Whitehorse Residential Land Demand:
Analysis and Forecast

Final Report

Prepared for the Engineering and Development Branch
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Executive Summary

This study answers the following questions about the Whitehorse residential land market:

- What kind of lots do people want to buy?
- How many lots will they want in the future?

The intent of this study is to guide the Department of Community and Transportation Services and the City of Whitehorse in determining how many and what kind of residential lots should be developed in the future in the City of Whitehorse and its periphery (Ibex Valley, Mount Lorne, Marsh Lake, Upper Lake Laberge).

Methodology

There were three steps in our methodology:

- Data Collection
- Data Analysis
- Forecasting

Data Collection

The conclusions are based on information collected from Yukon government administrative data sources available in early 1999 for the period 1988-1998, as well as Statistics Canada Census data and a survey of potential land buyers.

In our data collection exercise we conducted a survey of people intending to buy land, developed a land sales database for the last 10 years from Yukon Government administrative data, and obtained 1996 Census data from Statistics Canada.

The telephone survey contacted 1,831 randomly selected households in the Whitehorse area. Seventeen per cent (312) of respondents indicated that they were “extremely likely” or “somewhat likely” to buy land within the next five years. Those respondents likely to buy were then administered a survey instrument asking questions about their preferences and demographic characteristics.

We developed a Land Sales database using information from the Lands and Property Assessment Branch as well as interviews with private sector developers and some field examination. The database has information on 1,174 government and private sector residential lot sales since 1988, including date of sale, and a number of lot characteristics such as size etc.

We obtained special runs of Census statistical information from Statistics Canada. The data was obtained separately for the Whitehorse urban core (serviced urban lots) and the periphery (unserviced lots including country and rural residential subdivisions)

Data Analysis

The data analysis step included a literature review, analysis of survey results and regression analyses on the land sales database.

Forecast

We developed a demographic model to project population, households, housing demand and land demand. We used three different population growth scenarios with differing migration assumptions. Our assumptions for the three scenarios were:

- **Low**: net out-migration of about 170 people per year
- **Medium**: zero net migration
- **High**: net in-migration of 200 people per year

Results

Analysis: What kind of lots do people want?

Overall survey results were:

- 56% wanted country and rural residential lots.
- 25% wanted urban serviced land
- 13% expressed interest in recreational land
- 6% wanted agricultural or other types of land.

For those wanting land in residential subdivisions, about one third wanted rural residential land outside the city limits. The remaining two thirds were evenly split between those who want country residential or full serviced lots within the Whitehorse City limits.

In rural areas outside the city limits:

61% of respondents preferred lots less than 2 hectares

In country residential areas within city limits:

80% of the respondents preferred lots under 2 hectares and
10% preferred lots similar to standard urban lots (60X100 feet).

In urban residential areas:

25% indicated a preference for ¼ hectare lots
One-third of the respondents preferred the present lot size (60X100 feet)
18% favoured smaller lots similar to those found in the downtown area.

Based on both the survey and the regression analysis of lot sales, the important requirements in lot development design were:

- Roads and power (all three areas)
- Access to green space (all three areas)
- Telephone service (all three)
- Privacy (especially in country and rural areas)
- Views (especially in rural areas)

The least important requirements were:

- Cable TV
- Garbage pick-up
- Distance from shopping and schools
- Access to public transit
- Paved roads

Demand for land is extremely sensitive to price. For every $10,000 increase in the cost of land, 25% of those wishing to buy are eliminated from the market. Our analysis shows that, with all other factors equal including **total** price, people prefer larger lots. However, demand is especially sensitive to price per m^2. People buy smaller lots if the price per m^2 is kept constant for all sizes of lots

Forecast: How many lots do people want?

Our forecast shows a continuing demand for new lots over the next five years, even with a continued population decline. The results on our three scenarios are:

Low scenario

- 100 new lots needed over the next five years (20 lots per year), even with a population decline.
- Very little demand for new lots from 2006 to 2020,

Medium scenario

- 300 lots over the next five years (60 lots per year), similar to survey
- 240 lots between 2006 and 2010 (about 50 lots per year)
- 360 lots between 2011 and 2020 (about 35 lots per year).

High scenario

- 510 lots over the next five years (about 100 lots per year)
- 500 lots between 2006 and 2010 (100 lots per year)
- 960 lots between 2011 and 2020 (about 100 lots per year).

Policy Considerations

While it is not the purpose of this study to develop policy, a number of our findings have bearing on policy development.

First is the continued demand for land. Both the survey and forecast point to continued demand for lots over the next five years, despite the population decline and weak economy. About one third of the demand is for serviced urban subdivisions, one-third four country residential and one-third for rural residential.

Secondly, demand is very sensitive to price. Higher cost to the consumer will mean that lots could remain unsold. So pricing policy and development standards need to be carefully examined in light of policy objectives. Some of the implicit policy objectives relate to affordability and accessibility, cost recovery, development standards, sizing of lots, and the effect of new development on market prices.

Thirdly, demand is not uniform: people want choices. There is a demand for different types and sizes of lots in different areas. The demand for a variety of choices should be examined in light of the social costs it can impose, such as schools and other costs for developing and maintaining social infrastructure, as well as the environmental impacts. Some of it might not be realistic (e.g. city sized lots in areas without sewer & water), and some of it not sustainable, but it does indicate that consumers want a variety of choices.

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Whitehorse Residential Land Demand Analysis and Forecasts

A. Introduction

This study answers the following questions about the Whitehorse area land market:

1. What kind of lots do people want to buy?
2. How many lots will they want in the future?

The answers to these questions are intended to guide the Government of Yukon and the City of Whitehorse in determining how many and what kind of lots should be developed in the future in the vicinity of Whitehorse. Ultimately, the intent is to help the Department of Community & Transportation Services to develop the "right" amount and type of building lots so that shortages are eliminated while not burdening the taxpayer with excessive holdings of unsold lots.

For residential land demand, personal preferences and their relation to demographic characteristics are the key factors.

Our approach to residential land demand in the Whitehorse area combines a number of different techniques. For residential demand, we use regression analysis[1] and surveys to answer the first question. We then use the results of that analysis, combined with some demographic analysis to establish the relationship between population and land demand. A demographic projection model is then used to estimate different scenarios for population growth, household formation and total housing demand. Finally, the existing housing stock is subtracted from the total demand to calculate the number of lots required.

The study period begins in 1988 and ends in 1998. Very little land development occurred in the six years prior to 1988. That year marked the resurgence of land development in the Whitehorse area coupled with the reopening of the Faro Mine. In 1988 the Granger, Robinson and Mary Lake subdivisions were developed.

1. Study Area

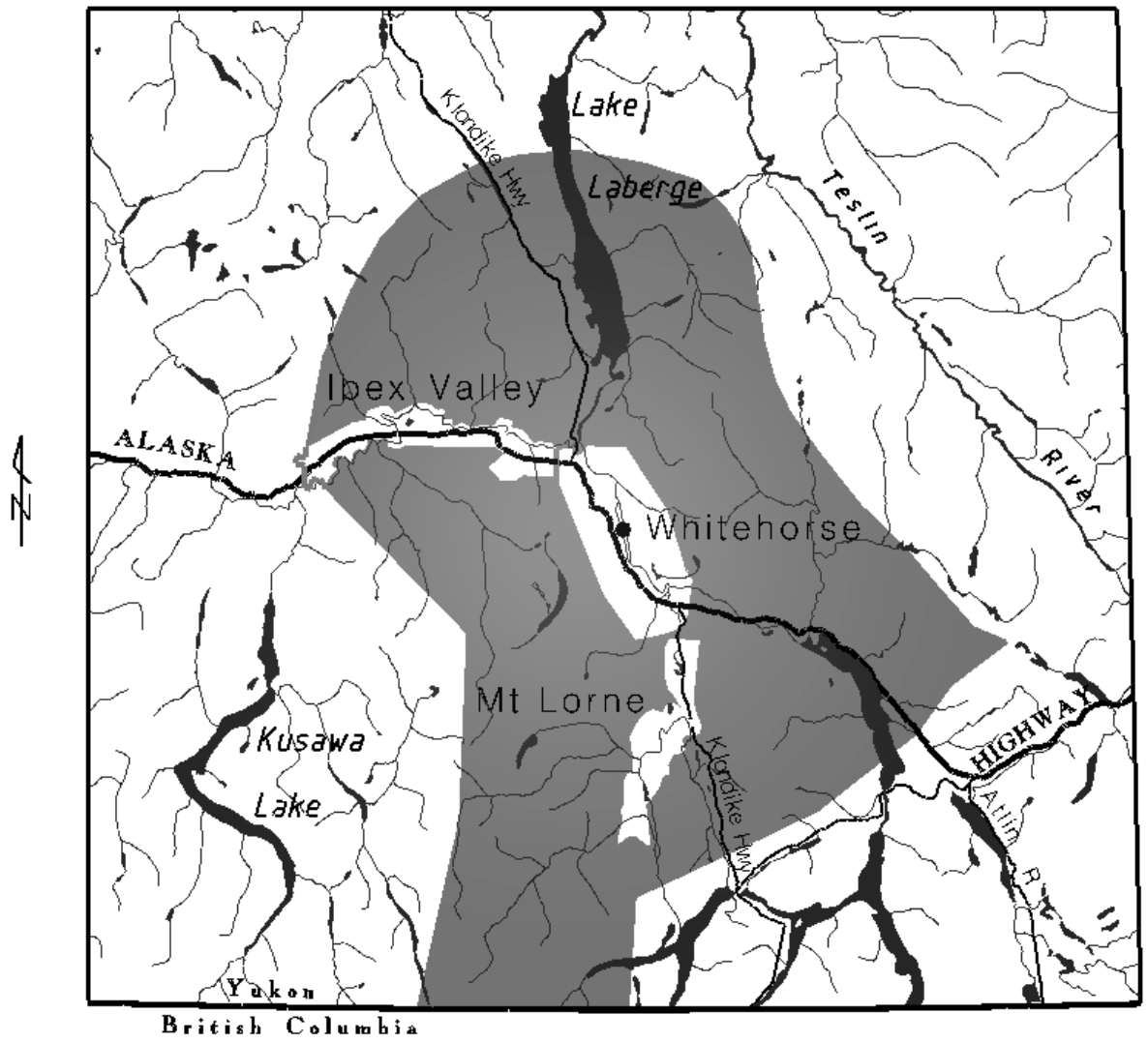
This study deals with the Whitehorse land market. The boundaries of that market include the City of Whitehorse as well as the surrounding countryside where a large portion of the population commutes to Whitehorse. This includes the hamlets of Mount Lorne and Ibex Valley, and what Statistics Canada refers to as "Whitehorse Unorganized" in the 1996 Census. The boundaries of this area are:

- North: Two thirds of the way down Lake Laberge along the Klondike Highway (includes Fox Lake but not Braeburn)
- South: South of the Annie Lake Road and the area west of the Annie Lake Road down to the BC border (excludes Carcross and Tagish)
- East: Judas Creek on Marsh Lake
- West: The Western end of Ibex Valley Hamlet (to the Takhini River bridge)

[1] Appendix 1 presents a short overview of regression analysis.

The following map shows the Whitehorse Census Agglomeration (Whitehorse CA) as defined by Statistics Canada.

Figure 1 - Map of Whitehorse Census Agglomeration



In 1996, the Census counted 21,786 people living in this area forming 8,115 households (i.e. inhabiting 8,115 dwelling units).[2] Table 1 presents the population and number of dwellings in the study area.

Table 1 - Population and Households/Dwellings, Whitehorse Census Agglomeration, 1996 Census

	Population	Occupied Private Dwellings
City of Whitehorse	19,157	7,060
Hamlet of Mount Lorne	399	145
Hamlet of Ibex Valley	322	115
Whitehorse Unorganized	1,908	795
Total	21,786	8,115

Source: YBS. *Community Profiles*, May 1999

[2] There are two sources of population data for Whitehorse, the quinquennial Census held by Statistics Canada and Health Care statistics published by the Yukon Bureau of Statistics. The two are different and measure different things. In June 1996, the YBS counted 23,538 people with Whitehorse addresses compared to the 21,786 counted by the Census in May. There are a number of reasons for the discrepancy. YBS counts all people who are hold a valid Yukon Medicare card and have a Whitehorse postal address, while the Census counted the number of occupied private dwellings and people actually residing in them. The Census data is more useful for this exercise because it can be related to residents and housing while the YBS counts the number of people the Yukon government is responsible for. For example, students living Outside are counted in the YBS numbers but not in the Census. Also, the YBS and the Health Services Branch may take up to a year to remove individuals who have moved out. Nevertheless, the YBS numbers are very useful in tracking year-to-year population movements, unlike the Census, which is held only every five years.

B. The Whitehorse Residential Land Market

1. Unique Characteristics of the Land Market

The Whitehorse area has a number of unique characteristics compared to other land markets in Canada:

- Undeveloped land is mainly owned by the Crown
- Government is the dominant land developer
- Newly developed land prices are usually administered (i.e. set by government), not market prices
- Newly developed lots are allocated by a lottery system
- There has been a conscious effort to plan and develop country/rural residential lots

These characteristics must be taken into account in developing a land demand forecast and mean that the experience of most other Canadian jurisdictions is not directly applicable to the Whitehorse area.

2. A Brief History of Land Development in Whitehorse

Non-native people began to settle in what is now Whitehorse during the Klondike Gold Rush in the late 1890s. The initial settlement — known as Whitehorse —was located on the east side of the Yukon River, across from the current downtown. When the White Pass and Yukon Route Railway was built, its terminus was on the west side of the river at “Closeleigh”. Eventually the name Whitehorse was adopted for the new community.
For the next forty years — until WW II — almost no land development occurred outside the bench of land along the river that is now called the downtown core. Throughout the period, the commercial sector clustered around the train station at First and Main, with the residential districts surrounded the commercial core and stretched along the riverbank. The industrial area (largely there to service the trains and riverboats) stretched along the river to the north of downtown.

The Second World War brought the construction of the Alaska Highway, the upgrading of the airstrip on the escarpment above the town, the construction of the oil refinery along the river in Marwell, and Whitehorse’s first three residential subdivisions — Hillcrest, Valleyview and Camp Takhini. Hillcrest was built by the air force to house its officers and men while Valleyview was built for army officers and Camp Takhini housed the army’s enlisted men. The industrial area of Marwell grew up around the refinery while the McCrae industrial area on the highway to the south of town grew up around a large army construction camp. The huge influx of people also filled up the squatter’s areas — where much of the land was owned by White Pass — including Whiskey Flats (where Rotary Peace Park and the SS Klondike are now), the Shipyards and Moccasin Flats.

In 1957 the Robert Campbell Bridge was constructed and the development of Riverdale began. The new subdivision grew slowly — old-timers thought the idea ridiculous, who would want to live so far from town? — and most of the first houses were built by the federal government to house its employees. For many years Teslin Road was the outer boundary of Riverdale. One upshot of Riverdale’s development was that Whiskey Flats was no longer on the outskirts of town, middle class commuters now passed through it daily. Their lobbying to clean up the unsightly Flats added impetus to the efforts already underway to deal with the perceived squatter problem. By the late 1960s Whiskey Flats had been completely cleared.

The 1960s saw the beginnings of another two residential subdivisions in the Whitehorse area. Porter Creek and Crestview were both outside of city limits when lots were first surveyed and sold in the area. The first Porter Creek lots were large — up to 200' x 200' — and were sold for $200.00. In effect, Porter Creek was Whitehorse's first country residential development (albeit with smaller lots than what would become the norm) well out of town and with no municipal services in the area. Through the 1960s and early 1970s Whitehorse continued to grow and the downtown core, Riverdale, Porter Creek and Crestview all expanded steadily. The late 1970s saw a large upsurge in development in anticipation of the Alaska Highway Gas Pipeline being constructed through the territory.

The pipeline boom resulted in both a rash of house building and the construction of the necessary infrastructure for a number of new subdivisions. Riverdale rapidly filled out to its maximum size, and Porter Creek also expanded rapidly. Roads, sewer, water and streetlights were put in for what would become Porter Creek C, McIntyre and Granger. But the pipeline was not built and the territory plunged into recession in the early 1980s leaving these new subdivisions entirely empty for a number of years and spawning a large number of jokes about the benefits the local squirrel population was deriving from the sidewalks and streetlights.

There were also some country residential developments in the 1970s — McPherson in the middle of the decade and Wolf Creek at its end.

3. Land Development in the Last 10 Years

Following the Yukon's economic recovery in the mid-1980s land development picked up once again. Country residential lots became a hot commodity with the opening up of Mary Lake and Robinson in 1988. The Kwanlin Dun First Nation relocated to the McIntyre subdivision from Marwell. The lots in Granger began to sell in 1988 and the largely private development at Hidden Valley began.

The early 1990s saw the expansion of Granger and Mary Lake as well as the beginnings of Arkell — a subdivision devoted entirely to mobile homes. Urban residential lots were developed in the Logan and Copper Ridge subdivisions through the mid and late 1990s. On the country residential front, Pine Ridge was developed in the early 1990s followed by Cowley Creek in the mid 1990s. Spruce Hill is the latest country residential subdivision to be developed, with the lots going to lottery in December of 1999

Below are lists of subdivisions developed since 1988 in and around Whitehorse showing the year(s) when lots in that subdivision were first put up for sale and the number of lots put on the market. Subdivisions are grouped under urban residential, country/rural residential and mobile home headings.

Table 2 - Number of residential lots put on the market by subdivision, Whitehorse, 1988-1998

Year	*Subdivision*	*Zoning*	*Number of lots*
1988	Granger	Urban	104
1988	Hidden Valley	Country/Rural	1
1988	Mary Lake	Country/Rural	41
1988	Robinson	Country/Rural	26
1989	Granger	Urban	11
1989	Hidden Valley	Country/Rural	24
1989	Pineridge	Country/Rural	40
1990	Golden Horn	Country/Rural	6
1991	Hidden Valley	Country/Rural	3
1992	Arkell	Mobile Home	78
1992	Granger	Urban	146
1992	Hidden Valley	Country/Rural	2
1992	Mary Lake	Country/Rural	1
1993	Arkell	Mobile Home	87
1993	Hidden Valley	Country/Rural	3
1993	Logan	Urban	52
1993	Mary Lake	Country/Rural	14
1993	Pineridge	Country/Rural	24
1994	Cowley Creek	Country/Rural	35
1994	Hidden Valley	Country/Rural	11
1994	Logan	Urban	63
1994	Mary Lake	Country/Rural	4
1994	Takhini	Urban	2
1994	Valleyview	Urban	12
1995	Copper Ridge	Urban	113
1995	Cowley Creek	Country/Rural	28
1995	Hidden Valley	Country/Rural	4
1995	Takhini	Urban	35
1996	Copper Ridge	Urban	66
1996	Cowley Creek	Urban	23
1996	Hidden Valley	Country/Rural	2
1996	Takhini	Urban	43
1997	Hidden Valley	Country/Rural	3
1998	Copper Ridge	Urban	131

Source: Land Sales Database

Table 3 shows that the Yukon Government developed over 80 per cent of these lots. The following table presents the extent of land development by the Yukon government, federal government and private sector. The federal government was responsible for the new lots in Takhini and Valleyview, while one private sector developer did the work on Pineridge. A large number of private landholders subdivided their lots in Hidden Valley.

Table 3 - Lots developed by developer, Whitehorse, 1988-1998

Year	*Federal*	*Private*	*YTG*	*Total*
1988	-	1	171	172
1989	-	64	11	75
1990	-	-	6	6
1991	-	3	-	3
1992	-	2	225	227
1993	-	27	153	180
1994	14	11	102	127
1995	35	4	141	180
1996	43	2	89	134
1997	-	3	-	3
1998	-	-	131	131
Total	92	117	1,029	1,238
Percent of total	*7.4%*	*9.5%*	*83.1%*	*100.0%*

Source: Land Sales Database

While this development was occurring, the nature of subdivisions along the shores of Marsh Lake evolved from primarily recreational cottage lots to permanent residences. Evidence for this is provided by the 1986, 1991 and 1996 Census. In 1986, there were only 43 occupied private dwellings in the Marsh Lake area. This increased to 131 in 1991 and 268 in 1996. Thus, from 1991 to 1996, 137 lots were transformed from recreational use to residential, relieving the pressure on country/rural residential development. This is a significant number compared to the 295 lots developed and sold in country/rural residential subdivisions in those years. Remaining recreational land is far from Whitehorse. Tagish and Braeburn imply a commute of more than one hour.

Table 4 - Marsh Lake Population and Occupied Private Dwellings, 1986, 1991 and 1996

	Population	*Dwellings*
1986	116	43
1991	312	131
1996	589	268

Source: Statistics Canada, special request on 1986, 1991 and 1996 Census

4. Land Sales, Population and the Economy

This section reviews the total amount of land developed and sold since 1999 and examines the relationship between land sales, economic variables and population. The following table summarizes the size of the inventory of lots on the market and sold in each year since 1988. It includes all lots sold in new subdivisions including privately and federally developed land.

Table 5 - Inventory of lots on the market, 1988-1998

	New lots developed	*Inventory of lots on the market*	*Lots sold*	*Year-end inventory*
1988	172	172	82	90
1989	75	165	31	134
1990	6	140	71	69
1991	3	72	54	18
1992	227	245	205	40
1993	180	220	109	111
1994	127	238	140	98
1995	180	278	115	163
1996	134	297	182	115
1997	3	118	104	14
1998	131	145	59	86

Source: Land Sales Database

The "Lots Sold" column in Table 5 above also suggests that economic conditions may have played a role in how many lots were sold each year. The two years where the most lots sold, 1992 and 1996 were also boom years. If country/rural residential lots are excluded, this becomes even more obvious. Table 6 separates urban serviced lots from rural/country residential lot sales.

Table 6 - Rural and Urban Lots Sold, Whitehorse, 1988-1998

Year	Urban Lots sold	Rural Lots sold	Total Lots sold
1988	14	68	82
1989	9	22	31
1990	42	29	71
1991	38	16	54
1992	197	8	205
1993	70	39	109
1994	94	46	140
1995	81	34	115
1996	156	26	182
1997	98	6	104
1998	58	1	59
1999	21	0	21

Source: Land Sales Database

We then looked at how the number of lots sold related to economic conditions. The variables we considered included: Yukon Gross Domestic Product, Yukon Real Personal Income, Yukon Real Personal Disposable (after tax) Income, and Whitehorse Health Care population.

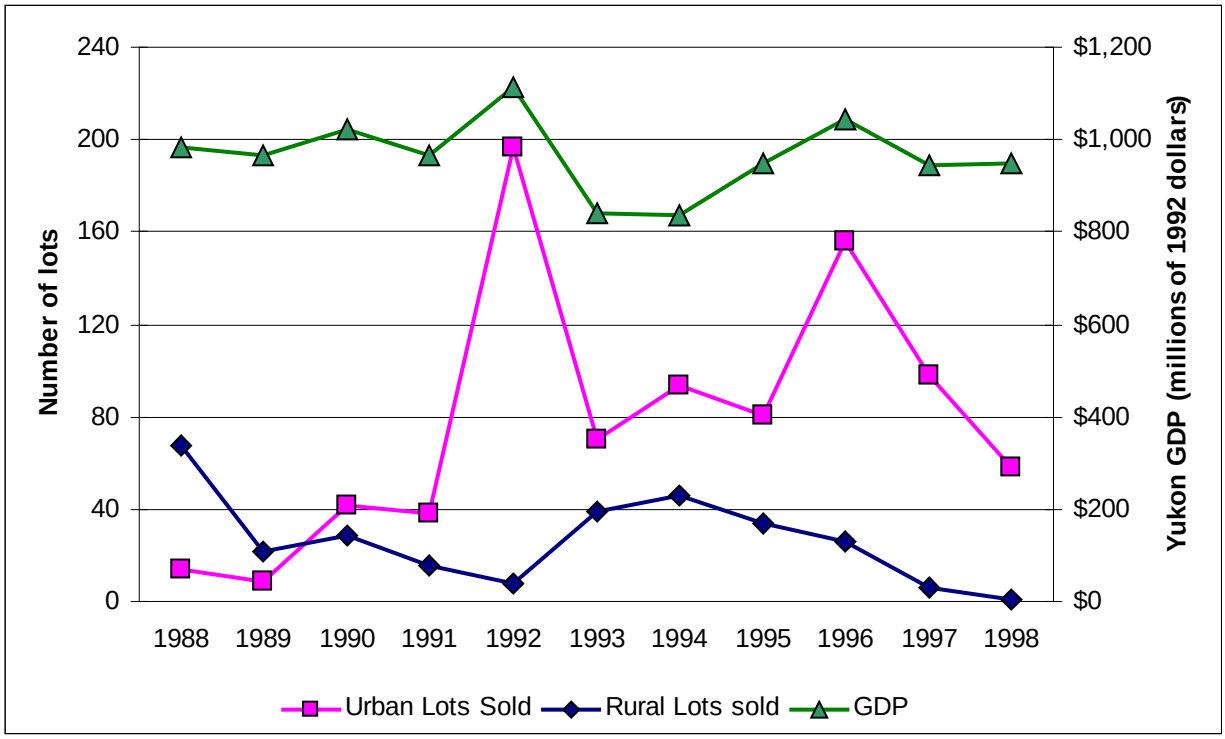
4.1 GDP and Land Sales

Gross Domestic Product (GDP) is the only indicator for the economy as a whole where we have consistent data since 1988. Figure 2 shows that urban serviced lot sales move in the same

direction as GDP in most years. Boom years such as 1992 and 1996 result in sharp increases in urban serviced lot sales. However, when regression analysis is used, that relationship is statistically weak.[3] GDP only explains 5% of the variation in lot sales. That statistical weakness implies that the relationship between lot sales and the economy cannot be used for forecasting land demand.

The same is true for country/rural residential lots, but for other reasons. Sales of country/rural lots were constrained by the availability of lots and do not follow the economy at all as all lots were snapped up as soon as they were put on the market. It is too early to tell at this point but This might be changing as one factor for the slow lot sales in 1999 in the new Spruce Hill subdivision might be the weak economy.

Figure 2 - Yukon Gross Domestic Product and Whitehorse Land Sales



4.2 Personal Income, Population and Land Sales

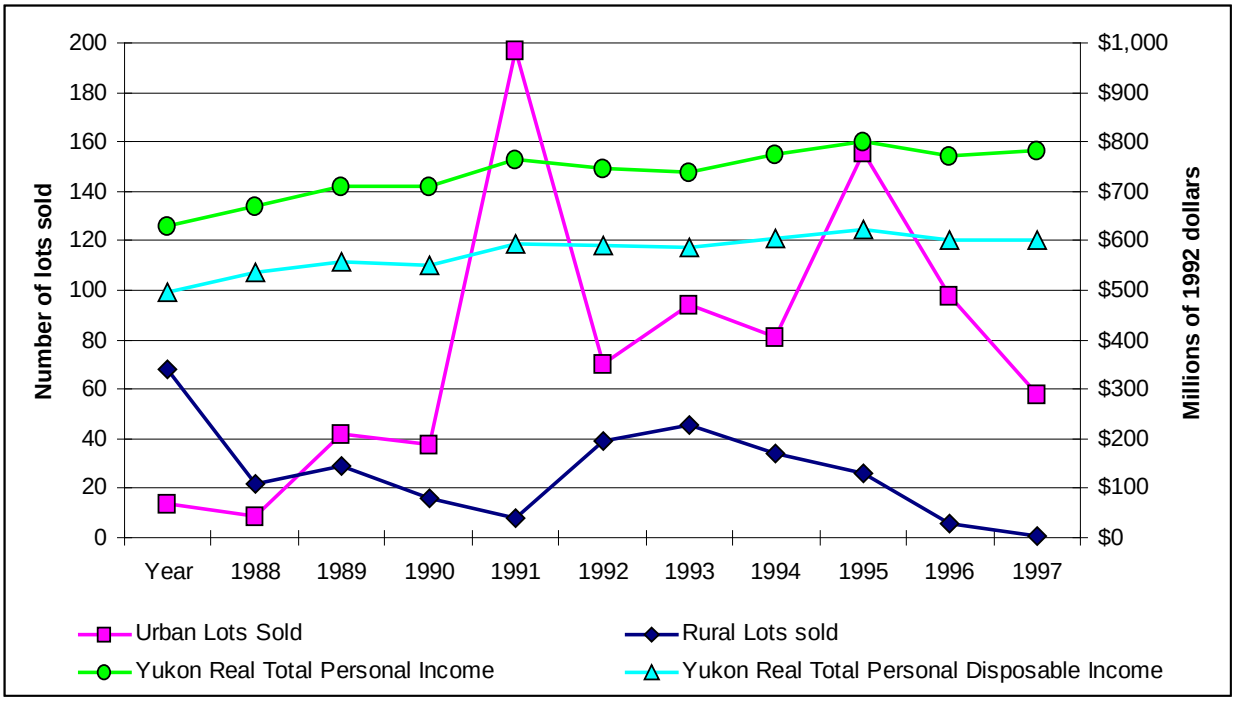
Using total personal income and total personal disposable income adjusted for inflation gave better results than GDP. Total Income and urban lot sales tended to move together more. Lot sales were much more volatile, as the following Figure 3 shows. Despite the large volatility in lot sales, there is a statistically significant relationship between urban lot sales and total personal

[3] A regression analysis of urban lot sales on GDP resulted in

	R^2=0.0520	
F=0.4945	Significance=0.4996	
Intercept=-398	t =-05879	p-value=0.5710
Dispos. Inc.=0.0183	t =0.7032	p-value=0.4996

income or total personal disposable income.[4] However, the same cannot be said for rural and country residential lots. The relationship between rural lot sales and personal income was not statistically significant. This means that personal income or personal disposable income can only be used as a predictor of urban lot sales, and should not be used for country/rural lots.

Figure 3 - Personal Income and Land Sales



Growth in personal income has two components: growth in average income per person and population growth. Both population growth and individual income growth can lead to increases in land demand. Generally, rising incomes can lead to a demand for more and better housing. This, in turn, can generate a demand for more land.

Regressions run on *average per capita* disposable income are not statistically significant. If the two variables (population and disposable income) are included in the same regression equation, only population becomes significant. Average disposable income per person is not.[5]

[4] For urban lot sales on personal disposable income, the regression results were

R^2=0.5084		
F=0.9.3074	Significance=0.0138	
Intercept=-566	t =-2.7473	p-value=0.0226
Coefficient=1.1162	t = 3.0508	p-value=0.0138

[5] For urban lot sales on personal disposable income per person and Whitehorse population,

R^2=.05022		
F=4.0359	Significance=0.0614	
Intercept=-1306	t =-2.1051	p-value=0.0684
Population Coefficient=0.0277	t =2.6897	p-value=0.0275
Income Coefficient=0.0295	t =1.4464	p-value=0.1861

Intuition would dictate that population increase would be a major factor in stimulating land sales. The statistical evidence does show this.[6] Over the short 11-year period for which we have data, population alone was the best predictor of urban lot sales, better than income in terms of statistical significance. This provides a fairly powerful rationale for using population as the main predictor of future land sales.

Briefly, what the regression results show is that for every increase of one person in the population, we can expect (with at least 95% confidence) an increase in sales of between 0.005 and 0.049 urban residential lots, with an expected value of 0.025 new lots per person increase. Put another way, the regression results suggest that for every additional 40 new residents, on average, an additional new urban residential lot will be sold.

4.3 Summary

The statistical evidence shows that population is a better determinant of urban lot sales. It is more important than general economic conditions and people's income. However, with a time series of only 11 years and a wide confidence interval, it would be unwise to rely on these regression results to undertake a long-term forecast. Further, population changes are strongly affected by economic conditions. The analysis shows, however, that economic conditions affect land demand mainly through their effects on population changes, rather than through changing people's incomes.

Further, this analysis only applies to urban lot sales. There is no statistical relationship between country/rural residential land and economic variables. This does not mean that economic and demographic conditions do not affect country/rural lot sales. These kinds of lots have largely been snapped up as soon as they were offered for sale. Thus supply appears to have been the main determinant of sales, rather than the local economic or demographic conditions. Had more country residential lots been available during this period, the data suggests they would have sold. What is not known is the saturation point where the pent-up demand for such lots would have been met.

[6] For urban lot sales on Whitehorse population alone, the regression results were

	R^2=0.3721	
F=5.3325	Significance=0.0462	
Intercept=-469	t =-1.9767	p-value=0.0794
Coefficient=0.0247	t = 2.3092	p-value=0.0463

C. Economic Theory and the Market for Land

This study is done from an economics perspective rather than a land use planning perspective. It is therefore useful to understand the basic economic theory relevant to this problem.

1. Supply & Demand

Supply and demand is basic to understanding economics. In particular, the law of demand states that as prices of a certain commodity go up, people will buy less of it (and vice versa). Figure 4 below illustrates this by a downward sloping demand curve (***D***). In the case of building lots, the supply is vertical (***S***), because there are only a certain number of lots (Q_s) available in a given year, no matter what the price.

In a competitive market with a sufficient number of buyers and sellers, economic theory tells us that prices would eventually settle at the equilibrium point (***E***), at price P_e, assuming of course that the demand remains constant.

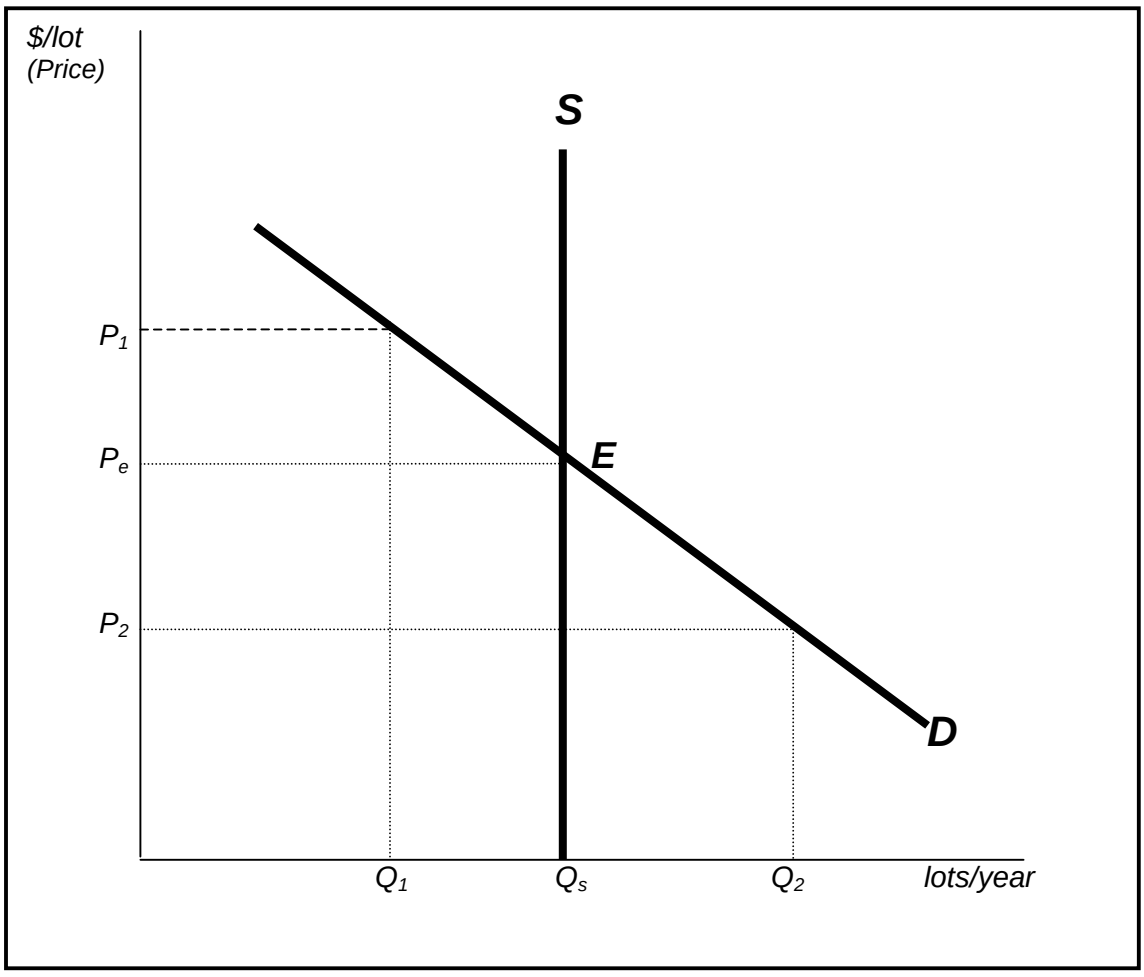


Figure 4 - Supply and Demand Diagram

2. Prices, Surpluses and Shortages

When prices are administered (arbitrarily set) rather than freely determined by the market, this can result in shortages or surpluses of land. For example, if the price is set at P_1, the quantity demanded will be Q_1, which is less than the number of lots supplied (Q_s). This results in an excess supply or surplus of lots. Not all will be sold in a given year because the administered price is higher than the market equilibrium price. This appears to be the situation with serviced urban lots in Whitehorse.

On the other hand, if the administered price is set below the equilibrium, shortages result. In Whitehorse, it can be argued that this is true for country and rural residential lots. This is typically the case for commodities supplied by the state where prices are set at or below production costs. Referring back to Figure 4, at the price P_2, the quantity demanded is Q_2, which is greater than the quantity supplied, hence a shortage of lots.

Based on this analysis, it could be argued that a solution to the dilemma of shortages and surpluses would be for the government to set the price at the equilibrium point. While that point could be estimated using econometric techniques, it would be simpler to auction the lots off. Given that government remains the main land developer, unreserved auctions for developed lots would ensure that all lots are sold and create genuine free market prices. However, auctions could also result in highly unstable prices. When the supply was greater than the demand, prices would fall and the government would not always recover its costs. Falling lot prices would also result in falling housing prices in the rest of the market. An auction approach would probably be politically unpalatable because of the risks involved to both the government and to buyers.

As long as prices are administered rather than set through market forces, there will be shortages and surpluses of land, unless the developers can accurately forecast the precise demand in any given year.

We realize that the government currently attempts to sell land at market prices by obtaining appraisals of each lot it puts up for sale. This is nevertheless an administered price because appraisals cannot take into account the effect of putting the new subdivision on the market. The cost and comparison, and revenue approaches used in appraisals only take into account past land prices. Appraisals implicitly assume that the new development will have no effect on the overall market. The Yukon government is such a large player on the land market that any action it takes is bound to have an effect on market prices.

3. Long-run Prices and Market Dynamics

Economic theory says that, in the long run, if demand does not change, prices in a competitive market will eventually settle at a point that covers costs and only allows a small “normal” profit. This happens because suppliers enter and exit the market and adjust their production to the price level. With high prices, new producers are tempted to enter the market and existing producers may increase their production. When prices do not allow sufficient profit, suppliers begin to leave the market and prices rise until the producers remaining earn sufficient money to remain in the market without inducing new entrants.

However, the long run is not real time. In reality, demand conditions often change before the long run equilibrium is achieved. Effectively, the long run equilibrium is never achieved and prices continue to fluctuate, always tending towards the current short-run equilibrium of supply

and demand. This is especially true of any commodity that takes a relatively long time to produce, such as a building lot.

One phenomenon often observed in this type of commodity is the “hog cycle.” Because the decision to produce hogs for market must be made approximately a year before they are ready to be sold, farmers are always relying on outdated market information to guide their decisions. If the price of hogs rises this year, many farmers will respond by increasing (or going into) production. When all this increased production reaches the market the following year, prices collapse and farmers decide to curb production or get out of the business altogether. This results in a shortage the following year that drives up prices and the cycle continues. The same thing can happen in a free market for building lots. Suppliers overshoot the mark in one year and under supply the next.

Hog cycles can result in highly unstable prices, with oversupply and falling prices in one year followed by shortages and rising prices the following year.

4. Economic Rents

Nineteenth-century economists originally applied the term economic rent to income obtained from the ownership of land. Its meaning has now broadened to include the return paid to any factor in fixed supply. Its most commonly understood use is the rents paid through royalties and stumpage to governments by firms in exchange for the right to exploit publicly owned resources such as timber, minerals or oil.

For land slated for residential development, the economic rent is represented by the price paid for the raw land before any development takes place. For privately owned land — a farm on the outskirts of a city for example — the owner would likely not sell to a housing developer unless the price exceeded the total expected flow of farming income from the land. The case in Whitehorse is, as usual, somewhat different. Here the government is largely both the original land owner and the developer. When building lots are sold, the price is fixed at roughly the cost of development and therefore the government — as landowner — collects no economic rent at all. In effect the government is not behaving as an economically rational landowner and seeking to maximize economic rent. Instead, it is presumably trading off potential rents for other social goods such as relatively more affordable building lots and price stability.

5. Land Demand and the Housing Market

There is also the substitution choice issue in housing. In this case the prospective purchaser may opt to buy an existing house rather than a building lot. There are many reasons for this. First, the preferred lot may not be available or at a price the potential purchaser can afford. Second, many people want to build their “dream” home but become overwhelmed by the complexity of the building process and choose not to proceed. Ultimately, the demand for building lots is derived from the demand for housing. If a large stock of existing housing is available at attractive prices, the demand for new building lots generally falls. This was well illustrated in the Whitehorse housing market during the mid-1980s when housing prices stagnated and the demand for new building lots did not materialize. On the other hand, when the demand for housing is increasing, so will the demand for building lots. Increasing population and rising incomes are the main reasons for an increase in housing demand. Increased demand for housing results in higher housing prices as well as increased demand for lots. In a free market, prices of new developed lots follow housing prices.

The availability of building lots priced essentially at cost has an important effect in damping down housing market booms. Since government administered prices are not responsive to demand, they can create a price ceiling, not only in the land market, but also in the housing market. People who want to buy a house have the choice of building a new one. If the price of built houses gets "out of line" compared to land and construction costs, people will switch to building new houses rather than buying existing ones. This reduces the demand for existing houses and keeps their prices down.

6. Variety, Equity and Efficiency

Building lots as a class of goods — like most other goods — have the elements that lead to what Lancaster has labelled the variety, equity, and efficiency problem.[7] In any market for building lots there are a variety of individual preferences, there is the potential variety in product, and economies of scale in production. These three elements of variety, equity and efficiency are often in conflict and their simultaneous presence leads inevitably to a less than optimal outcome in the production and consumption of building lots.

The inevitable sub-optimal outcome can readily be illustrated by imagining the upshot if every individual could choose the exact spot on which he or she wished to build and the seller of the land had to supply a road, sewer and water. The outcome would produce sufficient variety to satisfy everyone. It would likely also be a relatively equitable outcome as all could have the lot that gives them what they need and want. However, the inefficiency, and the expense, would be staggering. Efficiency does require that most residential building lots be developed in clusters. In the Whitehorse area only two basic varieties of lot are available: urban residential and country residential. This concession to efficiency leads to both reduced variety and reduced equity as not all individual preferences can be met.

[7] Kelvin Lancaster. 1979. Variety, Equity, and Efficiency: Product Variety in an Industrial Society. Basil Blackwell: Oxford.

D. Literature Survey

Surprisingly, very little work has been done on forecasting land demand. Our search included:

- A review of indexes and abstracts of professional literature in the fields of land economics and planning;
- Interviews with researchers active in the field or with related interests; and
- A search of the collections of the Canadian Housing Information Centre (CMHC) and Intergovernmental Committee on Urban and Regional Research (ICURR) Libraries.

The economic literature on demand for land in urban areas can be divided into two broad subsets. The first consists of the efforts to model urban land-use at a macro level. These are largely urban residential land-use simulation models. The second literature subset includes efforts to look in more detail at the bundles of variables that influence behaviour and thus the value attributed to any particular piece of land in a given location. These variables include everything from the nature of the neighbourhood to the shape of the lot since these factors may all determine both the actual appraised or perceived value of particular land (and housing) in an urban area and the subsequent demand.

1. Urban Residential Land-Use Simulation Models

Urban residential land-use simulation models attempt to analyse and predict — in very broad and simple terms — how an urban area will develop over time given the constraints of the model used. The two most common models described in the literature are by Mills[8] and Muth[9]. They are so closely related that that are now referred to as one. For "Mills-Muth" models to work, the urban landform has to be simplified. The urban area is assumed to be circular with one central business district to which all workers commute. All workers commute by automobile along radial routes and transportation costs are identical at any given distance. Households are divided into residence classes and within each class, all are assumed to be the same size, have identical incomes, and create identical housing demand.

"Mills and Muth's models are based on three mathematical functions: a housing production function, a housing demand function, and transportation cost function. Both transportation cost functions consist of a congestion-free component and a congestion component."[10] In addition to the three basic functions, both models contain the following independent variables:

- number of urban-area households,
- household income (assumed equal across all households),
- land areas available for urban use,
- residential housing,
- transportation systems,
- rate of return on capital,
- congestion-free transportation costs,
- price and income elasticity of housing demand,
- Scale parameters.

[8] Mills, E.S. 1972. Studies in the Structure of the Urban Economy. John Hopkins Press: Baltimore.
[9] Muth, Richard F. 1969. Cities and Housing. University of Chicago Press: Chicago.
[10] Altmann, James L. 1981. "Analysis and Comparison of the Mills-Muth Urban Residential Land-Use Simulation Models." Journal of Urban Economic Vol.9 p.365.

The Mills and Muth models have been used to show — using data from the late 1960-70's provided by the United States government — that many of the intuitive assumptions about how cities develop in North America are valid. For example, population density, housing density, land rent and the price of housing (per square metre) all generally fall as the distance from the central business district increases. Efforts have also been made to apply these models to specific cities but with mixed results.

Simulation models are only as good as the parameters selected to run them. Getting accurate results using an actual city requires a very large amount of empirical data to create a model that can account for local geography, internal neighbourhood composition and all the other variables that are present in the "real world". This information is not available for Whitehorse and would be costly to generate. In our view, applying these types of models to the Whitehorse market demand issue will not generate any useful answers. These models assume that market and other economic forces generate development, while government has mainly decided new developments in Whitehorse. Further, these are models that attempt to explain development patterns and are not very useful in predicting the amount of land needed.

2. Hedonic Pricing and Housing Choice Forecasting

A number of economic tools have been developed to help determine what factors drive the demand for urban land Two common methods are hedonic pricing and various housing choice forecasting models.

2.1 Hedonic Pricing

The hedonic pricing method is a technique developed to estimate missing prices, (i.e. prices that have not been observed). First applied by Andrew Court in 1939[11] in the automobile industry, it was used as a means of estimating what the value of each different feature on an automobile was. The technique became popular when Zvi Griliches[12] applied the methodology to a wide variety of goods, including land. The technique consists of constructing price indexes with variables that stand as proxies for the qualities of interest. These indexes use regression techniques to relate the prices of different versions of a commodity to differences in that commodity's characteristics or qualities. The intent is to discover the relative variation and hence significance of one or more of those qualities relative to others. In simple terms, this method can help tell us whether a treed lot is of greater significance (and thus value) than one that is not, all other values being equal.

The market value of a piece of land is closely related to the stream of benefits the owner derives from that land. Hedonic price valuation techniques applied to land are based on this fundamental assumption. For a piece of residential land Pearce and Turner divide the benefits into four classes of variables: property, neighbourhood, accessibility, and environment.[13] Hedonic price techniques usually attempt to isolate one particular variable and place a value on it by using the variations in property prices as illustrated by the treed lot example described above.

[11] Court, Andrew. 1939. "Hedonic Price Indexes with Automotive Examples." In: Dynamics of Automotive Demand. pp.99-117. New York: General Motors

[12] Griliches, Zvi. 1961. "Hedonic Price Indexes for Automobiles: An Econometric Analysis of Quality Change." In: The Price Statistics of the Federal Government, pp173-96. NBER Staff Report No. 3, General Series No. 73. New York; NBER.

[13] Pearce, David W. and R. Kerry Turner. 1990. Economics of Natural Resources and the Environment. John Hopkins University Press. Baltimore.

Property variables include such things as the size and shape of the lot and its topography. Neighbourhood variables include such things as building density and the socio-economic characteristics of the area. Accessibility variables include proximity to the city centre, place of work, schools, recreational facilities etc. Environmental variables include such things as the level of air pollution.

The property price is a function of the four classes of variables and can be expressed as:

$$lnPP = (\alpha)ln\ Prop + (\beta)ln\ Nhood + (\gamma)ln\ Access + (\delta)ln\ Enviro$$

To construct a hedonic price index, data are taken either on a small number of similar properties over a period of years (time series), or on a large number of diverse properties at a point in time (cross section), or on both (pooled data). In practice, most property value studies use the cross-section approach, as controlling for other influences over time are very difficult.

To measure the effect of one particular variable on the value of the property, all relevant variables must be included in the analysis. If any are left out, the results will be biased either upwards or downwards depending on how the included and excluded variables are related to one another. If an irrelevant variable is included, no systematic bias will result, although the estimated effects of relevant variables are rendered somewhat less reliable.

Therefore a fundamental rule of hedonic price analysis is to include as many variables as possible. Unfortunately, many variables do not lend themselves to easy measurement, and many are so closely correlated that they overlap. Hedonic price practitioners therefore spend an inordinate amount of time and effort creating “representative” measures meant to pool a number of closely related variables and searching for adequate (and measurable) proxies for many variables.

Hedonic price methods have been used successfully in community land demand studies elsewhere.

2.2 Housing Choice Forecasting Models

Few housing choice forecasting models were found in our survey of the economic literature. Two of these by Boehm[14] and Quigley[15] appear to be simply aimed at comparing the suitability of various existing statistical choice models when they are applied to the market for housing. Tu and Goldfinch, developed a model that breaks down housing demand forecasts by type.[16]

Tu and Goldfinch argue that their model solves the biggest single problem in forecasting housing demand at a disaggregated level — the empirical calculation problem arising from the enormous bundle of characteristics that contribute to the choice being made.

Their method does this by splitting the process of choosing a dwelling into two stages and making a number of simplifying assumptions. The first stage consists of a buyer’s choice of the key dwelling components that identity the housing sub-markets. The second stage is the choice

[14] Boehm, T.P. 1982. “A hierarchical model of housing choice.” Urban Studies Vol. 19.
[15] Quigley, J. 1985. “Consumer choice of dwelling, neighbourhood and public services.” Regional Science and Urban Economics Vol. 15.
[16] Tu, Yong and Judy Goldfinch. 1996. “A two-stage housing choice forecasting model.” Urban Studies Vol. 33.

of the other dwelling components that distinguish individual dwellings within each housing sub-market. One of the assumptions made is that as long as a buyer ends up with full information on their options, it does not matter in which order they proceed through the decision process.

What an individual buyer considers a key component may vary, but the authors define the term as any component that makes a significant difference in the price of a dwelling. For example, type of dwelling (e.g. house, condo etc.), size range, type of construction (i.e. wood, brick) and age are generally considered key components. Neighbourhood characteristics such as available amenities, presence of schools etc., and transportation issues (i.e. distance to work) are also key considerations, but are treated as a separate choice set in the hierarchy. Non-key dwelling components are such things as number of additional bathrooms and other amenity features like garages that the individual will consider based on personal preferences or particular needs.

The authors apply their model to the City of Edinburgh to illustrate its use. While individual housing choices are impossible to predict, the authors show that by treating potential buyers as demographic groupings (i.e.. “young single” and “young couple with children”) close approximations of the groupings' housing choices can be predicted.

3. Applicability of Models to Whitehorse

The major problem in directly applying any of the economic theory of land demand to the Whitehorse land market is the role played by government in the local market. The Government of Yukon is the main (and often sole) developer and seller of building lots. This means the natural market forces present in most communities that affect the supply and demand of land are not really present.

With government developing and selling most lots, the supply side and prices in the Whitehorse market do not, and cannot, function freely. Prices are “administered” rather than being set by the market. Government does not respond to market conditions by changing prices.

The fixed supply of building lots and especially the administered price, make the urban land use simulation models largely irrelevant to the Whitehorse experience.

The same cannot be said for the use of hedonic pricing techniques for determining the value of various features of building lots. If prices are not set by the demand, then the difference in those prices cannot be used to determine hidden prices. However, hedonic regression techniques can be used if other indicators of the “desirability” of lots or of people’s preferences can be devised. Accordingly, two different indicators of lot desirability are proposed to reflect local conditions: These two indicators are:

- The length of time a lot is on the market; and
- The number of applicants per lot in each lottery.

While the data for the Whitehorse area is not complete, hedonic regression methods can be used to estimate the desirability of different lot characteristics as well as the trade-offs people make between different characteristics and price. There is sufficient “pooled” time-series and cross-sectional data that can be used to estimate the desirability for individual lots, as well as the value of each lot characteristic.

A modified version of Tu and Goldfinch’s model might usefully be used to forecast land demand in the Whitehorse area as its functioning is not dependent on market prices. The model has been modified to look only at land demand. For Whitehorse, the key components in a Tu and

Goldfinch model will be to break out the demand for country and rural residential land versus. urban serviced lots.

The following section discusses the results of testing our conclusions on the suitability of applying the two different market demand methodologies to the Whitehorse market. The focus is on urban lot demand because this is the only data set for which there is sufficient historical evidence. However, as a note of caution because prices are administered, interfering with free market behaviour, the price component cannot accurately be predicted.

E. Estimation of Demand

1. Methodology

This section addresses the first question: “What kind of new residential building lots do people want?” Two approaches were used to answer this question. First, it was decided to undertake a statistical analysis of actual buying behaviour in the Whitehorse area since 1988. A survey was then developed to ask people about their preferences bearing in mind that the survey does not predict their actual behaviour. On the other hand, analysis of buying behaviour shows what people actually did given the constraints on availability of different types of lots, and lot choices. The statistical analysis does not indicate what the absolute preferences are.

1.1 Survey

DataPath Systems of Whitehorse conducted a random telephone survey of Whitehorse area households in January 2000. The survey first asked the respondent how likely they were to buy land for a new house in the next five years. Those who did intend to buy were then asked to complete a 10-minute survey. The survey questionnaire is presented in and the responses to the questions are in Appendix 3. Respondents were asked what kind of land they preferred, and information was collected on their demographic characteristics.

A total of 9,225 calls were placed, 1,831 resulted in a contact, and 312 of the 1,831 respondents stated they intended to buy land or a new house within the next five years. Only this segment was asked to complete the survey.

Given that there are approximately 8,000 households in the Whitehorse area, the survey reached about 23% of the Whitehorse population. With that size of sample, the 95% confidence interval is ±1.7%. The survey indicates that 17.0% ± 1.7% of the approximately 8,000 households in the Whitehorse area are "extremely likely" or "somewhat likely" to buy land in the next five years. Stated alternatively, we can expect that a survey of this size will be within ±1.7%.

It should be noted that the confidence interval for percentages the 312 responses presented in Appendix 3 is much wider, since it includes only part of the sample. The 95% confidence interval for percentages involving only the 312 sample is ±5.5%.

1.2 Regression Analysis

The statistical analysis uses a pooled cross-sectional-time series hedonic regression model to estimate what kinds of characteristics people want in the land they buy. Because prices are administered, they cannot be used as an indicator of preferences. The indicators of preference that we used are:

- Time taken for a lot to sell; and
- How many people selected each lot in the lottery

The regression parameters allow for the estimation of the desirability of each characteristic and also the potential trade-offs between different characteristics. Further, the statistical results can be compared against actual sales behaviours while the results of the survey mean actual past buyer behaviour can be compared to potential land buyer interests.

The methodology is based on the following assumptions:

- There is a continuum of characteristics on the demand side,
- Fixed sets of characteristics on the supply side; (i.e. country vs. rural vs. urban residential)
- There are tradeoffs among characteristics and between characteristics and price

The characteristics included in the regression analysis are:

- Price
- Price per m^2
- Lot Size (m^2)
- Lot Shape (pie or rectangular)
- Slope
- View
- SE/SW Backyard
- Distance to school (m)
- Distance to park/greenbelt (m)
- Out-corner lot
- In-corner lot
- Frontage (m)
- Kind of street (Cul de Sac, Minor, Major, Arterial)
- Zoning
- Urban vs. Rural
- Distance from city centre (km)
- Economic/demographic conditions at time of putting on market

A database of all residential lots sold in the study area since 1988 has been created containing all available data on the characteristics outlined above. However, the time it takes to sell indicator will not work for country/rural lots. The reason for this is that until recently, all country residential lots were sold as quickly as they could be produced and made available for purchase.

The hardest factor to obtain was the number of times any given lot was listed as a preference in the lottery because the Government of Yukon has not consistently kept that information. Thus the data set for this variable is somewhat limited. Seventy-five observations were obtained, all in the late 1980's or early 1990's taken from the Golden Horn, Mary Lake and Robinson records. This represents only a small number of observations and the information that could be gleaned from it is limited and dated.

The demographic and real-estate market indicators used are:

- Percentage population growth in Whitehorse in the previous year
- Percentage Change in seasonally adjusted value of single family real estate sales.

Six different indicators of the state of the housing market were tested. All are measures of the percentage change in the previous year to average price of single family houses, the number of single family sales and the value of those sales. For the regression analysis, we used the “percentage change in the value of real estate sales in the year prior to selling the lot” because it had the best correlation with the time it took to sell lots. We also tested the effect of the size of the land inventory on time required to sell. It had no effect.

2. Market Preference Characteristic Results

2.1 Survey Results

Tables giving the responses to the individual questions in the survey are provided in Appendix 3. Other results relevant to the analysis, such as cross-tabulations, are presented in this section.

(a) Size of Markets

The survey indicates that 17% (312 out of 1,831) of households in the Whitehorse area are extremely or somewhat likely to buy land in the next five years, despite the current state of the economy (January 2000). Given that there are approximately 8,000 households in the Whitehorse area[17], this means that up to 1,360 households may be interested in buying land over the next five years.

This number is considerably greater than in any 5-year period in the past. The average number of lots sold per five-year period since 1988 is about 600 lots over 5 years, if the conversion of seasonal cottage lots to year round dwellings on Marsh Lake are included.

The survey does not give a good indicator of the extent of the total market. It is highly probable that few of those responding "somewhat likely" to buy land will in fact do so. Most of the 312 people (72.8%) responding said they were "Somewhat likely" to buy land compared to 27.2% who said they were "extremely likely." When weighted to represent the actual population, this translates into 980 "somewhat likely" households and 370 "extremely likely" households.

As we have no way of knowing how many of the "somewhat likely" will actually buy land, the survey results should be treated with caution and do not give a true picture of the absolute size of the market. Adding demographic considerations helps to some degree to qualify the numbers but is not entirely satisfactory either. The survey results do however provide a picture that can be used to estimate the relative proportion of demand for different kinds of lots.

(b) Composition of Market

The survey asked three questions relating to lot type preferences. What kind of land are respondents looking for (Question 2), what size of lot were they most likely to buy (Question 3), and where their ideal lot is located (Question 7). The responses are provided in Appendix 3.

Fifty-six percent of the respondents prefer country and rural residential lots. Another 25 per cent want urban serviced land (including mobile home lots), while 13% expressed interest in recreational land, and the remaining 6% want agricultural or other types of land.

To get better results on those who are interested in buying land in residential subdivisions, the survey data was filtered to eliminate respondents who wanted agricultural or recreational lots (57 responses), and those whose maximum price was less than $20,000 (30 responses).

[17] The 1996 Census counted 8,135 households. However, population has declined since then. The YBS health care statistics show 22,879 people in December 1999 and 23,538 in June 1996, while the 1996 Census counted 21,690 people. The discrepancy between the Census and the Health Care population counts make it impossible to arrive at a precise estimate of the number of households. 8,000 household is as good an estimate as can be arrived at this point. It was arrived at by computing a ratio of 1996 Census to 1996 health care population and applying to the 1999 population. That ratio was applied to the 199 population, yielding 21,083 people. Then, the average 2.67 persons per household was applied to that number, giving 7,896 households.

Unless the Yukon Government significantly adjusts its land pricing policy to start subsidising lot sales, the group of respondents wanting land for less than $20,000 cannot be satisfied since current development costs are already higher within the Whitehorse area. Those who did not state either a preference for type of land or preferred location (13 responses) were also eliminated. This reduced the sample size to 205, representing about 895 households within the Whitehorse study area.

Question 7 asked about preferred location. After filtering the data, more than one-third (37.6%) preferred to purchase land outside Whitehorse city limits, while one third (32.7%) were interested in land inside city limits but outside the core (Country-residential areas) and a little less than one-third expressed interest in core area subdivisions. Based on these survey results, about two thirds of the land development effort should be directed towards providing new lots in country residential and rural areas.

Table 7 - Survey Respondents Land Location Preferences

Location	Sample Size	Percent of total	Total households
Urban Core	61	29.8	267
Country within City	67	32.7	293
Rural	77	37.6	336
Total	205	100.0	895

These numbers represent the total potential demand. However, we need to consider that only about a quarter of respondents said they were "extremely likely" to buy land. If only the "extremely likely" respondents all bought lots, this would translate into a demand for 270 lots over the next five years. About one quarter of this "extremely likely" demand is for urban residential, one-third for country residential and the rest (about 42%) for rural residential lots. This distribution is not significantly different than the one-third demand in each category.

It is also worth noting that this data only reflects the stated preferences of the respondents and does not address the larger policy questions of whether such a development pattern is prudent from a land use planning perspective. The policy issues are beyond the scope of this study.

(c) Prices

The following Table 8 present the maximum prices survey respondents said they were prepared to pay for a lot. There was very little difference in the prices people are prepared to pay for urban, rural and country residential land. An equal proportion of respondents (one-quarter) were prepared to pay in the $20,000 to $30,000 price range for a lot as in the 31,000 to 40,000 price range and the 41,000 to 50,000 range. About one fifth were prepared to pay more than $50,000 and the rest would not pay more than $20,000 for a lot. Essentially, providing lots in the $20,000 to $50,000 price range for all categories of residential land can satisfy the majority of demand.

Table 8 - Maximum Prices Respondents were Prepared to Pay

	Urban	Country	Rural
$20,000 and under	6.6	3.0	13.0
$21,000 - $30,000	23.0	20.9	23.4
$31,000 - $40,000	24.6	29.9	26.0
$41,000 - $50,000	24.6	28.4	26.0

More than $50,000	21.3	17.9	11.7
Responses	61	67	77

As economic theory would suggest, the survey results on maximum prices indicate that the demand for lots is very sensitive to prices. For every $10,000 increase in the cost of land, 25% of those wishing to buy are eliminated from the market.

(d) Lot Sizes

Question #3 asked respondents about their lot size preferences. The answers are also presented in Appendix 3. It is also instructive to examine lot size preferences with respect to preferred area as the following table shows. Of note is the desire for large lots (1/2 acre and up) in the urban core. Also of note is a desire for fairly large lots in (1-5 acre) range in both country residential and rural residential locations.

Table 9 - Survey Respondent Preferred lot sizes by Location

	Urban		**Country**		**Rural**	
Preferred Size	No. of Replies	of Replies	No. of Replies	% of Replies	No. of Replies	% of Replies
1/2 acre [about 1/4 hectare]	15	24.6%	4	6.0%	3	3.9%
1 to 2 acres [1/2-1 ha]	6	9.8%	23	34.3%	14	18.2%
3 to 5 acres [1-2 ha]	8	13.1%	27	40.3%	30	39.0%
6 to 10 acres [2-4]	1	1.6%	6	9.0%	7	9.1%
over 10 acres [over 4 ha]	0	0.0%	0	0.0%	21	27.3%
Larger urban lot 60 X 110'	20	32.8%	5	7.5%	1	1.3%
Standard urban lot 50 X 100'	11	18.0%	2	3.0%	1	1.3%
Total	61	100.0%	67	100.0%	77	100.0%

These numbers only show their "ideal" preference and not necessarily what they are prepared to purchase. People are often prepared to trade off size against price especially if the majority of their other "preferences" have been satisfied. These results do not support the contention that the Spruce Hill lots were too small as a third of the respondents stated they preferred lots in this size range. This means other factors such as overall price, privacy and health concerns, and economic conditions were more important.

(e) Other Lot Characteristics

The following table presents the average score (from 1 to 10) given by survey respondents for 23 different lot and neighbourhood/subdivision characteristics (Questions 4, 5 and 6). There are substantial differences in the importance given to different lot characteristics by preferred location although all three rank cable TV service the least important.

Table 10 - Respondent Lot Characteristics and Amenities Preferences

	All	Urban		Country		Rural	
	Avg. score	Avg. score	Rank	Avg. score	Rank	Avg. score	Rank
Roads & Electricity	8.6	9.4	1	9.3	1	8.6	2
Treed Lot	8.4	7.7	7	8.6	3	8.4	3
Privacy	8.0	7.2	8	7.9	5	8.7	1
Phone Service	7.9	9.3	2	9.1	2	7.7	6
Scenic Views	7.7	7.2	8	7.7	7	8.0	4
Off Major Street	7.4	6.9	10	7.4	9	7.8	5
Resale Value	7.3	7.8	5	8.1	4	6.7	9
Access to Green Space	7.3	7.8	5	7.9	5	6.6	10
Fire Protection	7.0	8.2	4	7.6	8	6.6	10
Property Tax Rates	6.7	6.6	11	7.1	10	7.1	7
Water Front	6.5	4.9	19	6.0	13	6.9	8
Backyard	5.7	5.6	14	6.1	12	5.7	12
City Water and Sewer	5.6	8.5	3	6.3	11	4.6	13
Access to Parks	5.0	5.9	13	5.5	15	4.2	15
Lot Shape	4.5	4.7	20	4.7	16	4.6	13
School Nearby	4.4	5.0	17	5.6	14	3.7	17
Cul-de-Sac	4.2	5.0	17	4.7	16	4.0	16
Access to Public Transit	4.1	5.4	15	4.5	18	3.2	19
Garbage Pickup	4.0	6.4	12	4.1	20	3.0	20
Paved Roads	3.7	5.4	15	3.9	21	2.8	21
Corner Lot	3.7	4.1	22	3.6	22	3.6	18
Close to Shopping	3.5	4.6	21	4.2	19	2.8	21
Cable TV	2.8	3.9	23	3.1	23	2.3	23

A better guide is the number of people who said they would not consider a lot unless a given characteristic was present. This gives a direct indication of what characteristics the minimum percentage of lots have to have to match people's preferences. Table 11 below presents the percentage of respondents who stated they would not buy a lot if it lacked a certain characteristic. It should be noted that these percentages include only those respondents who ranked the importance of a characteristic as an 8 or higher.

This Table 11 gives planners and developers a good indication of what characteristics are most important to future lot buyers. It also indicates what percentage of buyers is eliminated when a given characteristic is not present. It should be noted that this table reflects the desires of those people who say they intend to buy land. It is not necessarily a guide for existing subdivisions. For example, only 3.9 per cent of potential rural purchasers require fire protection. However, existing residents in rural areas have successfully lobbied for fire halls.

Table 11 - Percentage of Respondents who would NOT Buy Land if the Following Characteristic is Missing

	Urban	Country	Rural	All
Total number Responses	61	67	77	205
Power & Roads	75.4	76.1	40.3	62.4
Phone Service	72.1	73.1	39.0	60.0
Treed Lot	37.7	70.1	55.8	55.1
City Water and Sewer	72.1	37.3	23.4	42.4
Privacy	24.6	32.8	49.4	36.6
Access to Green Space	27.9	46.3	23.4	32.2
Off Major Street	24.6	31.3	39.0	32.2
Scenic Views	8.2	32.8	27.3	23.4
Fire Protection	41.0	23.9	3.9	21.5
Backyard	6.6	19.4	6.5	10.7
School Nearby	18.0	11.9	2.6	10.2
Access to Public Transit	18.0	6.0	1.3	7.8
Access to Parks	9.8	7.5	5.2	7.3
Lot Shape	6.6	9.0	6.5	7.3
Water Front	1.6	4.5	6.5	4.4
Garbage Pickup	9.8	1.5	1.3	3.9
Paved Roads	6.6	3.0	2.6	3.9
Cable TV	8.2	3.0	-	3.4
Close to Shopping	1.6	3.0	2.6	2.4
Corner Lot	-	-	2.6	1.0
Cul de Sac	-	-	-	-

2.2 Regression Results

The records on land lotteries for country and rural residential lots were inadequate for our purposes. Lack of information on the number of times that lots were selected did not allow us to calculate our indicators of desirability for those types of lots. As a result we were unable to perform a comparable analysis on those types of developments.

The valid results we have are on urban residential lots. Table 12 below presents the results of performing the regression analysis of time taken to sell urban serviced lots against a number of explanatory variables. The shaded areas represent variables that are statistically significant at the 95% level of confidence.

The coefficients represent how much the variable affects the number of days required to sell a lot, on average. A negative coefficient means it will take longer to sell a lot, while a positive coefficient means the lot will sell faster. For example, the negative coefficient for lot size (-0.6923) means that the larger the lot, the fewer the number of days required to sell it, everything thing else held equal. In particular, that coefficient means that for every additional square metre, the lot will sell 0.6923 days faster. On the other hand, the positive coefficient for price (0.0228) means that the higher the price, the longer it will take to sell a lot.

Looking at the regression results for single family lots, the following variables were all statistically significant in explaining the time it takes to sell a lot:

- population growth,
- the housing market indicator.

- price per m^2 or total price paid
- size of lot
- sloped lots and view lots
- lots on cul-de-sac
- lots with south facing backyards,
- distance from parks and downtown,

The other variables (distance from schools, frontage, corner lots, pie-shaped lots, and minor or major street) did not have a statistically significant effect.

Table 12 - Regression Results, Urban Residential Lots

	Regression #1		**Regression #2**	
	Total Price R^2=0.4163		**Price/ m^2** R^2=0.4186	
Variable description	**Coefficient**	**Prob-Value**	**Coefficient**	**Prob-Value**
Intercept	-42.4	0.7038	-770.1	0.0001
% population increase, market date	-1993.4	0.0151	-1993.7	0.0157
% change in value of seasonally adjusted single family real estate sales	-80.3	0.0579	-104.1	0.0138
Lot size (m2)	-0.6923	0.0001	0.2817	0.0021
Price variable	0.0228	0.0001	15.1301	0.0001
Sloped Lot	-80.3	0.0049	-77.5	0.0070
View Lot	-109.8	0.0003	-97.3	0.0012
South Facing Back Yard	-107.5	0.0001	-102.5	0.0001
Distance from Park/Greenbelt (metres)	0.3120	0.0042	0.3359	0.0022
Distance from Downtown (km)	16.3	0.0053	22.3	0.0002
Cul-de-sac	-124.8	0.0002	-122.1	0.0002
Distance from School (metres)	0.0449	0.1917	0.0650	0.0632
Pie-shaped Lot	-11.3902	0.7096	6.0415	0.8434
Outside Corner Lot	34.3	0.3753	25.4	0.5138
Inside Corner Lot	-60.6	0.1558	-45.5	0.2880
Street Frontage (metres)	1.6131	0.3224	2.1161	0.1967
Minor Street	-71.8	0.3678	-80.3	0.3167

First, it should be noted that the speed at which urban residential lots are sold clearly depends on population growth in the previous year. Fast population growth in the year before a lot was put on the market results in lots selling faster. For every one percentage point growth in population increase, lots sold faster by about 20 days on average.

The effect of the state of the real estate market was not as conclusive although it was in the right direction. The regression results show that higher demand in the real estate market, as indicated by higher real estate sales, results in new building lots selling faster.

Some explanation is required on the price and size interaction. Both variables are statistically significant in explaining the speed at which lots sold. Both price variables we tested have positive coefficients. This means that, with everything else held equal, the higher the price, the slower the lot sold. If we look at total price, bigger lots sell faster provided we hold total price constant. On the other hand, holding price per m^2 constant, the regression results show that bigger lots actually sold more slowly on average. What this means is that people will usually buy the cheaper lot because total price has more influence on the purchasing decision than lot size. Of course, people will also take advantage of bargains. Lower land costs per m^2 will result in faster sales.

Looking at the interaction of price and the other variables, it seems that using a different price variable does not materially change the effect of the characteristic. The coefficients in the two regressions are fairly similar.

The results on the other variables confirm some of the survey findings and contradict others. Cul-de-sacs sell faster although survey respondents did not consider them important. Survey respondents considered being off a major street important, but this did not turn out to be statistically significant. However, this could be because there were very few lots in the sales database that were not off a major street.

The survey and the analysis both confirm that views and access to green space are important, while distance to schools is not. This goes counter to traditional subdivision design thinking, which uses school/park combination sites as the focus for most neighbourhood layouts.

3. Demographic Characteristics

The DataPath survey provided basic demographic information about people living in the Whitehorse area who want to buy land. This can be compared to the demographics of home-owning households in the study area using 1996 Census data provided by Statistics Canada. The data distinguishes between households living in the core urban area of Whitehorse (i.e. the fully serviced subdivisions) and those living in the periphery (areas outside the City limits as well as rural subdivisions within the City limits). The periphery includes areas outside the limits of the City of Whitehorse, as well as the Country Residential areas within the City limits (Mary Lake, Cowley Creek, Pineridge, McPherson, and Hidden Valley).

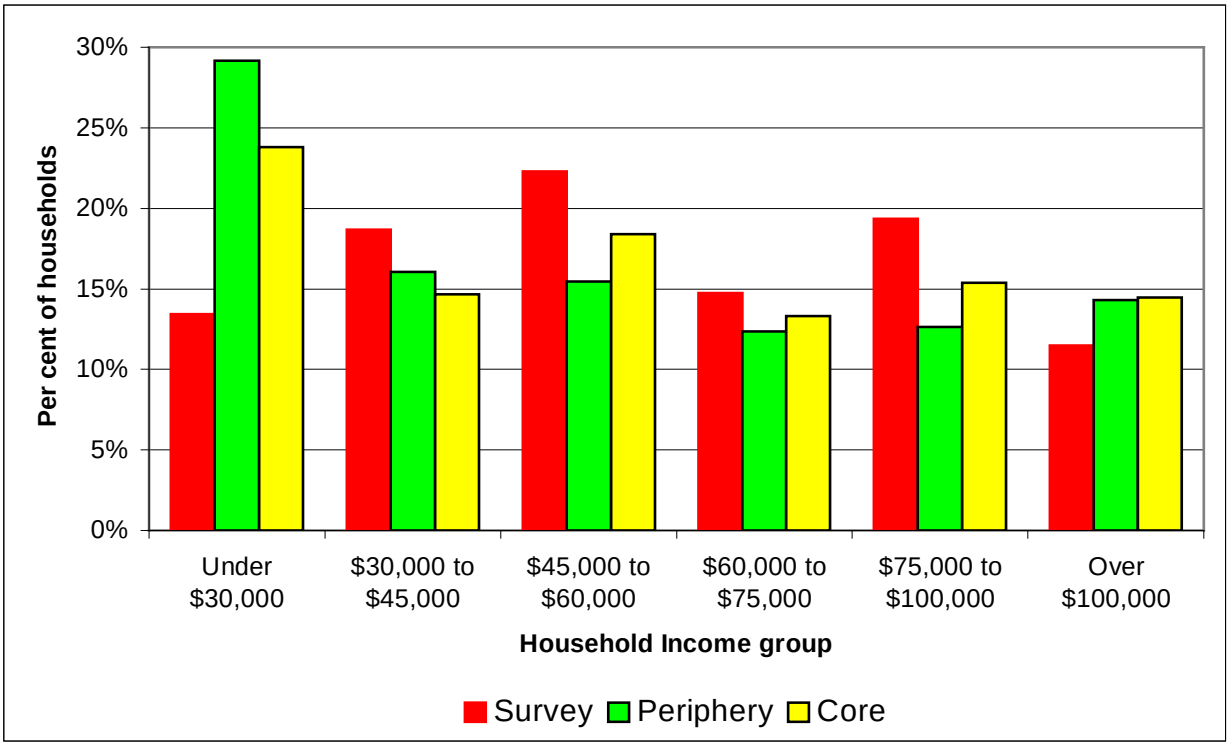
3.1 Household Size

The people wishing to buy land tend to have larger households than the general population. Close to 80% of households in the survey had 3 or more people. This implies that potential land buyers are mainly family households with children. (Anything on single-parent households?)

3.2 Household Income

Figure 5 shows the 1996 income distribution of households in the core and periphery of Whitehorse as well as the income distribution of households who said they were likely to buy land. The 1996 Census showed that people living in the periphery tended to have lower incomes than those living in the core area. However, potential land buyers are over-represented in the $30,000 to $100,000 income groups. In other words, people wishing to buy land are mainly in the middle income groups, with fewer in the low-income and in the high-income groups compared to the general population. Considering that two-thirds of potential land buyers indicated a preference for land in the periphery, this implies that the periphery is no longer assumed to be an option for low-income people to access home-ownership.

Figure 5 - Household Income Distribution, Whitehorse Core (1996 Census), Periphery (1996 Census) and Land Demand Survey (1999)



3.3 Other Household Characteristics

Middle income families with children are most likely to be interested in buying land. Most of them (60 per cent) currently own their home, and close to 70 per cent already live in a single detached home. These percentages are similar to those for the general population.

Thus, the basic profile of the land buyer is a middle income family with children who already own their own home. This suggests that these families are making a lifestyle decision in seeking to upgrade their accommodation. It follows then that there is an expectation from this group that they will be able to sell their existing homes and capture any capital gains to offset their new land purchasing cost.

F. Housing Demographic Projections

1. Methods

We have developed a demographic projection model that estimates three different scenarios for population growth, household formation and total housing demand for different housing types. The existing housing stock is subtracted from the total demand to estimate the number of new lots required over 5, 10 and 15 years.

1.1 Assumptions

The model we developed is a five-year cohort (age group) population projection model. A demographic projection model requires a number of assumptions about birth rates, death rates and migration. After the population is forecast, the number of households, and the number of dwellings by type need to be forecast. These also require assumptions about household formation and the dwelling types chosen by different households.

(a) Births and Deaths

The birth rate assumption we use is the 1991-1995 Yukon average fertility rate for each 5-year cohort of women. Birth rates are forecast to decline by 10% over the next 10 years in the low and medium scenario and to remain constant in the high scenario.[18] Death rates are the average 1992-1995 Yukon death rate for each five-year age group and are assumed to remain constant in all scenarios. [19]

Table 13 - Age Specific Fertility Rates, 1991-95 Average, Yukon

Age of mother	Annual Births per 1000 women
15-19	41.2
20-24	127.4
25-29	121.3
30-34	79.6
35-39	36.7
40-44	7.1
45+	0.3

Source: Statistics Canada #84-210-XIB

[18] This is the same assumption used by the Yukon Bureau of Statistics in its low growth population projections. (YBS, *Population Projections to 2009*, Information sheet #66.04-99.09)

[19] Birth and death rates were obtained from Statistics Canada, *Births and Deaths*, *1993* and *Births and Deaths*, *1995,* Catalogue #84-210

Table 14 - Age-Specific Annual Death Rates, 1992-95 Average, Yukon

Age group	Males	Females
<1	8.8	4.3
1-4	0.9	0.5
5-9	0.4	0.5
10-14	0.2	0.2
15-19	1.9	0.0
20-24	2.1	0.5
25-29	2.7	1.5
30-34	2.1	0.3
35-39	3.2	1.2
40-44	2.7	1.8
45-49	4.7	1.8
50-54	5.5	4.8
55-59	16.5	7.2
60-64	14.5	10.4
65-69	16.8	14.9
70-74	43.3	33.3
75-79	75.1	68.9
80-84	184.7	121.4
85-89	199.4	80.4
90+	201.5	153.5

Source: Statistics Canada #84-210-XIB

(b) Net Migration

Three different migration assumptions form the basis for the different scenarios. The low scenario assumes a net annual out-migration of about 170 individuals per year. The out-migration is in the 15-25 age groups (young people leaving for school) and in the 45-69 age groups (retirement), with no net migration in other age groups. The total was arrived at by looking at the percentage of each age group that migrates every year, rounding it to the nearest percentage, and applying it to the population age distribution.

The medium scenario has zero net migration. It has the same net out-migration as the low scenario, but that is offset by net in-migration in other age groups (0-14 and 25-44).

The high scenario assumes a net in-migration of 200 people per year, distributed in the same age-group pattern as was experienced in the Yukon during the high net in-migration years (1991,1992, 1995, & 1996). The 200 total was selected to match the high-growth YBS population projections migration assumption of 300. It is assumed that two-thirds of the net migration will settle in Whitehorse, roughly matching that city's percentage of the Yukon population.)

(c) Household Formation

The household formation is assumed to stay the same as revealed by the 1996 Census. Each five-year group had a certain "household headship rate" in 1996. Household headship rates are the percentages of the population in each age-sex group who are the primary household maintainer.

Dwelling and tenure choice are also assumed to remained consistent the 1996 rates. The following table presents the household headship rates as well as the proportion of households who live in single family dwellings.

Table 15 - Household Headship Rates and Percentage in SFD, Whitehorse CA, 1996

	Male		Female	
Age Group	Household headship rate	Per cent in SFD	Household headship rate	Per cent in SFD
15-19	0.0%	0.0%	5.2%	37.5%
20-24	26.5%	23.1%	22.4%	23.3%
25-29	53.2%	39.3%	42.0%	42.1%
30-34	56.6%	48.2%	46.9%	53.6%
35-39	71.8%	66.0%	46.1%	51.4%
40-44	71.4%	68.8%	44.1%	61.5%
45-49	76.2%	78.2%	42.9%	60.3%
50-54	80.5%	67.0%	34.8%	67.5%
55-59	79.4%	66.2%	39.7%	64.0%
60-64	71.4%	77.5%	57.1%	50.0%
65+	76.8%	66.7%	57.1%	35.4%

Source: Calculated from Statistics Canada 1996 Census data

2. Demographic Growth and Projected Land Demand

The following Table 16 presents the results for the three scenarios. These projections do not take into account economic conditions. However, economic conditions are assumed to underlie the different migration assumptions. These projections also do not take into account land prices. With higher prices, fewer lots will be demanded. These projections implicitly assume that land will be priced at levels similar to the past. Thus the same proportion of people will be willing and able to buy land as they did in the past.

In the low growth scenario, there will be a slight increase in population in the next five years, with the natural increase outstripping the out-migration. After 2005, population will start to decline. However, the changing age structure of the population will nevertheless result in an increase in housing demand for the next 10 years. This is a result of the ageing of the baby boomers and household formation by the "baby boom echo." About 100 new lots will be needed over the next five years (20 lots per year), with little additional demand after that.

The medium growth scenario, despite zero net migration, will result in a definite population increase, mainly because of the net in-migration of women in childbearing years (25-40). This will result in new household formation and a demand for about 300 new lots over the next five years or 60 lots per year. Demand will taper off after that, with another 250 lots required between 2005 and 2010. Only 360 lots are expected to be required in the second decade of the 21st century.

The high growth scenario, say with a boom caused by the construction of a pipeline or the opening of a major mine, will result in a fairly large population increase and in housing demand. One can expect a demand of about 100 new lots per year.

We can compare the high growth scenario with the 1989-1999 period. In that period, Whitehorse's health care population increased from 20,284 to 22,984 with some intervening ups and downs, for a total change of 2,700. In that same period, 1,050 residential lots were sold, about 100 per year. For the same population growth over 5 years, our model forecasts 100 lots per year rather than the 200 if lots were sold at the same rate as between 1989 and 1999. This indicates that the demographic projection model might underestimate the demand for land or that the demographic profile of the population is changing the housing demand.

For example, there will be a large increase in the number of people in older age groups who have a lower incidence of living in single housing. This points to an increased demand for apartment and other multiple-unit housing, which results in freeing up single houses and reducing the demand for new building lots.

Our projections are for new building lots. The demand for new housing will be greater that for new residential building lots. The demand for housing not met through new single family lots will be met through increased density such as construction of new apartments, basement suites, and duplexes.

Table 16 - Population, Housing Demand and Lot Demand Forecast, 2000-2020

	2000	2005	2010	2020
Low Growth Scenario				
Total Population	21,060	21,129	20,879	19,834
Total Households	8,000	8,190	8,270	8,050
New housing needed		190	80	(220)
SFD required	4,750	4,860	4,870	4,660
New Lots needed		110	10	(210)
Medium Growth Scenario				
Total Population	21,060	21,966	22,718	23,865
Total Households	8,000	8,540	9,020	9,720
New housing needed		540	480	700
SFD required	4,750	5,040	5,280	5,640
New Lots needed		290	240	360
High Growth Scenario				
Total Population	21,060	23,150	25,214	29,137
Total Households	8,000	8,940	9,910	11,670
New housing needed		940	970	1,760
SFD required	4,750	5,260	5,760	6,680
New Lots needed		510	500	920

G. Summary and Conclusions

This study was asked to answer two main questions:

- What kinds of lots do people want to buy; and
- How many lots will they want in the future

1. Data Collection

The lack of data and the difficulty of matching data from different sources hampered our study. The Yukon government needs to improve its data collection and retention processes. In particular:

- There should be one database that would make it possible to easily match data from Land Titles, Property Assessment data, and Land sales.
- Lottery data on individual lots needs to be kept (e.g. how many selected each lot)
- Staff need to be trained and understand why creating a consistent data base is needed
- It would be useful to obtain demographic data on land purchasers

2. What kind of lots?

By comparing the results of actual lot sales between 1988 and 1998 with survey results it is possible to draw a number of general conclusions about market demand in the Whitehorse area. This information can be used for policy development and land planning purposes during the next five years.

The survey results show there is still a strong interest in obtaining land within the Whitehorse area despite the state of the economy. Almost 17% of all respondents indicated they were extremely likely or somewhat likely to try and purchase land within the next five years. About one-third of the demand is for country residential lots within city limits, while another third want rural lots outside the city. The remaining third are looking for full serviced urban residential lots within the city. The demand for mobile home lots is fairly low.

When the survey and the lot sales data were analysed, the main conclusions that emerged are:

- The typical land buyer is a middle income family with children who already owns their own home.
- The survey could not identify the total size of the current demand because over 75% of respondents stated they were only "somewhat likely" (rather than "extremely likely") to purchase a lot within the next five years. If the "extremely likely" respondents all bought lots, this would translate into a demand for 270 lots over the next five years. About one quarter of this "extremely likely" demand is for urban residential, one-third for country residential and the rest (about 42%) for rural residential lots. If we include those who said they were "somewhat likely", the proportion is about equal for all three land categories.
- Survey respondents also provide some information regarding their willingness to pay for different types of land. Only about one-fifth of respondents were prepared to pay more than $50,000 while three quarters indicated an equal preference for land within three price ranges: $20-30,000, $31-40,000 and $41-50,000. What this means is that as the total cost of the lot increases, the number of people whose demand is satisfied declines. For every

$10,000 increase in the cost of land, 25% of those wishing to buy are eliminated from the market.

- Based on survey responses, most of the demand for land can be satisfied by providing lots in the $20,000 to $50,000 price range for all categories of residential land.

This has important policy implications. If the policy objective is to maximize the opportunity for people to buy the type of land they want, costs should be kept down. On the other hand, if other policy objectives have a higher priority such as a desire for a higher servicing standard, the net result is an overall increase in lot price, which means more people are excluded from buying the land they want.

- In general, given a choice with all other factors equal including total price, people prefer larger lots. However, our statistical analysis shows that the demand for lots is very price sensitive. It is especially sensitive to price per square metre. Surprisingly, the statistical evidence indicates that people would tend to buy smaller lots if the price per square metre were kept constant for all sizes of lots.
- The survey reveals that in rural areas outside the city limits, 61% of respondents prefer lots under 2 hectares, which is smaller than expected. In country residential areas within city limits 80% of the respondents prefer lots less than 2 hectares and 10% prefer lots even smaller similar to standard urban lots. In the urban areas, respondents tended to prefer larger lots with 25% indicating a preference for ¼ hectare lots (similar in size to the original Porter Creek). A third of the respondents preferred the present lot sizes while 18% favoured smaller lots similar to those found in the downtown area.

Other than price and lot size, lot characteristics that our analysis shows are important are:

- Roads and power (all three types of lots)
- Access to green space(all three types)
- Telephone service (all three types)
- Privacy (especially in country and rural residential)
- Views (especially in rural residential)

Significant unimportant characteristics included, among others, cable TV, garbage pick-up, distance from shopping and schools, access to public transit, and paved roads.

3. How many lots?

Our economic analysis shows, not surprisingly, that population growth is the main driving force behind land demand. Economic conditions affect land demand through increasing or reducing migration, rather than directly. Living standards (people's incomes) do not seem to affect land demand directly, especially over the 10 year period we examined. We therefore used a demographic projection model with differing migration assumptions to project land demand.

Our demographic analysis indicates that there will be additional demand for land over the next five years even with a constant level of out-migration. This is because of new household formation as the population ages.

- In a low scenario, we estimate a demand of 100 lots over the next five years (20 lots per year), even with a large out-migration. However, that demand for land will disappear in the period from 2006 to 2020, when there will be more than sufficient housing to accommodate the full population.

- Our medium scenario of zero net migration results in an additional demand of about 300 lots over the next five years (60 lots per year), 240 lots between 2006 and 2010 (about 50 lots per year), and 360 lots over the 10 year period between 2011 and 2020 (36 lots per year).
- Our high growth scenario assumes a net in-migration of 200 people per year. Under this scenario, we can expect a continuing demand of about 100 lots per year over the next 20 years. There will be a demand for 510 lots over the next five years, another 500 lots between 2006 and 2010 and 960 lots between 2011 and 2020.

The medium scenario is very similar to the demand expressed by those who are "extremely likely" to buy land, 240 lots over 5 years compared to 270 lots in the survey. This reinforces the confidence in the forecasts. The survey measures people's intentions today.

However, with a continuing decline in population, the implication is that demand will decline below the levels forecast. With a fairly constant population, we can expect a demand of about 50-60 lots per year. Thus, there is a need to continually monitor population data and readjust targets as population changes.

Also, the accuracy of the projections and analysis done in this study needs to be monitored. They are clearly dependent on the migration assumptions we made. Actual and forecasted demand may differ because our assumptions about migration and household formation do not materialize. It is also possible that demand will fluctuate within the overall projected timeline occurring at a faster or slower pace in any given year as pointed out earlier. If this occurs, the analysis presented here should be re-evaluated.

In particular, the projection were done based on 1996 Census information. We tried to update the 1996 information to 2000 because of the substantial demographic changes that have occurred since the Census was taken. However, it would be prudent to redo the projections when the 2001 Census data becomes available in 2002.

4. Policy Considerations

While it is not the purpose of this study to develop policy, a number of our findings have bearing on policy development.

First is the continued demand for land. Both the survey and forecast point to continued demand for lots over the next five years, despite the population decline and the weak economy. About one third of the demand is for serviced urban lots, one-third four country residential lots and one-third for rural residential lots.

Secondly, demand is very sensitive to price. Higher cost to the consumer will mean that lots could remain unsold. So pricing policy and development standards need to be carefully examined in light of policy objectives. Some of the implicit policy objectives relate to affordability and accessibility of land, cost of development and cost recovery, development standards, sizing of lots, and the effect of new development on market prices.

Thirdly, demand is not uniform: people want choices. There is a demand for different types and sizes of lots in different areas. The demand for a variety of choices should be examined in light of the social costs it can impose, such as schools and other costs for developing and maintaining social infrastructure, as well as the environmental impacts. Some of the demand might not be realistic (e.g. city sized lots in areas without sewer & water), and some of it not sustainable, but it does indicate that consumers do want a variety of choices.

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Appendix 1 Interpreting Regression Results

Multiple regression is a common statistical technique used to measure the effect of a series of independent variables or factors on a dependent variable. A regression equation calculates "coefficients" which show how much change in the dependent variable we can expect on average for a given change in an independent variable, holding all other factors constant. Regression analysis allows us to isolate the effect of one variable on another, while holding other influences constant.

A number of "statistics' can be used to interpret the results: R^2, F, the significance level of F, the intercept and coefficients, the Student's "t" statistic and the "prob-value" or "P-Value" associated with the intercept and coefficients.

The R^2 statistic indicates what percentage of the variation in the dependent variable is "explained" by the regression equation. The closer it is to one, the better. However, a good R^2 could be the product of a large number of variables. Adding new variables to the regression equation can easily increase R2, whether they are relevant to the relationship or not. The greater the number of variables, the higher we can expect R^2 to be.

The F statistic tells us whether the regression as a whole is meaningful. The important number is the significance level of F. We want this number to be below 0.05 for a 5% level of significance or 95% confidence. If it is above that, we reject the whole regression.

The "coefficients" can be interpreted to mean by how many days the time to sell is increased for a one unit change in the independent variable. Thus looking at the effect of price per m2, every dollar increase means an average increase of 5.45 days in the time required to sell the lot. If the coefficient is negative, an increase in the variable means a reduction in selling time. The interpretation of coefficients is similar for "dummy" 0-1 variables. Looking at slope, the coefficient of -50.1745 means that, on average, sloped lots sell in about 50 fewer days than lots without a slope.

The final interpretation is the "prob-value" The Prob-value indicates the level of statistical significance. A prob-value of 0.05 indicates that we are 95% sure that the independent variable has an effect on the time need to sell lots. This is akin to the pollsters' 19 times out of 20. The 5% level of significance is the usually accepted level. At any prob-value above 0.05 we reject the coefficient as not statistically significant and conclude that the independent variable probably does not have an effect on the dependent variable.

Appendix 2 Survey Questionnaire

Whitehorse Area market demand survey
FINAL – JAN 5, 2000

Dial results:

Callback	Don't call back
Busy	Out of Service
No Answer	Language
Answering Machine	Fax or Modem tone
	Refused/hung up/not interested
	Business

Screener

Hello, this is _____ calling from DataPath Systems, a Yukon based market research firm. We are conducting a short survey today on behalf of the Yukon Government, Community and Transportation Services Dept.

1. Within the next 5 years, how likely are you, or anyone in your household to purchase land for a new house or recreational use, in the general area of Whitehorse. Would you say: (READ LIST)

   1. Extremely likely
   2. Somewhat likely
   Not very likely
   Not at all likely
   > Terminate (save in not qualified table)

Great, your household has qualified to complete the rest of this 5 minute survey. May I speak to a person who will be involved in buying the land and who has the next birthday coming up?

2. . Is that you?

   No – ASK FOR THAT PERSON – IF NOT AVAILABLE – SET UP CALL BACK
   Yes

We would like you to participate in this survey to help determine Yukoners needs for different types of land in the Whitehorse area. This information will be used in ensuring land is available to meet future needs.

Questionnaire

1. How actively have you been looking for or pricing out land? Would you say: (READ LIST)
   Extremely active
   Somewhat active
   Not very active
   Not at all active

   Data table shows exact words shown

2. What type of land are you looking for? Would you consider it? (READ LIST)
   Urban residential for a single family home
   Urban residential for a mobile home
   Country residential
   Agricultural
   Recreational use/cottage
   Other

   Data table shows exact words shown

   Urban is within city limits

3. A. In terms of the size of the property, what size are you MOST likely to buy? (DO NOT READ LIST UNLESS NEEDED)
   B. What would be your second choice?

   Standard urban lot approximately 50 X 100
   Larger urban lot approximately 60 X 110
   ½ acre (about 1/4 hectare)
   1 – 2 acres (1/2 to 1 hectares)
   3 – 5 acres (1 to 2. hectares)
   6 – 10 acres (2 to 4 hectares)
   Over 10 acres (over 4 hectares)

   Data table shows exact words shown

4. A. There are many factors which may influence your decision on purchasing land. One may be activities available in the area. For each item I read, please tell me how important it is to your decision on where to purchase land. Use a scale from a low of 1 to a high of 10, where a 1 means it is not at all important and a 10 means it is extremely important. How important is (READ ITEM – IF 8 OR GREATER ASK 4b)

   B. If this was not available, would you still consider that area? (YES OR NO)

   Access to green space and trails
   Developed parks with skating rinks and playgrounds
   Public transit
   Close to shopping
   Schools nearby
   Property tax rates and city development charges (DON'T ASK B)
   Resale value (DON'T ASK B)

   Q4a.
   1 – 10
   99 = Don't know

   Q4b.
   1=Yes
   2=No

5. A variety of utility levels and services are available in different areas. Using that same 1 to 10 scale, how important is; (READ ITEM – IF 8 OR GREATER ASK 5b)

   B. If this was not available, would you still consider that area? (YES OR NO)

   City water and sewer
   Basic services such as electric and roads to the lot
   Neighbourhood Fire Protection (fire hall, fire department, etc)
   Garbage pickup
   Paved roads
   Telephone
   Cable TV

   Q5a. 1 – 10 99 = Don't know

   Q5b. 1=Yes 2=No

6. And now think about the lot itself. How important is: (READ ITEM – IF 8 OR GREATER ASK 6b)
   B. If this was not available, would you still consider that lot? (YES OR NO)

   Scenic views (mountain, rivers, lakes, etc)
   Lake or river front
   Corner lot
   Trees
   Cul de sac
   SE/SW backyard
   The shape of the lot
   Away from a major street
   Privacy from neighbours

   Q6a. 1 – 10 99 = Don't know

   Q6b. 1=Yes 2=No

7. And is your ideal lot located in, (READ LIST)
   1. An urban subdivision within Whitehorse city limits (ASK Q.8)
   2. A country residential subdivision within Whitehorse city limits (ASK Q9)
   3. A rural or country residential subdivision outside city limits (ASK Q10)
   99. Don' t know/undecided

8. What general subdivision area would you prefer that to be: (READ LIST IF NEEDED, CHECK 1st and 2nd CHOICE IF 2 ARE MENTIONED)
   1. **West** in the Hillcrest, Copper Ridge and Granger area
   2. **South** near Mclean Lake, Lobird area
   3. **North** near Crestview,
   4. The Takhini, Yukon College area
   5. Lower Porter Creek/golf course area
   6. Across the river near Riverdale
   7. Other
   99. Don't know

B. What is the main reason you prefer that area? (DO NOT READ LIST, CHECK ALL THAT ARE MENTIONED) (ASK FOR MAIN REASON)

Main choice code:

1. Close to town - school/work/shopping
2. Near friends/family
3. Fewer restrictions on what you can do on the land
4. Other : specify: _____
99. Don't know

ALL ITEMS: 1=Mentioned Blank= not mentioned

9. What general area would you prefer that to be: (READ LIST, CHECK 1st and 2nd CHOICE IF 2 ARE MENTIONED)
   1. **South** in the Mary Lake, Cowley Creek area
   2. **West** in the McLean lake Copper Mine area
   3. **North** along Mayo road in Hidden Valley, McPherson area
   4. **North** of Crestview along the Alaska Highway
   5. Across the river east of Riverdale
   6. Other
   99. Don't know

B. What is the main reason you prefer that area? (DO NOT READ LIST, CHECK ALL THAT ARE MENTIONED)

Main choice code:

1. Close to town - school/work/shopping
2. Near friends/family
3. Fewer restrictions on the what you can do on the land
4. Lake/river (fishing, boating, view)
5. Other : specify: _____
99. Don't know

ALL ITEMS: 1=Mentioned Blank= not mentioned

10. What general area would you prefer that to be (READ LIST, CHECK 1st and 2nd CHOICE IF 2 ARE MENTIONED)
    1. **South** of the Carcross Cutoff to Marsh Lake (includes Golden Horn)
    2. Carcross Cutoff to Annie Lake Road (includes Mount Lorne)
    3. **West** along the AK Highway towards Mendenhall (includes Ibex Valley)
    4. **North** along Mayo/Takhini Hot Springs Road to Lake LaBerge
    5. Other
    99. Don't know

B. What is the main reason you prefer that area? (DO NOT READ LIST, CHECK ALL THAT ARE MENTIONED)

Main choice code:

1. Not in the city (fewer people, cars, quiet, etc)
2. Near friends/family
3. Fewer restrictions on the what you can do on the land
4. Lake/river/outdoor recreation (fishing, boating, views, nature)
5. Small town/community
6. Other : specify: _____-
99. Don't know

ALL ITEMS: 1=Mentioned Blank= not mentioned

(ASK ONLY FOR COUNTRY AND RURAL RESIDENTIAL GROUPS)

11. A. And in terms of driving time, how far away would you like your property to be from downtown Whitehorse?

_____ minutes

Actual # in data table

B. Will you or anyone in your household be commuting to and from downtown Whitehorse on a daily basis?

1. Yes
2. No

12. (deleted question)

13. Based on your answers here, would you agree that your ideal lot could be described as: ____ size, ___ min. from Whitehorse, ___ acres, with ___activities, ____ services, ____ general area, and with a ____, _____ lot. (Top rated items will be inserted).

Is there anything else your ideal lot would have?

Good/low price

Other: _____

Two options – recorded verbatim

14. A. If your ideal lot became available, without any housing costs included, what is the VERY most you would be willing to pay for the lot?

$ _____ (SKIP TO q.15)

don't know

Actual number recorded + DK for don't know

B. Do you think it would be: (READ LIST)

Less than $20,000
Between $21 and $30,000
Between $31 and $40,000
Between $ 41 and $50,000
Over $50,000
Don't know

Data table shows exact words shown

And finally, a few profile questions, all responses are confidential. These are important for us to know in order to match land decisions to the population needs.

15. Are you (READ LIST)
    1. Single
    2. Married or living with someone

16. A. What year were you born? Actual number recorded + DK for don't know

    B.(IF 15 = Married or living with someone) In what year was your spouse (significant other) born? Actual number recorded + DK for don't know

17. Including yourself, how many adults live in your household? (18 and over)
    Actual number recorded + DK for don't know

18. A. How many children live in your household?
    B. how many under age 6
    C. how many are age 6 to 14
    D. How many are 15 to 17
    E. How many are 18 or older
    Actual number recorded + DK for don't know

19. Do you currently live in: (READ LIST)
    A single family house in an urban subdivision
    A single family house in a country or rural subdivision
    A semi-detached, duplex or row home
    A Mobile home
    An apartment
    A suite in a house
    Other
    Data table shows exact words shown

20. Do you own or rent?
    Own (including condo)
    Rent (including coop)
    Band/First Nation Housing
    Owned mobile on rented pad
    Data table shows exact words shown

21. And in which of the following ranges, was your household's annual income last year? Was it (READ LIST)?
    Under $30,000
    $30,000 - $45,000
    $45,000 - $60,000
    $60,000 - $75,000
    $75,000 - $100,000
    Over $100,000
    Refused
    Data table shows exact words shown

22. Do you have any other comments? Recorded verbatim

Thank you very much for your time. RECORD GENDER 1 Male 2 Female

Appendix 3 Survey Results