price-premium-on-land-inside-it-20-Feb-2020.pdf p. 23.

Horowhenua and Palmerston North being labelled urban. The relationship between land prices and urban or rural location is shown in Figure 12.

Figure 12 Price/m² is higher in more urban areas than in more rural areas



4.2.3 Model an explanation of rural land values

We built a regression model that expresses price/m^2 as a function of:

- Contour ratio (flat=0, partly = 1, sloped = 2)
- Urban location (0 for districts with a density below 20/km2, otherwise 1)
- Improvements ratio (0 = none, 1 = limited, 2 = established, 3 = new).

The results of the analysis are shown in Figure 13. All variables are statistically significant at the 95% confidence level. The model explains 63% of all variation in property values in the sample. Naturally there are other variables that would add more to particular properties, while their absence subtracts value from other properties. But as a general explanation of land prices, this model works well. It will provide a fair estimate of the change in rural land value associated with less use value, assuming a roughly equal distribution of properties across these other factors that influence price.

Figure 13 Strong empirical model results for rural land emerge from the analysis

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.813898
R Square	0.662431
Adjusted R Square	0.62751
Standard Error	1.385067
Observations	33

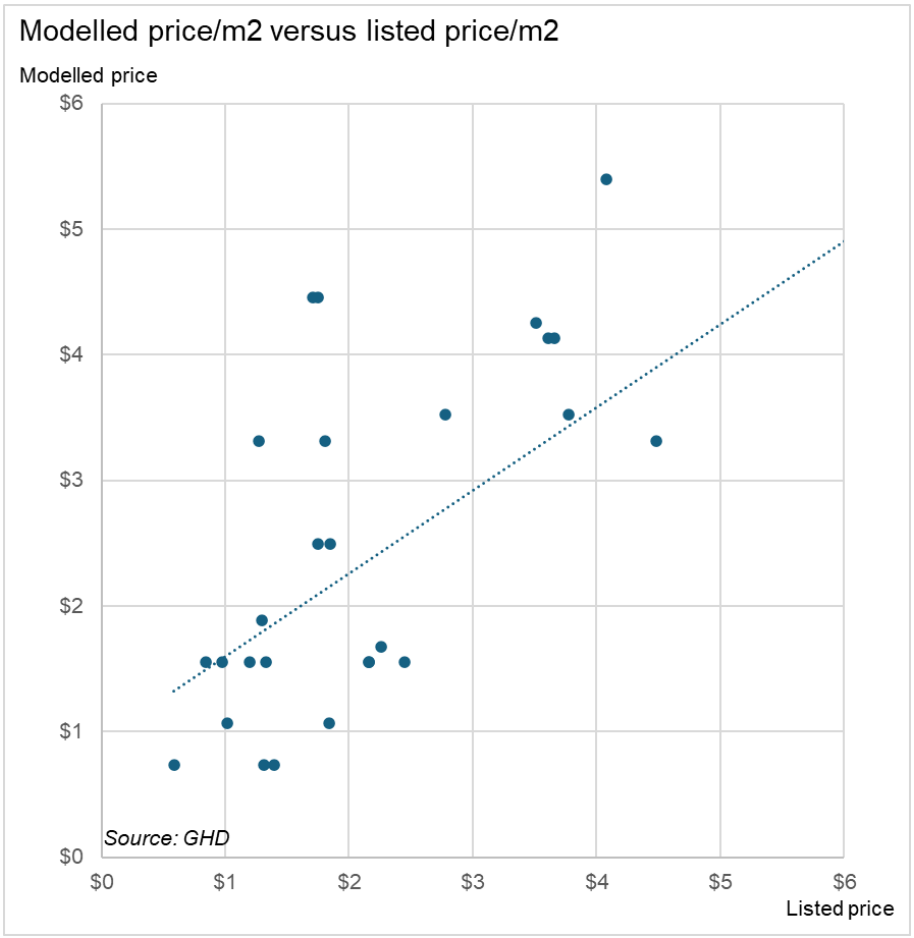
ANOVA

	df	*SS*	*MS*	*F*	*gnificance F*
Regression	3	109.1735	36.39116	18.96943	5.28E-07
Residual	29	55.63391	1.918411		
Total	32	164.8074			

	Coefficients	*andard Err*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95.0%*	*Upper 95.0%*
Intercept	3.432426	0.754576	4.548812	8.87E-05	1.889144	4.975708	1.889144	4.9757077
Contour Ratio	-1.75777	0.340819	-5.1575	1.64E-05	-2.45482	-1.06072	-2.45482	-1.0607193
Improvement Ratio	0.81893	0.261233	3.134869	0.003917	0.284649	1.35321	0.284649	1.3532101
Urban	1.146562	0.522386	2.194856	0.036331	0.078163	2.214962	0.078163	2.2149616

The model yields the results compared to listing prices shown in Figure 14. There are some clear outliers, but the bulk of results are clustered fairly well along the middle of the trend line.

Figure 14 The model explains a significant proportion of variation in prices across the City



4.2.4 Calibrate the model

The next step was to calibrate the model results between Wellington and the Manawatū-Whanganui region. REINZ data shows that in November 2023, rural properties in the Manawatū-Whanganui region sold on average for $26,530 per hectare, compared with $36,460 per hectare in Wellington City (i.e. around 37% more). The modelled average price per hectare for properties in the Manawatū-Whanganui region in the analysis was $18,148. To preserve the relationship between modelled values in Wellington and the Manawatū-Whanganui region, we assumed the average Wellington City rural property would have a contour ratio of around 1.81 (i.e. strongly sloped), and the same average extent of improvements as in the Manawatū-Whanganui region, while rural properties in Wellington City were naturally all classified as urban given their proximity to the city centre. A comparison of the state of rural properties in the two comparator areas is shown in Figure 15.

Figure 15 Wellington City rural properties are close to urban amenity, and are likely contoured

	Calculated/Assumed state of rural properties		
Location	**Contour ratio**	**Improvement ratio**	**Urban**
Manawatu	1.72	1.32	0.27
Wellington	1.81	1.32	1.00

Modelled Wellington City rural land values were inflated by a further 47% such that the modelled values align closely with the most recent average price per hectare of $36,460.

4.2.5 Express Wellington rural land values by contour

Having modelled the list prices of real rural properties for sale, having determined the relationship between Wellington and Manawatū-Whanganui region rural properties, and having isolated the value of improvements on a

rural property, we built a generalised model to estimate Wellington rural land value by contour. We excluded the value of improvements because our interest is in the useability value of unimproved land.

Estimated price/hectare by contour, excluding any improvements:

- Flat land = $67,253
- Partly sloped land = $41,436
- Sloped land = $15,619.

4.2.6 Apply the rural land values

We use an example to show how the estimate of the land value is affected. Suppose a 40 hectare partly sloped rural property exists (with or without an existing dwelling, as our interest is only in the land value). Based on our modelling, the land on such a property would be worth, on average, $1.66 million. In this example, an SNA is identified that includes eight hectares of the property.

In the case of rural land, where the minimum subdivision size is large, any subdivision value is minimal compared to the useability impact of the land. Therefore, our focus is on the productive value of the land. As the land is used for rural purposes, it is likely that the most productive land on any property is already being used productively. We therefore assume that any land still in a natural form likely to have value as an SNA will be on more marginally-productive parts of the property. For this reason, we assume the loss in value of land proposed as part of an SNA on rural land would be valued at the price per hectare of unimproved sloped land, $15,619 per hectare. The lost value of the eight hectares that cannot be used for farming purposes would be $15,619 x 8 = $124,954.

By applying the model to each affected rural property, we can build an estimate of the total estimated impact on rural property values of the proposed SNAs.

An estimated 1,230 hectares of privately-held rural land would be subject to the proposed SNAs, at an estimated land reduction of $19.2 million in total. If publicly-held rural land were also subject to land value reductions, this figure would rise to $23.0 million.

4.3 A note on exclusions / sensitivity

In estimating the total cost of lost potential use or production on residential and rural land respectively, only the impacts on ***privately-held*** residential/future urban and rural land is estimated in the base estimations in this report. The reasons for this are that:

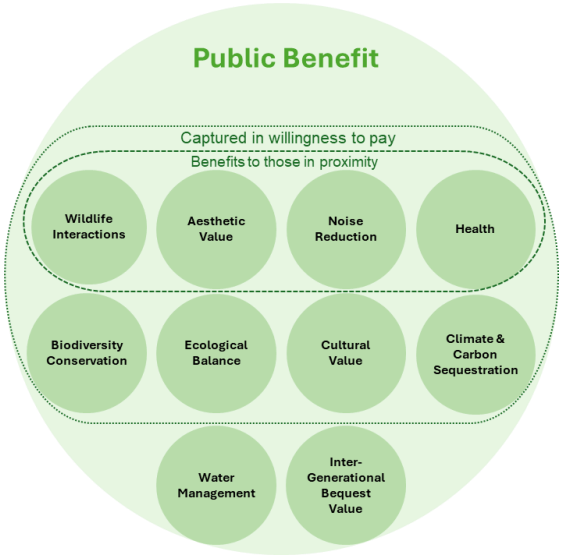
- publicly held land included in the study already includes a large number of large-scale reserves and open spaces that are unlikely to be put to alternative uses – there is therefore no real risk of reduced potential use or production on that land
- publicly held land in general is less likely to be put to different uses to its current use.

Nevertheless, it is possible that some publicly held land zoned residential/future urban could be sold off for residential purposes if not protected as an SNA. We therefore include a ***sensitivity analysis*** of the costs that includes placing a reduced use value on publicly held residential land, to provide an upper limit of the quantified costs range.

Further, in the past WCC has considered establishing SNAs only on rural land and in existing natural open spaces and not on residential land. We therefore include sensitivity testing where SNAs are established only on rural and natural open space land, whether privately-held only, or privately- and publicly-held.

5. Methodology: Benefits

The bulk of the benefits of establishing SNAs will accrue to the public more broadly. The bulk of these benefits will be captured in a willingness to pay measure, with benefits accruing to those who may be nearby or able to access the SNAs (especially if they are on public land) and to those further afield who still benefit from, for instance, conservation of biodiversity or carbon sequestration.



Willingness to pay refers to the price residents would be willing to pay for a good or service, in this case the preservation of indigenous biodiversity. It is a well-documented approach to estimating the value people derive from something, particularly when that good or service is not something that is bought or sold on the open market. There are different ways of estimating this willingness to pay, that have different strengths and weaknesses, and different levels of accuracy, as we will describe later.

In this particular case, ***benefits*** will accrue to the ***public*** broadly because, as will be shown, the public derives benefit from preserving biodiversity. The ***costs*** are borne by the ***owners of land*** where SNAs are established, because of reduced developability.

We note again that in the main scenario presented in this report, it is assumed that SNAs are established on natural open space, residential and rural zoned land. However, three sensitivity tests are run, that take account of the historical debate on whether or not residential properties should be subject to SNAs, and to account for any potential loss in land value on publicly-owned residential and rural land. The three sensitivity tests are:

- All privately-held and publicly residential ***and*** rural properties are subject to land value reductions due to reduced development or use potential
- SNAs are only established on rural and open space-zoned land, and land value reductions are ***only*** assumed to eventuate on privately-held land
- SNAs are only established on rural and open space-zoned land, and land value reductions are assumed to eventuate on privately-held ***and*** publicly-held land.

5.1 Previous studies

There are no known studies in New Zealand on the specific topic of the value of protecting biodiversity to use as a starting point for estimating the benefits of SNAs. There were, however, related studies in New Zealand and abroad to guide this estimation.

We looked at three studies: an older study from New Zealand (Vesely, É., 2007),[16] another from Hong Kong (Lo, A., & Jim, C., 2010),[17] and a more recent one from the UK (Fields in Trust, 2018).[18]

- The ***New Zealand study*** used stated preference (SP) methods to determine the willingness to pay (WTP) of users in 15 cities across New Zealand to avoid a 20% reduction in their urban tree estate. Payments were assumed to be for three years.
- The ***Hong Kong study*** used SP methods to determine the willingness to pay of users and non-users to recover a possible loss of urban green spaces area by 20%. Payments were assumed to be for five years.

[16] Vesely, É. T. (2007). Green for green: The perceived value of a quantitative change in the urban tree estate of New Zealand. *Ecological Economics*, *63*(2-3), 605-615.
[17] Lo, A. Y., & Jim, C. Y. (2010). Willingness of residents to pay and motives for conservation of urban green spaces in the compact city of Hong Kong. *Urban Forestry & Urban Greening*, *9*(2), 113-120.
[18] Fields in Trust. (2018). *Revaluing parks and green spaces: Measuring their economic and wellbeing value to individuals*. http://www.fieldsintrust.org/Upload/file/research/Revaluing-Parks-and-Green-Spaces-Report.pdf

- The ***UK study*** used SP methods to determine the willingness of both users and non-users of local parks to pay to avoid the closure of a person's most-used park, as well as to avoid the closure of all parks in the area.

5.2 Points of departure from previous studies

None of these studies were a perfect match for estimating the public benefit of SNAs.

All of the studies used SPs, where the respondent is simply asked how much they would pay to avoid a certain scenario. SP studies are often criticised because respondents do not always fully understand the scope of the question, and what the real trade-offs are. Consequently, there is a propensity to over- or understate preferences, giving somewhat unreliable estimates that are not always borne out by actual behaviour.[19]

Further considerations from the New Zealand study are that it:

- is now over 17 years old
- expresses use values for urban tree canopies rather than for SNAs
- does not baseline the existing tree stock prior to valuing a 20% reduction
- assumes public access (which is not the case for our current analysis).

Similarly, the Hong Kong study:

- is 14 years old
- deduces willingness to pay for use of parks rather than urban canopy or biodiversity more broadly
- was conducted in a highly urbanised setting
- and assumes public access (which is not the case for our current analysis).

Finally, while the UK study is only six years old and is particularly useful in that it elicits both use and non-use values. However, it

- still focuses on parks and green spaces alone
- assumes public access (which is not the case for our current analysis).

On the basis of comparability, the Hong Kong study was discarded. We retained the UK study because of the usefulness of it providing user and non-user relative values for protecting green space.

5.3 From previous studies to our estimates

Our headline approach was to use the New Zealand study as a starting point, given it was New Zealand based and its focus was on losing canopy cover which is likely to be more comparable to the present study.

The following steps were undertaken:

5.3.1 Update results to 2023 New Zealand dollars

1. Convert UK willingness to pay values to New Zealand dollars
2. Scale UK and New Zealand study to 2023 dollars.

This work yielded an average value per New Zealand household for not reducing canopy cover by 20% of $304 per year (Figure 16) per household.

[19] See these studies for instance: De Corte, K., Cairns, J., & Grieve, R. (2021). Stated versus revealed preferences: An approach to reduce bias. *Health economics, 30(5),* 1095-1123. and Murphy, J. J., Allen, P. G., Stevens, T. H., & Weatherhead, D. (2005). A meta-analysis of hypothetical bias in stated preference valuation. *Environmental and Resource Economics, 30,* 313-325.

Figure 16 Annual household WTP from surveyed literature (2023 NZD)

Country	Currency Year	Nominal Value	Frequency	2023 NZD per annum
New Zealand	2003	NZD 184.00	Annually	$304
Hong Kong	2010	HKD 77.43	Monthly	$239
United Kingdom	2018	GBP 2.52	Monthly	$71
User	*2018*	*GBP 2.98*	*Monthly*	*$84*
Non	*2018*	*GBP 1.64*	*Monthly*	*$46*

5.3.2 Estimate user and non-user values for New Zealand

3. Estimate user and non-user willingness to pay in New Zealand using the ratio between average willingness to pay and user and non-user willingness to pay respectively from the UK study.

This work yielded a value for not reducing canopy cover by 20% of $360 for ***user*** households and $198 for ***non-user*** households per year. SNAs on private land are likely to remain inaccessible to the public, which means that some SNAs may provide guaranteed ongoing benefits to the public who may be able to use them on public land, while other SNAs will only carry non-user benefits as they will be inaccessible to the public.

Figure 17 Preliminary annual household WTP - Average, non-user and user (2023 NZD)

Country	Annual average HH WTP	Annual user HH WTP	Annual non-user HH WTP
New Zealand	$304	$360	$198
Hong Kong	$239	$283	$156
United Kingdom	$71	$84	$46

5.3.3 Allow for over-estimation of value in SP studies

4. Divide the stated preference (SP) estimates calculated above by 1.10 to 2.75 to account for the typical extent to which stated preference studies overstate willingness to pay when compared to revealed preferences, as highlighted previously.[20] Dividing by this range covers the spread of studies from the lower quartile to the upper quartile of observations covered in the Murphy et al study.

This yields the range of user and non-user values per household set out in Figure 18.

Figure 18 Annual household WTP – adjusted for stated preference over-estimation (2023 NZD)

Willingness to Pay	Low estimate	High estimate
User value	$131	$327
Non-user value	$72	$180

We note separately that the New Zealand study asks people how much they would be willing to pay per year for three years, not indefinitely. People are likely to offer to pay more if they know the period of payments will end in the medium-term. To keep our analysis consistent with the New Zealand study, in calculating net benefits later in this report, we assume a three-year willingness to pay period as well.

5.3.4 Estimate share of households to visit publicly accessible SNAs

5. Consider reasonable estimates of households who are likely to use SNAs if those SNAs are publicly available to determine likely users. Two sources were used:

[20] Murphy, J. J., Allen, P. G., Stevens, T. H., & Weatherhead, D. (2005). A meta-analysis of hypothetical bias in stated preference valuation. Environmental and Resource Economics, 30, 313-325.

- Auckland Council's study on the use and non-use values of amenities usership for parks, which estimated that 67% of residents had used their local park in the last six months.[21]
- The Department of Conservation's estimate that around 19% of New Zealanders visited a "park or reserve beyond the urban area" in the four weeks to May 2021.[22]

We assume that a share of Wellington residents midway between these two estimates (43%) is likely to use publicly-accessible SNAs, to provide balance between the fact that these are not typical parks, and may sometimes, and that many of these areas are already reserves being used by the public.

5.3.5 Account for differences in scope

6. Determine the share of land in Wellington City that is proposed to be protected by SNAs. This was determined to be 5,240 hectares in total, with:
    - 3,620 hectares on publicly-held land (12.5% of total land within Wellington City), made up of 3,110 hectares on publicly-held rural or residential land (10.7%) and 510 hectares on publicly-held land zoned natural open space or open space (1.8%)
    - 1,620 hectares on privately-held rural or residential (5.6%), using data on SNAs provided by WCC.
7. Relate this level of protection to the results of the earlier New Zealand study that focused on a 20% canopy reduction) and the current study. A 2021 study estimated Wellington City's total canopy cover at 30.6%.[23] This study, combined with the 2007 study, suggests that the "20% canopy reduction" people were asked to value in 2007 would have been about a six percentage point reduction in total area of Wellington City covered by canopy. This compares to a 12.5 percentage points and 5.6 percentage points of the City's surface area being proposed to be protected by SNAs on public and private land respectively.
8. Adjust the implied percentage of land in SNAs genuinely receiving an additional layer of protection for a more valid comparison to the 2007 study on canopy loss by reducing the total share of land covered by SNAs to an estimate of land genuinely receiving additional protection.

We note large proportions of the land covered in the proposed SNAs already have protected status, meaning they are unlikely at risk of development. Examples include the Te Kopahou, Waipapa Stream coastal scrub and shrubland SNA, with an area of 418 hectares, which includes the existing Te Kopahou Reserve. Other examples include the Kaukau Johnsonville Park Khandallah Park SNA (385 hectares), which includes the Mount Kaukau Reserve, or the Makara Peak SNA (452 hectares). Just five SNAs that largely overlap existing reserve or sanctuary areas account for nearly one-third of the total cover of the SNAs.

Therefore, in the main scenario, we assume that only privately-held rural or residentially-zoned land is genuinely at risk of loss. This equates to 6.1% of Wellington City's entire land area at risk of being affected. We note that in the sensitivity analysis, where residential land is assumed to be excluded from SNAs, only 5.1% of Wellington City's total land area is assumed to be genuinely at risk of loss.

9. Estimate the user value for accessing publicly-held SNAs at between $18 and $45 a year for three years per household (a low range because of the small share of publicly-held land genuinely assumed to be at risk of alternative uses), the non-user value for publicly-held land at $10 to $25 a year for three years, and the non-user value for privately-held SNA land at $61 to $153 for three years (a much higher range because of the genuine at-risk nature of privately-held land). These results are set out in Figure 19.

[21] Accent, Nexus, RAND. (2020). *Use and non-use values of Auckland Council amenities*. https://knowledgeauckland.org.nz/publications/use-and-non-use-values-of-auckland-council-amenities/
[22] Department of Conservation. (2021). *2020/21 visitor insights report.* https://www.doc.govt.nz/globalassets/documents/about-doc/role/visitor-research/visitor-insights-report-2020-2021.pdf
[23] Morgenroth, J. (20xx). *Tree canopy cover in Wellington City and Suburbs, New Zealand.* https://ir.canterbury.ac.nz/bitstreams/2a2d5b15-18de-44ef-a236-40fc6563bb99/download

Figure 19 Annual household WTP – adjusted for shares of SNA land at risk, main scenario

Willingness to Pay	Low estimate	High estimate
User, publicly-owned	$18	$45
Non-user, publicly owned	$10	$25
Non-user, privately owned	$61	$153

5.3.6 Determine use and non-use value of public and private SNAs

10. Multiply, in the main scenario:
    - The use value per household for SNAs on public land ($18-$45) by the share of households that are users (43%) and then by the number of assumed households in Wellington City in each year of analysis, starting at 87,000 households as at 1 July 2024.
    - The non-value per household for SNAs on public land ($10-$25) by the share of households that are non-users (57%) and then by the number of assumed households in Wellington in each year of analysis
    - The non-value per household for SNAs on private land ($61-$153) by the number of assumed households in Wellington in each year of analysis (all households are assumed to be non-users of private SNAs).

Summing up these three categories over a three-year period yields a net benefit (discounted by 4%) of $19 million to $47.5 million in user and non-user benefits. In the sensitivity test that excludes residential land from SNAs, the benefits stream ranges from $16.0 million to $40.0 million.

6. Estimates of the costs and benefits

This section sets out the key results of the analysis. For a detailed methodology for cost and benefit estimation, see sections 4 and 5.

Net present values and partial benefit-cost ratios (BCRs) were developed for four scenarios – the base case and three sensitivity tests. The term "partial BCR" is used to acknowledge that the storm management benefits of maintaining natural areas and the potential maintenance costs the landowner may incur in managing an SNA on their land have not been included in the quantified BCR. It is likely the bulk of the benefits and costs have been captured in the analysis here, but decision-makers need to bear in mind these other benefits and costs in making a decision.

A range is given for each scenario as there is debate over the extent to which stated preference surveys may overestimate willingness-to-pay. The analysis has attempted to fairly capture the breadth of the possible impact of biases in these types of surveys, which were the source of data used in the current analysis.

In summary:

- The ***base case***, where SNAs are established on natural open space, rural and ***residential*** zoned land (both current residential and future urban), and where the assumption is a genuine loss in useability or developability on privately-held land only, yields a partial benefit-cost ratio (BCR) of 0.29 to 0.71.
- ***Sensitivity 1***, where SNAs are established on natural open space and rural land only, and where the assumption is a genuine loss in useability or developability on privately-held land only, yields a BCR of 0.83 to 2.08.
- ***Sensitivity 2***, where SNAs are established on natural open space and rural land only, and where the assumption is a genuine loss in useability or developability on privately- **and** publicly held land, yields a BCR of 0.70 to 1.74.
- ***Sensitivity 3***, where SNAs are established on natural open space, rural and **residential** zoned land (both current residential and future urban), and where the assumption is a genuine loss in useability or developability on privately- **and** publicly held land, yields a BCR of 0.26 to 0.64.

Figure 20 Summary of net present value benefits and costs and BCR by scenario

Scenario	Willingness to pay benefits ($m)	Costs to landowners ($m)	Net benefit ($m)	Partial Benefit-Cost Ratio (BCR)
Base case: SNAs on natural open space, residential and rural land; land value loss to private land only				
High benefits estimate	*$47.5*	*$66.5*	*-$18.9*	*0.71*
Low benefits estimate	*$19.0*	*$66.5*	*-$47.5*	*0.29*
Sensitivity 1: SNAs on natural open space and rural land; land value loss to private land only				
High benefits estimate	*$40.0*	*$19.2*	*$20.8*	*2.08*
Low benefits estimate	*$16.0*	*$19.2*	*-$3.2*	*0.83*
Sensitivity 2: SNAs on natural open space and rural land; land value loss to private and public land				
High benefits estimate	*$40.0*	*$23.0*	*$17.0*	*1.74*
Low benefits estimate	*$16.0*	*$23.0*	*-$7.0*	*0.70*
Sensitivity 3: SNAs on natural open space, residential and rural land; land value loss to private and public land				
High benefits estimate	*$47.5*	*$74.4*	*-$26.9*	*0.64*
Low benefits estimate	*$19.0*	*$74.4*	*-$55.4*	*0.26*

6.1 Costs

In line with the representation in Figure 4, the bulk of the cost imposed on landowners by introduction of SNAs will be captured by impacts on land values. These likely impacts are quantified below. Other costs, no less real but harder to quantify (and some less material) are discussed as well.

6.1.1 Quantified costs

The quantified costs of lost land useability and development potential due to establishment of SNAs on ***privately-held*** land is estimated at $66.5 million, consisting of $19.2 million for privately-held rural properties and $47.3 million for privately-held residential properties.

6.1.1.1 Sensitivity tests: publicly held residential land included

In estimating the total cost of lost potential use or production on residential and rural land respectively, only the impacts on ***privately-held*** land is estimated in the base scenario in this report. The reasons are set out in section 4.3. Allowing for land value reductions on publicly-held residential and rural land leads to a cost to landowners estimated at $74.4 million, consisting of $23.0 million on rural land and $51.5 million on residential land.

6.1.2 Further costs

As set out in section 3, there are some potential costs not captured in the land value reduction analysis.

- There are potential ***maintenance costs*** associated with keeping land identified as being within an SNA in the state that justified its inclusion:
    - In the case of ***privately-held land***, particularly in rural areas, it is likely land in a state currently making it a candidate for SNA status has mostly been left as it is because of the difficulty of using it for anything else, which is the premise of the rural land reduction valuation process described in section 4. It is unlikely much is being spent on maintaining this privately-held land today. It is not currently proposed that landowners would need to maintain this land any more than they do now. While it is not possible to estimate with certainty the likely impact on landowners, decision-makers should bear any maintenance costs in mind when finalising policy.
    - In the case of ***publicly-held land***, there may also be some additional maintenance costs associated with SNA designation. Large areas proposed as SNAs on public land are already zoned as reserves and will have maintenance and protection plans in place, so again it is unclear how much additional maintenance may be involved in ensuring SNA-covered public land maintains the biodiversity the SNA is designed to protect. Again, policy making needs to consider the impacts on potential maintenance costs.
    - Related to these maintenance costs are any more onerous ***consenting processes for maintaining or doing other work*** in areas designated as SNAs. For instance, if a WCC-managed reserve has SNA status, will there be further consents or costs imposed for upgrading, improving or fixing walking tracks or other infrastructure allowing access to those spaces. If this were to be the case, this could have the perverse outcome of decreasing the public's access to biodiversity due to the time needed to get approvals, and could increase maintenance costs further for WCC. Policy makers will need to keep this possible unintended consequence in mind in policy-formulation.
- Impacts of ***pests and allergens*** associated with keeping land identified for inclusion in SNAs in its current form is likely to be small. This is because land identified for inclusion is already in its natural state and the SNA would simply be preserving that state. Only in cases where a private landowner is intending to remove an identified area because of the allergen or pest impact, rather than because of development potential, would this constitute a material impact.

6.2 Benefits

In line with the representation in Figure 4, the bulk of the benefits to the wider community by introduction of SNAs will be captured by the public's willingness to pay to preserve these areas. These impacts are quantified below. A further benefit, that of water management, is likely additional and should be considered as part of weighing up the costs and benefits of the proposal.

6.2.1 Quantified benefits

Depending on the dollar estimate used for the willingness to pay for preserving indigenous biodiversity (methodology set out in section 5), the likely range of the quantified benefits of instituting SNAs across natural open space, residential and rural zoned land, both publicly and privately held, is between $19.0 million and $47.5 million in net present value terms in today's dollars.

6.2.1.1 Sensitivity tests: SNAs on natural open space and rural land only

In Sensitivity tests 1 and 2, we consider the possibility of SNAs only being established on rural and natural open space land, in line with the notified plan proposal. This reduces both the benefits and the costs of the proposed policy. The benefits in net present value terms in today's dollars would be $16.0 million to $40.0 million if residential zoned land was excluded from the SNAs.

6.2.2 Further benefits

The literature suggests that in valuing the keeping of natural areas, the public does not consider the ***water manageme***nt element to any great extent. We would argue therefore that the benefit of ensuring a greater proportion of land is kept in its natural state in residential areas in particular likely carries an additional benefit over and above that captured by the public's willingness to pay to maintain areas of indigenous biodiversity. Given that the proposed SNAs would protect approximately 1,372 hectares in residential areas, the water management impact could be significant.

Further, while biodiversity conservation as something people consider in their willingness to pay to protect green space, it can be strongly argued that people do not routinely consider the ***inter-generational bequest values*** to, for example, people living 50 or 100 years from now. Discounting, an appropriate tool for acknowledging that the value of future benefits is lower than if a benefit was received today, do not tend to account for those as-yet-unseen generations and the benefit they may derive from having access to that biodiversity.

6.3 In conclusion

There are two key points to highlight from the quantitative analysis.

First, only scenarios where SNAs are limited to rural and natural open space zoned land, and are not declared on residential land, have BCRs likely to be greater than 1.0, where the benefits to the community outweigh the costs borne by landowners.

Second, the ***costs*** of the proposal accrue to the relatively small proportion of affected properties (as a share of total properties in the City) that would be affected by SNAs being established, while the benefits would be borne broadly across the City's residents.

Third, the majority of the benefits and costs not captured in the quantified benefits and costs are likely to be small, assuming careful policy-making that, for instance, minimises the costs that could otherwise eventuate.

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