# Impact Of High Voltage Transmission Lines On Rural Property Values

# DRAFT

**Prepared For**

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**June, 2012**

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# EXECUTIVE SUMMARY

## PURPOSE

The purpose of this report is to evaluate the effects of high voltage transmission lines (HVTLs) on rural property values. For this study we have researched a variety of property types, including agricultural, country residential and recreational uses, along specific ATCO Electric Ltd. (ATCO) transmission lines. The research has included both bareland and improved properties.

As is well known, rural property values are affected by many factors. These factors all revolve around the overall Highest and Best Use of the property. The Highest and Best Use of a property is defined as *"The reasonably probable and legal use of vacant land or an improved property that is physically possible, appropriately supported, and financially feasible and that results in the highest value".*[1] Based on the Highest and Best Use, additional factors such as location, access, current land use, soil quality and topography all affect property values. Each of these factors can have a different influence on the value of a property, depending on the Highest and Best Use. The analysis in this report is designed to isolate the effects that a 144 kV or 240 kV transmission line has on property values.

## APPROACH

With the numerous factors that may affect property values in play, and with many being difficult to measure or quantify, it is hard to determine the effect of any one factor on property values. In this report, two approaches are considered in evaluating the effects of a transmission line on rural property values. The first of these is a "Paired Sales Analysis", and the second is a "Regression Analysis".

**Paired Sales Analysis:** A Paired Sales Analysis is typically what would be used to determine the market value of the property that is to be offered for sale. Characteristics of the property in question will be compared to other properties that have recently sold in the same area and the selling prices of those other properties will be used to arrive at a market value for the property that is about to be offered for sale, with some positive or negative price adjustments being made for differences in location, soil and topography, access, etc., as well as for the amount of time that has elapsed since the other properties were sold, depending on market conditions. By comparing the subject property to other properties that sold in the same area, with the only difference being a HVTL, the analysis does not necessitate having to put dollar values on characteristics that are difficult to measure.

In the context of determining the effects of a 144 kV or 240 kV transmission line on property values, the Paired Sales Analysis takes a similar form. Specifically, within a particular area, selling prices are

[1] Source: The Appraisal of Real Estate, Third Canadian Edition, The Appraisal Institute of Canada (2010).

compared for two properties that were of the same or similar Highest and Best Use, had similar physical characteristics, and were sold at a similar time, where the only significant difference between the properties is that one contained a HVTL and the other did not. In this way, any difference in the selling price, and therefore the difference in the property value, can be attributed to the presence of the transmission line. One of the difficulties with this approach is finding pairs of properties that have matching characteristics except for the transmission line being present on one of the two properties. As a result, it is usually necessary to find a pair of properties that are similar in many characteristics, and to make adjustments to the selling price for any small differences in the other characteristics. The dollar amount of such adjustments would be based on the differences in selling prices for other pairs of properties which are similar except for that particular characteristic. For example, if two otherwise similar properties are sold, neither of which contains a HVTL, but one property has a better soil rating (CLI Class 2 vs. Class 3), and the property with the superior soil rating (Class 2) sells for $10,000.00 more than the other property, then the value of having a Class 2 soil versus a Class 3 soil would be $10,000.00 or $62.50 per acre for a full quarter section ($10,000/160), and this adjustment would be used to make adjustments for soil quality in other paired sales comparisons.

The Paired Sales Analysis, which involved sales where one sale of each pair contained a HVTL and the other did not, was conducted separately for eight 144 kV transmission lines and five 240 kV transmission lines across Alberta. These transmission lines are considered to represent a broad cross-section of market areas and land uses within ATCO's service area in the province. Along each transmission line, attempts were made to pair each sale of a property during the period from January, 2004 to December, 2011 that sold and contained a HVTL, with the sale of an otherwise similar property that did not contain a transmission line.

Due to strict selection criteria, outlined further in the report, in some cases, no pairing could be made, while in other cases it was possible to determine several pairings. Only comparisons of fairly similar properties were made in order to keep adjustments to a minimum. In each case, adjustments were made, as necessary, for some differences in property characteristics (other than for the HVTL), and then the difference in the selling prices was calculated. Statistical analysis of these differences was conducted to determine whether the difference between the selling price of a property containing a HVTL and an otherwise similar property that does not contain a HVTL, was statistically significant.

It is noted that as a result of the strict pairing criteria outlined further in the report, our research included an analysis of many more properties than were included in the report. It is also noted that for some types of properties there was very limited subject and comparable sale data that could be used in the analysis. Therefore, there are a limited number of paired sales for some property types.

**Regression Analysis:** The second approach used in this report to evaluate the effect of a 144 kV or 240 kV transmission line on property values is a Multiple Regression Analysis, which is commonly referred to as a Regression Analysis. This is a statistical methodology in which a variable of interest,

here the property value as measured by the selling price, is specified to depend on a set of explanatory variables that jointly determine the selling price. The mathematical equation that links the property value to the values of the explanatory variables, known as a regression equation, involves a set of unknown parameters or coefficients as well as an unknown random error term. The purpose of Regression Analysis is to use data on property values and the values of the explanatory variables to determine estimates of these unknown coefficients, and then to conduct statistical testing to assess whether the individual and joint effects of the explanatory variables on property values are statistically significant or just reflect underlying randomness. The estimates themselves indicate the effects of a change in a particular explanatory variable on property values, holding the effects of all other variables constant. Hence, by including a variable or variables that indicate the proximity of a property to a HVTL among the explanatory variables that determine the selling price, the effect on property values of such proximity can be isolated.

The study area traverses a large part of the province of Alberta and location variables have been applied to individual properties based on the municipality in which the property is located. Although this methodology does not necessarily isolate all micro variations due to location of individual properties, it is expected to account for broad locational differences.

A similar selection criteria was used for the Regression Analysis utilizing sales along the same eight 144 kV and five 240 kV transmission lines across Alberta. Sales during the January, 2004 to December, 2011 were used to compile a robust data set. Additional property characteristics were then gathered for all properties in the data set to help uncover as many significant explanatory variables as possible to ensure an accurate model.

## RESULTS

The two approaches utilized in this study yielded similar results. Both the Paired Sales and Regression Analysis indicated similar mathematical and statistically insignificant results. The study indicated that when doing a statistical analysis of all rural properties included in the study, there was no statistically significant effect of the presence of a HVTL on property values.

Bareland: From a strictly mathematical standpoint, the results are very similar. When analyzing average differences of on-line and off-line properties on both a value per acre and percentage term, results show differences near zero with some being positive and some negative. No calculable pattern existed when the paired sales data was broken down in minimal adjustments, 144 kV line and 240 kV line mini-data sets. Overall, mathematical analysis mirrored the statistical and Regression Analysis in their conclusion of “insignificance”. Based on the findings, 144 kV and 240 kV HVTLs in the ATCO service areas have no impact on rural property values.

Improved Properties: Due to a lack of sufficient volume and thorough information, no analysis was possible on improved rural properties. A lack of on-line sales and the difficulty of obtaining suitable pairs, makes the analysis of improved large parcels nearly impossible and certainly unreliable or unsubstantiated.

# 1.0 INTRODUCTION

## 1.1 OBJECTIVE AND SCOPE

Serecon Valuations Inc. has been asked to determine, if possible, if there is any impact on the value of rural properties throughout Alberta, resulting from the presence of a 144 kV or 240 kV transmission line on, or in a road allowance adjacent to the property. This request is summarized into the following study objective:

- *To determine if there is an impact from existing 144 kV and 240 kV transmission lines on the market value of the rural properties where the transmission line is located thereon or is immediately adjacent in the road allowance.*

Serecon completed the study based on the following assumptions and scope.

To address the objective, the study included various areas throughout ATCO's service area in Alberta, where 144 kV and 240 kV transmission lines are currently located, that provided a broad cross section of market areas and land uses. Eight 144 kV lines and five 240 kV lines were identified and utilized.

The transmission lines studied included areas in northern, eastern and southern Alberta, specifically throughout ATCO's service area. Although the data included in the report may be limited for some types of properties, and specific locations, attempts were made to include as much variety in the range of property types and locations studied as reasonably possible.

## 1.2 STUDY APPROACHES

In addressing the question of impact on property values, the following scope of activities was undertaken:

1. Paired Sales Analysis: To determine the impact (if any) on existing rural properties which contain a HVTL or are adjacent to a road allowance ("on-line") which contains an HVTL, we analyzed sales of properties which contain a 144 kV or 240 kV transmission line and compared these sales with similar properties with similar features that did not contain a transmission line ("off-line"). The comparable property located off-line was adjusted to the on-line subject for noticeable differences to determine if there was a difference in values between on-line and off-line properties.

   The data indicates our findings for each line studied. The data collected for the Paired Sales Analysis was then analyzed statistically, through the use of a statistical t-test, to determine whether the difference in values was statistically significant.

2. Regression Analysis: A second approach for determining the potential impact on rural properties containing or adjacent to a HVTL utilizes a Regression Analysis. With this approach, all sales for the January 2004 to December 2011 time period, across the same lines used in the Paired Sales Analysis, were used to evaluate the effect on property values of proximity to the HVTL while holding the effects of other factors constant. Regression analysis is not limited to similar properties with similar features, since characteristics of the properties – including those used to compare properties in the Paired Sales Analysis are explicitly included in the analysis. This is outlined in more detail later in this report.

## 1.3 Study Area And Lines

The following map identifies the location of the lines studied:

- 7L14 – Vermilion – Hill
- 7L16 – Three Hills – Nevis
- 7L32 – Little Smoky – Kleskun
- 7L58 – Meikle – Keg River
- 7L70 – Whitby lake – Bonnyville
- 7L76 – High Level – Blumenort
- 7L92 – Vegreville – Vilna – Whitby Lake
- 7L98 – Monitor – Oyen
- 9L11 – Little Smoky – Wesley Creek
- 9L20 – Nevis – Battle River
- 9L36/9L37 – Whitefish Lake – Marguerite Lake
- 9L59 – Battle River – Sheerness
- 9L960/9L961 – Deerland – Whitefish Lake


7L76
7L58
9L11
7L32
9L960/9L96
7L92
7L16
9L36/9L37
7L70
7L14
9L20
7L98
9L59
ALBERTA
SASKATCHEWAN
Assumption
High Level
John D'Or Prairie
Fort Chipewyan
Rainbow Lake
Fox Lake
Fort Vermilion
La Crete
Manning
Fort McMurray
Grimshaw
Peace River
Fairview
Wabasca-Desmarais
Spirit River
Lesser Slave L
High Prairie
Slave Lake
Grande Prairie
Valleyview
Lac La Biche
Cold Lake
Swan Hills
Fox Creek
Athabasca
Barrhead
Westlock
Bonnyville
St Paul
Grande Cache
Whitecourt
St Albert
Fort Saskatchewan
Vegreville
Edson
Hinton
Spruce Grove
Edmonton
Vermilion
Drayton Valley
Leduc
Lloydminster
Camrose
Jasper
Wetaskiwin
Ponoka
Wainwright
Rocky Mountain House
Red Deer
Lacombe
Stettler
Innisfail
Hanna
Drumheller
Canmore
Airdrie
Oyen
Banff
Calgary
Bow
Brooks
High River
Medicine Hat
Crowsnest Pass
Taber
Lethbridge
Fort Macleod
Pincher Creek
Milk River
Cardston

# 2.0 STUDY METHODOLOGIES

The study methodology is based on approaches utilized by Serecon in undertaking similar land use and impact studies that utilize large amounts of raw data. The methodologies chosen must be appropriate to address the impact or influence of any one market factor or feature on the market value of rural properties. In our opinion, the applicable approaches are the two utilized in this study, namely the Paired Sales Analysis and the Regression Analysis. Detailed analysis using both of these approaches is reported in the following sections of this report.

The following section outlines our approach to Paired Sales Analysis, while the Regression Analysis approach is subsequently described.

## 2.1 PAIRED SALES ANALYSIS

This approach, in many cases, is utilized as part of a quantitative or statistical study. This approach takes "like properties", one with a HVTL located on or adjacent to it, and compares it to another sale in a "control" area, or one without a transmission line. The properties must have similar market features, including: Highest and Best Use, time of sale, physical and locational features, access, buildings and improvements, etc. The properties are compared and this comparison should identify any difference in value between the properties. If the only major difference between the properties is the presence of a transmission line, then one should be able to identify the impact of the HVTL and its influence on the market value of the property.

The criteria utilized for the Paired Sales Analysis data collection and analysis, in the appraisers' opinion, provides the basis for reliability in the results regarding an indication of any impact of the transmission line on market values. If the lands are truly comparable with the exception of the one factor, the powerline, this should be a reliable approach that reflects market participants' opinions. The criteria in establishing the comparable off-line or control zone sales were as follows:

- an arm's-length sale: exposed to the open market;
- the same or similar date of sale
  (within 6 months of the date of sale for the subject property);
- same Highest and Best Use;
- a similar parcel size;
- similar land use;
- similar location; and
- similar physical features (including soil and topography).

To reduce the potential of including non-arm's length properties in the analysis, transfer documents were obtained for each of the on-line and off-line sales. As well, all of the on-line and off-line properties were inspected by way of adjacent municipal roads where possible.

To reduce the variability attributed to location, only comparables within one township around the on-line sale were researched. However, due to the potential for changes in value within a relatively small area, especially for properties in close proximity to towns and cities, the appraisers also used personal experience and discretion to limit the comparables to those considered to have similar locational influences.

Due to the strict selection criteria described above, many more on-line and off-line sales were searched and analyzed than were included in the report. Properties with unique characteristics that significantly limited the direct comparability between the subject and comparable properties were removed from the analysis. The sales included in the Paired Sales Analysis include only those that are considered to be the most comparable and thus best indicators of the possible impact that the transmission line would have on market value.

### 2.1.1 Paired Sales Statistical Analysis

The sample size by specific line is too limited, but for the province, the sample size is adequate for a valid comparison and a statistical analysis. A statistical analysis of the paired sales data was carried out comparing the sale prices of on-line versus off-line sales. This analysis determined if there are any statistically significant differences in the values between the on-line and off-line sales.

## 2.2 Regression Analysis

An alternative approach to determining the effect of a 144 kV or 240 kV transmission line on property values is by way of a Regression Analysis. By regressing property values on property characteristics, the effect of a transmission line on property values can be isolated. The main advantage of this approach relative to a Paired Sales Analysis is that the estimated regression coefficients show the effect of particular characteristics on property values holding the effects of all other variables in the regression equation constant. This means that it is not necessary to try to identify properties that have similar characteristics where one is adjacent to the HVTL and an otherwise similar property is located away from the line. Since two properties are never exactly the same, in the Paired Sales Analysis this may necessitate adjustments to the selling price to account for differences in time of sale, physical features, location, access, etc., and in some cases sales must be excluded because the differences are too great. In addition, this need to find matched pairs limits the sample size that can be used for the Paired Sales Analysis. Neither of these limitations applies to Regression Analysis. However, Regression Analysis requires information on all relevant characteristics that might affect the property value, and in practice much of this information is simply not collected or readily accessible. Thus,

Regression Analysis is best viewed as being complementary to the Paired Sales Analysis. In particular, it should be kept in mind that a form of paired analysis – based on comparisons of one particular property with various other properties and making price adjustments for particular differences – is generally the approach used by realtors to determine a reasonable selling price for a property.

Data used in the Regression Analysis was extracted from provincial transfer data for the period January, 2004 to December, 2011. Only transfers with sufficient information available were used to reduce the likelihood of non-arm's-length transactions. However, it is likely that the Regression dataset may include some non-arm's-length transactions due to the volume of data and the less rigorous data analysis. In general, the Regression was estimated using data on all transfers that occurred within a township which contains a 144 kV or 240 kV transmission line where some sales contained or were adjacent to the transmission line, while others occurred elsewhere in the township.

The Regression Analysis that is described in this report focuses on the same 13 HVTLs studied in the Paired Sales Analysis section of the report.

In addition to price, other characteristics of the property that were available from various sources were also collected and utilized in the Regression Analysis. These include such information as land use, CLI soil classification, the number of surface leases if any, the presence of improvements etc. Complete details on all these variables are provided in Section 4 of this report.

# 3.0 PAIRED SALES COMPARISON

## 3.1 METHODOLOGY

As previously indicated, the basic premise behind this approach is the process of comparing the sale prices of like properties that have the same physical characteristics and locational features; one considered an on-line sale due to the fact it contains, or is adjacent to a road allowance which contains, a 144 kV or 240 kV transmission line, with the comparable being an off-line sale without a transmission line. In the appraisers' opinion, if adequate "true comparables" are utilized and the comparison is made based on sound appraisal principles, this approach provides supportable conclusions based on the reactions of market participants, with respect to any impact of the transmission line on rural values.

In the appraisers' opinion, a determination had to be made as to whether it was possible to complete a Paired Sales Analysis on sales where there are significant building improvements. The major limitation would be whether truly comparable properties with similar Highest and Best Uses, and buildings and improvements could be found. The premise behind the Paired Sales Analysis is to analyze like sales, and to complete adjustments for different features between the properties, leaving the only unadjusted difference to be the transmission line on or adjacent to the subject property. The land characteristics, including Highest and Best Use, as well as building and improvement characteristics, must be similar to conduct a true paired comparison. In rural settings, it is difficult to find an identical or very close compliment of buildings and improvements on two different properties. Therefore, significant adjustments are often required to equate the two sales. Where significant adjustments are required for differences, the properties are deemed to be too different to use for purposes of a reliable comparison. Where a sale occurred on-line but no truly comparable sale off-line could be found, the on-line sale was excluded from our analysis. The inclusion of paired sales requiring substantial adjustment was thought to compromise the integrity of the study, and such sales were therefore excluded from the analysis. Due to the restrictions described above, improved properties and their inclusion within this study are discussed separately following the analysis of bareland properties.

The following steps provide the process undertaken in completing the Paired Sales Analysis:

- All 144 kV and 240 kV transmission lines were identified throughout the ATCO service area in Alberta. Eight 144 kV lines and five 240 kV lines were then selected to be included in the study to provide a cross section of different regions and land uses across the ATCO service area. Sales of properties 70 acres and greater in size, which contain these lines, were researched. We researched those sales that occurred between January, 2004 and December, 2011.

- Data was researched through provincial transfer records by searching all properties containing a portion of the determined transmission lines or located adjacent to the transmission line which is in a road allowance to determine whether they had transferred during the above time period.
- On-line sales were then researched through obtaining a copy of the respective transfer document from Alberta Land Titles to identify if the transfer may have occurred between related parties. Multiple Listing Services (MLS) was also searched to identify if the identified property had sold through the relevant real estate board.
- Aerial photographs were obtained for each of the on-line properties identified above, including a historic aerial search for sales that occurred prior to the date of the photograph.
- Based on the aerial photographs, the assessment departments of the relevant municipalities were contacted to request assessment information for properties that appeared to have improvements.
- To strengthen the reliability of the study, improved properties that did not have either MLS or assessment data were removed from the analysis.
- Once on-line sales were identified, all sales were researched through MLS and provincial records throughout these same areas to identify comparable off-line sales. These comparable sales were reduced to only those that provided the best direct comparison to the on-line sales.
- As indicated, we attempted to identify comparables with the same Highest and Best Use, size, land use and similar physical characteristics, all within the same location and time period. However, some adjustments were still required for any differences.

Our search process yielded 201 original on-line transfers within the January, 2004 to December, 2011 time period. From these, 86 were deemed to be arm's-length transactions based on transfer documents. On-line sales were further reduced with the exclusion of 10 improved properties and a further 23 properties for which no suitable comparables could be found. This left a dataset of 53 on-line properties.

### Adjustments

Although the desired outcome of the Paired Sales Analysis is to find on-line and comparable properties which are identical, it is unrealistic to think that a large number of these perfect matches are available. Therefore, comparable off-line sales were chosen which were as similar as possible to the on-line sales. Small adjustments were then made to these comparables to account for any differences in order to make the properties a matched pair. Adjustments for time, location, land use, soil and topography, size, access, severance, and aesthetics were all considered. Only properties requiring minimal adjustments were utilized in the Paired Sales Analysis.

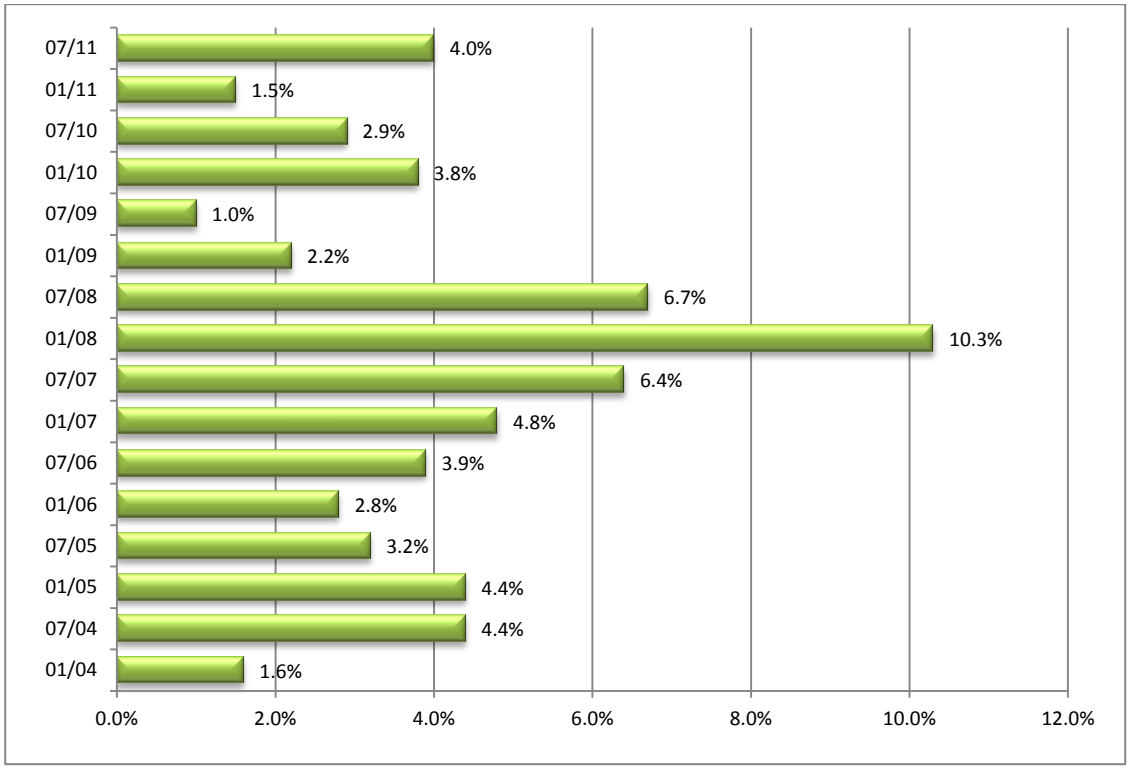
Serecon is completing rural appraisals across Alberta on a continuous basis and has an extensive land sales database that goes back to 1968. Extensive experience affords us the opportunity to witness

market participants and the various influences on market values that different factors have. The following explains how various factors were considered and addressed for purposes of this study.

**Time:** Time is one of the most important factors to take into consideration in any Paired Sales Analysis. The relevant time period (January, 2004 to December, 2011) was a time of great fluctuation in real estate prices throughout Alberta, and the rural real estate market was not immune to these fluctuations. This time period saw significant increases in value throughout most of rural Alberta. The following graph shows semi-annual percent change in Alberta farmland values based on data provided by Farm Credit Canada (FCC).

This chart shows typical semi-annual gains between 1.5% and 4.5%, with more robust value increases occurring in 2007 and 2008 and then a subsequent levelling-off in 2009. Unlike urban property values, rural values have seen increases throughout the study period. However, farmland closer to urban centers which is influenced by urban values and speculation would have seen price patterns more like the urban property values which would have included a more dramatic increase in values throughout the 2006 and 2007 period, with a significant decrease in 2008 and into 2009, followed by a levelling off during later 2009 and into 2010. This market has been relatively stable with some minor increases since early 2010.

**Semi-Annual Percent Change in Alberta Farmland Values**




Source: Farm Credit Canada

Time adjustments throughout the study areas are quite variable depending on the area, distance to urban development, degree of speculation and Highest and Best Use. Therefore, there is no one guide to follow when determining individual time adjustments in specific areas. In this study, time adjustments were kept to a minimum by using comparable sales which sold at a similar time to the sale date of the on-line properties. For paired-sales in which this was not possible, time adjustments were determined using the FCC data as well as supplemental municipal specific data from the Alberta Agriculture and Rural Development and the appraisers' knowledge and experience of the specific location and its prevailing market factors. A monthly percentage change was then applied to estimate the change in values between the sale dates of the subject and comparable properties.

**Location:** The location of a rural property is very important when estimating the overall value of that property. This factor was considered when determining the 'best' comparable because proximity to urban centers has a significant effect on land values. The Paired Sales Analysis is performed in such a way as to eliminate any need to do location adjustments regarding large general areas throughout the province. This is completed by only utilizing comparables which are within the same general area (generally within a 16.0 km radius of the subject (on-line) property. Therefore the only locational adjustments that need to be made are based on particular smaller scale issues such as location with respect to distance to major highways, distance to major urban centers, etc. These adjustments however, are far less in magnitude due to the on-line and off-line sales already being within the same market area.

Location adjustments were made to some of the off-line sales to account for these particular locational differences. These adjustments were based, where possible, on paired sales comparison, or if a paired sale isolating the value was not available, the adjustment was based on the experience of the appraisers involved.

**Land Use:** The term "land use" in the Paired Sales Analysis refers to the type and quantity of various agricultural land uses. For example in many areas annually cultivated land sells for more on a per acre basis than hay or pasture land, because this type of land is typically of lower quality. Similarly, a parcel with a larger percentage of cultivated land would sell for more per acre than one with a smaller percentage. Once again this adjustment was minimized by attempting to find comparable properties with a similar land use to that of the subject. Nevertheless, adjustments were necessary in some circumstances and in this instance, were based on the appraisers' knowledge and experience to determine the appropriateness and magnitude of the adjustments.

**Soil and Topography:** Soil and topography adjustments were made where necessary to adjust for differences in soil quality and topography in terms of their effect on the Highest and Best Use of the property. Soil suitability for agricultural purposes is rated through two different systems in Canada:

i) the Canadian Land Inventory (CLI) system; and
ii) the Land Suitability Rating System (LSRS).

The LSRS is the most current rating system; however, most people involved with agriculture, especially rural landowners, are more familiar with the older CLI system. Therefore, soil data was based on the ratings on the Canadian Land Inventory (CLI) Soil Capability for Agriculture Maps.

The Canada Land Inventory Soil Capability for Agriculture Maps, rates soils based on their capability for agricultural production.

This study encompassed lands with the following CLI Classes, the explanations for which are included in the CLI rating system.

**CLI Classes**

Class 1 soils have no significant limitations in use for crops.

Class 2 soils have moderate limitations that restrict the range of crops or require moderate conservation practices.

Class 3 soils have moderately severe limitations that restrict the range of crops or require special conservation practices.

Class 4 soils have severe limitations that restrict the range of crops or require special conservation practices, or both.

Class 5 soils have very severe limitations that restrict their capability to producing perennial forage crops, and improvement practices are feasible.

Class 6 soils are capable only of producing perennial forage crops, and improvement practices are not feasible.

Class 7 soils have no capability for arable culture or permanent pasture.

Organic soils are not placed in any capability class.

**CLI Sub-Classes**

The subclasses are based on the kinds of limitations.

Subclass C: adverse climate – The main limitation is low temperature or low or poor distribution of rainfall during the cropping season, or a combination of these.

Subclass D: soil structure – Undesirable soil structure and or low permeability. The soils are difficult to till, absorb water slowly or the depth of the rooting zone is restricted.

Subclass M: moisture holding capacity – Low moisture holding capacity caused by adverse inherent soil characteristics which limits crop growth.

Subclass S: soil limitations – A combination of two or more subclasses D, F, M, and N.

Subclass T: adverse topography – Either steepness or the pattern of slopes limits agricultural use.

Subclass W: excess water – Excess water other than from flooding limits use for agriculture. The excess water may be due to poor drainage, a high water table, seepage or runoff from surrounding areas.

Subclass "X" refers to minor cumulative limitations which have a moderate limiting affect on the soil capability.

Topography was determined by way of CLI rating, mapping program, and/or visual inspection of the properties.

Adjustments under this category were based on municipal specific data supplied by Alberta Agriculture and Rural Development. This data shows price value differences within municipalities between the different soil ratings. In addition to this data, paired sales and the appraisers' knowledge and experience were used to determine adjustments for soil and topography.

**Size:** Size adjustments were eliminated if at all possible; however, in some instances an adjustment was required in order to retain as many paired sales as possible. Generally, smaller parcels sell for more per acre than larger parcels. Adjustments for size were made under this assumption and applied where determined to be necessary by the appraisers.

**Access:** Access is another issue that must be addressed in the rural marketplace. Properties which are located with highway frontage or which have superior access are likely to sell for a higher value than those properties without such characteristics. Properties with limited or no access were only compared to like properties with similar access. For all other properties, adjustments were made regarding the quality of the access where determined by the appraisers to be necessary.

**Severance:** Adjustments for severance were made in the event that either the on-line or off-line sale was severed by a road, a railroad or similar infrastructure.. Generally, properties with some form of severance sell for less than those properties without any severance issues. Severance is adjusted based on the type and severity of the severance with respect to the market value of the property.

**Aesthetics:** Aesthetic characteristics were considered for those properties which were determined to be in an area in which general desirability in terms of non-agricultural characteristics were determined to be important.

## 3.2 HIGHEST AND BEST USE

The most important component in real estate valuation is the determination of the property's Highest and Best Use.

The principle of Highest and Best Use is defined by the Appraisal Institute of Canada as being:

> *The reasonably probable and legal use of vacant land or an improved property that is physically possible, appropriately supported, and financially feasible and that results in the highest value.*
>
> Source: The Appraisal of Real Estate, Third Canadian Edition, The Appraisal Institute of Canada (2010).

When determining the Highest and Best Use, appraisers always need to consider the following criteria:

- the use must be legal;
- the use must be probable and possible within a reasonable period of time;
- there must be a demand for the use; and
- the use must be profitable and provide the highest net returns in the foreseeable future.

Most of the properties utilized in this study have an agricultural Highest and Best Use. However, some larger, treed or aesthetically pleasing parcels may have a greater recreational or large parcel country residential use rather than an agricultural use. For this study, the appraisers have considered the above listed criterion as well as professional judgement and experience to determine the Highest and Best Use of a property. The appraisers have only utilized comparable properties which have the same Highest and Best Use as the given subject on-line property.

There can be confusion between the Highest and Best Use and the current use, as well, how those uses impact on the current market value. Lands in a considerable portion of the province, specifically areas around urban centres in particular, have for the foreseeable future an agricultural Highest and Best Use. Due to the distance from these urban centres, there is limited current potential for more intensive development. The returns from the land are exclusively from agricultural uses. These returns support the productive capacity of the land, but do not support the current market value. Demand from buyers not dependent on agricultural returns and large farmers wanting to expand their land base and willing to pay more for the single quarter, has driven the value of the land to a higher level than can be supported by agriculture. However, the Highest and Best Use still remains agriculture as there are no other potential alternative uses within the foreseeable future.

The buyer of land, which due to location and zoning has no alternative use potential, is purchasing the land as a long-term investment with a marginal annual return on investment, but speculative long-term return on capital appreciation. Therefore the lands being purchased for $3,000.00 to $4,000.00 per acre in some areas only have annual returns supporting a $1,500.00 to $2,000.00 per acre value; the market

is anticipating capital gains to make up the difference. However, the land's Highest and Best Use remains agriculture, with continued demand from the hobby use/investment buyer to support the current market value.

## 3.3 FINDINGS

The following is a summary of the sales utilized, the overall adjustments made to those sales and the price differences for each of the paired sales utilized. Maps indicating the location of the subject (on-line) and comparable (off-line) properties for each transmission line utilized are located in the Appendix to the report.

| | Subject/Comparable | Land Use | Size | Transfer Date | Sale Price | Imp | ECV | Inferior/Superior Characteristics | | Adjustments | | | Price Difference | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | Time | -/+ Characteristics | | Adj. Price | Price/ Acre | (Subj-Comp) | % Diff. |
| | **Line 7L16 (Single Pole)** | | | | | | | | | | | | | | | |
| **1** | **NW & E ½ 30-33-23-W4** | **DC** | **455.25** | **31/03/2004** | **500,000** | **4 leases** | **$42,000** | | | | | | **458,000** | **1,006** | | |
| 1A | SW 24-33-23-W4 | DC | 160 | 04/09/2004 | 160,000 | | | | | -3.50% | | | 154,400 | 965 | 41 | 4.25% |
| 1B | W ½ 1-34-23-W4 | DC | 320 | 13/05/2004 | 322,000 | 1 lease | $10,500 | Inferior Soil | | -0.70% | 5% | | 324,785 | 1,015 | -9 | -0.88% |
| **2** | **SW 18-34-23-W4** | **OP, DC** | **158.84** | **21/06/2007** | **210,000** | **2 leases** | **$21,000** | | | | | | **189,000** | **1,190** | | |
| 2A | SW 11-35-24-W4 | OP, DC | 148.67 | 07/11/2007 | 210,000 | 1 lease | $10,500 | | | -5.60% | | | 188,328 | 1,267 | -77 | -6.07% |
| 2B | SE 11-35-24-W4 | DC, OP | 160 | 09/01/2007 | 202,000 | 3 leases | $31,500 | | | 7.00% | | | 182,435 | 1,140 | 50 | 4.36% |
| **3** | **SW 14-37-23-W4** | **DC, OP** | **160** | **17/08/2004** | **167,500** | **2 leases** | **$21,000** | | | | | | **146,500** | **916** | | |
| 3A | SE 21-37-22-W4 | OP, DC | 160 | 22/05/2004 | 153,280 | 1 lease | $10,500 | Inferior Land Use | | 2.10% | 10% | | 160,356 | 1,002 | -87 | -8.64% |
| | **Line 7L32 (Single Pole)** | | | | | | | | | | | | | | | |
| **4** | **SW 14-72-4-W6** | **DC** | **144.3** | **02/09/2011** | **380,000** | | | | | | | | **380,000** | **2,633** | | |
| 4A | NW 13-72-5-W6 | DC | 155.11 | 31/08/2011 | 400,000 | | | Superior Soil | Inferior Land Use | 0.00% | -5% | 10% | 420,000 | 2,708 | -74 | -2.75% |
| **5** | **NE 8-71-25-W5** | **BU, DC** | **118.72** | **02/11/2004** | **76,000** | | | | | | | | **76,000** | **640** | | |
| 5A | NW 4-72-26-W5 | BU, DC | 64.3 | 10/08/2004 | 52,500 | 1 lease | $7,500 | Size | | 2.10% | -10% | | 41,351 | 643 | -3 | -0.45% |
| **6** | **SE 29-72-4-W6** | **DC** | **160** | **09/06/2005** | **185,000** | | | | | | | | **185,000** | **1,156** | | |
| 6A | NW 3-72-4-W6 | DC | 146.2 | 31/05/2005 | 178,000 | | | Superior Soil | | 0.00% | -10% | | 160,200 | 1,096 | 60 | 5.52% |
| **7** | **SE 16-72-3-W6** | **DC, OP** | **126.64** | **17/10/2005** | **110,000** | | | | | | | | **110,000** | **869** | | |
| 7A | NE 6-72-3-W6 | DC | 156.02 | 19/10/2005 | 145,000 | | | Superior Land Use | Superior Soil | 0.00% | -10% | -5% | 123,250 | 790 | 79 | 9.96% |
| **8** | **NE 4-71-25-W5** | **DC** | **146.24** | **14/02/2007** | **100,000** | | | | | | | | **100,000** | **684** | | |
| 8A | NW 24-71-26-W5 | DC | 78.89 | 14/02/2007 | 75,000 | | | Superior Soil | Size | 0.00% | -10% | -10% | 60,000 | 761 | -77 | -10.09% |
| **9** | **NE 4-72-1-W6** | **DC** | **127.03** | **17/01/2008** | **170,000** | | | | | | | | **170,000** | **1,338** | | |
| 9A | SW 32-72-1-W6 | DC | 160 | 28/05/2008 | 160,000 | | | Inferior Soil | Inferior Access | -2.80% | 15% | 5% | 186,624 | 1,166 | 172 | 14.73% |
| **10** | **SW 16-69-22-W5** | **OP, BU** | **100.18** | **18/06/2009** | **74,500** | | | | | | | | **74,500** | **744** | | |
| 10A | SE 4-70-22-W5 | BU, OP | 108.86 | 04/12/2009 | 125,000 | | | Superior Access | Superior Location | -2.40% | -10% | -10% | 97,600 | 897 | -153 | -17.05% |
| 10B | SE 36-70-23-W5 | DC, BU | 157.98 | 12/03/2009 | 100,000 | | | Superior Land Use | Size | 1.20% | -5% | 10% | 106,260 | 673 | 71 | 10.56% |
| **11** | **SE 21-70-24-W5** | **BU** | **76.63** | **27/08/2009** | **60,000** | | | | | | | | **60,000** | **783** | | |
| 11A | SE 4-71-25-W5 | BU, DC | 167.17 | 27/03/2009 | 100,000 | | | Superior Land Use | Size | 2.00% | -5% | 10% | 107,100 | 641 | 142 | 22.21% |
| **12** | **SW 21-70-24-W5** | **DC, BU** | **143.97** | **27/08/2009** | **120,000** | | | | | | | | **120,000** | **834** | | |
| 12A | SE 36-70-23-W5 | DC, BU | 157.98 | 12/03/2009 | 100,000 | | | Inferior Land Use | | 2.00% | 10% | | 112,200 | 710 | 123 | 17.36% |
| 12B | NW 7-71-25-W5 | DC, BU | 161.24 | 22/06/2009 | 145,000 | | | | | 0.80% | | | 146,160 | 906 | -73 | -8.05% |
| | **Line 7L58 (Steel Lattice)** | | | | | | | | | | | | | | | |
| **13** | **NW 25-93-23-W5** | **DC** | **114.46** | **02/10/2009** | **107,500** | | | | | | | | **107,500** | **939** | | |
| 13A | SE 24-92-24-W5 | DC, BU | 160 | 19/02/2010 | 125,000 | | | Size | | -1.40% | 5% | | 129,413 | 809 | 130 | 16.12% |

| | Subject/Comparable | Land Use | Size | Transfer Date | Sale Price | Imp | ECV | Inferior/Superior Characteristics | Adjustments | | Price Difference | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Time | -/+ Characteristics | Adj. Price | Price/ Acre | (Subj-Comp) | % Diff. |
| | **Line 7L70 (Single Pole)** | | | | | | | | | | | | | |
| **14** | **NE 5 & SE 8-60-13-W4** | **BU, DC** | **316** | **17/05/2010** | **180,000** | **1 lease** | **$7,500** | | | | **172,500** | **546** | | |
| 14A | N ½ 18-59-14-W4 | BU, DC | 322.48 | 15/01/2010 | 205,200 | | | Superior Access | 1.20% | -10% | 186,896 | 580 | -34 | -5.81% |
| **15** | **N ½ 4-60-13-W4** | **BU, DC** | **314** | **21/09/2010** | **170,000** | **2 leases** | **$15,000** | | | | **155,000** | **494** | | |
| 15A | N ½ 18-59-14-W4 | BU, DC | 322.48 | 15/01/2010 | 205,200 | | | Superior Access | 2.40% | -10% | 189,112 | 586 | -93 | -15.82% |
| **16** | **NW 2 & SE 10-60-12-W4** | **OP, DC** | **320** | **23/04/2005** | **145,000** | | | | | | **145,000** | **453** | | |
| 16A | NW 27-60-11-W4 | OP, BU | 157.81 | 26/05/2005 | 70,000 | | | Inferior Land Use | -0.50% | 10% | 76,615 | 485 | -32 | -6.67% |
| 16B | SE 22-59-12-W4 | OP, BU | 160 | 17/05/2005 | 60,000 | | | Inferior Land Use | -0.50% | 10% | 65,670 | 410 | 43 | 10.40% |
| **17** | **NW 20-61-7-W4** | **DC, OP, BU** | **157.97** | **08/06/2004** | **78,000** | | | | | | **78,000** | **494** | | |
| 17A | SW 9-60-7-W4 | DC, BU | 149.99 | 04/02/2004 | 82,000 | | | Superior Land Use | 2.10% | -10% | 75,350 | 502 | -9 | -1.71% |
| 17B | SW 33-61-8-W4 | OP, BU | 150.03 | 03/08/2004 | 95,000 | 1 lease | $5,000 | | -1.40% | | 88,740 | 591 | -98 | -16.52% |
| **18** | **NW 1-60-13-W4** | **BU** | **150.25** | **21/06/2006** | **76,000** | | | | | | **76,000** | **506** | | |
| 18A | SE 36-59-13-W4 | BU | 158.98 | 06/06/2006 | 70,000 | | | | 0.00% | | 70,000 | 440 | 66 | 14.88% |
| 18B | NE 9-60-13-W4 | BU | 157.03 | 19/12/2006 | 72,000 | | | | -4.20% | | 68,976 | 439 | 67 | 15.16% |
| **19** | **NE 5 & SE 8-60-13-W4** | **BU, DC** | **316** | **09/08/2007** | **155,000** | **1 lease** | **$5,000** | | | | **150,000** | **475** | | |
| 19A | SE 6-60-12-W4 | BU, DC | 159.78 | 08/05/2007 | 85,000 | | | Superior Access | 4.20% | -10% | 79,713 | 499 | -24 | -4.85% |
| 19B | NE 10-60-13-W4 | BU, DC | 147.02 | 19/06/2007 | 80,000 | 1 lease | $5,000 | Superior Access | 2.80% | -10% | 69,390 | 472 | 3 | 0.57% |
| **20** | **NW 6-60-12-W4** | **OP, BU** | **158** | **13/02/2007** | **75,000** | | | | | | **75,000** | **475** | | |
| 20A | NE 10-60-13-W4 | BU, DC | 147.02 | 19/06/2007 | 80,000 | 1 lease | $5,000 | | -5.60% | | 70,800 | 482 | -7 | -1.43% |
| **21** | **SE 24-61-10-W4** | **DC** | **158.97** | **08/04/2009** | **158,000** | | | | | | **158,000** | **994** | | |
| 21A | S ½ 31-61-9-W4 | DC, BU | 295.22 | 02/12/2008 | 320,000 | | | Inferior Land Use | 1.60% | 5% | 341,376 | 1,156 | -162 | -14.05% |
| | **Line 7L76 (Single Pole except #22; H-Frame)** | | | | | | | | | | | | | |
| **22** | **SW 30-109-15-W5** | **DC, BU** | **160** | **26/08/2004** | **30,000** | | | | | | **30,000** | **188** | | |
| 22A | NE 34-109-14-W5 | DC, BU | 156.93 | 05/10/2004 | 25,000 | | | Inferior Soil | -1.40% | 5% | 25,883 | 165 | 23 | 13.68% |
| 22B | N ½ 9-110-15-W5 | DC, BU | 316.04 | 19/05/2004 | 50,000 | | | Inferior Soil | 2.10% | 5% | 53,603 | 170 | 18 | 10.55% |
| **23** | **SW 4-110-18-W5** | **DC** | **142.82** | **11/07/2005** | **55,000** | | | | | | **55,000** | **385** | | |
| 23A | NW 9-110-17-W5 | DC | 157.03 | 22/07/2005 | 52,500 | | | Inferior Soil | 0.00% | 5% | 55,125 | 351 | 34 | 9.70% |
| 23B | SW 25-110-19-W5 | DC | 137.55 | 22/10/2005 | 60,000 | | | Inferior Soil | -1.50% | 5% | 62,055 | 451 | -66 | -14.64% |
| **24** | **S ½ 15-110-19-W5** | **DC** | **303.12** | **30/06/2008** | **190,000** | | | | | | **190,000** | **627** | | |
| 24A | SW 32-109-18-W5 | DC | 160 | 13/06/2008 | 95,000 | | | Superior Soil | 0.00% | -5% | 90,250 | 564 | 63 | 11.13% |
| 24B | N ½ 15-110-19-W5 | DC | 309.56 | 25/06/2008 | 190,000 | | | | 0.00% | | 190,000 | 614 | 13 | 2.12% |

| | Subject/Comparable | Land Use | Size | Transfer Date | Sale Price | Imp | ECV | Inferior/Superior Characteristics | | Adjustments | | | Price Difference | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | Time | -/+ Characteristics | | Adj. Price | Price/ Acre | (Subj-Comp) | % Diff. |
| | **Line 7L92 (Single Pole)** | | | | | | | | | | | | | | | |
| **25** | **SE 19-59-13-W4** | **OP, BU** | **96.28** | **18/10/2010** | **85,000** | | | | | | | | **85,000** | **883** | | |
| 25A | NE 30-59-12-W4 | OP | 74.68 | 28/10/2010 | 70,000 | | | Inferior Access | Superior Land Use | 0.00% | 10% | -10% | 70,000 | 937 | -54 | -5.81% |
| **26** | **SW 19-59-13-W4** | **OP, BU** | **108.6** | **21/01/2004** | **40,000** | | | | | | | | **40,000** | **368** | | |
| 26A | NE 22-59-14-W4 | OP, BU | 100.15 | 10/02/2004 | 33,000 | | | | | -0.70% | | | 32,769 | 327 | 41 | 12.57% |
| **27** | **SW 36-53-14-W4** | **OP, DC** | **160** | **23/04/2004** | **85,000** | | | | | | | | **85,000** | **531** | | |
| 27A | SE 15-54-13-W4 | OP | 80.12 | 07/04/2004 | 41,500 | | | Inferior Land Use | Size | 0.00% | 10% | -10% | 41,500 | 518 | 13 | 2.56% |
| **28** | **E ½ 36-58-14-W4 and NW 30-58-13-W4** | **DC, BU** | **374.06** | **09/01/2007** | **230,000** | | | | | | | | **230,000** | **615** | | |
| 28A | N ½ 27-58-15-W4 | BU, DC | 229.62 | 04/08/2006 | 150,000 | 1 lease | $7,500 | Inferior Land Use | | 3.50% | 10% | | 162,236 | 707 | -92 | -12.97% |
| **29** | **NW 31-55-13-W4** | **DC** | **80** | **15/04/2008** | **100,000** | | | | | | | | **100,000** | **1,250** | | |
| 29A | SW 9-54-12-W4 | DC | 79.5 | 17/03/2008 | 80,000 | | | Inferior Soil | | 0.70% | 20% | | 96,672 | 1,216 | 34 | 2.80% |
| 29B | SW 3-55-13-W4 | DC | 137.73 | 19/12/2007 | 133,000 | | | Size | | 2.10% | 5% | | 142,583 | 1,035 | 215 | 20.75% |
| **30** | **NE 18-59-13-W4** | **OP, BU** | **153** | **17/07/2008** | **95,000** | | | | | | | | **95,000** | **621** | | |
| 30A | SW 28-58-14-W4 | OP, BU | 158.01 | 04/06/2008 | 120,000 | 1 lease | $7,500 | | | 0.70% | | | 113,288 | 717 | -96 | -13.40% |
| **31** | **NW 19-56-13-W4** | **DC** | **158.98** | **10/09/2009** | **160,000** | | | | | | | | **160,000** | **1,006** | | |
| 31A | SW 34-56-12-W4 | DC | 160 | 15/12/2009 | 155,000 | | | | | -1.20% | | | 153,140 | 957 | 49 | 5.15% |
| 31B | NW 1-56-12-W4 | DC | 149.92 | 16/04/2009 | 155,000 | | | | | 2.00% | | | 158,100 | 1,055 | -48 | -4.57% |
| 31C | SE 9-56-13-W4 | DC, BU | 157.9 | 13/01/2010 | 125,000 | | | Inferior Land Use | | -1.60% | 20% | | 147,600 | 935 | 72 | 7.66% |
| | **Line 7L98 (Single Pole)** | | | | | | | | | | | | | | | |
| **32** | **NW 10-32-4-W4** | **DC** | **155.84** | **09/03/2009** | **63,360** | | | | | | | | **63,360** | **407** | | |
| 32A | S ½ 26-31-4-W4 | DC | 314.97 | 05/02/2009 | 128,000 | 1 lease | $5,000 | | | 0.40% | | | 123,492 | 392 | 14 | 3.70% |
| 32B | SE 5-31-4-W4 | DC, OP | 159.07 | 10/07/2009 | 72,000 | | | | | -1.60% | | | 70,848 | 445 | -39 | -8.72% |
| 32C | W ½ 11-31-4-W4 | DC | 318.2 | 24/08/2009 | 126,000 | | | | | -2.00% | | | 123,480 | 388 | 19 | 4.77% |
| **33** | **NW 10-34-4-W4** | **OP** | **155.54** | **13/01/2004** | **45,750** | | | | | | | | **45,750** | **294** | | |
| 33A | NW 19-34-3-W4 | DC, OP | 154.25 | 13/01/2004 | 54,600 | | | Superior Land Use | | 0.00% | -10% | | 49,140 | 319 | -24 | -7.67% |
| 33B | NW 14-34-3-W4 | DC | 127.61 | 23/04/2004 | 50,000 | | | Superior Land Use | | -2.10% | -10% | | 44,055 | 345 | -51 | -14.80% |
| 33C | NE 23-34-4-W4 | OP | 160 | 13/01/2004 | 47,250 | | | | | 0.00% | | | 47,250 | 295 | -1 | -0.40% |
| | **9L11 (H-Frame)** | | | | | | | | | | | | | | | |
| **34** | **SW 23-71-21-W5** | **BU, OP** | **160** | **05/07/2008** | **75,000** | | | | | | | | **75,000** | **469** | | |
| 34A | NW 28-71-21-W5 | OP, BU | 116.5 | 25/01/2008 | 60,000 | | | Inferior Soil | Size | 4.20% | 5% | -5% | 62,520 | 537 | -68 | -12.65% |
| 34B | SW 28-71-21-W5 | BU, OP | 160 | 07/02/2008 | 75,000 | | | Inferior Soil | | 3.50% | 5% | | 81,506 | 509 | -41 | -7.98% |
| **35** | **NE 23-71-21-W5** | **BU** | **160** | **05/08/2009** | **75,000** | | | | | | | | **75,000** | **469** | | |
| 35A | NE 11-72-21-W5 | BU | 126.05 | 02/06/2009 | 50,000 | 1 lease | $5,000 | Inferior Soil | | 0.80% | 5% | | 47,628 | 378 | 91 | 24.06% |

| | Subject/Comparable | Land Use | Size | Transfer Date | Sale Price | Imp | ECV | Inferior/Superior Characteristics | | | Adjustments | | | | Price Difference | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | Time | -/+ Characteristics | | | Adj. Price | Price/ Acre | (Subj-Comp) | % Diff. |
| **36** | **SW 19-82-18-W5** | **BU** | **159** | **21/11/2011** | **99,900** | | | | | | | | | | **99,900** | **628** | | |
| 36A | SE 27-82-19-W5 | BU, DC | 158.97 | 21/02/2011 | 120,000 | | | Superior Soil | Superior Land Use | | 5.40% | -5% | -10% | | 107,508 | 676 | -48 | -7.09% |
| **37** | **SW 21-76-19-W5** | **DC** | **160** | **25/01/2010** | **150,000** | | | | | | | | | | **150,000** | **938** | | |
| 37A | NE 18-76-20-W5 | DC | 160 | 11/01/2010 | 220,000 | | | Superior Access | Superior Soil | Superior Location | 0.00% | -10% | -5% | -5% | 176,000 | 1,100 | -163 | -14.77% |
| 37B | SW 7-76-20-W5 | DC | 160 | 02/04/2010 | 210,000 | | | Superior Access | Superior Soil | Superior Location | 0.60% | -10% | -5% | -5% | 169,008 | 1,056 | -119 | -11.25% |
| **38** | **SW 19-81-18-W5** | **BU, DC** | **156** | **12/01/2006** | **59,000** | **Cabin** | **$7,500** | | | | | | | | **51,500** | **330** | | |
| 38A | S ½ 33-80-19-W5 | DC, BU | 310.74 | 24/10/2005 | 105,000 | | | Severed | Superior Land Use | | 1.70% | 5% | -5% | | 106,785 | 344 | -14 | -3.93% |
| 38B | NE 25-81-19-W5 | BU, OP | 160 | 04/09/2006 | 42,000 | | | Inferior Soil | Inferior Land Use | | -5.60% | 5% | 10% | | 45,595 | 285 | 45 | 15.85% |
| **39** | **SW 19-81-18-W5** | **BU, DC** | **156** | **29/07/2005** | **59,000** | **Cabin** | **$7,500** | | | | | | | | **51,500** | **330** | | |
| 39A | E ½ 12-81-19-W5 | OP, BU | 320 | 31/05/2005 | 86,000 | | | Inferior Soil | Inferior Land Use | | 1.00% | 5% | 10% | | 99,889 | 312 | 18 | 5.76% |
| 39B | S ½ 33-80-19-W5 | DC, BU | 310.74 | 24/10/2005 | 105,000 | | | Severed | Superior Land Use | | 1.70% | 5% | -5% | | 106,785 | 344 | -14 | -3.93% |
| | 9L36/9L37 (Steel Lattice) | | | | | | | | | | | | | | | | | |
| **40** | **SE 8-63-10-W4** | **BU** | **161.24** | **24/03/2005** | **45,000** | | | | | | | | | | **45,000** | **279** | | |
| 40A | SW 10-64-11-W4 | BU | 161.24 | 02/06/2005 | 50,600 | 1 lease | $5,000 | Superior Access | | | -1.00% | -10% | | | 40,630 | 252 | 27 | 10.76% |
| | 9L59 (H-Frame) | | | | | | | | | | | | | | | | | |
| **41** | **W ½ 18-33-13-W4** | **OP** | **314.75** | **13/04/2011** | **110,162** | **3 leases** | $15,000 | | | | | | | | **95,162** | **302** | | |
| 41A | E ½ 5-34-13-W4 | OP | 318 | 15/04/2011 | 135,150 | 3 leases | $15,000 | Superior soil | Inferior Access | Superior Topography | 0.00% | -5% | 5% | -10% | 108,135 | 340 | -38 | -11.09% |
| **42** | **E ½ 18-39-13-W4** | **OP** | **318.99** | **23/10/2007** | **190,000** | **1 lease** | **$5,000** | | | | | | | | **185,000** | **580** | | |
| 42A | SE 12-39-13-W4 | OP, DC | 139.11 | 28/11/2007 | 77,000 | | | Superior Land Use | | | -1.40% | 5% | | | 79,718 | 573 | 7 | 1.20% |
| **43** | **S ½ 24-29-14-W4** | **OP** | **318** | **20/12/2004** | **104,000** | | | | | | | | | | **104,000** | **327** | | |
| 43A | NE 32-28-15-W4 | DC | 159 | 26/11/2004 | 71,550 | 1 lease | $5,000 | Superior Land Use | | | 0.70% | -5% | | | 63,665 | 400 | -73 | -18.32% |
| 43B | NE 29-30-15-W4 | OP,DC | 159 | 01/06/2005 | 66,400 | | | | | | -3.00% | | | | 64,408 | 405 | -78 | -19.26% |
| | 9L960/9L961 (Steel Lattice) | | | | | | | | | | | | | | | | | |
| **44** | **NE 28-57-18-W4** | **OP, BU** | **160** | **17/01/2008** | **105,000** | | | | | | | | | | **105,000** | **656** | | |
| 44A | SE 12-57-17-W4 | OP, DC | 160 | 15/11/2007 | 140,000 | | | Superior Soil | Superior Land Use | | 2.80% | -10% | -10% | | 115,136 | 720 | -63 | -8.80% |
| **45** | **NE 30-61-11-W4** | **BU, OP** | **160** | **25/05/2007** | **80,000** | | | | | | | | | | **80,000** | **500** | | |
| 45A | SE 35-61-11-W4 | OP, BU | 160 | 31/05/2007 | 92,000 | | | Superior Land Use | | | 0.00% | -10% | | | 82,800 | 518 | -18 | -3.38% |
| 45B | NW 26-61-11-W4 | BU | 156.44 | 04/06/2007 | 78,500 | | | Inferior Land Use | | | 0.00% | 10% | | | 86,350 | 552 | -52 | -9.42% |
| **46** | **NW 30 & SW 31-60-13-W4** | **BU, OP** | **314.2** | **06/07/2007** | **100,000** | | | | | | | | | | **100,000** | **318** | | |
| 46A | SW 30-60-13-W4 | BU, OP | 138.49 | 06/07/2007 | 50,000 | | | Superior Access | | | 0.00% | -5% | | | 47,500 | 343 | -25 | -7.21% |
| 46B | SE 15-59-14-W4 | BU, OP | 161.24 | 14/05/2007 | 45,000 | | | Superior Access | | | 2.80% | -10% | | | 41,634 | 258 | 60 | 23.26% |
| **47** | **SE 23-62-12-W4** | **DC, OP** | **158.49** | **16/12/2008** | **60,000** | | | | | | | | | | **60,000** | **379** | | |
| 47A | S 1/2 10-62-12-W4 | DC, OP, BU | 320 | 18/12/2008 | 101,000 | | | Inferior Land Use | Inferior Soil | | 0.00% | 5% | 5% | | 111,100 | 347 | 31 | 9.04% |
| 47B | NE 14-62-12-W4 | OP | 160 | 16/12/2008 | 60,000 | | | Inferior Land Use | | | 0.00% | 5% | | | 63,000 | 394 | -15 | -3.85% |

| | Subject/Comparable | Land Use | Size | Transfer Date | Sale Price | Imp | ECV | Inferior/Superior Characteristics | | Adjustments | | | Price Difference | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | Time | -/+ Characteristics | | Adj. Price | Price/ Acre | (Subj-Comp) | % Diff. |
| **48** | **NW 6-59-15-W4** | **BU, OP** | **154.5** | **19/11/2004** | **99,000** | | | | | | | | **99,000** | **641** | | |
| 48A | NE 28-60-16-W4 | BU | 159.3 | 09/02/2005 | 81,000 | | | Inferior Land Use | | -1.70% | 10% | | 87,585 | 550 | 91 | 16.54% |
| **49** | **SE 30-61-11-W4** | **OP, BU** | **158.97** | **19/01/2011** | **97,000** | | | | | | | | **97,000** | **610** | | |
| 49A | SE 35-61-11-W4 | OP, BU | 160 | 16/08/2010 | 100,000 | | | | | 1.50% | | | 101,500 | 634 | -24 | -3.81% |
| **50** | **NW 16-59-15-W4** | **DC** | **160** | **26/03/2004** | **110,000** | **1 lease** | **$7,500** | | | | | | **102,500** | **641** | | |
| 50A | NE 21-58-15-W4 | DC | 151.34 | 18/02/2004 | 106,000 | 1 lease | $7,500 | | | 0.70% | | | 99,190 | 655 | -15 | -2.26% |
| **51** | **SE 7-59-15-W4** | **BU, OP** | **161** | **13/08/2010** | **200,000** | | | | | | | | **200,000** | **1,242** | | |
| 51A | NE 15-59-16-W4 | BU, OP | 160.88 | 09/04/2010 | 169,900 | 2 leases | $15,000 | | | 1.20% | | | 156,759 | 974 | 268 | 27.49% |
| | **7L14 (Single Pole)** | | | | | | | | | | | | | | | |
| **52** | **SE 25-50-5-W4** | **OP** | **146.73** | **10/05/2007** | **110,047** | | | | | | | | **110,047** | **750** | | |
| 52A | SW 27-49-5-W4 | DC, OP | 158.78 | 04/05/2007 | 130,000 | | | Superior Land Use | Superior Soil | 0.00% | -10% | -5% | 110,500 | 696 | 54 | 7.77% |
| **53** | **SW 25-50-5-W4** | **OP** | **158.61** | **02/09/2011** | **150,680** | | | | | | | | **150,680** | **950** | | |
| 53A | SE 4-51-4-W5 | OP | 163.21 | 30/05/2011 | 132,000 | 1 lease | $7,500 | | | 1.80% | | | 126,741 | 777 | 173 | 22.34% |

### 3.3.1 Mathematical Analysis

Over the 13 total lines there were 53 on-line sales and 79 off-line sales utilized. Based on a simple average of the differences between the 79 pairs, there is no definitive difference between the sale price of on-line properties and the sale price of similar off-line properties. In fact on a dollar per acre basis, the mathematical average difference between on-line properties and the average off-line property is +$2.16. As a percentage difference this difference is +0.82%. Both of these factors show that there is no effect of the HVTL on property values. When you eliminate the pairs which necessitated a gross adjustment of more than 5%, the differences become +$11.72 or +1.96%. This limited mathematical analysis shows negligible price effect from the power lines, which results are complimentary to the statistical analysis in the next section.

There also appears to be very little difference in terms of impact between the 144 kV transmission lines and the 240 kV transmission lines. Of the 79 total pairs, 53 are along 144 kV lines (primarily single pole structures) and 26 are along 240 kV lines (H-frame and steel lattice structures). From a mathematical standpoint the 144 kV pairs show average differences between on-line and off-line values of +$6.87 and +1.37%. The average differences on the 240 kV lines are -$8.75 and -0.58%.

Similarly, another mathematical analysis was done in respect of properties containing the actual 144 kV and 240 kV structures and omitting those on-line properties which were immediately adjacent to a HVTL contained within a road allowance. This distinction narrowed the data set to a total of 42 pairs. These pairs then showed average differences of -$0.24 per acre and -0.47%.

### 3.3.2 Statistical Analysis

The objective of this study has been to assess the impact of 144 kV and 240 kV transmission lines on property values. In order to quantify the difference, data has been collected in respect of property values located on lines or where the line is adjacent to the property in a road right-of–way, in addition to comparative values of properties located away from the transmission lines. This data was then organized in a way that allows for the best statistical analysis of the data.

**Paired Two Sample Comparison of Means**

In this approach we have organized the data into pairs, or matched pairs of data. One match pair is made up of one on-line property and one comparative off-line property. The resulting analysis can be viewed as analyzing the mean difference between the matched pairs (mean of the differences), or a paired two sample comparison of means. The reason this approach was used as opposed to a straight forward comparison of two means (mean of properties located on line versus the mean of those located of line) is that the data in question is not independent of each other. The value of a 160 acre property in say, Consort, Alberta located off-line is not independent of a 160 acre property in Consort Alberta located on-line. When dealing with two means that each have wide values ($1,000.00 to $16,000.00 per acre properties for example) each sample will have a large standard deviation. However, the

standard deviation of the differences of the matched pairs will be much smaller as the property values of each pair are dependent on one another. This matched pairs approach allows for an appropriate determination if the mean values of the sample populations are different.

The data has been compared on both a value and a percentage basis, and this has been done based on three scenarios:

(i) on all properties within the previously discussed study area;

(ii) by considering only those properties in respect of which minimal adjustments have been made by Serecon (minimal adjustments are defined as those paired sales in which only a gross 5% or less adjustment was made to the comparable or [off-line] sale); and

(iii) by considering only those properties on which a HVTL is present and not in an adjacent road allowance.

The following two tables have been prepared to summarize the findings. Included in these tables are the mean (average) differences in the three populations, the standard deviation of this difference, and the statistical test. In this case the statistical test is in the form of a t-test, or p-value. A t-test is a statistical test used to determine if there is a significant difference between the mean or average values of two groups. The hypothesis that we are testing is that there is no difference between property values on-line and property values off-line. We write this as the null hypothesis of $H_O$: $(x_D) = 0$, where $x_D$ is the mean difference of the properties on-line, and those off-line. Our alternative hypothesis is that on-line properties are less than those off-line expressed as $H_A$: $(x_D) < 0$.

If we use a 95% confidence level, or alpha of 0.05, we can reject the null hypothesis in favour of the alternative hypothesis if the p-value is less than 0.05. Similarly, we can reject the null hypothesis in favour of the alternative hypothesis if the t-stat is larger (negative) than the relevant t-test.

We have organized the data into two tables, one for the difference in value and one for the difference in percent.

**Statistical Analysis of Properties in Value Terms**

| Data Set | Number of Matched Pairs | Mean Difference in Value | Standard Deviation of Differences in Value | Relevant t-test | t-stat (values) | P-Value (Values) | Reject or Not-Reject $H_0$ ($) |
|---|---|---|---|---|---|---|---|
| All Data | 79 | $2.16 | $80.68 | 1.66 | 0.238 | 0.406 | Not-Reject |
| Min. Adjustments | 37 | $11.72 | $86.81 | 1.69 | 0.821 | 0.208 | Not-Reject |
| HVTL on Property | 42 | -$0.24 | $82.00 | 1.68 | -0.019 | 0.492 | Not-Reject |

**Statistical Analysis of Rural Properties in Percentage Terms**

| Data Set | Number of Matched Pairs | Mean Difference of % | Standard Deviation of Differences in % | Relevant t-test | t-stat (%) | P-Value (%) | Reject or Not-Reject $H_0$ (%) |
|---|---|---|---|---|---|---|---|
| All Data | 79 | 0.82% | 11.66% | 1.66 | 0.621 | 0.268 | Not-Reject |
| Min. Adjustments | 37 | 1.96% | 12.40% | 1.69 | 0.962 | 0.171 | Not-Reject |
| HVTL on Property | 42 | -0.47% | 11.87% | 1.68 | -0.256 | 0.340 | Not-Reject |

Based on the above statistical analysis, the null hypothesis is not-rejected in favour of the alternative hypothesis. In other words, the statistical evidence indicates that the value of properties on-line are not lower than values of properties off-line. This can be seen in the first table as the p-value of 0.406 for "all data" is much higher than 0.05. In the analysis of the percent differences in the second table, the p-value is 0.268, also much higher than 0.05.

While the results vary slightly when properties in respect of which significant adjustments were required are removed; the conclusion is the same; there is not enough statistical evidence to reject the null hypothesis in favour of the alternative hypothesis. The difference between on-line and off-line values is not statistically significant.

## 3.4 Improved Properties

The purpose of this report is to evaluate the effects of HVTLs on rural property values, including rural properties with buildings and improvements. Properties along the aforementioned transmission lines were searched in order to find recent sales. These sales, between January, 2004 and December, 2011, included both bareland sales and improved sales. However, the volume of improved sales was very limited. Along the 13 lines searched 10 properties were identified as being arm's-length transactions and having buildings or improvements of some degree. Of these ten sales, six were deemed to be building sites with major improvements and four were building sites with minor improvements. Major improvements were deemed to be sites with a residence and three or more significant service buildings. Minor improvements were sites with a residence and two or less service buildings.

The difficulty with assessing properties with building sites is twofold. First, it is very difficult to obtain the necessary information regarding the buildings (type of building, size of building, age of building, etc.). Secondly, it is very difficult to find comparable building sites with a very similar complement of buildings in the same market area. The appraisers attempted to utilize multiple listing services (MLS) and local municipalities' assessment branches to determine the exact compliment and necessary detail of buildings on the subject properties. This was met with a lack of MLS sales and a number of municipalities that were not willing to divulge the necessary information. In addition to these issues, it was deemed that utilizing the major building sites, due to their complexity, was not a viable option. In the end, we were left with two on-line sales in respect of which sufficient data was

available to complete a Paired Sale Analysis. It is the opinion of the appraisers that two sales, with still quite limited data, is not enough from which to draw any conclusions, even of a general nature. Therefore, an additional analysis of improved properties was not completed.

Any impact from transmission lines on improved properties would need to be assessed on a site specific basis.

## 3.5 PAIRED SALES CONCLUSIONS

Overall, the quantitative results from the Paired Sales Analysis indicated no difference between the adjusted sale prices of vacant on-line and off-line properties. Our general observations can be summarized as follows:

- Taken as a whole, the information reported here, when analyzed statistically, indicates that vacant on-line sales compared to vacant off-line sales are the same. It is not possible to attribute any variation to the presence of the overhead transmission line.
- Due to a lack of sales and information, the impact of HVTLs on improved properties is not easily calculated on a general scale. Rather, a site specific analysis would need to be completed in order to assess any possible impacts.

# 4.0 REGRESSION ANALYSIS

## 4.1 METHODOLOGY

As described previously, an alternative approach to determining the effect on property values of HVTLs is by way of a Regression Analysis. With this approach, property values are regressed on specific property characteristics, and the resulting estimates indicate the effects of each of these characteristics on property values, holding the effects of all other variables constant.

Even though the focus of the Regression Analysis is the effect on property values of the transmission line, it is necessary to explicitly include other variables that affect property values in the regression models that are estimated. Failure to do so would mean that the coefficient on the transmission line variable would be biased, so that any inferences that were made in such a case could be misleading. For example, if a smaller property size is expected to result in a higher property value per acre, but the parcel size variable is omitted from the regression model, and if larger parcel sizes happen to be more prevalent adjacent to a transmission line, then the results of the regression analysis may indicate that the values of properties adjacent to transmission lines are lower than the values of other properties. By explicitly including property size and other variables that are expected to affect property values in the regression model, the coefficients on the transmission line variable will indicate the effect on property values of a HVTL, while holding constant the effects of all other variables that are included in the model. Of course, it is not possible to include all variables that may affect property values in the regression analysis as some are not recorded or all the necessary information is not always available. The effects of factors such as these are addressed as part of the error term in the regression model.

### 4.1.1 Data

Data utilized in the regression analysis was collected from Alberta Municipal transfer data. The same 13 lines searched in the Paired Sales Analysis were also used in the Regression Analysis, searching all townships which contain a portion of one of the studied 144 kV or 240 kV transmission lines. These transfers were then sorted to include only transfers in which the properties were 70 acres in size or larger and a value and consideration were both recorded. Additional information was then obtained for the selected properties in order to determine parcel size, land use, CLI soil rating, presence of surface leases, presence of improvements and the relevant municipality. These characteristics were then included with the sale price, time of transfer and whether the property is on-line or off-line and utilized as the regression data set.

Four separate regression analyses were run in order to obtain the best model in determining the significance of the on-line variable. The first model was a base linear model containing all variables. The second was a base model using (natural) log of value. The third model was a base model with log values, with two extra variables to help explain parcel size. The fourth model was similar to model #3 with the addition of an interaction term for each location.

## 4.2 FINDINGS

The findings of the Regression Analysis were very similar to those of the Paired Sales Analysis, in that the effect of the on-line variable was insignificant overall in all four models. In general, the log model was preferred to the base model as it indicated a better overall fit; however, neither model is perfect and therefore some explanatory issues persist with both. Both the base model and the log model did show similar results in terms of the on-line variable in that they both show it as a positive and not significant coefficient (regression output is summarized in the Appendix).

The third model introduces two extra variables:

i) parcel size squared; and
ii) parcel size x on-line.

These additional variables allow the property value to increase non-linearly as parcel size increases, and for the effect of being on-line to change as parcel size increases. Both of these additional variables helped to improve the model. The on-line coefficient then becomes negative, however it is still considered not significant.

Finally, the fourth model adds an interaction term for each municipality in which the properties are located. This allows the effect for being on-line to be different for each municipality. However, this final addition leads to non-credible results which likely stems from the lack of on-line properties for any one municipality.

Overall the findings of the Regression Analysis are consistent across all of the models run. No matter the model, the final results show that the on-line variable remains insignificant. This would indicate that the presence of the HVTL (on-line) is not a significant variable when trying to determine the value of the parcel.

## 4.3 CONCLUSIONS

Overall, the results of the Regression Analysis showed that the inclusion of an on-line variable was insignificant to the overall regression model. Our general observations can be summarized as follows:

- Regardless of the model used (some models were preferred and considered better) the on-line variable was considered insignificant.
- The addition of extra explanatory variables increased the reliability of the model, but not the significance of the on-line variable.
- There is not enough location (municipality) specific data to determine if the impact of the on-line variable changes based on the municipality it is located in.

# 5.0 OVERALL CONCLUSIONS

The two approaches utilized (Paired Sales Analysis and Regression Analysis) to estimate the impact of HVTLs on rural property values resulted in similar findings.

When analyzed statistically, the Paired Sales Analysis did not indicate any negative effect on vacant rural or bareland property values from the presence of a transmission line on, or in a road allowance adjacent to, the property when all on-line sales were considered together. When analyzed on a purely mathematical basis, properties as a whole had average impacts of +$2.16 per acre and +0.82%. Properties with minimal adjustments had average impacts of +$11.72 per acre and +1.96%. These results are somewhat inconsistent, but overall small and insignificant. This insignificance was further confirmed through statistical analysis of the paired sales. Unfortunately, inadequate data and information resulted in the inability to determine the impact on improved properties.

The Regression Analysis yielded similar results showing in all four models that the on-line variable within the regression was insignificant. The direction of impact (positive or negative) changed based on the model, but the overall results were the same, showing insignificance.

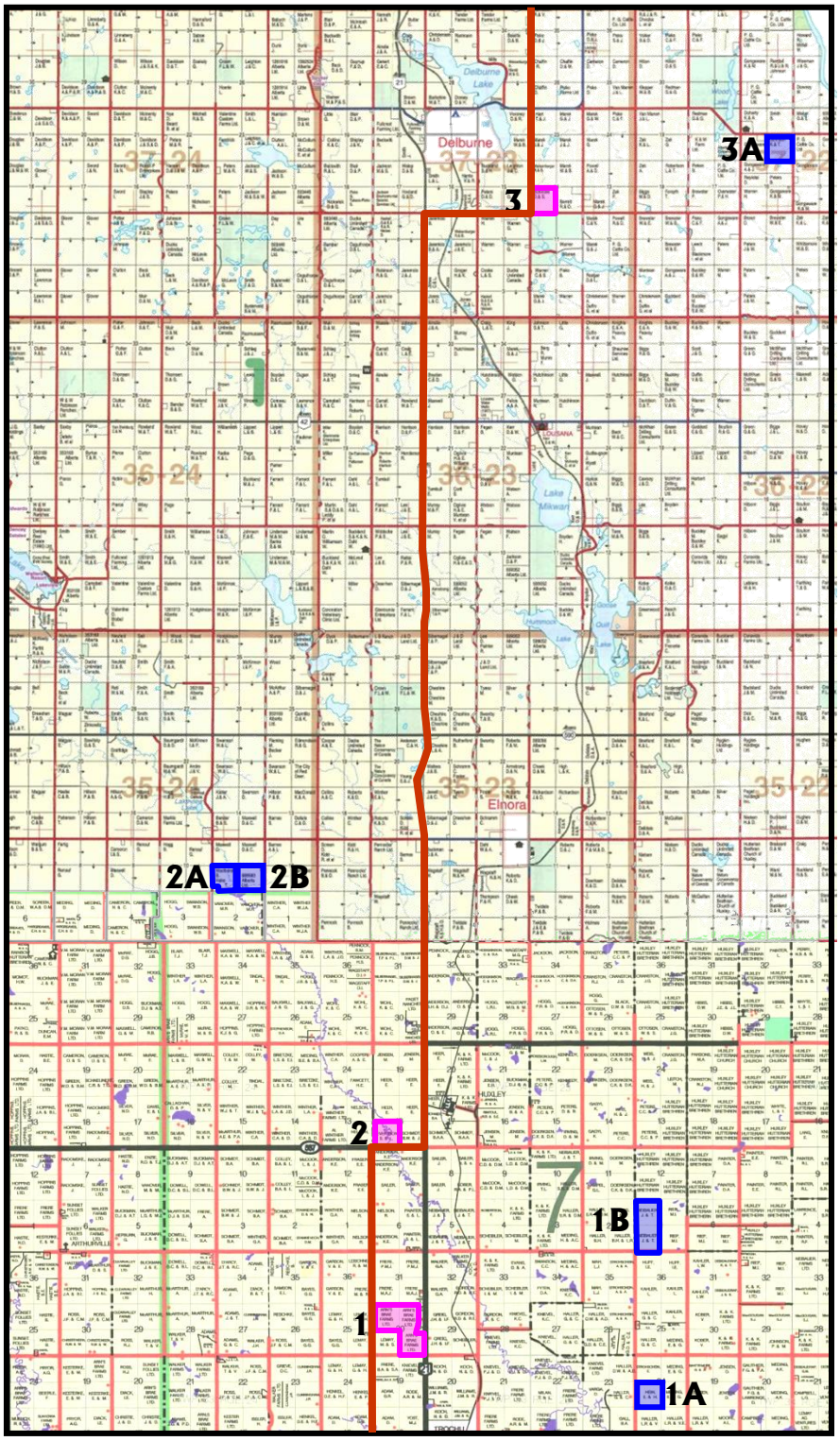
It is our opinion, based on the results from this study, that 144 kV and 240 kV transmission lines located on, or in road allowances adjacent to vacant rural properties, have no impact on their market values.

# APPENDIX

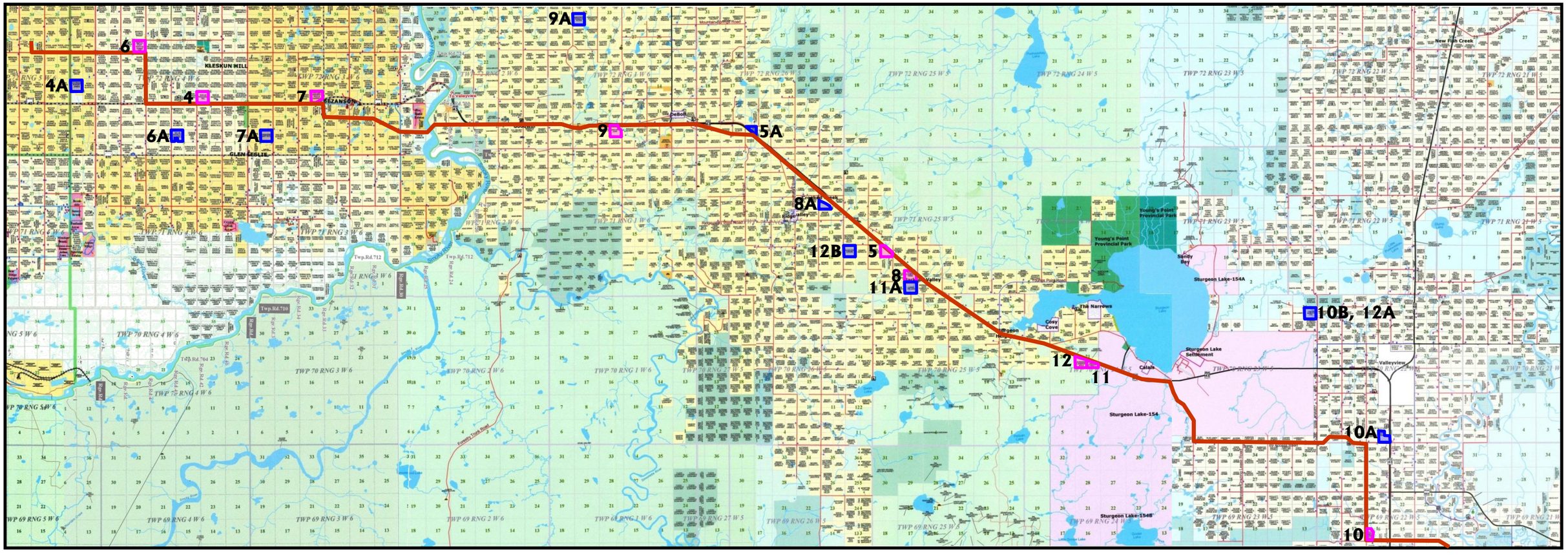
## APPENDIX A – SUBJECT AND COMPARABLE MAPS

## APPENDIX B – REGRESSION ANALYSIS OUTPUT

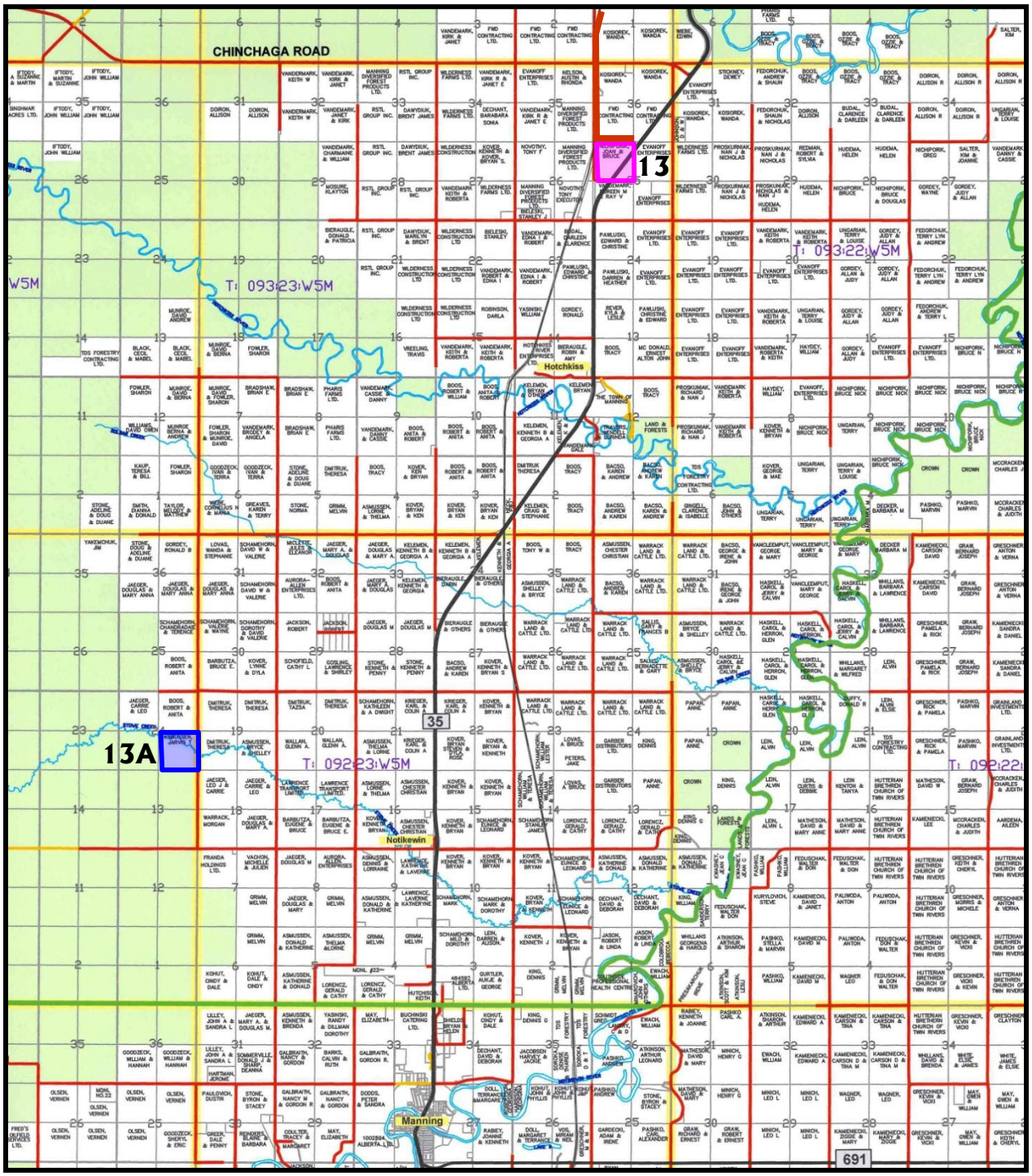
## Line 7L16


Delburne
Elnora
3A
3
2A
2B
2
1B
1
1A
On-line
Off-line
Approximate Location of Transmission Line

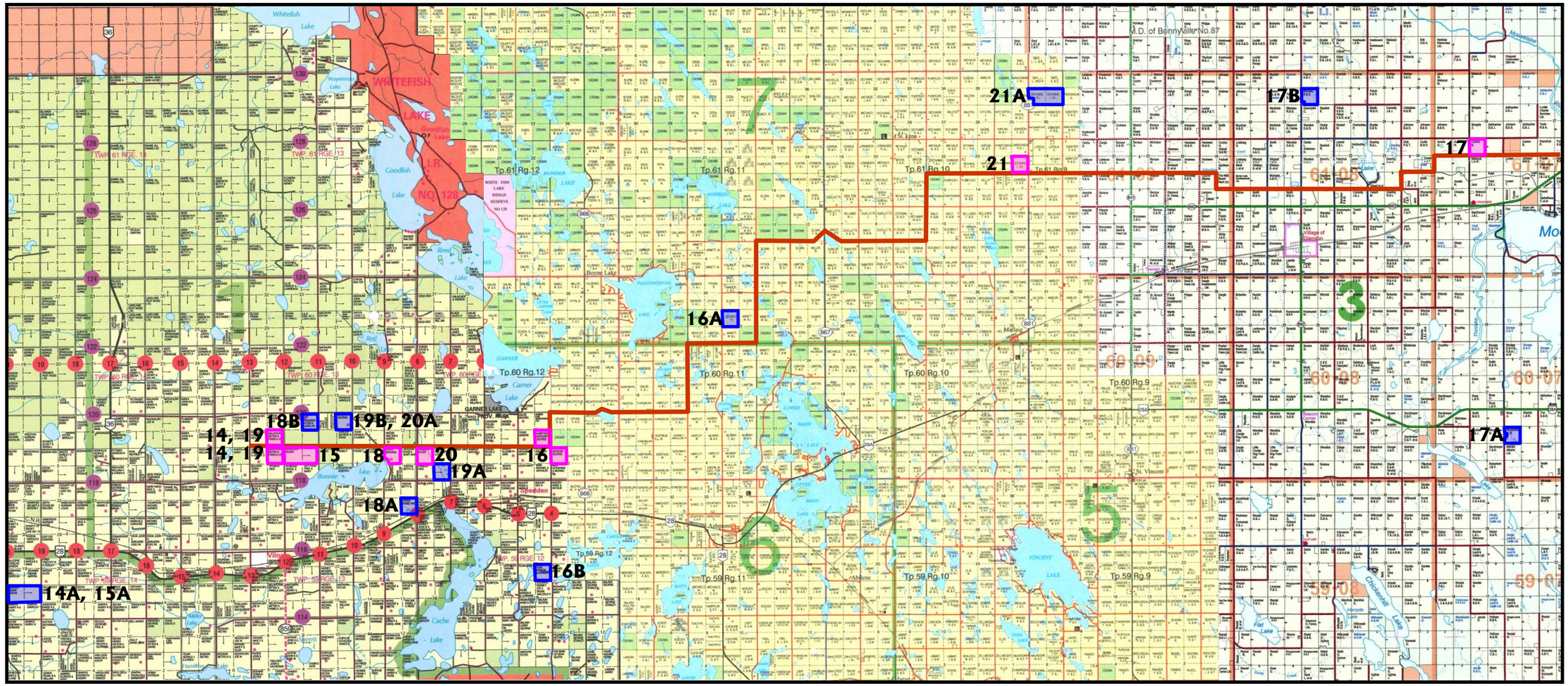
## Line 7L32


9A
6
4A
4
7
6A
7A
9
5A
8A
12B
5
8
11A
10B, 12A
12
11
10A
10
On-line
Off-line
Approximate Location of Transmission Line

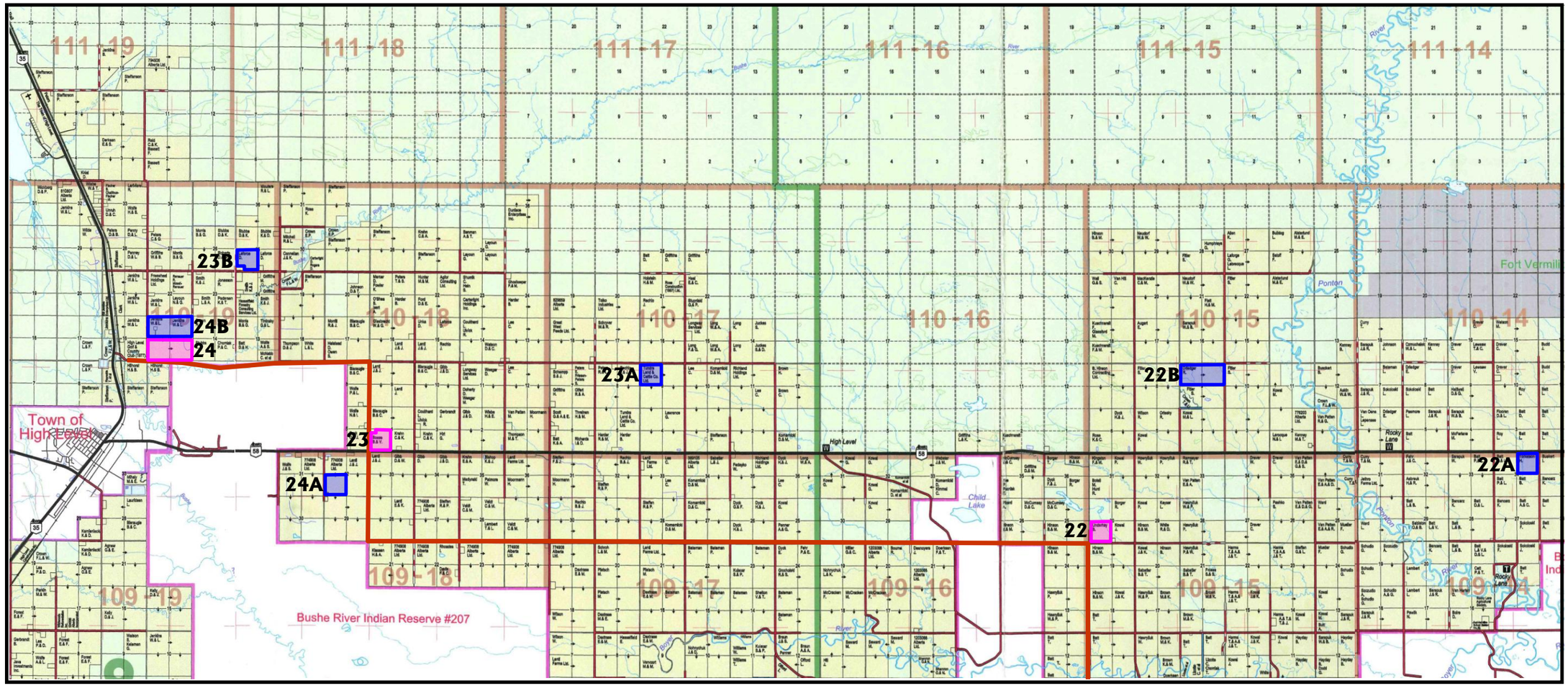
## Line 7L58


CHINCHAGA ROAD
13
13A
T: 093-23-W5M
T: 093-22-W5M
T: 092-23-W5M
Hotchkiss
Notikewin
Manning
691
On-line
Off-line
Approximate Location of Transmission Line

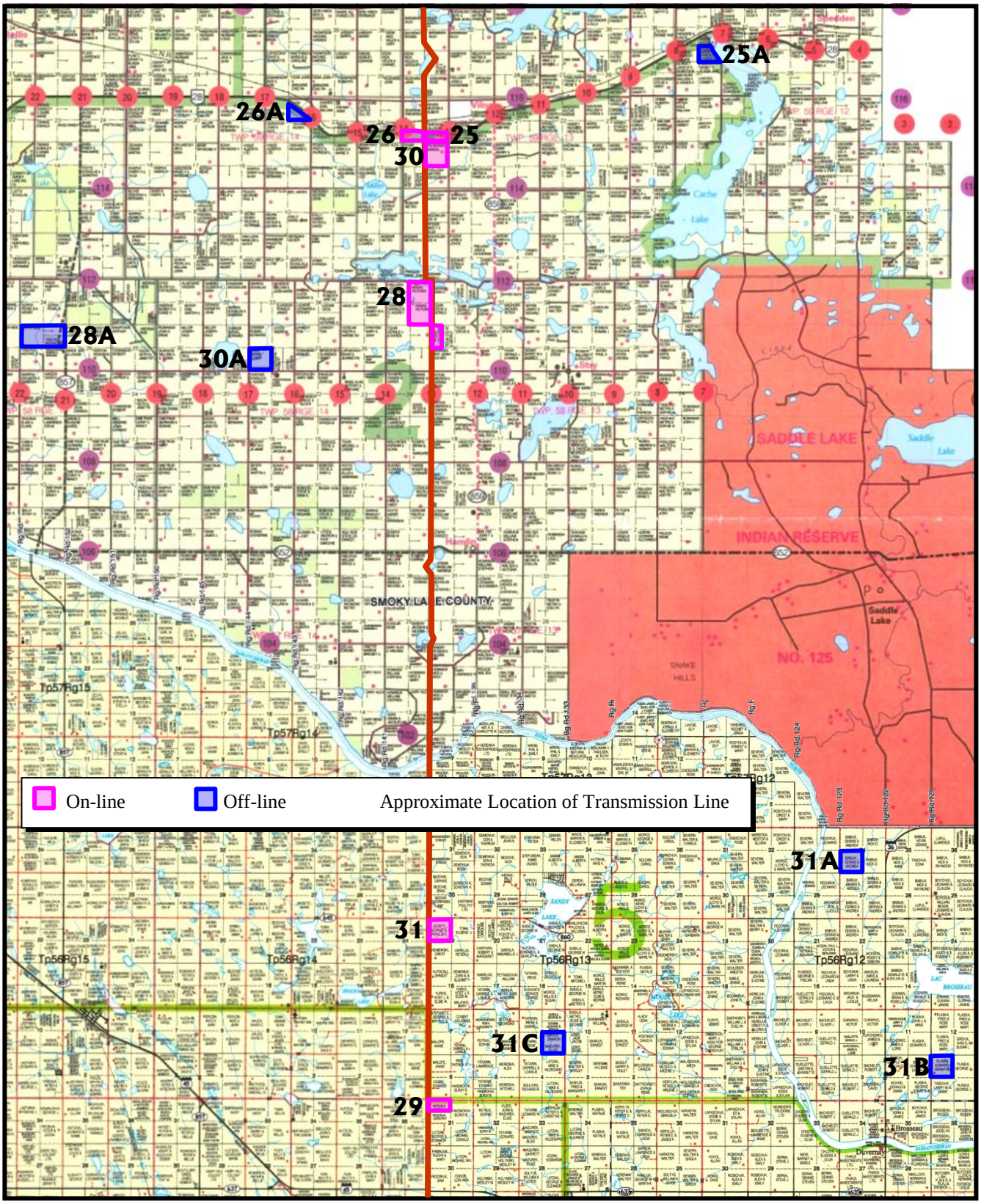
## Line 7L70


21A
17B
21
17
16A
18B
19B, 20A
14, 19
14, 19
15
18
20
19A
16
18A
16B
14A, 15A
17A
Tp.61 Rg.12
Tp.61 Rg.11
Tp.61 Rg.10
Tp.61 Rg.9
Tp.60 Rg.12
Tp.60 Rg.11
Tp.60 Rg.10
Tp.60 Rg.9
Tp.59 Rg.12
Tp.59 Rg.11
Tp.59 Rg.10
Tp.59 Rg.9
M.D. of Bonnyville No.87
WHITEFISH LAKE I.R. NO. 128
On-line
Off-line
Approximate Location of Transmission Line

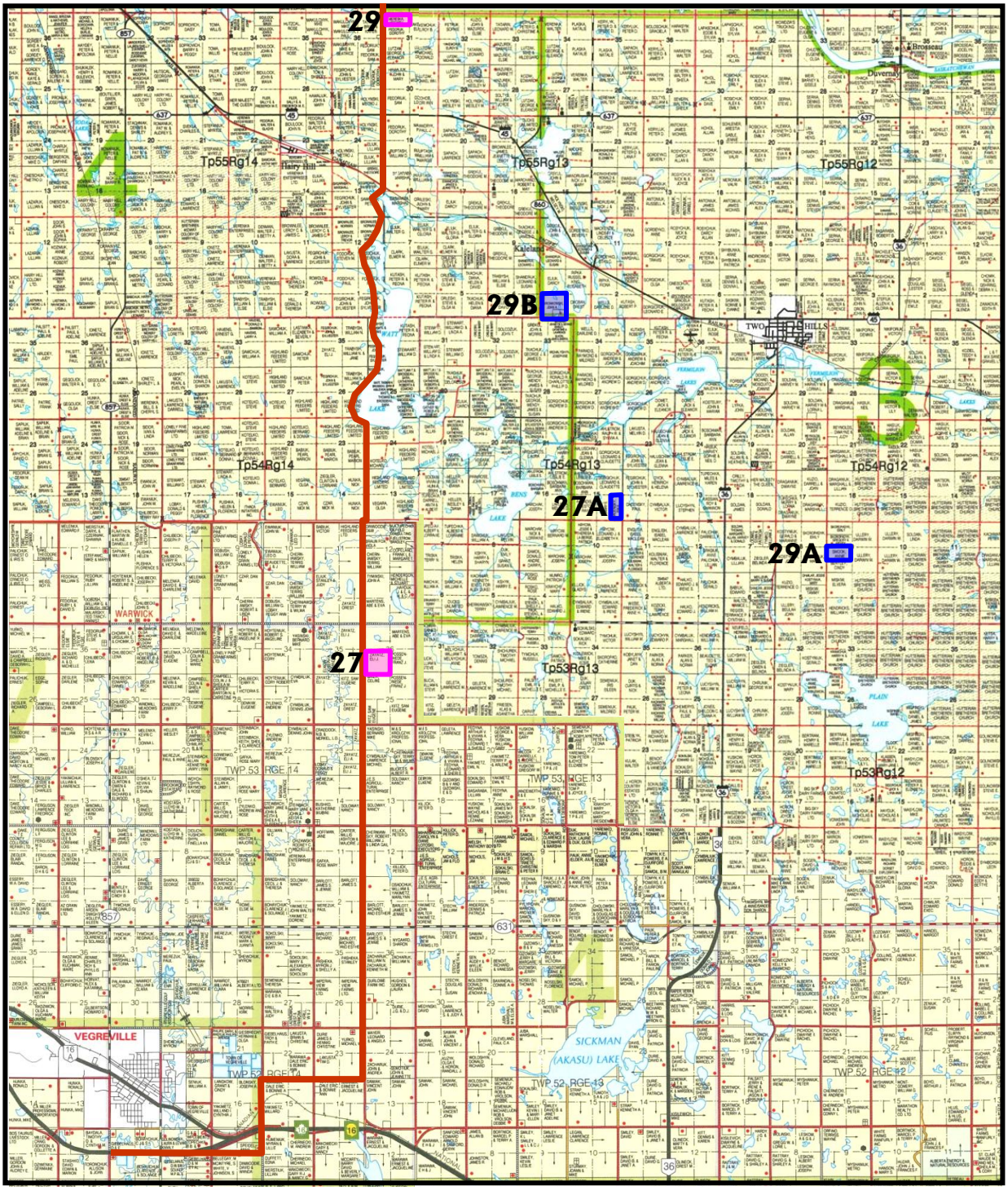
## Line 7L76


111 - 19
111 - 18
111 - 17
111 - 16
111 - 15
111 - 14
110 - 19
110 - 18
110 - 17
110 - 16
110 - 15
110 - 14
109 - 19
109 - 18
109 - 17
109 - 16
109 - 15
109 - 14
23B
24B
24
23A
22B
23
24A
22A
22
Town of High Level
High Level
Bushe River Indian Reserve #207
Fort Vermilion
Ponton
Child Lake
Rocky Lane
On-line
Off-line
Approximate Location of Transmission Line

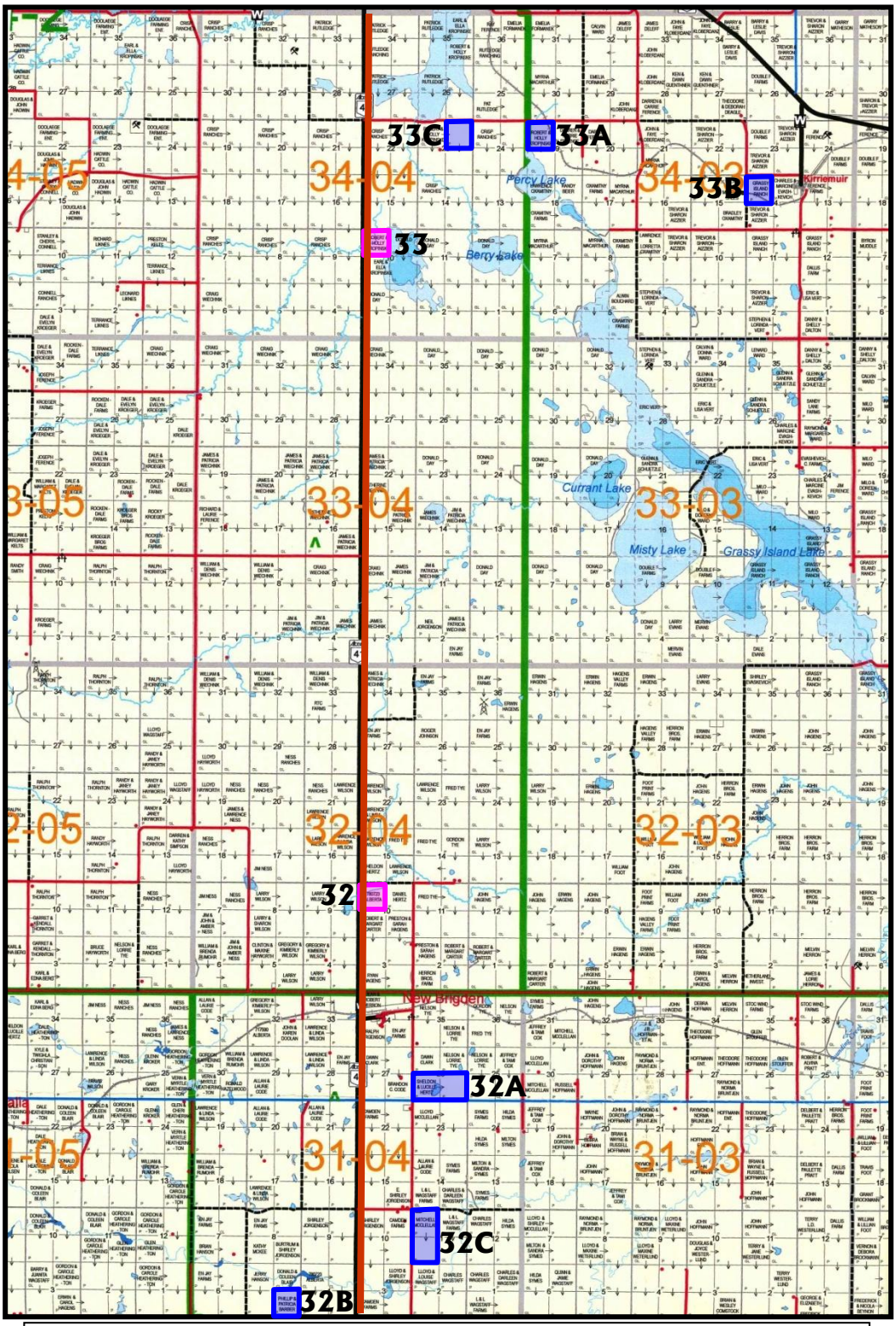
## Line 7L92


25A
26A
26
25
30
28
28A
30A
SADDLE LAKE
INDIAN RESERVE
SMOKY LAKE COUNTY
Saddle Lake
NO. 125
SNAKE HILLS
Tp57Rg15
Tp57Rg14
On-line
Off-line
Approximate Location of Transmission Line
31A
31
31C
31B
29
Tp56Rg15
Tp56Rg14
Tp56Rg13
Tp56Rg12
Brosseau
Diversy

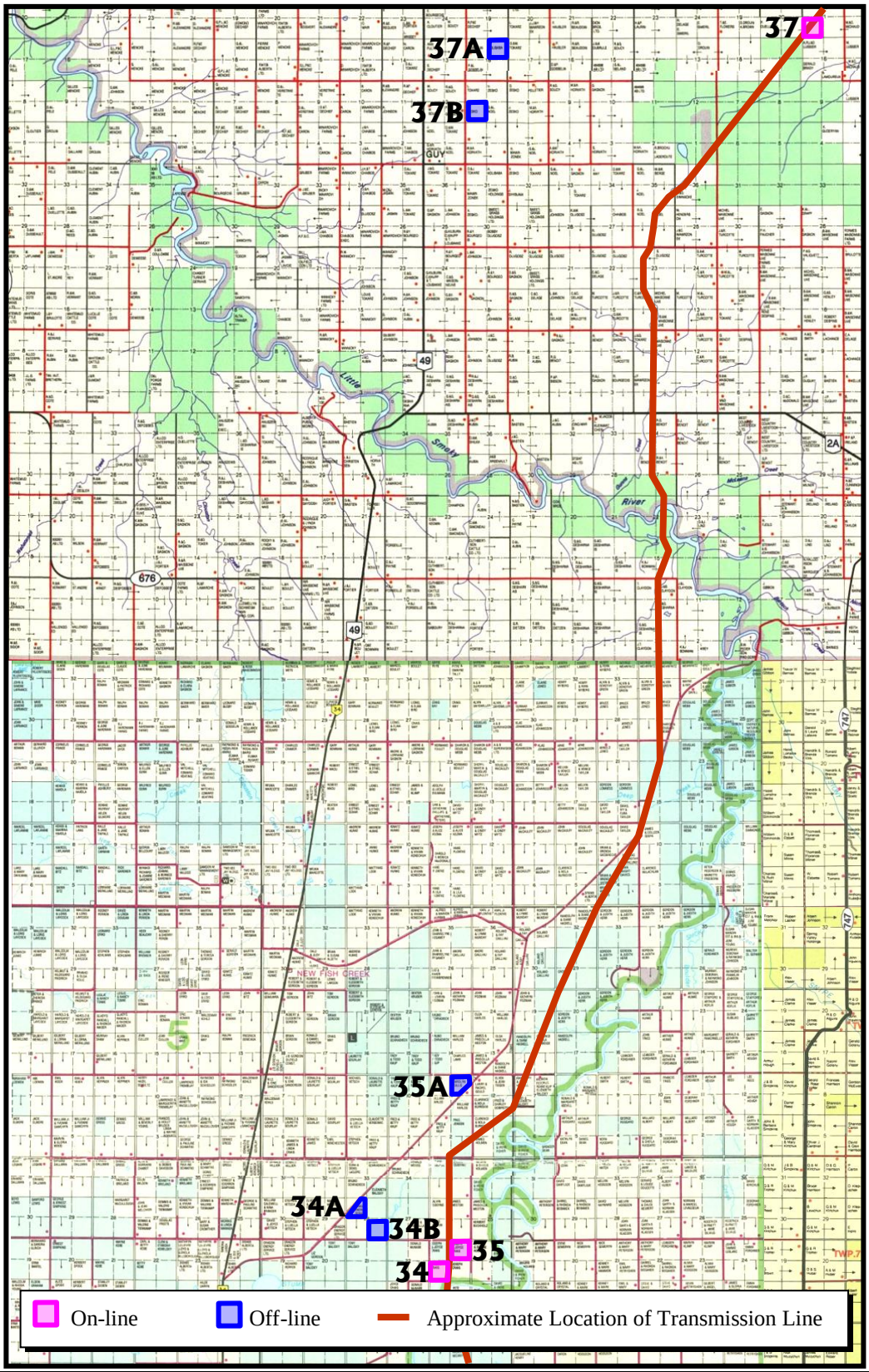
## Line 7L92 (continued)



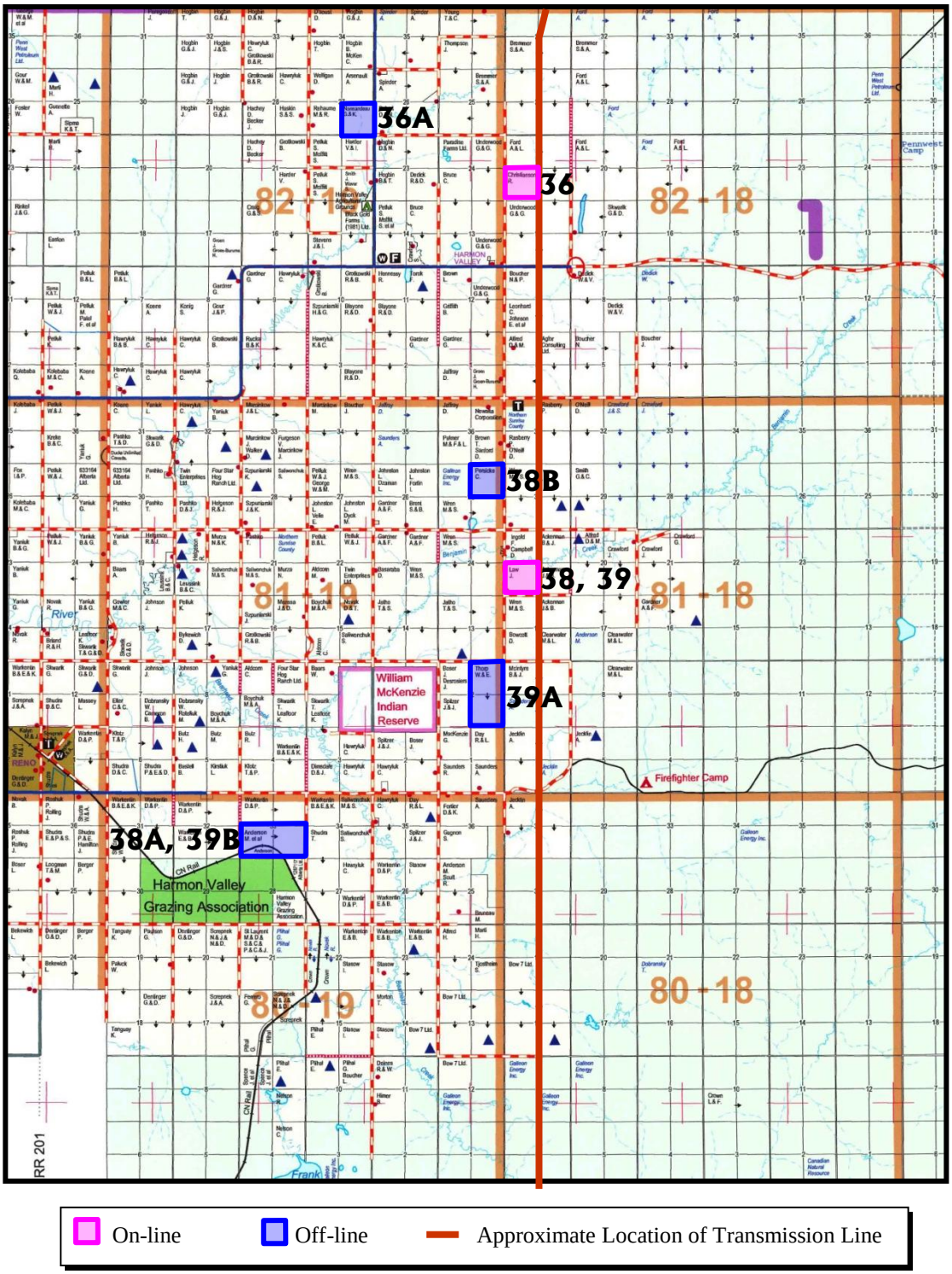
## Line 7L98


33C
33A
33B
33
32
32A
32C
32B
Percy Lake
Bery Lake
Currant Lake
Misty Lake
Grassy Island Lake
New Brigden
Kirriemuir
34-04
34-03
33-04
33-03
32-04
32-03
31-04
31-03
On-line
Off-line
Approximate Location of Transmission Line

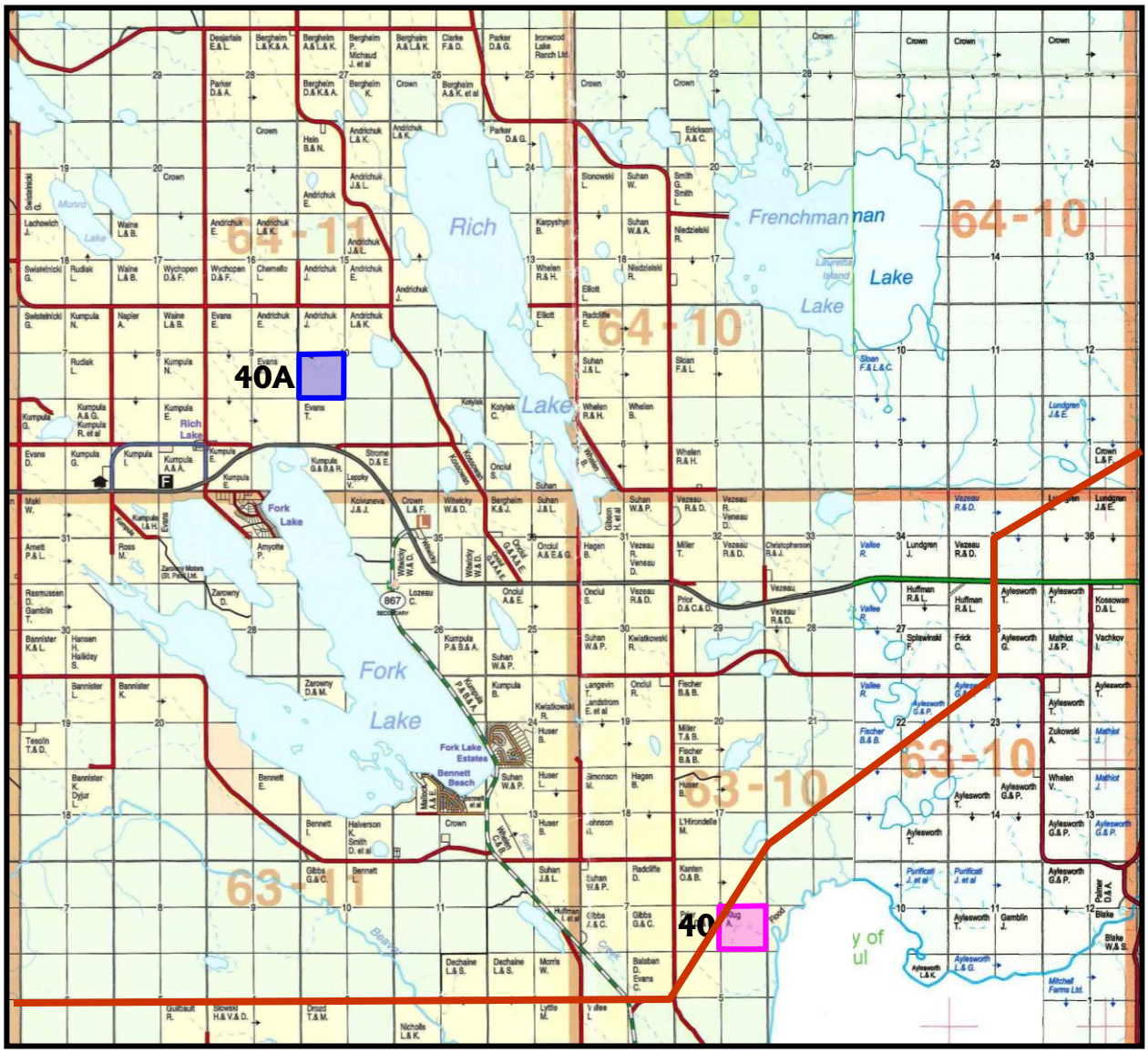
## Line 9L11


37
37A
37B
35A
34A
34B
35
34
On-line
Off-line
Approximate Location of Transmission Line

## Line 9L11 (continued)

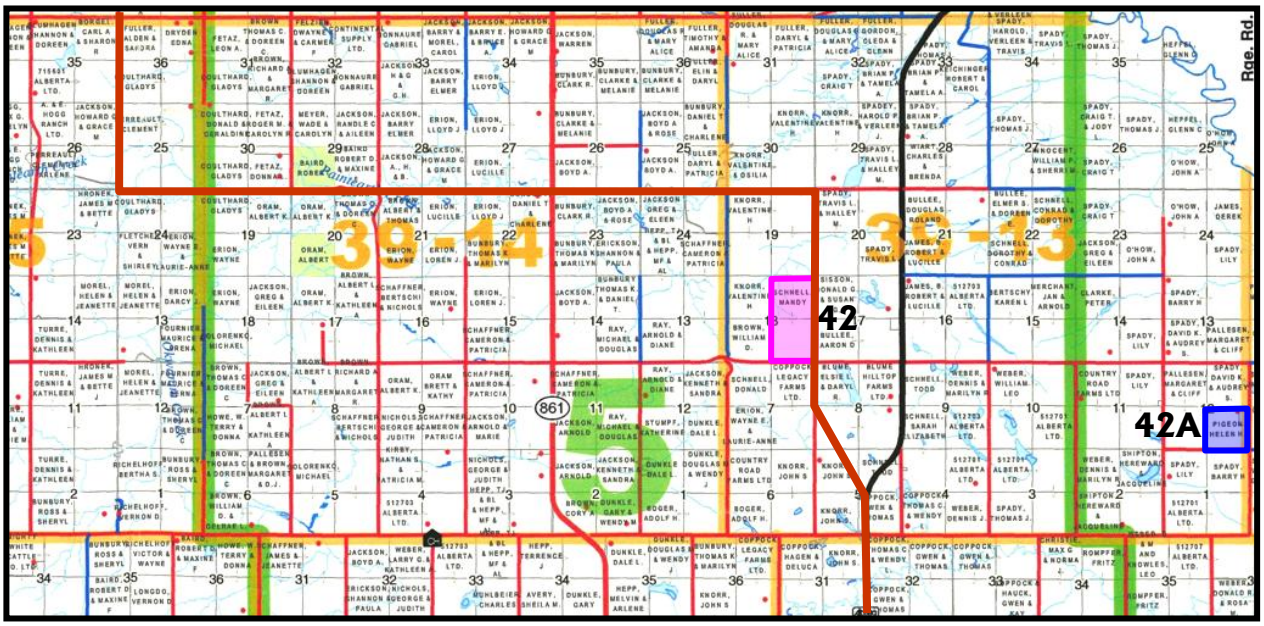


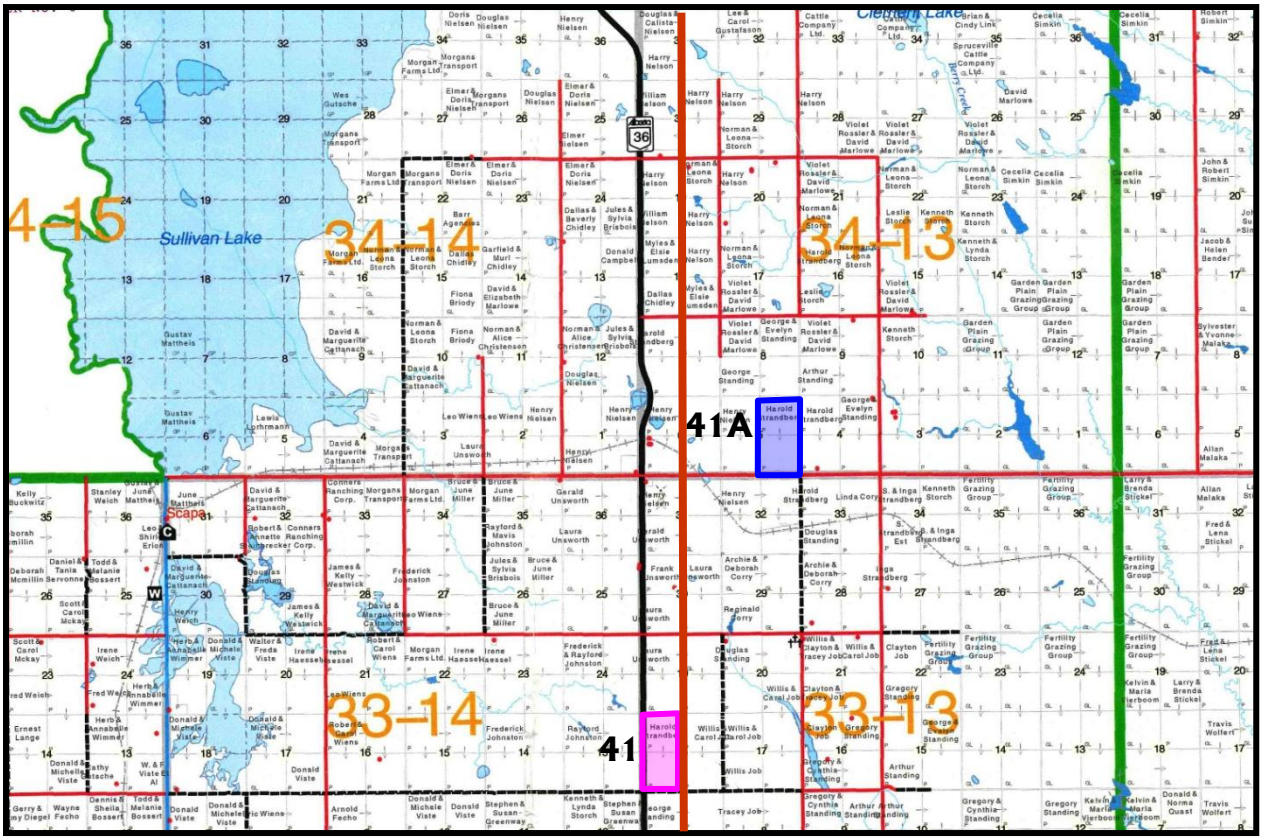
## Line 9L36/9L37



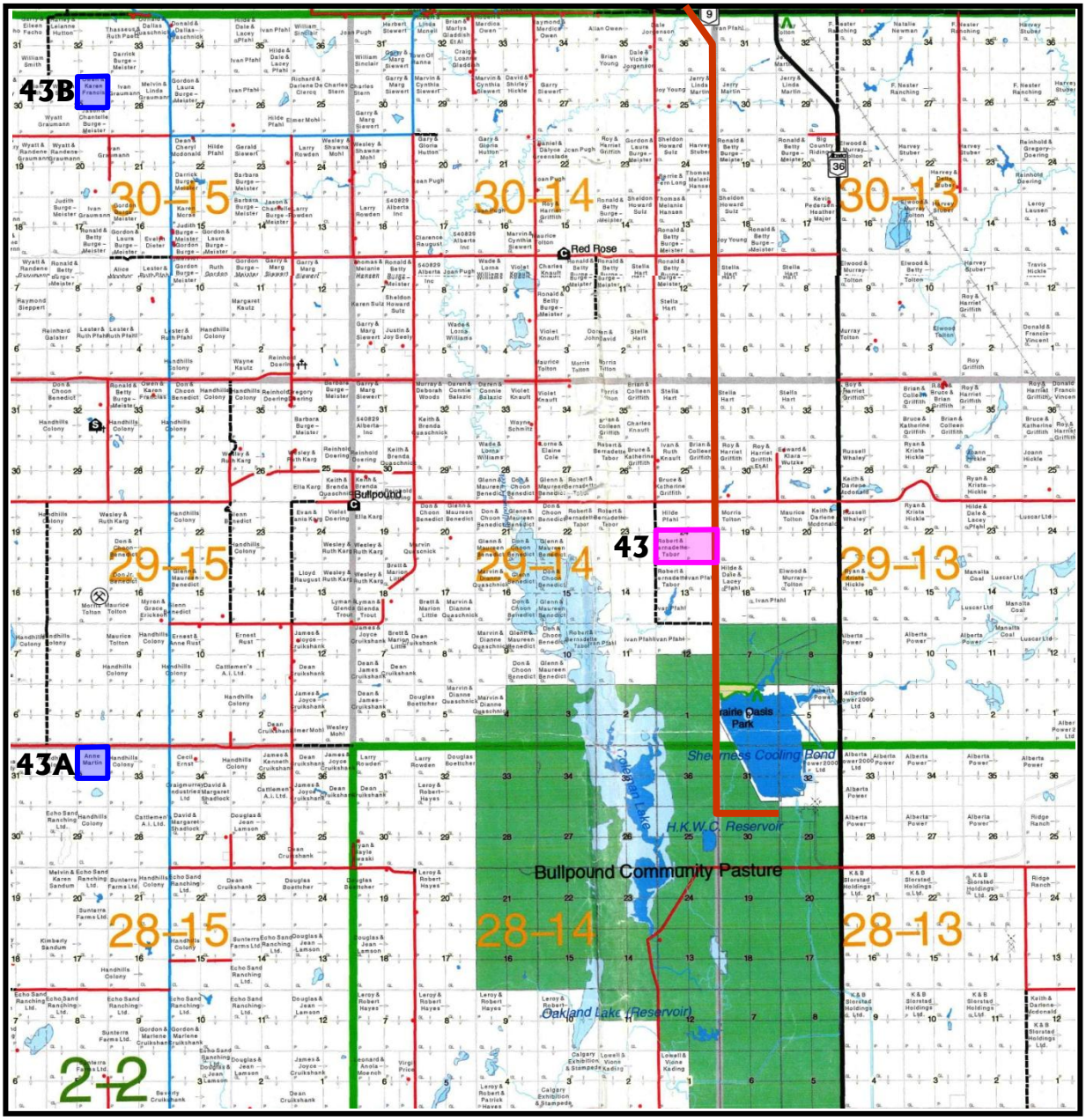

On-line  Off-line  Approximate Location of Transmission Line

## Line 9L59

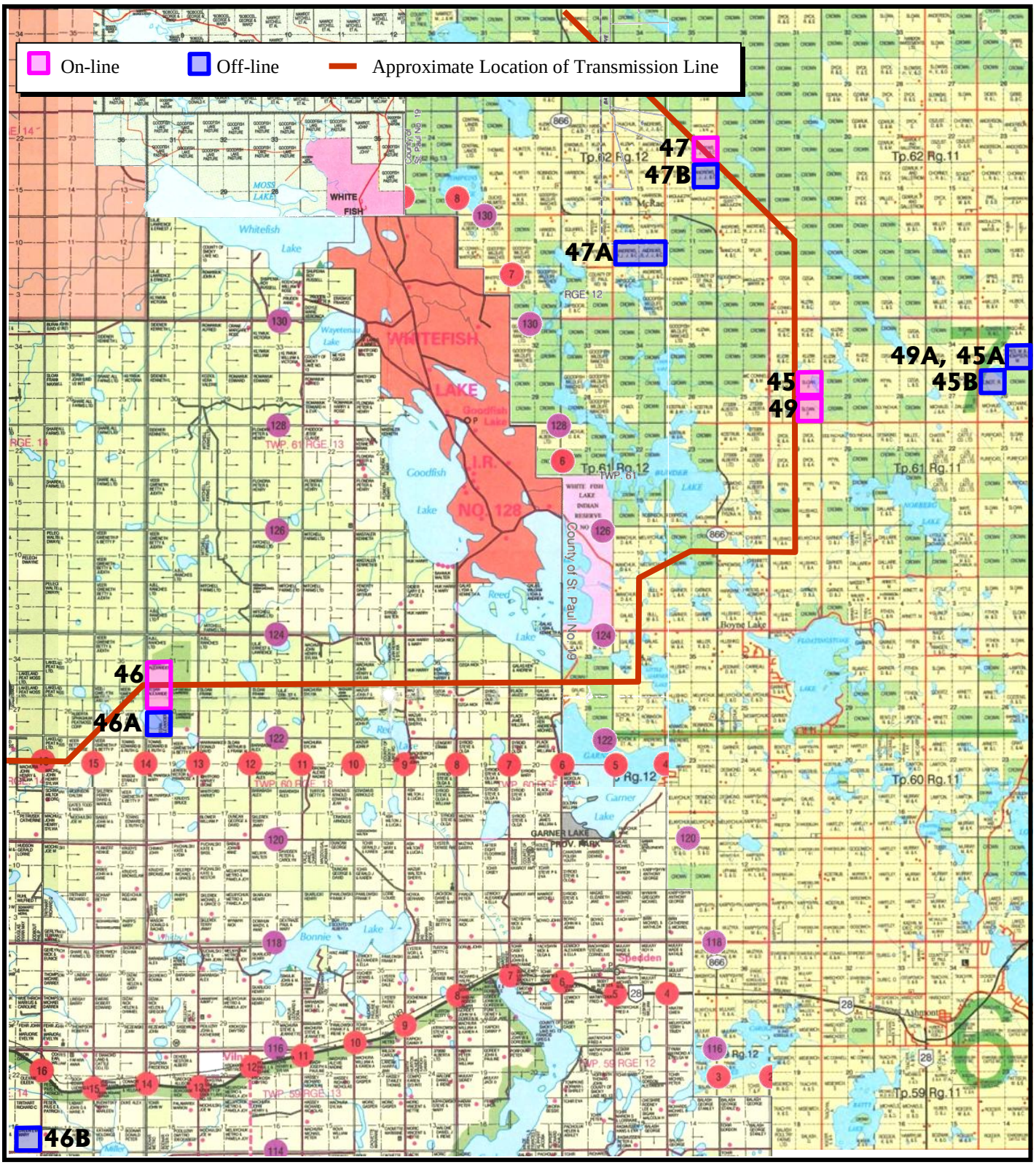

Rge. Rd.
42
42A
861


Sullivan Lake
Clayburn Lake
34-14
34-13
33-14
33-13
41A
41
On-line
Off-line
Approximate Location of Transmission Line

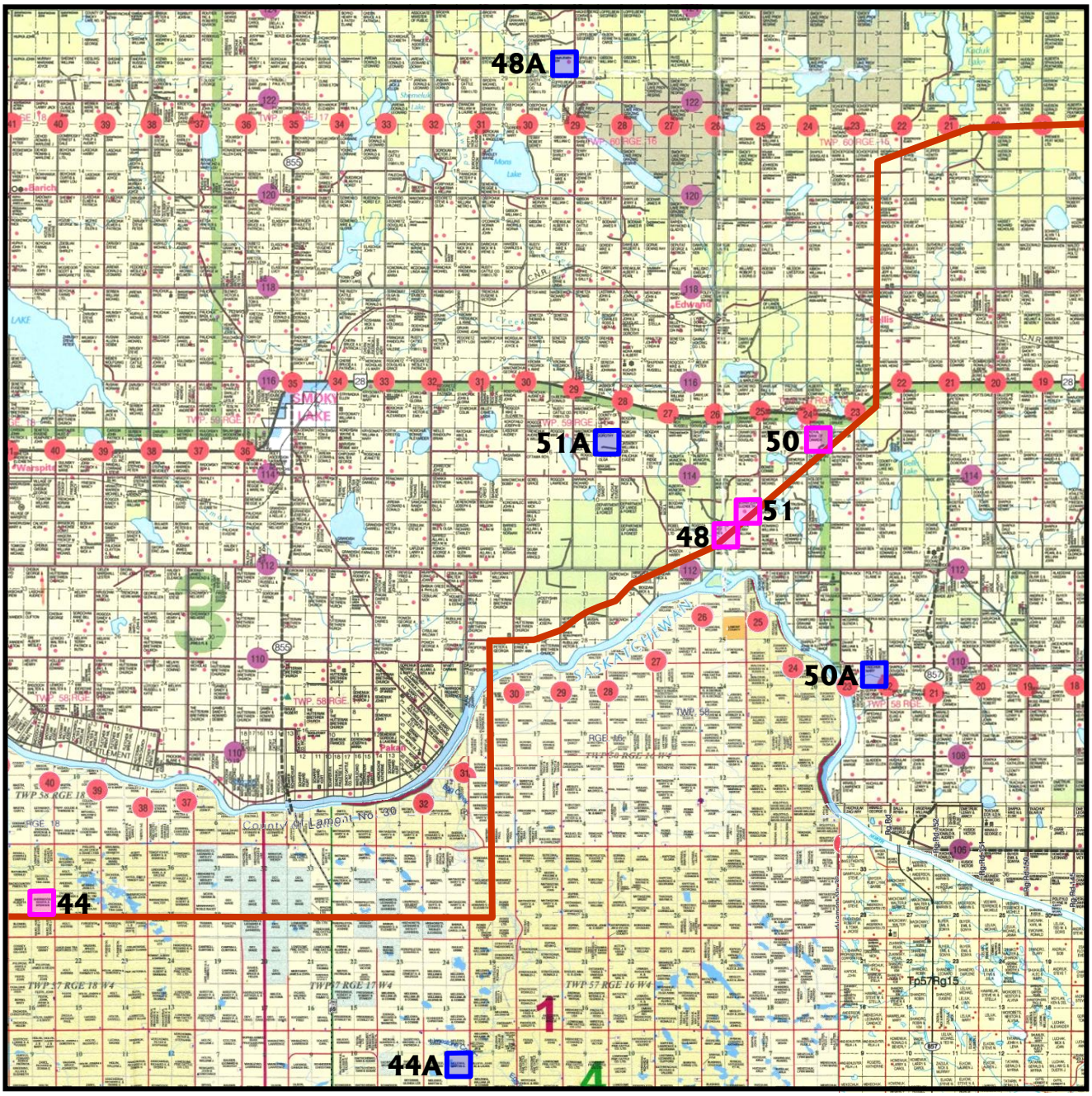
## Line 9L59 (continued)



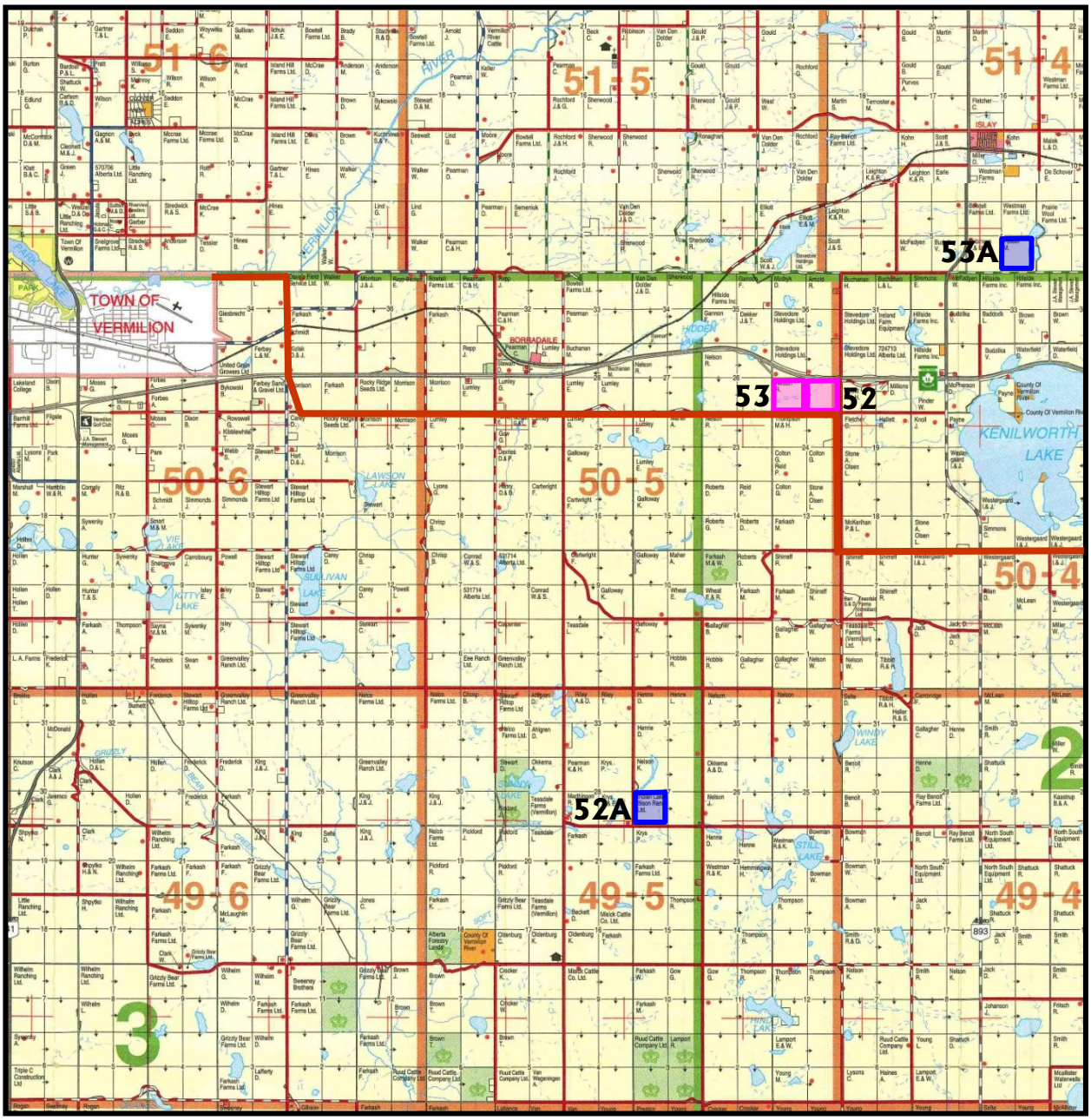
## Line 9L960/9L961



## Line 9L960/9L961 (continued)



## Line 7L14


TOWN OF VERMILION
53A
53
52
52A
KENILWORTH LAKE
BORDADAILE
LAWSON LAKE
SULLIVAN LAKE
KITTY LAKE
WINDY LAKE
STILL LAKE
HIDDEN LAKE
HINDS LAKE
51-6
51-5
51-4
50-6
50-5
50-4
49-6
49-5
49-4
On-line
Off-line
Approximate Location of Transmission Line

# APPENDIX B – REGRESSION ANALYSIS OUTPUT

**Welcome to SHAZAM - Version 10.0 - JAN 2009 SYSTEM=WIN-XP PAR= 11000 - 03/11/12 13:01:15**
*CURRENT WORKING DIRECTORY IS: C:\Documents and Settings\dryan\Desktop*

```
read (ATCO.txt) &
/skiplines=1

 UNIT 88 IS NOW ASSIGNED TO: ATCO.txt

...SAMPLE RANGE IS NOW SET TO: 1 962

skipif(psize.eq.-9999)

OBSERVATION 913 WILL BE SKIPPED
OBSERVATION 914 WILL BE SKIPPED
stat /all
```

| Name | N | Mean | St. Dev | Variance | Minimum | Maximum |
|---|---|---|---|---|---|---|
| VALUE | 960 | 0.15985E+06 | 0.16179E+06 | 0.26176E+11 | 4000.0 | 0.22800E+07 |
| PSIZE | 960 | 155.00 | 42.239 | 1784.1 | 69.900 | 572.96 |
| ONLINE | 960 | 0.76042E-01 | 0.26520 | 0.70333E-01 | 0.0000 | 1.0000 |
| OP | 960 | 0.28229 | 0.45035 | 0.20281 | 0.0000 | 1.0000 |
| BU | 960 | 0.17917 | 0.38369 | 0.14722 | 0.0000 | 1.0000 |
| UR | 960 | 0.10417E-02 | 0.32275E-01 | 0.10417E-02 | 0.0000 | 1.0000 |
| CLASS2 | 960 | 0.17292 | 0.37837 | 0.14317 | 0.0000 | 1.0000 |
| CLASS3 | 960 | 0.30000 | 0.45850 | 0.21022 | 0.0000 | 1.0000 |
| CLASS4 | 960 | 0.31875 | 0.46623 | 0.21737 | 0.0000 | 1.0000 |
| CLASS5 | 960 | 0.10625 | 0.30832 | 0.95060E-01 | 0.0000 | 1.0000 |
| CLASS6 | 960 | 0.46875E-01 | 0.21148 | 0.44724E-01 | 0.0000 | 1.0000 |
| CLASS7 | 960 | 0.83333E-02 | 0.90953E-01 | 0.82725E-02 | 0.0000 | 1.0000 |
| ORGANIC | 960 | 0.52083E-02 | 0.72018E-01 | 0.51866E-02 | 0.0000 | 1.0000 |
| LEASES | 960 | 0.24375 | 0.63850 | 0.40768 | 0.0000 | 7.0000 |
| IMPROVE | 960 | 0.24479 | 0.43019 | 0.18506 | 0.0000 | 1.0000 |
| LCOGP | 960 | 0.34375E-01 | 0.18229 | 0.33228E-01 | 0.0000 | 1.0000 |
| LLAMC | 960 | 0.80208E-01 | 0.27176 | 0.73852E-01 | 0.0000 | 1.0000 |
| LCOM | 960 | 0.17708E-01 | 0.13196 | 0.17413E-01 | 0.0000 | 1.0000 |
| LCOP | 960 | 0.60417E-01 | 0.23838 | 0.56826E-01 | 0.0000 | 1.0000 |
| LRDC | 960 | 0.33333E-01 | 0.17960 | 0.32256E-01 | 0.0000 | 1.0000 |
| LSMC | 960 | 0.10104 | 0.30154 | 0.90927E-01 | 0.0000 | 1.0000 |
| LMDOSR | 960 | 0.47917E-01 | 0.21370 | 0.45668E-01 | 0.0000 | 1.0000 |
| LCOSP | 960 | 0.47917E-01 | 0.21370 | 0.45668E-01 | 0.0000 | 1.0000 |
| LCOS | 960 | 0.50000E-01 | 0.21806 | 0.47550E-01 | 0.0000 | 1.0000 |
| LCOTH | 960 | 0.57292E-01 | 0.23252 | 0.54066E-01 | 0.0000 | 1.0000 |
| LCOVR | 960 | 0.32292E-01 | 0.17687 | 0.31281E-01 | 0.0000 | 1.0000 |
| SPEC | 960 | 0.58333E-01 | 0.23449 | 0.54988E-01 | 0.0000 | 1.0000 |
| SPEC4 | 960 | 0.15625E-01 | 0.12408 | 0.15397E-01 | 0.0000 | 1.0000 |
| LMDOG | 960 | 0.12292 | 0.32851 | 0.10792 | 0.0000 | 1.0000 |
| LNSC | 960 | 0.10417E-01 | 0.10158 | 0.10319E-01 | 0.0000 | 1.0000 |
| LMC | 960 | 0.75000E-01 | 0.26353 | 0.69447E-01 | 0.0000 | 1.0000 |
| LCONL | 960 | 0.45833E-01 | 0.20923 | 0.43778E-01 | 0.0000 | 1.0000 |
| LLAKC | 960 | 0.28125E-01 | 0.16542 | 0.27362E-01 | 0.0000 | 1.0000 |
| LFC | 960 | 0.20833E-02 | 0.45620E-01 | 0.20812E-02 | 0.0000 | 1.0000 |
| LKC | 960 | 0.13542E-01 | 0.11564 | 0.13372E-01 | 0.0000 | 1.0000 |
| LLACC | 960 | 0.12500E-01 | 0.11116 | 0.12357E-01 | 0.0000 | 1.0000 |
| Y2004S | 960 | 0.66667E-01 | 0.24957 | 0.62287E-01 | 0.0000 | 1.0000 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Y2005F | 960 | 0.53125E-01 | 0.22440 | 0.50355E-01 | 0.0000 | 1.0000 |
| Y2005S | 960 | 0.62500E-01 | 0.24219 | 0.58655E-01 | 0.0000 | 1.0000 |
| Y2006F | 960 | 0.75000E-01 | 0.26353 | 0.69447E-01 | 0.0000 | 1.0000 |
| Y2006S | 960 | 0.64583E-01 | 0.24592 | 0.60475E-01 | 0.0000 | 1.0000 |
| Y2007F | 960 | 0.84375E-01 | 0.27809 | 0.77336E-01 | 0.0000 | 1.0000 |
| Y2007S | 960 | 0.64583E-01 | 0.24592 | 0.60475E-01 | 0.0000 | 1.0000 |
| Y2008F | 960 | 0.59375E-01 | 0.23645 | 0.55908E-01 | 0.0000 | 1.0000 |
| Y2008S | 960 | 0.57292E-01 | 0.23252 | 0.54066E-01 | 0.0000 | 1.0000 |
| Y2009F | 960 | 0.44792E-01 | 0.20695 | 0.42830E-01 | 0.0000 | 1.0000 |
| Y2009S | 960 | 0.37500E-01 | 0.19008 | 0.36131E-01 | 0.0000 | 1.0000 |
| Y2010F | 960 | 0.66667E-01 | 0.24957 | 0.62287E-01 | 0.0000 | 1.0000 |
| Y2010S | 960 | 0.62500E-01 | 0.24219 | 0.58655E-01 | 0.0000 | 1.0000 |
| Y2011F | 960 | 0.69792E-01 | 0.25493 | 0.64988E-01 | 0.0000 | 1.0000 |
| Y2011S | 960 | 0.56250E-01 | 0.23052 | 0.53141E-01 | 0.0000 | 1.0000 |
| SKIP$ | 960 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |

*

**set nowarnskip**

**skipif(online.eq.0)**

**stat / all**

| Name | N | Mean | St. Dev | Variance | Minimum | Maximum |
|---|---|---|---|---|---|---|
| VALUE | 73 | 0.13973E+06 | 0.21454E+06 | 0.46029E+11 | 5900.0 | 0.18120E+07 |
| PSIZE | 73 | 149.07 | 22.056 | 486.47 | 69.900 | 161.24 |
| ONLINE | 73 | 1.0000 | 0.0000 | 0.0000 | 1.0000 | 1.0000 |
| OP | 73 | 0.35616 | 0.48218 | 0.23250 | 0.0000 | 1.0000 |
| BU | 73 | 0.24658 | 0.43400 | 0.18836 | 0.0000 | 1.0000 |
| UR | 73 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| CLASS2 | 73 | 0.13699 | 0.34621 | 0.11986 | 0.0000 | 1.0000 |
| CLASS3 | 73 | 0.17808 | 0.38523 | 0.14840 | 0.0000 | 1.0000 |
| CLASS4 | 73 | 0.36986 | 0.48611 | 0.23630 | 0.0000 | 1.0000 |
| CLASS5 | 73 | 0.13699 | 0.34621 | 0.11986 | 0.0000 | 1.0000 |
| CLASS6 | 73 | 0.95890E-01 | 0.29648 | 0.87900E-01 | 0.0000 | 1.0000 |
| CLASS7 | 73 | 0.27397E-01 | 0.16437 | 0.27017E-01 | 0.0000 | 1.0000 |
| ORGANIC | 73 | 0.13699E-01 | 0.11704 | 0.13699E-01 | 0.0000 | 1.0000 |
| LEASES | 73 | 0.21918 | 0.55893 | 0.31240 | 0.0000 | 3.0000 |
| IMPROVE | 73 | 0.13699 | 0.34621 | 0.11986 | 0.0000 | 1.0000 |
| LCOGP | 73 | 0.13699E-01 | 0.11704 | 0.13699E-01 | 0.0000 | 1.0000 |
| LLAMC | 73 | 0.68493E-01 | 0.25434 | 0.64688E-01 | 0.0000 | 1.0000 |
| LCOM | 73 | 0.13699E-01 | 0.11704 | 0.13699E-01 | 0.0000 | 1.0000 |
| LCOP | 73 | 0.41096E-01 | 0.19989 | 0.39954E-01 | 0.0000 | 1.0000 |
| LRDC | 73 | 0.13699E-01 | 0.11704 | 0.13699E-01 | 0.0000 | 1.0000 |
| LSMC | 73 | 0.12329 | 0.33104 | 0.10959 | 0.0000 | 1.0000 |
| LMDOSR | 73 | 0.41096E-01 | 0.19989 | 0.39954E-01 | 0.0000 | 1.0000 |
| LCOSP | 73 | 0.54795E-01 | 0.22915 | 0.52511E-01 | 0.0000 | 1.0000 |
| LCOS | 73 | 0.13699E-01 | 0.11704 | 0.13699E-01 | 0.0000 | 1.0000 |
| LCOTH | 73 | 0.54795E-01 | 0.22915 | 0.52511E-01 | 0.0000 | 1.0000 |
| LCOVR | 73 | 0.41096E-01 | 0.19989 | 0.39954E-01 | 0.0000 | 1.0000 |
| SPEC | 73 | 0.13699 | 0.34621 | 0.11986 | 0.0000 | 1.0000 |
| SPEC4 | 73 | 0.27397E-01 | 0.16437 | 0.27017E-01 | 0.0000 | 1.0000 |
| LMDOG | 73 | 0.10959 | 0.31454 | 0.98935E-01 | 0.0000 | 1.0000 |
| LNSC | 73 | 0.68493E-01 | 0.25434 | 0.64688E-01 | 0.0000 | 1.0000 |
| LMC | 73 | 0.27397E-01 | 0.16437 | 0.27017E-01 | 0.0000 | 1.0000 |

| | | | | | | |
|---|---|---|---|---|---|---|
| LCONL | 73 | 0.95890E-01 | 0.29648 | 0.87900E-01 | 0.0000 | 1.0000 |
| LLAKC | 73 | 0.13699E-01 | 0.11704 | 0.13699E-01 | 0.0000 | 1.0000 |
| LFC | 73 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| LKC | 73 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| LLACC | 73 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Y2004S | 73 | 0.95890E-01 | 0.29648 | 0.87900E-01 | 0.0000 | 1.0000 |
| Y2005F | 73 | 0.27397E-01 | 0.16437 | 0.27017E-01 | 0.0000 | 1.0000 |
| Y2005S | 73 | 0.54795E-01 | 0.22915 | 0.52511E-01 | 0.0000 | 1.0000 |
| Y2006F | 73 | 0.54795E-01 | 0.22915 | 0.52511E-01 | 0.0000 | 1.0000 |
| Y2006S | 73 | 0.54795E-01 | 0.22915 | 0.52511E-01 | 0.0000 | 1.0000 |
| Y2007F | 73 | 0.41096E-01 | 0.19989 | 0.39954E-01 | 0.0000 | 1.0000 |
| Y2007S | 73 | 0.54795E-01 | 0.22915 | 0.52511E-01 | 0.0000 | 1.0000 |
| Y2008F | 73 | 0.41096E-01 | 0.19989 | 0.39954E-01 | 0.0000 | 1.0000 |
| Y2008S | 73 | 0.95890E-01 | 0.29648 | 0.87900E-01 | 0.0000 | 1.0000 |
| Y2009F | 73 | 0.27397E-01 | 0.16437 | 0.27017E-01 | 0.0000 | 1.0000 |
| Y2009S | 73 | 0.68493E-01 | 0.25434 | 0.64688E-01 | 0.0000 | 1.0000 |
| Y2010F | 73 | 0.27397E-01 | 0.16437 | 0.27017E-01 | 0.0000 | 1.0000 |
| Y2010S | 73 | 0.95890E-01 | 0.29648 | 0.87900E-01 | 0.0000 | 1.0000 |
| Y2011F | 73 | 0.10959 | 0.31454 | 0.98935E-01 | 0.0000 | 1.0000 |
| Y2011S | 73 | 0.41096E-01 | 0.19989 | 0.39954E-01 | 0.0000 | 1.0000 |
| SKIP$ | 73 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |

**delete skip$**

*VARIABLE SKIP$ IS DELETED 962 WORDS RELEASED*

**skipif(online.eq.1)**

**skipif(psize.eq.-9999)**

**stat / all**

| Name | N | Mean | St. Dev | Variance | Minimum | Maximum |
|---|---|---|---|---|---|---|
| VALUE | 887 | 0.16151E+06 | 0.15671E+06 | 0.24557E+11 | 4000.0 | 0.22800E+07 |
| PSIZE | 887 | 155.49 | 43.456 | 1888.4 | 70.100 | 572.96 |
| ONLINE | 887 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| OP | 887 | 0.27621 | 0.44738 | 0.20014 | 0.0000 | 1.0000 |
| BU | 887 | 0.17362 | 0.37900 | 0.14364 | 0.0000 | 1.0000 |
| UR | 887 | 0.11274E-02 | 0.33577E-01 | 0.11274E-02 | 0.0000 | 1.0000 |
| CLASS2 | 887 | 0.17587 | 0.38093 | 0.14511 | 0.0000 | 1.0000 |
| CLASS3 | 887 | 0.31003 | 0.46277 | 0.21415 | 0.0000 | 1.0000 |
| CLASS4 | 887 | 0.31454 | 0.46460 | 0.21585 | 0.0000 | 1.0000 |
| CLASS5 | 887 | 0.10372 | 0.30507 | 0.93067E-01 | 0.0000 | 1.0000 |
| CLASS6 | 887 | 0.42841E-01 | 0.20261 | 0.41052E-01 | 0.0000 | 1.0000 |
| CLASS7 | 887 | 0.67644E-02 | 0.82013E-01 | 0.67262E-02 | 0.0000 | 1.0000 |
| ORGANIC | 887 | 0.45096E-02 | 0.67040E-01 | 0.44943E-02 | 0.0000 | 1.0000 |
| LEASES | 887 | 0.24577 | 0.64485 | 0.41583 | 0.0000 | 7.0000 |
| IMPROVE | 887 | 0.25366 | 0.43535 | 0.18953 | 0.0000 | 1.0000 |
| LCOGP | 887 | 0.36077E-01 | 0.18659 | 0.34814E-01 | 0.0000 | 1.0000 |
| LLAMC | 887 | 0.81172E-01 | 0.27325 | 0.74668E-01 | 0.0000 | 1.0000 |
| LCOM | 887 | 0.18038E-01 | 0.13317 | 0.17733E-01 | 0.0000 | 1.0000 |
| LCOP | 887 | 0.62007E-01 | 0.24130 | 0.58228E-01 | 0.0000 | 1.0000 |
| LRDC | 887 | 0.34949E-01 | 0.18375 | 0.33766E-01 | 0.0000 | 1.0000 |
| LSMC | 887 | 0.99211E-01 | 0.29911 | 0.89469E-01 | 0.0000 | 1.0000 |
| LMDOSR | 887 | 0.48478E-01 | 0.21490 | 0.46180E-01 | 0.0000 | 1.0000 |
| LCOSP | 887 | 0.47351E-01 | 0.21251 | 0.45159E-01 | 0.0000 | 1.0000 |

| | | | | | | |
|---|---|---|---|---|---|---|
| LCOS | 887 | 0.52988E-01 | 0.22414 | 0.50237E-01 | 0.0000 | 1.0000 |
| LCOTH | 887 | 0.57497E-01 | 0.23292 | 0.54252E-01 | 0.0000 | 1.0000 |
| LCOVR | 887 | 0.31567E-01 | 0.17494 | 0.30605E-01 | 0.0000 | 1.0000 |
| SPEC | 887 | 0.51860E-01 | 0.22187 | 0.49226E-01 | 0.0000 | 1.0000 |
| SPEC4 | 887 | 0.14656E-01 | 0.12024 | 0.14458E-01 | 0.0000 | 1.0000 |
| LMDOG | 887 | 0.12401 | 0.32978 | 0.10876 | 0.0000 | 1.0000 |
| LNSC | 887 | 0.56370E-02 | 0.74910E-01 | 0.56115E-02 | 0.0000 | 1.0000 |
| LMC | 887 | 0.78918E-01 | 0.26976 | 0.72772E-01 | 0.0000 | 1.0000 |
| LCONL | 887 | 0.41714E-01 | 0.20005 | 0.40019E-01 | 0.0000 | 1.0000 |
| LLAKC | 887 | 0.29312E-01 | 0.16878 | 0.28485E-01 | 0.0000 | 1.0000 |
| LFC | 887 | 0.22548E-02 | 0.47458E-01 | 0.22522E-02 | 0.0000 | 1.0000 |
| LKC | 887 | 0.14656E-01 | 0.12024 | 0.14458E-01 | 0.0000 | 1.0000 |
| LLACC | 887 | 0.13529E-01 | 0.11559 | 0.13361E-01 | 0.0000 | 1.0000 |
| Y2004S | 887 | 0.64262E-01 | 0.24536 | 0.60200E-01 | 0.0000 | 1.0000 |
| Y2005F | 887 | 0.55242E-01 | 0.22858 | 0.52250E-01 | 0.0000 | 1.0000 |
| Y2005S | 887 | 0.63134E-01 | 0.24334 | 0.59215E-01 | 0.0000 | 1.0000 |
| Y2006F | 887 | 0.76663E-01 | 0.26621 | 0.70866E-01 | 0.0000 | 1.0000 |
| Y2006S | 887 | 0.65389E-01 | 0.24735 | 0.61182E-01 | 0.0000 | 1.0000 |
| Y2007F | 887 | 0.87937E-01 | 0.28336 | 0.80294E-01 | 0.0000 | 1.0000 |
| Y2007S | 887 | 0.65389E-01 | 0.24735 | 0.61182E-01 | 0.0000 | 1.0000 |
| Y2008F | 887 | 0.60879E-01 | 0.23924 | 0.57238E-01 | 0.0000 | 1.0000 |
| Y2008S | 887 | 0.54115E-01 | 0.22637 | 0.51244E-01 | 0.0000 | 1.0000 |
| Y2009F | 887 | 0.46223E-01 | 0.21009 | 0.44136E-01 | 0.0000 | 1.0000 |
| Y2009S | 887 | 0.34949E-01 | 0.18375 | 0.33766E-01 | 0.0000 | 1.0000 |
| Y2010F | 887 | 0.69899E-01 | 0.25512 | 0.65086E-01 | 0.0000 | 1.0000 |
| Y2010S | 887 | 0.59752E-01 | 0.23716 | 0.56245E-01 | 0.0000 | 1.0000 |
| Y2011F | 887 | 0.66516E-01 | 0.24932 | 0.62162E-01 | 0.0000 | 1.0000 |
| Y2011S | 887 | 0.57497E-01 | 0.23292 | 0.54252E-01 | 0.0000 | 1.0000 |
| SKIP$ | 887 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |

**delete skip$**

*VARIABLE SKIP$ IS DELETED 962 WORDS RELEASED*

**skipif(psize.eq.-9999)**

*

**ols Value Online PSize OP BU UR Class2 Class3 Class4 Class5 Class6 Class7 Organic Leases Improve LCOGP LLAMC LCOM &**

**/hetcov nogf**

| | |
|---|---|
| REQUIRED MEMORY IS PAR | 802 |
| CURRENT PAR | 11000 |

**OLS ESTIMATION**

960 OBSERVATIONS DEPENDENT VARIABLE VALUE

*...NOTE..SAMPLE RANGE SET TO: 1, 962*

USING HETEROSKEDASTICITY-CONSISTENT COVARIANCE MATRIX

| | |
|---|---|
| R-SQUARE | 0.3442 |
| R-SQUARE ADJUSTED | 0.3082 |
| VARIANCE OF THE ESTIMATE-SIGMA**2 | 0.18109E+11 |
| STANDARD ERROR OF THE ESTIMATE-SIGMA | 0.13457E+06 |
| SUM OF SQUARED ERRORS-SSE | 0.16462E+14 |
| MEAN OF DEPENDENT VARIABLE | 0.15985E+06 |

| | |
|---|---|
| LOG OF THE LIKELIHOOD FUNCTION | -12673.4 |

MODEL SELECTION TESTS - SEE JUDGE ET AL. (1985,P.242)

| | |
|---|---|
| AKAIKE (1969) FINAL PREDICTION ERROR - FPE | 0.19072E+11 |
| *(FPE IS ALSO KNOWN AS AMEMIYA PREDICTION CRITERION - PC)* | |
| AKAIKE (1973) INFORMATION CRITERION - LOG AIC | 23.671 |
| SCHWARZ (1978) CRITERION - LOG SC | 23.930 |

MODEL SELECTION TESTS - SEE RAMANATHAN (1998,P.165)

| | |
|---|---|
| CRAVEN-WAHBA (1979) | |
| GENERALIZED CROSS VALIDATION - GCV | 0.19126E+11 |
| HANNAN AND QUINN (1979) CRITERION | 0.21043E+11 |
| RICE (1984) CRITERION | 0.19186E+11 |
| SHIBATA (1981) CRITERION | 0.18969E+11 |
| SCHWARZ (1978) CRITERION - SC | 0.24696E+11 |
| AKAIKE (1974) INFORMATION CRITERION - AIC | 0.19070E+11 |

**ANALYSIS OF VARIANCE - FROM MEAN**

| | SS | DF | MS | F |
|---|---|---|---|---|
| REGRESSION | 0.86417E+13 | 50. | 0.17283E+12 | 9.544 |
| ERROR | 0.16462E+14 | 909. | 0.18109E+11 | **P-VALUE** |
| TOTAL | 0.25103E+14 | 959. | 0.26176E+11 | 0.000 |

**ANALYSIS OF VARIANCE - FROM ZERO**

| | SS | DF | MS | F |
|---|---|---|---|---|
| REGRESSION | 0.33173E+14 | 51. | 0.65045E+12 | 35.918 |
| ERROR | 0.16462E+14 | 909. | 0.18109E+11 | **P-VALUE** |
| TOTAL | 0.49635E+14 | 960. | 0.51703E+11 | 0.000 |

| Variable Name | Estimated Coefficient | Standard Error | T-Ratio | p-Value ( 909 DF) | Partial Correlation | Standardised Coefficient | Elasticity at Means |
|---|---|---|---|---|---|---|---|
| ONLINE | 27763. | 0.2557E+05 | 1.086 | 0.278 | 0.036 | 0.0455 | 0.0132 |
| PSIZE | 464.66 | 89.22 | 5.208 | 0.000 | 0.170 | 0.1213 | 0.4505 |
| OP | -15599. | 9899. | -1.576 | 0.115 | -0.052 | -0.0434 | -0.0275 |
| BU | -8588.5 | 0.1066E+05 | -0.8060 | 0.420 | -0.027 | -0.0204 | -0.0096 |
| UR | 0.44839E+06 | 0.2852E+05 | 15.72 | 0.000 | 0.462 | 0.0894 | 0.0029 |
| CLASS2 | -71670. | 0.5610E+05 | -1.278 | 0.202 | -0.042 | -0.1676 | -0.0775 |
| CLASS3 | -82322. | 0.5424E+05 | -1.518 | 0.129 | -0.050 | -0.2333 | -0.1545 |
| CLASS4 | -88034. | 0.5409E+05 | -1.628 | 0.104 | -0.054 | -0.2537 | -0.1755 |
| CLASS5 | -69068. | 0.5895E+05 | -1.172 | 0.242 | -0.039 | -0.1316 | -0.0459 |
| CLASS6 | -91189. | 0.5664E+05 | -1.610 | 0.108 | -0.053 | -0.1192 | -0.0267 |
| CLASS7 | -52154. | 0.6416E+05 | -0.8129 | 0.417 | -0.027 | -0.0293 | -0.0027 |
| ORGANIC | -0.12202E+06 | 0.5837E+05 | -2.091 | 0.037 | -0.069 | -0.0543 | -0.0040 |
| LEASES | 18736. | 0.1178E+05 | 1.590 | 0.112 | 0.053 | 0.0739 | 0.0286 |
| IMPROVE | 0.12159E+06 | 0.1096E+05 | 11.09 | 0.000 | 0.345 | 0.3233 | 0.1862 |
| LCOGP | 0.11506E+06 | 0.3527E+05 | 3.262 | 0.001 | 0.108 | 0.1296 | 0.0247 |
| LLAMC | -8149.0 | 0.2565E+05 | -0.3178 | 0.751 | -0.011 | -0.0137 | -0.0041 |
| LCOM | -44384. | 0.3520E+05 | -1.261 | 0.208 | -0.042 | -0.0362 | -0.0049 |
| LCOP | -42532. | 0.3799E+05 | -1.120 | 0.263 | -0.037 | -0.0627 | -0.0161 |
| LRDC | 89573. | 0.2884E+05 | 3.105 | 0.002 | 0.102 | 0.0994 | 0.0187 |
| LSMC | -58561. | 0.2020E+05 | -2.898 | 0.004 | -0.096 | -0.1091 | -0.0370 |
| LMDOSR | -20159. | 0.2595E+05 | -0.7768 | 0.437 | -0.026 | -0.0266 | -0.0060 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| LCOSP | -47394. | 0.2095E+05 | -2.262 | 0.024 | -0.075 | -0.0626 | -0.0142 |
| LCOS | 76217. | 0.3973E+05 | 1.919 | 0.055 | 0.064 | 0.1027 | 0.0238 |
| LCOTH | -67381. | 0.2738E+05 | -2.461 | 0.014 | -0.081 | -0.0968 | -0.0241 |
| LCOVR | -19276. | 0.2692E+05 | -0.7159 | 0.474 | -0.024 | -0.0211 | -0.0039 |
| SPEC | -0.10055E+06 | 0.2056E+05 | -4.890 | 0.000 | -0.160 | -0.1457 | -0.0367 |
| SPEC4 | -96151. | 0.3679E+05 | -2.614 | 0.009 | -0.086 | -0.0737 | -0.0094 |
| LMDOG | -64034. | 0.2217E+05 | -2.889 | 0.004 | -0.095 | -0.1300 | -0.0492 |
| LNSC | -0.13057E+06 | 0.2753E+05 | -4.743 | 0.000 | -0.155 | -0.0820 | -0.0085 |
| LMC | -72274. | 0.2422E+05 | -2.984 | 0.003 | -0.098 | -0.1177 | -0.0339 |
| LCONL | -0.12108E+06 | 0.2329E+05 | -5.199 | 0.000 | -0.170 | -0.1566 | -0.0347 |
| LLAKC | -55853. | 0.2132E+05 | -2.619 | 0.009 | -0.087 | -0.0571 | -0.0098 |
| LFC | -60624. | 0.2842E+05 | -2.133 | 0.033 | -0.071 | -0.0171 | -0.0008 |
| LKC | 59996. | 0.3290E+05 | 1.824 | 0.069 | 0.060 | 0.0429 | 0.0051 |
| LLACC | 0.11812E+06 | 0.4753E+05 | 2.485 | 0.013 | 0.082 | 0.0812 | 0.0092 |
| Y2004S | 4888.6 | 0.1181E+05 | 0.4138 | 0.679 | 0.014 | 0.0075 | 0.0020 |
| Y2005F | -9814.6 | 0.1376E+05 | -0.7131 | 0.476 | -0.024 | -0.0136 | -0.0033 |
| Y2005S | 9005.3 | 0.1248E+05 | 0.7217 | 0.471 | 0.024 | 0.0135 | 0.0035 |
| Y2006F | 13967. | 0.1312E+05 | 1.064 | 0.287 | 0.035 | 0.0227 | 0.0066 |
| Y2006S | 22101. | 0.1317E+05 | 1.678 | 0.094 | 0.056 | 0.0336 | 0.0089 |
| Y2007F | 26811. | 0.1170E+05 | 2.292 | 0.022 | 0.076 | 0.0461 | 0.0142 |
| Y2007S | 85794. | 0.2815E+05 | 3.047 | 0.002 | 0.101 | 0.1304 | 0.0347 |
| Y2008F | 52037. | 0.1683E+05 | 3.091 | 0.002 | 0.102 | 0.0760 | 0.0193 |
| Y2008S | 35336. | 0.1487E+05 | 2.377 | 0.018 | 0.079 | 0.0508 | 0.0127 |
| Y2009F | 53811. | 0.1673E+05 | 3.215 | 0.001 | 0.106 | 0.0688 | 0.0151 |
| Y2009S | 60393. | 0.1568E+05 | 3.851 | 0.000 | 0.127 | 0.0710 | 0.0142 |
| Y2010F | 83189. | 0.3605E+05 | 2.308 | 0.021 | 0.076 | 0.1283 | 0.0347 |
| Y2010S | 84365. | 0.2068E+05 | 4.080 | 0.000 | 0.134 | 0.1263 | 0.0330 |
| Y2011F | 77772. | 0.1482E+05 | 5.248 | 0.000 | 0.171 | 0.1225 | 0.0340 |
| Y2011S | 99566. | 0.3353E+05 | 2.970 | 0.003 | 0.098 | 0.1419 | 0.0350 |
| CONSTANT | 0.12629E+06 | 0.5696E+05 | 2.217 | 0.027 | 0.073 | 0.0000 | 0.7900 |

**genr llflin=$LLF**

..NOTE..CURRENT VALUE OF $LLF -12673.

*

**genr Logvalue=log(value)**

**ols logValue Online PSize OP BU UR Class2 Class3 Class4 Class5 Class6 Class7 Organic Leases Improve LCOGP LLAMC LCOM &**

**/hetcov loglin nogf**

REQUIRED MEMORY IS PAR 818
CURRENT PAR 11000

**OLS ESTIMATION**

960 OBSERVATIONS DEPENDENT VARIABLE LOGVALUE
*...NOTE..SAMPLE RANGE SET TO: 1, 962*

USING HETEROSKEDASTICITY-CONSISTENT COVARIANCE MATRIX

R-SQUARE 0.5371
R-SQUARE ADJUSTED 0.5116
VARIANCE OF THE ESTIMATE-SIGMA**2 0.33410
STANDARD ERROR OF THE ESTIMATE-SIGMA 0.57801
SUM OF SQUARED ERRORS-SSE 303.70

| | |
|---|---|
| MEAN OF DEPENDENT VARIABLE | 11.658 |
| LOG OF THE LIKELIHOOD FUNCTION(IF DEPVAR LOG) | -12001.5 |

MODEL SELECTION TESTS - SEE JUDGE ET AL. (1985,P.242)

| | |
|---|---|
| AKAIKE (1969) FINAL PREDICTION ERROR - FPE | 0.35185 |
| *(FPE IS ALSO KNOWN AS AMEMIYA PREDICTION CRITERION - PC)* | |
| AKAIKE (1973) INFORMATION CRITERION - LOG AIC | -1.0447 |
| SCHWARZ (1978) CRITERION - LOG SC | -0.78610 |

MODEL SELECTION TESTS - SEE RAMANATHAN (1998,P.165)

| | |
|---|---|
| CRAVEN-WAHBA (1979) | |
| GENERALIZED CROSS VALIDATION - GCV | 0.35284 |
| HANNAN AND QUINN (1979) CRITERION | 0.38822 |
| RICE (1984) CRITERION | 0.35396 |
| SHIBATA (1981) CRITERION | 0.34996 |
| SCHWARZ (1978) CRITERION - SC | 0.45562 |
| AKAIKE (1974) INFORMATION CRITERION - AIC | 0.35181 |

**ANALYSIS OF VARIANCE - FROM MEAN**

| | SS | DF | MS | F |
|---|---|---|---|---|
| REGRESSION | 352.37 | 50. | 7.0473 | 21.094 |
| ERROR | 303.70 | 909. | 0.33410 | **P-VALUE** |
| TOTAL | 656.06 | 959. | 0.68411 | 0.000 |

**ANALYSIS OF VARIANCE - FROM ZERO**

| | SS | DF | MS | F |
|---|---|---|---|---|
| REGRESSION | 0.13083E+06 | 51. | 2565.2 | 7678.031 |
| ERROR | 303.70 | 909. | 0.33410 | **P-VALUE** |
| TOTAL | 0.13113E+06 | 960. | 136.59 | 0.000 |

| Variable Name | Estimated Coefficient | Standard Error | T-Ratio | p-Value ( 909 DF) | Partial Correlation | Standardised Coefficient | Elasticity at Means |
|---|---|---|---|---|---|---|---|
| ONLINE | 0.12771 | 0.8678E-01 | 1.472 | 0.141 | 0.049 | 0.0409 | 0.0097 |
| PSIZE | 0.33129E-02 | 0.4277E-03 | 7.745 | 0.000 | 0.249 | 0.1692 | 0.5135 |
| OP | -0.14737 | 0.4621E-01 | -3.189 | 0.001 | -0.105 | -0.0802 | -0.0416 |
| BU | -0.16445 | 0.6470E-01 | -2.542 | 0.011 | -0.084 | -0.0763 | -0.0295 |
| UR | 1.1888 | 0.1128 | 10.54 | 0.000 | 0.330 | 0.0464 | 0.0012 |
| CLASS2 | -0.12025 | 0.1164 | -1.033 | 0.302 | -0.034 | -0.0550 | -0.0208 |
| CLASS3 | -0.23908 | 0.1140 | -2.097 | 0.036 | -0.069 | -0.1325 | -0.0717 |
| CLASS4 | -0.29727 | 0.1181 | -2.518 | 0.012 | -0.083 | -0.1676 | -0.0948 |
| CLASS5 | -0.28921 | 0.1385 | -2.088 | 0.037 | -0.069 | -0.1078 | -0.0307 |
| CLASS6 | -0.31391 | 0.1378 | -2.277 | 0.023 | -0.075 | -0.0803 | -0.0147 |
| CLASS7 | -0.19968E-01 | 0.2256 | -0.8852E-01 | 0.929 | -0.003 | -0.0022 | -0.0002 |
| ORGANIC | -0.76379 | 0.3068 | -2.490 | 0.013 | -0.082 | -0.0665 | -0.0040 |
| LEASES | 0.33204E-01 | 0.3882E-01 | 0.8554 | 0.393 | 0.028 | 0.0256 | 0.0081 |
| IMPROVE | 0.71572 | 0.4483E-01 | 15.96 | 0.000 | 0.468 | 0.3723 | 0.1752 |
| LCOGP | 0.38386 | 0.1177 | 3.260 | 0.001 | 0.108 | 0.0846 | 0.0132 |
| LLAMC | -0.22750 | 0.9742E-01 | -2.335 | 0.020 | -0.077 | -0.0747 | -0.0182 |
| LCOM | -0.32742 | 0.1509 | -2.170 | 0.030 | -0.072 | -0.0522 | -0.0058 |
| LCOP | -0.45762 | 0.1040 | -4.401 | 0.000 | -0.144 | -0.1319 | -0.0276 |
| LRDC | 0.35828 | 0.9831E-01 | 3.644 | 0.000 | 0.120 | 0.0778 | 0.0119 |
| LSMC | -0.46158 | 0.8593E-01 | -5.372 | 0.000 | -0.175 | -0.1683 | -0.0466 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| LMDOSR | -0.23592 | 0.1049 | -2.250 | 0.025 | -0.074 | -0.0610 | -0.0113 |
| LCOSP | -0.36311 | 0.8990E-01 | -4.039 | 0.000 | -0.133 | -0.0938 | -0.0174 |
| LCOS | 0.16972 | 0.9906E-01 | 1.713 | 0.087 | 0.057 | 0.0447 | 0.0085 |
| LCOTH | -0.46969 | 0.9978E-01 | -4.707 | 0.000 | -0.154 | -0.1320 | -0.0269 |
| LCOVR | -0.11532 | 0.1051 | -1.097 | 0.273 | -0.036 | -0.0247 | -0.0037 |
| SPEC | -1.1037 | 0.1391 | -7.936 | 0.000 | -0.255 | -0.3129 | -0.0644 |
| SPEC4 | -1.2493 | 0.2864 | -4.362 | 0.000 | -0.143 | -0.1874 | -0.0195 |
| LMDOG | -0.50736 | 0.9069E-01 | -5.594 | 0.000 | -0.182 | -0.2015 | -0.0624 |
| LNSC | -0.96373 | 0.1906 | -5.057 | 0.000 | -0.165 | -0.1184 | -0.0100 |
| LMC | -0.86510 | 0.1146 | -7.550 | 0.000 | -0.243 | -0.2756 | -0.0649 |
| LCONL | -1.0358 | 0.1146 | -9.038 | 0.000 | -0.287 | -0.2620 | -0.0475 |
| LLAKC | -0.30469 | 0.1040 | -2.930 | 0.003 | -0.097 | -0.0609 | -0.0086 |
| LFC | -0.34336 | 0.1432 | -2.399 | 0.017 | -0.079 | -0.0189 | -0.0007 |
| LKC | 0.29778 | 0.1178 | 2.529 | 0.012 | 0.084 | 0.0416 | 0.0040 |
| LLACC | 0.52771 | 0.1485 | 3.554 | 0.000 | 0.117 | 0.0709 | 0.0066 |
| Y2004S | -0.84211E-01 | 0.9400E-01 | -0.8959 | 0.371 | -0.030 | -0.0254 | -0.0056 |
| Y2005F | -0.22664 | 0.1129 | -2.008 | 0.045 | -0.066 | -0.0615 | -0.0120 |
| Y2005S | -0.30674E-01 | 0.1084 | -0.2829 | 0.777 | -0.009 | -0.0090 | -0.0019 |
| Y2006F | 0.62206E-01 | 0.8896E-01 | 0.6992 | 0.485 | 0.023 | 0.0198 | 0.0047 |
| Y2006S | 0.13010 | 0.9231E-01 | 1.409 | 0.159 | 0.047 | 0.0387 | 0.0084 |
| Y2007F | 0.16569 | 0.8120E-01 | 2.040 | 0.042 | 0.068 | 0.0557 | 0.0140 |
| Y2007S | 0.41400 | 0.8976E-01 | 4.612 | 0.000 | 0.151 | 0.1231 | 0.0267 |
| Y2008F | 0.28059 | 0.1049 | 2.676 | 0.008 | 0.088 | 0.0802 | 0.0167 |
| Y2008S | 0.13957 | 0.1123 | 1.243 | 0.214 | 0.041 | 0.0392 | 0.0080 |
| Y2009F | 0.28731 | 0.8854E-01 | 3.245 | 0.001 | 0.107 | 0.0719 | 0.0129 |
| Y2009S | 0.43206 | 0.1020 | 4.234 | 0.000 | 0.139 | 0.0993 | 0.0162 |
| Y2010F | 0.33792 | 0.9990E-01 | 3.383 | 0.001 | 0.111 | 0.1020 | 0.0225 |
| Y2010S | 0.38056 | 0.1056 | 3.603 | 0.000 | 0.119 | 0.1114 | 0.0238 |
| Y2011F | 0.46588 | 0.9451E-01 | 4.929 | 0.000 | 0.161 | 0.1436 | 0.0325 |
| Y2011S | 0.48668 | 0.1087 | 4.478 | 0.000 | 0.147 | 0.1356 | 0.0274 |
| CONSTANT | 11.455 | 0.1534 | 74.65 | 0.000 | 0.927 | 0.0000 | 11.4555 |

```
genr llflog=$LLF

 ..NOTE..CURRENT VALUE OF $LLF                    -12002.

*

?box Value Online PSize OP BU UR Class2 Class3 Class4 Class5 Class6 Class7 Organic Leases Improve LCOGP
LLAMC LCOM &

Y2005F Y2005S Y2006F Y2006S Y2007F Y2007S Y2008F Y2008S Y2009F Y2009S Y2010F Y2010S Y2011F
Y2011S

*

genr llfbc=$LLF

 ..NOTE..CURRENT VALUE OF $LLF                    -11987.

gen1 LRlin=2*(llfbc-llflin)

gen1 LRlog=2*(llfbc-llflog)

print LRlin LRlog

  LRLIN
  1372.707

  LRLOG
```

28.83774

*

genr P2=Psize*Psize

genr PO=PSize*online

genr PO2=P2*online

*

ols logValue Online PSize OP BU UR Class2 Class3 Class4 Class5 Class6 Class7 Organic Leases Improve LCOGP LLAMC LCOM &
P2 PO /hetcov loglin nogf

| | |
|---|---|
| REQUIRED MEMORY IS PAR | 871 |
| CURRENT PAR | 11000 |

**OLS ESTIMATION**

| | |
|---|---|
| 960 OBSERVATIONS DEPENDENT VARIABLE | LOGVALUE |

*...NOTE..SAMPLE RANGE SET TO: 1, 962*

USING HETEROSKEDASTICITY-CONSISTENT COVARIANCE MATRIX

| | |
|---|---|
| R-SQUARE | 0.5392 |
| R-SQUARE ADJUSTED | 0.5128 |
| VARIANCE OF THE ESTIMATE-SIGMA**2 | 0.33329 |
| STANDARD ERROR OF THE ESTIMATE-SIGMA | 0.57731 |
| SUM OF SQUARED ERRORS-SSE | 302.30 |
| MEAN OF DEPENDENT VARIABLE | 11.658 |
| LOG OF THE LIKELIHOOD FUNCTION(IF DEPVAR LOG) | -11999.3 |

MODEL SELECTION TESTS - SEE JUDGE ET AL. (1985,P.242)

| | |
|---|---|
| AKAIKE (1969) FINAL PREDICTION ERROR - FPE | 0.35169 |
| *(FPE IS ALSO KNOWN AS AMEMIYA PREDICTION CRITERION - PC)* | |
| AKAIKE (1973) INFORMATION CRITERION - LOG AIC | -1.0451 |
| SCHWARZ (1978) CRITERION - LOG SC | -0.77642 |

MODEL SELECTION TESTS - SEE RAMANATHAN (1998,P.165)

| | |
|---|---|
| CRAVEN-WAHBA (1979) | |
| GENERALIZED CROSS VALIDATION - GCV | 0.35277 |
| HANNAN AND QUINN (1979) CRITERION | 0.38954 |
| RICE (1984) CRITERION | 0.35398 |
| SHIBATA (1981) CRITERION | 0.34966 |
| SCHWARZ (1978) CRITERION - SC | 0.46005 |
| AKAIKE (1974) INFORMATION CRITERION - AIC | 0.35165 |

**ANALYSIS OF VARIANCE - FROM MEAN**

| | SS | DF | MS | F |
|---|---|---|---|---|
| REGRESSION | 353.77 | 52. | 6.8032 | 20.412 |
| ERROR | 302.30 | 907. | 0.33329 | **P-VALUE** |
| TOTAL | 656.06 | 959. | 0.68411 | 0.000 |

**ANALYSIS OF VARIANCE - FROM ZERO**

| | SS | DF | MS | F |
|---|---|---|---|---|
| REGRESSION | 0.13083E+06 | 53. | 2468.5 | 7406.287 |
| ERROR | 302.30 | 907. | 0.33329 | **P-VALUE** |
| TOTAL | 0.13113E+06 | 960. | 136.59 | 0.000 |

| Variable Name | Estimated Coefficient | Standard Error | T-Ratio | p-Value ( 907 DF) | Partial Correlation | Standardised Coefficient | Elasticity at Means |
|---|---|---|---|---|---|---|---|
| ONLINE | -0.36778 | 0.5654 | -0.6504 | 0.516 | -0.022 | -0.1179 | -0.0280 |
| PSIZE | 0.53523E-02 | 0.1361E-02 | 3.932 | 0.000 | 0.129 | 0.2733 | 0.8296 |
| OP | -0.14266 | 0.4618E-01 | -3.089 | 0.002 | -0.102 | -0.0777 | -0.0403 |
| BU | -0.16002 | 0.6473E-01 | -2.472 | 0.014 | -0.082 | -0.0742 | -0.0287 |
| UR | 1.1945 | 0.1126 | 10.60 | 0.000 | 0.332 | 0.0466 | 0.0012 |
| CLASS2 | -0.13375 | 0.1165 | -1.148 | 0.251 | -0.038 | -0.0612 | -0.0231 |
| CLASS3 | -0.25347 | 0.1147 | -2.211 | 0.027 | -0.073 | -0.1405 | -0.0760 |
| CLASS4 | -0.30680 | 0.1180 | -2.600 | 0.009 | -0.086 | -0.1729 | -0.0978 |
| CLASS5 | -0.30122 | 0.1382 | -2.180 | 0.030 | -0.072 | -0.1123 | -0.0320 |
| CLASS6 | -0.31908 | 0.1377 | -2.317 | 0.021 | -0.077 | -0.0816 | -0.0150 |
| CLASS7 | -0.20597E-01 | 0.2316 | -0.8893E-01 | 0.929 | -0.003 | -0.0023 | -0.0002 |
| ORGANIC | -0.78560 | 0.3118 | -2.520 | 0.012 | -0.083 | -0.0684 | -0.0041 |
| LEASES | 0.33717E-01 | 0.3849E-01 | 0.8759 | 0.381 | 0.029 | 0.0260 | 0.0082 |
| IMPROVE | 0.71574 | 0.4497E-01 | 15.92 | 0.000 | 0.467 | 0.3723 | 0.1752 |
| LCOGP | 0.37797 | 0.1185 | 3.188 | 0.001 | 0.105 | 0.0833 | 0.0130 |
| LLAMC | -0.21414 | 0.9825E-01 | -2.180 | 0.030 | -0.072 | -0.0704 | -0.0172 |
| LCOM | -0.32052 | 0.1531 | -2.094 | 0.037 | -0.069 | -0.0511 | -0.0057 |
| LCOP | -0.45240 | 0.1038 | -4.356 | 0.000 | -0.143 | -0.1304 | -0.0273 |
| LRDC | 0.36018 | 0.9939E-01 | 3.624 | 0.000 | 0.119 | 0.0782 | 0.0120 |
| LSMC | -0.45743 | 0.8637E-01 | -5.296 | 0.000 | -0.173 | -0.1668 | -0.0462 |
| LMDOSR | -0.23311 | 0.1052 | -2.216 | 0.027 | -0.073 | -0.0602 | -0.0112 |
| LCOSP | -0.36702 | 0.9071E-01 | -4.046 | 0.000 | -0.133 | -0.0948 | -0.0176 |
| LCOS | 0.17754 | 0.1001 | 1.773 | 0.077 | 0.059 | 0.0468 | 0.0089 |
| LCOTH | -0.46368 | 0.9983E-01 | -4.645 | 0.000 | -0.152 | -0.1304 | -0.0266 |
| LCOVR | -0.11814 | 0.1055 | -1.120 | 0.263 | -0.037 | -0.0253 | -0.0038 |
| SPEC | -1.1051 | 0.1376 | -8.033 | 0.000 | -0.258 | -0.3133 | -0.0645 |
| SPEC4 | -1.2559 | 0.2853 | -4.402 | 0.000 | -0.145 | -0.1884 | -0.0196 |
| LMDOG | -0.51044 | 0.9140E-01 | -5.585 | 0.000 | -0.182 | -0.2027 | -0.0627 |
| LNSC | -0.99238 | 0.1915 | -5.181 | 0.000 | -0.170 | -0.1219 | -0.0103 |
| LMC | -0.86883 | 0.1152 | -7.540 | 0.000 | -0.243 | -0.2768 | -0.0652 |
| LCONL | -1.0410 | 0.1153 | -9.028 | 0.000 | -0.287 | -0.2634 | -0.0477 |
| LLAKC | -0.31140 | 0.1043 | -2.986 | 0.003 | -0.099 | -0.0623 | -0.0088 |
| LFC | -0.34969 | 0.1466 | -2.385 | 0.017 | -0.079 | -0.0193 | -0.0007 |
| LKC | 0.29217 | 0.1183 | 2.469 | 0.014 | 0.082 | 0.0408 | 0.0040 |
| LLACC | 0.54175 | 0.1508 | 3.594 | 0.000 | 0.118 | 0.0728 | 0.0068 |
| Y2004S | -0.83898E-01 | 0.9371E-01 | -0.8953 | 0.371 | -0.030 | -0.0253 | -0.0056 |
| Y2005F | -0.22853 | 0.1130 | -2.023 | 0.043 | -0.067 | -0.0620 | -0.0121 |
| Y2005S | -0.14894E-01 | 0.1099 | -0.1355 | 0.892 | -0.004 | -0.0044 | -0.0009 |
| Y2006F | 0.66669E-01 | 0.8682E-01 | 0.7679 | 0.443 | 0.025 | 0.0212 | 0.0050 |
| Y2006S | 0.13125 | 0.9133E-01 | 1.437 | 0.151 | 0.048 | 0.0390 | 0.0085 |
| Y2007F | 0.16863 | 0.8116E-01 | 2.078 | 0.038 | 0.069 | 0.0567 | 0.0142 |
| Y2007S | 0.41516 | 0.8959E-01 | 4.634 | 0.000 | 0.152 | 0.1234 | 0.0268 |
| Y2008F | 0.28829 | 0.1056 | 2.731 | 0.006 | 0.090 | 0.0824 | 0.0171 |
| Y2008S | 0.13966 | 0.1124 | 1.243 | 0.214 | 0.041 | 0.0393 | 0.0080 |
| Y2009F | 0.28274 | 0.8819E-01 | 3.206 | 0.001 | 0.106 | 0.0707 | 0.0127 |
| Y2009S | 0.43737 | 0.1021 | 4.285 | 0.000 | 0.141 | 0.1005 | 0.0164 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Y2010F | 0.33944 | 0.9871E-01 | 3.439 | 0.001 | 0.113 | 0.1024 | 0.0226 |
| Y2010S | 0.38111 | 0.1057 | 3.606 | 0.000 | 0.119 | 0.1116 | 0.0238 |
| Y2011F | 0.46139 | 0.9378E-01 | 4.920 | 0.000 | 0.161 | 0.1422 | 0.0322 |
| Y2011S | 0.48525 | 0.1079 | 4.499 | 0.000 | 0.148 | 0.1352 | 0.0273 |
| P2 | -0.50211E-05 | 0.2833E-05 | -1.772 | 0.077 | -0.059 | -0.1123 | -0.1296 |
| PO | 0.33072E-02 | 0.3834E-02 | 0.8627 | 0.389 | 0.029 | 0.1599 | 0.0375 |
| CONSTANT | 11.275 | 0.1872 | 60.24 | 0.000 | 0.894 | 0.0000 | 11.2755 |

```
test

test PO=0

test p2=0

end
```

| | |
|---|---|
| F STATISTIC | 2.1407803 |
| WITH 2 AND 907 D.F. P-VALUE | 0.11816 |
| WALD CHI-SQUARE STATISTIC | 4.2815607 |
| WITH 2 D.F. P-VALUE | 0.11756 |
| UPPER BOUND ON P-VALUE BY CHEBYCHEV INEQUALITY | 0.46712 |

```
*
test online+PO=0

 TEST VALUE = -0.36447     STD. ERROR OF TEST VALUE  0.56165
 T STATISTIC = -0.64892922     WITH  907 D.F.    P-VALUE= 0.51655
 F STATISTIC =  0.42110914     WITH    1 AND  907 D.F.  P-VALUE= 0.51655
 WALD CHI-SQUARE STATISTIC =  0.42110914     WITH    1 D.F.  P-VALUE= 0.51638
 UPPER BOUND ON P-VALUE BY CHEBYCHEV INEQUALITY = 1.00000
test online+10*PO=0

 TEST VALUE = -0.33470     STD. ERROR OF TEST VALUE  0.52757
 T STATISTIC = -0.63442339     WITH  907 D.F.    P-VALUE= 0.52596
 F STATISTIC =  0.40249304     WITH    1 AND  907 D.F.  P-VALUE= 0.52596
 WALD CHI-SQUARE STATISTIC =  0.40249304     WITH    1 D.F.  P-VALUE= 0.52580
 UPPER BOUND ON P-VALUE BY CHEBYCHEV INEQUALITY = 1.00000
test online+30*PO=0

 TEST VALUE = -0.26856     STD. ERROR OF TEST VALUE  0.45208
 T STATISTIC = -0.59404957     WITH  907 D.F.    P-VALUE= 0.55263
 F STATISTIC =  0.35289489     WITH    1 AND  907 D.F.  P-VALUE= 0.55263
 WALD CHI-SQUARE STATISTIC =  0.35289489     WITH    1 D.F.  P-VALUE= 0.55248
 UPPER BOUND ON P-VALUE BY CHEBYCHEV INEQUALITY = 1.00000
test online+50*PO=0

 TEST VALUE = -0.20241     STD. ERROR OF TEST VALUE  0.37707
 T STATISTIC = -0.53680826     WITH  907 D.F.    P-VALUE= 0.59153
 F STATISTIC =  0.28816311     WITH    1 AND  907 D.F.  P-VALUE= 0.59153
 WALD CHI-SQUARE STATISTIC =  0.28816311     WITH    1 D.F.  P-VALUE= 0.59140
 UPPER BOUND ON P-VALUE BY CHEBYCHEV INEQUALITY = 1.00000
test online+100*PO=0

 TEST VALUE = -0.37052E-01 STD. ERROR OF TEST VALUE  0.19527
 T STATISTIC = -0.18974779     WITH  907 D.F.    P-VALUE= 0.84955
 F STATISTIC =  0.36004223E-01 WITH    1 AND  907 D.F.  P-VALUE= 0.84955
 WALD CHI-SQUARE STATISTIC =  0.36004223E-01 WITH    1 D.F.  P-VALUE= 0.84951
 UPPER BOUND ON P-VALUE BY CHEBYCHEV INEQUALITY = 1.00000
test online+200*PO=0
```

```
 TEST VALUE =  0.29367     STD. ERROR OF TEST VALUE  0.22468
 T STATISTIC =   1.3070529     WITH  907 D.F.    P-VALUE= 0.19153
 F STATISTIC =   1.7083874     WITH    1 AND  907 D.F.  P-VALUE= 0.19153
 WALD CHI-SQUARE STATISTIC =   1.7083874     WITH    1 D.F.  P-VALUE= 0.19119
 UPPER BOUND ON P-VALUE BY CHEBYCHEV INEQUALITY = 0.58535
test online+300*PO=0

 TEST VALUE =  0.62440     STD. ERROR OF TEST VALUE  0.59731
 T STATISTIC =   1.0453541     WITH  907 D.F.    P-VALUE= 0.29614
 F STATISTIC =   1.0927651     WITH    1 AND  907 D.F.  P-VALUE= 0.29614
 WALD CHI-SQUARE STATISTIC =   1.0927651     WITH    1 D.F.  P-VALUE= 0.29586
 UPPER BOUND ON P-VALUE BY CHEBYCHEV INEQUALITY = 0.91511
*
genr OLCOGP=online*LCOGP

genr OLLAMC=online*LLAMC

genr OLCOM=online*LCOM

genr OLCOP=online*LCOP

genr OLRDC=online*LRDC

genr OLSMC=online*LSMC

genr OLMDOSR=online*LMDOSR

genr OLCOSP=online*LCOSP

genr OLCOS=online*LCOS

genr OLCOTH=online*LCOTH

genr OLCOVR=online*LCOVR

genr OSPEC=online*SPEC

genr OSPEC4=online*SPEC4

genr OLMDOG=online*LMDOG

genr OLNSC=online*LNSC

genr OLMC=online*LMC

genr OLCONL=online*LCONL

genr OLLAKC=online*LLAKC

*genr OLFC=online*LFC
*genr OLKC=online*LKC
*genr OLLACC=online*LLACC
*

ols logValue Online PSize OP BU UR Class2 Class3 Class4 Class5 Class6 Class7 Organic Leases Improve LCOGP
LLAMC LCOM &
/hetcov loglin nogf

 REQUIRED MEMORY IS PAR                          1151
```

| | |
|---|---|
| CURRENT PAR | 11000 |

**OLS ESTIMATION**

| | |
|---|---|
| 960 OBSERVATIONS DEPENDENT VARIABLE | LOGVALUE |
| *...NOTE..SAMPLE RANGE SET TO: 1, 962* | |

USING HETEROSKEDASTICITY-CONSISTENT COVARIANCE MATRIX

| | |
|---|---|
| R-SQUARE | 0.5593 |
| R-SQUARE ADJUSTED | 0.5246 |
| VARIANCE OF THE ESTIMATE-SIGMA**2 | 0.32520 |
| STANDARD ERROR OF THE ESTIMATE-SIGMA | 0.57027 |
| SUM OF SQUARED ERRORS-SSE | 289.11 |
| MEAN OF DEPENDENT VARIABLE | 11.658 |
| LOG OF THE LIKELIHOOD FUNCTION(IF DEPVAR LOG) | -11977.9 |

MODEL SELECTION TESTS - SEE JUDGE ET AL. (1985,P.242)

| | |
|---|---|
| AKAIKE (1969) FINAL PREDICTION ERROR - FPE | 0.34926 |
| *(FPE IS ALSO KNOWN AS AMEMIYA PREDICTION CRITERION - PC)* | |
| AKAIKE (1973) INFORMATION CRITERION - LOG AIC | -1.0522 |
| SCHWARZ (1978) CRITERION - LOG SC | -0.69227 |

MODEL SELECTION TESTS - SEE RAMANATHAN (1998,P.165)

| | |
|---|---|
| CRAVEN-WAHBA (1979) | |
| GENERALIZED CROSS VALIDATION - GCV | 0.35118 |
| HANNAN AND QUINN (1979) CRITERION | 0.40046 |
| RICE (1984) CRITERION | 0.35343 |
| SHIBATA (1981) CRITERION | 0.34570 |
| SCHWARZ (1978) CRITERION - SC | 0.50044 |
| AKAIKE (1974) INFORMATION CRITERION - AIC | 0.34916 |

**ANALYSIS OF VARIANCE - FROM MEAN**

| | SS | DF | MS | F |
|---|---|---|---|---|
| REGRESSION | 366.96 | 70. | 5.2423 | 16.120 |
| ERROR | 289.11 | 889. | 0.32520 | **P-VALUE** |
| TOTAL | 656.06 | 959. | 0.68411 | 0.000 |

**ANALYSIS OF VARIANCE - FROM ZERO**

| | SS | DF | MS | F |
|---|---|---|---|---|
| REGRESSION | 0.13084E+06 | 71. | 1842.8 | 5666.712 |
| ERROR | 289.11 | 889. | 0.32520 | **P-VALUE** |
| TOTAL | 0.13113E+06 | 960. | 136.59 | 0.000 |

| Variable Name | Estimated Coefficient | Standard Error | T-Ratio | p-Value ( 889 DF) | Partial Correlation | Standardised Coefficient | Elasticity at Means |
|---|---|---|---|---|---|---|---|
| ONLINE | -0.75058 | 0.8185 | -0.9170 | 0.359 | -0.031 | -0.2407 | -0.0571 |
| PSIZE | 0.54792E-02 | 0.1414E-02 | 3.876 | 0.000 | 0.129 | 0.2798 | 0.8493 |
| OP | -0.16422 | 0.4630E-01 | -3.547 | 0.000 | -0.118 | -0.0894 | -0.0464 |
| BU | -0.17377 | 0.6233E-01 | -2.788 | 0.005 | -0.093 | -0.0806 | -0.0311 |
| UR | 1.1503 | 0.1106 | 10.40 | 0.000 | 0.329 | 0.0449 | 0.0012 |
| CLASS2 | -0.14559 | 0.1179 | -1.234 | 0.217 | -0.041 | -0.0666 | -0.0252 |
| CLASS3 | -0.23843 | 0.1153 | -2.067 | 0.039 | -0.069 | -0.1322 | -0.0715 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| CLASS4 | -0.27716 | 0.1187 | -2.334 | 0.020 | -0.078 | -0.1562 | -0.0883 |
| CLASS5 | -0.27483 | 0.1357 | -2.025 | 0.043 | -0.068 | -0.1024 | -0.0292 |
| CLASS6 | -0.27086 | 0.1373 | -1.973 | 0.049 | -0.066 | -0.0693 | -0.0127 |
| CLASS7 | 0.39955E-01 | 0.2221 | 0.1799 | 0.857 | 0.006 | 0.0044 | 0.0003 |
| ORGANIC | -0.59760 | 0.2852 | -2.095 | 0.036 | -0.070 | -0.0520 | -0.0031 |
| LEASES | 0.29997E-01 | 0.3826E-01 | 0.7841 | 0.433 | 0.026 | 0.0232 | 0.0073 |
| IMPROVE | 0.71612 | 0.4475E-01 | 16.00 | 0.000 | 0.473 | 0.3725 | 0.1753 |
| LCOGP | 0.38895 | 0.1177 | 3.304 | 0.001 | 0.110 | 0.0857 | 0.0134 |
| LLAMC | -0.21216 | 0.9888E-01 | -2.146 | 0.032 | -0.072 | -0.0697 | -0.0170 |
| LCOM | -0.29739 | 0.1571 | -1.894 | 0.059 | -0.063 | -0.0474 | -0.0053 |
| LCOP | -0.53561 | 0.8954E-01 | -5.981 | 0.000 | -0.197 | -0.1544 | -0.0324 |
| LRDC | 0.35308 | 0.9929E-01 | 3.556 | 0.000 | 0.118 | 0.0767 | 0.0118 |
| LSMC | -0.47503 | 0.8705E-01 | -5.457 | 0.000 | -0.180 | -0.1732 | -0.0480 |
| LMDOSR | -0.21838 | 0.1045 | -2.090 | 0.037 | -0.070 | -0.0564 | -0.0105 |
| LCOSP | -0.38055 | 0.9038E-01 | -4.210 | 0.000 | -0.140 | -0.0983 | -0.0182 |
| LCOS | 0.15605 | 0.9918E-01 | 1.573 | 0.116 | 0.053 | 0.0411 | 0.0078 |
| LCOTH | -0.47560 | 0.1001 | -4.753 | 0.000 | -0.157 | -0.1337 | -0.0272 |
| LCOVR | -0.81246E-01 | 0.1109 | -0.7328 | 0.464 | -0.025 | -0.0174 | -0.0026 |
| SPEC | -1.1295 | 0.1472 | -7.674 | 0.000 | -0.249 | -0.3202 | -0.0659 |
| SPEC4 | -1.3197 | 0.3261 | -4.048 | 0.000 | -0.135 | -0.1980 | -0.0206 |
| LMDOG | -0.49249 | 0.8791E-01 | -5.602 | 0.000 | -0.185 | -0.1956 | -0.0605 |
| LNSC | -1.2159 | 0.2573 | -4.725 | 0.000 | -0.157 | -0.1493 | -0.0127 |
| LMC | -0.87261 | 0.1144 | -7.629 | 0.000 | -0.248 | -0.2780 | -0.0654 |
| LCONL | -1.1751 | 0.1147 | -10.25 | 0.000 | -0.325 | -0.2973 | -0.0539 |
| LLAKC | -0.31731 | 0.1039 | -3.054 | 0.002 | -0.102 | -0.0635 | -0.0089 |
| LFC | -0.32820 | 0.1465 | -2.241 | 0.025 | -0.075 | -0.0181 | -0.0007 |
| LKC | 0.27153 | 0.1166 | 2.328 | 0.020 | 0.078 | 0.0380 | 0.0037 |
| LLACC | 0.52177 | 0.1510 | 3.455 | 0.001 | 0.115 | 0.0701 | 0.0065 |
| Y2004S | -0.44595E-01 | 0.9320E-01 | -0.4785 | 0.632 | -0.016 | -0.0135 | -0.0030 |
| Y2005F | -0.19371 | 0.1155 | -1.677 | 0.094 | -0.056 | -0.0526 | -0.0103 |
| Y2005S | -0.11361E-01 | 0.1083 | -0.1049 | 0.916 | -0.004 | -0.0033 | -0.0007 |
| Y2006F | 0.58305E-01 | 0.8377E-01 | 0.6960 | 0.487 | 0.023 | 0.0186 | 0.0044 |
| Y2006S | 0.14116 | 0.9150E-01 | 1.543 | 0.123 | 0.052 | 0.0420 | 0.0091 |
| Y2007F | 0.19101 | 0.8199E-01 | 2.330 | 0.020 | 0.078 | 0.0642 | 0.0161 |
| Y2007S | 0.40477 | 0.9326E-01 | 4.340 | 0.000 | 0.144 | 0.1203 | 0.0261 |
| Y2008F | 0.28979 | 0.1065 | 2.722 | 0.007 | 0.091 | 0.0828 | 0.0172 |
| Y2008S | 0.18114 | 0.1073 | 1.687 | 0.092 | 0.057 | 0.0509 | 0.0104 |
| Y2009F | 0.28311 | 0.8990E-01 | 3.149 | 0.002 | 0.105 | 0.0708 | 0.0127 |
| Y2009S | 0.43227 | 0.9949E-01 | 4.345 | 0.000 | 0.144 | 0.0993 | 0.0162 |
| Y2010F | 0.36750 | 0.9755E-01 | 3.767 | 0.000 | 0.125 | 0.1109 | 0.0245 |
| Y2010S | 0.39988 | 0.1046 | 3.823 | 0.000 | 0.127 | 0.1171 | 0.0250 |
| Y2011F | 0.49819 | 0.9492E-01 | 5.249 | 0.000 | 0.173 | 0.1536 | 0.0348 |
| Y2011S | 0.47964 | 0.9992E-01 | 4.801 | 0.000 | 0.159 | 0.1337 | 0.0270 |
| P2 | -0.51886E-05 | 0.3010E-05 | -1.724 | 0.085 | -0.058 | -0.1161 | -0.1339 |
| PO | 0.43678E-02 | 0.4525E-02 | 0.9653 | 0.335 | 0.032 | 0.2112 | 0.0495 |
| OLCOGP | -0.45079 | 0.4369 | -1.032 | 0.302 | -0.035 | -0.0176 | -0.0005 |
| OLLAMC | 0.15340 | 0.4539 | 0.3380 | 0.735 | 0.011 | 0.0134 | 0.0008 |
| OLCOM | -0.15131 | 0.4320 | -0.3502 | 0.726 | -0.012 | -0.0059 | -0.0002 |
| OLCOP | 1.4652 | 0.7342 | 1.996 | 0.046 | 0.067 | 0.0989 | 0.0046 |
| OLRDC | -0.72775E-02 | 0.4285 | -0.1698E-01 | 0.986 | -0.001 | -0.0003 | 0.0000 |
| OLSMC | 0.20041 | 0.4342 | 0.4616 | 0.644 | 0.015 | 0.0234 | 0.0019 |
| OLMDOSR | -0.26622 | 0.4549 | -0.5852 | 0.559 | -0.020 | -0.0180 | -0.0008 |
| OLCOSP | 0.12508 | 0.4768 | 0.2624 | 0.793 | 0.009 | 0.0097 | 0.0005 |
| OLCOS | 0.69510 | 0.5723 | 1.215 | 0.225 | 0.041 | 0.0271 | 0.0007 |
| OLCOTH | | | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | 0.29405 | 0.4308 | 0.6826 | 0.495 | 0.023 | 0.0229 | 0.0012 |
| OLCOVR | -0.16300 | 0.4697 | -0.3470 | 0.729 | -0.012 | -0.0110 | -0.0005 |
| OSPEC | 0.20070 | 0.5079 | 0.3951 | 0.693 | 0.013 | 0.0246 | 0.0021 |
| OSPEC4 | 0.52069 | 0.5187 | 1.004 | 0.316 | 0.034 | 0.0287 | 0.0011 |
| OLMDOG | -0.22159 | 0.5334 | -0.4154 | 0.678 | -0.014 | -0.0244 | -0.0018 |
| OLNSC | 0.61318 | 0.4991 | 1.229 | 0.220 | 0.041 | 0.0534 | 0.0032 |
| OLMC | -0.57683 | 0.4487 | -1.286 | 0.199 | -0.043 | -0.0318 | -0.0012 |
| OLCONL | 1.0301 | 0.4497 | 2.290 | 0.022 | 0.077 | 0.1060 | 0.0075 |
| OLLAKC | -0.28079 | 0.4405 | -0.6375 | 0.524 | -0.021 | -0.0110 | -0.0003 |
| CONSTANT | 11.253 | 0.1892 | 59.48 | 0.000 | 0.894 | 0.0000 | 11.2526 |

```
test

test OLCOGP=0

test OLLAMC=0

test OLCOM=0

test OLCOP=0

test OLRDC=0

test OLSMC=0

test OLMDOSR=0

test OLCOSP=0

test OLCOS=0

test OLCOTH=0

test OLCOVR=0

test OSPEC=0

test OSPEC4=0

test OLMDOG=0

test OLNSC=0

test OLMC=0

test OLCONL=0

test OLLAKC=0

end
```

| | |
|---|---|
| F STATISTIC | 4.3638438 |
| WITH 18 AND 889 D.F. P-VALUE | 0.00000 |
| WALD CHI-SQUARE STATISTIC | 78.549188 |
| WITH 18 D.F. P-VALUE | 0.00000 |
| UPPER BOUND ON P-VALUE BY CHEBYCHEV INEQUALITY | 0.22916 |

```
genr oc2=online*Class2

genr oc3=online*Class3
```

```
genr oc4=online*Class4

genr oc5=online*Class5

genr oc6=online*Class6

genr oc7=online*Class7

genr oo=online*Organic

genr oL=online*Leases

genr oI=online*Improve

ols logValue Online PSize OP BU UR Class2 Class3 Class4 Class5 Class6 Class7 Organic Leases Improve LCOGP
LLAMC LCOM &
/hetcov loglin nogf
```

| | |
|---|---|
| REQUIRED MEMORY IS PAR | 1292 |
| CURRENT PAR | 11000 |

**OLS ESTIMATION**

| | |
|---|---|
| 960 OBSERVATIONS DEPENDENT VARIABLE | LOGVALUE |

*...NOTE..SAMPLE RANGE SET TO: 1, 962*

USING HETEROSKEDASTICITY-CONSISTENT COVARIANCE MATRIX

| | |
|---|---|
| R-SQUARE | 0.5633 |
| R-SQUARE ADJUSTED | 0.5241 |
| VARIANCE OF THE ESTIMATE-SIGMA**2 | 0.32559 |
| STANDARD ERROR OF THE ESTIMATE-SIGMA | 0.57060 |
| SUM OF SQUARED ERRORS-SSE | 286.52 |
| MEAN OF DEPENDENT VARIABLE | 11.658 |
| LOG OF THE LIKELIHOOD FUNCTION(IF DEPVAR LOG) | -11973.5 |

MODEL SELECTION TESTS - SEE JUDGE ET AL. (1985,P.242)

| | |
|---|---|
| AKAIKE (1969) FINAL PREDICTION ERROR - FPE | 0.35272 |
| *(FPE IS ALSO KNOWN AS AMEMIYA PREDICTION CRITERION - PC)* | |
| AKAIKE (1973) INFORMATION CRITERION - LOG AIC | -1.0425 |
| SCHWARZ (1978) CRITERION - LOG SC | -0.63689 |

MODEL SELECTION TESTS - SEE RAMANATHAN (1998,P.165)

| | |
|---|---|
| CRAVEN-WAHBA (1979) | |
| GENERALIZED CROSS VALIDATION - GCV | 0.35519 |
| HANNAN AND QUINN (1979) CRITERION | 0.41147 |
| RICE (1984) CRITERION | 0.35815 |
| SHIBATA (1981) CRITERION | 0.34820 |
| SCHWARZ (1978) CRITERION - SC | 0.52893 |
| AKAIKE (1974) INFORMATION CRITERION - AIC | 0.35258 |

**ANALYSIS OF VARIANCE - FROM MEAN**

| | SS | DF | MS | F |
|---|---|---|---|---|
| REGRESSION | 369.55 | 79. | 4.6778 | 14.367 |
| ERROR | 286.52 | 880. | 0.32559 | **P-VALUE** |
| TOTAL | 656.06 | 959. | 0.68411 | 0.000 |

| ANALYSIS OF VARIANCE - FROM ZERO | | | | |
|---|---|---|---|---|
| | SS | DF | MS | F |
| REGRESSION | 0.13084E+06 | 80. | 1635.5 | 5023.387 |
| ERROR | 286.52 | 880. | 0.32559 | P-VALUE |
| TOTAL | 0.13113E+06 | 960. | 136.59 | 0.000 |

| Variable Name | Estimated Coefficient | Standard Error | T-Ratio | p-Value ( 880 DF) | Partial Correlation | Standardised Coefficient | Elasticity at Means |
|---|---|---|---|---|---|---|---|
| ONLINE | -0.44963 | 0.7352 | -0.6116 | 0.541 | -0.021 | -0.1442 | -0.0342 |
| PSIZE | 0.55344E-02 | 0.1417E-02 | 3.905 | 0.000 | 0.131 | 0.2826 | 0.8578 |
| OP | -0.15936 | 0.4655E-01 | -3.424 | 0.001 | -0.115 | -0.0868 | -0.0450 |
| BU | -0.16489 | 0.6292E-01 | -2.621 | 0.009 | -0.088 | -0.0765 | -0.0295 |
| UR | 1.1659 | 0.1108 | 10.53 | 0.000 | 0.334 | 0.0455 | 0.0012 |
| CLASS2 | -0.13283 | 0.1237 | -1.074 | 0.283 | -0.036 | -0.0608 | -0.0230 |
| CLASS3 | -0.20723 | 0.1224 | -1.693 | 0.091 | -0.057 | -0.1149 | -0.0622 |
| CLASS4 | -0.24674 | 0.1256 | -1.964 | 0.050 | -0.066 | -0.1391 | -0.0786 |
| CLASS5 | -0.24581 | 0.1426 | -1.724 | 0.085 | -0.058 | -0.0916 | -0.0261 |
| CLASS6 | -0.32369 | 0.1476 | -2.193 | 0.029 | -0.074 | -0.0828 | -0.0152 |
| CLASS7 | 0.17150 | 0.2608 | 0.6575 | 0.511 | 0.022 | 0.0189 | 0.0014 |
| ORGANIC | -0.55442 | 0.3147 | -1.762 | 0.078 | -0.059 | -0.0483 | -0.0029 |
| LEASES | 0.32594E-01 | 0.3946E-01 | 0.8261 | 0.409 | 0.028 | 0.0252 | 0.0079 |
| IMPROVE | 0.71188 | 0.4597E-01 | 15.48 | 0.000 | 0.463 | 0.3703 | 0.1743 |
| LCOGP | 0.38579 | 0.1178 | 3.274 | 0.001 | 0.110 | 0.0850 | 0.0133 |
| LLAMC | -0.18403 | 0.9999E-01 | -1.840 | 0.066 | -0.062 | -0.0605 | -0.0148 |
| LCOM | -0.28106 | 0.1566 | -1.795 | 0.073 | -0.060 | -0.0448 | -0.0050 |
| LCOP | -0.52747 | 0.9051E-01 | -5.828 | 0.000 | -0.193 | -0.1520 | -0.0319 |
| LRDC | 0.35850 | 0.9986E-01 | 3.590 | 0.000 | 0.120 | 0.0778 | 0.0120 |
| LSMC | -0.47059 | 0.8716E-01 | -5.399 | 0.000 | -0.179 | -0.1716 | -0.0475 |
| LMDOSR | -0.21319 | 0.1047 | -2.036 | 0.042 | -0.068 | -0.0551 | -0.0102 |
| LCOSP | -0.38973 | 0.9069E-01 | -4.297 | 0.000 | -0.143 | -0.1007 | -0.0187 |
| LCOS | 0.15809 | 0.9929E-01 | 1.592 | 0.112 | 0.054 | 0.0417 | 0.0079 |
| LCOTH | -0.46155 | 0.1012 | -4.559 | 0.000 | -0.152 | -0.1298 | -0.0264 |
| LCOVR | -0.81227E-01 | 0.1116 | -0.7281 | 0.467 | -0.025 | -0.0174 | -0.0026 |
| SPEC | -1.1272 | 0.1477 | -7.631 | 0.000 | -0.249 | -0.3196 | -0.0658 |
| SPEC4 | -1.3072 | 0.3202 | -4.083 | 0.000 | -0.136 | -0.1961 | -0.0204 |
| LMDOG | -0.49766 | 0.8876E-01 | -5.607 | 0.000 | -0.186 | -0.1977 | -0.0612 |
| LNSC | -1.2158 | 0.2589 | -4.695 | 0.000 | -0.156 | -0.1493 | -0.0127 |
| LMC | -0.87578 | 0.1149 | -7.622 | 0.000 | -0.249 | -0.2790 | -0.0657 |
| LCONL | -1.1671 | 0.1150 | -10.15 | 0.000 | -0.324 | -0.2952 | -0.0535 |
| LLAKC | -0.32141 | 0.1041 | -3.087 | 0.002 | -0.104 | -0.0643 | -0.0090 |
| LFC | -0.31326 | 0.1494 | -2.097 | 0.036 | -0.071 | -0.0173 | -0.0007 |
| LKC | 0.27298 | 0.1165 | 2.343 | 0.019 | 0.079 | 0.0382 | 0.0037 |
| LLACC | 0.52336 | 0.1514 | 3.458 | 0.001 | 0.116 | 0.0703 | 0.0065 |
| Y2004S | -0.65492E-01 | 0.9347E-01 | -0.7007 | 0.484 | -0.024 | -0.0198 | -0.0044 |
| Y2005F | -0.20592 | 0.1156 | -1.781 | 0.075 | -0.060 | -0.0559 | -0.0109 |
| Y2005S | -0.28613E-01 | 0.1092 | -0.2621 | 0.793 | -0.009 | -0.0084 | -0.0018 |
| Y2006F | 0.56499E-01 | 0.8334E-01 | 0.6779 | 0.498 | 0.023 | 0.0180 | 0.0042 |
| Y2006S | 0.13444 | 0.9140E-01 | 1.471 | 0.142 | 0.050 | 0.0400 | 0.0087 |
| Y2007F | 0.18273 | 0.8236E-01 | 2.219 | 0.027 | 0.075 | 0.0614 | 0.0154 |
| Y2007S | 0.40054 | 0.9245E-01 | 4.332 | 0.000 | 0.145 | 0.1191 | 0.0259 |
| Y2008F | 0.28263 | 0.1059 | 2.669 | 0.008 | 0.090 | 0.0808 | 0.0168 |
| Y2008S | 0.18352 | 0.1066 | 1.721 | 0.086 | 0.058 | 0.0516 | 0.0105 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Y2009F | 0.26657 | 0.9087E-01 | 2.934 | 0.003 | 0.098 | 0.0667 | 0.0119 |
| Y2009S | 0.43562 | 0.9807E-01 | 4.442 | 0.000 | 0.148 | 0.1001 | 0.0163 |
| Y2010F | 0.35527 | 0.9806E-01 | 3.623 | 0.000 | 0.121 | 0.1072 | 0.0237 |
| Y2010S | 0.36403 | 0.1047 | 3.477 | 0.001 | 0.116 | 0.1066 | 0.0228 |
| Y2011F | 0.47002 | 0.9607E-01 | 4.893 | 0.000 | 0.163 | 0.1449 | 0.0328 |
| Y2011S | 0.47017 | 0.9929E-01 | 4.735 | 0.000 | 0.158 | 0.1310 | 0.0264 |
| P2 | -0.53066E-05 | 0.3019E-05 | -1.758 | 0.079 | -0.059 | -0.1187 | -0.1369 |
| PO | 0.54504E-02 | 0.4175E-02 | 1.305 | 0.192 | 0.044 | 0.2635 | 0.0618 |
| OLCOGP | -0.49662 | 0.5095 | -0.9747 | 0.330 | -0.033 | -0.0194 | -0.0005 |
| OLLAMC | -0.27266 | 0.5003 | -0.5450 | 0.586 | -0.018 | -0.0237 | -0.0014 |
| OLCOM | -1.0129 | 0.6180 | -1.639 | 0.102 | -0.055 | -0.0395 | -0.0011 |
| OLCOP | 1.4104 | 0.8491 | 1.661 | 0.097 | 0.056 | 0.0952 | 0.0044 |
| OLRDC | 0.38307E-01 | 0.5234 | 0.7319E-01 | 0.942 | 0.002 | 0.0015 | 0.0000 |
| OLSMC | -0.62775E-01 | 0.4691 | -0.1338 | 0.894 | -0.005 | -0.0073 | -0.0006 |
| OLMDOSR | -0.24023 | 0.5015 | -0.4790 | 0.632 | -0.016 | -0.0162 | -0.0008 |
| OLCOSP | 0.61158E-01 | 0.5053 | 0.1210 | 0.904 | 0.004 | 0.0048 | 0.0003 |
| OLCOS | 0.67637 | 0.5608 | 1.206 | 0.228 | 0.041 | 0.0264 | 0.0007 |
| OLCOTH | 0.18280E-01 | 0.5060 | 0.3613E-01 | 0.971 | 0.001 | 0.0014 | 0.0001 |
| OLCOVR | -0.12817 | 0.4885 | -0.2624 | 0.793 | -0.009 | -0.0087 | -0.0004 |
| OSPEC | 0.71363E-01 | 0.5162 | 0.1382 | 0.890 | 0.005 | 0.0088 | 0.0007 |
| OSPEC4 | 0.42922 | 0.5214 | 0.8232 | 0.411 | 0.028 | 0.0237 | 0.0009 |
| OLMDOG | -0.47364 | 0.6812 | -0.6953 | 0.487 | -0.023 | -0.0521 | -0.0039 |
| OLNSC | 0.53089 | 0.5438 | 0.9763 | 0.329 | 0.033 | 0.0462 | 0.0028 |
| OLMC | -0.57781 | 0.5857 | -0.9866 | 0.324 | -0.033 | -0.0319 | -0.0012 |
| OLCONL | 0.21856 | 0.6094 | 0.3587 | 0.720 | 0.012 | 0.0225 | 0.0016 |
| OLLAKC | -0.32979 | 0.4616 | -0.7144 | 0.475 | -0.024 | -0.0129 | -0.0003 |
| OC2 | 0.37681 | 0.3144 | 1.199 | 0.231 | 0.040 | 0.0463 | 0.0039 |
| OC3 | -0.36515 | 0.2470 | -1.478 | 0.140 | -0.050 | -0.0511 | -0.0049 |
| OC4 | -0.36223 | 0.2893 | -1.252 | 0.211 | -0.042 | -0.0724 | -0.0102 |
| OC5 | -0.42966 | 0.3748 | -1.146 | 0.252 | -0.039 | -0.0528 | -0.0045 |
| OC6 | 0.24968 | 0.2456 | 1.017 | 0.310 | 0.034 | 0.0257 | 0.0018 |
| OC7 | -0.79665 | 0.3655 | -2.179 | 0.030 | -0.073 | -0.0439 | -0.0017 |
| OO | -0.58310 | 0.4035 | -1.445 | 0.149 | -0.049 | -0.0228 | -0.0006 |
| OL | -0.79611E-01 | 0.1838 | -0.4331 | 0.665 | -0.015 | -0.0158 | -0.0013 |
| OI | -0.58475E-01 | 0.1794 | -0.3260 | 0.745 | -0.011 | -0.0072 | -0.0006 |
| CONSTANT | 11.228 | 0.1920 | 58.49 | 0.000 | 0.892 | 0.0000 | 11.2283 |

**test**

**test OLCOGP=0**

**test OLLAMC=0**

**test OLCOM=0**

**test OLCOP=0**

**test OLRDC=0**

**test OLSMC=0**

**test OLMDOSR=0**

**test OLCOSP=0**

**test OLCOS=0**

```
test OLCOTH=0

test OLCOVR=0

test OSPEC=0

test OSPEC4=0

test OLMDOG=0

test OLNSC=0

test OLMC=0

test OLCONL=0

test OLLAKC=0

end
```

| | |
|---|---|
| F STATISTIC | 3.5499043 |
| WITH 18 AND 880 D.F. P-VALUE | 0.00000 |
| WALD CHI-SQUARE STATISTIC | 63.898277 |
| WITH 18 D.F. P-VALUE | 0.00000 |
| UPPER BOUND ON P-VALUE BY CHEBYCHEV INEQUALITY | 0.28170 |

```
test

test oc2=0

test oc3=0

test oc4=0

test oc5=0

test oc6=0

test oc7=0

test oo=0

test oL=0

test oI=0

end
```

| | |
|---|---|
| F STATISTIC | 2.6314907 |
| WITH 9 AND 880 D.F. P-VALUE | 0.00524 |
| WALD CHI-SQUARE STATISTIC | 23.683416 |
| WITH 9 D.F. P-VALUE | 0.00483 |
| UPPER BOUND ON P-VALUE BY CHEBYCHEV INEQUALITY | 0.38001 |

```
stop
```