A report on the Estimation of Unit Values of Land Occupied by Transportation Infrastructures in Canada

FINAL REPORT

Part of the fulfillment of
Transport Canada
Contract No. T8080-05-0191

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June 7, 2006

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Executive Summary

The goal of this project is:

> *to estimate the unit values (by square meter) of land occupied by the different transportation infrastructure in Canada in the framework of the Full-Cost Investigation of Transportation project*

To achieve this goal our team has developed an approach that meets and in many ways exceeds the RFP's requirements. It is considered a "mass" approach given that it is carried out across various spatial scales for all of Canada. It uses the best available data sources and applies a methodology that is suitable for use in most Canadian jurisdictions. This type of analysis can be quite challenging. Our team has worked to balance this complexity with the need to develop practical and defensible land value estimates that can be used for various types of transport infrastructure evaluation.

This study is part of a three-year project to investigate the full costs of transportation infrastructure, services and vehicles associated with the movement of people and goods in Canada, for use in economic analysis. This research can help improve transportation policy and planning by giving decision-makers more detailed and comprehensive information on the effects of options, including impacts that are often overlooked or undervalued because they are more difficult to quantify.

This project has three specific objectives.

Objective 1: Critical Evaluation of Available Evidence and Research

> Provide an up to date understanding of how land valuation has and should be applied for full cost accounting of transportation systems.

Objective 2: Development of the Land Valuation Methodology

> Develop a comprehensive and flexible land valuation tool that can be applied across modes and at various spatial scales.

Objective 3: Recommendation of Unit Value Estimates

> Based on the critical examination of Objective 1 and the valuation tools from Objective 2, develop specific, defensible recommended unit estimates of the value of land occupied by transportation infrastructure for use in the Full Cost Investigation project.

Our approach uses a GIS (Geographic Information Systems) framework. Three geographic categories were evaluated using somewhat different methodologies, due to differences in data resources and analysis requirements. A common theme in the methodology used is the recognition and incorporation of "distance decay" effects – generally one finds higher value lands in the core of cities or regions and the values decline as one moves away from that core. Different analysis methods were tested for each, and the best option selected, based on the availability of data, the scale of analysis, and other factors.

Group 1	Major Urban Areas (Census Metropolitan Areas or *CMAs*).
Group 2a	Non-CMA Urban (smaller urban areas)
Group 2b	Rural (all areas not considered urban)

The main sources of land value information employed included Census of Canada information, Farm Credit Canada information on agricultural land sales, the national MLS and ICX property listings, and other commercial vendor data sources. Spatial data included various Census geographic layers on which the study area units were based. These data were analyzed in four different ways to create four different unit land value estimates at the CMA scale (dollars per square metre), summarized below, ranked from simplest to most complex:

Estimate one: based entirely on the adjusted average dwelling values derived from Census of Canada data (assume all land is residential - w_r = 1).

Estimate two: based on the *average* proportions of the 3 main land use categories (residential, commercial, industrial) *in each CMA* (averaged across CT's), multiplied by the land use category specific land values in each CT (e.g. in Toronto the weights are: residential = 0.847, industrial = 0.116 and commercial = 0.037).

Estimate three: based on the *actual* proportions of the 3 land use categories *in each CT*, multiplied by the land use category specific land value in each CT.

Estimate four: based on defined infrastructure specific proportions of the 3 land use categories multiplied by the CT's land use specific value of land estimates.

These four estimates vary in the original source of land valuation data, the land use categories considered, the geographic scale at which different land use category values are averaged, and whether unit values are adjusted for different types of transportation infrastructure to reflect the degree to which the infrastructure affects land use patterns (for example, commercial and industrial land uses concentrating along arterials, ports and airports).

Group 2a was analyzed using a similar set of estimation approaches, although the lack of spatial detail within these smaller centres, made the calculation of Estimates 2 and 3 infeasible. Group 2b was analyzed using a much more straightforward method, being driven largely by the more reliable estimates of agricultural land values developed for this study.

Table 1 summarizes the four approaches to estimating unit land values for the CMAs. In a sense, Estimate 4 is the reverse of the 3 other estimates – In estimate 4, it is the infrastructure type that drives the estimation. In Estimates 1 through 3, it is the characteristics of the Census Tract – land values and mix of uses – that drive the estimate.

Table 1: Estimate Approach Comparison

	Estimate Characteristics			
Estimate	**Land Value Data**	**Based On Land Values for**	**Employ Land Use Data area Calculations**	**Vary Across Infrastructure Types**
One	Statistics Canada	Residential	No	No
Two	Statistics Canada, ICX sampling, Industry Reports	All 3 land uses	In Aggregate	No
Three	Statistics Canada, ICX sampling, Industry Reports	All 3 land uses	Yes	No
Four	Statistics Canada, ICX sampling, Industry Reports	All 3 land uses	No	Yes

This table summarizes the four analysis methodologies to estimating unit land values.

A similar analysis framework with four similar estimate options was created for geographic Group 2a and Group 2b, reflecting differences in data resource availability and analysis requirements. These options were evaluated in terms of feasibility and accuracy, and a recommended methodology identified, as summarized in Table 2.

Table 2 Summary of Recommendations

Geographic Scale	Recommendations With Current Data Resources	Recommendations For Improving Data Resources
CMA	Estimate Method 3	Collect more data on non-residential property values, and land use mix adjacent to transport facilities to allow application of Method 4.
Non-CMA Urban	Estimate Method 1	Collect additional data to allow application of Estimate Method 3
Rural	Estimate Method A	Collect more information on forest land values to allow application of Estimate Method B

This table summarizes the method recommended for use in various geographic areas, and ways to improve their accuracy.

This study indicates that data are available for calculating transportation infrastructure land values in all parts of Canada, with the ability to perform more detailed analysis in urban areas due to greater data availability (more information available in smaller spatial units). This type of analysis requires thoughtful balancing of factors such as data availability, data accuracy, spatial scale, and project costs, as well as assumptions about the value of a particular location and the degree to which lower-value urban-fringe land can substitute for higher value land in urban centers. Although there is still a degree of variability and uncertainty, the analysis methods we've identified provide values which appear to be consistent with economic theory and accurately reflect real world conditions. We therefore believe that the results can be applied with confidence to a wide range of applications.

The GIS based analysis is flexible and will allow for the exploration of modified estimation approaches with a modest amount of effort. Inputs, weightings, and other factors can be easily adjusted in each framework to test different assumptions and conditions. Should more reliable data sources be obtained, they would be easily incorporated into this framework.

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1.0 Introduction

The primary goal of this project as stated in the RFP is:

> *to estimate the unit values (by square meter) of land occupied by the different transportation infrastructure in Canada in the framework of the Full-Cost Investigation of Transportation project*

To achieve this goal our team has developed an approach that meets and in many ways exceeds the RFP's requirements. It is considered a "mass" approach given that it is carried out across various spatial scales for all of Canada. It uses the best available data sources and applies a methodology that is suitable for use in most Canadian jurisdictions. Valuing land is a complex and dynamic challenge, which requires special considerations under both urban and regional conditions. Our team has worked to balance this complexity with the need to develop practical and defensible land value estimates that can be used for various types of transport infrastructure evaluation.

1.1 Project Context

This study is part of a three-year project to investigate the full costs of transportation infrastructure, services and vehicles associated with the movement of people and goods in Canada, for use in economic analysis (Transport Canada, 2003). This type of research has been performed by transportation economists in several other jurisdictions, including the U.S. (Delicchi, 1996; Murphy and Delucchi, 1998; Litman, 2006), Europe (Dings, et al., 2003; European Pricing Initiatives), and New Zealand (Booz Allen, 2005), as well as individual metropolitan regions (KPMG, 1993: Anderson and McCullough, 2000).

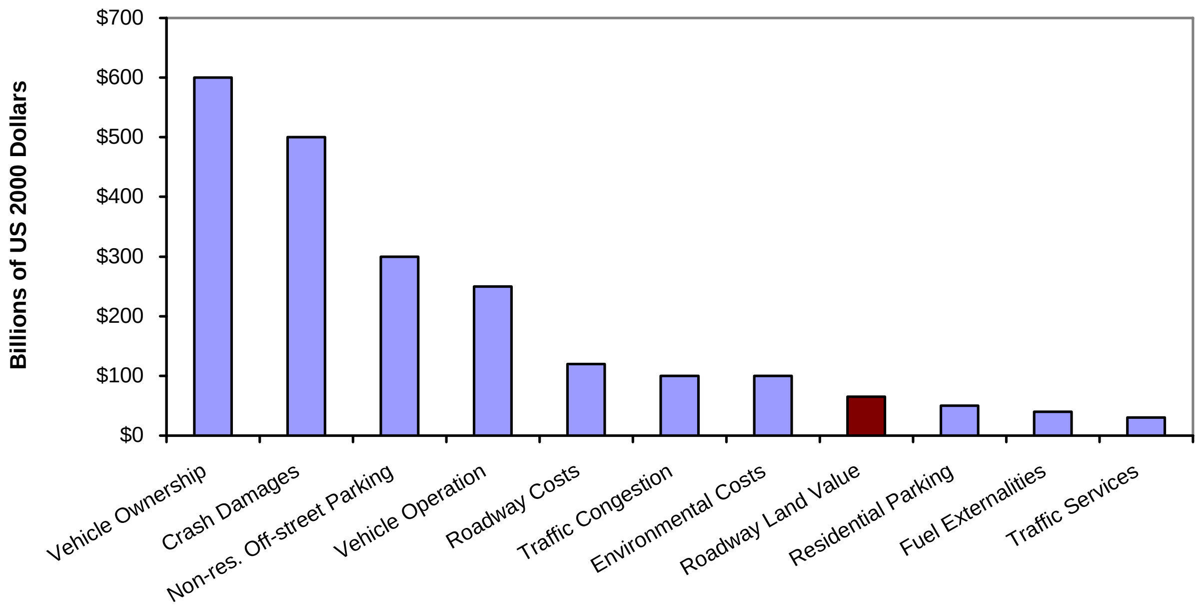
This research can help improve transportation policy and planning by giving decision-makers more detailed and comprehensive information on the effects of options, including impacts that are often overlooked or undervalued because they are more difficult to quantify (Greene, Jones and Delucchi, 1997). Just as a consumer wants comprehensive information about a vehicle they are considering purchasing, including factors such as operating costs, safety, comfort and reliability, communities want comprehensive information about transport policy and planning options.

There is sometimes confusion about this type of research, because it usually begins with *cost* analysis, and so people may wonder if it ignores the equally important *benefits* of transportation. But benefits and costs often have a mirror image relationship: a reduction in costs represents an increase in benefits, and an increase in benefits represents a reduction in costs. For example, mobility improvement benefits are generally measured in terms of reduction in congestion delay or travel time costs, and improved traffic safety is generally measured in terms of reduced crash costs. Unit costs (dollars per hour of travel time, or dollars per vehicle-mile) therefore become the basis for measuring benefits.

Transportation economists have long tried to quantify and monetize (measure in monetary units) various types of transportation costs, including facility construction and operating costs, vehicle operating costs, the marginal costs of various transport services, congestion delay, and values for travel time and accident risks. Methods for quantifying such costs were well established by the 1980s, including the development of various computer models (FHWA, 1997). More recently, efforts have been made to quantify additional cost categories, including environmental and social impacts (Delucchi, 1996; Litman, 2006).

The valuation of transportation facility land is an important component of these efforts to develop more comprehensive analysis of transportation economic impacts. Most comprehensive transportation cost studies indicate that transportation facility land value is a moderate size cost (Delucchi, 1996; Litman, 2006). However, except when it must be acquired, transportation facility land is often considered a sunk cost and ignored in economic analysis; it is generally not included in transportation agency financial accounts and facility users are generally not required to pay rent or property taxes for its use, based on conventional treatment of land in public ownership.

Figure 1 **Estimated Magnitude of Transportation Costs** ("Transportation Costs," VTPI, 2006)



This figure illustrates the estimated magnitude of various categories of roadway transportation costs in the U.S. Roadway land value is moderate in magnitude, estimated to equal about half the value of roadway system itself. Put differently, incorporating the opportunity value of roadway land would increase roadway facility cost estimates by about 50%.

However, most economists would agree that land used for transportation facilities has an opportunity cost, and its value should be considered in economic analysis (Anas, Arnott and Small, 1997). Failing to consider the full value of transportation land can result in oversupply of space-intensive transportation facilities, and underinvestment in more space efficient modes and management strategies that result in more efficient use of existing transportation facilities. Described differently, failing to consider transportation facility land values ignores the potential benefits of strategies that reduce transportation land requirements, such as roadway designs, traffic management and alternative modes that are relatively space efficient. Considering transportation facility land value can therefore support innovations that reduce transport land requirements. This is particularly true in urban areas where the opportunity cost of land is high and the value of land is significantly affected by the accessibility of its location (Lee, 1992; Vickrey, 1997).

Although at a national level Canada has among the lowest population densities of all countries on earth, the majority of the Canadian population resides in urban areas where land values are rising, and most travel activity is concentrated on major urban corridors. These corridors are experiencing growing traffic congestion. As a result, many current transportation policy and planning decisions involve trade-offs related to the amount of potentially high-value land to be used for transportation facilities.

1.2 Objectives

Objective 1: Critical Evaluation of Available Evidence and Research

Provide an up to date understanding of how land valuation has and should be applied for full cost accounting of transportation systems. Evaluate theoretical and practical research to provide justification and support for the methods developed in this project, and for future components of the overall Full Cost Investigation project.

Objective 2: Development of the Land Valuation Methodology

Developed a comprehensive and flexible land valuation tool that can be applied across modes and at various spatial scales. This involved evaluating various possible methodologies for calculating unit values for land occupied by transportation infrastructures, and selecting the approach that is most suitable for use in the Canadian context.

Objective 3: Recommendation of Unit Value Estimates

Based on the critical examination of Objective 1 and the valuation tools from Objective 2, we developed specific, defensible recommended unit estimates of the value of land occupied by transportation infrastructure for use in the Full Cost Investigation project.

1.3 State of Practice: A Synthesis of Approaches to Land Valuation

Several previous studies have estimated the value of land used for transportation facilities (KPMG, 1993; Lee, 1995; Delucchi, 1996; TERM, 2000; TeleCommUnity, 2002; Litman, 2005; Litman, 2006). This generally involves two steps: first, quantify the amount of land devoted to such facilities in units such as square metres or acres, and second, establish unit costs for such land, such as dollars per square metre or acre. Such studies often disaggregate the facilities by type (local streets, arterials, highway, rail line, airport, etc.) and geographic area. Some studies simply categorize land into *urban* and *rural* categories, but others use smaller geographic areas, such as census tracts. Generally, the smaller the analysis areas the more accurate the cost values can be.

With new, Geographic Information Systems (GIS) which incorporate various types of databases, such as land use maps, census data and land assessments, it is increasingly possible to measure the amount of land used for transportation facilities and determine the location of each parcel with a high degree of detail. The greatest challenge for this type of analysis tends to be assigning an appropriate monetary value to each parcel which accurately reflects its opportunity cost, that is, the incremental value to society that could be gained if that unit of land were available for other productive uses. Conceptual and practical issues involved in this are discussed below.

Theoretical Issues

Virtually any piece of land has multiple potential uses, both for human activities such as buildings, recreational facilities and farming, and for natural activities such as wildlife habitat and watersheds. Using land for one activity often reduces its ability to serve other uses. This is particularly true for land used for transportation facilities (roads, parking facilities, airports and ports), which tend to be paved and occupied by disruptive activities that emit noise, air and water pollution. Devoting land to transportation facilities therefore has an opportunity cost in terms of other beneficial activities that are displaced.

Described differently, marginal reductions in the amount of land devoted to transportation facilities usually provide benefits by allowing that land to be used for other productive activities. The magnitude of these benefits tends to vary depending on location. For example, reducing transportation land consumption in growing city centers, where land costs millions of dollars per hectare, can provide greater economic benefits than an equal reduction in transportation facility land in a rangeland area where land costs thousands of dollars a hectare. Although transportation facilities only occupy a small portion of total national land area, some of this land has a high value because these facilities provide access to destinations where land costs are high, for example, in urban centers and along shorelines.

However, the value of transportation facility land can be difficult to determine, since such facilities provide *accessibility* (they allow people to reach destinations) and so tend to increase adjacent property values. It could therefore be argued that transportation land provides a benefit rather than a cost. It is true that access tends to increase property values, but there would still be productivity gains and benefits to society if less land were required to provide a given amount of accessibility, for example, by using overhead highways, underground railways, and structured rather than surface parking facilities. As a result, the value of accessibility does not eliminate the opportunity costs of devoting land to transportation facilities, or the benefits that could result from marginal reductions in transportation facility land requirements.

A common practice is to assess transportation facility land based on the values of adjacent properties (called "across the fence," values, as described in Recommendation 13.4 of the Canadian Transportation Act Review). However, this can be technically challenging due to the wide variety of land uses that are often adjacent to transportation infrastructure. For example, an arterial road may have adjacent lands that range from high priced high-rises to abandoned buildings. Similarly, a port or airport may abut high value land on one side and low value land on another. Some adjacent lands, such as parks, may never have been assessed.
Another technical challenge is that transportation facility land valuation should generally reflect the value of raw land, without buildings, services and other infrastructure, but most transactions used for property valuation involve developed land with buildings and other improvements.

Another factor that complicates the valuation of urban land is that marginal increases in land consumption can be offset by expanding the urban area. For example, if the portion of land devoted to roads and parking facilities increases from 10% to 20% of an urban area, a city that would otherwise be 1,000 hectares could simply expand to 1,100 hectares, so its net land area stays constant. The opportunity cost is therefore the value of urban fringe land rather than urban center land.

However, there are reasons that urban fringe cannot be considered a perfect substitute for urban center land. The first reason is that cities provide efficiencies of accessibility and agglomeration which are reduced with urban expansion. A basic concept in urban economics is that urban centers, such as towns and cities, arise because some activities have "agglomeration economies" that benefit from locating close together. This explains the historical development of cities around marketplaces that serve a surrounding region. As cities developed further, commercial activities with the greatest agglomeration economies dominated the urban center, which became the area of highest land value. That single concept underlies a progression of increasingly mathematical theories of the urban location patterns of activities, starting with *Location Theory* (Van Thunen, 1826), and followed by *Central Place Theory* (Christaller, 1933), *Concentric Ring Theory* (Burgess, 1924), Regional Science Theory (Isard, 1956) and the *New Economic Geography* (Krugman, 1991). These various theories also explain why both density of activities and land values tend to fall with distance from city centers.

Transportation access became an underlying basis for explaining the observed relationship between urban land values and distances from city centers, with the advent of "bid-rent theory" among economists (Alonso, 1964; Muth, 1969; Mills, 1972). This explains how land values rise with proximity to city centers because central locations minimize transportation costs for serving a broader region, and firms that profit most from those access benefits will also be willing to pay more for locating there. (It is referred in the urban economic literature as "bid-rent theory" – since land values near city centers are bid up higher to reflect advantages that are called location rents.) This theory also helps explain why cities originally developed with monocentric patterns of density and land value, rather than with polycentric centers as would occur if only agglomeration economies (and not access) mattered.

In other words, businesses tend to locate in city centers because of access and agglomeration economies, and those advantages are reflected by the higher land values that are bid up by greater demand for location at or near city centers. Bid-rent theory also explains why different types of land uses (residential, industrial and commercial) gravitate to different parts of cities (see Wheaton, 1979).

The advent of integrated land use and transportation models makes it possible to better relate land values to transportation access. These models show that improved transportation access can flatten the slope of “bid-rent” gradients that relate property values to distance from the city center. For example, rail or highway facilities can give a location that is 10 km from the city center the same travel time to the city center as a location elsewhere that is only 5 km away from the center (Putman, 1983). Other studies observed that larger cities also tend to have flatter bid-rent gradients, presumably because of their greater transportation infrastructure.

In recent times, there has been a growth of satellite activity centers and “edge cities” which are making some metropolitan regions become more multi-nucleated (they have multiple commercial centers). While these sub-centers are seldom as large as the central business district, they do lead to localized spikes in land values and they can also make the “center of gravity” of land values and population distant from the traditional city center (Waddell, 1993; Bertraud, 2004).

While property values vary systematically with access from the city center, the pre-existing location of transportation facilities can significantly skew that relationship. For instance, both rail lines and highways occur along corridors with a transportation spine, so land value gradients can reflect access to those spines. This relationship may be continuous (for areas served by open access roads), or they may be discontinuous and peaked (for highway with access limited to interchanges, or rail service with access limited to station locations). The role of major transportation corridors also helps explain the tendency of some commercial and industrial activities to be concentrated along radial sectors or corridors of an urban area that correspond to major commercial arteries or industrial-serving rail or truck routes (Hoyt, 1939; Struyk, 1975; Lockwood, 1996).

Yet, while transportation facilities often enhance land value by improving accessibility, they can also disrupt land use. For instance, expanding roads and parking lots in an urban core where land is scare can serve to disperse some activities and reduce the efficiencies of agglomeration in the urban core. Traffic congestion can also reduce transportation advantages of urban centers and drive some businesses to relocate in more peripheral areas.

There are also external factors affecting land values that reflect the interaction of transportation facilities with land use. For instance, residential land values tend to rise with proximity to green spaces, lakes and other amenities. They tend to fall with proximity to industrial zones, and they also tend to be lower on the eastern part of most North American cities because older industrial zones tended to develop on the downwind side of cities in earlier centuries. Differences in schools, crime and other factors also interact with transportation proximity (Weisbrod, 1980; Dokmeci, 2003).

Some experts have argued that automobile transportation and improved telecommunications had eliminated the accessibility advantages of urban location and the resulting economies of agglomeration, allowing any economic activity to locate nearly anywhere within an urban region, including at the urban fringe (preferably near a major highway intersection). However, recent experience suggests that this is untrue, that many activities require frequent physical interactions among diverse people and equipment which is facilitated by proximity, particularly within a walkable area. For example, certain types of economic and creative activities tend to be most productive if located in a major activity center such as a downtown or campus. Ironically, even computer software and related industries, which are highly dependent on electronic communications and so could theoretically locate anywhere on the earth, still depend heavily on physical interaction, and so tend to flourish in dense urban centers.

Another reason that cheaper urban fringe land does not necessarily substitute for higher cost urban center land is that many jurisdictions cannot expand due to physical or political barriers, so from their perspective each hectare of land devoted to transportation facilities represents one less hectare available for total productive uses in that area.

For these reasons, higher density land at or near an urban core is nearly always worth more than an equal unit of urban fringe land, and the value of land in between those locations tends to be strongly correlated with travel time and distance from the city center. Similar relationships occur at many geographic scales and in response to many types of land use. For example, there may be bid-rent curves around neighborhood shopping centers and activity centers such as a university campus or transit station, resulting in variations in accessibility, land use mix and land values within a given distance band.

In addition to the direct economic benefits that a particular parcel of land provides to its owners, many land uses provide indirect, external benefits. Biologically active areas such as wetlands, forests, farms, rangelands, gardens, and parks (collectively called *greenspace*) in particular provide external environmental and social benefits, including wildlife habitat, air and water regeneration, social benefits of agricultural production and aesthetic benefits. These external benefits exist in addition to direct benefits to the landowner and are not reflected in the land's market value because they are enjoyed by society as a whole. These benefits are reflected by increased value to adjacent real estate, improved local water quality, recreation and tourism, and in existence, option, and bequest values.

The table below summarizes the various categories of impacts that transportation facilities can have on land values.

Table 1: Transportation Land Values

Category	Definition	Quantification
Opportunity cost of land	Potential benefits from alternative uses of that parcel of land.	Similar to the value of comparable land nearby.
Accessibility benefits	External benefit from improved accessibility.	Increased value of land located adjacent or near transportation facilities.
Agglomeration benefits	Value of more compact development, which is lost as the portion of urban land devoted to transportation facilities increases.	Urban economic analysis of the value of urban agglomeration and central location.
External impacts (gained or lost)	Value to society of environmental services provided by land which is lost when used for transportation facilities (particularly when paved).	Various methods used to calculate the external value of environmental services that could be provided if less land were devoted to transportation facilities.

This table summarizes various categories of impacts that transportation facilities can have on land values, including both positive and negative effects. This study focuses on the first impact category, the opportunity cost of transportation facility land.

Previous Research

Several previous studies have estimated the value of land devoted to transportation facilities, particularly road rights of way. Delucchi (1998) estimates that U.S. roadway land value (roadbed and shoulder area) totaled $218 billion in 1991, as indicated in the table below. This represents an annualized value of $17.5 billion (using an 8% discount rate).

Table 2: Estimated U.S. Roadway Land Value in 1991 (Delucchi, 1996)

	Road Area (mi^2)		**Extra ROW Factor**		**Price of Land** ($/acre)		**Value of Land** (1991$$10^9$)		**Totals**
Urban	**P**	**UP**	**P**	**UP**	**P**	**UP**	**P**	**UP**	**P & UP**
Interstate Freeway	231	0	1.2	1.2	$50,000	$35,000	$7.4	$0.0	$7.4
Other Freeway	124	0	1.2	1.2	$50,000	$35,000	$3.9	$0.0	$3.9
Principal Arterial	532	0	1.2	1.2	$50,000	$35,000	$17.0	$0.0	$17.0
Minor Arterial	546	3	1.2	1.2	$55,000	$38,500	$19.2	$0.1	$19.3
Collector	458	5	1.2	1.2	$65,000	$45,500	$19.1	$0.1	$19.2
Local Road	2,573	179	1.2	1.2	$70,000	$49,000	$115.3	$5.6	$120.9
Subtotal Urban	*4,463*	*187*	*Na*	*Na*	*na*	*na*	$*181.9*	$*5.8*	$*187.7*
Rural	**P**	**UP**	**P**	**UP**	**P**	**UP**	**P**	**UP**	
Interstate Freeway	533	0	1.25	1.25	$5,000	$600	$1.7	$0.0	$1.7
Other Freeway	971	0	1.25	1.25	$5,000	$600	$3.1	$0.0	$3.1
Principal Arterial	1,058	0	1.25	1.25	$5,000	$600	$3.4	$0.0	$3.4
Minor Arterial	2,355	292	1.25	1.25	$5,000	$600	$7.5	$0.1	$7.6
Collector	932	464	1.25	1.25	$5,000	$600	$3.0	$0.2	$3.2
Local Road	2,865	5,674	1.25	1.25	$5,000	$600	$9.2	$2.2	$11.4
Subtotal Rural	*8,715*	*6,430*	Na	na	na	na	*$27.9*	*$2.5*	*$30.4*
Urban + Rural	***13,178***	***6,617***	***na***	***na***	***na***	***Na***	***$209.8***	***$8.3***	***$218.1***

P = Paved, UP = Unpaved, Na = not applicable

The accounting firm KPMG (1993) calculated the value of road land dedicated to motor vehicle use in the Vancouver area to be worth $578 million a year when amortized at 10%. Lee (1995) applied prototypical land acquisition cost values developed by the U.S. Federal Highway Administration to the U.S. road system to estimate total land value and calculate annual interest forgone to be $75 billion ($87 billion in 2001 dollars).

The New Zealand Ministry of Transport estimated the annualized value of "recoverable" road system capital assets (i.e., the value of land and related property) at $750 million (with a range of $300 million to $980 million), which is about the same as total annual roadway maintenance expenditures, and the value of "non-recoverable" assets (i.e., sunk costs associated with building roads is estimated at $1,860 million (Booz Allen Hamilton, 2005).

TeleCommUnity (2002) estimated that U.S. roadway rights-of-way total 22,437 square miles, with a value of $3,565 billion, or up to $10.9 trillion using a *comparable transaction valuation* methodology. Using U.S. federal data they estimate that the entire roadway system has a present value of $4,676 billion, of which $3,565 billion (76%) is land value and $1,110 billion (24%) is for improvements. Using a different valuation methodology they estimate that entire value of the nation's rights of way for a single year produces an annual rental value range between $305 and $366 billion. Assuming normal sales prices for real estate are based on 30 times annual lease payments, comparable rates for the rights-of-way ranges between $9,153 and $10,984 billion. They comment, "…the cost of acquiring a right-of-way corridor necessarily is more expensive than simply the ATF (Across the Fence) value of the abutting land. Applying the lowest corridor enhancement factor now employed by appraisers suggests the value is $7.1 Trillion. These results are consistent and conservative when measured against comparable transactions reported by federal government agencies."

Methodological Considerations

Building on the earlier theoretical discussion, we now consider more practical aspects of valuing land devoted to transportation facilities using real estate and property assessment data and methods.

Antonides (2001) describes various property appraisal methods suitable for valuing rail rights of way. The challenge, similar to this project, involves attempting to set the value of an abandoned (or slated to be abandoned) rail corridor. The method of “across the fence” (ATF) valuation receives considerable attention, with variations on the basic idea of setting the value of the corridor based on adjacent properties explored. The variations of ATF include a factor to enhance the value based on an argument that replacing a corridor would be even more costly (according to Antonides, some jurisdictions use 2 to 6 times the across the fence value to account for this factor). According to the author, one of the major challenges in applying this approach is the requirement to collect detailed and consistent property information.

Another challenge is establishing the value of undeveloped (“raw”) land. Undeveloped land sales are relatively common on the periphery or urban fringe, but are less frequent in more built or established areas. It is therefore necessary to estimate the portion of the value of developed parcels represented by the undeveloped land. Davis and Heathcote (2004) draw a number of relevant conclusions in their study of residential land values. For example their empirical analysis suggests that typically 47% of the dollar value of a residential home in the older part of cities reflects the value of land, whereas this figure is only 11% in more recently developed urban fringe locations. They further contend that regions across the U.S. respond differently to changes in market factors such as interest rates, reflecting historical land values and related development practices. In the Canadian context, a good example of this regional variation would be the difference between how Vancouver and Saskatoon respond to changes in macro-economic conditions and the housing market.

Researchers have long recognized that property values follow certain predictable patterns as one moves from the city core to the periphery. These “bid-rent” curves typically reflect the additional value placed on locations closer to the core, with different land use categories exhibiting different patterns. Rodrigue (1996) employs a series of concentric rings in his spatial exploration of land value relationships in the city of Shanghai, China. He employs a 1 km circle to represent the core area and then uses 10 three-kilometer wide bands to reflect zones moving out from the core. However, his justification for the use of this particular size is not detailed. Miller et al. (2004) explore housing and distance relationships in the GTA (Greater Toronto Area) and find a distinct trend of decreasing land values as one moves away from the CBD (central business district).

2.0 Methodology: Presentation and Discussion

In brief, our approach is built on a GIS (Geographic Information Systems – employing ESRI’s ArgGIS 9 software) framework which allows us to 1) select a representative sample of locations within appropriate land categories in each province: (e.g. rural vs. urban); 2) determine the relevant property mix (or land use type) on which to base our unit land value estimates; and 3) calculate unit value estimates (per sq. metre) for functional classes of infrastructure. The details of the overall approach are described in more detail in the following steps.

Spatial Scale and Frame of Reference

For each of the modal categories (road, airports, marine ports and rail), unit value estimates are developed for the specified types of transportation infrastructure (functional road classes, rail lines and terminal facilities, airports and marine ports) in a hierarchical fashion as follows:

Group 1	Major Urban Areas (Census Metropolitan Areas, CMAs). There are 27 in Canada.	
Group 2a	Provincial Level –	non-CMA Urban (smaller urban areas)
Group 2b	Provincial Level –	Rural

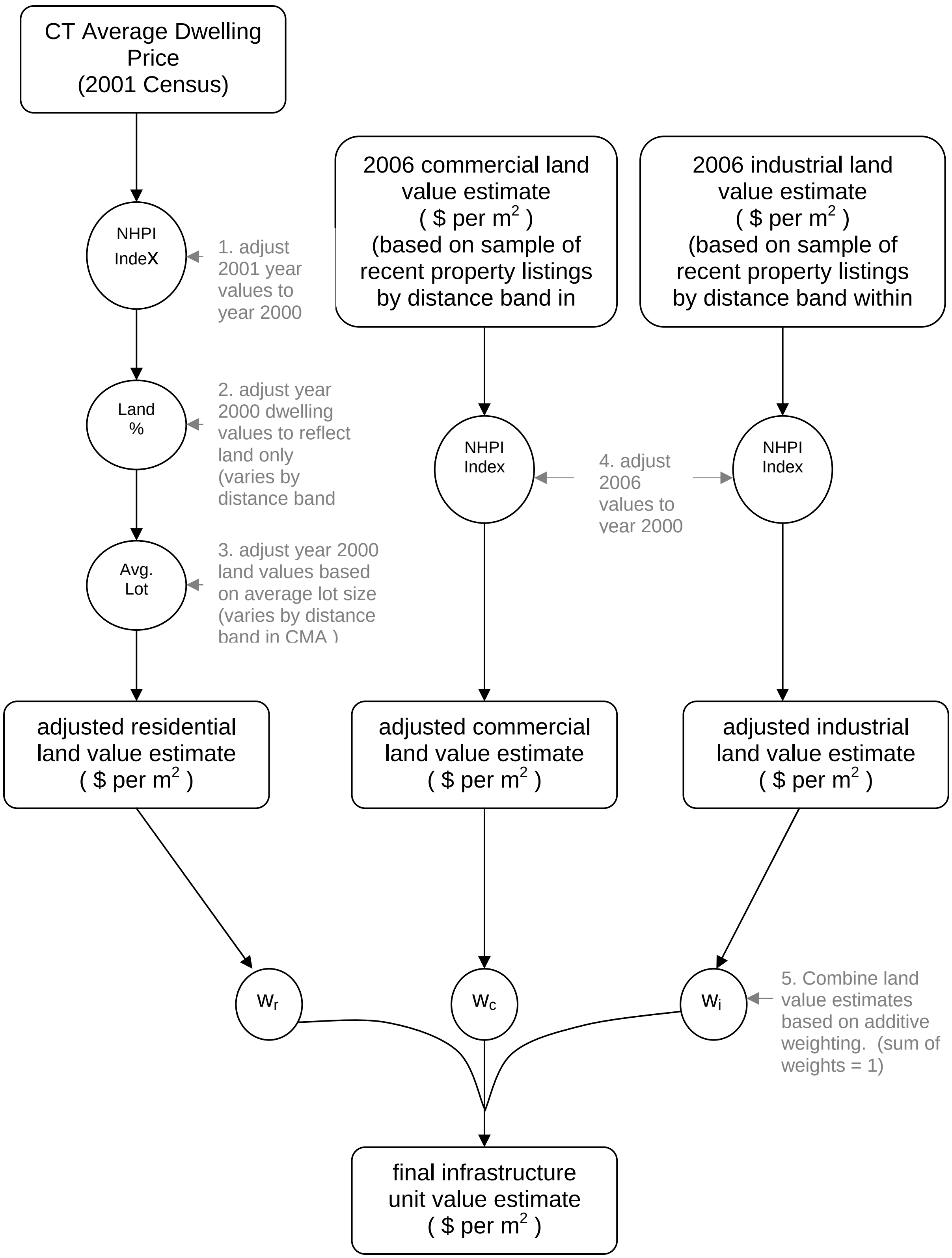
2.1 Establishing Unit Value Estimates for Group 1: Major Urban Areas (CMA's)

Figure 2 provides a schematic which is referred to in this description of our approach to establishing unit land value estimates for CMA transportation infrastructure. Analysis is performed at the Census Tract (CT) scale. Unit value estimates (i.e., value per square metre) are provided for each infrastructure type in each CT. Figure 2 is intentionally generic; this methodology is applied to each CMA, with modifications in some cases as noted. (e.g. the size of distance bands).

1. Starting at the top left text box, the Initial land value estimates in CMA's are based on the variable " average dwelling value" reported for 2001 Census of Canada (by census tract, labeled "CT").

.

Figure 2: CMA Unit Land Value Estimation Flow Chart



At point 1, the initial 2001 dwelling values are adjusted down to year 2000 dollars using Statistics Canada's National Housing Price Index (NHPI), based on mid-year (July) values. For example, NHPI values for 2001 to 2000 July for Canada are 107.2 and 104.1 respectively, which translates into year 2000 values being 97% of 2001 year values. A complete table of adjustments is provided in Appendix D (Table D-1).

At point 2, the 2000 average dwelling values are adjusted further to isolate the "land value" component. Ratios of housing value to total dwelling value (including land) from Statistics Canada's New Housing Index are used to isolate land value: Table 3 presents an example:

Table 3: NHPI Ratios of House Value To Total Value (Selected Cities)

	Ratio of House Value to Total Dwelling Price (including land portion)						
	1999	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**
CANADA AVG.	**74.644**	**74.988**	**75.082**	**75.205**	**75.777**	**76.150**	**75.482**
VANCOUVER	61.338	62.384	64.829	65.611	68.079	71.691	66.813
SAINT JOHN	83.183	83.098	84.188	84.097	84.374	84.600	84.242
OTTAWA-HULL	80.035	80.191	80.207	81.139	81.460	81.169	81.041
KITCHENER-WATERLOO	72.162	73.852	72.792	73.079	74.258	73.565	72.186
SASKATOON	77.928	77.415	75.916	76.151	76.974	77.358	78.217
TORONTO	64.438	64.969	66.856	68.375	69.144	67.716	63.972

Source: Statistics Canada

This table shows the estimated portion of total residential property values that consist of "improvements" (buildings). This is used to calculate the portion of assessed value that consists of raw land.

The values in Table 3 illustrate that these ratios a) are relatively stable over time and b) vary considerably from market to market. Centres like Toronto and Vancouver exhibit lower ratios, indicating that land values are typically higher and represent a greater share of total housing costs than in less urbanized markets like Saint John.

The NHPI is based on a relatively small sample during any one year, and is directed at the "new housing" market, which is typically under development on the fringes of urban centres and so is not necessarily representative of total land values. As a result, it is more suitable for tracking price changes then establishing actual price values

Despite these limitations, the house/land ratios provide an important contribution to the land valuation methodology by helping to separate raw land values from total building assessment values. Table 4 presents the distance band categories for the Toronto CMA with the land value proportion figures. The NHPI based ratio from Table 3 is used to establish the "fringe" proportion (bolded value 0.35). If the ratios in this table represent the proportion of house to total, then 1 minus these values would provide the proportion of total value devoted to the land component. The other bolded value, 0.5, represents an assumed proportion for core residential areas, which is based on estimates from the urban economics literature of the higher range of land as a portion of total property values, as occurs in major urban centers.

Table 4: Distance Bands and Land Proportion Values

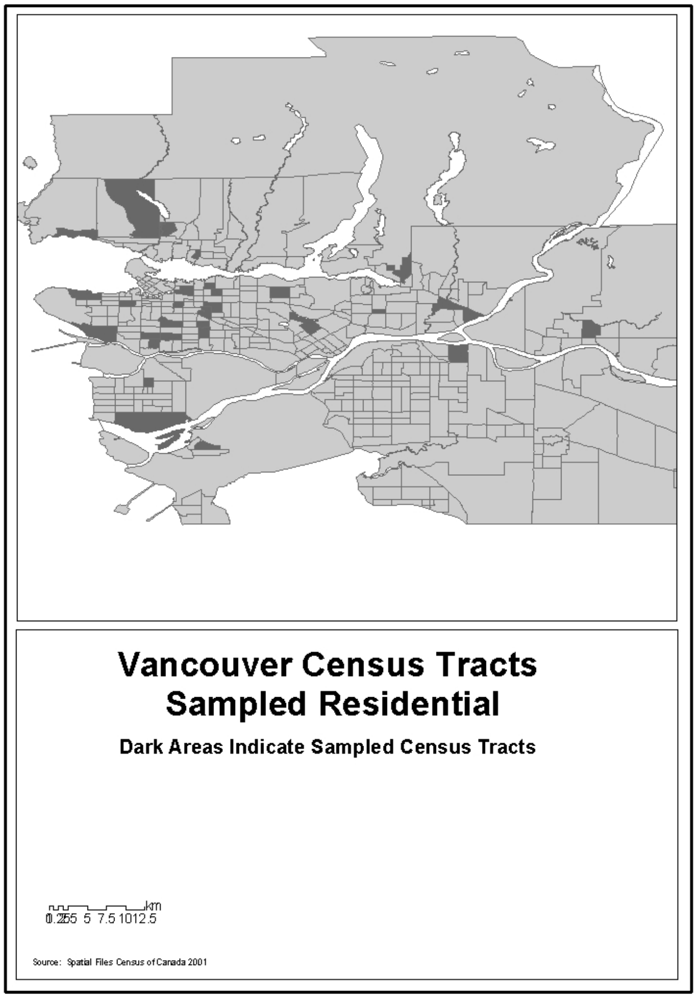
Distband (Distance Band) Number	Distance from core in Km	Land proportion of Average Dwelling Price
1	2	**0.50**
2	4	0.49
3	6	0.48
4	8	0.47
5	10	0.46
6	12	0.45
7	14	0.44
8	16	0.43
9	18	0.41
10	20	0.40
11	24	0.39
12	28	0.38
13	32	0.37
14	36	0.36
15	40	**0.35**
16	46	0.35
17	52	0.35
18	58	0.35
19	64	0.35
20	70	0.35
21	>70	0.35

This table indicates the ratios used to calculate the portion of total property assessment values that consist of raw land values.

The land proportion values in the distance bands between the core and fringe are calculated with a linear interpolation that considers the distance and the difference between 0.35 and 0.5 (for this city) – in effect spreading the difference consistently as you move from core to fringe. This reflects the generally accepted assumption that the portion of total property values consisting of land declines as one moves from the core to fringe. Attempts to validate these figures with actual property sale data (e.g. comparing neighbourhood housing sale prices to vacant residential lot prices) are difficult due to the small number of vacant residential lot transactions occurring in any single zone, particularly in more central, built-up areas. In Table 4, the decision on which distance band should be considered fringe (in this case beginning at 15), is a function of where the newer areas are in each CMA. In part, this can be determined from the land use spatial layers as well as assumptions about fringes of city being zones, rather than linear features.

At point 3 in Figure 2, the 2000 isolated land values are adjusted using a standard lot size to establish a per m^2 value of residential land for each CT. The variability in lot sizes across a city is quite high, influenced by factors such as type of housing, age of development, terrain, and proximity to major land use elements. The average lot size variable used in this process is established based on sampling from the Canadian Real Estate Board’s MLS listing service carried out for each CMA (sampling details provided in Appendix D – Table D-2). A stratified sample from zones within each distance band has been carried out in each CMA: an example is illustrated below in Figure 3. An effort was made to sample a minimum of 10 properties in each location, choosing "single family dwelling" as the housing type (details of the sampling are provided in Appendix D). In Vancouver, for example, over 300 properties were sampled for lot size information. The CT's with lot size averages in each distance band were further summarized to provide a "distance band" specific average lot size.

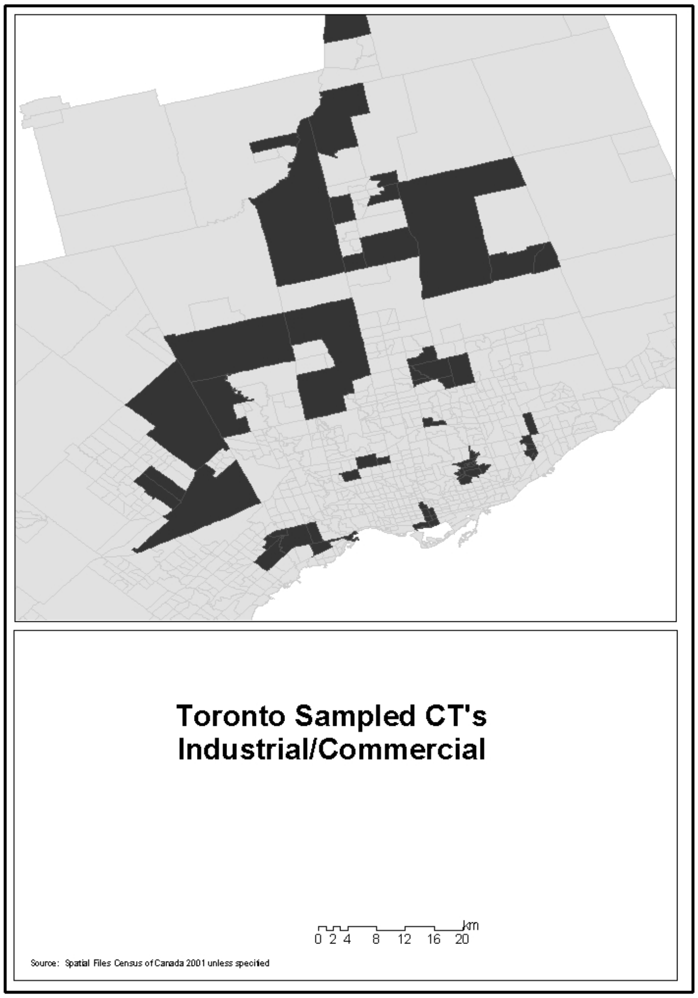
Figure 3: Sampled Residential CT's: Vancouver



This figure illustrates Vancouver area Census Tracts (CTs) where residential property values and size were sampled. Similar sampling was performed in other cities.

Returning to the top of the Figure 2, the right two text boxes describe the starting point of incorporating industrial and commercial land values. The commercial real estate listing arm of the MLS service, ICX (www.icx.ca) is used to sample both industrial and commercial vacant land values in respective CMA's (typically reported in, or easily adjusted to per m^2 values). Again, the distance bands are used to stratify the sampling across the CMA. This sampled information is supplemented by a number of other sources of land value information. In part, this decision is driven by the sparseness of the ICX data base for "vacant land". Published reports by commercial firms such as CB Richard Ellis and Colliers International are used to provide further insights on land values. Finally, in the Ontario market, a historical/active database of industrial commercial property sales is used as a richer source of sample information (RealTrack Inc., 2006). Unfortunately, this better quality data source was not available for use in other jurisdictions.

Figure 4: Sampled Industrial CT's, Toronto CMA



This figure illustrates Toronto area Census Tracts (CTs) where commercial and industrial property values and size were sampled. Similar sampling was performed in other cities.

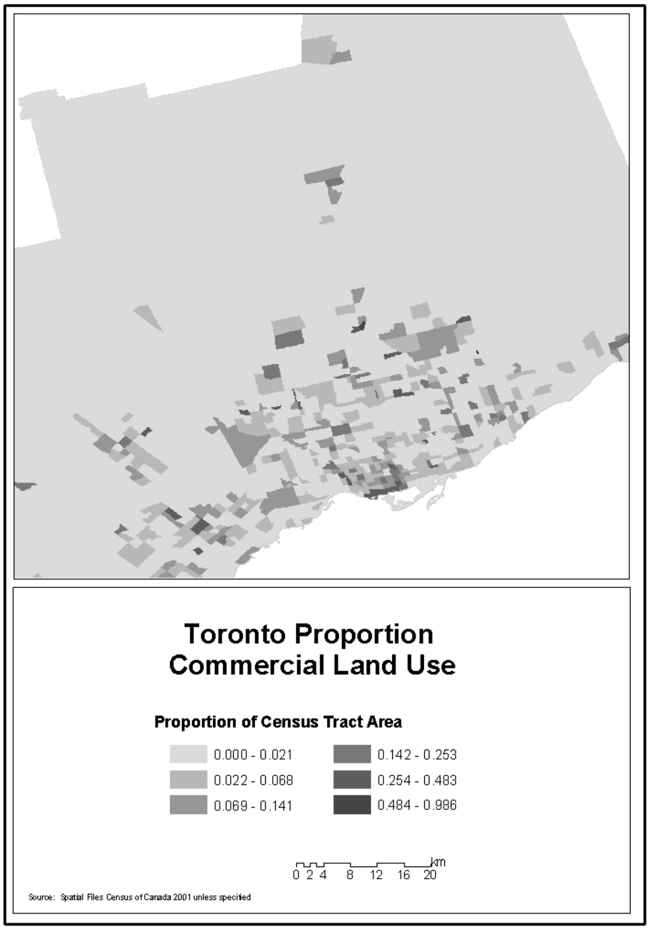
In Figure 4, the highlighted areas represent those for which sufficient vacant land parcel sale records existed to generate an estimate of the average vacant land value for industrial and commercial. Subsequently, those CT's with land value information in each Distance Band were used to calculate an average land value for the distance band. In some cases, there was not a sufficient sample of vacant properties on which to establish an average value for the distance band, and interpolation techniques were employed. For example, the property values from an adjacent distance band were used, or if a gap of more than 1 distance band, an interpolation based on the number of bands in the gap and the known sampled values was used. The end result is that there are industrial and commercial vacant land values for each distance band value in each CMA. However, they are a mixture of values based on ICX and RealTrack samples, as well as interpolation.

At point 4 in Figure 2, the 2006-2005 values for vacant land (commercial and industrial) are adjusted down to 2000 values using the NHPI index provided by Statistics Canada (See Table D-1 Appendix D). Although this index was not developed specifically for the non-residential market, it is probably a more appropriate deflator of commercial/industrial property values than the CPI (Consumer Price Index).

A key question is, in a given census tract, what percentage of infrastructure frontage (road classes, rail etc) is devoted to residential, commercial or industrial land? This is a central consideration in our mass evaluation approach to estimating unit values and applying “across the fence” (ATF) land valuation. Our model uses the mix of land uses (residential, industrial, commercial, etc.) in each census tract, and specific features of the infrastructure class, assuming, for example, that most major arterials are lined with something other than single family dwellings. The “weights” are applied at point 5 in Figure 2 and the different weights utilized form the basis for the 4 estimates developed in our approach.

Land use data from DMTI Spatial (DMTI, 2006, CanMap RouteLogistics) is used to better understand the spatial distribution of land use types and what types of properties line streets of a certain class and in certain zones (Distance bands). It forms a key part of 3 of the 4 estimation approaches utilized for this group (CMA’s). Spatial calculations in the GIS environment allow us to capture the area of land use in each CT and relate it to the overall area of the CT, thereby establishing the CT specific proportions.

Figure 5: Proportion of Commercial Land by CT, Toronto CMA



This figure illustrates the portion of land zoned commercial in each CT in Toronto. Similar analysis was performed in other cities.

As is expected, the spatial pattern in Figure 5 exhibits distinct linear bands along major arteries as well as focal points, like the CBD where commercial lands dominate. This is an important consideration in establishing the unit values of transportation infrastructure across the city. There are many land use categories in a typical city, but residential, commercial and industrial are generally the largest, and the land use categories that are most likely to substitute for transportation infrastructure land. There are exceptions, for example, if one considers cities like Ottawa and Quebec City, which contain large tracts of public parks and institutional lands. Even if we attempted to broaden our land use classification, however, we would be faced with the further challenge of placing market values on lands which typically don't enter into the broader market for land. Our approach involved isolating the industrial and commercial land uses in each CT, calculating their areal proportions, and then assuming that the remainder of the land use was residential. This approach, while not ideal, presents a basis where even if a parcel that is actually park is treated as residential land, one would assume that a "fair market value" for that park land would be based in large part on surrounding residential land values.

These data were analyzed in four different ways to create four different unit land value estimates (dollars per square metre), summarized below, ranked from simpliest to most complex:

Estimate one: based entirely on the adjusted average dwelling values derived from Census of Canada data (assume all land is residential - w_r = 1).

Estimate two: based on the average proportions of the 3 main land use categories *in each CMA* (averaged across CT's), multiplied by the land use category specific land values in each CT (e.g. in Toronto the weights are: residential = 0.847, industrial = 0.116 and commercial = 0.037).

Estimate three: based on the *actual* proportions of the 3 land use categories *in each CT*, multiplied by the land use category specific land value in each CT.

Estimate four: based on defined (see Table 5) infrastructure specific proportions of the 3 land use categories multiplied by the CT's land use specific value of land estimates.

Table 5: Estimate 4 Land Use Weightings

Infrastructure Class		Land Use Mix		
Road		Residential	Industrial	Commercial
Road (Provincial)	Freeway	30%	40%	40%
	Arterial 1	20%	30%	50%
	Collector 1	70%	10%	20%
	Local	80%	10%	10%
Road (Municipal)	Arterial	20%	30%	50%
	Collector	70%	10%	20%
	Local	80%	10%	10%
Rail	Mainline	60%	20%	20%
	Branch line	60%	20%	20%
	Rail Yards	20%	60%	20%
	Terminals	20%	60%	20%
Marine	Ports	10%	50%	40%
	Terminals	0%	50%	50%
Air	Airports	10%	60%	30%

This table indicates the mix of land uses estimated to be adjacent to each class of transportation infrastructure, for "across the fence" analysis. These values are applied to the average value of each land category in each census tract.

These four estimates vary in the original source of land valuation data, the land use categories considered, the geographic scale at which different land use category values are averaged, and whether unit values are adjusted for different types of transportation infrastructure to reflect the degree to which the infrastructure affects land use patterns (for example, commercial and industrial land uses concentrating along arterials, ports and airports).

Table 6 summarizes the four approaches to estimating unit land values. In a sense, Estimate 4 is the reverse of the 3 other estimates – In estimate 4, it is the infrastructure type that drives the estimation. In Estimates 1 through 3, it is the characteristics of the Census Tract – land values and mix of uses – that drive the estimate. Table 6 provides further clarification.

Table 6: Estimate Approach Comparison

	Estimate Characteristics			
Estimate	**Land Value Data**	**Based On Land Values for**	**Employ Land Use Data area Calculations**	**Vary Across Infrastructure Types**
One	Statistics Canada	Residential	No	No
Two	Statistics Canada, ICX sampling, Industry Reports	All 3 land uses	In Aggregate	No
Three	Statistics Canada, ICX sampling, Industry Reports	All 3 land uses	Yes	No
Four	Statistics Canada, ICX sampling, Industry Reports	All 3 land uses	No	Yes

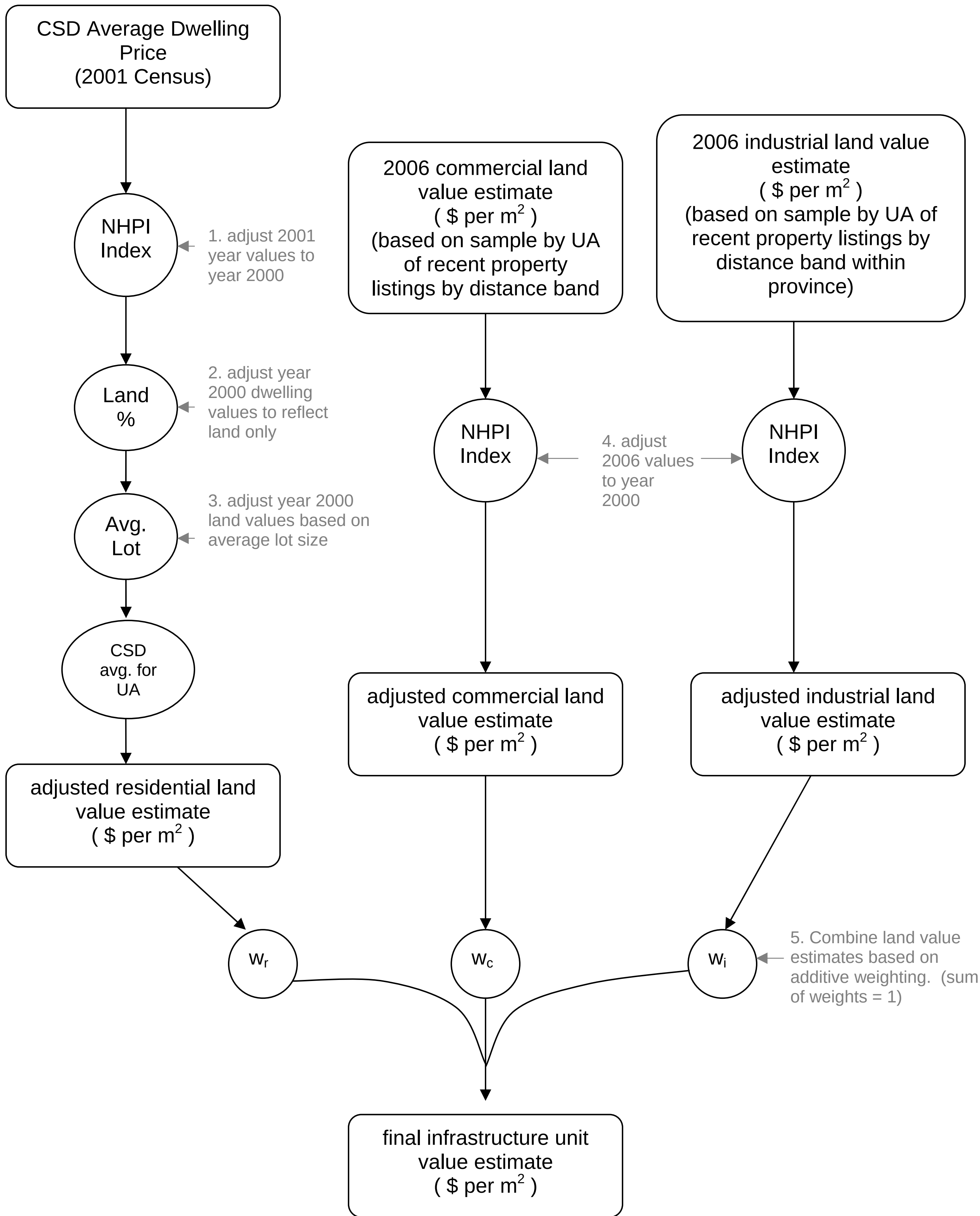
This table summarizes the four analysis methodologies to estimating unit land values.

These inputs and weights can be easily adjusted to test different assumptions and conditions, although sensitivity analysis is beyond the scope of the current study.

2.2 Establishing Unit Value Estimates for Group 2: Provincial – a) non-CMA urban

A modified methodology is used to calculate land values outside of urban CMA areas. Figure 6 provides a schematic which details our approach to this category of unit value estimates.

Figure 6: Provincial a) non-CMA URBAN Unit Land Value Estimation Flow Chart



The general approach is similar to that used in the previously described CMA category. The major differences are as follows:

1. The Urban Area (UA) is the spatial unit for which unit value estimates are provided. These represent the boundaries of cities (non CMA or CA) and are typically combinations of Census Subdivisions (CSD's).

2. The adjustments applied to the 2001 "average dwelling value" variable which forms the basis for the residential portion of the final unit values do not vary spatially within the UA or between UA's. We use a set of standard values for the "point 2 and 3" adjustments in each Province.

3. In cases where a UA is made up of more than one CSD, an area weighted average of the dwelling value for CSD's in the UA is used (the step following the adjustment at Point 3 in Figure 6)

4. The sampling of "industrial" and "commercial" categories is stratified by distance bands in each province, emanating from the boundaries of each provincial CMA. These distance bands are established in each Province based on the extent of the populated areas and driving times (distance) (Note: The urban areas sampled in each province are presented in Table I, end of Appendix B).

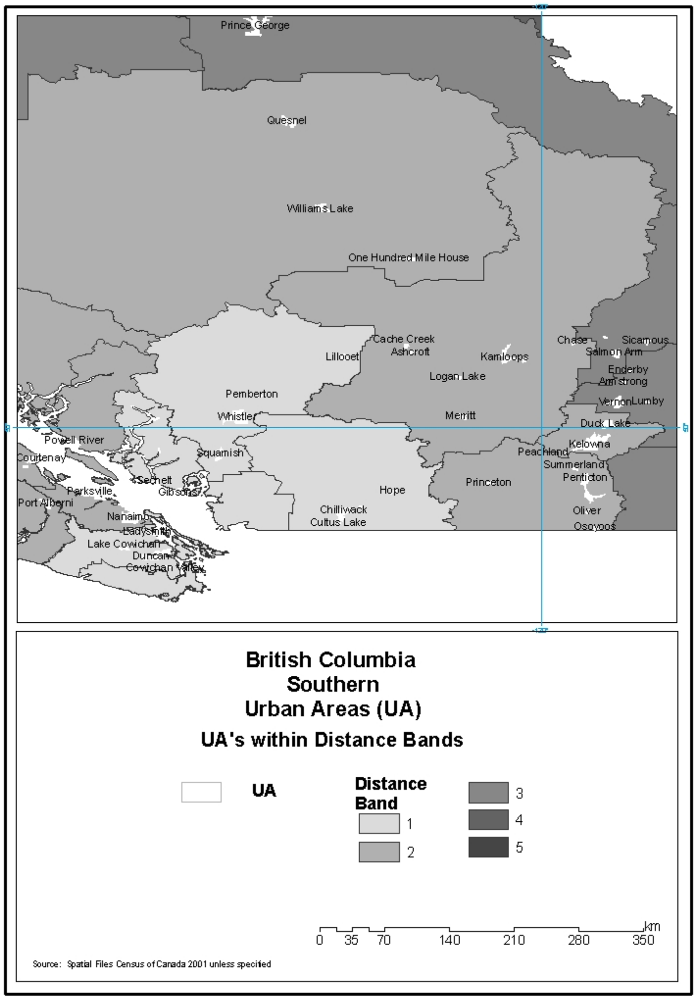
Table 7: Example of Provincial Distance Band Calculations: BC

DistBand Variable Value	Distance from Vancouver (Km)	Distance from Vancouver (Minutes of Drive Time)
1	90	60
2	360	240
3	630	420
4	990	660
5	>990	>660

5. The weightings applied at point 5 are those associated with Estimate one and Estimate four as described in the previous section. Estimates 2 and 3 are not calculated in part because of the extensive spatial calculations that would need to take place and the general lack of enough spatial detail to pick up major differences in proportions of land use types.

The urban areas outside of the CMA's represent an important component in the overall infrastructure system. The following map depicts an example of UA's in BC. It should be noted that the use of the CSD level of information was needed to inject more detail into the analysis, rather than relying on CD's.

Figure 7: Map of BC Urban Areas and Distance Bands



This figure indicates the location of Urban Areas (UAs) in British Columbia. A standard value is applied to all residential land in UAs in each province. Distance bands from CMAs (the major urban centres in each province) are used to calculate commercial and industrial land values in different UAs.

2.3 Establishing Unit Value Estimates for Group 2: Provincial – b) Rural

A somewhat different approach is used to establish unit values for transportation infrastructure in rural areas. These areas encompass a wide range of land types, including farms and private forests, recreation lands, Crown Lands, provincial and national parks, and major wilderness areas.

The basic steps for analysis are the same as described previously. Beginning at the top boxes of Figure 8, the spatial unit of reporting in this case is the Census Division (CD) and the two major categories of land are 1) agricultural and 2) non-agricultural. On the Agricultural side, recent farm sale prices (2005 by acre) for spatial units utilized by Farm Credit Canada (FCC,

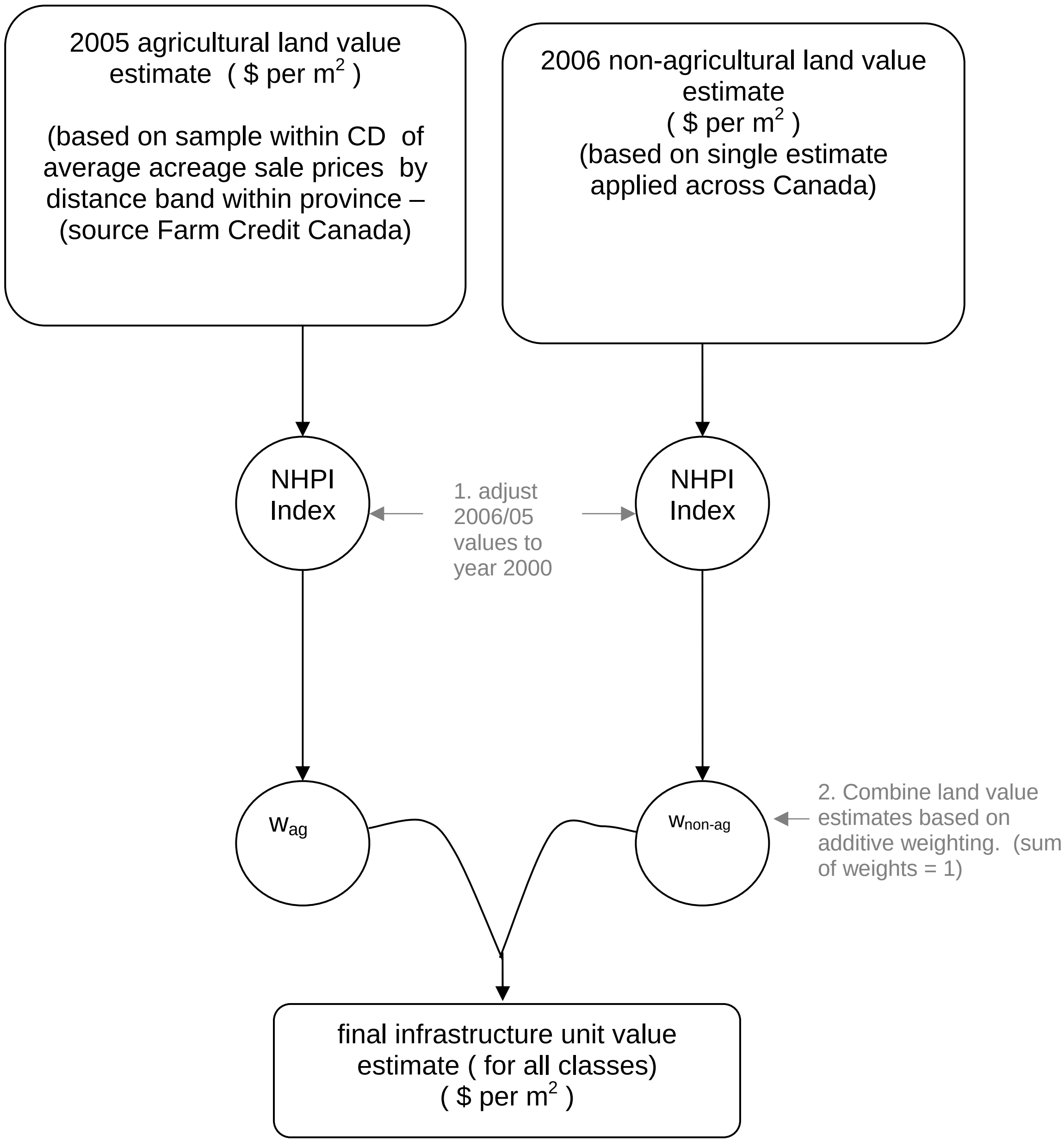
2006) (corresponding to the sub-census division units employed in the Census of Agriculture) form one of the major sources of land value data. Sampling has been carried out for all CD's where agricultural activity is present and the sampling results are used to establish a weighted average agricultural land value in each CD.

The second major category of land is the non-agricultural land (forested land). It is difficult to establish a consistent source of information for commercial forestry land and the non-agricultural land encompasses a wide range of status (e.g. lake front bush vs swamp). Therefore, the MLS service was used to sample "vacant land", in non-agricultural areas to establish a per acre value of non-agricultural land. However, this did not provide reliable results and it has been a challenge to identify the market value of forested land. In part, this is due to the fact that in most provinces with substantial commercial forests, the forested land is primarily Crown Land, and subject to use agreements rather than outright sale. Research by the Province of British Columbia estimated that provincial forest lands are typically worth $300 to $500 per hectare (Land and Water BC, Inc., 2005). This estimate is used to calculate "forested land" values, although more research may be justified to provide more specific estimates for various locations and conditions, and perhaps to take into account non-market values that are lost when productive forest land is developed for transportation infrastructure.

The methodology used to calculate rural lands involves the following steps, as illustrated in Figure 8.

> At point 1, the respective land values (in per m^2) form are adjusted to reflect year 2000 values by using the NHPI (New Housing Price Index – for adjustment values, see Table D-1, Appendix D).
>
> At point 2, the adjusted 2000 rural land values are combined via a weighting scheme to establish a unit value of land estimate for each CD in each Province. The weighting is driven by the calculation of the proportion of forested land in each CD (where forested land is obtained from 1:2,000,000 scale digital land cover maps for Canada).
>
> Two estimates are calculated for this scale. Estimate A is based primarily on the FCC based agricultural land values with the exception of those CD's without any agricultural land. In those cases, an average forest land value is employed. Estimate B utilizes the weights as calculated based on the amount of forested land. For Example, if a CD is 40% forest, the Estimate B value would be 0.4 X forest land value + 0.6 X agricultural land value.
>
> The end result is two value estimates of transportation infrastructure land by CD, and these are established for *all* types of transportation infrastructure. There is no attempt to vary the application of the weightings by class of infrastructure since it is unlikely that the "across the fence" type of land use varies significantly (between ag. vs. non-ag) across infrastructure categories.

Figure 8: Provincial b) RURAL Unit Land Value Estimation Flow Chart



3.0 Results

In this section, exemplary results from the full analysis are presented and discussed. The remaining sets of results are presented in Appendices A, B, and C.

3.1 Group 1 Results: Examples from Major Urban Areas

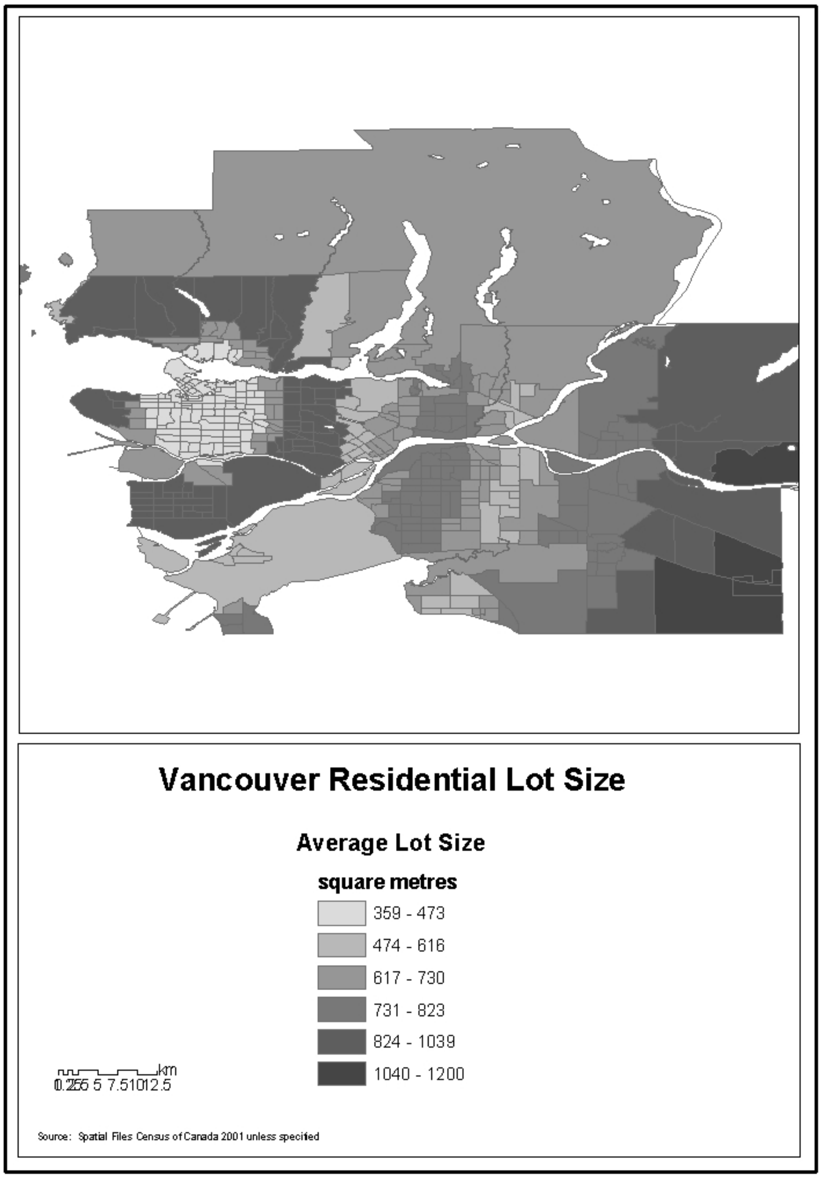
Table 8 provides an overview of the main variables that are associated with each spatial file (Census Tract level) for each CMA. Each of the variables as been previously described in the methods section of this report and all unit infrastructure estimates are provided in year 2000 dollars per sq. metre. In the following pages, a number of maps of these variables are presented for discussion.

Table 8: CMA Results Variable Key

Variable	Description	Notes
AVGLOT	Average Lot Size established by averaging within distance bands	Lot Sizes Sampled from MLS system
Landprop	Proportion of Housing Price related to land value	NHPI CMA specific ratios for fringe develeopments a startingpoint
AVGDWL2001	2001 Census Variable "Average Dwelling Price"	
F_IND_VAL	Industrial Land Value averaged across distance band based sampling	
F_COMVAL	Commercial Land Value averaged across distance band based sampling	
INDPROP	proportion of industrial land within CT	
COMPROP	proportion of commercial land within CT	
RESPROP	proportion of residential land within CT	
avdw2000	AVGDWL2001adjusted to 2000 values	based on NHPI adjustment factors
RESVAL	per sq. metre estimate of residential land value	derived from avdw2000 and Avglot, Landprop in each CT
estim1	repeat of RESVAL	represents a "base case" of land values
estim2	general estimate based on average CMA land use proportions	
estim3	general estimate based on actual CT land use proportions	
e4frway	freeway	
e4arterial	arterial	
e4collec	collector	
e4local	local	
e4railm	Rail Mainline	estimate of infrastructure land value based on proportions of industrial, commercial, residential land use which vary based on infrastructure type
e4railb	Rail Branchline	
e4railter	Rail Terminal	
e4marip	Marine Port	
e4marit	Marine Terminal	
e4air	Airport	

This table indicates the main variables used for calculating land values in major urban areas (CMAs).

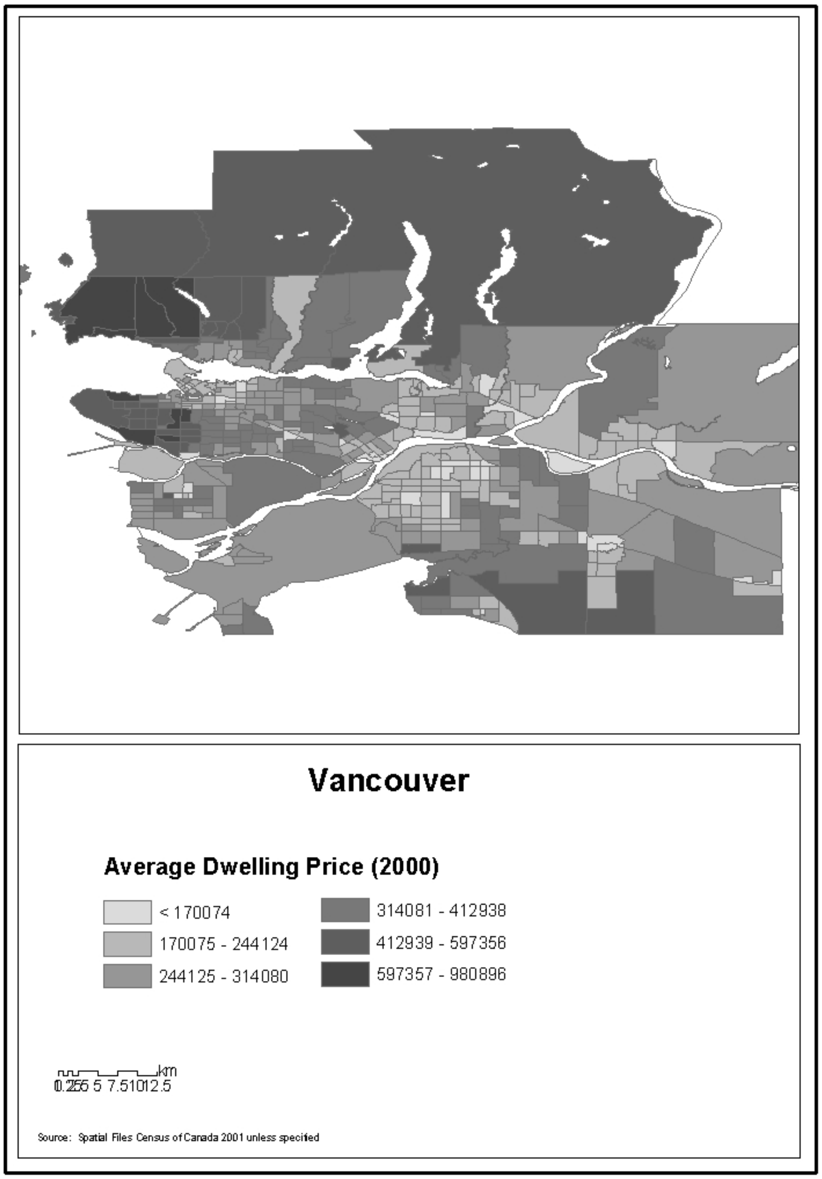
Figure 9: Vancouver Average Lot Sizes



This figure illustrates the average lot size in the Vancouver CMA. Similar analysis was performed in other cities.

The pattern in Figure 9 exhibits the multinucleated character of the Greater Vancouver Region. Average residential lots sizes are relatively small in the core as we would anticipate and then increase as you move outwards. However, this increase outward is not uniform, but decreases as suburban centres (satellite cities) are encountered. Another characteristic that is evident is the uniformity resulting from the use of the distance band approach. Sampled information was averaged for all CT's within a given distance band which ignores the variability related to the underlying land development pattern. In contrast, consider the pattern of average dwelling prices in the Vancouver region (Figure 10). While there is some consistency as one moves out from the downtown area, it does not have the uniformity of Figure 9.

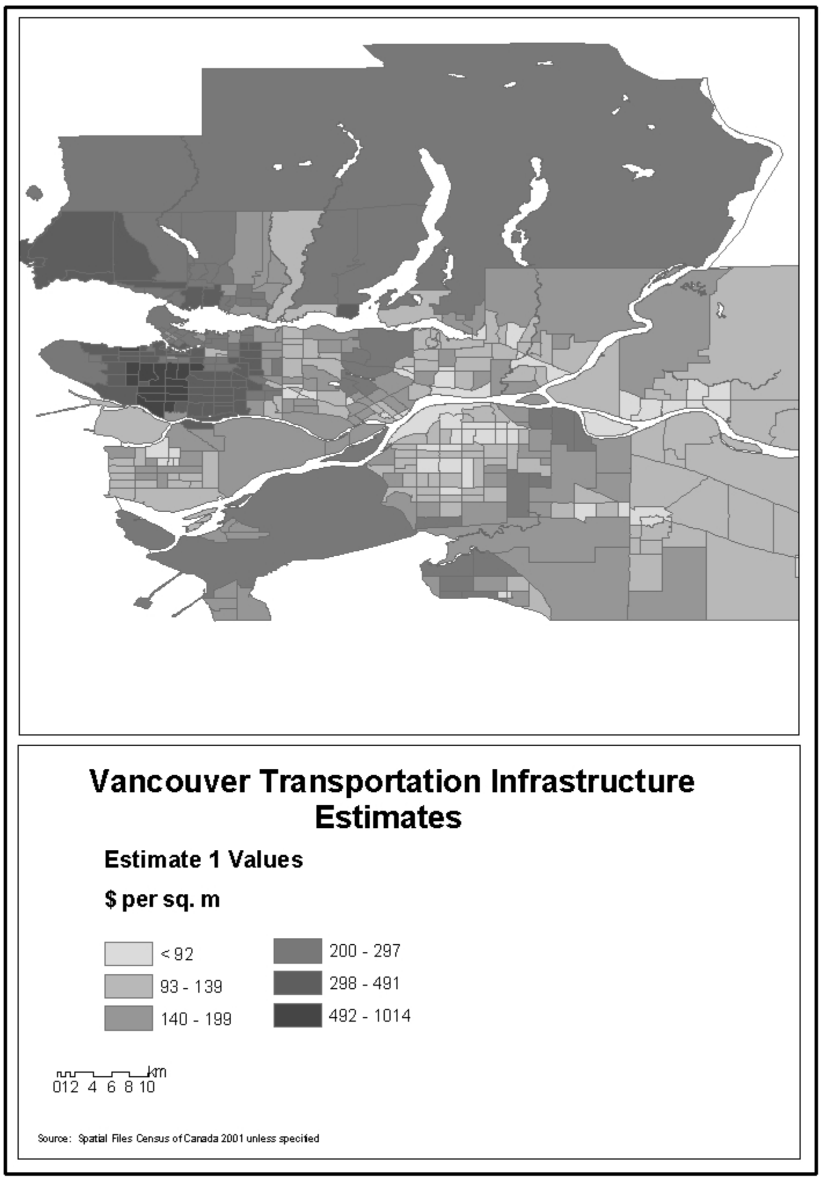
Figure 10: Vancouver Average Dwelling Price



This figure illustrates the average dwelling price in the Vancouver CMA. Similar analysis was performed in other cities.

The Estimate 1 values for the Vancouver CMA are depicted in Figure 11. Not surprisingly, the overall pattern is very similar to that of Figure 10, since the driving element in Estimate 1 is residential property value. Summary statistics for all Vancouver estimate values are presented in Table 9.

Figure 11: Vancouver Estimate 1 Values



This figure illustrates transportation facility land values in the Vancouver CMA calculated using Estimate Method 1, which uses residential land values in each census tract. Similar analysis was performed in other major urban areas (CMAs).

Table 9: Vancouver Summary Statistics

	AVGLOT	Landprop	AVGDWL2001	F_IND_VAL	F_COMVAL	INDPROP	COMPROP	RESPROP	avdw2000	RESVAL
Mean	723.04	0.425	$295,400.06	$199.80	$270.79	0.090	0.021	0.889	$292,157.47	$197.17
Standard Error	10.43	0.002	6295.67	5.07	6.92	0.007	0.002	0.008	6226.57	6.73
Median	725.00	0.421	$273,759.50	$142.00	$191.00	0.030	0.003	0.952	$270,754.50	$154.00
Standard Deviation	208.08	0.040	125598.28	101.12	137.96	0.147	0.044	0.160	124219.59	134.27
Minimum	359.00	0.376	$0.00	$85.00	$102.00	0	0	0	$0.00	$0.00
Maximum	1,200.00	0.5	$991,783.00	$420.00	$567.00	0.914	0.388	1	$980,896.00	$1,014.00
Count	398	398	398	398	398	398	398	398	398	398

	estim1	estim2	estim3	e4frway	e4arterial	e4collec	e4local	e4railm	e4railb	e4railter
Mean	$197.17	$198.93	$204.95	$247.42	$234.82	$293.44	$204.85	$212.43	$212.43	$213.46
Standard Error	6.73	6.38	6.66	6.26	5.91	7.83	6.20	5.84	5.84	5.37
Median	$154.00	$155.50	$158.00	$198.50	$175.00	$228.50	$159.50	$168.00	$168.00	$162.00
Standard Deviation	134.27	127.19	132.94	124.82	117.98	156.20	123.76	116.57	116.57	107.06
Minimum	$0.00	$14.00	$0.00	$90.00	$87.00	$90.00	$27.00	$54.00	$54.00	$81.00
Maximum	$1,014.00	$951.00	$1,000.00	$699.00	$612.00	$1,035.00	$910.00	$806.00	$806.00	$568.00
Count	398	398	398	398	398	398	398	398	398	398

	e4marip	e4marit	e4air
Mean	$227.98	$235.60	$220.89
Standard Error	5.75	6.00	5.56
Median	$162.00	$167.00	$157.00
Standard Deviation	114.61	119.62	110.91
Minimum	$88.00	$94.00	$87.00
Maximum	$538.00	$494.00	$524.00
Count	398	398	398

This table summarizes the statistics from the four methods used to estimate transportation facility unit land values (2000 Canadian dollars per square metre) in Vancouver area census tracts. Similar analysis was performed in other major urban areas. The remaining CMA tables are presented in Appendix C).

Table 9 notes:

- These statistics are generated from the census tract level (n = 398).
- The aggregate nature of this summary is exemplified in the similarity of the average per metre value of residential ($97.17), and industrial ($199.80).
- Commercial properties are on average the highest value ($270.79), but in the case of Vancouver this is based on an adjustment of estimated industrial land values (rather than sampled information).
- Industrial land makes up 9% of the region, with commercial at 2%.
- The maximum values for INDPROP (0.914), and COMPROP (0.388) indicate that, as is commonly recognized, specific areas of the city are focal points for industrial and commercial activity.
- Estimates 1 and 2 are most similar given their respective emphasis on the residential side.

- Estimate 3 is slightly higher on average; based on the actual land use proportions in each CT, it allows for the influence of high value commercial lands to play more of role in the unit value estimate (in those CT's where it is a factor).
- Estimate 4 values are typically all higher than either estimates 1,2, or 3 – this is driven by the fact that the influence of residential land value is diminished in each case – CT's with high value commercial or industrial land are of greater influence in the overall estimate average for a particular type of infrastructure.
- Estimate 4 local street estimates are most similar to 1 through 3.

For comparison purposes here, the summary table for the Toronto CMA is presented below.

Table 10: Toronto CMA Summary Statistics

	AVGLOT	Landprop	AVGDWL2001	F_IND_VAL	F_COMVAL	INDPROP	COMPROP	RESPROP	avdw2000	RESVAL
Mean	726.47	0.404	$266,815.52	$141.03	$547.99	0.116	0.037	0.847	$260,066.79	$215.67
Standard Error	15.35	0.001	3914.44	6.09	26.17	0.006	0.002	0.006	3815.43	6.61
Median	550.00	0.393	$243,089.00	$75.00	$220.00	0.035	0.007	0.925	$236,940.00	$164.00
Standard Deviation	470.91	0.045	120078.28	186.87	802.82	0.174	0.074	0.190	117041.09	202.65
Minimum	218.00	0.35	$0.00	$17.00	$16.00	0	0	0.002	$0.00	$0.00
Maximum	2,292.00	0.5	$1,418,892.00	$888.00	$3,615.00	0.985	0.986	1	$1,383,003.00	$2,140.00
Count	941	941	941	941	941	941	941	941	941	941

	estim1	estim2	estim3	e4frway	e4arterial	e4collec	e4local	e4railm	e4railb	e4railter
Mean	$215.67	$219.22	$234.59	$340.35	$359.49	$439.12	$241.49	$267.21	$267.21	$237.36
Standard Error	6.61	6.54	8.06	13.88	15.52	16.34	7.35	8.98	8.98	9.52
Median	$164.00	$158.00	$159.00	$174.00	$172.00	$242.00	$165.00	$161.00	$161.00	$125.00
Standard Deviation	202.65	200.65	247.15	425.78	476.19	501.34	225.61	275.60	275.60	291.91
Minimum	$0.00	$7.00	$0.00	$21.00	$18.00	$28.00	$10.00	$20.00	$20.00	$19.00
Maximum	$2,140.00	$1,857.00	$2,126.00	$2,278.00	$2,392.00	$3,009.00	$1,789.00	$1,854.00	$1,854.00	$1,574.00
Count	941	941	941	941	941	941	941	941	941	941

	e4marip	e4marit	e4air
Mean	$311.34	$344.75	$270.64
Standard Error	13.76	16.06	11.75
Median	$146.00	$148.00	$131.00
Standard Deviation	422.18	492.52	360.56
Minimum	$18.00	$17.00	$18.00
Maximum	$2,049.00	$2,252.00	$1,776.00
Count	941	941	941

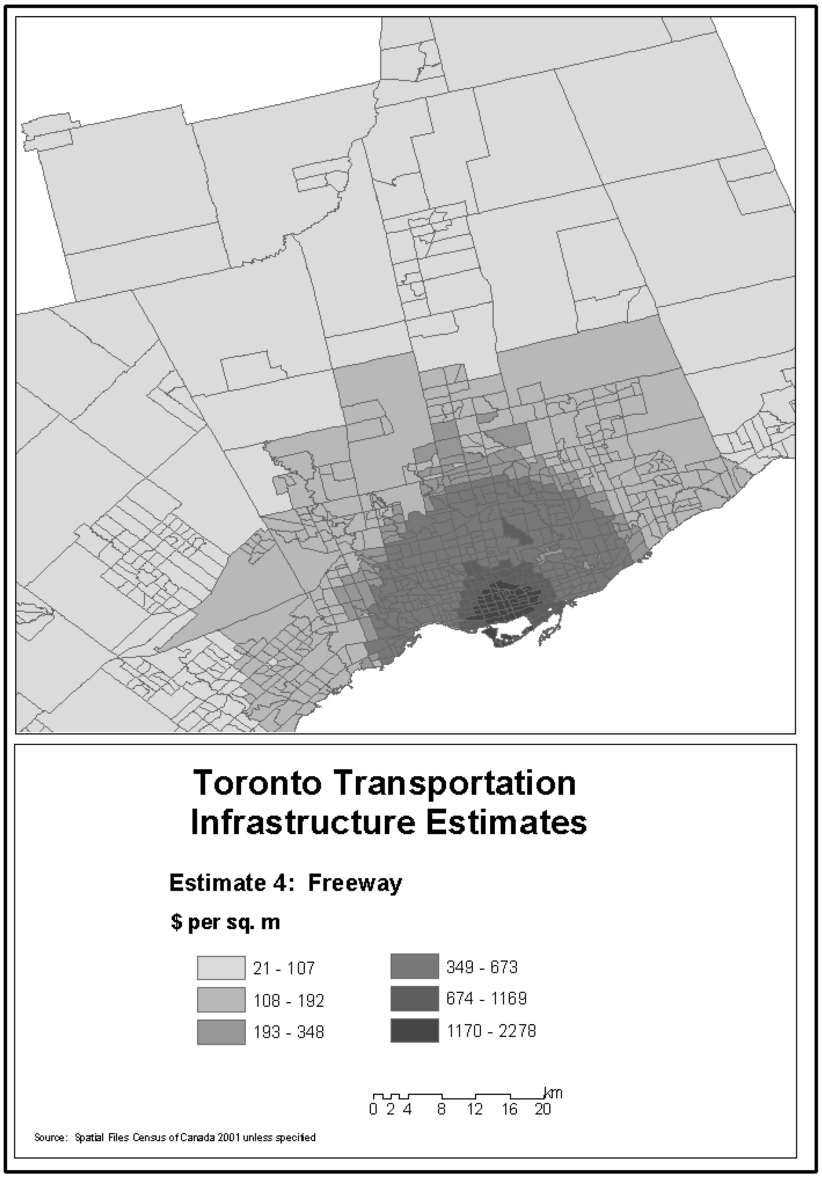
This table summarizes the statistics from the four methods used to estimate transportation facility unit land values (2000 Canadian dollars per square metre) in Toronto area census tracts. Similar analysis was performed in other major urban areas (see Appendix C)

Table 10 notes:

- Average residential values are similar to Vancouver, as are average lot sizes.
- The average Commercial land value is by far the highest (of the 3 land use categories) and is responsible for the major differences exhibited between estimates 1, 2 and 3, 4.
- The influence of the high commercial land values is most evident in estimates for Arterial Roads (e4arterial) and Marine Terminals (e4marit).

- In both cases (Vancouver and Toronto), the major differences in the estimates are reflected in the comparison of Figures, 12 and 13 on the following pages.

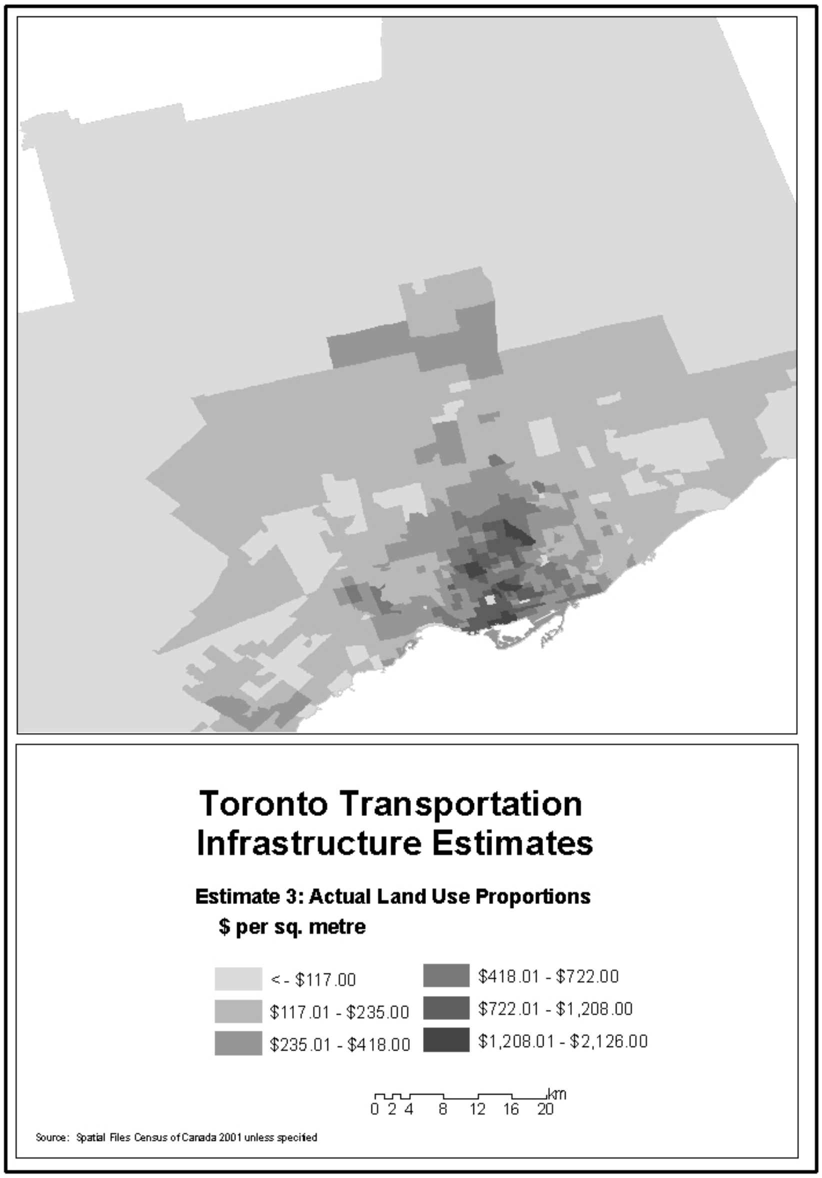
Figure 12: Toronto Estimate 4: Freeways



This figure illustrates freeway land values in Toronto area census tracts (in 2000 Canadian dollars per square metre) using Estimate Method 4, which is the most complex of the four methodologies applied in this.

The pattern above exhibits the underlying reliance of this estimate on property value information, which has been averaged across distance bands. It reflects the general trend of high values for freeway lands in the core, decreasing as one moves outwards.

Figure 13: Toronto Estimate 3 Results



This figure illustrates transportation infrastructure land values in Toronto area census tracts (in 2000 Canadian dollars per square metre) using Estimate Method 3.

In Figure 13, the range of unit value estimates are similar, but their spatial pattern reflects the actual underlying make-up of land uses, rather than relying on an assumed distance decay pattern (evident in figure 12).

If employed to estimate Freeway land values, one would still capture the higher values in the core, but the opportunity to capture higher values in the periphery (commercial cluster) is better than in the case of the estimate presented in Figure 12 (Estimate 4 Freeway).

3.2 Results Discussion and Recommendation

In the opening section of this report, a discussion of the complexity of establishing urban land values presented ideas such as “bid rent curves” and the tendency for land values to follow a distance decay pattern. The notion of sectors and corridors was also reviewed. The intersection of these 2 ideas is reflected in the underlying patterns of our CMA estimate approaches (compare Figures 12 and 13).

The summary statistical tables reflect a number of the differences in these estimate approaches as well. The following are general comments about the reliability of these estimates.

Estimate 1

This is perhaps the most reliable since the land value driving it, is entirely based on Census of Canada values: “average dwelling value” in each CT. Local market influences come into play in terms of establishing the average lot size (based on MLS sampling) and land proportions (based on NHPI values). However, it is also the most limited in terms of reflecting the reality of the urban land market because of this singular reliance. There is no influence of other land values and therefore this estimate is not highly recommended in the case of CMA’s. Typically, the highest land values are associated with the commercial core of our major cities and to have an “across the fence” estimate of infrastructure land values which ignores this is a concern.

Estimate 2

This estimate incorporates the sampled values of industrial and commercial land as well as residential and is therefore an improvement. It brings in the calculations of land use proportions, however in a limited way (assuming the average proportional mix of land use types applies to all CTs in a CMA). Concerns about the reliability of the land use data used (from DMTI Spatial) are somewhat ameliorated as a result. The reliability of the industrial and commercial land values is a concern given the lack of detailed sample data (in most CMA’s) on which to base these estimates. Sample sizes are very small, and the reliance on reported averages is also a concern (firm market reports). One of the major challenges with a mass estimation across all cities in Canada is the need to balance research effort with the need for detail. It would have been preferable to establish liaison with local market professionals and assessment agencies, to bolster our commercial / industrial land value estimates. However, this challenge was beyond the scope of this particular project. For the industrial commercial land estimates we do provide, we are confident in their reflection of general market (city to city comparisons) conditions. They may lack detail within areas of a particular CMA, but as an aggregate reflection of the overall differences between residential and commercial land values, they perform reasonably well.

Estimate 3

The benefit of this estimate is that it best reflects the underlying land use make up of each study area unit (the census tract) and is therefore most realistic in terms of capturing the type of properties that would be “across the fence”. As a single estimate (applied to all infrastructure within a given CT), it has the advantage (as does Estimate 1 and 2) of being reasonably easy to implement in the context of the larger FCI study. However, it too suffers from reliance on the sampled industrial commercial property data as well as the additional concern of relying extensively on the DMTI land use data. It can be argued that while the spatial land use data may not be of sufficient spatial accuracy (or attribute accuracy) to be used for legal or tax assessment purposes, it does provide a way to distinguish between the general characteristics of study area units (CTs). It allows one to identify areas of the city that are largely commercial or industrial, in comparison to those that are largely residential. This is an important aspect of establishing land values.

Estimate 4

In this case, the DMTI land use data does not have an influence. The results are driven by the residential and industrial/commercial land values (sourced from Census and sampling) and infrastructure specific assumptions of the mix of properties adjacent to each infrastructure element (the proportion of adjacent properties that are likely to be residential, commercial or industrial). As a result, the unit land value estimates for certain types of infrastructure tend to be on average much higher than other group of estimates. Comparatively, the Estimate 4 values would be considered the high end of the range of unit values. There is the added concern of ignoring the actual underlying pattern of land uses, although the actual mix would be reflected somewhat in the values of the property. For example, a largely commercial area in the distance bands close to the core would have higher land values on average.

The following are recommendations for additional research to better quantify CMA land value estimates:

> a) Carry out a more detailed survey and analysis of non-residential property values, perhaps by establishing a working relationship with property assessment agencies in the various jurisdictions to get a more thorough reflection of land values. This would involve establishing relationships with land registry offices or agencies charged with property tax assessment to help develop a more comprehensive and reliable data basis for determining the value of land. In general, MLS and ICX are convenient and provide a good overview of values in an area, but their intent is to list sellable property rather than to provide accurate and comprehensive data on properties.
>
> b) Carry out a thorough analysis of the make up of properties adjacent to specific infrastructure elements at the property parcel level. For example, take a random selection of infrastructure elements and enumerate the properties adjacent to them to develop a more realistic assessment of the land use proportions. Rather than relying on the set assumed proportions as presented with Estimate 4, a more accurate set could be developed for each CMA.

In short, a) would enhance the reliability of all the estimates, while b) would specifically enhance the reliability of the infrastructure specific estimate 4 approach.

With current data resources utilized, we recommend using the results from the Estimate 3 approach, since this approach provides the most representative and defensible results with the available data in the context of this project.

Table 10a presents the results from this estimation approach for all CMAs. For comparison to the other estimation approaches in each CMA, the reader is referred to the tables in Appendix

C. Below, the results are intuitive in that they reflect what is generally known about the land market and general economic characteristics of the various CMAs. The higher values for Estimate 3 are found in the major markets (expanding economies) like Vancouver, Toronto and to a lesser extent Montreal, as well as those markets known to have higher than average land values such as Victoria and Ottawa. Furthermore, the influence of those major markets, like Toronto, extends to the CMAs in close proximity such as Oshawa, Hamilton and Kitchener. This particular result is noteworthy since the level of confidence in the commercial and industrial land values is higher for the Ontario CMA markets, being obtained from the commercial data provider (RealTrack Inc.), rather than based on ICX sampling. The lower Estimate 3 values are associated with the smaller market CMAs, those primarily in the East and more removed from the traditional cores of Canadian economic activity.

Table 10a: **Comparison of Estimate 3 Values Across Canadian CMAs** (values in Dollars per square metre)

	Abbotsford	Calgary	Chicoutimi – Jonquière	Edmonton	Greater Sudbury	Halifax	Hamilton
Mean	$71.44	$138.39	$23.44	$77.48	$48.84	$81.44	$109.23
Standard Err.	9.71	4.64	2.89	1.96	4.97	9.01	4.75
Median	$79.62	$122.36	$11.95	$71.69	$40.62	$47.80	$104.27
Standard Dev.	57.47	64.52	17.33	28.46	32.18	103.10	62.33
Minimum	$0.64	$0.00	$5.30	$5.97	$0.16	$0.00	$3.70
Maximum	$207.19	$549.47	$55.30	$215.19	$144.33	$611.60	$315.45
Count	35	193	36	211	42	131	172

	Kingston	Kitchener	London	Montréal	Oshawa	Ottawa	Hull
Mean	$63.28	$106.01	$69.40	$117.82	$125.37	$109.46	$50.63
Standard Err.	9.61	3.75	3.24	3.63	3.80	10.03	5.46
Median	$24.02	$107.25	$66.65	$78.36	$127.97	$77.51	$43.03
Standard Dev.	67.95	35.78	33.22	106.58	31.33	134.55	41.25
Minimum	-$44.88	$31.76	$12.43	$0.00	$55.93	$0.05	$7.11
Maximum	$265.62	$210.31	$217.68	$779.32	$184.54	$1,145.90	$192.34
Count	50	91	105	861	68	180	57

	Québec City	Regina	Saint John	Saskatoon	Sherbrooke	St. Catharines – Niagara	St. John's
Mean	$38.47	$64.06	$44.36	$74.03	$35.15	$52.64	$72.30
Standard Err.	1.59	2.86	5.41	4.21	1.70	3.47	8.65
Median	$38.12	$61.30	$42.13	$74.31	$36.21	$45.35	$65.27
Standard Dev.	20.80	20.24	37.90	30.08	10.77	33.30	59.31
Minimum	$2.32	$17.55	$1.02	$2.81	$6.80	$5.05	$8.40
Maximum	$109.34	$113.49	$116.41	$160.19	$56.84	$157.05	$317.39
Count	171	50	49	51	40	92	47

	Thunder Bay	Toronto	Trois-Rivières	Vancouver	Victoria	Windsor	Winnipeg
Mean	$46.01	$234.59	$31.19	$204.95	$115.61	$95.69	$52.64
Standard Err.	5.46	8.06	2.29	6.66	9.23	3.60	2.51
Median	$34.16	$159.00	$36.01	$158.00	$109.36	$90.72	$48.30
Standard Dev.	37.01	247.15	13.92	132.94	80.96	31.75	32.26
Minimum	$7.63	$0.00	$0.30	$0.00	$7.16	$44.74	$4.80
Maximum	$138.82	$2,126.00	$62.74	$1,000.00	$367.60	$215.67	$154.99
Count	46	941	37	398	77	78	165

3.3 Group 2 Results: a) non CMA urban

The approaches used to estimate infrastructure values in the urban areas outside of the CMA's are very similar to those employed within the CMA's. The major difference is that no specific spatial land use (in the GIS analysis) information is employed, and subsequently Estimates 2 and 3 are not provided for this class.

Table 11: British Columbia Urban Area Summary Statistics

	Avgdwl_AWM	F_IND_VAL	F_COM_VAL	avdw2000	RESVAL	estim1	e4frway	e4arterial	e4collec	e4local
Mean	$110,807.92	$147.22	$263.43	$109,708.42	$45.70	$45.70	$178.04	$185.05	$178.52	$77.68
Standard Error	6542.14	7.07	12.63	6477.23	2.70	2.70	7.64	8.24	6.81	2.56
Median	$121,066.00	$150.00	$190.00	$119,865.00	$50.00	$50.00	$151.00	$150.00	$145.00	$69.00
Standard Deviation	76852.75	83.01	148.31	76090.17	31.73	31.73	89.73	96.85	80.02	30.10
Minimum	$0.00	$10.00	$30.00	$0.00	$0.00	$0.00	$31.00	$28.00	$36.00	$21.00
Maximum	$568,663.99	$237.00	$440.00	$563,021.00	$235.00	$235.00	$341.00	$338.00	$408.00	$256.00
Count	138	138	138	138	138	138	138	138	138	138

	e4railm	e4railb	e4railter	e4marip	e4marit	e4air
Mean	$109.45	$109.45	$150.12	$183.70	$205.64	$171.96
Standard Error	3.86	3.86	6.58	8.43	9.74	7.86
Median	$98.00	$98.00	$138.00	$156.00	$170.00	$152.00
Standard Deviation	45.33	45.33	77.34	99.02	114.42	92.31
Minimum	$24.00	$24.00	$22.00	$22.00	$20.00	$20.00
Maximum	$276.00	$276.00	$277.00	$318.00	$339.00	$298.00
Count	138	138	138	138	138	138

This table summarizes the statistics from the two methods used to estimate transportation facility unit land values (2000 Canadian dollars per square metre) in non-CMA urban areas in British Columbia. Similar analysis was performed in other provinces (See Appendix B).

In Table 11, the main comparison is between "estim1", (estimate 1) based on residential property values, and the remaining infrastructure specific estimates that incorporate the influence of the sample based industrial and commercial property values. Clearly, the gap between the residential and non-residential land values is responsible for the major differences, combined with the influence of the weightings used (see Table 5). The higher values for industrial and commercial are evident in the various distance bands used in BC. There is a definite distance decay effect as one moves away from the Vancouver region, however, you also have major centers like the Okanogan Valley, with Kelowna and Vernon as urban areas, which break this trend.

Table 12: Ontario Urban Area Summary Statistics

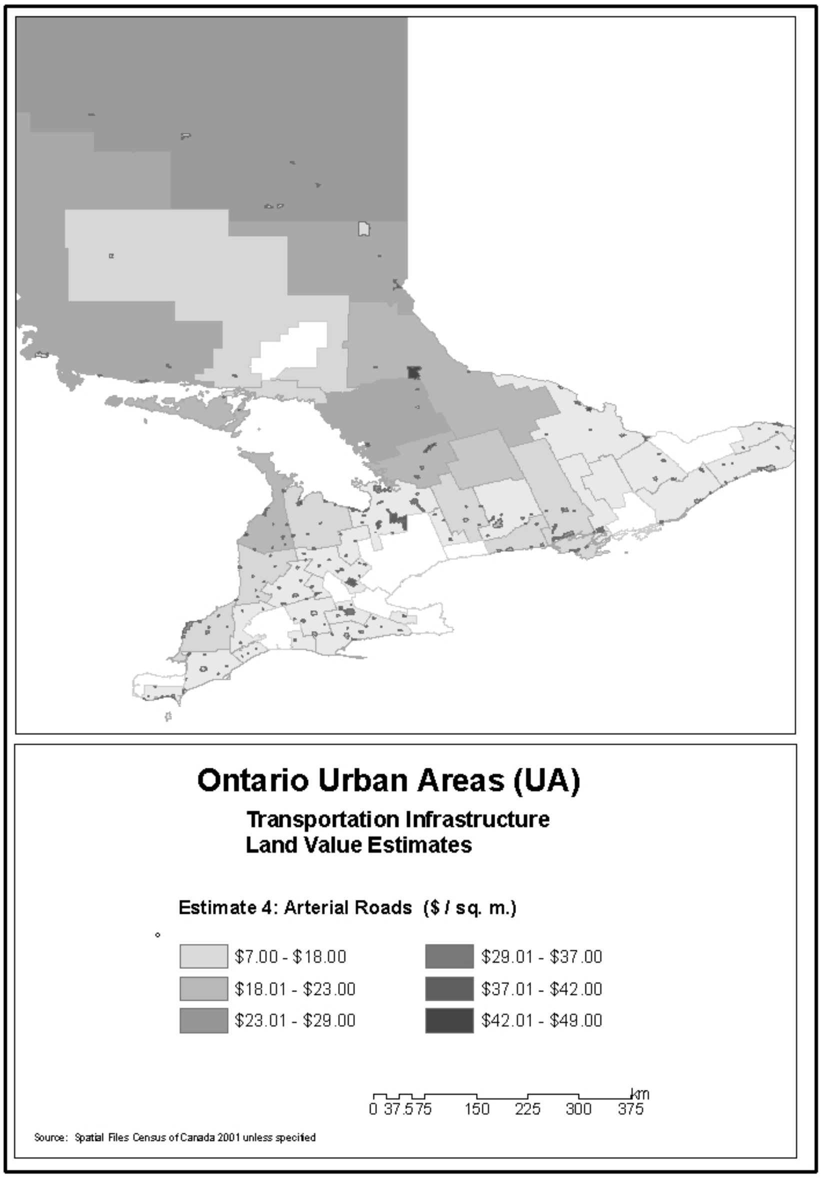
	Avgdwl_AWM	F_IND_VAL	F_COM_VAL	avdw2000	RESVAL	estim1	e4frway	e4arterial	e4collec	e4local
Mean	$133,709.75	$11.61	$24.92	$129,373.26	$53.90	$53.90	$30.79	$26.80	$51.38	$46.88
Standard Error	2828.68	0.40	1.06	2736.94	1.14	1.14	0.69	0.69	1.04	0.95
Median	$133,554.50	$12.00	$23.00	$129,223.00	$54.00	$54.00	$29.00	$24.50	$50.50	$48.00
Standard Deviation	41379.99	5.83	15.52	40037.95	16.70	16.70	10.10	10.03	15.22	13.92
Minimum	$0.00	$6.00	$11.00	$0.00	$0.00	$0.00	$7.00	$7.00	$6.00	$2.00
Maximum	$276,060.00	$22.00	$64.00	$267,107.00	$111.00	$111.00	$56.00	$49.00	$97.00	$95.00
Count	214	214	214	214	214	214	214	214	214	214

	e4railm	e4railb	e4railter	e4marip	e4marit	e4air
Mean	$39.64	$39.64	$22.74	$21.21	$18.71	$19.88
Standard Error	0.79	0.79	0.52	0.60	0.66	0.54
Median	$40.00	$40.00	$21.00	$19.00	$18.00	$18.00
Standard Deviation	11.54	11.54	7.55	8.77	9.61	7.89
Minimum	$3.00	$3.00	$6.00	$7.00	$9.00	$7.00
Maximum	$78.00	$78.00	$42.00	$38.00	$38.00	$35.00
Count	214	214	214	214	214	214

This table summarizes the statistics from the two methods used to estimate transportation facility unit land values (2000 Canadian dollars per square metre) in non-CMA urban areas in Ontario (other Provinces are presented in Appendix B)..

The BC results are atypical and the influence of industrial and commercial land values is not evident in the case of Ontario's nonCMA urban areas (nor in most other Provinces – see appendix B). There are CMA's located (Sudbury, Thunder Bay), significant distances from the heartland of Toronto but their influence is localized and does not extend to outlying communities in terms of property values. The pattern is difficult to visualize in Figure 14, which illustrates the Estimate 4 values for arterial roads in Ontario UA's.

Figure 14: Ontario Urban Areas: Estimate 4 Arterial Values



This figure illustrates transportation infrastructure land values in Ontario non-CMA urban areas (in 2000 Canadian dollars per square metre) using Estimate Method 4. Similar analysis was performed in other provinces.

3.4 Discussion and Recommendation

The strengths and weaknesses of the estimate methods 1 and 4, as described in Section 3.2 are in some cases enhanced at this scale of analysis. In particular, the inability to obtain reliable information on non-residential land values, due largely to a small population of properties to draw from in each urban area, is a major point of concerning undermining the use of Estimate

Method 4 approaches. There is also a question of how appropriate these weightings would be in the context of smaller urban centres which lack the development of extensive corridors and clusters of non-residential development. This is clearly a case where the scope of this project precludes us from gathering the detailed data (tax assessment for example) from a large enough selection of urban areas within each distance band.

We recommend using Estimate Method 1. The reliance on residential land values alone is less of an issue in smaller urban centres compared to CMAs, since smaller cities would lack the major clusters of industrial and commercial land, as well as typically lack the supply constraints that would drive property values upwards. Further, single family dwellings (on which the average dwelling value is largely based) would arguably be the dominate land use type in these smaller centres. It would be possible to generate Estimate 3 results for this scale as well, but would require additional spatial processing and be constrained by the lack of spatial detail on the residential property side.

3.5 Group 2 Results: b) Rural

The estimates from this grouping are perhaps the most straightforward to conceptualize, and although much lower in dollar values, are none the less important given the fact that considerable amounts of transportation infrastructure are located outside of CMA's and UA's.

Table 13: British Columbia Rural Summary Statistics

	f_agrval	PROP_FOR	Estim_a	Estim_b
Mean	$1.59	0.822	$1.60	$0.34
Standard Error	0.348	0.024	0.347	0.140
Median	$0.40	0.870	$0.40	$0.07
Standard Deviation	$2.26	0.153	$2.25	$0.91
Minimum	$0.00	0.4939817	$0.02	$0.02
Maximum	$11.06	1	$11.06	$5.62
Count	42	42	42	42

This table summarizes the statistics from the two methods used to estimate transportation facility unit land values (2000 Canadian dollars per square metre) in rural areas in British Columbia. Similar analysis was performed for other provinces (see Appendix A for details).

Table 14: Ontario Rural Summary Statistics

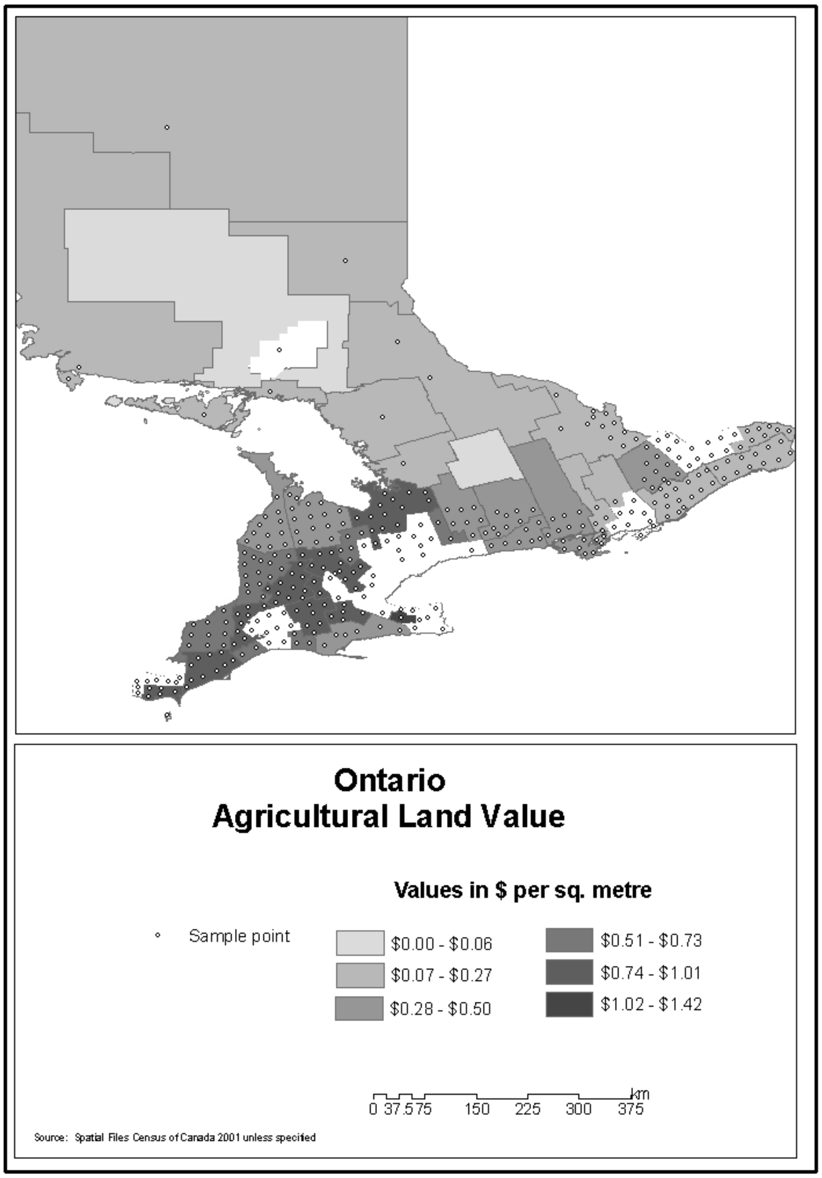
	f_agrval	PROP_FOR	Estim_a	Estim_b
Mean	$0.32	0.500	$0.33	$0.25
Standard Error	0.044	0.048	0.044	0.039
Median	$0.19	0.407	$0.19	$0.04
Standard Deviation	$0.38	0.404	$0.37	$0.33
Minimum	$0.00	0	$0.00	$0.00
Maximum	$1.42	1	$1.42	$1.13
Count	72	72	72	72

This table summarizes the statistics from the two methods used to estimate transportation facility unit land values (2000 Canadian dollars per square metre) in rural areas in Ontario.

The general differences between Ontario and BC are reflected in the summary statistics above. For example, pressure in the Lower Mainland and Okanogan serves to drive up the value of agricultural land (f_agrval) which is considerably higher than in Ontario (on average). Similarly, the proportion of forested land in BC is generally higher as well.

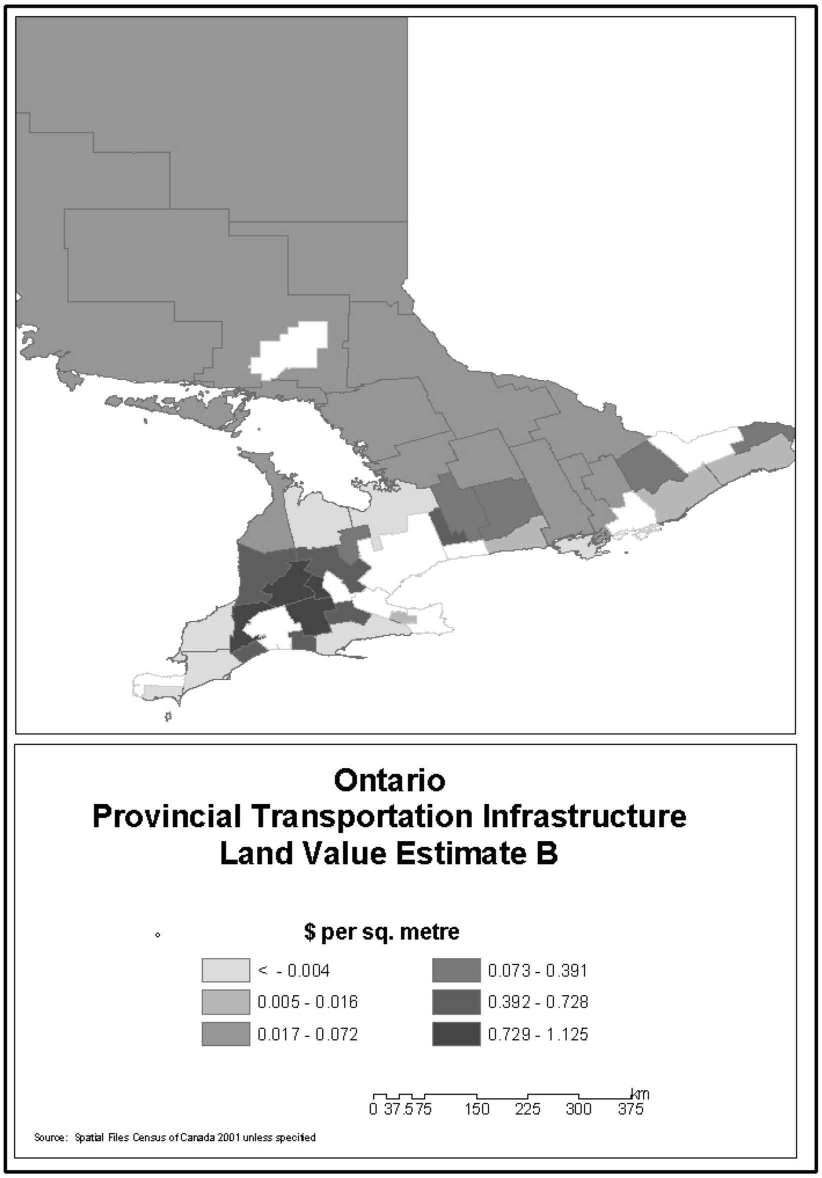
Figure 15 illustrates the pattern of agriculture land values in Ontario, and shows the extensive sampling of agricultural property values (the pattern of points). The finer spatial scale of the Farm Credit Canada database allowed for a weighted average (weighted by the size of the sample in each sub-CD unit) to be established for each CD.

Figure 15: Ontario Rural: Agricultural Land Value



This figure illustrates transportation agricultural land values in Ontario rural areas (in 2000 Canadian dollars per square metre). The smaller scale agricultural land value data available in that province allows more detailed analysis of these values.

Figure 16: Ontario Rural: Infrastructure Estimate Method B



This figure illustrates transportation infrastructure land values in Ontario rural areas (in 2000 Canadian dollars per square metre) using Estimate Methodology B.

Figure 16 illustrates the results of the Estimate Method B calculations for Ontario.

3.6 Discussion and Recommendation

The major difference between Estimate Methods A and B for the rural class of transportation infrastructure is that A is based on reliable sample data, while B, is at this point, not.

The FCC (Farm Credit Canada, 2006) data base provided the opportunity to develop a more reliable picture of agricultural land values (relative to the MLS and ICX databases). For this reason, Estimate Method A unit values would be more reliable than those of Estimate Method B, which suffers from a lack of detail on forested land values. Estimate B does have the advantage of incorporating a measure of landscape realism via the proportion of forested area in a Census Division. However, given the aggregate scale, this added detail may not be that valuable. Finally, it is important to recognize that in Estimate A, if there were no agricultural land values, an estimate of forested land value was incorporated. A chart comparing the results across Canada (all provinces) is presented in Appendix A (pg. 48).

We recommend using Estimate Method A. If more reliable information on forested land values became available, the balance would swing towards Estimate Method B.

4.0 Conclusions

The aim of this project is to establish unit value estimates for the land associated with Canada's transportation infrastructure. This information has many potential uses in transportation policy and planning analysis.

This study identified various reasons for developing standard estimates of transportation infrastructure land values, investigated theoretical and practical issues related to the development of such estimates, and applied several methods to various geographic areas across Canada. The results are evaluated and compared in Section 3.

We developed and tested several analysis methods for three different geographic scales, and based on this analysis we provide recommendations, as summarized in Table 15.

Table 15: Summary of Recommendations

Geographic Condition	Recommendations With Current Data Resources	Recommendations For Improving Data Resources
CMA	Estimate Method 3	Collect more data on non-residential property values, and land use mix adjacent to transport facilities to allow application of Method 4.
Non-CMA Urban	Estimate Method 1	Collect additional data to allow application of Estimate Method 3
Rural	Estimate Method A	Collect more information on forest land values to allow application of Estimate Method B

This table summarizes the method recommended for use in various geographic areas, and ways to improve their accuracy.

This experience indicates that data are available for calculating transportation infrastructure land values in all parts of Canada, with the ability to perform more detailed analysis in urban areas due to greater data availability (more information available in smaller spatial units). This type of analysis requires thoughtful balancing of factors such as data availability, data accuracy, spatial scale, and project costs, as well as assumptions about the value of a particular location and the degree to which lower-value urban-fringe land can substitute for higher value land in urban centers. Although there is still a degree of variability and uncertainty, the analysis methods we've identified provide values which appear to be consistent with economic theory and accurately reflect real world conditions. We therefore believe that the results can be applied with confidence to a wide range of applications.

Furthermore, the GIS based analysis is flexible and will allow for the exploration of modified estimation approaches with a modest amount of effort. Changing the proportions in Table 5 (part of the Estimate 4 approach) would directly result (because of linkages) in a completely new set of results. Should more reliable data sources be obtained, they would be easily incorporated within this modeling framework.

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Appendix A : Provincial Scale Analysis Summary (Group 2: Rural)

The following series of charts and tables presents a summary related to the estimation work carried out for the Provincial Scale of analysis (rural).

Table 1 and Chart 1 represent the statistical summary for the Estimate A and B values for each Province and for Canada as a whole at the Census Division level of spatial representation. The values provided are in year 2000 dollars per sq. metre.

Tables 2 and 3 represent the summaries on the proportion of forested land (on average by provincial census divisions) and final agricultural land values utilized in the analysis, derived from Farm Credit Canada sampling in each province (again, on average by Census Divisions). Of note, the values for BC are a major influence on the Canadian average, and the values for NFLD are skewed by the fact that only one area reported agricultural land values which were subsequently applied to all CD's in the Province.

Table: 1 Estimates A and B by Census Division: Canadian Comparison

	BC		AB		SASK		MAN		ON	
	Estim_a	Estim_b	Estim_a	Estim_b	Estim_a	Estim_b	Estim_a	Estim_b	Estim_a	Estim_b
Mean	$1.60	$0.34	$0.17	$0.13	$0.09	$0.08	$0.13	$0.11	$0.33	$0.25
Standard Error	0.347	0.140	0.018	0.018	0.004	0.004	0.013	0.013	0.044	0.039
Median	$0.40	$0.07	$0.17	$0.10	$0.09	$0.08	$0.13	$0.10	$0.19	$0.04
Standard Deviation	$2.25	$0.91	$0.08	$0.08	$0.02	$0.02	$0.06	$0.06	$0.37	$0.33
Minimum	$0.02	$0.02	$0.04	$0.04	$0.04	$0.04	$0.03	$0.03	$0.00	$0.00
Maximum	$11.06	$5.62	$0.30	$0.29	$0.12	$0.10	$0.25	$0.23	$1.42	$1.13
Count	42	42	19	19	18	18	24	24	72	72

	QUE		NB		NS		PEI		NFLD	
	Estim_a	Estim_b	Estim_a	Estim_b	Estim_a	Estim_b	Estim_a	Estim_b	Estim_a	Estim_b
Mean	$0.23	$0.16	$0.28	$0.07	$0.26	$0.08	$0.51	$0.33	$0.39	$0.13
Standard Error	0.021	0.019	0.018	0.012	0.033	0.010	0.058	0.092	0.000	0.032
Median	$0.18	$0.06	$0.29	$0.06	$0.21	$0.06	$0.56	$0.37	$0.39	$0.09
Standard Deviation	$0.22	$0.19	$0.07	$0.05	$0.14	$0.04	$0.10	$0.16	$0.00	$0.10
Minimum	$0.00	$0.00	$0.18	$0.04	$0.04	$0.04	$0.39	$0.16	$0.39	$0.05
Maximum	$0.99	$0.99	$0.37	$0.23	$0.51	$0.17	$0.57	$0.47	$0.39	$0.39
Count	104	104	15	15	18	18	3	3	10	10

	CAN_Overall	
	Estim_a	Estim_b
Mean	$0.42	$0.18
Standard Error	0.053	0.021
Median	$0.18	$0.07
Standard Deviation	$0.95	$0.38
Minimum	$0.00	$0.00
Maximum	$11.06	$5.62
Count	325	325

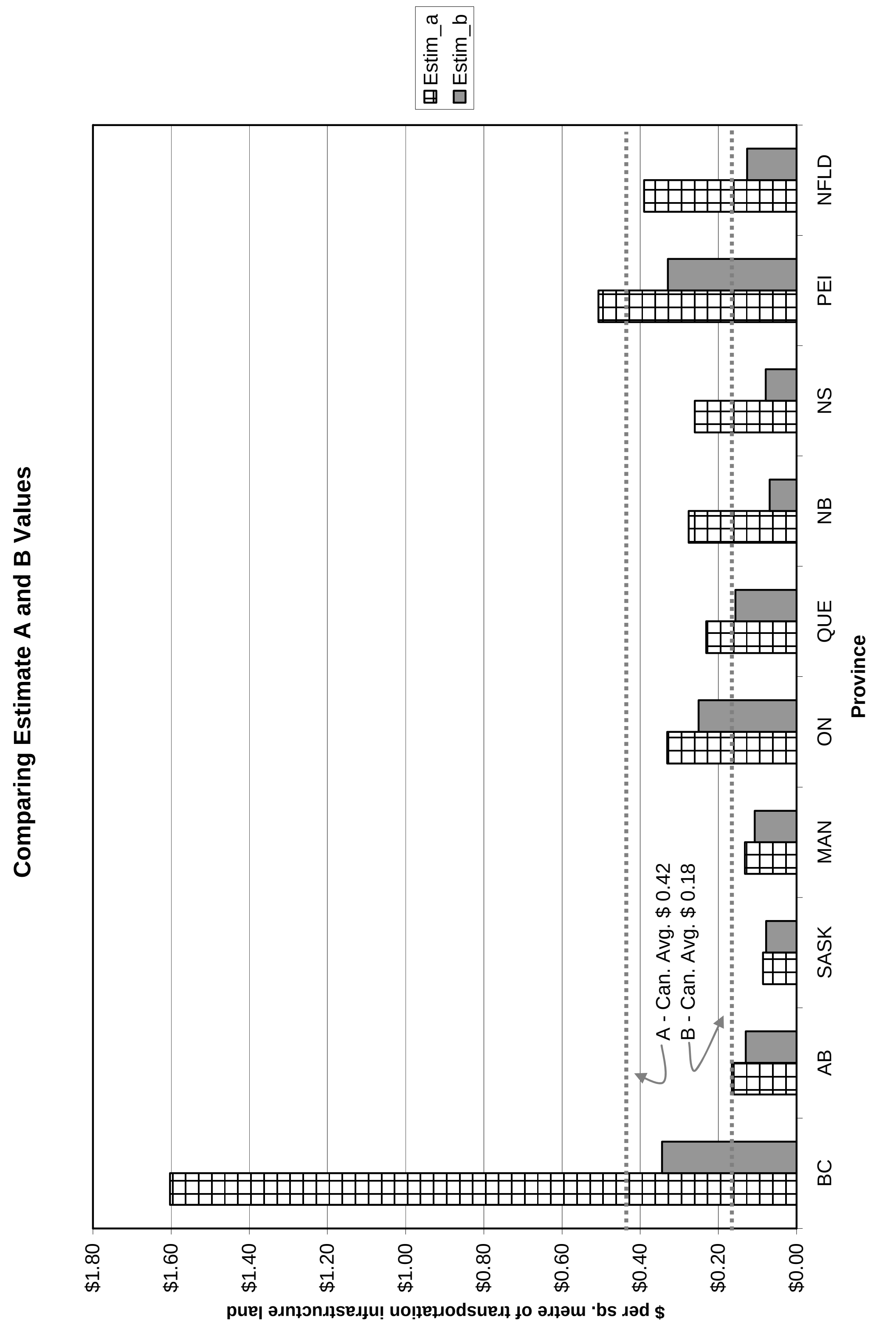

Comparing Estimate A and B Values
Estim_a
Estim_b
$ per sq. metre of transportation infrastructure land
$1.80
$1.60
$1.40
$1.20
$1.00
$0.80
$0.60
$0.40
$0.20
$0.00
A - Can. Avg. $ 0.42
B - Can. Avg. $ 0.18
BC
AB
SASK
MAN
ON
QUE
NB
NS
PEI
NFLD
Province

Table: 2 Proportion Forested Land by Census Division: Canadian Comparison

	BC	AB	SASK	MAN	ON
Mean	0.822	0.391	0.177	0.413	0.500
Standard Error	0.024	0.092	0.068	0.072	0.048
Median	0.870	0.195	0.014	0.230	0.407
Standard Deviation	0.153	0.403	0.289	0.354	0.404
Minimum	0.494	0	0.000	0.000	0
Maximum	1	1.000	1.000	1	1
Count	42	19	18	24	72

	QUE	NB	NS	PEI	NFLD
Mean	0.627	0.854	0.810	0.409	0.747
Standard Error	0.033	0.063	0.056	0.143	0.093
Median	0.711	0.932	0.864	0.383	0.839
Standard Deviation	0.336	0.243	0.236	0.247	0.293
Minimum	0.000	0.000	0.000	0.176	0.000
Maximum	1	0.992	0.981	0.668	0.968
Count	104	15	18	3	10

	CAN
Mean	0.592
Standard Error	0.020
Median	0.723
Standard Deviation	0.368
Minimum	0.000
Maximum	1.000
Count	325

Table: 3 Final Agriculture Land Values: Canadian Comparison

	BC	AB	SASK	MAN	ON
Mean	$1.59	$0.16	$0.08	$0.13	$0.32
Standard Error	0.348	0.018	0.006	0.015	0.044
Median	$0.40	$0.17	$0.09	$0.13	$0.19
Standard Deviation	$2.26	$0.08	$0.02	$0.07	$0.38
Minimum	$0.00	$0.00	$0.00	$0.00	$0.00
Maximum	$11.06	$0.30	$0.12	$0.25	$1.42
Count	42	19	18	24	72

	QUE	NB	NS	PEI	NFLD
Mean	$0.22	$0.28	$0.26	$0.51	$0.39
Standard Error	0.022	0.018	0.034	0.058	0.000
Median	$0.18	$0.29	$0.21	$0.56	$0.39
Standard Deviation	$0.23	$0.07	$0.14	$0.10	$0.00
Minimum	$0.00	$0.18	$0.00	$0.39	$0.39
Maximum	$0.99	$0.37	$0.51	$0.57	$0.39
Count	104	15	18	3	10

	CAN
Mean	$0.42
Standard Error	0.053
Median	$0.18
Standard Deviation	$0.95
Minimum	$0.00
Maximum	$11.06
Count	325

Appendix B: Provincial Scale Analysis Summary (Group 2: Urban Areas (non-CMA)

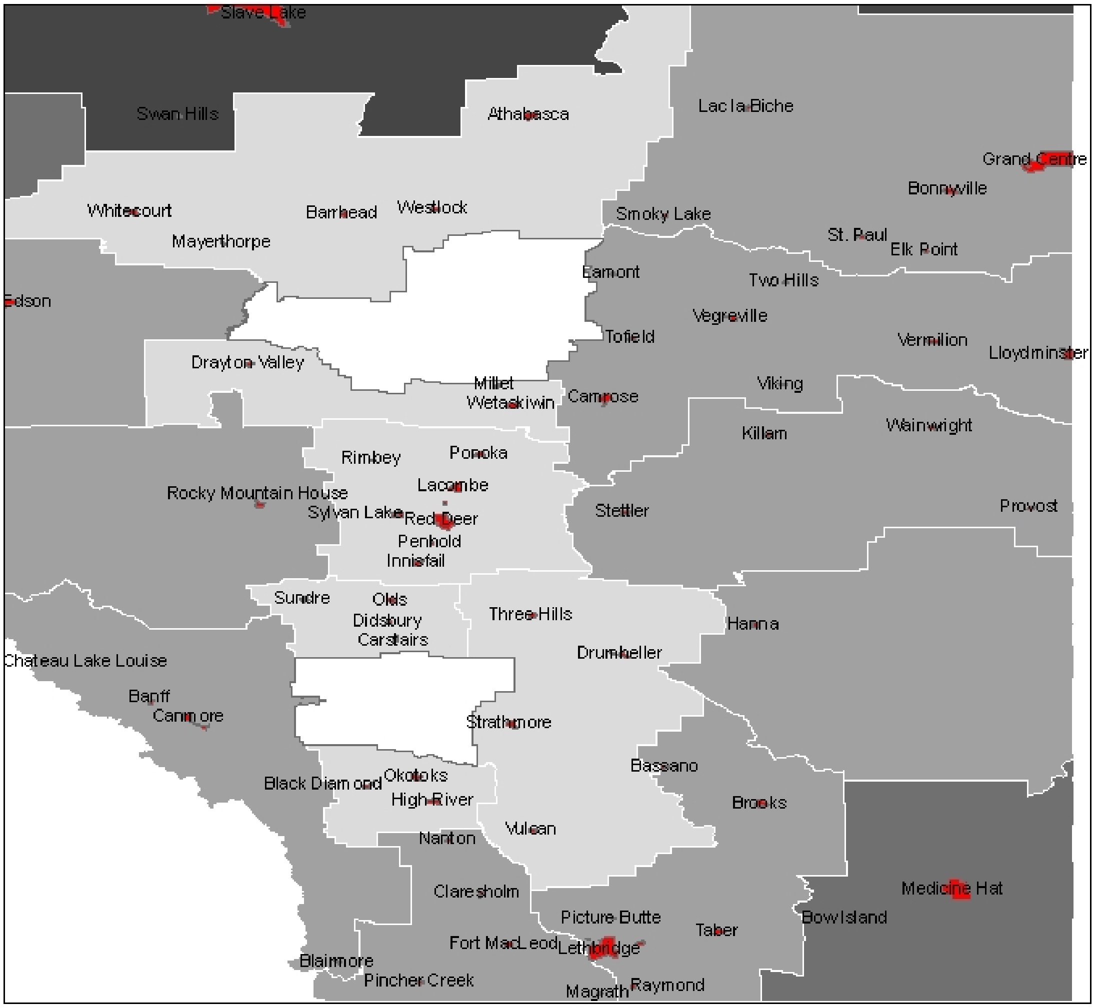
The following series of charts and tables presents a summary related to the estimation work carried out for the Provincial Scale of analysis (Urban – UA's).

For each Province (outside of Ontario and BC which are reported in the draft final report), a summary table and map of Urban Areas (a selection to provide an visual of the scale of analysis) is provided. The values provided are in year 2000 dollars per sq. metre. Important considerations include a) the relatively small sample size on which the values of industrial and commercial land are based and b) the lack of data reporting for some classes of UA – Native reserves for example. The small sample size led to interpolation for some of the distance band classes in a province – this was particularly true in those Provinces with generally lower levels of economic activity in outlying areas.

Table A : Alberta Urban Areas (UA) Summary of Data Estimates

	Avgdwl_AWM	F_IND_VAL	F_COM_VAL	avdw2000	RESVAL	estim1	e4frway	e4arterial
Mean	$114,233.87	$19.66	$46.44	$111,387.81	$46.41	$46.41	$40.37	$38.43
Standard Error	4472.08	0.40	2.76	4360.65	1.81	1.81	1.17	1.38
Median	$107,419.00	$18.00	$45.00	$104,743.00	$44.00	$44.00	$38.00	$36.00
Standard Deviation	42660.88	3.77	26.35	41597.97	17.30	17.30	11.18	13.19
Minimum	$46,796.00	$17.00	$16.00	$45,630.00	$19.00	$19.00	$23.00	$20.00
Maximum	$372,859.73	$27.00	$74.00	$363,570.00	$151.00	$151.00	$82.00	$73.00
Count	91	91	91	91	91	91	91	91

	e4collec	e4local	e4railm	e4railb	e4railter	e4marip	e4marit	e4air
Mean	$57.71	$43.74	$41.08	$41.08	$30.36	$33.09	$33.14	$30.45
Standard Error	1.87	1.48	1.20	1.20	0.60	1.04	1.29	0.77
Median	$57.00	$40.00	$40.00	$40.00	$31.00	$33.00	$34.00	$31.00
Standard Deviation	17.87	14.09	11.49	11.49	5.75	9.90	12.35	7.37
Minimum	$24.00	$20.00	$20.00	$20.00	$20.00	$21.00	$20.00	$20.00
Maximum	$145.00	$130.00	$109.00	$109.00	$56.00	$54.00	$46.00	$48.00
Count	91	91	91	91	91	91	91	91



Alberta: Selected
Urban Areas (UA)

Greyscale indicates distance band (by Census Division)
White area indicates CMA

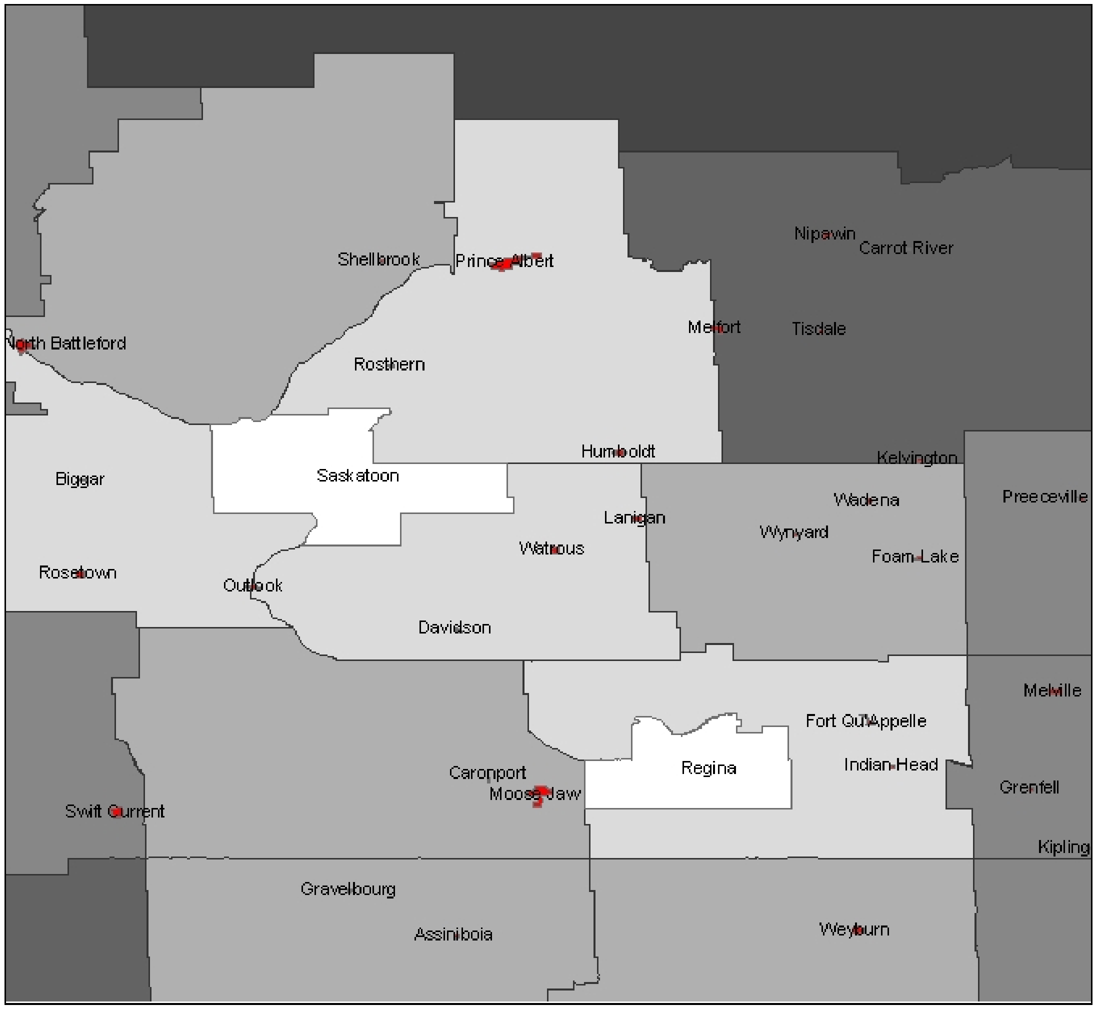
0 35 70 140 210 280 350 km

Source: Spatial Files Census of Canada 2001 unless specified

Table B : Saskatchewan Urban Areas (UA) Summary of Data Estimates

	Avgdwl_AWM	F_IND_VAL	F_COM_VAL	avdw2000	RESVAL	estim1	e4frway	e4arterial
Mean	$71,816.53	$16.00	$24.60	$69,612.79	$28.95	$28.95	$24.96	$22.89
Standard Error	2127.87	1.30	2.00	2062.57	0.86	0.86	1.32	1.38
Median	$71,963.02	$12.00	$18.00	$69,755.00	$29.00	$29.00	$21.00	$18.00
Standard Deviation	16065.04	9.81	15.13	15572.04	6.48	6.48	9.97	10.42
Minimum	$38,751.10	$9.00	$13.00	$37,562.00	$16.00	$16.00	$16.00	$15.00
Maximum	$110,991.02	$37.00	$57.00	$107,585.00	$45.00	$45.00	$48.00	$47.00
Count	57	57	57	57	57	57	57	57

	e4collec	e4local	e4railm	e4railb	e4railter	e4marip	e4marit	e4air
Mean	$34.18	$27.21	$25.53	$25.53	$20.26	$20.79	$20.40	$19.93
Standard Error	1.22	0.72	0.79	0.79	1.17	1.45	1.65	1.37
Median	$32.00	$27.00	$25.00	$25.00	$17.00	$16.00	$15.00	$16.00
Standard Deviation	9.22	5.47	5.93	5.93	8.85	10.91	12.43	10.37
Minimum	$21.00	$16.00	$16.00	$16.00	$13.00	$13.00	$11.00	$13.00
Maximum	$57.00	$39.00	$40.00	$40.00	$41.00	$45.00	$47.00	$43.00
Count	57	57	57	57	57	57	57	57



Saskatchewan: Selected Urban Areas (UA)

Greyscale indicates distance band (by Census Division)
White area indicates CMA

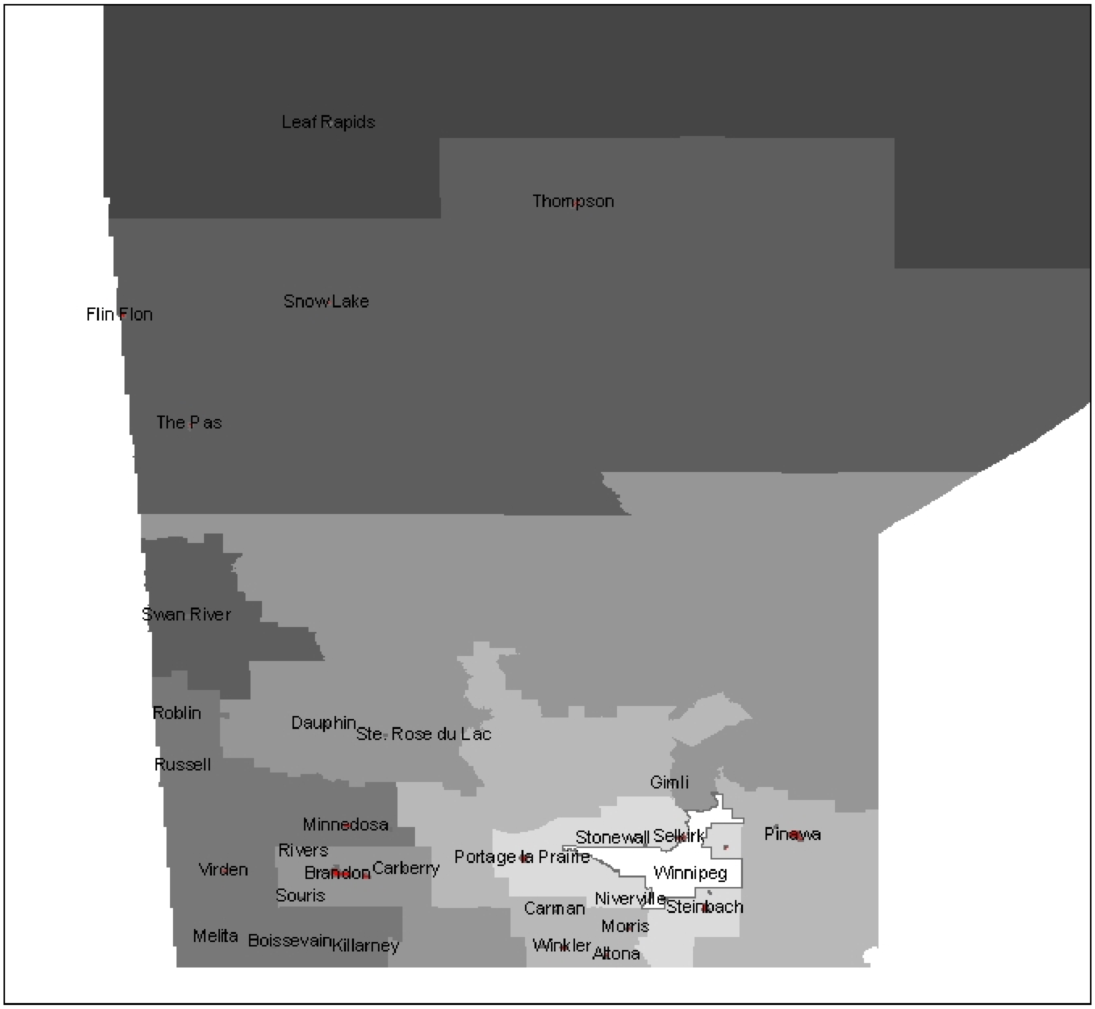
km: 0 30 60 120 180 240 300

Source: Spatial Files Census of Canada 2001 unless specified

Table C : Manitoba Urban Areas (UA) Summary of Data Estimates

	Avgdwl_AWM	F_IND_VAL	F_COM_VAL	avdw2000	RESVAL	estim1	e4frway	e4arterial
Mean	$84,649.84	$2.77	$4.57	$83,623.30	$34.84	$34.84	$13.39	$10.09
Standard Error	3268.81	0.27	0.37	3229.17	1.35	1.35	0.49	0.39
Median	$87,017.00	$2.22	$3.41	$85,961.76	$35.82	$35.82	$13.50	$9.87
Standard Deviation	20930.59	1.73	2.38	20676.77	8.62	8.62	3.15	2.49
Minimum	$30,079.00	$0.41	$3.03	$29,714.24	$12.38	$12.38	$5.09	$4.11
Maximum	$120,122.50	$6.06	$9.32	$118,665.79	$49.44	$49.44	$18.57	$14.75
Count	41	41	41	41	41	41	41	41

	e4collec	e4local	e4railm	e4railb	e4railter	e4marip	e4marit	e4air
Mean	$26.95	$28.61	$22.37	$22.37	$9.54	$6.70	$3.67	$6.52
Standard Error	0.97	1.08	0.83	0.83	0.37	0.32	0.32	0.31
Median	$27.30	$29.06	$22.88	$22.88	$9.50	$6.10	$2.82	$5.98
Standard Deviation	6.24	6.93	5.29	5.29	2.39	2.06	2.04	2.01
Minimum	$10.22	$10.25	$8.12	$8.12	$3.33	$2.66	$1.72	$2.39
Maximum	$36.54	$40.12	$30.79	$30.79	$13.78	$10.90	$7.69	$10.57
Count	41	41	41	41	41	41	41	41



Manitoba: Selected Urban Areas (UA)

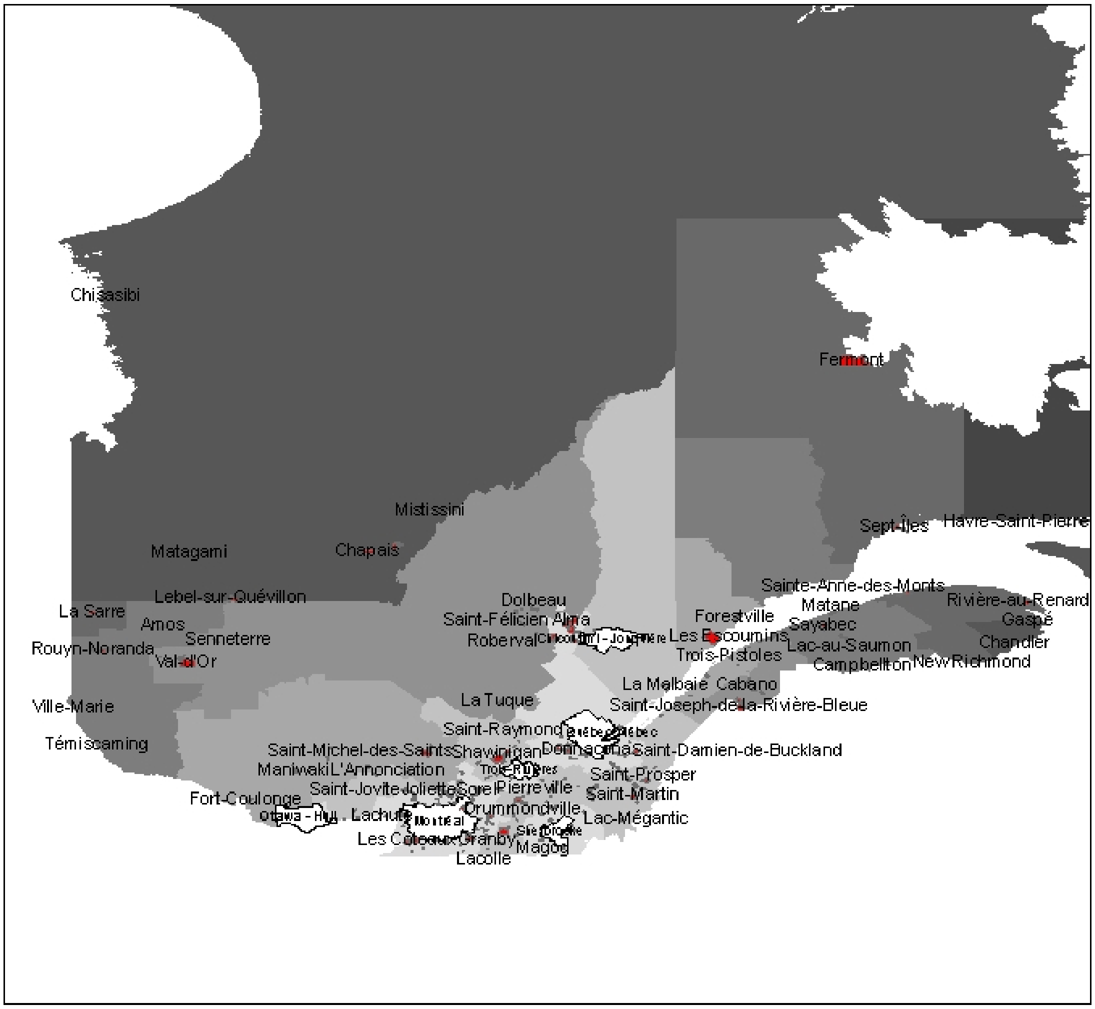
Greyscale indicates distance band (by Census Division)
White area indicates CMA

Source: Spatial Files Census of Canada 2001 unless specified

Table D :Quebec Urban Areas (UA) Summary of Data Estimates

	Avgdwl_AWM	F_IND_VAL	F_COM_VAL	avdw2000	RESVAL	estim1	e4frway	e4arterial
Mean	$77,530.52	$13.14	$24.22	$73,559.96	$30.65	$30.65	$24.14	$22.18
Standard Error	1400.16	0.60	0.41	1328.45	0.55	0.55	0.39	0.36
Median	$77,720.99	$13.49	$27.00	$73,740.67	$30.73	$30.73	$25.33	$23.69
Standard Deviation	20434.62	8.82	6.05	19388.10	8.08	8.08	5.70	5.29
Minimum	$0.00	$1.93	$10.08	$0.00	$0.00	$0.00	$9.94	$10.06
Maximum	$148,458.95	$34.38	$33.62	$140,855.93	$58.69	$58.69	$35.78	$32.57
Count	213	213	213	213	213	213	213	213

	e4collec	e4local	e4railm	e4railb	e4railter	e4marip	e4marit	e4air
Mean	$34.88	$28.26	$25.86	$25.86	$18.86	$19.32	$18.68	$18.22
Standard Error	0.47	0.44	0.36	0.36	0.42	0.42	0.46	0.45
Median	$35.23	$28.27	$26.20	$26.20	$19.68	$20.66	$20.25	$19.31
Standard Deviation	6.79	6.47	5.31	5.31	6.09	6.20	6.75	6.53
Minimum	$8.51	$2.49	$4.97	$4.97	$7.51	$7.27	$6.19	$6.42
Maximum	$55.93	$51.00	$43.31	$43.31	$32.06	$30.49	$29.90	$30.85
Count	213	213	213	213	213	213	213	213



Quebec: Selected Urban Areas (UA)

Greyscale indicates distance band (by Census Division)
White area indicates CMA

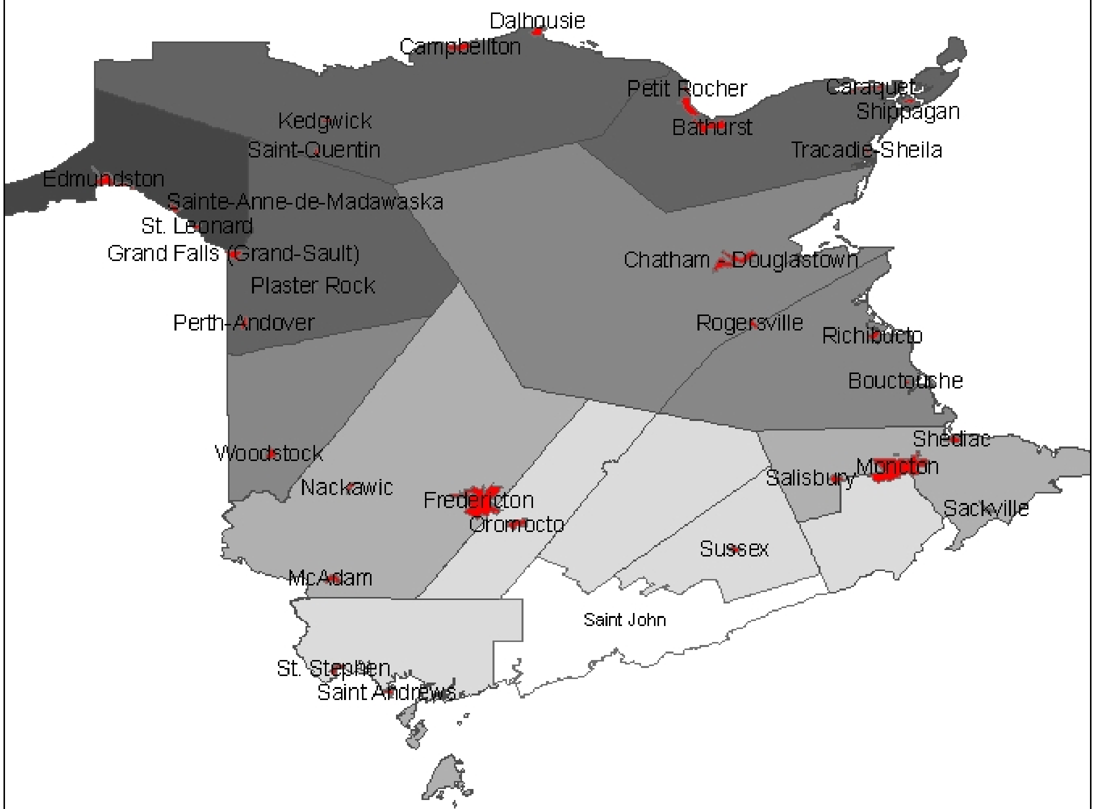
0 90 180 360 540 720 900 km

Source: Spatial Files Census of Canada 2001 unless specified

Table E : New Brunswick Urban Areas (UA) Summary of Data Estimates

	Avgdwl_AWM	F_IND_VAL	F_COM_VAL	avdw2000	RESVAL	estim1	e4frway	e4arterial
Mean	$85,113.53	$8.47	$28.76	$84,594.02	$35.25	$35.25	$25.47	$23.97
Standard Error	4232.92	0.50	3.10	4207.08	1.75	1.75	1.45	1.66
Median	$83,960.99	$8.11	$18.34	$83,448.51	$34.77	$34.77	$22.65	$19.78
Standard Deviation	23945.01	2.83	17.51	23798.86	9.92	9.92	8.21	9.37
Minimum	$39,442.01	$5.71	$9.72	$39,201.26	$16.33	$16.33	$13.66	$11.58
Maximum	$171,078.99	$11.92	$50.72	$170,034.76	$70.85	$70.85	$43.83	$41.24
Count	32	32	32	32	32	32	32	32

	e4collec	e4local	e4railm	e4railb	e4railter	e4marip	e4marit	e4air
Mean	$39.90	$31.92	$28.59	$28.59	$17.88	$19.26	$18.62	$17.24
Standard Error	2.38	1.56	1.41	1.41	0.71	1.19	1.40	0.86
Median	$34.96	$31.14	$27.05	$27.05	$17.69	$16.81	$15.13	$16.17
Standard Deviation	13.46	8.82	8.00	8.00	3.99	6.71	7.90	4.88
Minimum	$22.39	$18.71	$17.69	$17.69	$10.56	$9.46	$8.02	$9.12
Maximum	$75.53	$62.32	$53.80	$53.80	$27.74	$30.23	$28.22	$25.73
Count	32	32	32	32	32	32	32	32



New Brunswick: Selected Urban Areas (UA)

Greyscale indicates distance band (by Census Division)
White area indicates CMA

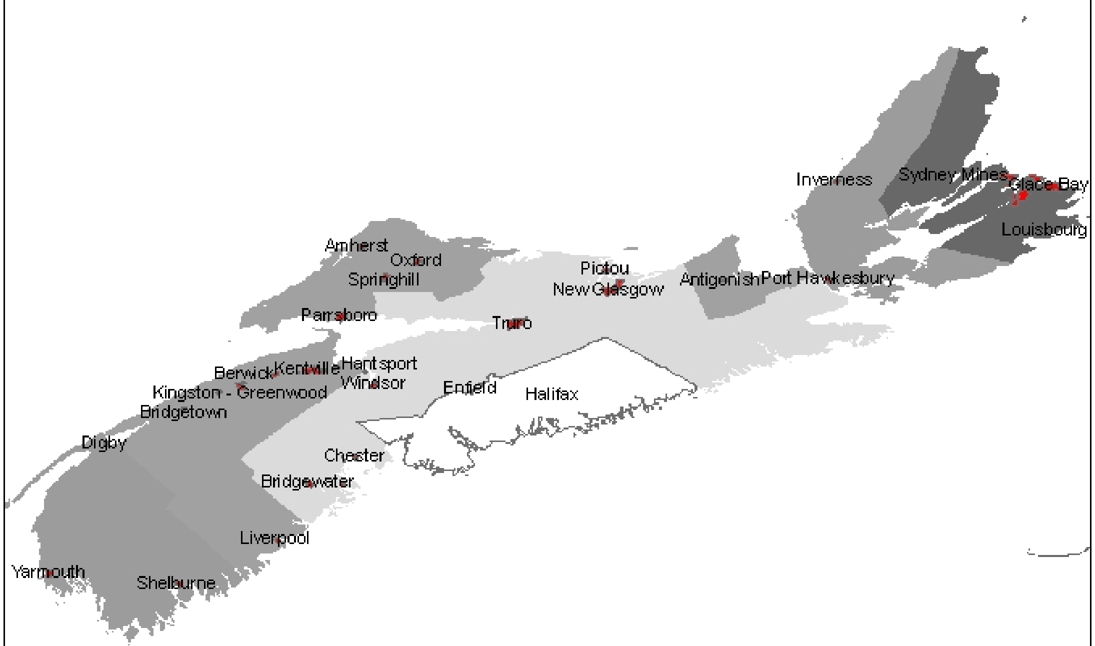
km
0 25 50 100 150 200 250

Source: Spatial Files Census of Canada 2001 unless specified

Table F : Nova Scotia Urban Areas (UA) Summary of Data Estimates

	Avgdwl_AWM	F_IND_VAL	F_COM_VAL	avdw2000	RESVAL	estim1	e4frway	e4arterial
Mean	$88,767.76	$27.56	$42.40	$86,992.40	$36.25	$36.25	$38.86	$36.72
Standard Error	3682.28	1.14	1.75	3608.63	1.50	1.50	1.30	1.30
Median	$87,134.50	$22.13	$34.04	$85,391.81	$35.58	$35.58	$38.61	$35.02
Standard Deviation	21471.18	6.64	10.21	21041.76	8.77	8.77	7.60	7.57
Minimum	$53,181.53	$20.35	$31.31	$52,117.90	$21.72	$21.72	$28.72	$27.13
Maximum	$163,568.33	$37.94	$58.36	$160,296.96	$66.79	$66.79	$49.76	$48.05
Count	34	34	34	34	34	34	34	34

	e4collec	e4local	e4railm	e4railb	e4railter	e4marip	e4marit	e4air
Mean	$49.33	$35.99	$35.74	$35.74	$32.27	$34.36	$34.98	$32.88
Standard Error	1.55	1.28	1.14	1.14	1.12	1.30	1.44	1.24
Median	$49.52	$37.60	$36.58	$36.58	$31.44	$30.36	$28.09	$29.17
Standard Deviation	9.04	7.46	6.67	6.67	6.53	7.59	8.43	7.23
Minimum	$34.44	$22.99	$24.27	$24.27	$23.84	$25.39	$25.83	$24.29
Maximum	$65.99	$59.05	$51.31	$51.31	$41.93	$46.06	$48.15	$44.02
Count	34	34	34	34	34	34	34	34



Nova Scotia: Selected Urban Areas (UA)

Greyscale indicates distance band (by Census Division)
White area indicates CMA

0 35 70 140 210 280 350 km

Source: Spatial Files Census of Canada 2001 unless specified

Table G : Prince Edward Island Urban Areas (UA) Summary of Data Estimates

	Avgdwl_AWM	F_IND_VAL	F_COM_VAL	avdw2000	RESVAL	estim1	e4frway	e4arterial
Mean	$93,471.72	$10.26	$15.78	$91,760.77	$38.23	$38.23	$21.89	$18.62
Standard Error	7132.56	3.27	5.02	7002.00	2.92	2.92	4.16	4.05
Median	$91,280.06	$8.17	$12.56	$89,609.23	$37.34	$37.34	$19.60	$16.27
Standard Deviation	17471.13	8.00	12.31	17151.33	7.15	7.15	10.19	9.92
Minimum	$72,871.21	$4.36	$6.71	$71,537.35	$29.81	$29.81	$13.37	$10.63
Maximum	$125,367.00	$26.11	$40.17	$123,072.22	$51.28	$51.28	$41.90	$38.17
Count	6	6	6	6	6	6	6	6

	e4collec	e4local	e4railm	e4railb	e4railter	e4marip	e4marit	e4air
Mean	$35.68	$33.19	$28.15	$28.15	$16.96	$15.27	$13.03	$14.72
Standard Error	4.82	3.13	3.37	3.37	3.53	3.92	4.14	3.75
Median	$33.49	$32.20	$26.77	$26.77	$14.95	$12.88	$10.37	$12.44
Standard Deviation	11.82	7.67	8.25	8.25	8.63	9.60	10.15	9.18
Minimum	$24.66	$24.96	$20.10	$20.10	$9.92	$7.85	$5.54	$7.61
Maximum	$58.59	$47.65	$44.02	$44.02	$33.96	$34.25	$33.14	$32.85
Count	6	6	6	6	6	6	6	6

Prince Edward Island: Selected Urban Areas (UA)

Greyscale indicates distance band (by Census Division)
White area indicates CMA

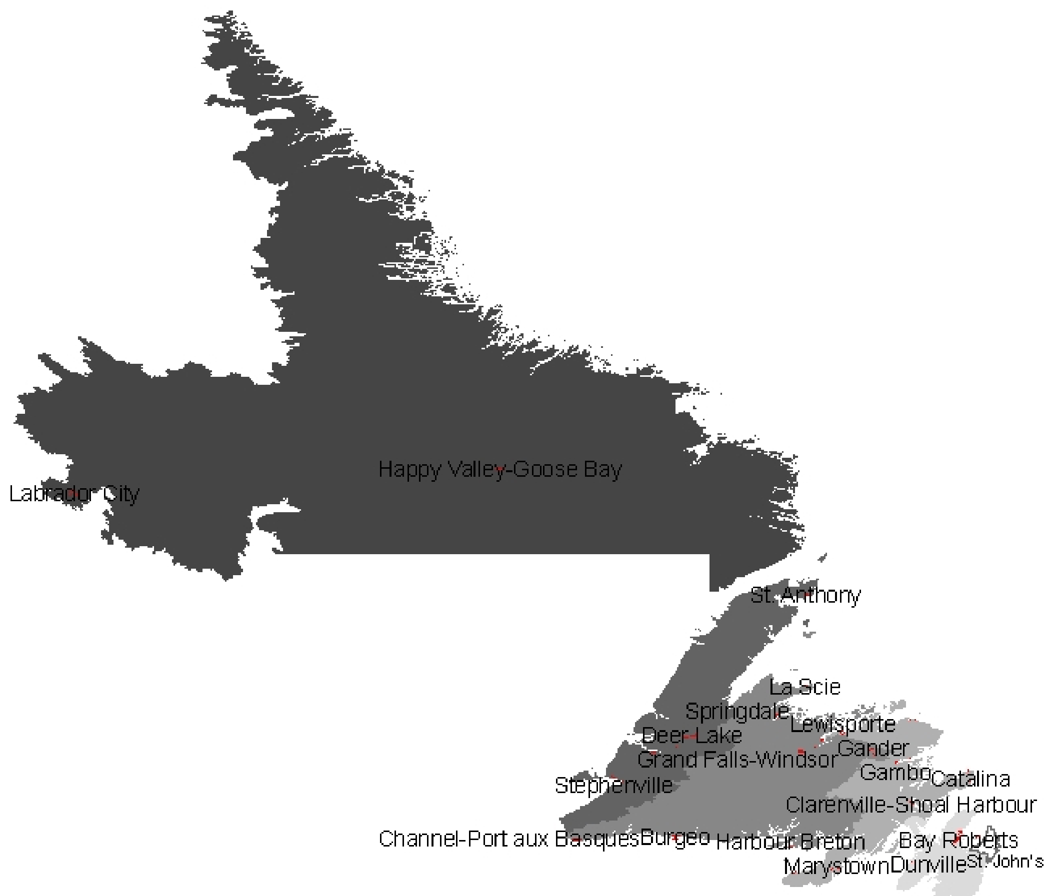
0 12.5 25 50 75 100 125 km

Source: Spatial Files Census of Canada 2001 unless specified

Table H : Newfoundland and Labrador Urban Areas (UA) Summary of Data Estimates

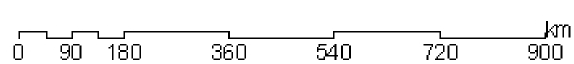
	Avgdwl_AWM	F_IND_VAL	F_COM_VAL	avdw2000	RESVAL	estim1	e4frway	e4arterial
Mean	$64,715.42	$8.38	$12.89	$63,165.72	$26.32	$26.32	$16.40	$14.22
Standard Error	3551.84	0.78	1.19	3466.78	1.44	1.44	0.76	0.78
Median	$65,330.85	$6.50	$10.00	$63,766.41	$26.57	$26.57	$15.26	$13.30
Standard Deviation	20092.22	4.39	6.75	19611.08	8.17	8.17	4.30	4.42
Minimum	$34,476.00	$2.55	$3.93	$33,650.43	$14.02	$14.02	$10.06	$8.08
Maximum	$112,683.97	$16.54	$25.44	$109,985.60	$45.83	$45.83	$25.62	$23.57
Count	32	32	32	32	32	32	32	32

	e4collec	e4local	e4railm	e4railb	e4railter	e4marip	e4marit	e4air
Mean	$25.71	$23.18	$20.05	$20.05	$12.87	$11.98	$10.63	$11.53
Standard Error	1.01	1.10	0.82	0.82	0.67	0.83	0.99	0.79
Median	$24.56	$22.65	$19.48	$19.48	$11.94	$10.43	$8.25	$10.08
Standard Deviation	5.70	6.25	4.65	4.65	3.77	4.69	5.57	4.45
Minimum	$17.35	$13.85	$13.68	$13.68	$7.64	$5.52	$3.24	$5.39
Maximum	$37.73	$38.31	$30.80	$30.80	$20.90	$21.39	$20.99	$20.50
Count	32	32	32	32	32	32	32	32



Newfoundland and Labrador: Selected Urban Areas (UA)

Greyscale indicates distance band (by Census Division)
White area indicates CMA



Source: Spatial Files Census of Canada 2001 unless specified

Table I: Urban Areas Sampled in Each Province

British Columbia	Alberta	Manitoba	Saskatchewan	Ontario	Quebec	New Brunswick	Newfoundland	Nova Scotia	P.E.I.
100 Mile House	Drumheller	Brandon	Melfort	Barrie	Acton Vale	Campbellton	Bay Roberts	Amherst	Charlottetown
Chase	Grand Cache	Morris	Moosejaw	Brantford	Alma	Chatham-Douglas Town	Carbonear	Bridgewater	Kensington
Chetwynd	Grand Centre	Portage La Prairie	Prince Albert	Collingwood	Amos	Fredericton	Corner Brook	Chester	Sherwood
Chilliwack	Grande Prairie	Steinbach	Swift Current	Erin	Asbestos	Moncton	Dunville	Digby	Stratford
Cranbrook	High Level	Virden		Essex	Baie-Comeau	Shediac		Glace Bay	
Dawson Creek	Lethbridge			Goderich	Bonaventure	Woodstock		Hantsport	
Duncan	Medicine Hat			Guelph	Chute-aux-Outardes			Inverness	
Fort Nelson	Red Deer			Leamington	Donnacona			Kingston-Greenwood	
Fort St. James	Rocky Mountain House			Midland	Granby			Liverpool	
Fort St. John				North Bay	Huntingdon			New Glasgow	
Gibsons				Orillia	La Sarre			New Waterford	
Golden				Parry Sound	La Tuque			Port Hawkesbury	
Grand Forks				Pembroke	Labelle			Shelburne	
Invermere				Peterborough	Lachute			Truro	
Kamloops				Shelburne	Lacolle			Wolfville	
Kelowna				Stratford	L'Annonciation			Yarmouth	
Kitimat				Wasaga Beach	Louiseville				
NAKUSP				Wellesley	Magog				
Nanaimo					Malartic				
Pemberton					Maskinongé				
Penticton					Matane				
Prince George					Montmagny				
Princeton					Nicolet				
Quesnel					Port-Cartier				
Revelstoke					Portneuf				
Terrace					Rimouski				
Vernon					Roberval				
Whistler					Rouyn-Noranda				
					Saint-Apollinaire				
					Saint-Bruno				
					Sainte-Adèle				
					Sainte-Agathe-des-Monts				
					Sainte-Anne-des-Monts				
					Sainte-Marie				
					Saint-Éphrem-de-Tring				
					Saint-Félix-de-Valois				
					Saint-Jean-Port-Joli				
					Saint-Jean-sur-Richelieu				
					Saint-Marc-des-Carrières				
					Saint-Michel-des-Saints				
					Saint-Raphaël				
					Salaberry-de-Valleyfield				
					Sept-Îles				
					Shawinigan				
					Thetford Mines				
					Val-d'Or				
					Yamachiche				

Appendix C: CMA Scale Analysis Summary

The following series of charts and tables presents a summary related to the estimation work carried out for the Group 1 Analysis: Major Urban Areas (CMAs).

The results are presented for all CMAs, with the exception of Toronto and Vancouver which are presented in the body of the main report. These statistical summaries are generated by first estimating a number of the key variables (as described in Table C-0), and then calculating the summary statistics across all Census Tracts (CTs) within each CMA.

They are presented alphabetically within each province, beginning in British Columbia and moving east.

Table: C-0 CMA Variable Key

Variable	Description	Notes
AVGLOT	Average Lot Size established by averaging within distance bands	Lot Sizes Sampled from MLS system
Landprop	Proportion of Housing Price related to land value	NHPI CMA specific ratios for fringe develeopments a startingpoint
AVGDWL2001	2001 Census Variable "Average Dwelling Price"	
F_IND_VAL	Industrial Land Value averaged across distance band based sampling	
F_COMVAL	Commercial Land Value averaged across distance band based sampling	
INDPROP	proportion of industrial land within CT	
COMPROP	proportion of commercial land within CT	
RESPROP	proportion of residential land within CT	
avdw2000	AVGDWL2001adjusted to 2000 values	based on NHPI adjustment factors
RESVAL	per sq. metre estimate of residential land value	derived from avdw2000 and Avglot, Landprop in each CT
estim1	repeat of RESVAL	represents a "base case" of land values
estim2	general estimate based on average CMA land use proportions	
estim3	general estimate based on actual CT land use proportions	
e4frway	freeway	
e4arterial	arterial	
e4collec	collector	
e4local	local	
e4railm	Rail Mainline	estimate of infrastructure land value based on proportions of industrial, commercial, residential land use which vary based on infrastructure type
e4railb	Rail Branchline	
e4railter	Rail Terminal	
e4marip	Marine Port	
e4marit	Marine Terminal	
e4air	Airport	

Table C-1 : Abbotsford Summary of Data Estimates

	AVGLOT	Landprop	AVGDWL2001	F_IND_VAL	F_COMVAL	INDPROP	COMPROP	RESPROP	avdw2000	RESVAL
Mean	10,826.34	0.357	$193,566.71	$182.99	$247.13	0.059	0.004	0.937	$191,645.99	$63.78
Standard Error	2,532.42	0.016	14311.76	17.43	23.51	0.020	0.002	0.021	14169.75	9.91
Median	665.90	0.375	$187,736.00	$112.52	$151.91	0.008	0.000	0.991	$185,873.13	$77.81
Standard Deviation	14,982.01	0.093	84669.54	103.11	139.10	0.121	0.012	0.124	83829.38	58.61
Minimum	613.10	0.25	$0.00	$80.60	$109.10	0	0	0.335	$0.00	$0.00
Maximum	33,448.90	0.5	$373,838.00	$346.93	$468.35	0.665	0.048	1	$370,128.47	$209.52
Count	35	35	35	35	35	35	35	35	35	35

	estim1	estim2	estim3	e4frway	e4arterial	e4collec	e4local	e4railm	e4railb	e4railter
Mean	$63.78	$71.60	$71.44	$191.19	$191.22	$186.51	$94.04	$124.30	$124.30	$171.98
Standard Error	9.91	9.49	9.71	17.02	17.35	15.96	9.38	10.72	10.72	15.54
Median	$77.81	$80.23	$79.62	$140.26	$132.71	$167.69	$88.74	$121.87	$121.87	$120.89
Standard Deviation	58.61	56.16	57.47	100.69	102.66	94.40	55.50	63.45	63.45	91.95
Minimum	$0.00	$5.23	$0.64	$75.88	$78.73	$62.61	$18.97	$37.94	$37.94	$70.18
Maximum	$209.52	$203.54	$207.19	$326.95	$338.81	$326.79	$194.06	$225.58	$225.58	$302.39
Count	35	35	35	35	35	35	35	35	35	35

	e4marip	e4marit	e4air
Mean	$196.73	$215.07	$190.32
Standard Error	18.27	20.47	17.67
Median	$128.52	$132.22	$124.58
Standard Deviation	108.11	121.10	104.52
Minimum	$83.94	$94.85	$81.09
Maximum	$361.08	$407.64	$348.94
Count	35	35	35

Table C-2 : Victoria Summary of Data Estimates

	AVGLOT	Landprop	AVGDWL2001	F_IND_VAL	F_COMVAL	INDPROP	COMPROP	RESPROP	avdw2000	RESVAL
Mean	1,845.33	0.402	$243,547.14	$186.08	$619.86	0.052	0.012	0.936	$241,292.08	$101.92
Standard Error	227.53	0.008	7999.93	11.32	37.79	0.009	0.003	0.011	7925.85	7.96
Median	1,018.24	0.417	$228,289.00	$135.00	$449.00	0.017	0.001	0.978	$226,175.21	$88.70
Standard Deviation	1,996.59	0.067	70199.06	99.34	331.65	0.082	0.028	0.093	69549.07	69.84
Minimum	471.52	0.305	$130,266.00	$0.00	$0.00	0	0	0.5314066	$129,059.83	$7.04
Maximum	8,308.74	0.5	$486,274.00	$378.00	$1,258.00	0.439844	0.16847832	1	$481,771.46	$326.82
Count	77	77	77	77	77	77	77	77	77	77

	estim1	estim2	estim3	e4frway	e4arterial	e4collec	e4local	e4railm	e4railb	e4railter
Mean	$101.92	$112.31	$115.61	$352.95	$386.14	$399.88	$162.13	$222.34	$222.34	$256.00
Standard Error	7.96	8.25	9.23	21.51	23.52	24.54	10.59	13.80	13.80	15.58
Median	$88.70	$103.20	$109.36	$266.41	$284.37	$314.55	$146.58	$182.42	$182.42	$189.14
Standard Deviation	69.84	72.41	80.96	188.74	206.41	215.36	92.91	121.09	121.09	136.72
Minimum	$7.04	$15.95	$7.16	$5.93	$3.95	$13.83	$15.80	$11.85	$11.85	$3.95
Maximum	$326.82	$340.26	$367.60	$752.44	$807.76	$895.57	$425.05	$523.29	$523.29	$543.76
Count	77	77	77	77	77	77	77	77	77	77

	e4marip	e4marit	e4air
Mean	$351.17	$402.97	$307.80
Standard Error	21.38	24.55	18.73
Median	$254.18	$292.00	$222.78
Standard Deviation	187.62	215.43	164.38
Minimum	$1.98	$0.00	$1.98
Maximum	$724.88	$818.00	$636.88
Count	77	77	77

Table C-3 : Calgary Summary of Data Estimates

	AVGLOT	Landprop	AVGDWL2001	F_IND_VAL	F_COMVAL	INDPROP	COMPROP	RESPROP	avdw2000	RESVAL
Mean	487.77	0.332	$194,667.29	$166.04	$255.45	0.069	0.011	0.920	$189,250.75	$130.35
Standard Error	3.65	0.004	4565.43	8.15	12.53	0.008	0.003	0.009	4438.40	3.99
Median	481.40	0.327	$184,827.00	$119.53	$183.89	0.022	0.000	0.971	$179,684.26	$118.62
Standard Deviation	50.67	0.058	63424.96	113.19	174.13	0.118	0.037	0.123	61660.18	55.45
Minimum	417.10	0.284	$0.00	$22.83	$35.13	0	0	0.212	$0.00	$0.00
Maximum	600.00	0.5	$517,301.00	$530.08	$815.50	0.785	0.277	1	$502,907.30	$551.02
Count	193	193	193	193	193	193	193	193	193	193

	estim1	estim2	estim3	e4frway	e4arterial	e4collec	e4local	e4railm	e4railb	e4railter
Mean	$130.35	$134.17	$138.39	$207.70	$203.61	$235.57	$146.43	$162.51	$162.51	$176.78
Standard Error	3.99	4.09	4.64	8.97	9.16	8.89	4.64	5.78	5.78	7.85
Median	$118.62	$121.29	$122.36	$158.85	$154.69	$193.62	$131.36	$137.59	$137.59	$134.49
Standard Deviation	55.45	56.77	64.52	124.56	127.26	123.45	64.39	80.24	80.24	109.03
Minimum	$0.00	$1.96	$0.00	$23.18	$24.41	$19.85	$5.80	$11.59	$11.59	$20.72
Maximum	$551.02	$549.65	$549.47	$670.42	$642.10	$818.12	$567.09	$583.17	$583.17	$561.74
Count	193	193	193	193	193	193	193	193	193	193

	e4marip	e4marit	e4air
Mean	$198.24	$210.75	$189.29
Standard Error	9.31	10.34	8.87
Median	$151.25	$151.71	$144.38
Standard Deviation	129.28	143.66	123.19
Minimum	$25.47	$28.98	$24.24
Maximum	$614.43	$672.79	$585.89
Count	193	193	193

Table C-4 : Edmonton Summary of Data Estimates

	AVGLOT	Landprop	AVGDWL2001	F_IND_VAL	F_COMVAL	INDPROP	COMPROP	RESPROP	avdw2000	RESVAL
Mean	589.21	0.341	$131,025.12	$59.48	$91.51	0.085	0.011	0.903	$129,114.09	$74.88
Standard Error	4.39	0.005	3443.71	2.01	3.10	0.013	0.002	0.013	3393.48	2.30
Median	613.10	0.344	$127,772.00	$64.92	$99.88	0.015	0.002	0.978	$125,908.42	$71.50
Standard Deviation	63.82	0.065	50022.73	29.26	45.02	0.187	0.026	0.193	49293.14	33.36
Minimum	383.60	0.266	$0.00	$9.63	$14.81	0	0	0.016	$0.00	$0.00
Maximum	700.00	0.5	$286,901.00	$185.94	$286.07	0.957	0.166	1	$282,716.48	$217.16
Count	211	211	211	211	211	211	211	211	211	211

	estim1	estim2	estim3	e4frway	e4arterial	e4collec	e4local	e4railm	e4railb	e4railter
Mean	$74.88	$73.75	$77.48	$82.86	$78.57	$104.12	$75.00	$75.13	$75.13	$68.96
Standard Error	2.30	2.16	1.96	2.39	2.36	2.78	2.08	2.00	2.00	2.04
Median	$71.50	$70.83	$71.69	$84.91	$81.74	$106.48	$74.38	$76.38	$76.38	$71.25
Standard Deviation	33.36	31.37	28.46	34.68	34.32	40.38	30.23	29.00	29.00	29.68
Minimum	$0.00	$5.64	$5.97	$21.47	$18.09	$29.64	$11.96	$18.37	$18.37	$16.53
Maximum	$217.16	$215.27	$215.19	$253.95	$242.25	$313.64	$220.93	$224.70	$224.70	$212.21
Count	211	211	211	211	211	211	211	211	211	211

	e4marip	e4marit	e4air
Mean	$73.83	$75.49	$70.63
Standard Error	2.34	2.56	2.23
Median	$78.30	$82.40	$74.80
Standard Deviation	34.01	37.14	32.45
Minimum	$14.64	$12.22	$14.12
Maximum	$229.11	$236.01	$219.10
Count	211	211	211

Table C-5 : Regina Summary of Data Estimates

	AVGLOT	Landprop	AVGDWL2001	F_IND_VAL	F_COMVAL	INDPROP	COMPROP	RESPROP	avdw2000	RESVAL
Mean	484.02	0.349	$99,166.70	$30.67	$47.19	0.071	0.023	0.906	$96,296.08	$66.21
Standard Error	4.41	0.012	5024.44	0.80	1.24	0.018	0.007	0.020	4879.00	3.17
Median	507.50	0.360	$94,898.50	$32.41	$49.86	0.030	0.003	0.959	$92,151.44	$62.37
Standard Deviation	31.17	0.087	35528.18	5.68	8.74	0.126	0.049	0.139	34499.73	22.41
Minimum	426.80	0.221	$0.00	$15.84	$24.37	0	0	0.35	$0.00	$0.00
Maximum	508.40	0.5	$189,715.00	$36.55	$56.24	0.626	0.241	1	$184,223.25	$114.09
Count	50	50	50	50	50	50	50	50	50	50

	estim1	estim2	estim3	e4frway	e4arterial	e4collec	e4local	e4railm	e4railb	e4railter
Mean	$66.21	$63.25	$64.06	$51.01	$46.04	$73.01	$60.76	$55.30	$55.30	$41.08
Standard Error	3.17	2.89	2.86	1.35	1.15	2.43	2.58	2.01	2.01	1.04
Median	$62.37	$60.17	$61.30	$50.80	$47.22	$71.89	$58.65	$54.68	$54.68	$41.65
Standard Deviation	22.41	20.41	20.24	9.56	8.12	17.21	18.22	14.21	14.21	7.37
Minimum	$0.00	$3.89	$17.55	$26.03	$23.57	$31.78	$9.28	$18.56	$18.56	$21.01
Maximum	$114.09	$106.37	$113.49	$70.83	$61.56	$110.44	$99.18	$85.99	$85.99	$55.65
Count	50	50	50	50	50	50	50	50	50	50

	e4marip	e4marit	e4air
Mean	$40.83	$38.93	$39.18
Standard Error	1.00	1.02	0.96
Median	$41.97	$41.14	$40.23
Standard Deviation	7.06	7.21	6.77
Minimum	$20.98	$20.11	$20.13
Maximum	$52.01	$46.40	$50.04
Count	50	50	50

Table C-6 : Saskatoon Summary of Data Estimates

	AVGLOT	Landprop	AVGDWL2001	F_IND_VAL	F_COMVAL	INDPROP	COMPROP	RESPROP	avdw2000	RESVAL
Mean	526.56	0.323	$120,743.76	$71.57	$110.11	0.035	0.012	0.953	$116,984.34	$73.74
Standard Error	11.89	0.013	5002.83	6.81	10.48	0.006	0.004	0.008	4847.06	4.46
Median	485.10	0.294	$121,981.00	$58.71	$90.33	0.015	0.000	0.974	$118,183.06	$72.30
Standard Deviation	84.94	0.094	35727.33	48.65	74.84	0.045	0.032	0.056	34614.94	31.88
Minimum	458.10	0.226	$0.00	$0.57	$0.88	0	0	0.797	$0.00	$0.00
Maximum	729.90	0.5	$230,048.00	$153.24	$235.75	0.195	0.159	1	$222,885.33	$161.07
Count	51	51	51	51	51	51	51	51	51	51

	estim1	estim2	estim3	e4frway	e4arterial	e4collec	e4local	e4railm	e4railb	e4railter
Mean	$73.74	$74.09	$74.03	$94.79	$91.28	$113.83	$77.16	$80.58	$80.58	$79.71
Standard Error	4.46	4.25	4.21	6.97	7.29	6.55	3.88	4.26	4.26	6.20
Median	$72.30	$73.12	$74.31	$88.17	$82.03	$113.22	$78.08	$81.08	$81.08	$72.98
Standard Deviation	31.88	30.36	30.08	49.81	52.07	46.75	27.74	30.42	30.42	44.28
Minimum	$0.00	$4.29	$2.81	$10.78	$7.62	$23.50	$18.09	$17.86	$17.86	$7.44
Maximum	$161.07	$155.40	$160.19	$181.82	$181.33	$194.38	$137.90	$130.24	$130.24	$156.57
Count	51	51	51	51	51	51	51	51	51	51

	e4marip	e4marit	e4air
Mean	$87.20	$90.84	$83.35
Standard Error	7.59	8.65	7.22
Median	$74.74	$74.52	$71.57
Standard Deviation	54.18	61.75	51.57
Minimum	$4.21	$0.73	$4.18
Maximum	$179.66	$194.50	$171.41
Count	51	51	51

Table C-7 : Winnipeg Summary of Data Estimates

	AVGLOT	Landprop	AVGDWL2001	F_IND_VAL	F_COMVAL	INDPROP	COMPROP	RESPROP	avdw2000	RESVAL
Mean	755.52	0.338	$94,988.70	$24.36	$37.48	0.086	0.016	0.898	$93,836.79	$55.86
Standard Error	40.63	0.007	2915.65	1.30	2.00	0.009	0.002	0.010	2880.29	2.77
Median	494.30	0.360	$93,384.00	$21.44	$32.99	0.050	0.004	0.938	$92,251.54	$54.68
Standard Deviation	521.90	0.093	37452.16	16.72	25.73	0.117	0.032	0.124	36997.98	35.52
Minimum	292.30	0.22	$0.00	$1.41	$2.16	0	0	0.265	$0.00	$0.00
Maximum	2,062.70	0.5	$224,061.00	$62.33	$95.89	0.677	0.175	1	$221,343.84	$162.47
Count	165	165	165	165	165	165	165	165	165	165

	estim1	estim2	estim3	e4frway	e4arterial	e4collec	e4local	e4railm	e4railb	e4railter
Mean	$55.86	$52.85	$52.64	$41.50	$37.22	$60.28	$50.88	$45.89	$45.89	$33.29
Standard Error	2.77	2.46	2.51	1.44	1.41	2.08	2.18	1.69	1.69	1.22
Median	$54.68	$51.26	$48.30	$37.16	$32.96	$57.74	$48.73	$41.94	$41.94	$29.71
Standard Deviation	35.52	31.64	32.26	18.55	18.16	26.73	28.05	21.65	21.65	15.70
Minimum	$0.00	$2.38	$4.80	$7.20	$5.35	$14.68	$5.45	$10.89	$10.89	$5.12
Maximum	$162.47	$147.91	$154.99	$105.27	$94.63	$152.14	$134.68	$115.61	$115.61	$84.57
Count	165	165	165	165	165	165	165	165	165	165

	e4marip	e4marit	e4air
Mean	$32.76	$30.93	$31.45
Standard Error	1.43	1.65	1.37
Median	$28.93	$27.22	$27.73
Standard Deviation	18.42	21.22	17.54
Minimum	$3.49	$1.79	$3.42
Maximum	$83.52	$79.11	$80.16
Count	165	165	165

Table C-8 : Greater Sudbury Summary of Data Estimates

	AVGLOT	Landprop	AVGDWL2001	F_IND_VAL	F_COMVAL	INDPROP	COMPROP	RESPROP	avdw2000	RESVAL
Mean	956.00	0.323	$115,985.88	$15.48	$23.82	0.025	0.006	0.969	$117,581.45	$50.33
Standard Error	69.39	0.013	4765.52	1.54	2.37	0.007	0.003	0.008	4831.07	5.25
Median	771.70	0.268	$111,549.50	$12.48	$19.20	0.004	0.001	0.994	$113,084.05	$41.01
Standard Deviation	449.69	0.082	30884.07	9.99	15.38	0.046	0.017	0.049	31308.93	34.01
Minimum	477.30	0.268	$0.00	$6.16	$9.48	0	0	0.792	$0.00	$0.00
Maximum	1,635.10	0.5	$195,334.00	$31.42	$48.34	0.201	0.093	1	$198,021.13	$153.88
Count	42	42	42	42	42	42	42	42	42	42

	estim1	estim2	estim3	e4frway	e4arterial	e4collec	e4local	e4railm	e4railb	e4railter
Mean	$50.33	$49.31	$48.84	$30.82	$26.62	$48.69	$44.20	$38.06	$38.06	$24.12
Standard Error	5.25	5.13	4.97	2.98	2.57	4.81	4.52	3.80	3.80	2.33
Median	$41.01	$39.96	$40.62	$22.56	$20.76	$37.31	$34.37	$29.01	$29.01	$18.40
Standard Deviation	34.01	33.24	32.18	19.30	16.63	31.19	29.28	24.65	24.65	15.07
Minimum	$0.00	$0.78	$0.16	$11.11	$9.82	$16.68	$5.84	$11.68	$11.68	$8.83
Maximum	$153.88	$150.21	$144.33	$78.07	$64.37	$135.03	$131.08	$108.28	$108.28	$59.30
Count	42	42	42	42	42	42	42	42	42	42

	e4marip	e4marit	e4air
Mean	$22.30	$19.65	$21.47
Standard Error	2.16	1.96	2.08
Median	$18.15	$15.84	$17.47
Standard Deviation	14.01	12.69	13.48
Minimum	$8.49	$7.82	$8.16
Maximum	$50.43	$39.88	$48.74
Count	42	42	42

Table C-9 : Hamilton Summary of Data Estimates

	AVGLOT	Landprop	AVGDWL2001	F_IND_VAL	F_COMVAL	INDPROP	COMPROP	RESPROP	avdw2000	RESVAL
Mean	728.87	0.393	$170,106.94	$22.89	$46.92	0.095	0.027	0.878	$165,605.93	$118.40
Standard Error	34.60	0.004	4199.64	0.58	0.75	0.011	0.004	0.012	4088.51	4.83
Median	595.90	0.352	$166,864.50	$19.38	$42.33	0.032	0.006	0.946	$162,449.29	$117.62
Standard Deviation	453.74	0.051	55077.72	7.57	9.90	0.144	0.051	0.160	53620.37	63.35
Minimum	331.10	0.352	$0.00	$10.50	$30.71	0	0	0.342	$0.00	$0.00
Maximum	1,468.40	0.5	$392,490.00	$37.14	$65.56	0.656	0.341	1	$382,104.77	$333.63
Count	172	172	172	172	172	172	172	172	172	172

	estim1	estim2	estim3	e4frway	e4arterial	e4collec	e4local	e4railm	e4railb	e4railter
Mean	$118.40	$107.37	$109.23	$63.44	$54.01	$108.63	$101.70	$85.00	$85.00	$46.80
Standard Error	4.83	4.28	4.75	1.78	1.33	3.62	3.93	3.04	3.04	1.29
Median	$117.62	$105.37	$104.27	$57.43	$48.84	$102.52	$98.76	$80.90	$80.90	$42.37
Standard Deviation	63.35	56.11	62.33	23.29	17.43	47.45	51.57	39.87	39.87	16.90
Minimum	$0.00	$4.73	$3.70	$30.89	$31.12	$33.15	$9.25	$18.49	$18.49	$24.23
Maximum	$333.63	$297.00	$315.45	$132.97	$102.17	$263.34	$275.12	$216.62	$216.62	$94.47
Count	172	172	172	172	172	172	172	172	172	172

	e4marip	e4marit	e4air
Mean	$42.05	$34.91	$39.65
Standard Error	0.93	0.67	0.91
Median	$36.40	$30.86	$34.24
Standard Deviation	12.21	8.73	12.00
Minimum	$26.04	$20.61	$24.02
Maximum	$69.07	$51.35	$66.50
Count	172	172	172

Table C-10 : Kingston Summary of Data Estimates

	AVGLOT	Landprop	AVGDWL2001	F_IND_VAL	F_COMVAL	INDPROP	COMPROP	RESPROP	avdw2000	RESVAL
Mean	1,395.77	0.318	$153,333.62	$15.79	$23.64	0.082	0.010	0.908	$148,360.64	$71.89
Standard Error	155.15	0.012	6850.07	0.91	1.34	0.034	0.003	0.035	6627.91	10.28
Median	1,562.90	0.250	$152,861.00	$13.87	$20.80	0.001	0.000	0.998	$147,903.35	$24.88
Standard Deviation	1,097.11	0.087	48437.31	6.42	9.49	0.244	0.024	0.245	46866.37	72.66
Minimum	370.20	0.25	$0.00	$5.14	$7.91	0	0	-0.6	$0.00	$0.00
Maximum	3,387.50	0.5	$264,558.00	$26.95	$40.13	1.6	0.087	1	$255,977.74	$267.09
Count	50	50	50	50	50	50	50	50	50	50

	estim1	estim2	estim3	e4frway	e4arterial	e4collec	e4local	e4railm	e4railb	e4railter
Mean	$71.89	$66.79	$63.28	$37.34	$30.93	$63.72	$61.46	$51.02	$51.02	$28.58
Standard Error	10.28	9.40	9.61	3.82	2.85	7.79	8.40	6.52	6.52	2.73
Median	$24.88	$23.93	$24.02	$21.62	$19.73	$29.20	$23.37	$21.86	$21.86	$17.65
Standard Deviation	72.66	66.43	67.95	27.00	20.12	55.12	59.36	46.09	46.09	19.31
Minimum	$0.00	$1.77	-$44.88	$10.38	$8.94	$14.37	$4.55	$9.10	$9.10	$8.11
Maximum	$267.09	$244.63	$265.62	$102.64	$77.04	$206.07	$219.30	$171.51	$171.51	$73.71
Count	50	50	50	50	50	50	50	50	50	50

	e4marip	e4marit	e4air
Mean	$24.54	$19.72	$23.75
Standard Error	1.90	1.13	1.86
Median	$17.97	$17.34	$17.27
Standard Deviation	13.43	7.96	13.14
Minimum	$7.46	$6.53	$7.18
Maximum	$53.77	$33.54	$52.45
Count	50	50	50

Table C-11 : Kitchener Summary of Data Estimates

	AVGLOT	Landprop	AVGDWL2001	F_IND_VAL	F_COMVAL	INDPROP	COMPROP	RESPROP	avdw2000	RESVAL
Mean	588.28	0.398	$166,783.01	$42.35	$57.96	0.125	0.018	0.857	$161,571.04	$114.47
Standard Error	17.15	0.008	4519.52	1.46	1.67	0.016	0.004	0.017	4378.29	4.00
Median	522.40	0.420	$156,674.00	$47.32	$58.19	0.056	0.001	0.917	$151,777.94	$119.29
Standard Deviation	163.60	0.076	43113.52	13.91	15.91	0.156	0.034	0.163	41766.22	38.14
Minimum	503.20	0.261	$0.00	$4.19	$10.18	0	0	0.059	$0.00	$0.00
Maximum	1,060.10	0.5	$324,248.00	$58.54	$72.80	0.941	0.177	1	$314,115.25	$210.96
Count	91	91	91	91	91	91	91	91	91	91

	estim1	estim2	estim3	e4frway	e4arterial	e4collec	e4local	e4railm	e4railb	e4railter
Mean	$114.47	$104.44	$106.01	$74.46	$64.58	$113.35	$101.61	$88.74	$88.74	$59.89
Standard Error	4.00	3.58	3.75	2.20	1.85	3.51	3.41	2.85	2.85	1.81
Median	$119.29	$109.49	$107.25	$81.66	$71.18	$120.02	$106.90	$94.54	$94.54	$66.37
Standard Deviation	38.14	34.11	35.78	20.96	17.67	33.45	32.56	27.16	27.16	17.29
Minimum	$0.00	$5.15	$31.76	$18.92	$15.13	$29.34	$8.57	$17.14	$17.14	$13.33
Maximum	$210.96	$188.03	$210.31	$111.34	$92.79	$188.80	$180.78	$150.60	$150.60	$85.14
Count	91	91	91	91	91	91	91	91	91	91

	e4marip	e4marit	e4air
Mean	$55.80	$50.16	$54.24
Standard Error	1.62	1.47	1.61
Median	$63.98	$58.37	$61.94
Standard Deviation	15.49	14.04	15.37
Minimum	$10.56	$7.19	$9.96
Maximum	$73.88	$60.06	$71.33
Count	91	91	91

Table C-12 : London Summary of Data Estimates

	AVGLOT	Landprop	AVGDWL2001	F_IND_VAL	F_COMVAL	INDPROP	COMPROP	RESPROP	avdw2000	RESVAL
Mean	851.18	0.335	$151,996.75	$39.82	$60.59	0.094	0.027	0.880	$148,442.10	$71.66
Standard Error	53.19	0.008	4477.72	0.81	1.47	0.013	0.006	0.015	4373.00	3.55
Median	673.40	0.312	$141,662.00	$39.17	$60.26	0.027	0.002	0.961	$138,349.04	$67.02
Standard Deviation	545.00	0.081	45882.96	8.26	15.07	0.136	0.057	0.157	44809.92	36.34
Minimum	442.00	0.249	$0.00	$26.20	$34.32	0	0	0.319	$0.00	$0.00
Maximum	2,279.40	0.5	$280,813.00	$50.56	$86.20	0.643	0.306	1	$274,245.81	$218.47
Count	105	105	105	105	105	105	105	105	105	105

	estim1	estim2	estim3	e4frway	e4arterial	e4collec	e4local	e4railm	e4railb	e4railter
Mean	$71.66	$68.38	$69.40	$61.66	$56.57	$84.44	$67.37	$63.08	$63.08	$50.34
Standard Error	3.55	3.18	3.24	1.71	1.47	2.99	2.96	2.39	2.39	1.28
Median	$67.02	$64.23	$66.65	$62.26	$58.53	$84.01	$64.14	$61.94	$61.94	$51.53
Standard Deviation	36.34	32.56	33.22	17.56	15.07	30.62	30.32	24.49	24.49	13.16
Minimum	$0.00	$6.78	$12.43	$32.19	$32.49	$31.52	$12.80	$20.62	$20.62	$28.58
Maximum	$218.47	$199.22	$217.68	$120.25	$101.96	$201.09	$188.45	$158.43	$158.43	$91.27
Count	105	105	105	105	105	105	105	105	105	105

	e4marip	e4marit	e4air
Mean	$51.31	$50.21	$49.24
Standard Error	1.21	1.14	1.14
Median	$52.24	$49.72	$50.13
Standard Deviation	12.37	11.64	11.70
Minimum	$32.06	$30.26	$31.24
Maximum	$81.61	$68.38	$78.04
Count	105	105	105

Table C-13 : Oshawa Summary of Data Estimates

	AVGLOT	Landprop	AVGDWL2001	F_IND_VAL	F_COMVAL	INDPROP	COMPROP	RESPROP	avdw2000	RESVAL
Mean	450.89	0.349	$179,710.35	$16.24	$82.27	0.056	0.019	0.926	$175,164.83	$132.05
Standard Error	2.23	0.010	4799.13	0.76	2.35	0.013	0.005	0.014	4677.74	3.48
Median	455.60	0.313	$176,269.00	$16.56	$79.87	0.010	0.001	0.981	$171,810.53	$133.97
Standard Deviation	18.37	0.080	39574.65	6.24	19.34	0.107	0.042	0.115	38573.67	28.67
Minimum	426.20	0.25	$84,861.00	$6.07	$49.89	0	0	0.449	$82,714.56	$68.08
Maximum	484.50	0.5	$261,715.00	$22.88	$104.93	0.539	0.245	1	$255,095.29	$187.95
Count	68	68	68	68	68	68	68	68	68	68

	estim1	estim2	estim3	e4frway	e4arterial	e4collec	e4local	e4railm	e4railb	e4railter
Mean	$132.05	$124.66	$125.37	$79.02	$72.42	$135.19	$115.49	$98.93	$98.93	$52.61
Standard Error	3.48	3.26	3.80	1.97	1.84	3.23	2.95	2.45	2.45	1.41
Median	$133.97	$126.03	$127.97	$82.39	$74.11	$139.76	$117.15	$100.72	$100.72	$55.12
Standard Deviation	28.67	26.91	31.33	16.28	15.16	26.60	24.31	20.23	20.23	11.62
Minimum	$68.08	$65.84	$55.93	$48.70	$45.93	$82.72	$65.68	$57.97	$57.97	$30.51
Maximum	$187.95	$176.37	$184.54	$105.10	$95.31	$180.69	$160.00	$133.51	$133.51	$70.70
Count	68	68	68	68	68	68	68	68	68	68

	e4marip	e4marit	e4air
Mean	$54.24	$49.26	$47.63
Standard Error	1.51	1.54	1.36
Median	$56.19	$48.22	$49.39
Standard Deviation	12.48	12.72	11.22
Minimum	$33.25	$28.93	$28.42
Maximum	$71.40	$63.91	$63.20
Count	68	68	68

Table C-14 : Ottawa Summary of Data Estimates

	AVGLOT	Landprop	AVGDWL2001	F_IND_VAL	F_COMVAL	INDPROP	COMPROP	RESPROP	avdw2000	RESVAL
Mean	870.24	0.278	$194,057.04	$60.36	$107.01	0.071	0.025	0.904	$171,870.16	$112.05
Standard Error	58.13	0.008	6066.70	4.87	8.88	0.008	0.004	0.010	5373.08	10.38
Median	450.70	0.198	$183,160.50	$47.13	$54.21	0.020	0.001	0.964	$162,219.45	$78.93
Standard Deviation	779.92	0.104	81393.28	65.38	119.20	0.111	0.056	0.128	72087.45	139.25
Minimum	289.80	0.198	$0.00	$13.95	$21.46	0	0	0.308	$0.00	$0.00
Maximum	2,364.80	0.5	$833,629.00	$281.58	$433.20	0.691	0.359	1	$738,318.76	$1,195.08
Count	180	180	180	180	180	180	180	180	180	180

	estim1	estim2	estim3	e4frway	e4arterial	e4collec	e4local	e4railm	e4railb	e4railter
Mean	$112.05	$108.23	$109.46	$100.56	$94.02	$137.97	$106.37	$100.70	$100.70	$80.03
Standard Error	10.38	9.73	10.03	7.75	7.31	11.22	9.24	8.24	8.24	6.04
Median	$78.93	$75.69	$77.51	$55.39	$50.75	$81.09	$70.88	$62.54	$62.54	$45.06
Standard Deviation	139.25	130.54	134.55	103.92	98.14	150.47	123.99	110.54	110.54	81.06
Minimum	$0.00	$3.97	$0.05	$26.34	$23.69	$17.04	$7.18	$14.36	$14.36	$24.12
Maximum	$1,195.08	$1,111.07	$1,145.90	$644.44	$540.09	$1,081.31	$1,027.54	$860.00	$860.00	$494.60
Count	180	180	180	180	180	180	180	180	180	180

	e4marip	e4marit	e4air
Mean	$84.19	$83.69	$79.52
Standard Error	6.50	6.65	6.10
Median	$45.84	$44.73	$43.94
Standard Deviation	87.27	89.15	81.78
Minimum	$21.29	$17.71	$20.54
Maximum	$433.58	$357.39	$418.42
Count	180	180	180

Table C-15 : St. Catharines – Niagara Summary of Data Estimates

	AVGLOT	Landprop	AVGDWL2001	F_IND_VAL	F_COMVAL	INDPROP	COMPROP	RESPROP	avdw2000	RESVAL
Mean	1,564.11	0.353	$145,321.08	$22.52	$26.92	0.073	0.018	0.910	$142,231.88	$56.28
Standard Error	164.95	0.008	4243.92	0.91	0.48	0.010	0.003	0.012	4153.70	3.75
Median	1,099.70	0.335	$136,323.00	$20.31	$24.39	0.039	0.003	0.952	$133,425.08	$45.96
Standard Deviation	1,582.13	0.081	40706.22	8.71	4.58	0.098	0.034	0.112	39840.89	35.99
Minimum	553.00	0.253	$85,001.00	$10.83	$16.67	0	0	0.433	$83,194.07	$3.90
Maximum	5,400.70	0.5	$281,368.00	$33.50	$33.31	0.564	0.191	1	$275,386.75	$157.46
Count	92	92	92	92	92	92	92	92	92	92

	estim1	estim2	estim3	e4frway	e4arterial	e4collec	e4local	e4railm	e4railb	e4railter
Mean	$56.28	$53.30	$52.64	$36.66	$31.47	$55.11	$49.97	$43.66	$43.66	$30.15
Standard Error	3.75	3.41	3.47	1.25	0.91	2.76	3.02	2.29	2.29	0.92
Median	$45.96	$44.67	$45.35	$36.95	$31.44	$47.72	$42.56	$39.15	$39.15	$33.03
Standard Deviation	35.99	32.73	33.30	12.01	8.71	26.44	28.98	22.01	22.01	8.85
Minimum	$3.90	$5.13	$5.05	$17.27	$16.61	$16.51	$7.14	$10.39	$10.39	$14.85
Maximum	$157.46	$145.24	$157.05	$67.86	$53.21	$127.88	$131.12	$104.79	$104.79	$49.93
Count	92	92	92	92	92	92	92	92	92	92

	e4marip	e4marit	e4air
Mean	$27.66	$24.72	$27.22
Standard Error	0.63	0.46	0.67
Median	$30.30	$25.78	$30.68
Standard Deviation	6.01	4.43	6.40
Minimum	$14.59	$13.75	$14.01
Maximum	$38.40	$28.95	$37.31
Count	92	92	92

Table C-16 : Thunder Bay Summary of Data Estimates

	AVGLOT	Landprop	AVGDWL2001	F_IND_VAL	F_COMVAL	INDPROP	COMPROP	RESPROP	avdw2000	RESVAL
Mean	1,534.75	0.311	$119,577.35	$19.61	$30.18	0.097	0.012	0.891	$121,222.33	$50.69
Standard Error	162.82	0.012	4000.19	1.12	1.73	0.031	0.006	0.031	4055.22	6.18
Median	543.90	0.329	$113,721.00	$23.00	$35.39	0.007	0.000	0.983	$115,285.42	$60.69
Standard Deviation	1,104.30	0.080	27130.63	7.62	11.72	0.207	0.038	0.211	27503.86	41.91
Minimum	403.70	0.244	$74,158.00	$6.16	$9.48	0	0	0.001	$75,178.16	$7.63
Maximum	3,410.90	0.5	$198,140.00	$31.42	$48.34	0.999	0.243	1	$200,865.74	$159.34
Count	46	46	46	46	46	46	46	46	46	46

	estim1	estim2	estim3	e4frway	e4arterial	e4collec	e4local	e4railm	e4railb	e4railter
Mean	$50.69	$47.42	$46.01	$35.12	$31.11	$52.53	$45.53	$40.37	$40.37	$27.94
Standard Error	6.18	5.60	5.46	2.82	2.29	5.11	5.16	4.16	4.16	2.12
Median	$60.69	$56.72	$34.16	$41.56	$36.74	$62.48	$54.39	$48.09	$48.09	$33.02
Standard Deviation	41.91	38.01	37.01	19.12	15.50	34.64	35.02	28.20	28.20	14.36
Minimum	$7.63	$8.98	$7.63	$9.18	$8.54	$12.17	$9.36	$8.97	$8.97	$7.54
Maximum	$159.34	$145.08	$138.82	$75.43	$60.96	$135.19	$134.38	$109.42	$109.42	$56.57
Count	46	46	46	46	46	46	46	46	46	46

	e4marip	e4marit	e4air
Mean	$26.95	$24.90	$25.89
Standard Error	1.77	1.43	1.71
Median	$31.73	$29.20	$30.49
Standard Deviation	11.99	9.67	11.60
Minimum	$7.85	$7.82	$7.51
Maximum	$46.28	$39.88	$44.82
Count	46	46	46

Table C-17 : Windsor Summary of Data Estimates

	AVGLOT	Landprop	AVGDWL2001	F_IND_VAL	F_COMVAL	INDPROP	COMPROP	RESPROP	avdw2000	RESVAL
Mean	519.16	0.351	$157,085.54	$19.55	$99.38	0.123	0.015	0.862	$157,240.30	$106.44
Standard Error	10.43	0.009	4743.63	0.36	8.92	0.021	0.004	0.021	4748.30	3.82
Median	514.70	0.317	$152,814.50	$19.14	$75.56	0.031	0.004	0.952	$152,965.06	$100.25
Standard Deviation	92.10	0.082	41894.59	3.16	78.76	0.182	0.034	0.187	41935.86	33.77
Minimum	350.90	0.272	$92,361.00	$13.70	$48.51	0	0	0.215	$92,452.00	$54.92
Maximum	619.70	0.5	$296,024.00	$24.57	$344.84	0.776	0.24	1	$296,315.65	$220.61
Count	78	78	78	78	78	78	78	78	78	78

	estim1	estim2	estim3	e4frway	e4arterial	e4collec	e4local	e4railm	e4railb	e4railter
Mean	$106.44	$95.62	$95.69	$79.51	$76.85	$126.16	$97.05	$87.65	$87.65	$52.90
Standard Error	3.82	3.36	3.60	4.14	4.80	5.82	3.44	3.32	3.32	2.29
Median	$100.25	$90.01	$90.72	$67.14	$63.17	$108.26	$89.92	$78.23	$78.23	$46.10
Standard Deviation	33.77	29.70	31.75	36.58	42.40	51.40	30.36	29.36	29.36	20.25
Minimum	$54.92	$50.55	$44.74	$45.79	$42.31	$74.42	$52.59	$50.27	$50.27	$31.86
Maximum	$220.61	$194.38	$215.67	$187.92	$206.56	$268.58	$188.39	$156.18	$156.18	$110.48
Count	78	78	78	78	78	78	78	78	78	78

	e4marip	e4marit	e4air
Mean	$60.17	$59.47	$52.19
Standard Error	3.81	4.58	2.96
Median	$50.14	$47.35	$44.36
Standard Deviation	33.69	40.41	26.12
Minimum	$33.22	$31.11	$29.74
Maximum	$163.61	$184.71	$131.58
Count	78	78	78

Table C-18 : Chicoutimi – Jonquière Summary of Data Estimates

	AVGLOT	Landprop	AVGDWL2001	F_IND_VAL	F_COMVAL	INDPROP	COMPROP	RESPROP	avdw2000	RESVAL
Mean	1,547.66	0.319	$83,792.75	$9.18	$14.13	0.030	0.007	0.962	$79,501.48	$24.20
Standard Error	123.69	0.015	1987.82	0.31	0.48	0.007	0.003	0.008	1886.02	3.08
Median	1,850.10	0.250	$81,205.50	$9.82	$15.11	0.010	0.001	0.989	$77,046.73	$12.04
Standard Deviation	742.16	0.092	11926.93	1.88	2.89	0.041	0.019	0.049	11316.12	18.50
Minimum	584.10	0.25	$63,471.00	$6.61	$10.17	0	0	0.824	$60,220.46	$5.26
Maximum	2,863.20	0.5	$114,312.00	$11.48	$17.66	0.155	0.08	1	$108,457.75	$60.43
Count	36	36	36	36	36	36	36	36	36	36

	estim1	estim2	estim3	e4frway	e4arterial	e4collec	e4local	e4railm	e4railb	e4railter
Mean	$24.20	$23.67	$23.44	$16.58	$14.66	$24.92	$21.69	$19.18	$19.18	$13.18
Standard Error	3.08	2.98	2.89	1.18	0.89	2.37	2.53	1.97	1.97	0.85
Median	$12.04	$11.87	$11.95	$11.90	$11.79	$14.17	$11.31	$10.58	$10.58	$10.20
Standard Deviation	18.50	17.87	17.33	7.08	5.36	14.20	15.16	11.83	11.83	5.09
Minimum	$5.26	$5.47	$5.30	$9.45	$8.89	$12.12	$6.70	$8.14	$8.14	$7.82
Maximum	$60.43	$58.64	$55.30	$29.79	$24.36	$52.28	$51.26	$42.09	$42.09	$22.51
Count	36	36	36	36	36	36	36	36	36	36

	e4marip	e4marit	e4air
Mean	$12.67	$11.66	$12.17
Standard Error	0.61	0.40	0.60
Median	$11.60	$12.47	$11.07
Standard Deviation	3.68	2.39	3.59
Minimum	$8.28	$8.39	$7.93
Maximum	$18.85	$14.57	$18.23
Count	36	36	36

Table C-19 : Hull Summary of Data Estimates

	AVGLOT	Landprop	AVGDWL2001	F_IND_VAL	F_COMVAL	INDPROP	COMPROP	RESPROP	avdw2000	RESVAL
Mean	1,052.95	0.288	$107,409.04	$33.86	$62.66	0.057	0.017	0.927	$101,908.30	$52.56
Standard Error	110.28	0.012	3009.14	3.81	7.42	0.012	0.007	0.014	2855.04	5.72
Median	577.00	0.258	$101,215.00	$28.28	$50.27	0.023	0.001	0.972	$96,031.48	$45.28
Standard Deviation	832.60	0.089	22718.54	28.78	55.99	0.093	0.050	0.109	21555.06	43.17
Minimum	264.50	0.198	$68,257.00	$8.37	$12.88	0	0	0.451	$64,761.36	$6.65
Maximum	2,345.10	0.5	$189,263.00	$168.95	$259.92	0.544	0.337	1	$179,570.29	$190.63
Count	57	57	57	57	57	57	57	57	57	57

	estim1	estim2	estim3	e4frway	e4arterial	e4collec	e4local	e4railm	e4railb	e4railter
Mean	$52.56	$51.67	$50.63	$54.38	$52.00	$71.51	$51.70	$50.84	$50.84	$43.36
Standard Error	5.72	5.55	5.46	5.80	5.69	7.89	5.53	5.39	5.39	4.49
Median	$45.28	$44.65	$43.03	$47.82	$44.70	$62.56	$44.52	$43.92	$43.92	$39.37
Standard Deviation	43.17	41.90	41.25	43.79	42.93	59.54	41.77	40.71	40.71	33.89
Minimum	$6.65	$7.29	$7.11	$10.64	$10.38	$12.26	$7.82	$8.52	$8.52	$9.02
Maximum	$190.63	$190.55	$192.34	$228.74	$218.77	$280.30	$195.39	$200.15	$200.15	$191.48
Count	57	57	57	57	57	57	57	57	57	57

	e4marip	e4marit	e4air
Mean	$47.25	$48.26	$44.37
Standard Error	5.07	5.28	4.70
Median	$41.33	$41.48	$39.57
Standard Deviation	38.28	39.86	35.46
Minimum	$10.05	$10.63	$9.60
Maximum	$207.51	$214.44	$198.41
Count	57	57	57

Table C-20 :Montreal Summary of Data Estimates

	AVGLOT	Landprop	AVGDWL2001	F_IND_VAL	F_COMVAL	INDPROP	COMPROP	RESPROP	avdw2000	RESVAL
Mean	666.13	0.305	$146,048.18	$204.85	$454.77	0.126	0.030	0.844	$137,956.14	$80.97
Standard Error	10.31	0.003	2489.27	5.83	12.97	0.006	0.002	0.006	2351.35	2.55
Median	651.56	0.294	$131,108.00	$119.31	$265.13	0.057	0.009	0.908	$123,843.75	$62.02
Standard Deviation	302.44	0.100	73042.21	171.07	380.64	0.168	0.053	0.179	68995.19	74.84
Minimum	392.53	0.192	$0.00	$9.04	$20.10	0	0	0.137	$0.00	$0.00
Maximum	1,904.28	0.5	$964,788.00	$430.54	$956.75	0.863	0.507	1	$911,332.36	$779.32
Count	861	861	861	861	861	861	861	861	861	861

	estim1	estim2	estim3	e4frway	e4arterial	e4collec	e4local	e4railm	e4railb	e4railter
Mean	$80.97	$107.89	$117.82	$288.14	$305.03	$304.55	$130.74	$180.51	$180.51	$230.06
Standard Error	2.55	2.94	3.63	7.98	8.53	8.21	3.47	4.80	4.80	6.40
Median	$62.02	$83.17	$78.36	$176.86	$183.75	$198.35	$100.75	$123.05	$123.05	$140.00
Standard Deviation	74.84	86.31	106.58	234.13	250.41	241.00	101.84	140.73	140.73	187.65
Minimum	$0.00	$8.04	$0.00	$15.05	$15.03	$18.88	$11.97	$12.62	$12.62	$11.71
Maximum	$779.32	$732.79	$779.32	$734.73	$705.15	$1,016.23	$748.69	$718.06	$718.06	$561.79
Count	861	861	861	861	861	861	861	861	861	861

	e4marip	e4marit	e4air
Mean	$292.43	$329.81	$267.44
Standard Error	8.25	9.40	7.54
Median	$173.40	$192.22	$158.82
Standard Deviation	242.10	275.84	221.15
Minimum	$13.69	$14.57	$12.59
Maximum	$632.47	$693.65	$582.41
Count	861	861	861

Table C-21 :Quebec City Summary of Data Estimates

	AVGLOT	Landprop	AVGDWL2001	F_IND_VAL	F_COMVAL	INDPROP	COMPROP	RESPROP	avdw2000	RESVAL
Mean	839.11	0.295	$97,645.98	$27.72	$42.65	0.081	0.020	0.900	$94,566.24	$39.38
Standard Error	33.64	0.008	2096.87	0.98	1.51	0.011	0.003	0.011	2030.73	1.72
Median	648.50	0.256	$92,918.00	$21.32	$32.80	0.029	0.002	0.956	$89,987.38	$37.81
Standard Deviation	439.87	0.106	27420.07	12.88	19.81	0.139	0.037	0.146	26555.25	22.45
Minimum	546.70	0.195	$0.00	$4.67	$7.19	0	0	0	$0.00	$0.00
Maximum	2,378.10	0.5	$219,369.00	$52.11	$80.17	1	0.193	1	$212,450.13	$118.28
Count	171	171	171	171	171	171	171	171	171	171

	estim1	estim2	estim3	e4frway	e4arterial	e4collec	e4local	e4railm	e4railb	e4railter
Mean	$39.38	$38.50	$38.47	$39.96	$37.52	$51.67	$38.54	$37.70	$37.70	$33.04
Standard Error	1.72	1.55	1.59	1.14	1.12	1.50	1.40	1.16	1.16	0.97
Median	$37.81	$37.00	$38.12	$36.46	$35.13	$46.89	$37.25	$35.30	$35.30	$30.62
Standard Deviation	22.45	20.29	20.80	14.88	14.60	19.55	18.35	15.14	15.14	12.64
Minimum	$0.00	$5.77	$2.32	$6.88	$6.42	$9.05	$6.89	$6.65	$6.65	$5.67
Maximum	$118.28	$111.59	$109.34	$82.83	$73.52	$123.33	$106.46	$94.64	$94.64	$65.98
Count	171	171	171	171	171	171	171	171	171	171

	e4marip	e4marit	e4air
Mean	$34.86	$35.19	$33.37
Standard Error	1.12	1.25	1.06
Median	$29.23	$27.06	$28.22
Standard Deviation	14.60	16.34	13.92
Minimum	$5.92	$5.93	$5.67
Maximum	$64.24	$66.14	$61.43
Count	171	171	171

Table C-22 : Sherbrooke Summary of Data Estimates

	AVGLOT	Landprop	AVGDWL2001	F_IND_VAL	F_COMVAL	INDPROP	COMPROP	RESPROP	avdw2000	RESVAL
Mean	991.56	0.362	$97,980.25	$17.09	$26.29	0.076	0.012	0.912	$92,962.39	$36.88
Standard Error	76.43	0.014	3124.40	1.04	1.60	0.019	0.003	0.020	2964.39	1.85
Median	866.20	0.333	$94,673.50	$18.10	$27.85	0.035	0.002	0.963	$89,824.99	$38.37
Standard Deviation	483.37	0.092	19760.44	6.58	10.12	0.123	0.021	0.127	18748.45	11.70
Minimum	866.20	0.25	$70,875.00	$4.57	$7.04	0	0	0.38	$67,245.28	$6.80
Maximum	3,013.70	0.5	$176,046.00	$22.61	$34.79	0.615	0.089	1	$167,030.17	$61.24
Count	40	40	40	40	40	40	40	40	40	40

	estim1	estim2	estim3	e4frway	e4arterial	e4collec	e4local	e4railm	e4railb	e4railter
Mean	$36.88	$35.24	$35.15	$28.41	$25.65	$40.67	$33.84	$30.80	$30.80	$22.88
Standard Error	1.85	1.76	1.70	1.51	1.40	2.05	1.68	1.54	1.54	1.24
Median	$38.37	$36.76	$36.21	$30.60	$27.50	$43.35	$35.35	$32.33	$32.33	$24.58
Standard Deviation	11.70	11.13	10.77	9.54	8.88	12.95	10.64	9.72	9.72	7.84
Minimum	$6.80	$6.63	$6.80	$6.68	$6.25	$8.74	$6.60	$6.40	$6.40	$5.51
Maximum	$61.24	$57.97	$56.84	$41.33	$36.43	$62.52	$54.73	$48.22	$48.22	$32.77
Count	40	40	40	40	40	40	40	40	40	40

	e4marip	e4marit	e4air
Mean	$22.75	$21.69	$21.83
Standard Error	1.30	1.32	1.24
Median	$24.27	$22.98	$23.29
Standard Deviation	8.23	8.35	7.87
Minimum	$5.78	$5.81	$5.53
Maximum	$31.35	$28.70	$30.13
Count	40	40	40

Table C-23 : Trois-Rivières Summary of Data Estimates

	AVGLOT	Landprop	AVGDWL2001	F_IND_VAL	F_COMVAL	INDPROP	COMPROP	RESPROP	avdw2000	RESVAL
Mean	943.00	0.360	$78,712.03	$21.92	$33.57	0.084	0.016	0.900	$74,680.95	$32.02
Standard Error	43.99	0.013	3205.90	1.65	2.56	0.021	0.006	0.022	3041.72	2.42
Median	712.60	0.375	$80,624.00	$24.49	$37.68	0.030	0.002	0.970	$76,495.01	$36.08
Standard Deviation	267.60	0.080	19500.73	10.02	15.56	0.125	0.038	0.133	18502.04	14.70
Minimum	712.60	0.25	$0.00	$4.74	$7.29	0	0	0.549	$0.00	$0.00
Maximum	1,245.40	0.5	$110,768.00	$37.66	$57.94	0.429	0.162	1	$105,095.25	$63.32
Count	37	37	37	37	37	37	37	37	37	37

	estim1	estim2	estim3	e4frway	e4arterial	e4collec	e4local	e4railm	e4railb	e4railter
Mean	$32.02	$31.19	$31.19	$31.80	$29.77	$41.39	$31.16	$30.31	$30.31	$26.27
Standard Error	2.42	2.32	2.29	2.31	2.19	2.99	2.29	2.19	2.19	1.92
Median	$36.08	$35.13	$36.01	$36.55	$33.97	$48.54	$35.08	$35.79	$35.79	$30.02
Standard Deviation	14.70	14.14	13.92	14.07	13.30	18.20	13.93	13.34	13.34	11.65
Minimum	$0.00	$0.51	$0.30	$4.81	$5.07	$4.12	$1.20	$2.41	$2.41	$4.30
Maximum	$63.32	$60.37	$62.74	$50.55	$48.41	$71.34	$58.55	$53.77	$53.77	$42.33
Count	37	37	37	37	37	37	37	37	37	37

	e4marip	e4marit	e4air
Mean	$27.59	$27.75	$26.43
Standard Error	2.05	2.10	1.96
Median	$31.21	$31.09	$29.89
Standard Deviation	12.46	12.79	11.91
Minimum	$5.29	$6.02	$5.03
Maximum	$46.08	$47.80	$44.05
Count	37	37	37

Table C-24 : Halifax Summary of Data Estimates

	AVGLOT	Landprop	AVGDWL2001	F_IND_VAL	F_COMVAL	INDPROP	COMPROP	RESPROP	avdw2000	RESVAL
Mean	1,003.06	0.298	$120,890.33	$17.15	$26.38	0.016	0.016	0.968	$118,472.52	$85.36
Standard Error	92.12	0.009	5040.95	1.07	1.65	0.005	0.004	0.007	4940.13	9.42
Median	629.70	0.245	$109,691.00	$10.94	$16.82	0.000	0.000	1.000	$107,497.18	$47.80
Standard Deviation	1,054.36	0.104	57696.32	12.27	18.87	0.061	0.049	0.081	56542.39	107.78
Minimum	202.70	0.203	$0.00	$5.94	$9.14	0	0	0.511	$0.00	$0.00
Maximum	4,084.30	0.5	$390,864.00	$40.90	$62.92	0.489	0.304	1	$383,046.72	$611.60
Count	131	131	131	131	131	131	131	131	131	131

	estim1	estim2	estim3	e4frway	e4arterial	e4collec	e4local	e4railm	e4railb	e4railter
Mean	$85.36	$83.32	$81.44	$43.02	$35.41	$74.66	$72.64	$59.92	$59.92	$32.64
Standard Error	9.42	9.15	9.01	3.76	2.89	7.37	7.75	6.10	6.10	2.73
Median	$47.80	$46.91	$47.80	$30.71	$25.45	$50.20	$42.28	$38.06	$38.06	$23.47
Standard Deviation	107.78	104.73	103.10	43.03	33.07	84.30	88.76	69.80	69.80	31.25
Minimum	$0.00	$0.24	$0.00	$6.03	$6.35	$5.16	$1.51	$3.02	$3.02	$5.39
Maximum	$611.60	$593.65	$611.60	$225.01	$166.05	$463.67	$499.66	$387.72	$387.72	$159.44
Count	131	131	131	131	131	131	131	131	131	131

	e4marip	e4marit	e4air
Mean	$27.66	$21.77	$26.74
Standard Error	2.03	1.36	1.98
Median	$21.33	$13.88	$20.47
Standard Deviation	23.27	15.57	22.64
Minimum	$6.63	$7.54	$6.31
Maximum	$106.78	$51.91	$104.58
Count	131	131	131

Table C-25 : Saint John Summary of Data Estimates

	AVGLOT	Landprop	AVGDWL2001	F_IND_VAL	F_COMVAL	INDPROP	COMPROP	RESPROP	avdw2000	RESVAL
Mean	1,878.81	0.382	$85,285.71	$24.38	$37.51	0.035	0.011	0.954	$84,765.15	$44.87
Standard Error	324.49	0.015	4982.85	1.93	2.97	0.010	0.005	0.013	4952.44	5.69
Median	502.10	0.417	$85,953.00	$29.54	$45.45	0.000	0.000	1.000	$85,428.36	$42.35
Standard Deviation	2,271.46	0.104	34879.96	13.49	20.76	0.073	0.036	0.089	34667.06	39.86
Minimum	502.10	0.25	$0.00	$5.68	$8.74	0	0	0.64	$0.00	$0.00
Maximum	10,605.10	0.5	$184,188.00	$39.09	$60.14	0.287	0.182	1	$183,063.76	$117.44
Count	49	49	49	49	49	49	49	49	49	49

	estim1	estim2	estim3	e4frway	e4arterial	e4collec	e4local	e4railm	e4railb	e4railter
Mean	$44.87	$44.07	$44.36	$38.22	$35.05	$52.61	$42.09	$39.30	$39.30	$31.11
Standard Error	5.69	5.50	5.41	3.40	2.98	5.32	4.92	4.17	4.17	2.69
Median	$42.35	$41.93	$42.13	$42.70	$41.80	$55.32	$41.38	$40.41	$40.41	$35.48
Standard Deviation	39.86	38.52	37.90	23.77	20.89	37.21	34.42	29.21	29.21	18.80
Minimum	$0.00	$1.80	$1.02	$6.34	$6.45	$6.26	$2.95	$4.02	$4.02	$5.53
Maximum	$117.44	$114.04	$116.41	$74.92	$65.29	$116.19	$103.88	$90.31	$90.31	$58.97
Count	49	49	49	49	49	49	49	49	49	49

	e4marip	e4marit	e4air
Mean	$31.68	$30.95	$30.37
Standard Error	2.59	2.45	2.49
Median	$38.28	$37.50	$36.43
Standard Deviation	18.12	17.13	17.40
Minimum	$6.53	$7.21	$6.22
Maximum	$55.35	$49.62	$53.24
Count	49	49	49

Table C-26 : St. John's Summary of Data Estimates

	AVGLOT	Landprop	AVGDWL2001	F_IND_VAL	F_COMVAL	INDPROP	COMPROP	RESPROP	avdw2000	RESVAL
Mean	923.31	0.355	$114,150.13	$36.14	$55.60	0.027	0.006	0.966	$111,416.65	$73.74
Standard Error	111.37	0.012	4961.48	6.66	10.24	0.006	0.004	0.007	4842.68	8.94
Median	529.10	0.289	$108,930.00	$19.68	$30.28	0.000	0.000	0.997	$106,321.52	$69.15
Standard Deviation	763.50	0.080	34014.23	45.63	70.20	0.044	0.026	0.050	33199.71	61.30
Minimum	363.80	0.289	$72,331.00	$11.51	$17.70	0	0	0.835	$70,598.94	$8.40
Maximum	2,427.90	0.5	$246,026.00	$161.32	$248.18	0.159	0.165	1	$240,134.57	$330.04
Count	47	47	47	47	47	47	47	47	47	47

	estim1	estim2	estim3	e4frway	e4arterial	e4collec	e4local	e4railm	e4railb	e4railter
Mean	$73.74	$72.60	$72.30	$58.82	$53.39	$83.03	$68.17	$62.59	$62.59	$47.55
Standard Error	8.94	8.82	8.65	8.87	8.48	11.15	8.44	8.13	8.13	7.42
Median	$69.15	$67.55	$65.27	$38.94	$31.74	$65.51	$60.83	$51.48	$51.48	$28.62
Standard Deviation	61.30	60.46	59.31	60.83	58.17	76.43	57.88	55.72	55.72	50.89
Minimum	$8.40	$8.54	$8.40	$14.20	$13.98	$15.88	$9.64	$10.88	$10.88	$12.13
Maximum	$330.04	$324.91	$317.39	$262.81	$238.49	$371.25	$304.98	$279.92	$279.92	$212.44
Count	47	47	47	47	47	47	47	47	47	47

	e4marip	e4marit	e4air
Mean	$47.68	$45.87	$45.74
Standard Error	8.09	8.45	7.73
Median	$26.87	$24.98	$25.81
Standard Deviation	55.43	57.91	52.98
Minimum	$13.68	$14.61	$13.06
Maximum	$212.94	$204.75	$204.25
Count	47	47	47

Appendix D: Technical Tables and Sampling Details

Table D-1 presents the NHPI data values used to adjust land values to the base study year of 2000. The 2006 column is used to adjust current year sampled information, primarily on industrial and commercial lands. The 2005 column is use to adjust the FCC based sampled data of agricultural land values. The 2001 column is used to adjust the Statistics Canada based, “average dwelling value” to year 2000.

Table D-1 - Land Value Price Adjustments

	NHPI Data Values				Value Adjustment		
Location	Jul-00	Jul-01	Jul-05	Feb-06	2001	2005	2006
Canada	104.10	107.20	129.5	135.3	0.971	0.804	0.769
Alberta	113.5	116.4	143.6	166.2	0.975	0.790	0.683
Atlantic region	103.8	105.5	119.6	123.6	0.984	0.868	0.840
BC	89.8	90.7	107	110.3	0.990	0.839	0.814
Calgary	115.3	118.6		173.4	0.972		0.665
Edmonton	108.1	109.7		150.2	0.985		0.720
Halifax	107.8	110		129.7	0.980		0.831
Hamilton	106.7	109.6		138.7	0.974		0.769
Kitchener	108.5	112		135.4	0.969		0.801
London	104.4	106.9		131.2	0.977		0.796
Manitoba	105.9	107.2	132.5	139.7	0.988	0.799	0.758
Montreal	105.7	111.9		145.3	0.945		0.727
New Brunswick	97.7	98.3	109.2	111.8	0.994	0.895	0.874
NLFD	101.9	104.4	125.3	127.8	0.976	0.813	0.797
NS	107.8	110	122.5	129.7	0.980	0.880	0.831
Ontario	107.4	111	133.2	135.7	0.968	0.806	0.791
Ottawa	110	124.2		156.6	0.886		0.702
PEI	101.9	103.8	114.2	113.5	0.982	0.892	0.898
Prairie region	112.4	115.1	141.8	162	0.977	0.793	0.694
Quebec	105.6	111.3	140.5	144.9	0.949	0.752	0.729
Quebec City	104.4	107.8		141.3	0.968		0.739
Regina	110.7	114		149.9	0.971		0.738
Saint John	97.7	98.3		111.8	0.994		0.874
Sask	107.4	110.8	132	136.2	0.969	0.814	0.789
Saskatoon	105.8	109.2		128.3	0.969		0.825
St.John's	101.9	104.4		127.8	0.976		0.797
St-Catherines-Niagara	110.5	112.9		141.8	0.979		0.779
Sudbury-Thunder Bay	95.8	94.5		101.1	1.014		0.948
Toronto / Oshawa	107.9	110.7		135.5	0.975		0.796
Vancouver	90.1	91.1	106	109.5	0.989	0.850	0.823
Victoria	85.6	86.4		117	0.991		0.732
Windsor	101.6	101.5		106	1.001		0.958
Winnipeg	105.9	107.2		139.7	0.988		0.758

Note: Source is Statistics Canada, New Housing Price Index, Various Years

From Table 10a

City	Average Land Value Per Sq. Metre	Average Land Value Per Acre	Average Land Value Per Sq. Ft.
Chicoutimi –Jonquière	$23.44	$94,862	$2.18
Trois-Rivières	$31.19	$126,226	$2.90
Sherbrooke	$35.15	$142,252	$3.27
Québec	$38.47	$155,688	$3.57
SaintJohn	$44.36	$179,525	$4.12
Thunder Bay	$46.01	$186,202	$4.27
Sudbury	$48.84	$197,655	$4.54
Hull	$50.63	$204,900	$4.70
St.Catharines/Niagara	$52.64	$213,034	$4.89
Winnipeg	$52.64	$213,034	$4.89
Kingston	$63.28	$256,094	$5.88
Regina	$64.06	$259,251	$5.95
London	$69.40	$280,862	$6.45
Abbotsford	$71.44	$289,118	$6.64
St.John's	$72.30	$292,598	$6.72
Saskatoon	$74.03	$299,599	$6.88
Edmonton	$77.48	$313,562	$7.20
Halifax	$81.44	$329,588	$7.57
Windsor	$95.69	$387,257	$8.89
Kitchener	$106.01	$429,022	$9.85
Hamilton	$109.23	$442,054	$10.15
Ottawa	$109.46	$442,985	$10.17
Victoria	$115.61	$467,874	$10.74
Montréal	$117.82	$476,818	$10.95
Oshawa	$125.37	$507,372	$11.65
Calgary	$138.39	$560,064	$12.86
Vancouver	$204.95	$829,433	$19.04
Toronto	$234.59	$949,386	$21.79
	$100.00	$404,700	$9.29
	$200.00	$809,400	$18.58
	$300.00	$1,214,100	$27.87
	$500.00	$2,023,500	$46.45
	$1,000.00	$4,047,000	$92.91
	$1,800.00	$7,284,600	$167.23