Auckland's Elite and Prime Land: Similar Messages and Continued Trade-offs 54 Years Later

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Auckland’s elite and prime land: similar messages and continued trade-offs 54 years later

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Executive Summary

A formidable global challenge is securing soil and water resources to support an ever-increasing population and sustainable land management options are essential to achieve these requirements. The population of Auckland is forecast to increase from 1.5 to 2.5 million by 2040 putting immense pressures on the region's soil resources to accommodate future growth. The objective of this study is to robustly quantify the amount of elite and prime land that has been lost, and what is likely to occur, to urban development in Auckland using both long-term trend and future growth records.

Spatial analysis indicated that 10,399 hectares (or 8.3%) of elite and prime land has been lost to urban development through incremental urban extension, operative/approved greenfields and building consents. Furthermore, the majority of land allocated to urban extension since 1996 is elite and prime land. Looking into the near future, lodged/future greenfield developments equate to an additional potential loss of 6,010 hectares (or 4.8%) of elite and prime land. Loss of highly productive agricultural and horticultural land in and around Auckland caused by the continuous extension of the urban frontier can be traced back to the early-mid 1900s and future growth pressures indicate that this trade-off will continue.

There is a real need to analyse the economic benefits and long-term sustainability of future development and the protection of elite and prime land for current and future production needs to provide prolonged benefits to the wider and future communities. Further research should account for the true cost of lost provisioning, regulatory and cultural services soil natural capital supports to ensure that these values are recognised and considered by not only urban planners but by both policy and, more importantly, decision-makers in Auckland. It has never been timelier to assess the consequences of continued elite and prime land trade-offs to development in Auckland, particularly its implications on current and future food security requirements.

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1.0 Introduction

Soils are natural capital assets and are a non-renewable resource, once they are lost they are lost forever (Haygarth and Ritz 2009; Mackay *et al.* 2011) through irreversible damage and degradation. For an ever increasing global population, an international challenge is securing adequate food supplies, and soil and water are fundamental to ensure that these needs are achieved (Busscher 2012). According to global demographic models, the global population is projected to reach 8, 9 and 10 billion by years 2025, 2043 and 2083, respectively (UNESA 2012), putting immense pressures on our natural resources to meet basic necessity demands. Tóth (2012) reported that with a growing rate of population increase, increasingly higher quality croplands are converted to artificial surfaces in Europe, and that for several states, infrastructural development occurs at the cost of highly productive croplands.

In New Zealand there are growing concerns about the competition of high-class land for rural versus urban uses on the fringe of large cities (Mackay *et al.* 2011; Rutledge *et al.* 2010). High-class land has been defined by some practioners as Land Use Capability (LUC) Classes 1-2 and other practioners as LUC Classes 1-3. Class 1 (or elite land) is the most versatile, multiple use land on flat to undulating land. Classes 2 and 3 (or prime land) is also very good prime agricultural and horticultural land with slight (Class 2) or moderate (Class 3) physical limitations to arable use (Lynn *et al.* 2009). Class 1-2 land represent 5% of total New Zealand land areas and Class 1-3 land represents 14% (Rutledge *et al.* 2010). Domestic retail sales of fresh and processed vegetables are estimated at $1 billion each year while export earnings range between $500 and $600 million (MPI 2013), and these operations are only suitable on these multiple use, highly versatile land areas. However, Rutledge *et al.* (2010) report that urbanisation disproportionately affects New Zealand's most high-class and productive soils which could have a negative impact on New Zealand's primary production capacity in the future.

Auckland is the largest city in New Zealand with a population forecast to increase from 1.5 to 2.5 million by 2040 (adapted from Statistics NZ (2006)). This translates to a population increase 5.5 times the 450,000 population in Auckland in the 1960s (Mayer 1962). The loss of elite and prime land is expected to be a highly contested land use issue in Auckland with the forecast growth equating to an additional 400,000 new dwellings by 2040 (AC 2012). In order to support the accommodation of some of this population increase, two satellite towns have been proposed for future growth, Warkworth and Pukekohe (AC 2012), the latter of

which is located where the majority of LUC Class 1 or elite land in Auckland is located, an area that supports a significant proportion of New Zealand's outdoor vegetable production (Fresh Facts 2011; Hunt 1959; Statistics NZ 2011). Future growth identified in the Auckland Plan also requires the need for additional greenfield developments over and above what is already planned and have been noted as "Greenfield Areas for Investigation" in the plan's Development Strategy (AC 2012).

Loss of highly productive agricultural and horticultural land in and around Auckland caused by the continuous extension of the urban frontier can be traced back to the early-mid 1900s (Coleman 1967). In the 1820s Panmure was considered to be the largest cultivated area in New Zealand and the Māori were soon to become known as the first commercial orchardist and market gardener in the history of Auckland by early settlers (Coleman 1967). In the 1850s, over 3,000 hectares of cultivated land was located in Mt Eden, Three Kings, Manukau Road, One Tree Hill, Mt St. John and Tamaki; the majority situated on basaltic soils known as 'Auckland's traditional horticultural soils' by Māori and the early settlers. Early 1870s marked the arrival and establishment of Chinese in and around Auckland and from the late 1870s Chinese growers were found spread throughout the Carlaw Park, Khyber Pass, One Tree Hill, Mt Eden, Mt Roskill, Meadowbank, Mt Wellington and Panmure areas (Coleman 1967). Being regarded as the traditional horticultural soils, if a soil did not have the red chroma associated with basaltic soils it was considered unsuitable for vegetable cropping (Coleman 1967). This can also be said to be the case for some growers to this day, however these areas no longer exist for vegetable growing operations and have since 'bowed' to urban development. Coleman (1967) reflects that only less than 20 years ago (i.e. late 1940s) Panmure, Mt. Wellington and Avondale were still renowned as vegetable growing areas.

Pukekohe and the Franklin region share a similar horticultural history, and with its naturally fertile soil, the first commercial potato crops were grown in 1870. Since then Pukekohe was supplying vegetables to the growing Auckland and it was not until the Second World War (1939-45), which caused the demand for vegetables for local USA and Pacific camps, that marked Pukekohe as a renowned permanent vegetable growing region (Coleman 1967).
Similarly, to Coleman (1967), Hunt (1959) reported that around the early-mid 1940s thousands of acres of highly productive market gardening land in Auckland had been lost to urban growth. Hunt (1959) also remarked that there was ample supply of this highly productive land required for vegetable growing in Franklin. Some of the soils in the Franklin region have been regarded as some of the best soils in New Zealand for food production and that every effort should be made to protect the Pukekohe Hill soils and the soils to the

west of Pukekohe from development (MAF 1975). However, considering that the Auckland Plan has identified Pukekohe as a satellite town to accommodate future growth, this highly productive land continues to be the trade-off and is required to bow to urban growth.

Despite these studies, there have been few in-depth evidence based investigations of this long-standing land use issue in Auckland. While some studies in New Zealand and overseas have focused on the encroachment of urbanisation onto productive agricultural or horticultural land, datasets have been limited to broad scale or short spanning records of between 6-18 years (Andrew and Dymond 2012; Tóth 2012), that although provide a useful indication as to what has occurred, were not necessarily designed for analysing urbanisation trends (Rutledge *et al.* 2010). Additionally, future growth projections are often not accounted for. The aim of this study is to address this gap for New Zealand's largest city.

The objective of this study is to robustly quantify the amount of elite and prime land that has been lost to urban development and what is likely to occur in Auckland using both long-term trend and future growth records. Urban development categories and corresponding datasets are based on four inter-related criteria: 1) the progressive extension of the built-up core urban area of Auckland over time; 2) greenfield developments (operative/approved and lodged/future) defined as large scale developments, primarily on the city edge, converting land that has previously been used for rural-based purposes to urban use; 3) building consent footprint; and 4) greenfield areas for investigation for future growth. Following the quantification and presentation of findings, the paper will discuss the implications of the research findings.

2.0 Data and Methodology

The spatial assessment to determine long-term losses of elite and prime land to urban development involved the use of a number of datasets. The Land Use Capability (LUC) layer from the New Zealand Land Resource Inventory (NZLRI 2009) was used to measure the proportion and spatial distribution of elite and prime land in Auckland. For the purposes of this study, LUC Classes 1-3 are collectively defined as high-class land, with Class 1 land defined as elite and Class 2 and 3 land defined as prime land in accordance with the Auckland Council Regional Policy Statement (2008b). Land Use Capability mapping became effective in and around the 1980s and therefore parts of the core urban area were not mapped because of pre 1980 development.

The analyses also incorporated four datasets and layers held within Auckland Council to determine the recent and anticipated loss of elite and prime land to various developments. These datasets include (with length of dataset establishment in parentheses):

1. **Extension of the urban boundary (1915-2010):**

   The periodic incremental extension of the urban boundary was mapped from 1915 to 2010 (hereafter referred to as urban extent or extension). The dataset has been continuously updated over time and was last updated in 2010. Older urban extents contained in this dataset were captured using historical data, and illustrate urban extension since 1915 (Bloomfield 1967). The new aerial photography captured for the region is digitised/created at the parcel/property level.

2. **Greenfield developments (operative/approved and lodged/future) (2010-2036):**

   The greenfield development dataset includes spatial information for current and proposed developments. For the purposes of this study, the greenfield development dataset has been divided into two categories; (i) operative/approved and (ii) lodged/future. The former describes those developments that have been approved for development. Any greenfield developments approved prior to 2010 have been captured in the urban extents dataset. Lodged greenfield developments are those that have been lodged with Auckland Council for planning consent consideration.

3. Building consents (1991-2012):

The building consents dataset is a compilation of building consents data between 1991 to 2012. The data has been collated following the enactment of the Building Act in 1991 (DBH 1991) and building consent reporting became mandatory, complementing the new planning regime created under the Resource Management Act 1991 (RMA 1991). The growth of impervious built up areas was recorded in terms of floor area or footprint of new building structures.

4. Greenfield areas for investigation for future growth (2013-2040):

Greenfield areas for investigation have been identified in the Auckland Plan's (2012) Development Strategy to accommodate up to 90,000 dwellings outside the current urban extent. This dataset also includes the proposed Rural Urban Boundary (RUB) options as at 11 September 2013. The proportion of elite and prime land occupied in these areas has been quantified and will overlap with some existing development as per datasets described in 1-3 above. However, the purpose of quantifying and illustrating these options is to provide some context as to where future growth has been earmarked.

Spatial analysis was carried out using ESRI ArcMap GIS software (version 9.3.1). All datasets were mapped to the Auckland regional boundary and spatial analyses carried out to quantify the proportion of elite and prime land lost to development for the period of time each dataset was available. For the purposes of this study, the loss of elite and prime land to development is defined as that lost to impervious surface. It was possible to discriminate between the loss of Class 1-3 land for the urban extension and greenfield development analyses. The loss of Class 1-3 land was also determined both within and outside of the current (2010) urban extent. This was also determined for building consents but it is was not possible to discriminate the loss of Class 1-3 land to this development type.

The coordinates provided for each building consent are taken from a centre point of the parcel boundary and are not reflective of the actual location of the development, therefore it was not possible to discriminate which LUC Class (1-3) the building consent was associated with, particularly when more than one LUC Class (1-3) occupied a land parcel. Furthermore, it should be noted that the LUC layer, at the 1:50,000 scale, was not designed to be used at the property level and, as a result, there will be issues with accuracy (Lynn *et al.* 2009). However, it does provide very useful information when used appropriately at the regional level. Another limitation regards the lack of building consent records for land parcels prior to 1991 which have not been digitised. To investigate building consent footprints prior to 1991

fourteen randomly selected land parcels were used as case studies to determine the nature and extent of pre-existing buildings and dwellings. The building footprint within each land parcel, which includes house area, sheds, additional buildings and driveways, were digitised using 2010 aerial photography for the fourteen land parcels. The developments were assessed against the building consent/s granted for the parcel of land to determine the extent of potential pre-existing (prior to 1991) building footprints on Class 1-3 land.

3.0 Results

Land Use Capability Classes 1, 2 and 3 occupy about 4,397ha (<1%), 55,365ha (12%), and 65,090ha (15%), respectively, in the Auckland region (Figure 1). The majority of Class 1 land is in the Franklin area, in and around Pukekohe, representing about 86% of LUC Class 1 (Figure 1 and Table 1).

Table 1. Breakdown and proportion of Land Use Capability (LUC) Classes 1-8 in Auckland.

LUC Class	Hectares	Per cent of region
1	4397	1
2	55356	12
3	65090	15
4	79641	18
5	0	0
6	174067	39
7	52420	12
8	12886	3

Loss of elite and prime land to urban extension

The loss of elite and prime land to urban extension since 1915 represents 7,172ha representing 4.8% Class 1, 67% Class 2 and 28% Class 3 land lost (Table 2). This represents a total loss of 5.8% of elite and prime land lost to urban extension since 1915 (Table 2 and Figure 2). The loss of Classes 1, 2 and 3 within the current urban area represent 214ha, 4,435ha and 1,871ha, respectively. Furthermore, the majority of land being allocated for urban extension is on elite and prime land (LUC 1-3) representing a 62% average for the five urban extent periods from 1996 onwards (Table 2).

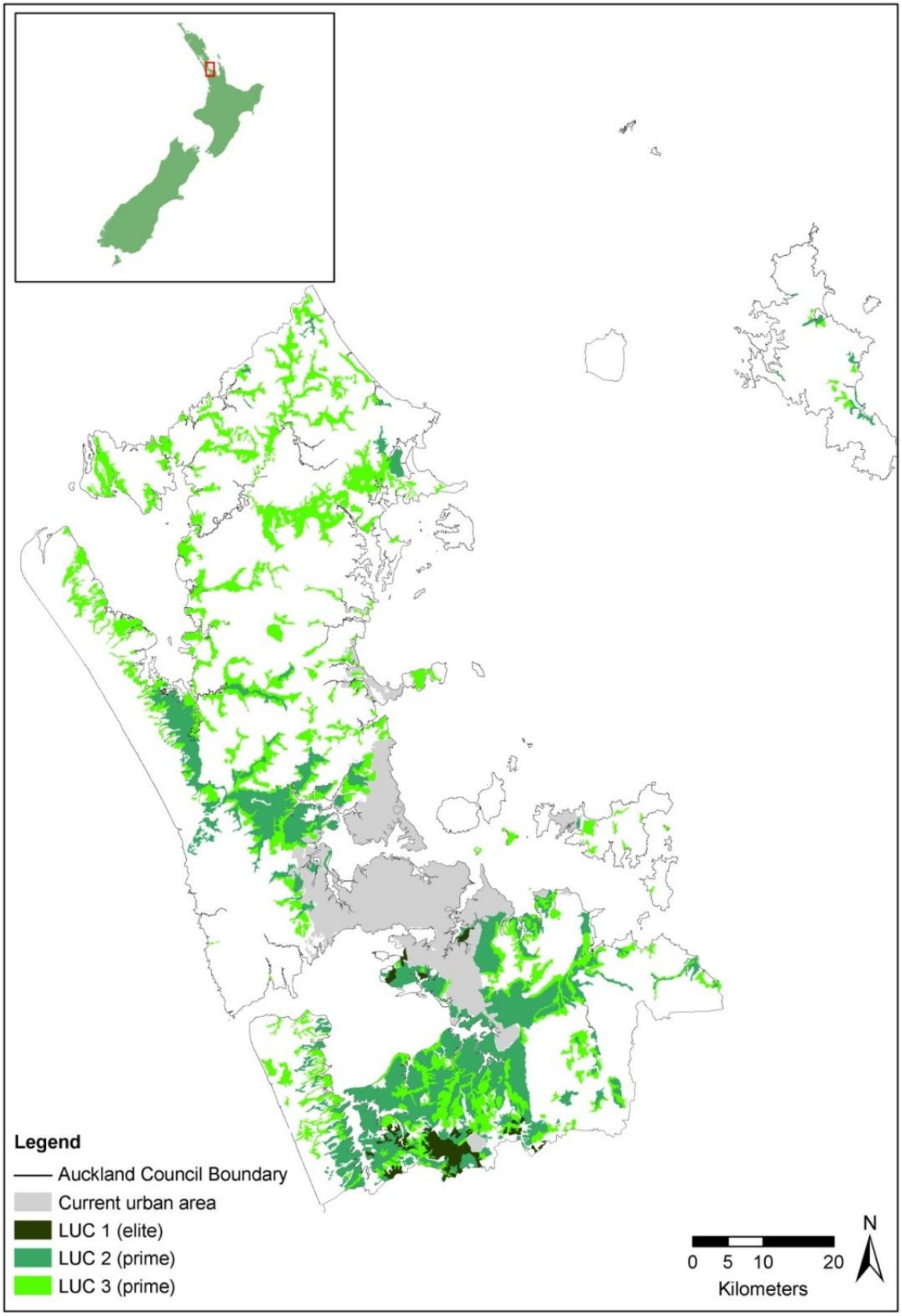

Figure 1. Distribution of Land Use Capability (LUC) Class 1 (elite land) and Classes 2 and 3 (prime land) across Auckland.

Table 2. Rate of elite and prime land lost to urban extension, urban extent growth and percentage proportion of Land Use Capability Classes 1-3 of urban extent.

Period	Land Use Capability Class					Urban extent growth (ha)	% LUC 1-3 of urban extent
	1	2	3	Total (ha)	Rate of loss (ha/yr)		
1915		11	22	33		5039	1
1945		102	24	126	4	8601	1
1964	9	107	43	160	8	13149	1
1975	18	292	152	462	42	10206	5
1987[1]	20	452	155	627	52	3021	21
1996	41	1388	601	2030	226	4369	46
2001	103	1062	271	1436	287	2405	60
2006	20	820	440	1280	256	2717	47
2008	31	108	168	307	154	382	80
2010	101	482	129	711	356	932	76
Total (ha)	**343**	**4823**	**2005**	**7172**	**-**	**50821**	**-**

Loss of elite and prime land to greenfield developments

The loss of elite and prime land to operative greenfield developments represents 1,832ha of land, the majority of which is occupied by LUC Class 2 (73%) (Table 3). This represents about 1.5% of the total available elite and prime land (Figures 1 and 3 and Table 1).

Table 3. Loss of elite and prime land to greenfield developments (ha).

Development stage	Land Use Capability Class			Total (ha)
	1	2	3	
Operative (ha)	16	1339	477	1832
Lodged/future (ha)	206	4494	1310	6010
Total (ha)	**222**	**5833**	**1787**	**7842**

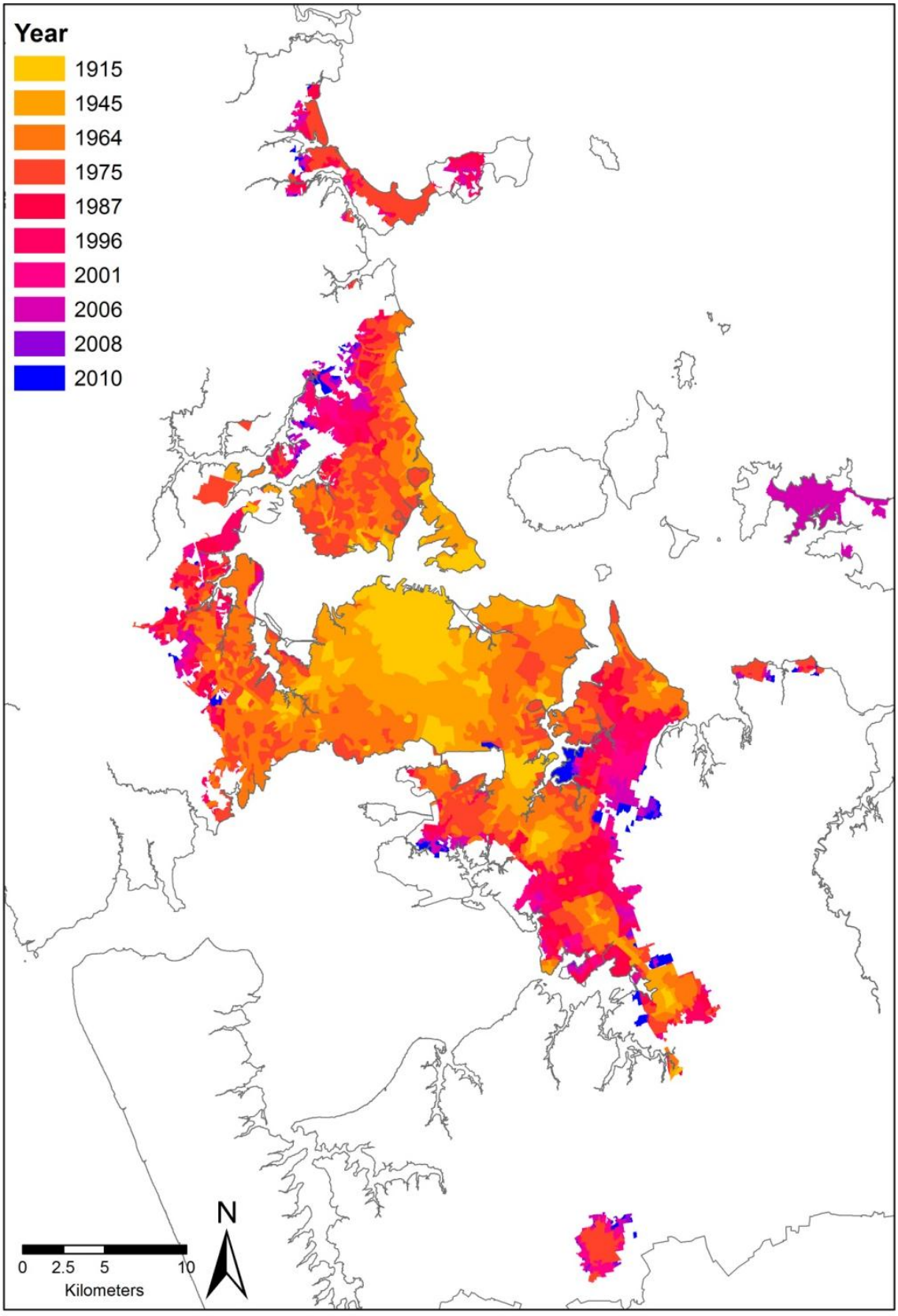

Figure 2. Illustration of increasing urban extension from 1915-2010 in Auckland.

Loss of elite and prime land to building consents

A total of 52,980 building consents were granted since 1991 across 44,852 land parcels containing elite and prime land (Figure 3). This equates to a total floor area and loss of elite and prime land of 1,395ha (1.12% of total available LUC 1-3). Of this, 31,528 building consents were granted within the current urban area equating to a floor area of 980ha which potentially overlaps with elite and prime land lost to urban extension (Figure 3). Therefore, 415ha of floor area representing 21,452 building consents provides a better reflection of the loss of elite and prime land to building consents.

Eighty per cent of the building consents represent one building category that included new (and pre-built) houses, units, and beach cottages with an average floor area of 223m^2. To investigate the nature and extent of building footprints prior to 1991 fourteen case study assessments were undertaken (data not shown). Eight of the fourteen case studies were occupied by pre-existing buildings prior to 1991, all of which were located on elite and prime land. The digitised pre-existing building footprint for these eight case studies amounted to 1.79ha of Class 1-3 land, representing 59% of the total impervious surfaces for the fourteen case studies. Thirty-nine % of the pre-existing 1.79ha building footprint was occupied on Class 1 land. These case study examples support the notion that the loss of elite and prime land to building consent footprint is underestimated due to a lack of records prior to 1991.

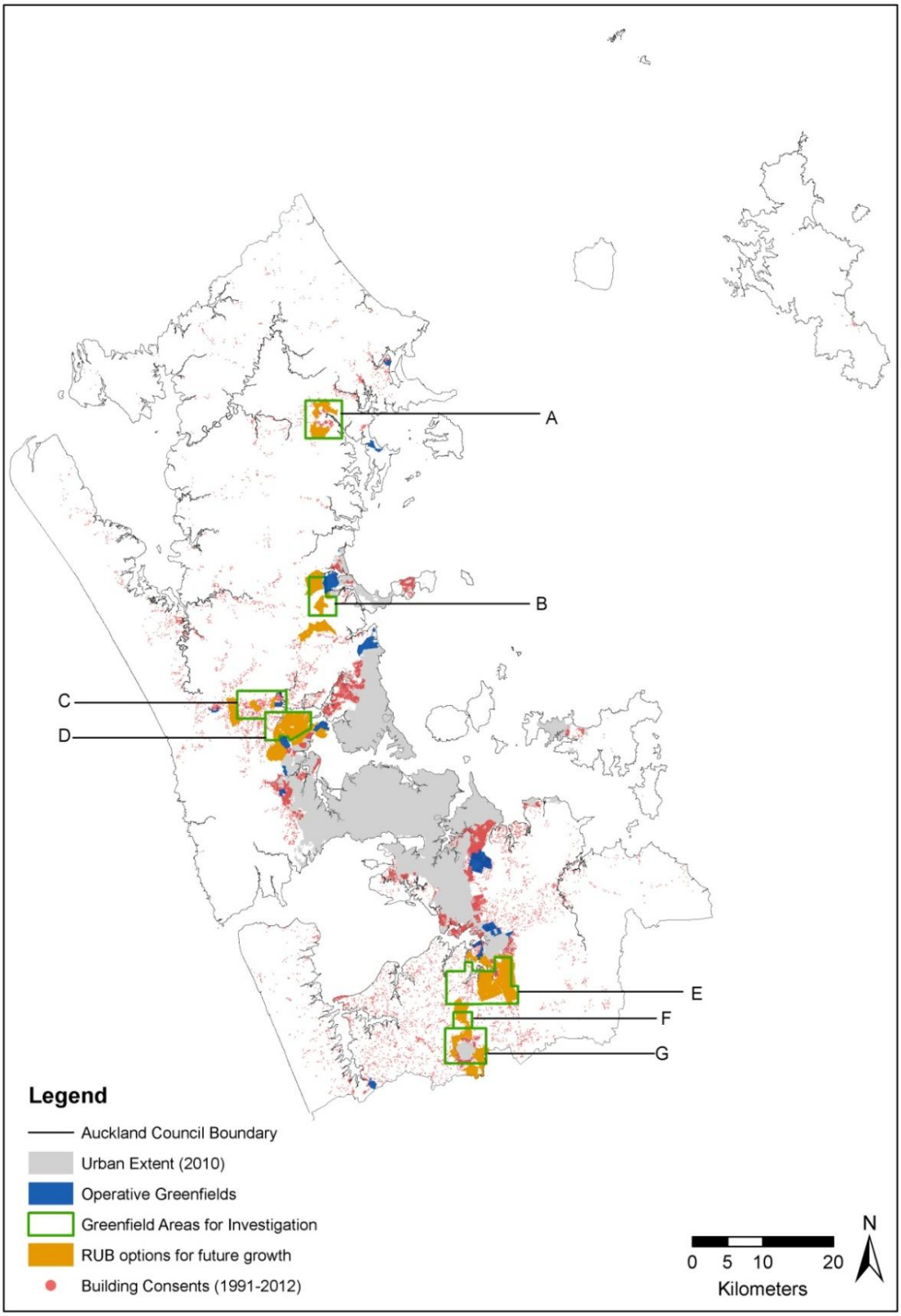

Figure 3. Extent of built up area including the 2010 urban extent, operative greenfield developments and building consents occupying elite and prime land. Greenfield areas and proposed Rural Urban Boundary (RUB) options to accommodate future growth are also illustrated. Letters A-G denotes the various greenfield areas for investigation for future growth.

A = Warkworth; B = Silverdale; C = Kumeu; D = Whenuapai; E = Drury; F = Paerata; and G = Pukekohe.

Future pressures on elite and prime land

Lodged/future greenfield developments equate to an additional 4.8% of available elite and prime land (Table 3). Whilst the majority of this 6,010ha is Class 2 land, it includes 206ha of Class 1 or elite land.

Furthermore, while the majority of the 400,000 dwellings expected to be required to accommodate future growth in Auckland is envisaged to occur within the existing urban boundary through intensification, greenfield areas for investigation have been identified to accommodate up to 90,000 new dwellings in rural Auckland (Figure 3). Apart from greenfield areas for investigation identified as A and B in Figure 3, which contain small areas of Class 3 land (Figure 1), the majority of land occupied in greenfield investigation areas C-G is Class 1-3 elite and prime land, with Class 1 land occupying parts of greenfield investigation area G (Figures 1 and 3). As at 11 September 2013, the proposed rural urban boundary options were released and notified to the public 30 September 2013 (Figure 3 and Table 4). While there will be some overlap between these areas earmarked for future growth and already existing development as quantified in this report, future growth continues to disproportionally encroach onto elite and prime land resources (Table 4).

Table 4. Breakdown and proportion of proposed rural urban boundary (RUB) options occupying Land Use Capability (LUC) classes 1-8 in Auckland.

LUC class	Hectares	% of RUB options	% of region
1	255	3	6
2	5150	56	9
3	1942	21	3
4	1805	19	2
5	0	0	0
6	120	1	0
7	0	0	0
8	0	0	0

4.0 Discussion

A total of 10,399ha (or 8.3%) of Auckland's elite and prime land has been lost to various urban development categories, with the majority of loss occurring from 1996 onwards. This excludes the thousands of acres of highly productive market gardening land that went out of production in and around the Auckland Isthmus in the early-mid 1900s (Hunt 1959). Furthermore, the majority of land allocated to urban extension since 1996 is elite and prime land (Table 2). Future growth pressures indicate that the loss of elite and prime land will continue to be the trade-off to accommodate future growth.

These pressures include lodged/future greenfield developments that currently amount to an additional potential loss of 6,010 hectares (or 4.8%) of elite and prime land (Table 3). Furthermore, the Auckland Plan is based on a 1 million population increase by 2040, putting additional pressures on elite and prime land to accommodate future growth (AC 2012). These include the need for additional greenfield developments over and above what is already planned; these areas are noted as "Greenfield Areas for Investigation" in the plan's Development Strategy (AC 2012). While the majority of the projected 400,000 dwellings required to accommodate future growth will be found within the existing urban boundary through intensification, it is being proposed that these greenfield areas under investigation will accommodate up to 90,000 new dwellings over the next 30 years. In contrast to the opening up of greenfields in Auckland to accommodate future growth, Bibby (2009) reported that while it was being perceived that development was encroaching into rural settlements in Britain, the majority of development occurred within the urban limit, tending to be at the expense of recreational land. The loss of green spaces in urban areas has been reported to affect the overall levels of physical activity for the public as well as limiting the ability of the green space to reduce the heat island effect of cities (Keenleyside *et al.* 2009). In Britain, Bibby (2009) estimated that the conversion of greenfields to development was about 5,000 ha/yr with the majority of this land being developed for residential use.

In Auckland, Pukekohe has been identified as a potential satellite town to accommodate up to 50,000 dwellings, an area where the majority of Class 1 or elite land is located, a renowned powerhouse in terms of outdoor vegetable production (Coleman 1967; Fresh Facts 2011; Hunt 1959; Statistics NZ 2011). Various factors render Pukekohe a highly efficient production system including its highly fertile and well-structured soils (Molloy 1993), its unique and effectively frost free climate (Hunt 1959), the availability of irrigation water, the supply of labour and its proximity to a multitude of freight options.

The encroachment of urban growth into rural communities has been reported to potentially have 'reverse sensitivity' impacts and social consequences which can drive agricultural activity away (Berry and Plaut 1978). In order to accommodate urban neighbours in a rural community, farmers and growers can be faced with new problems which include regulation of routine farming activities such as time constraints when operating noisy machinery or restrictive pesticide or fertiliser use. Farmers will either adapt to these requirements or can retaliate and potentially sell out (Berry and Plaut 1978). Elite and prime agricultural land can also become vulnerable when farmers' or growers' progeny choose not to enter the business (Keenleyside *et al.* 2009) and the land is sold to local or central government or private developers. The benefits of the latter are often realised by the original farmland owners in European countries such as The Netherlands and Germany. In contrast, the selling of land is a far more profit-making process felt by the government and not the original farmland owner in China due to the weak farmland property rights of Chinese farmers and growers (Tan *et al.* 2009).

Currently the remaining elite and prime land occupied in land parcels in Auckland is not solely being used for intensive primary production purposes related to commercial gain. Andrew and Dymond (2012) reported that in Auckland 21% of lifestyle blocks are on high-class land which amounts to 35% of all high-class land in the region. Currently lifestyle blocks cover about 10% of the Auckland region and represent 64% of land parcels (AssureQuality 2012). In comparison, drystock and dairy farms cover 49% and 14% of the Auckland region, respectively, and account for 17% and 2%, respectively, of land parcels (AssureQuality 2012).

Andrew and Dymond (2012) also calculated that 4.1% of high-class land was lost to urbanisation in Auckland between 1990 and 2008. However, high-class land was defined as LUC Classes 1 and 2, and national datasets were used to assess urban growth (Andrew and Dymond 2012).

While the Resource Management Act (RMA 1991), the principle national legislation for environmental management in New Zealand, acknowledges the value of sustaining natural and physical resources, and highlights the importance of safe guarding the life supporting capacity of soil, it does not refer directly to the value of high-class or elite and prime land. The Auckland Council's Regional Policy Statement does refer to the value of elite and prime land but only Class 1 or elite land is protected from development (ACRPS 2008) whereby section 2.6.2.2 states that '*Extensions may be made to the metropolitan urban limits*' '*and to the limits of rural and coastal settlements from time to time, but only where (ix) Areas of elite land are avoided*' (ACRPS 2008).

However, hundreds of hectares of elite land have been lost to various development types throughout the Auckland region in recent years and future growth pressures indicate that this trend will continue. If stricter controls on the development of elite and prime land are not set, the future of Auckland's most elite and prime land is at risk of continually being the trade-off for future urban growth reducing options for crop growth and other primary production. Jiang *et al.* (2013) reported that in China urban expansion onto agricultural land resulted in a decline in agricultural land use intensity. This was particularly the case in southern provinces in China which identified the need to shift intensive cropping activity to land areas in northern provinces of lesser versatility, that could ultimately jeopardise their self-sufficiency in food supply (Jiang *et al.* 2013). Considering the extension of the RUB into rural greenfields in Auckland, it has never been timelier to assess the consequences of continued elite and prime land trade-offs to development, particularly its implications on current and future food security requirements.

Alongside future pressures confronting these provisioning soil services, regulatory (Blouin *et al.* 2013) and cultural services (Daniel *et al.* 2012) soil natural capital support such as rural character, recreation, storm protection and the filtering of pollutants also need to be acknowledged. For example, Vejre *et al.* (2010) report that intangible ecosystem services rival tangible services in some peri-urban areas around Copenhagen. The value of all soil ecosystem services needs to be considered by not only urban planners but by both policy and decision-makers in Auckland.

5.0 Conclusion

The population of Auckland is forecasted to increase from 1.5 to 2.5 million by 2040 putting immense pressures on the region's soil resources to accommodate future growth. We analysed that 10,399 (8.3%) hectares of elite and prime land has been lost to various development types in Auckland and future growth pressures indicate that the loss of this elite and prime land will continue to be the trade-off to accommodate future growth.

There is a real need to analyse the economic benefits and long-term sustainability of future development and the protection of elite and prime land for current and future production needs to provide prolonged benefits to the wider and future communities. Further research should account for the true cost of lost provisioning, regulatory and cultural services soil natural capital supports to ensure that these values are recognised and considered by not only urban planners but by both policy and, more importantly, decision-makers in Auckland. It has never been timelier to assess the consequences of continued elite and prime land trade-offs to development in Auckland, particularly its implications on current and future food security requirements.

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