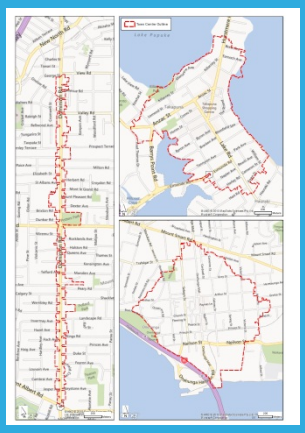

FINAL REPORT

The Economic Impacts of Minimum Parking Requirements

An Analysis of Dominion Rd, Takapuna, and Onehunga

Auckland Council

Prepared by:

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1. Introduction

Auckland Council (AC) commissioned MRCagney to investigate the economic impacts of minimum parking requirements in Auckland. By way of background, AC is currently considering parking policies as part of the draft Unitary Plan. The following sub-sections:

- Introduce the study;
- Summarise the economic and historical context; and
- Outline subsequent sections of this report.

We note that the study does not consider the economic impacts of maximum parking standards in detail, because they are a separate issue.

1.1 Introduction to this Study

This study comes at a unique time in Auckland's history: Following the formation of the Auckland Council, and associated CCOs, the Auckland Plan has established a unified direction for the region. In particular, the Auckland Plan establishes a number of targets/goals that are relevant to this study, namely:

- 70% of development occurring within the 2010 urban limit;
- Up-zoning to allow greater densities, housing affordability; and
- Doubling public transport patronage by 2022.

Parking regulations are discussed in directive 10.6 of the Auckland Plan. This directive instructs the Unitary Plan's to consider a wide range of issues when formulating parking policies, such as the latter's implications for development patterns; housing affordability; use of public transportation; investment in public facilities; and neighbourhood amenity.

The draft Unitary Plan is now under development. It will bring development policies in the Auckland region together within one document for the first time. We understand AC's draft Unitary Plan will not seek to roll over existing district plan rules, but will instead to re-examine those rules to ensure alignment with the strategic direction identified in the Auckland Plan, especially the aforementioned directive 10.6.

Given this strategic context, the purpose of the present study is to quantify the economic impacts of minimum parking requirements. As we shall see, minimum parking requirements are a contentious issue, with many critics arguing that their negative economic impacts provide ample justification for removing them altogether. The present study is the first, as far as we know, which attempts to quantify the economic impacts of minimum parking requirements through empirical research in an Auckland context.

Before we begin we note that the primary target audience for the study is an internal one. Accordingly, we have intended this report to be accessible to people that have some background in the topic, rather than aiming it at elected officials or the general public – who may be generally unfamiliar with the planning and economic issues that it covers. By limiting ourselves to an internal audience we are able to use more candid and/or technical language, which ultimately allows us to convey our results more succinctly.

Of course, if the conclusions of this study are to be more widely disseminated then AC may need to make these results more accessible through, for example, developing summary diagrams that can communicate the key concepts to a more general audience.

1.2 The Economic Context

We begin with a review of the economic context for this study. Minimum parking requirements can be understood as *a regulatory intervention (i.e. public policy) that seeks to increase the supply of parking above what would normally be provided by developments were they free to choose themselves.*

Minimum parking requirements are not always a binding constraint: Certain developments may choose to supply parking in excess of that specified. In these situations minimum parking requirements have no economic impact, beyond perhaps creating some minor compliance costs. As we shall see, however, minimum parking requirements appear to be a binding constraint on development in much of Auckland.

Economic theory suggests that in, a straightforward market setting, the "optimal" supply of parking will be given by the intersection of consumers' willingness-to-pay and the marginal costs of provision. The supply of parking above this optimal point, as is required by minimum parking requirements, can be expected to create economic costs. Economic theory also suggests that an increase in the supply of parking above what is optimal would cause the price of parking to be lower than what it would be otherwise. Hence, minimum parking requirements tend to create *more parking* at a *lower price*.

On the other hand, well-designed regulatory interventions can also reduce economic costs incurred elsewhere, such as externalities and transaction/search costs, which are either not considered by direct market participants and/or act as barriers to efficient market functioning. Such costs and barriers are the primary rationale for regulatory interventions. One of the proffered advantages of minimum parking requirements, for example, is that they reduce the time people spend looking for a car-park, while also reducing the need for local government to monitor/manage public parking.

This study thus attempts to consider whether minimum parking requirements are an appropriate regulatory intervention given their divergent economic impacts. Were minimums found to bring about a net economic benefit then they should be retained; vice versa in the event that they create net economic costs. In this light, the key question this study attempts to answer is this: *What are the overall economic impacts (costs and benefits) of minimum parking requirements?*

While subsequent sections will outline and discuss these economic impacts in more detail, it is useful to here summarise them:

- *Benefits*: Reduced local demand for parking and reduced public sector parking management costs
- *Costs*: Constrained development potential of a site, increases congestion (and associated environmental effects); suppresses agglomeration benefits; and creates compliance costs.

Drivers are the primary beneficiaries of minimum parking requirements, because they gain access to more convenient and lower cost parking. Local government also benefits to a degree, insofar as minimum parking requirements reduces the need for them to manage public parking (although we note that parking management is self-financing because the costs incurred tend to be offset by the revenues earned).

On the other hand, minimum parking requirements create direct costs for property owners, whose properties have lower development potential. By this we mean that minimum parking requirements reduce the degree to which landowners can develop their property. This highlights a crucial point: The economic cost of minimum parking requirements is mainly an *opportunity cost*, in that they reduce the space available for alternative uses, rather than a *financial cost* associated from the developing parking. Indeed, the financial costs of developing surface parking are often relatively low, even in areas where floor space is at a premium. Other costs mentioned above, namely congestion, loss of agglomeration benefits, and compliances costs are borne by drivers, workers, and local government respectively.

The key takeaway message of this discussion is that minimum parking requirements have a range of economic impacts on a range of different social.

1.3 The Historical Context

Current parking policy in Auckland is effectively the product of a tension and contraflow between more urban and more rural visions dating back to the 1940s and, in particular, the latter part of that decade, just prior to the age of the urban motorway.

Many people today tend to imagine that concerns with the availability of car parking and congestion are fairly new, but actually they are not. In 1947 the Ministry of Works publication *Design and Living* declared that "*The exciting novelty of the motor car has worn off, and we are becoming aware of its problems*." Two years later, in 1949, the City Engineer of Auckland City Council, Arthur Dickson, argued that it was essential that downtown traffic was to be kept to an "*absolute minimum*."

It was around this time that Auckland City Council first appreciated that parking now had an economic value. In 1953 Auckland became the first city in the wider British Commonwealth to install parking meters; between 1953 and 1960 approximately £284,000 in revenues was gathered from parking meters. In the image below the cartoonist for the NZ Herald, Gordon Minhinnick, implies that lucrative parking revenue has even prompted the Council's to prevent buses stopping on Queen Street, where they would require kerbside space that could otherwise accommodate parking. While hapless commuters look on, the City Council, with a swag-bag labelled 'Parking Revenue', prevents the Auckland Transport Board bus from using Queen Street, claiming "Keep out: This is our gold mine, not yours!"

Figure 1: "Keep out: This is our Gold Mine, Not Yours!" NZ Herald (circa 1960)

In terms of the origins of minimum parking requirements, we note that the first formally-promulgated Auckland District Scheme of 1961 required one off-street car parking space per dwelling, a requirement that persisted through to the end of the 1980s. Larger family houses could require more parking (the rule soon became 0.4 car parks per habitable room, with a minimum of one), but there was an awareness that town houses and flats in higher density zones would not be viable if Council insisted on much more

than one car park per unit for that type of housing, which the Auckland City Council of the 1960s, 1970s and 1980s did much to promote, at densities of up to 120 habitable rooms per acre (307 per hectare).

A requirement that no house-building project be done in such a way as to preclude later construction of a garage was also present from 1961, and may have been in force for longer, as a succession of more informal guidelines, draft schemes and by-laws predated the actual 1961 scheme. In the 1981 District Scheme parking maxima actually make their first appearance, along with the first exemptions from minimum parking requirements for retailers in inner-suburban areas, such as Three Lamps.

The oft-cited present-day requirement of two off-street parking spaces per residential dwelling unit outside the central area – including flats and townhouses – did not actually appear in Council planning documents until 1993, in the Operative District Scheme for the now-larger Auckland City, which came into existence in that year. In other words, in 1993 the whole of the enlarged Auckland City Council adopted quite high parking minima whereas they had previously been relatively modest.

It seems that in the last 20 years – the age of the Resource Management Act – Auckland's policies on minimum parking requirements have actually become stricter compared to the District Planning Schemes of the 1960s and 1970s. As we shall see, this trend seems to run counter to the emerging evidence on the negative impacts of minimum parking requirements, which began to emerge in the 1980s and 1990s. The only exception to this trend is the city centre, where minimums were removed circa 1996.

1.4 Structure of this Report

The following sections of this report are structured as follows:

- Review of the literature
- Analysis of economic impacts
- Discussion on policy implications
- Conclusions

We note that we have previously undertaken a number parking studies for central, regional, and local government clients, such as the NZTA, Auckland Regional Council, and Waitakere City Council. In these previous studies we have recommended the removal of minimum parking requirements. We have not, however, attempted to quantify their economic impacts.

2. Literature Review

2.1 District Plans

In New Zealand minimum parking requirements are applied through local District Plans. The objectives of the parking section of Auckland Council District Plan Isthmus Section (formerly the isthmus section of the Auckland City Council District Plan), for example, are illustrated below.

Figure 2: Parking objectives – District Plan Isthmus Section

12.7.1 OBJECTIVE & POLICIES

Objective

To ensure that the impact of activities on the capacity and safety of the road system is adequately catered for, so as to avoid adverse impacts on the environment.

Policies

- By requiring activities to provide adequate off-street parking and loading facilities.
- By providing opportunities to alleviate parking deficiencies within existing commercial centres.

Here we see that the objective is to ensure that "*the impact of activities on the capacity and safety of the road system is adequately catered for, so as to avoid adverse impacts on the environment*." The policy section proposes to achieve this objective primarily by "*requiring activities to provide adequate off-street parking and loading facilities*."

Subsequent sections define adverse impacts as:

- "*Overspill of parking onto the adjacent roadside*", i.e. localised increase in parking demands;
- "*Adversely affecting the "efficient use and capacity of a road*", i.e. localised congestion; and
- "*Adversely affecting the "amenity of an area in terms of aural privacy and visual appearance*."

The District Plan then provides a list of parking requirements for various land use activities.

Figure 3: Examples of minimum parking requirements - District Plan Isthmus Section

ACTIVITY	PARKING SPACES REQUIRED
Boarding house/hostel	One for every non-residential employee plus one for every 3 residents the boarding house/hostel is designed to accommodate; plus 2 for any manager's unit.
Bulk store	One for every 100m² of GFA plus one for every 100m² of outdoor storage.
Buildings used for recreation	One for every 4 people the facility (including grandstands) is designed to accommodate.
Building improvement and hire centres	One for every 20m² of gross floor area of building and one for every 100m² of outside area used for display purposes.

We note that minimum parking requirements for non-residential activities are usually prescribed in terms of the number of car-parks per square metre of GFA. This relationship is important because it means that within individual sites the floor area that can be provided will essentially "compete" with the requirement to provide parking. As such, minimum parking requirements can be seen as a "tax on floor space," where an increase in floor space demands an associated increase in parking. Within the constrained context of individual sites minimum parking requirements will therefore tend to limit development potential.

At this point we simply note that the Auckland City Council District Plan (Isthmus Section) does not acknowledge the potential for minimum parking requirements to have adverse impacts, nor alternative policies that might be better suited to achieving the same outcome. Indeed, the results of our literature review, which are presented in detail in the following section, seem to suggest:

- "Overspill" of parking demands into surrounding streets may be best dealt with by improving the management of on-street parking, rather than requiring off-street parking;
- The provision of large amounts of low-cost off-street parking does more to hamper the efficiency of the road network (through subsidising vehicle travel) than it reduces localised congestion associated with insufficient off-street parking; and
- Off-street parking facilities can have large negative amenity impacts, particularly in terms of the traffic they generate and their visual appearance.

At this stage, however, it is simply worth noting that the reasons offered as justification for minimum parking requirements in the previous Auckland City Council District Plan are relatively contentious.

The following issues are also relevant to our understanding of the development and application of minimum parking requirements in Auckland:

- Since 1996, developments in the City Centre have not been subject to minimum parking requirements but instead have been subjected to parking maxima.
- Prior to the formation of the Auckland Council, both Auckland City and Waitakere City were taking steps to relax and/or remove minimum parking requirements. Some parts of Newmarket, for example, do not have minimums, and Waitakere City had previously proposed (based on work undertaken by MRCagney) to remove minimum parking requirements in town centres.
- Development applications that were unwilling or unable to provide the required amount were either a) declined outright or b) subjected to a consenting process. Those that were considered under a consenting process might subsequently be approved.

In our experience of working with the private sector, however, the uncertainty associated with the outcomes of the consenting process means that almost all developments attempted to meet the minimum parking requirements if at all possible. In situations where developments could not meet the requirements then the most likely outcome was a change in the proposed activity (to one that had lower parking requirements), rather than proceeding with a non-complying consent application.

2.2 General Studies

In this section we review general studies into minimum parking requirements. The most original and thorough critique of minimum parking requirements are articulated in Donald Shoup's "The high cost of free parking". This book builds of earlier work by Shoup in the 1980s and 1990s. The arguments advanced by Shoup against minimum parking requirements can be summarised as follows:

- *They assume that parking should always be free, and estimate demand accordingly.* Minimums match supply to estimated demand for free parking. But as cities grow and intensify there are few reasons to support the presumption that parking would or should remain free; it

could readily be priced or managed. Minimums are therefore based on the implicit but unreasonable assumption that parking should always be free.

- *They create an over-supply of parking that causes congestion.* As we have seen, one of the key reasons advanced in favour of minimums is that they reduce localised congestion. Shoup, however, points out that the over-supply of under-priced parking created by minimum parking requirements will have the effect of increasing the supply of parking and lowering its costs, thereby stimulating vehicle travel (and congestion) which would not have otherwise eventuated.
- *They require more parking to be supplied to meet a given level of demand.* Requiring individual developments to meet their own parking demands is inefficient because it ignores opportunities to share parking between nearby activities. In this way, minimum parking requirements actually act as a barrier to "entry" for smaller developers and give market power to large landowners, who are better placed to realise economies of scale form the provision of consolidated parking facilities.
- *They create a fragmented and low density urban form.* This criticism flows logically from the first three: By assuming that large amounts of parking should be provided on individual properties, minimum parking requirements results in a fragmented, low density urban form. This undermines urban amenity and the relative attractiveness of other transport modes, especially walking.

Figure 4: "The High Cost of Free Parking", Donald Shoup (2005)

Criticisms of minimum parking requirements can also be grouped in terms of their economic, social, and environmental impacts, namely:

- *Economic:* Minimums effectively act as an indirect tax on floor space, which in turn lowers land use density and provide a subsidy for vehicle ownership and travel. This contributes to a range of negative externalities, such as congestion.
- *Social:* Minimums bundle what is a transport cost into the costs of development. In the case of residential developments, for example, the costs of providing parking will be reflected in higher

prices. And because vehicle ownership and travel tends to be positively correlated with income, a disproportionate share of the cost burden of minimums falls on low income households.

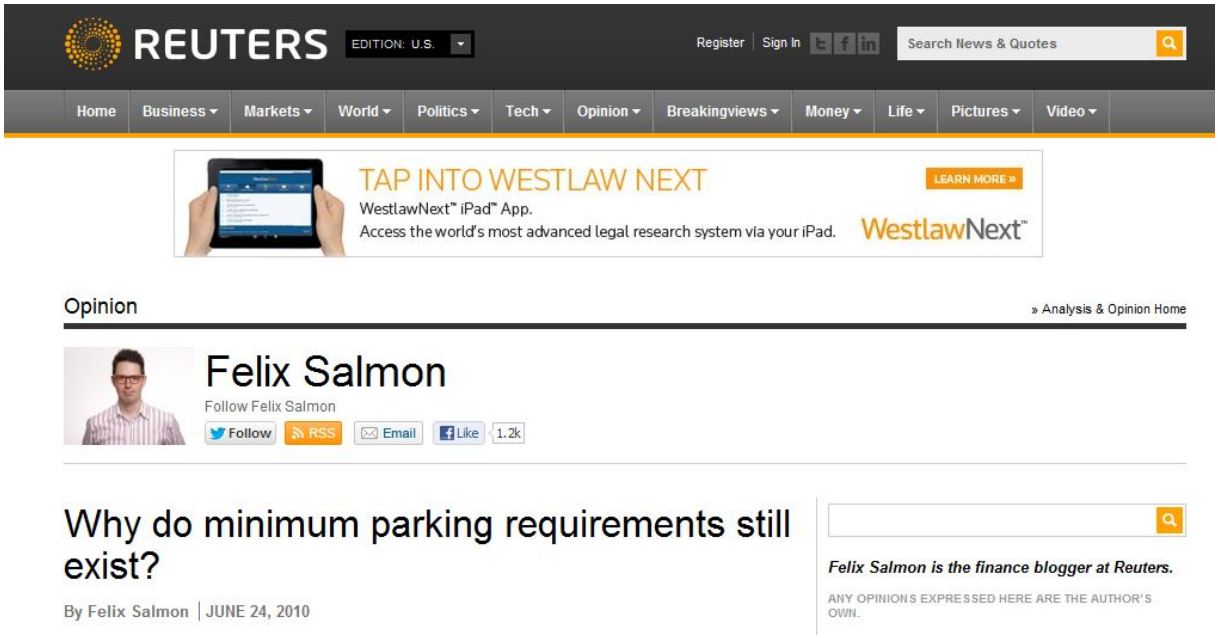
- *Environmental:* Most of the outcomes described above, especially higher rates of vehicle ownership and travel and impermeable surfaces tend to impact negatively on environmental outcomes. Air and water quality is undermined, especially in situations where parking promotes the outward expansion of urban areas into greenfield areas.

On the other hand, we know of no general texts that defend minimum parking requirements against these criticisms. In fact the only documents that we could find that advance arguments in support of minimum parking requirements were District Plans themselves (and other similar planning documents from other jurisdictions). Given the large body of research highlighting their pitfalls, the lack of countering evidence in support of minimum parking requirements is, in our opinion, rather notable.

2.3 Internet Resources

Numerous websites have picked up on the work of Shoup, and to a lesser extent Todd Litman, to criticise minimum parking requirements. One example is illustrated below.[1]

Figure 5: Why do minimum parking requirements still exist? Felix Salmon, Finance Blogger, Reuters



Such internet sites are interesting not so much for the original content that they provide (indeed much of it is simply regurgitated from the likes of Shoup), but more for the discussion threads that they facilitate. These threads provide wider perspectives on minimum parking requirements, which would not normally be so readily available. The comment below, for example, was made in response to the question posed in the blog post illustrated above:

> *How lucky I am to be both an urban planner and the first to comment. The simple answer is that these requirements persist because there is no organized group agitating for their repeal, and enough people think they benefit in some way to push back effectively whenever the issue is*

[1] http://blogs.reuters.com/felix-salmon/2010/06/24/why-do-minimum-parking-requirements-still-exist/

> *raised. I speak from experience, having pushed through some parking reductions (though not a full repeal) and lived to tell about it.*
>
> *On the developer side, the standards in these ordinances have become so much a part of the fabric of the development industry's assumptions that they are rarely questioned. Since every project includes the required amount of parking, it's become part of the lender's underwriting requirements, and developers will tell you that they can't finance a project unless they provide parking at the standard ratios. Further, national retail tenants won't sign a lease unless their internal parking requirements are met.*
>
> *On the public side, people don't perceive the cost, only the presumed benefits. They think inadequate parking will lead to traffic problems, when the opposite is true. Where residential areas abut commercial areas, the residents think that business patrons will overwhelm their on-street supply.*

The only website we could find that advocates for retaining minimums was the following editorial, which recently appeared in the Seattle Times:

> *The proposal [to remove minimums] is part of a package to lighten regulations that discourage investment and development. Seattle is a highly regulated city, sometimes to the detriment of reasonable development, and generally this package of reforms is good. But to allow the spread of housing without parking is utopian and anti-family.*
>
> *It is utopian to think that many people will abandon their cars. A few will, but the vast majority who can afford market-priced housing in Seattle will have a motor vehicle, now and always. If they have a vehicle, they will park it — somewhere.*
>
> *It is an old story. We know what happens when neighborhood density reaches a certain point, and a number of Seattle neighborhoods reached that point long ago.*
>
> *More city people these days have bicycles also, as the mayor does, but they still drive, particularly if they have children or elderly people to take care of. Seattle is famously a city with a low proportion of children, said to be second only to San Francisco. Still our leaders should think twice about making Seattle any less welcoming to families than it already is.*

The Seattle Times editorial has in turn been criticised by several online articles, one of which noted:

> *Minimum parking requirements are, essentially, a tax on development meant to encourage driving. The cost of housing and offices rises and the difference in rents and sales prices is plowed into new automobile infrastructure. But there is perhaps no other American entitlement as fiercely defended as this widely misunderstood car subsidy.*
>
> *If the* [Seattle] *Times is right, of course — if "the vast majority" of Seattle residents are "always" going to have a car — then the market, being the market, will provide parking for them. Nothing in the legislation the council is considering prevents that. All the proposal does is give developers some flexibility to provide less parking in cases where the demand for one parking space per unit isn't there — something the ordinarily pro-free-market Times should be willing to get behind.*

In many ways the cut and thrust of websites provides the most dynamic environment for gaining insight into the various perspectives that exist on this issue. In saying that, it seems fair to suggest that the great majority of online literature and commentary supports the removal of minimum parking requirements.

2.4 Academic Literature

Aside from general texts and internet resources, there is a small body of academic literature that considers the economic impacts of minimum parking requirements. We summarise some of the most

relevant studies in the following sub-sections. As with previous sections, we could find no academic literature that supported the retention of minimum parking requirements on economic grounds.

2.4.1 Parking requirements and housing affordability: A case study of San Francisco

In this study Jia (1998) investigated the relationship between housing prices and the provision of off-street parking in San Francisco using a hedonic regression model of property prices. Results indicated that an off-street car-park added approximately 10% to the cost of a residential property in San Francisco, where new residential developments are required to provide one car-park per unit.

The researchers conclude:

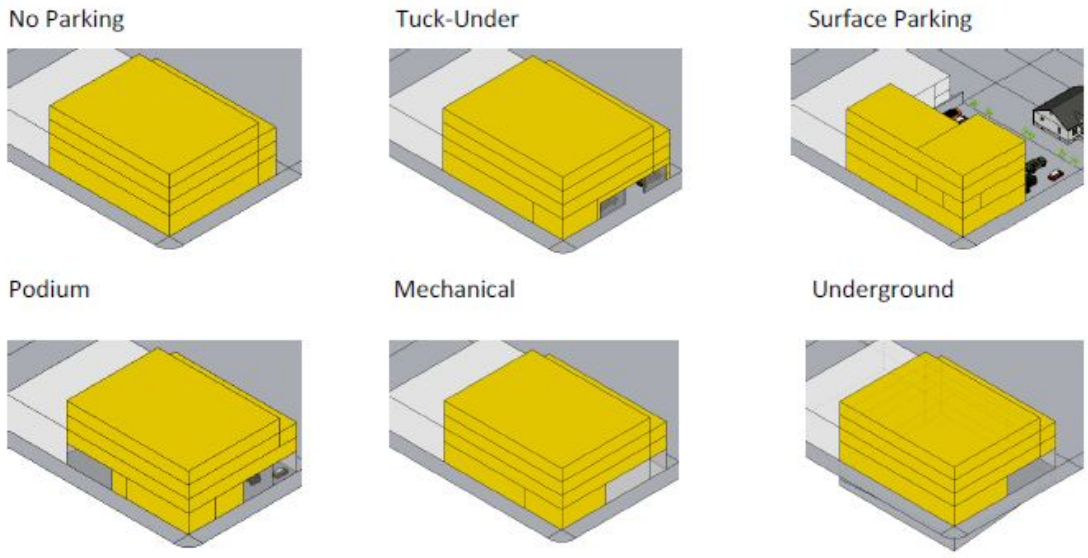
> *The results are statistically significant, robust, and dramatic. Housing affordability in San Francisco is directly affected by the requirements that parking spaces be provided along with housing units. Why is the requirement for a parking space bundled with housing? Why should each dwelling unit be required to have a fixed number of parking spaces regardless of the numbers of cars in the household? Would the public interest be better served if parking and housing were unbundled, creating separate markets for each?*

One of the more interesting aspects of this study in the Auckland context is that the author subsequently links the additional cost of parking to the issue of housing affordability. The authors estimate – using data on average incomes and residential selling prices – that 24% more households would be able to afford to purchase their own homes in a situation where the costs of parking was not bundled into the costs of the development. We suspect this estimate is relatively optimistic, because it presumes that all households would opt for dwellings without parking if they were given the choice, when in reality some would not. Nonetheless the calculation is instructive for providing soemthing of an upper bound on the degree to which minimum parking requirements may impact on housing affordability.

2.4.2 Cost of Onsite Parking + Impacts on Affordability

The Bureau of Planning and Sustainability in Portland undertook this sudy into the costs of on-site parking and subsequent impacts on housing affordability. The study considered six different building prototypes, as illustrated in the following figure.

Figure 6: The six parking prototypes considered in the study



The costs of these prototypes was analysed from a "ground-up" perspective – whereby the authors considered the land and construction costs, including parking costs, as well as the number of units and associated rental yields that would be required to deliver an appropriate return on investment.

The key relationship was that as more parking was provided, the construction costs tended to increase, whereas the number of units over which costs were able to be spread decreased. This economic "double whammy" means that even relatively low levels of on-site parking provision had large impacts on the rental yields required for the various prototypes to stack up. For example, even requiring the provision of 0.75 underground car-parks per unit would cause the rental yields required for the development to stack up to increase by USD $500 per month, or 63%.

Figure 7: Impacts of on-site parking on housing affordability

Building Development Prototype	# of Units	# of Parking Spaces	Parking Spaces per Unit	7% ROI* Monthly Rent	10 % ROI* Monthly Rent
No Parking	50	0	0	$800	$1150
Tuck-Under	45	9	0.25	$850	$1200
Surface	30	19	0.6	$1200	$1800
Podium	42	22	0.5	$950	$1350
Mechanical	46	23	0.5	$1175	$1660
Underground	44	33	0.75	$1300	$1900

Note: ROI= Return on Investment

These results suggest that in medium density settings even moderate minimum parking requirements may have significant adverse impacts on housing affordability.

2.4.3 Do parking requirements significantly increase the area dedicated to parking? A test of the effect of parking requirements in Los Angeles

In this study Cutter et al. (2010) test the hypothesis that minimum parking requirements cause an oversupply of parking by examining the value of space used for parking in Los Angeles. They develop a simple theoretical model to show that the implicit marginal value of additional parking to the sale price should be equal to the cost of land plus the cost of parking construction.

The authors rely on a large property data set that contains transactions recorded over the period 1997-2005. They use a hedonic regression model to calculate implicit prices for a variety of property attributes, of which the area used for parking is one. Results from this model suggest that:

- There is a positive value attached to the availability of parking in the surrounding vicinity; but
- The marginal value of parking is indeed considerably lower than the marginal value of land.

Stated differently, these results provide evidence to suggest that while the availability of parking has a positive impact on property values, this impact is smaller than potential alternative uses of that space. As such, requiring developers to provide parking will tend to reduce the value of their development.

The authors then conduct a direct parking regulation test. This involved comparing the level of parking provided with modern developments to the parking that would be required by the applicable minimums.

They found little discernible difference between what was provided and what was required, which in turn suggests that minimum parking requirements were indeed "binding" for their data set.

The authors' conclusions are worth repeating in full:

> *Thus, if the goal of minimum parking requirements is to prevent parking spillover and traffic congestion associated with cruising for on-street parking, our results suggest that MPRs are a blunt and inefficient form of parking management. Other forms of parking pricing that accounts for social externalities can be a superior parking management (Small (1992), Shoup (2004, 2005), Arnott et al. (2005)). For example, Arnott et al. (2005) show that an efficient on-street parking pricing scheme can produce travel time savings from reducing traffic congestion and wasteful cruising-for-parking activity and at the same time raise government revenues, which can be used to reduce distortionary taxation.*
>
> *Minimum parking regulation is a pervasive feature of United States land-use practices. Davidson and Dolnick (2002) state that parking planning questions are among the top five queries for the American planning service each year. Authors such as Shoup (1999) and Davidson and Dolnick (2002) have suggested that parking regulation forces developers to place far more parking spots than necessary on their lot. Arnold and Gibbons (1996) detail the destructive environmental effects of excessive impermeable surfaces. Shoup (1999) also suggest that parking regulations may have a dynamic effect where the design requirements of large parking areas render new development pedestrian unfriendly so that more individuals are forced to travel by car.*
>
> *However, to our knowledge, the evidence that parking requirements increase the amount of parking spaces built is limited to a few case studies. This paper seeks to remedy that by examining whether there is evidence of a parking regulation effect for sold properties in Los Angeles. A simple theoretical model of optimal development of a parcel implies that the marginal value of parking should be less (equal) to the marginal value of land for a parcel plus the construction cost of parking in the presence (absence) of binding minimum parking regulations.*
>
> *We test this proposition for a multi-year dataset of sales and for six different property types using a spatial error model. We find that for the majority of properties a null hypothesis of equality between marginal parking and marginal land plus construction costs is rejected at a 5% significance level. This supports the idea that minimum parking requirements significantly affect the amount of parking on a parcel. A direct comparison of required and actual parking spaces for a subset of office properties where we could obtain approximate parking requirements also indicates that parking requirements bind for a majority of properties. The magnitudes of the differences in the marginal quantities suggest that minimum requirements have large effects on the distribution of parcel space between various uses. Further research should examine the quantitative impact of parking minimums on the aggregate amount of parking and impervious space.*
>
> *This research provides further evidence for the arguments of Shoup (1999) and Wilson (1995) that parking minimums significantly distort land-use decisions. In addition, the evidence that, in some cases, parking use value is a small fraction of parcel land value suggests that the efficiency losses from parking minimums may be quite large. However, a full consideration of the optimal level of off-street parking would have to consider the congestion externalities due to lower requirements as well as the environmental benefits of less parking.*

The study by Cutter et al. is the most comprehensive study of its kind that we know of and has strongly influenced this study.

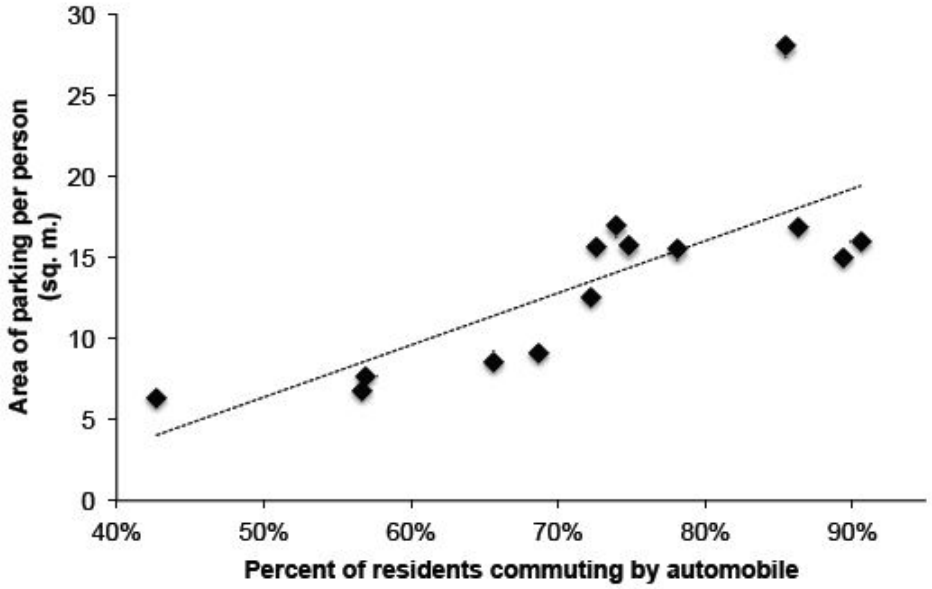
2.4.4 The influence of urban transportation and land use policies on the build environment and travel behaviour

In this dissertation McCahill (2012) considers two topics that are relevant to our discussion, namely:

- **Key policy decisions that influenced transport and land use outcomes.** In 1960 both Hartford (CT) and Cambridge (MA) had very similar transport and land use characteristics, but by 2000 vehicle mode share in Hartford had increased from 53% to 73%, whereas in Cambridge it declined from 42% to 38%. In Hartford the area of land per capita used for parking is more than three times that in Cambridge.
- **Relationships between automobile use and land consumption.** The author examines statistical relationships between vehicle mode share and the area of parking per capita in 14 cities in the U.S., and finds that increased vehicle mode share is somewhat intuitively positively correlated with increased area of parking per capita and negatively correlated with human density (residents plus population). This suggests that increased use of vehicles leads to more parking (and probably vice versa), which in turn reduces the land available for development.

McCahill's research strongly hints at (although does not prove) the fact that parking policy affects transport and land use outcomes. More specifically, it finds evidence of a relationship between the area of parking per person and the per cent of residents that commute by private vehicle. The author concludes that this suggests that the provision of parking leads to increased levels of driving and ultimately more parking area, which ultimately can be expected to cause congestion and lower land use density.

Figure 8: Relationship between parking per person and per cent of residents commuting by automobile



2.4.5 From Minimum to Maximum: Impact of the London Parking Reform on Residential Parking Supply from 2004 to 2010

The purpose of this study was to:

> *Examine residential parking supply in London before and after the minimum off-street parking standard was replaced by a maximum one in 2004. Based on 11,428 residential developments after and 216 developments before the reform, it is found that parking supply was reduced by approximately 40 per cent. Ninety-eight per cent was caused by the removal of the minimum*

> *standard, while only 2 per cent was due the imposition of the maximum standard. However, the parking supply is actually higher in areas with the highest density and the best transit service than in the areas immediately outside; the adopted maximum standard follows a similar pattern. The market-oriented approach to parking regulation can reduce excessive parking, but it depends on the particular sub-markets. Complementary policies such as strict parking maxima, on-street parking controls and parking taxes are often necessary to form an efficient parking market.*

To paraphrase the most relevant findings from this study:

- Changes in London's parking policy, i.e. the removal of minimums and the imposition of maximums, is associated with a 40% reduction in the parking supplied with new developments;
- 98% of this reduction in parking is attributable to the removal of minimum parking requirements, as opposed to the imposition of maximums; and
- The imposition of maximums will have relatively negligible impacts on the parking market unless they are set at a sufficiently low level that they "bind" for most developments."

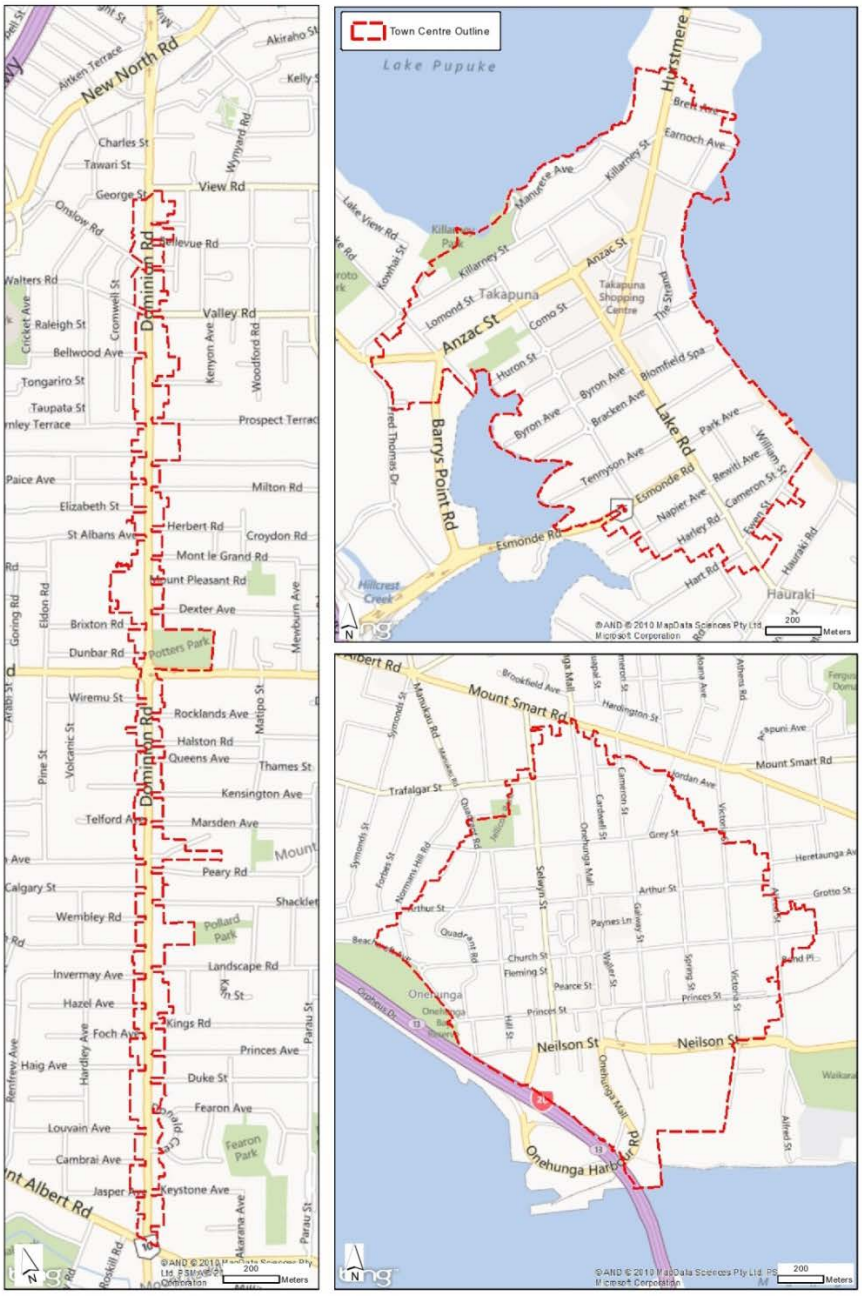
The findings of this research from London are consistent with the Los Angeles results, i.e. that minimum parking requirements are a binding constraint on urban development.

3. Analysis of Impacts in Auckland

3.1 Study Areas

We selected Onehunga, Dominion Rd, and Takapuna for detailed analysis of the economic impacts of minimum parking requirements because they are broadly indicative of medium density, mixed use urban areas that characterise Auckland, as illustrated below.

Figure 9: Outline of the study areas – Dominion Rd, Takapuna, and Onehunga



The extent of the town centres (i.e. Onehunga and Takapuna) was defined to include commercial properties within 2km walking distance of their geographic centre. We also included all properties that fronted onto Dominion Rd (between View Road and Mt Albert Road), as shown above.

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3.2 Economic Costs of Minimums

In the following sections we quantify the economic costs of minimum parking requirements, by way of their impacts on property values and congestion.

3.2.1 Property Value Impacts

Model and Hypotheses

Previous sections have suggested that minimum parking requirements result in more parking than what the market would deliver on its own. This in turn incurs an "opportunity cost", insofar as the area used to provide parking is unable to be used for more valuable uses, such as floor area.

Where the provision of parking comes at the expense of more valuable uses then we would expect property values to be lower, ceteris paribus. It is the relative gap between the value of floor space and the value of parking that in turn defines the economic cost to the property owner of providing more parking.

To investigate whether such a gap exists between the value of floor space and the value of parking in our study areas we applied the following hedonic regression model:[2]

$$\ln(S_i) = \beta_1.ln(L_i) + \beta_2.ln(F_i) + \beta_3.\ln(P_i) + \beta_4.\ln(D_i) + \beta_5.Year_i + \beta_6.Sale_i + \beta_7.T_i + \beta_8.O_i + \beta_9.Com_i + c$$

Variables are defined as follow (sourced from property transaction database unless otherwise stated):

- S_i is the sales price for property transaction *i*
- L_i is the land area (m^2) for property transaction *i*
- F_i is the floor area (m^2) for property transaction *i*
- P_i is the parking area (m^2) for property transaction *i,* which was calculated using GIS.
- D_i is the distance from the town centre for property *i,* which was calculated using GIS.
- $Year_i$ is the year in which the building associated with property transaction *i* was built.
- $Sale_i$ is the date of sale for property transaction *i*.
- O_i *and* T are dummy variables for Onehunga and Takapuna respectively
- $Comm_i$ is a dummy variable for commercial property transactions
- $\beta_1, \beta_2, \beta_3, \ldots \beta_9$ are the coefficients to be estimated
- c is the constant of the regression model

We also formulated the following two hypotheses about our model:

- *An increase in land and floor areas has a positive impact on property values*, i.e. $\beta_1, \beta_2 > 0$.
- *An additional square metre of floor area is worth more than an additional square metre of parking.*[3]

$$\left.\frac{\partial S}{\partial F}\right|_i = \left(\frac{S_i}{F_i}\right).\beta_2 \; and \; \left.\frac{\partial S}{\partial P}\right|_i = \left(\frac{S_i}{F_i}\right).\beta_2 \rightarrow \frac{\beta_2}{F_i} > \frac{\beta_3}{P_i}$$

In the following section we describe the data and present our results.

[2] Hedonic regression models have been extensively used in the economic literature to estimate people's willingness to pay for property attributes, which in this case is revealed by how much they pay for a particular property.
[3] This relationship is established by taking the partial conditional derivative of the model with respect to F and P.

Data and Results

The following table provides a statistical summary of the data used in our model. The highest average sales price for commercial transactions was recorded in Takapuna, with the lowest in Onehunga.

Figure 10: Summary of data for property price regression (n = 219)

Variable		Type	Mean	Std dev	Min	Max
Sales price [$]	S	Linear	$1,150,431	$1,123,732	$96,750	$10,800,000
		Log	13.6	0.831	11.48	16.20
Land area [m^2]	L	Linear	933	1034	100	7,714
		Log	6.47	0.820	4.61	8.95
Floor area [m^2]	F	Linear	641	761	60	4,847
		Log	6.06	0.842	4.09	8.49
Parking area [m^2]	P	Linear	279	384	15.3	3,281
		Log	5.05	1.06	2.73	8.10
Dist. to centre [m]	D	Linear	1,697	2,073	149	7,061
		Log	6.83	1.04	5.00	8.86
Build year [year]	$Year$	Linear	1957	21	1900	2000
Sale date [year]	$Sale$	Linear	2005	3.2	2000	2012
Onehunga	O	Dummy	53%	*Not applicable*		
Takapuna	T	Dummy	24%			
Commercial	Com	Dummy	33%			

We then applied the regression model specified in the previous section (in spatial error form) to this data; results are summarised in the table below.

Figure 11: Summary of results for property price regression

Variable		Coefficient	t-stat	P-value	95% confidence interval	
					Low	High
$ln(L)$	β_1	0.452	4.16	0.000	0.239	0.664
$ln(F)$	β_2	0.403	4.98	0.000	0.245	0.562
$ln(P)$	β_3	-0.068	-1.44	0.149	-0.165	0.025
$ln(D)$	β_4	-0.285	-4.18	0.000	-0.419	-0.151
$Year$	β_5	0.004	2.61	0.009	0.001	0.007
$Sale$	β_6	0.066	7.48	0.000	0.049	0.084
T	β_7	-0.547	-2.55	0.011	-0.968	-0.127
O	β_8	-1.183	-6.81	0.000	-1.522	-0.842
Com	β_9	-0.260	-3.74	0.000	-0.397	-0.124
c		-129.8	-6.81	0.000	-166.8	-92.8

The model has an overall R-squared of 82% and an F-statistic of 116.15, which suggests that it fits the underlying data reasonably well. Considering our hypotheses, we see $\beta_1, \beta_2 > 0$, i.e. an increase in land or floor area has a positive impact on property values, as expected.

With regard to our second (and more interesting) hypothesis, the first thing to note is that the coefficient on floor area is positive, whereas the coefficient on parking area is negative (although not statistically different from zero). This implies floor area will be worth more than parking area and in turn means that properties would be worth more if they provided relatively more floor area and proportionally less parking.

The following section will outline a process for generalising these results across our wider study areas.

Generalising our findings

To generalise our findings we first need to establish the degree to which parking "squeezes out", or substitutes for, floor area. To answer this question we developed a simple regression model of the ratio of floor area to parking area, where both variables were standardised by the land area. In this form, the variables represent the percentage of land area that is used to provide floor space and parking area:

$$fratio_i = \beta_1 . pratio_i + \beta_2 . D_i + c$$

Where for each property transaction *i*:

- $fratio_i$ is the ratio of floor area to land area;
- $pratio_i$ is the ratio of parking area to land area;
- D_i is the distance to the nearest town centre;
- $\beta_1 \; and \; \beta_2$ are coefficients to be estimated; and
- c is the constant of regression.

The following tables summarises the data and results for this regression. We note that we relaxed our high-density filters in this table, which increased the sample size.

Figure 12: Summary of data for floor area substation regression (n = 294)

Variable		Type	Mean	Std dev	Min	Max
Floor to land ratio	$fratio$	Percentage	77.8%	36.3%	26.0%	246%
Parking to land ratio	$pratio$	Percentage	28.5%	14.9%	2.14%	89.2%

Figure 13: Summary of results for floor area substitution regression (n = 294)

Variable		Coefficient	t-stat	P-value	95% confidence interval	
					Low	High
$pratio$	β_1	-0.5084	-3.70	0.000	-0.778	-0.239
D	β_2	0.007	2.04	0.041	0.000	0.014
Cons	c	0.427	4.07	0.000	0.222	0.633

We again used the spatial lag model to control for autocorrelation. Results suggest that every additional 100m^2 of parking results in 50.84m^2 reduction in floor area, ceteris paribus, i.e. a 51% substitution effect.

Our data suggests that the average area required for a car-park is 30m^2. The following table shows how all these results can be used to estimate the economic costs associated with an increase in parking and the consequent reduction in floor area, which has been calculated for the mean property in our sample.

Figure 14: Impacts of an additional car-park on property values

Attribute	Before	After	Change
Floor area	641m^2	622m^2	-18.5m^2
Parking Area	279m^2	309m^2	30m^2
Value	$1,150,431	$1,132,573	-$18,995

This suggests that in situations where minimum parking requirements are binding, then their marginal economic impact is approximately -$19,000 per car-park. To generalise our results further we must consider to what degree minimum parking requirements causes more parking to be provided than would occur otherwise. While we do not have direct information on the level of "over-supply", and such information would be relatively hard to come by, we can lean on other studies to guide our assumptions.

The aforementioned study of minimum parking requirements in London, for example, found that developments provided 40% less parking once minimum parking requirements were removed. While London is relatively dense compared to Auckland, the latter is likely to have higher parking requirements than the former. For this reason we chose to simulate three parking "over-supply" scenarios, ranging from 20%-50% with a mid-point scenario of 35%. We analysed the impacts of these parking over-supply scenarios in terms of their impacts on the improved value of properties, as summarised below.

Figure 15: Estimated economic costs of excess parking supply in our study areas

Scenario	Excess	Impact	Improvements	Cost
Current			$988,870,000	-
Low	20%	5.8%	$931,515,540	-$57,354,460
Medium	35%	9.2%	$897,893,960	-$90,976,040
High	50%	12.1%	$869,612,278	-$119,257,722

This suggests minimums cause a loss in value of between 5.8-12.1%, with the mid-point of our range (i.e. a parking oversupply of 35%) associated with a 9.2% reduction in the value of capital improvements. Based on this analysis, we estimate that the cost of minimum parking requirements for commercial properties in these town centres varies from $57-$119 million, with a mid-point estimate of $91 million.

3.2.2 Other economic costs

There are several other ways in which minimum parking requirements may create economic costs. The first and most obvious channel is increased congestion: By increasing the availability of parking, minimum parking requirements tend to lower the actual and perceived costs of parking. In the long run this means that minimum parking requirements are likely to stimulate more driving, and hence more congestion. To quantify these costs, we used AC's strategic regional transport model (ART3) to simulate higher parking costs in the areas considered in our study, namely Takapuna, Onehunga, and Dominion Rd. Short and long term parking prices (per trip) in the base scenario are illustrated in the figures below.

Figure 16: Short term parking costs in Takapuna, Onehunga, and Dominion Rd in 2041

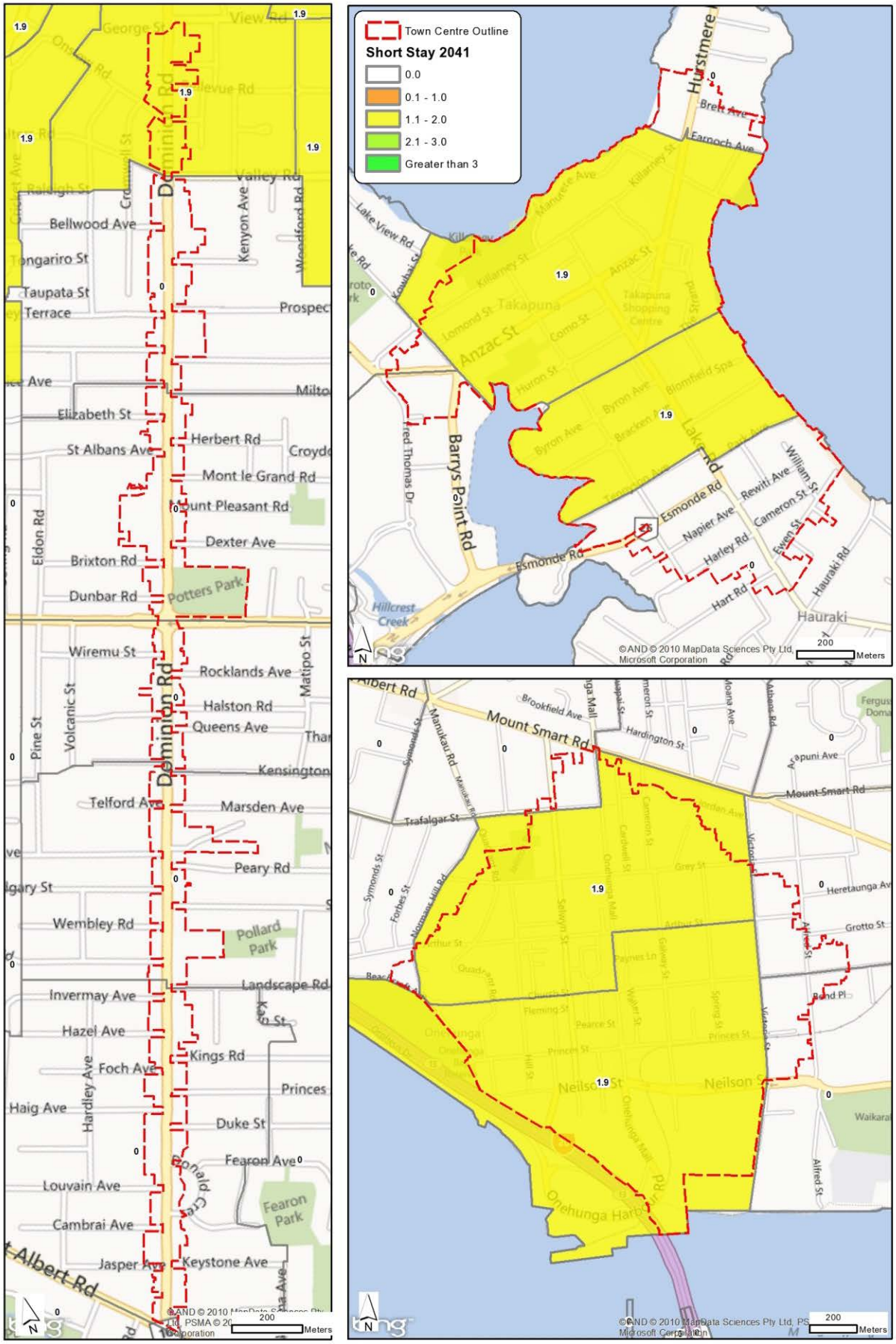

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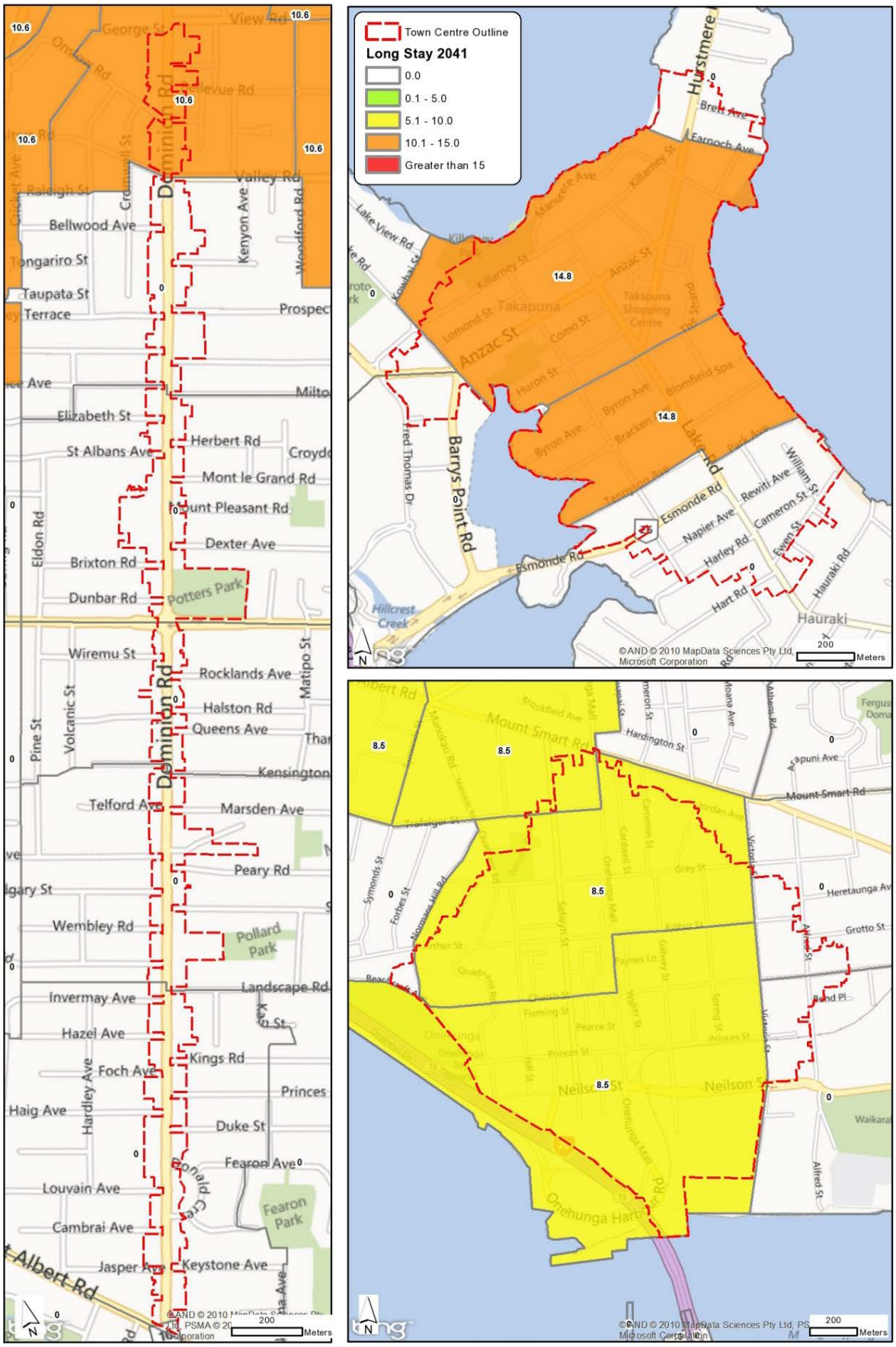
Figure 17: Long term parking costs in Takapuna, Onehunga, and Dominion Rd in 2041



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We can see that while Takapuna and Dominion Rd are subject to prices for long and short stay parking, Dominion Rd is not, aside from the northern end which is closest to the City Centre.

To simulate the costs of minimum parking prices, we assumed that in the absence of minimums prices for short stay parking in Onehunga, Takapuna, and Dominion Rd would increase by 50% from $1.87 to $2.80 per trip in 2041. In terms of long stay parking, we assumed that prices would rise by 25% in Takapuna and Onehunga to $18.51 and $10.58 respectively. On Dominion Rd we set the price of long stay parking along the whole length of the road equal to those reached at the northern end of the road in 2041. While we have estimates the impacts of removing minimum parking requirements on the price of parking, they seem reasonable given the underlying changes already assumed in the ART3 model.

The ART3 mode was then run with these adjusted parking input prices, while all other factors remained constant. Results showed a total reduction in vehicle trips of 1,700 in the AM and PM peak periods, with 3,800 fewer vehicle-kilometres travelled per day. We then annualised this figure by multiplying it by 240 (5 days per week times 48 work weeks per year) and converted it into dollar terms by assuming a congestion benefit rate of $1.70 per km.[4] On this basis, the congestion costs from minimum parking requirements were estimated to be $1.5 million per year in 2041.

Of course, the dis-benefit associated with increased congestion will not be achieved instantaneously but will instead be realised incrementally over time. For this reason we analysed congestion benefits within a discounted cash flow model, where we assumed benefits ramped up from $0.75 million in year 0 to $1.5 million in 2041. Using a standard discount rate of 8% this yields $12.3 million of congestion reduction benefits over the 30 year evaluation period.

To finish, we note that the ART strategic transport model predicted that approximately 80% of the vehicle trips averted by the higher parking costs would shift to public transport, which would in turn reduce the need for public transport operating subsidies. This is a good example of how removing a distortion in one market (i.e. lower subsidies for parking) enables another market to operate more efficiently (i.e. lower subsidies for public transport).

3.3 Economic Benefits of Minimums

The economic benefits of minimum parking requirements arise from what they enable us to avoid. Put simply, over-supplying parking makes life easier in the following two key ways:

- *Lower search costs* – because people will be able to find a car-park more quickly; and/or
- *Lower management costs* – because supply will always increase to match demand.

Lower search costs are quite difficult to estimate. One would first have to estimate how the removal of minimum parking requirements would impact on parking vacancy rates[5], and in turn how this reduction in vacancy levels impacted on the time people spent searching for a car-park. The calculation would also have to implicitly assume that there was no offsetting action taken by Auckland Transport in response to low parking vacancy rates, which we consider to not be a reasonable assumption.

In fact we know that scarcity of parking is precisely the situation in which Auckland Transport would be expected to intervene in order to manage the demand for parking, by way of implementing pay parking and/or time-limits. Both of these have the intended effect of reducing demand and increasing turnover of parked vehicles, such that people can find a car-park when and where they need it, i.e. the response by Auckland Transport would aim to mitigate high search costs.

[4] NZTA's EEM Vol. 2 specifies a rate of $1.56 per km in 2008 dollar terms. We inflated this rate to 2012 values using the Reserve Bank of New Zealand inflation calculator, which came to $1.70 per km.
[5] By "vacancy" we mean the number of car-parks that are available but not occupied by vehicles, as distinct from supply.

Ultimately we suggest that parking search costs and parking management costs are inter-related and inseparable. So, rather than risk double-counting, for the purposes of this study we have assumed that the removal of minimum parking requirements precipitates a major increase in *parking management costs*, which in turn is sufficient to maintain search costs at present day levels. Stated differently, by counting high parking management costs we can assume that search costs are unaffected, i.e. that people can still find a car-park relatively easily if they need to.

In particular, we have assumed that the removal of minimum parking requirements would result in the following parking management costs being incurred by Auckland Transport:

- *Comprehensive parking management plans (CPMP)* – surveys and analysis of supply/demand, which we have assumed cost $100,000 per year from the first year that minimum parking requirements are not applied.
- *Monitoring and enforcement* – to ensure compliance with parking restrictions; we have assumed additional monitoring and enforcement costs $90,000 per year per town centre, i.e. $270,000 (this is sufficient to cover the costs of three full time enforcement officers).
- *Purchasing and servicing parking meters* – we have assumed that parking meters cost $12,000 each. The need for parking meters is assumed to emerge from year 5 onwards, when 300 meters are purchased for a total cost of $3.6 million. After that, an additional 300 meters are purchased every 5 years. We have also assumed that the metres need to be replaced every ten years and incur additional maintenance/servicing costs of $150 per machine per year.

We incorporated these parking management costs into a discounted cash flow model to estimate their total net present value, where we assumed a discount rate of 8% over 30 time period. This suggested that minimum parking requirements help to avoid economic costs of parking management to the value of $14.5 million over 30 years. The discounted cash flow model is summarised in the following table:

Figure 18: Inputs into the discounted cash flow model of parking management costs

Year	Discount factor	CPMP	Enforce	Meters	
				Servicing	Capital
1	100%	$100,000	$270,000	$0	$0
2	93%	$100,000	$270,000	$0	$0
3	86%	$100,000	$270,000	$0	$0
4	79%	$100,000	$270,000	$0	$0
5	74%	$100,000	$270,000	$45,000	$3,600,000
6	68%	$100,000	$270,000	$45,000	$0
7	63%	$100,000	$270,000	$45,000	$0
8	58%	$100,000	$270,000	$45,000	$0
9	54%	$100,000	$270,000	$45,000	$0
10	50%	$100,000	$270,000	$90,000	$3,600,000
11	46%	$100,000	$270,000	$90,000	$0
12	43%	$100,000	$270,000	$90,000	$0
13	40%	$100,000	$270,000	$90,000	$0

14	37%	$100,000	$270,000	$90,000	$0
15	34%	$100,000	$270,000	$135,000	$7,200,000
16	32%	$100,000	$270,000	$135,000	$0
17	29%	$100,000	$270,000	$135,000	$0
18	27%	$100,000	$270,000	$135,000	$0
19	25%	$100,000	$270,000	$135,000	$0
20	23%	$100,000	$270,000	$135,000	$3,600,000
21	21%	$100,000	$270,000	$135,000	$0
22	20%	$100,000	$270,000	$135,000	$0
23	18%	$100,000	$270,000	$135,000	$0
24	17%	$100,000	$270,000	$135,000	$0
25	16%	$100,000	$270,000	$135,000	$7,200,000
26	15%	$100,000	$270,000	$135,000	$0
27	14%	$100,000	$270,000	$135,000	$0
28	13%	$100,000	$270,000	$135,000	$0
29	12%	$100,000	$270,000	$135,000	$0
30	11%	$100,000	$270,000	$135,000	$3,600,000
Totals		**$1,215,841**	**$3,282,770**	**$776,147**	**$9,254,301**

The major economic benefit of minimum parking requirements is therefore cost savings associated with having to purchase and service parking meters. While these costs are likely to be fiscally neutral for AT, they are economic costs nonetheless and need to be counted as such

3.4 Cost-benefit Ratio

In this section we condense findings from previous sections into a single cost-benefit cost ratio (CBR). The purpose of the CBR is to compare the costs of minimum parking requirements to their benefits; a CBR greater than one thus indicates that minimum parking requirements have net economic costs, and vice versa for a CBR less than one. Costs and benefits are summarised in the following table.

Figure 19: Estimated economic costs of excess parking supply in our study areas

Estimates		High (50%)	Med (35%)	Low (20%)
Costs of minimums	Property values	$260,832,112	$198,976,404	$125,441,646
	Congestion	$12.3 million		
	Agglomeration	As yet unquantified.		
	Compliance	As yet unquantified.		
Benefits of minimums		$14,529,058	$14,529,058	$14,529,058
Cost-benefit ratio		18.8	14.5	9.5

Results suggest that the economic costs of minimum parking requirements exceed their benefits in all scenarios. This in turn suggests minimum parking requirements, on balance, have negative economic impacts, even in those situations where they cause only a small (20%) parking over-supply. We emphasise again that earlier studies in London found that the removal of minimum parking requirements resulted in 46% less parking being provided than what had been provided when minimum parking requirements were in force.

We note that this cost-benefit analysis is considered to be "conservative" insofar as it is likely to underestimate the economic costs of minimum parking requirements for the following reasons:

- ***We consider only economic costs for commercial properties.*** In reality, the application of minimum parking requirements would also be expected to create costs for residential properties, especially in medium to high density areas where the need to provide more parking could require parking structures and reduce the space available for other more valuable uses.
- ***We focus on lower density properties.*** Because we rely on aerial photos and GIS to calculate the parking area on each property we could not include high density properties where parking is not visible from the air. It is precisely these locations where the value of floor space is likely to be higher and minimum parking requirements are more likely to bind.
- ***There are a number of unquantified costs.*** We have not yet quantified the impacts of minimum parking requirements on agglomeration and compliance costs. While these are not expected to be as large as the direct impacts on property values, they may be significant nonetheless. By not including them in our analysis, the resulting cost-benefit ratio is likely to be relatively low.

On the basis of these results, and the caveats noted above, we would suggest that minimum parking requirements have, on balance, significantly negative economic impacts. We also suggest that these economic impacts are directly proportional to two key variables: 1) the value of floor space and 2) the degree to which parking "squeezes out" floor space.

As both these variables are likely to be positively correlated with the density of development, we conclude that the negative economic impacts of minimum parking requirements may be expected to increase non-linearly with density. That is, the economic costs of minimum parking requirements will accelerate as density increases. We suggest these economic impacts are highly relevant given the intensification of urban areas espoused in the Auckland Plan.

The policy implications of our findings are discussed in more detail in the following section.

4. Policy Implications

We have found that the benefits of minimum parking requirements, such as lower search and management costs, are greatly outweighed by their costs, i.e. lower property values and increased congestion. These results have several implications for policy.

First, we find no economic justification for retaining minimum parking requirements. This is especially pertinent in areas where:

- Floor space is highly valued, or it will be so in the future;
- The provision of affordable housing is desired; and
- Congestion exists on the road network.

Minimum parking requirements they will increasingly bind as density increases. This means that minimum parking requirements will tend to impact on development outcomes in precisely those areas where their consequences, in terms of economic costs, are the most problematic.

For this reason, we would recommend the removal of minimum parking requirements from metropolitan areas. This contrasts with the gradual roll back or relaxation previously advocated in, for example, the Auckland Regional Parking Strategy (ARPS). And unlike the ARPS we suggest the removal of minimum parking requirements should not be linked to the availability of public transport, because the latter is a public policy designed primarily to alleviate congestion, rather than facilitate development. It is the impacts of minimum parking requirements on development that are the most economically detrimental.

While we have not considered impacts on residential development in our analyses, research suggests minimum parking requirements will inflate the costs of development. Moreover, this cost burden tends to fall disproportionately on low income households, i.e. it is regressive (c.f. Litman). This is because low income households are more likely to reside in higher density dwellings, such as units and apartments, where minimum parking requirements are binding. Low income households also tend to own fewer vehicles and drive less, such that they benefit less from the availability of low-cost parking. For this reason, we suggest minimum parking requirements are not only inefficient, but also inequitable.

For these reasons we recommend Auckland Council adopt a “neutral” parking policy, especially within the MUL. A major advantage of assuming such a neutral policy position is that it avoids creating “moral hazards”. For example, minimums create cultural expectations for abundant, low-cost (if not free) parking. Over time, the presence of minimum parking requirements will therefore unintentionally shift responsibility for parking to Council – which is quite the opposite of their intended outcome.

By not specifying minimum parking requirements, Council will not only avoid lumbering economic costs on society, but also avoid lending support to cultural expectations for parking that, in our opinion, are best managed by the people that are directly affected. Specifically, we suggest that the drivers of vehicles and, to a lesser degree, the developments to which they are travelling, are better placed to manage the need for parking. In turn, all Council should focus on is managing public parking in a way that creates the right incentives for drivers and developers.

To finish, it is also worth noting that, in light of ongoing discussions around mechanisms for addressing Auckland’s pervasive shortfall in transport funding, retaining minimum parking requirements is likely to be problematic should Council elect to apply a commercial parking levy. Were they to both retain minimum and elect to apply a commercial parking levy, then Council would be requiring landowners to provide parking before subsequently rating them based on the parking they provide. This circular regulatory and taxation process would seem to create an obvious and unhealthy conflict of interest. Alternatively, the presence of minimums could prevent or delay the implementation of a parking levy.

5. Conclusions

Based on the results of this study we have drawn the following conclusions:

- The Auckland Plan establishes a number of targets/goals that interact with parking policy, such as:
  - Up to 70% of development occurring within the 2010 urban limit through intensification;
  - Improving housing affordability; and
  - Doubling PT patronage by 2022.
- In response to these targets/goals, directive 10.6 of the Auckland Plan suggests the Unitary Plan consider a wider range of issues than has traditionally influenced parking policy.
- Minimum parking requirements can be understood as a regulatory intervention (i.e. public policy) that seeks to increase the supply of parking above what would normally be provided by new developments were they free to choose themselves. Economic theory suggests that an increase in the supply of parking above what is optimal would cause prices to be lower than what they would be otherwise. Hence, minimum parking requirements tend to create *more parking* at a *lower price*.
- On the other hand, well-designed regulatory interventions can also reduce economic costs incurred elsewhere, such as externalities and transaction/search costs, which are either not considered by direct market participants and/or act as barriers to efficient market functioning. One of the proffered advantages of minimum parking requirements is that they 1) make it easier for people to find a park and thereby alleviate localised congestion and 2) reduce the need for local government to monitor/manage public parking. In this light, the key question we seek to answer is: *What are the overall economic impacts (costs and benefits) of minimum parking requirements?*
- Minimum parking requirements are effectively a tax on floor space, where an increase in floor space triggers increased parking provision. Ultimately minimum parking requirements will constrain the development potential of a site. We evaluated the economic impacts of minimum parking requirements in Takapuna, Onehunga, and Dominion Rd. These areas were selected because they are relatively typical of medium density, mixed use urban areas in Auckland.
- The costs of minimum parking requirements were found to exceed the benefits by a ratio of approximately 15 to one respectively. Put another way, the benefits of removing minimum parking requirements are fifteen times greater than the costs incurred in doing so. These results are relatively conservative insofar they do not include impacts on residential property or agglomeration economies, which would tend to strengthen the case for removing minimum parking requirements.
- While this study has not considered the impacts of minimum parking requirements on residential development, international research suggests they may significantly inflate the costs of housing. Moreover, the cost burden that results tends to falls disproportionately on low income households, i.e. it is regressive (c.f. Litman).
- While the economic impacts of parking are complex and multi-variable, we suggest the balance of evidence shows them to be negative. For this reason we recommend Auckland Council adopt a “neutral” position on parking policy, especially within the MUL.
- A major advantage of assuming a neutral policy position is that it avoids creating “moral hazards”. In the absence of minimum parking requirements, Council can slowly divulge the (unreasonable) public expectation that they are reasonable for parking.
- Ultimately, the demand for and supply of parking seems to be an issue most appropriately managed by the drivers and developers directly affected by its availability. Council can then focus on managing public parking efficiently, e.g. through setting appropriate prices, rather than stipulating how much parking should be supplied with private developments.

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