Property Value Impacts from Transmission Lines, Subtransmission Lines, and Substations

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Property Value Impacts from Transmission Lines, Subtransmission Lines, and Substations

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Abstract

Prior research on the value impact of proximity to transmission lines has relied on relatively limited sample sizes, property characteristics, and types of lines. This study extends the previous research by analyzing almost all single-family home sales over a fourteen-year period for Salt Lake County, Utah, using over 125,000 transactions and approximately 450 home characteristics to examine the effects of various types of transmission lines and of substations. This large sample analysis permits estimation of the countywide aggregate effects of these factors on property values. The results find some negative effects that differ by type of transmission line, and as in previous research, the effects diminish with distance. As with some previous research, the results also show some evidence of modest positive effects associated with proximity to large transmission lines, which may be related to greenways constructed beneath such lines. Ongoing research to improve the reliability of the study results will include consideration of property rights associated with the transmission corridors and impact on home values of fronting road types.

Introduction

Numerous previous quantitative studies have addressed the impact of power lines on property values. These studies have been carefully reviewed and summarized by a number of authors, including Colwell, 1990; Kroll and Priestley, 1992; Delaney and Timmons, 1992; Chalmers and Vooraart, 2009; Jackson and Pitts, 2010; and Haggerty, 2012.[1] Such studies have yielded a mix of conclusions, ranging from no impact on property value to a negative impact of usually less than 10%. In virtually every study, any impact on property value diminishes rapidly as the distance from the property to the power line increases. Unfortunately, these studies have a number of deficiencies, which may be attributable to the limited data sets on which these studies are based. In contrast, the current study includes a comprehensive data set compiled for the largest counties in Utah, although the discussion in this article focuses specifically on Salt Lake County, the most populous county in the state.

Using more comprehensive data, it is possible to address several important issues that have not been adequately analyzed in previous research

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[1] Peter F. Colwell, "Power Lines and Land Value," *Journal of Real Estate Research* 5, no. 1 (1990): 117–127; Cynthia Kroll and Thomas Priestley, *The Effects of Overhead Transmission Lines on Property Values: A Review and Analysis of the Literature* (Washington, DC: Edison Electric Institute Siting and Environmental Planning Task Force, 1992); Charles J. Delaney and Douglas Timmons, "High Voltage Power Lines: Do They Affect Residential Property Value?" *Journal of Real Estate Research* 7, no. 3 (June 1992): 315–329; James A. Chalmers and Frank A. Voorvaart, "High-Voltage Transmission Lines: Proximity, Visibility, and Encumbrance Effects," *The Appraisal Journal* (Summer 2009): 227–245; Thomas O. Jackson, and Jennifer Pitts, "The Effects of Electric Transmission Lines on Property Values: A Literature Review," *Journal of Real Estate Literature* 18, no. 2 (2010): 239–259; and Julia Haggerty, "Transmission Lines and Property Value Impacts: A Summary of Published Research on Property Value Impacts from High Voltage Transmission Lines" (report prepared by Headwaters Economics for the Mountain States Transmission Intertie Review Project, May 2012).

studies. First, while previous research has focused on a specific neighborhood or even a single subdivision, the current study's data set covers almost all single-family home sales in Salt Lake County from 2001 through 2014.[2]

Second, the transmission line data contains location information for all types of high-voltage and medium-voltage transmission lines (500 kV, 345 kV, 230 kV, 138 kV, 100 kV, and 46 kV) as well as substation locations.[3] Consequently, it is possible to examine the effects of one type of line, e.g., 345 kV, while controlling for the effects of other types of lines. Previous research has either considered a single type of line[4] or combined the effects of various types of power lines.[5] Such simplifications, which are likely the by-product of limited data, can lead to erroneous estimates. For example, consider the impact of proximity to a 345 kV transmission line within 200 meters and beyond 200 meters. The presence of other types of transmission lines close to the properties studied, but omitted from the data, may significantly impact the indicated effects of the 345 kV lines.

Third, the data includes almost all single-family home sales for all of Salt Lake County over a fourteen-year period, representing well over 100,000 sales. The depth and breadth of the data in the database allows investigation of the impacts of a wider range of property characteristics than has been considered in previous studies. The scope of the data also permits future investigation into the property-value impacts of other externalities, such as pipelines, road expansions, open-space areas, and research centers.

Fourth, while previous studies often proxy the influence of macroeconomic factors by simply introducing time variables, this study directly tests the impact on price of macroeconomic factors in order to isolate the influence of power lines on property values. Correctly accounting for such factors is essential in this case as the data begins before the housing crash in 2007, includes the entire recession, and stretches well into the recovery period. Time dummy variables are included to capture any effects not included in the macroeconomic variables; this is discussed in more detail later.

Finally, the data and methodology introduced here can be used to analyze the effects of many other changes to neighborhood infrastructure on property values, including mass transit, sources of solid waste and pollution, pipelines, roads, and, of particular interest to the Salt Lake region, proximity to earthquake and liquefaction risk areas.

Background on Transmission Lines and Substations

The current study is unique in that it simultaneously, but separately, analyzes the impact of different types of transmission lines on property values. It is important, therefore, to understand the different types of transmission lines that potentially impact property values. The starting point for electricity generation lies at the power plant. Generators at power plants generate electricity at voltages that usually fall below 22 kV. Power must then be transmitted, often across long distances, to the areas where it will be consumed. To reduce energy loss, power is transmitted at very high voltages. In the United States, transmission lines voltages range up to 765 kV, with lines above 220 kV commonly referred to as extra-high-voltage transmission lines. The highest-voltage line in Utah is 500 kV, though such lines are not located in Salt Lake County and are not considered in this analysis. The highest-voltage lines in Salt Lake County are 345 kV, which are discussed in this analysis.

Power plants use generating transformers to "step up" the voltage to transmission level. Very-high-voltage lines, such as 500 kV and 345 kV, then carry bulk power from the generating station to transmission substations near population centers. Power must then be transmitted across the entire area, which often includes hundreds

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[2] While the database covers other counties in Utah, this study focuses on Salt Lake County because (1) we are well familiar with the area, (2) it is the most populated county in Utah, and (3) there is a rich transmission line data set.

[3] Data were obtained from the Utah Geographical Survey. Substation locations were identified as either company-owned (PacifiCorp/Rocky Mountain Power) or privately owned.

[4] Chalmers and Voorvaart, "High-Voltage Transmission Lines."

[5] Stanley W. Hamilton and Gregory M. Swann, "Do High Voltage Transmission Lines Affect Property Value?" *Land Economics* 71, no. 4 (November 1995): 436–444.

of thousands of homes. Large towers, such as the ones that support 500 kV and 345 kV lines, are not ubiquitous in population centers. Homes require voltages at much lower levels: 120 volts in the United States. Therefore, interconnected transformers at transmission substations "step down" the power to subtransmission voltages of generally between 46 kV and 138 kV. These subtransmission lines, which are commonly located along highways or arterial roads, then carry bulk power from major substations to regional and local distribution substations. Transmission line poles, such as those that carry 138 kV lines, can have under-built power distribution lines as well as cable TV and communications lines. Exhibit 1 illustrates such a configuration in Salt Lake County, Utah.

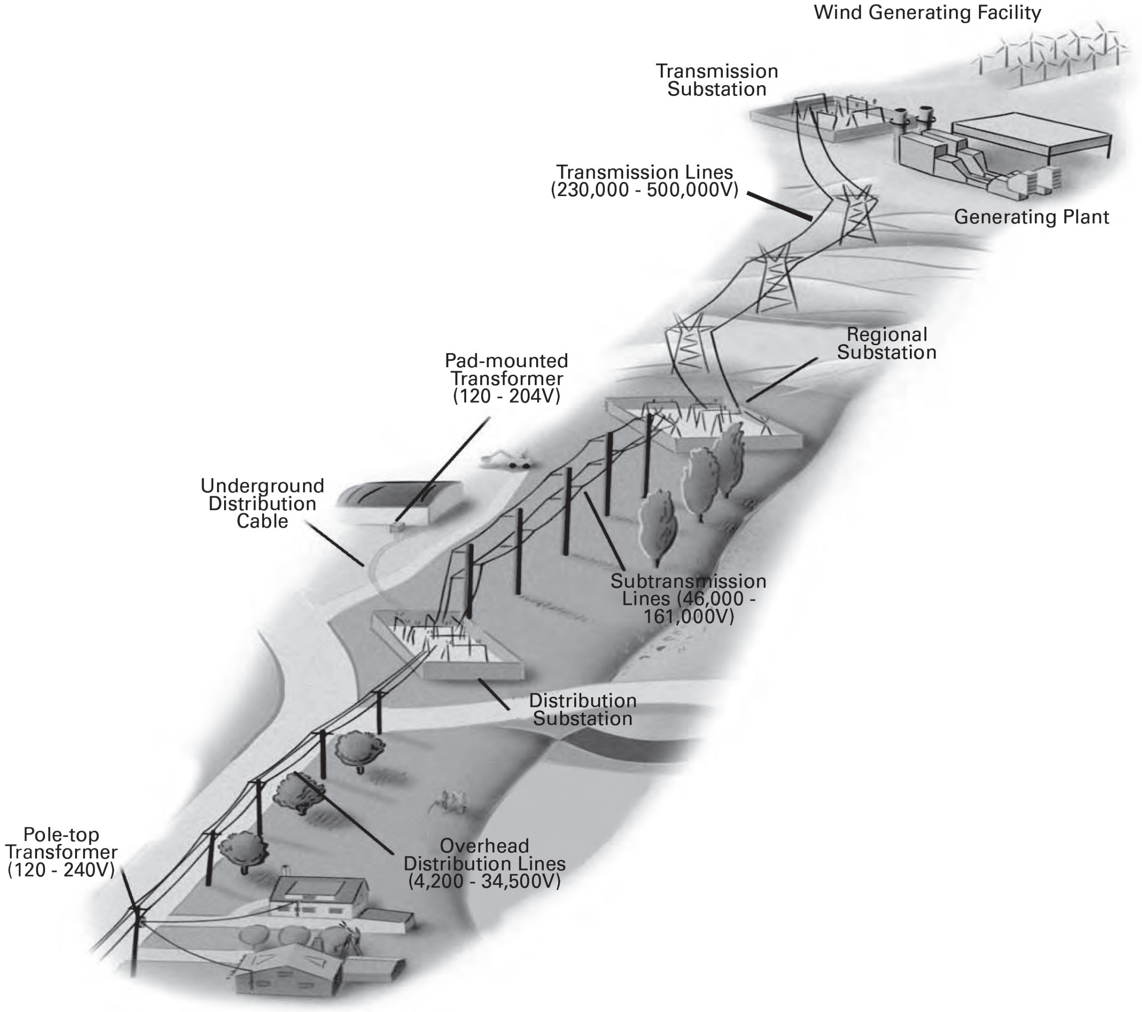
The distribution substations, which are located close to consumers, then step down the voltage again to between 2 kV and 35 kV, which is considered medium voltage. Primary distribution lines then carry the power to distribution transformers near a customer location. The distribution transformers, usually located on a wooden power pole, step down the voltage again to utilization voltage. Secondary distribution lines typically service multiple customers, who connect using service drops, i.e., the line running from the home to the power pole. Exhibit 2 depict the electric power supply chain. This combination of power plants, substations, transmission lines, and distribution lines is known as the *power grid*.

The study analysis only considers transmission lines, subtransmission lines, and substations in the power grid. Also, although the database contains other types of transmission lines, only the line types that exist in Salt Lake County are discussed. The types of transmission lines are distinguished not just by voltage, but also by the appearance. Higher-voltage transmission lines are often located

Exhibit 1 Double Circuit 138 kV Transmission Line with 12.5 kV Distribution Under-Build

Source: Mickey Beaver, "Siting Transmission Lines and Substations," Salt Lake County Electrical Plan Task Force (Rocky Mountain Power, December 3, 2009).

Exhibit 2 The Power Supply Chain



Source: *Powering Our Future: Salt Lake County Electrical Plan Local Planning Handbook* (Rocky Mountain Power, September 2010).

on large steel poles, rather than single or double wooden poles. Furthermore, as voltages increase, the required clearances around the lines also increase. For example, 345 kV lines are often 90 meters to 120 meters above ground for an H-frame type and 130 meters to 200 meters above ground for a single-pole structure, compared to 60 meters to 90 meters and 70 meters to 115 meters, respectively, for comparably framed 138 kV lines. Also, single-pole structures require less right-of-way than lattice or multiple-pole structures. For example, a 138 kV H-frame structure has an average span of 600 meters span and can require up to a 100-foot right-of-way. In contrast, a single-pole structure has an average span of 300 meters and usually does not require more than a 60-foot right of way.

These details about the characteristics and coexistence of various transmission lines are often overlooked in the research. The effect of one type of transmission line on property values can be affected by proximity to other types of transmission or subtransmission lines or substations. The following images present examples of this potential for overlapping effects. Exhibits 3 and 4 show areas in Salt Lake County that contain both 345 kV and 138 kV lines in close proximity to each other. As these images highlight, when analyzing one type of transmission line the potential effects of other lines or substations should be taken into account. Doing so is especially important when transmission expansion is under consideration. If additional lines are proposed in proximity to existing lines, ignoring the presence of those existing lines could result in overstating the impact on property values of the proposed lines. Neglecting the presence of each type of transmission line can affect the calculated impact on property values of one or the other type of line.

Study Database

The study database has been compiled from a number of sources. Transmission-line location data for the entire state of Utah was obtained from the Utah Geographical Survey in the form of a shapefile identifying transmission line locations at regular intervals for all individual transmission lines in Utah.[6] The data, which contained approximately 165,000 coordinate points, also identified the types of transmission lines and the location of individual substations in Utah (Exhibit 5).

For Salt Lake County, arm's-length transaction sales and home characteristic data were obtained from the multiple listing service (MLS) and the county assessor's computer-assisted mass appraisal (CAMA) databases. These data provided a feature-rich array of variables identifying home and neighborhood characteristics. In addition to the variables provided, information was parsed from the "Remarks," "Amenities," "Interior Features," and "Exterior Features" fields in the MLS data; many home characteristics that could impact value are included as comments in these fields. For example, various amenities, such as skylights, Trex decking, solar paneling, tankless water heaters, gourmet kitchens, types of cabinetry, have no fields associated with them so realtors and homeowners often list such information in the Remarks field. The parsing effort proved useful since the analysis could control for a greater number of home characteristics than in previous research.

Geocoding data was also included in the form of latitude and longitude location of each home. These data were necessary in order to compute distances from each home to each point on each transmission line. The distance was calculated between each data point and the location of each of the approximately 350,000 properties in Salt Lake County, for a total of over 60 billion computations. Next, the minimum distance from each property to each transmission line was calculated. Thus, the database includes data on

Exhibit 3 Transmission Lines near King's Point Park, West Valley City, Utah

Source: © 2015, Google Earth.

Exhibit 4 Transmission Lines and Substation, Bluffdale, Utah

Source: © 2015, Google Earth.

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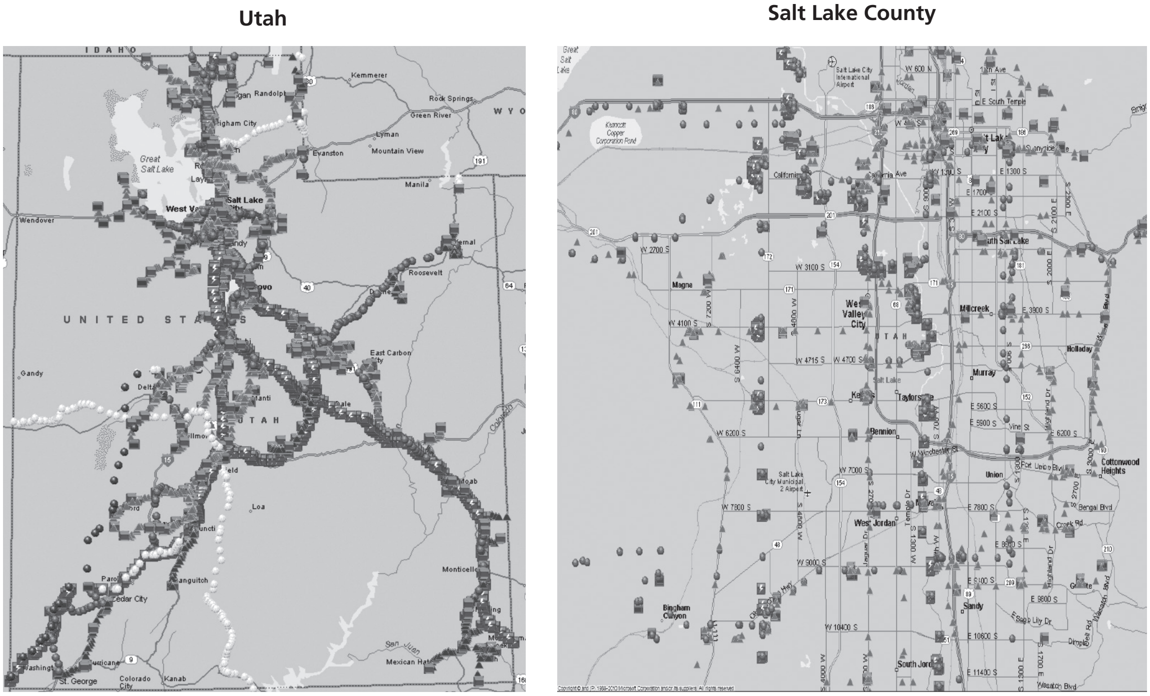
[6] These data were coded in North American Datum 83, the datum used to identify the geodetic network in North America. We translated these points into latitude and longitude coordinates.

Exhibit 5 Location Overview: Utah and Salt Lake County High-Voltage Transmission Lines and Substations


Utah

Salt Lake County

the distance to every 345 kV, 230 kV, 138 kV, and 46 kV line and substation for every parcel. (In Salt Lake County there were no 500 kV, 230 kV, 100 kV, or 69 kV lines.)

Each parcel in the assessor database was matched to each single-family home property sale during the period, as reported by the MLS. This matching resulted in a database that contains all sales information, including detailed characteristics as well as distances from each property to each type of transmission line and substation. Monthly economic variables (unemployment rate, housing starts, etc.) for Salt Lake County were based on data obtained from the Census Bureau.

Statistical Methodology

A hedonic regression model was used to estimate the property value impacts of proximity to various types of transmission lines. Hedonic analysis enjoys ubiquitous use and acceptance as a statistical method, and it is recognized as a reliable technique of analyzing real estate transaction data. Hedonic analysis involves the valuation of a commodity as a function of its constituent parts, estimating the implicit price impact of each of those characteristics.[7] Researchers often include additional variables to explain property values, such as economic factors, whether directly or by including time as a proxy. As is common for hedonic regression models, the sale price is estimated as a function of home characteristics and location variables. In addition, quarterly time dummies are included, using first quarter 2001 as the benchmark. Of course, time itself has little, if any, theoretical basis. Rather, it is used as a proxy for changing economic conditions or changing consumer preferences. For example, home sales in Utah generally dip during the winter season because of the difficult winters. Homes in certain neighborhoods, e.g.,

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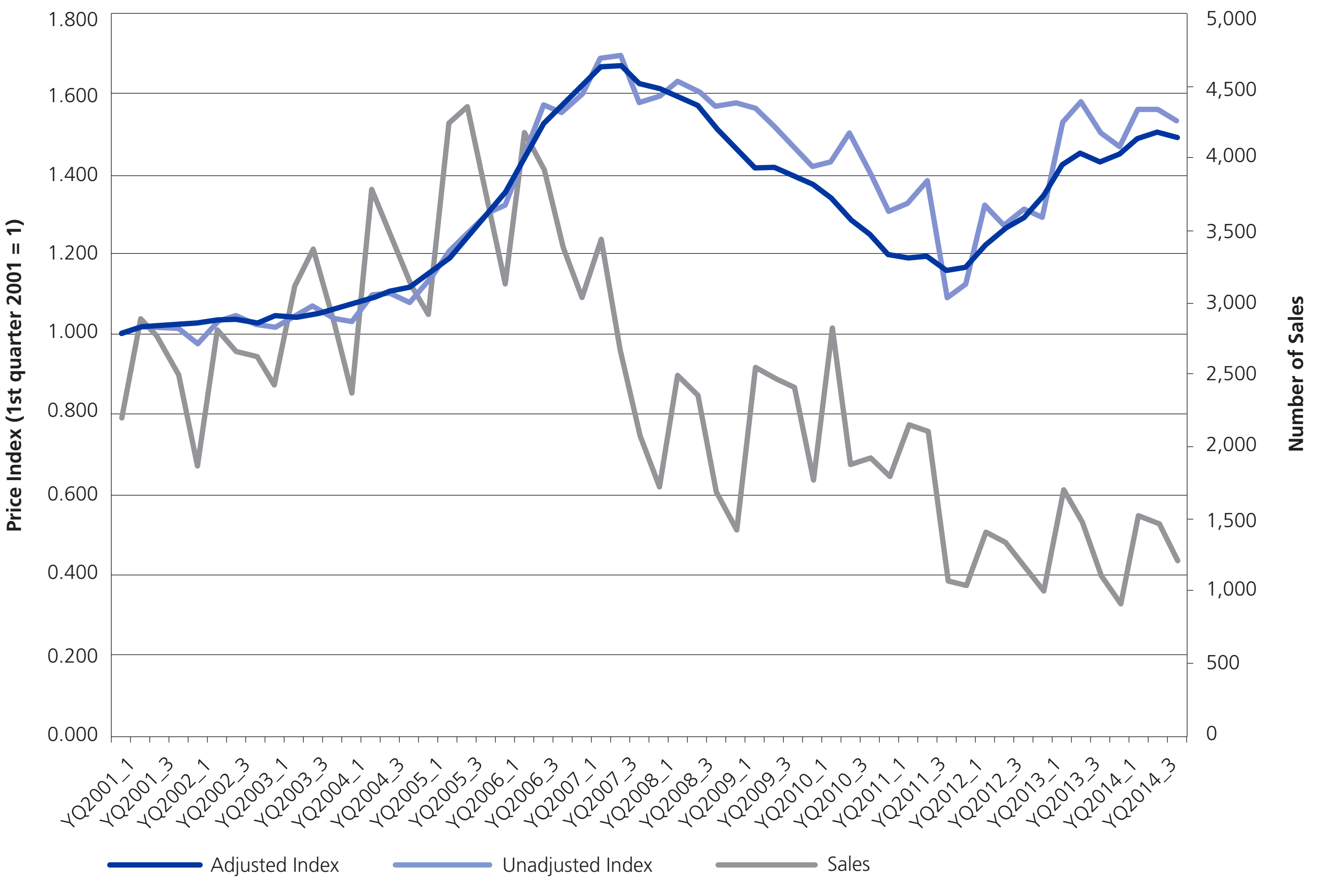
[7] Hedonic analysis is often performed using regression analysis, leading to the term *hedonic regression*. This term simply refers to the use of regression analysis to estimate a model where the value of a good is a function of its individual characteristics. For example, the general hedonic equation expresses the property's price as a function of its features: *Price* = Constant + β_1 *Bedrooms* + β_2 *Bathrooms* + β_3 *Lot Size*…etc.

Olympus Cove, are often covered in snow, making marketing considerably more difficult. Although time dummies are a rough measure that offer limited insight into the actual impacts of changing market factors on property values, they are helpful in creating quality-adjusted price indices. Price indices are often of great interest to realtors, investors, home buyers and sellers, and researchers since these can be used to measure overall price changes controlling for the qualitative differences in property transactions. For example, the current analysis shows a significant difference between the quality-adjusted and unadjusted indices in Salt Lake County beginning with the Great Recession. While the two indices generally followed each other before the recession, the quality-adjusted index shows a significantly greater drop than the unadjusted index during the post-recession period (Exhibit 6).

Such a result is not surprising. During the recession and the recovery the real estate market favored buyers, and higher-quality homes could be obtained at considerably lower prices. Thus, more high-quality homes were sold and more lesser-quality homes remained unsold. Such an effect would mask the actual drop in home prices, since, if the same quality of homes had been sold both pre- and post-recession, the drop would have been much greater.

In the study, the sale price is also adjusted by netting out seller-paid concessions. Also, many of the sales have inclusions that could affect the price of the home, such as appliances, hot tubs, playgrounds, sheds, etc. To control for these inclusions, they are added as dummy

Exhibit 6 Differences between Quality-Adjusted and Unadjusted Home Price Indices, 2001–2014 by Quarter



Source: Salt Lake County MLS data.

variables in the regression model. Also, short sales and home auctions increased during the study period due to the recession, and it was necessary to control for short sales, auctions, and sales of bank-owned homes. In total, the model for Salt Lake County for the 2001–2014 period includes 127,584 observations and 450 explanatory variables.

One of the key issues in hedonic analysis, and one that often receives less attention than warranted, is the handling of count variables, such as bedrooms, bathrooms, etc. These variables often enter hedonic models in natural log form (e.g., ln_*bedrooms*, ln_*bathrooms*, ln_*acreage*). A different approach is used in this study, by creating individual binary (dummy) variables for the values taken by bedrooms, bathrooms (whole bathrooms, half bathrooms, and three-quarter bathrooms are treated separately). This approach is preferred, because it avoids functional form assumptions with respect to these variables. Also, the dummy variable approach mitigates, at least in part, the obvious multicollinearity problem that arises from including both bedrooms and bathrooms in continuous form. For quasi-continuous variables, such as acreage and square footage, the natural log form is used.

For the key variables of interest—proximities to various types of transmission lines—dummy variables are created indicating whether homes are located within a certain radial distance from each type of transmission line. Then, the homes are grouped into distance categories, such as distances 50 meters or less, 50^{+}–100 meters, 100^{+}–150 meters, etc. For example, a property located 33 meters away from a 354 kV line and 77 meters away from a 138 kV line would be flagged with a 1 for the 100 meters or less category for the 345 kV line distance and a 1 for the 50^{+}–100m category for the 138 kV line distance. It would receive a 0 in all other categories. Exhibit 7 shows the definitions of the distance variables.

The final regression specification expresses the natural logarithm of sale price as a function of home characteristics, date identifiers, location factors, economic conditions, and transmission line proximities. As previously explained, proximities are expressed as dummy variables that indicate location in set distance bands around the transmission lines or substations. The regression equation is as follows:

$$\ln(Price) = \alpha + \sum_{i=1}^{n} \beta_i (HC) + \sum_{j=1}^{z} \beta_j (LOC) + \sum_{k=1}^{y} \beta_k (TL) + \sum_{h=1}^{v} \beta_i (EC) + \sum_{i=1}^{t} \beta_i (YQ)$$

where:

HC = home characteristics, appearing in dummy variable form

LOC = location dummies, identifying specific zip codes

TL = distance dummies, indicating proximity radii (e.g., property is within 100 meters) of a certain transmission line type or a substation

EC = economic factors, including unemployment rate and housing starts

YQ = dummy variables, indicating year and quarter. These were included to capture any additional effects that were not captured by the monthly economic factors.

Also addressed are two points that have been the subject of interest in this field: easements and the presence of power poles on the location. Easement information was obtained from Salt Lake County. This was included as a dummy variable in the model and, as expected, yielded a negative effect from the presence of an easement. The easement variable results are not used to draw any conclusions, however, because there is a low frequency of easements, and to date, it has not been confirmed that the easements only include transmission line access. As part of continued research, property-by-property investigation is being undertaken to identify, among other things, properties where such power-line easements occur.

Also part of the continuing research is an effort to identify the parcels on which power poles are located (although it is likely that poles located on residential parcels are distribution line poles, not transmission line poles). It is expected that there will be value impacts from poles located on residential parcels, and that such effects may extend to adjoining properties when the poles are located near lot lines. Determining these impacts will require a significant amount of research; such research would be aided significantly if utilities, which hold precise location data, became involved in the study.

The next step in the analysis is to address various data and statistical issues that often confront researchers using hedonic analysis. These issues can be separated into four categories: spatial relationships, functional form, hetero-

Exhibit 7 Definitions of Distance Variables

Variable	Type of Line	Proximity
TL_345_100	345 kV	≤ 100 meters
TL_345_100_200	345 kV	100^{+}–200 meters
TL_345_200_300	345 kV	200^{+}–300 meters
TL_345_300_400	345 kV	300^{+}–400 meters
TL_138_50	138 kV	≤ 50 meters
TL_138_50_100	138 kV	50^{+}–100 meters
TL_138_100_200	138 kV	100^{+}–200 meters
TL_138_200_300	138 kV	200^{+}–300 meters
TL_138_300_400	138 kV	300^{+}–400 meters
TL_46_50	46 kV	≤ 50 meters
TL_46_50_100	46 kV	50^{+}–100 meters
TL_46_100_200	46 kV	100^{+}–200 meters
TL_46_200_300	46 kV	200^{+}–300 meters
TL_46_300_400	46 kV	300^{+}–400 meters
TL_SUBCO_50	Substation	≤ 50 meters
TL_SUBCO_50_100	Substation	50^{+}–100 meters

skedasticity, and collinearity. Functional form, heteroskedasticity, and collinearity have received considerable attention in previous literature. Spatial relationships, however, have begun to receive greater scrutiny only recently as geographic information systems (GIS) have gained popularity. Issues such as functional form distinctions and heteroskedasticity can be solved by addressing spatial relationships, commonly called *spatial autocorrelation*. Rather than adopting computational solutions, the current study attempts to address spatial effects and other potential issues by including a large number of explanatory variables that capture the potential effects. Such variables may not be available for every study, as their collection is a time-consuming and perhaps impossible task given data limitations in specific studies. The large data set in the current study, however, does make it possible to address issues such as heteroskedasticity and spatial autocorrelation directly through analytical methods.[8]

Results Summary

The results over the entire 2001–2014 sample period indicate both practically and statistically significant effects from 138 kV and 69 kV lines but no negative effects from 345 kV lines. In fact, a slight positive effect was noted for properties within 50 meters of 345 kV lines. This is discussed in more detail below. In addition, a negative effect is noted for close proximity (within 50 meters) to substations. A summary of the results regarding transmission lines and substations appears in Exhibit 8; the full results are shown in the appendix at the end of this article.

As Exhibit 8 shows, 138 kV lines appear to generate the most significant effects, both practically and statistically. Homes within 50 meters of these lines see a 5.1% decrease in value, while the effect diminishes with distance. At 50^{+}–100 meters, homes see a 2.9% decrease, while after 400 meters the effect drops below 1%. Somewhat of interest, homes within 50 meters of 46 kV lines see no effect, but homes 50^{+}–100 meters see a 2.5% decrease. Beyond 200 meters, the effect for 46 kV lines drops to zero. Blockage of view may be one reason for this finding; the lines may actually be more noticeable by homes at a medium distance rather than directly adjacent. Since mountain views are an important positive factor in determining home values in Salt Lake County, this negative effect is not surprising. Finally, the results show that proximate location to substations (≤ 50 meters) is associated with a 2.9% decrease in value.

The results with regard to 345 kV lines are interesting, since one would expect that these larger transmission lines would have a commensurate negative effect on property values, but this is not the case for the entire sample. The location of these lines was closely investigated by conducting site visits and examining aerial photography, and this showed that homes abutting 345 kV corridors often benefit from open space unavailable to other homes. For example, the corridor might include a greenway and path amenity, as shown Exhibit 9. Further, since no other homes can be built on the corridor, homes adjacent to the corridor may benefit from viewshed and less crowding.

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[8] In-depth information on issues related to statistical significance and functional form can be obtained by contacting the authors.

Exhibit 8 Summary of Results

Variable	Type of Line	Proximity	Effect Size*	$Pr > \|t\|$[†]	VIF[‡]
Intercept			8.95476	<.0001	0
TL_345_100	345 kV	≤ 100 meters	0.94%	0.286	1.05525
TL_345_100_200	345 kV	100⁺–200 meters	0.85%	0.217	1.0778
TL_345_200_300	345 kV	200⁺–300 meters	0.88%	0.104	1.09186
TL_345_300_400	345 kV	300⁺–400 meters	0.65%	0.174	1.0888
TL_138_50	138 kV	≤ 50 meters	-5.10%	<.0001	1.02982
TL_138_50_100	138 kV	50⁺–100 meters	-2.91%	<.0001	1.04463
TL_138_100_200	138 kV	100⁺–200 meters	-2.09%	<.0001	1.12057
TL_138_200_300	138 kV	200⁺–300 meters	-1.85%	<.0001	1.11169
TL_138_300_400	138 kV	300⁺–400 meters	-1.11%	<.0001	1.10736
TL_46_50	46 kV	≤ 50 meters	-0.49%	0.399	1.14255
TL_46_50_100	46 kV	50⁺–100 meters	-2.53%	<.0001	1.10109
TL_46_100_200	46 kV	100⁺–200 meters	-0.94%	<.0001	1.16574
TL_46_200_300	46 kV	200⁺–300 meters	0.19%	0.303	1.10713
TL_46_300_400	46 kV	300⁺–400 meters	0.27%	0.103	1.08094
TL_SUBCO_50	Substation	≤ 50 meters	-2.92%	0.052	2.39144
TL_SUBCO_50_100	Substation	50⁺–100 meters	-0.38%	0.845	2.24569

* *Effect size* is the coefficient indicating the effect of each variable (i.e., the parameter estimate).

[†] $Pr > |t|$ is the p-value indicating the probability of observing an effect as large or larger if the assumption of no effect were true (i.e., if the null hypothesis were true). In other words, if we assume that this variable has no effect on price, what is the probability that there would be an effect size as large or larger than what is observed in the regression. Typically, a p-value less than 0.05 is considered statistically significant, though the study focus is more on the practical effect size rather than the statistical significance, especially given the sample size.

[‡] *VIF* is the variance inflation factor. The VIFs indicate how the presence of multicollinearity inflates the variance of an estimator by examining how one explanatory variable can be explained by the remaining explanatory variables in the model. If no collinearity exists, the VIF of a coefficient will be 1. Generally VIF values above 5 or 10 are considered indicators of a multicollinearity problem. See A. H. Studenmund, *Using Econometrics—A Practical Guide* 4th ed., at 258 ("While there is no table of formal critical VIF values, a common rule of thumb is that if $\mathrm{VIF}(\beta_i) > 5$, the multicollinearity is severe."). See also Damodar Gujarati, *Basic Econometrics* 3rd ed., at 339 ("As a rule of thumb, if the VIF of a variable exceeds 10 (this will happen if the R^2 exceeds 0.90), that variable is said to be highly collinear.").

Time Model Results

The study results cover the entire period from 2001 through 2014. In addition to quantifying any distance effects, the data is analyzed to determine whether the effects change over time. Salt Lake County experienced considerable development during the study period, particularly in the southern and western portions. As such, an interesting question is whether consumer preferences changed over the study period given additional development, economic changes due to the Great Recession, and, as a potential result, the divergence between adjusted and unadjusted price indices in Salt Lake County. Given the behavior of the indices, it was postulated that during buyers' markets the effects of transmission lines may be amplified. The attractiveness of neighborhoods in high demand may mute some of the effects of the transmission lines, particularly if those precise neighborhood characteristics cannot be fully controlled in the hedonic model.

To investigate the interaction of market changes over time and transmission line effects, the sample population was divided into the following temporal subsets of sales: 2001–2004, 2005–2008, 2009–2011, 2012–2014. Then, the model was run separately on these subsets to observe any changes in the effects of transmission lines. Exhibit 10 shows the number of observations, the resulting fit of each time subset model, and the effect sizes with corresponding *p*-values.

The time model results offer several findings of note. First, with respect to 138 kV lines, the effect on homes within 50 meters is the strongest in the most recent sample subset (2012–2014), with a negative effect of approximately -7%. Moreover, the findings show the opposite of what was originally expected. The effects were higher during the prerecession seller's market (2005–2008), coming in at -6.8%, and lower during the recession and immediately post-recession period (2009–2011), coming in at -5.3%. Second, the time model indicates most-pronounced negative effects from 345 kV lines occurred in the more recent samples (2012–2014), coming in at -4.6%, although these effects diminish at distances beyond 100 meters.

The time model results also offer some cautionary notes. The most recent period shows by far the lowest number of sales. The 2012–2014 period has fewer than half the number of sales per year compared with the first two periods, and only 63% of the sales of the immediately preceding 2008–2011 period, which included the recession. These findings indicate that examining small samples of more recent data may yield substantially different estimates than large samples that cover a longer period.

Further, while some studies have found that effects on value from proximity to transmission lines may dissipate over time, this study does not confirm such an effect. The findings presented here indicate that other potential factors could explain temporal effects, such as the state of the economy as a whole, regional employment, and supply and demand effects. If such factors are correlated with the passage of time, researchers may erroneously attribute diminishing proximity effects to the passage of time alone, while, in reality, other factors drive the effect. Consequently, care should be taken when including time variables. While time variables, either as dummy variables or time trends, can add significant explanatory power to a regression (usually in the form of increased R^2), these time factors serve as proxies for the underlying economic mechanism(s) driving the effect. The researcher must always keep in mind the purpose of the study when estimating the regression. A high R^2, with a high percentage of the variation in the dependent variable (e.g., prices) being explained by the model may be a visually pleasing statistic, but such comfort is misleading if the true purpose of the regression is to predict or investigate the effects of a particular variable or set of variables, such as proximity to transmission lines. Therefore, future research should continue to examine temporal effects on proximity to transmission lines.

Exhibit 9 Transmission Line Greenway

Source: *Powering Our Future: Salt Lake County Electrical Plan Local Planning Handbook* (Rocky Mountain Power, September 2010).

Conclusion

It should be noted that the foregoing results do not account for property rights considerations for abutting transmission corridors. While 345 kV corridors often exist in fee, 138 kV and 46 kV corridors typically involve only easements. Further, the data have not yet been qualified as to location of the lines relative to the properties (front yard, rear yard, etc). These refinements should allow more precise isolation of specific elements that may impact values of homes proximate to transmission lines.

Application of similar studies in other market areas is essential to improve the extrapolative reliability of any proximity study results. Over the past several years, we have assembled sales data nationwide and anticipate identifying other mar-

Exhibit 10 Time Model Results

Model	Observations Used	Adj. *R*-Squared
2001–2004	42,001	89.8%
2005–2008	47,084	92.8%
2009–2011	23,638	90.6%
2012–2014	14,863	92.0%

Variable	Model 2001–2004	Model 2005–2008	Model 2009–2011	Model 2012–2014
EFFECT_ESMT	-0.0597 (0.0001)	0.5536 (0.0000)	-0.4084 (0.0110)	-0.1820 (0.0017)
STREET_1W	0.0153 (0.5916)	-0.0578 (0.0164)	0.0237 (0.4644)	0.1281 (0.0107)
STREET_2W	-0.0535 (0.0000)	-0.0552 (0.0000)	-0.0230 (0.0070)	0.0276 (0.0046)
STREET_4L	-0.1238 (0.0000)	-0.1727 (0.0004)	-0.0570 (0.1282)	-0.0596 (0.0952)
STREET_CS	-0.0468 (0.0000)	-0.0518 (0.0000)	-0.0141 (0.1163)	0.0359 (0.0006)
STREET_DE	-0.0529 (0.0000)	-0.0648 (0.0000)	-0.0304 (0.0066)	0.0343 (0.0098)
STREET_EX	-0.2581 (0.0000)	-0.2834 (0.0000)	-0.2335 (0.0000)	-0.1752 (0.0000)
STREET_HW	-0.0906 (0.0003)	-0.1161 (0.0000)	-0.1087 (0.0000)	-0.0550 (0.0241)
STREET_RW	-0.1019 (0.0000)	-0.0897 (0.0008)	-0.0775 (0.0138)	-0.0105 (0.8123)
TL_138_100_200	-0.0179 (0.0004)	-0.0265 (0.0000)	-0.0158 (0.0554)	-0.0155 (0.0806)
TL_138_200_300	-0.0243 (0.0000)	-0.0194 (0.0000)	-0.0199 (0.0058)	-0.0050 (0.4958)
TL_138_300_400	-0.0165 (0.0000)	-0.0107 (0.0037)	-0.0104 (0.0765)	-0.0102 (0.1528)
TL_138_50	**-0.0210 (0.2233)**	**-0.0684 (0.0000)**	**-0.0532 (0.0160)**	**-0.0698 (0.0146)**
TL_138_50_100	-0.0273 (0.0046)	-0.0494 (0.0000)	-0.0060 (0.6697)	-0.0220 (0.2087)
TL_345_100	**0.0251 (0.0431)**	**0.0306 (0.0031)**	**0.0014 (0.9486)**	**-0.0461 (0.1125)**
TL_345_100_200	0.0201 (0.0432)	0.0004 (0.9564)	0.0274 (0.1409)	0.0060 (0.7751)
TL_345_200_300	0.0247 (0.0004)	0.0019 (0.7975)	0.0151 (0.2223)	-0.0130 (0.3365)
TL_345_300_400	0.0109 (0.1145)	0.0075 (0.2232)	0.0085 (0.4018)	-0.0220 (0.0425)
TL_46_100_200	-0.0030 (0.4409)	-0.0113 (0.0008)	-0.0220 (0.0002)	-0.0154 (0.0227)
TL_46_200_300	0.0038 (0.2299)	0.0024 (0.4089)	-0.0029 (0.5461)	-0.0033 (0.5625)
TL_46_300_400	0.0027 (0.3449)	0.0044 (0.0886)	-0.0049 (0.2595)	0.0044 (0.3937)
TL_46_50	-0.0151 (0.0815)	0.0067 (0.4855)	-0.0303 (0.0628)	0.0043 (0.7778)
TL_46_50_100	**-0.0207 (0.0011)**	**-0.0244 (0.0000)**	**-0.0358 (0.0006)**	**-0.0282 (0.0179)**
TL_SUBCO_100_200	-0.0049 (0.7501)	0.0108 (0.4477)	0.0107 (0.6806)	-0.0030 (0.9186)
TL_SUBCO_200_300	-0.0121 (0.1558)	-0.0015 (0.8341)	-0.0062 (0.6102)	0.0123 (0.3458)
TL_SUBCO_50	-0.0472 (0.0852)	-0.0110 (0.6063)	-0.0227 (0.5394)	0.0274 (0.5181)
TL_SUBCO_50_100	**0.0035 (0.9126)**	**0.0108 (0.7119)**	**-0.0196 (0.7114)**	**-0.0362 (0.4842)**

p-values indicated in parentheses

ket areas for study in the short term. Furthermore, while the foregoing study specifically addresses electrical transmission corridors, the data and methodology introduced here can be used to analyze other types of rights-of-way, including roadways, petroleum and natural gas pipelines, water and wastewater pipelines, and mass-transit routes.

In addition, the same data and models can be used in analyzing other geospatial value questions, such as correlation between home value and proximity to negative externalities (e.g., correctional facilities, sources of pollution, solid waste facilities) or positive externalities (e.g., public parks, universities, transit stations), and even value impacts of higher-risk areas associated with natural disasters, such as flooding, earthquakes/liquefaction, landslides, wildfires, and high winds.

Finally, the data and methodologies allow for the reliable analysis of value impacts associated with issues with considerable political implications, such as correlation between improving performance of neighborhood schools and home values or the impact on home value of adding energy-efficiency elements, such as solar panels.

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Appendix Full Results

Variable	Parameter Estimate	Standard Error	*t* -Value	*Pr* > |*t*|
Intercept	8.955	0.035	256.630	<.0001
TL_345_100	0.009	0.009	1.070	0.286
TL_345_100_200	0.009	0.007	1.230	0.217
TL_345_200_300	0.009	0.005	1.620	0.104
TL_345_300_400	0.007	0.005	1.360	0.174
TL_138_50	-0.051	0.010	-5.240	<.0001
TL_138_50_100	-0.029	0.006	-4.770	<.0001
TL_138_100_200	-0.021	0.003	-6.410	<.0001
TL_138_200_300	-0.018	0.003	-6.530	<.0001
TL_138_300_400	-0.011	0.003	-4.300	<.0001
TL_46_50	-0.005	0.006	-0.840	0.399
TL_46_50_100	-0.025	0.004	-6.510	<.0001
TL_46_100_200	-0.009	0.002	-4.250	<.0001
TL_46_200_300	0.002	0.002	1.030	0.303
TL_46_300_400	0.003	0.002	1.630	0.103
TL_SUBCO_50	-0.029	0.015	-1.940	0.052
TL_SUBCO_50_100	-0.004	0.020	-0.200	0.845
TL_SUBCO_100_200	0.002	0.009	0.200	0.842
TL_SUBCO_200_300	-0.003	0.005	-0.730	0.464
HILLSIDE	0.019	0.002	9.380	<.0001
RAISEDROOF	0.017	0.003	6.140	<.0001
EFFECT_ESMT	-0.072	0.067	-1.080	0.281
EFFECT_FLOD	-0.025	0.103	-0.240	0.812
STREET_HW	-0.102	0.007	-13.990	<.0001
STREET_2W	-0.046	0.003	-14.930	<.0001
STREET_1W	0.003	0.010	0.330	0.739
STREET_CS	-0.038	0.003	-11.480	<.0001
STREET_DE	-0.047	0.004	-11.570	<.0001
STREET_RW	-0.097	0.011	-8.640	<.0001
STREET_4L	-0.129	0.010	-13.240	<.0001
STREET_EX	-0.267	0.011	-23.820	<.0001
TOPO_MTN	0.024	0.012	1.970	0.049
TOPO_ROL	0.031	0.002	16.700	<.0001
ZIP_84006	-0.048	0.147	-0.330	0.743
ZIP_84020	0.112	0.013	8.700	<.0001
ZIP_84044	-0.077	0.033	-2.310	0.021
ZIP_84047	0.118	0.026	4.610	<.0001
ZIP_84065	0.066	0.040	1.660	0.097
ZIP_84070	0.118	0.017	6.950	<.0001
ZIP_84081	0.031	0.016	1.890	0.059
ZIP_84084	0.044	0.016	2.730	0.006
ZIP_84088	0.046	0.016	2.860	0.004

Appendix *(continued)*

Variable	Parameter Estimate	Standard Error	*t* -Value	*Pr* > |*t*|
ZIP_84090	0.257	0.075	3.420	0.001
ZIP_84091	0.315	0.147	2.140	0.033
ZIP_84092	0.187	0.017	11.030	<.0001
ZIP_84093	0.191	0.017	11.430	<.0001
ZIP_84094	0.121	0.017	7.150	<.0001
ZIP_84095	0.079	0.038	2.080	0.037
ZIP_84096	0.064	0.040	1.620	0.105
ZIP_84102	0.371	0.012	30.760	<.0001
ZIP_84103	0.572	0.013	42.530	<.0001
ZIP_84104	-0.050	0.011	-4.420	<.0001
ZIP_84105	0.429	0.012	37.140	<.0001
ZIP_84106	0.269	0.012	23.300	<.0001
ZIP_84107	0.105	0.012	8.690	<.0001
ZIP_84108	0.484	0.012	41.300	<.0001
ZIP_84109	0.329	0.012	28.120	<.0001
ZIP_84110	0.169	0.074	2.280	0.022
ZIP_84111	0.145	0.012	11.840	<.0001
ZIP_84112	-0.065	0.104	-0.630	0.530
ZIP_84113	0.078	0.085	0.920	0.357
ZIP_84114	0.000	.	.	.
ZIP_84115	0.119	0.012	10.320	<.0001
ZIP_84116	0.023	0.013	1.740	0.081
ZIP_84117	0.254	0.012	21.100	<.0001
ZIP_84118	-0.003	0.011	-0.280	0.776
ZIP_84119	-0.007	0.011	-0.590	0.552
ZIP_84120	-0.013	0.011	-1.140	0.253
ZIP_84121	0.186	0.012	15.930	<.0001
ZIP_84123	0.089	0.012	7.560	<.0001
ZIP_84124	0.275	0.012	23.290	<.0001
ZIP_84126	-0.060	0.085	-0.710	0.478
ZIP_84127	0.006	0.104	0.060	0.956
ZIP_84128	-0.026	0.012	-2.240	0.025
ZIP_84129	0.003	0.014	0.200	0.840
ZIP_84150	0.140	0.104	1.350	0.177
ZIP_84152	0.505	0.147	3.440	0.001
ZIP_84157	0.072	0.147	0.490	0.624
ZIP_84170	-0.065	0.085	-0.760	0.446
ZIP_84171	0.305	0.104	2.940	0.003
NSCoord	-0.000	0.000	-1.970	0.049
EWCoord	-0.000	0.000	0.000	0.998
EAST	0.106	0.003	38.100	<.0001
SOUTH	0.015	0.007	2.210	0.027

Appendix (*continued*)

Variable	Parameter Estimate	Standard Error	*t* -Value	*Pr* > |*t*|
NUM_STORIES	0.022	0.002	12.100	<.0001
BATHFULL1	0.028	0.005	5.750	<.0001
BATHFULL2	0.063	0.005	12.370	<.0001
BATHFULL3	0.107	0.005	19.580	<.0001
BATHFULL4	0.169	0.007	24.820	<.0001
BATHFULL5	0.269	0.011	25.380	<.0001
BATHFULL6	0.341	0.020	17.190	<.0001
BATHHAL1	0.023	0.001	19.590	<.0001
BATHHAL2	0.086	0.004	20.580	<.0001
BATHHAL3	0.177	0.016	10.780	<.0001
BATHHAL4	0.255	0.060	4.260	<.0001
BATHHAL5	-0.016	0.104	-0.150	0.877
BATHTQ1	0.030	0.001	24.450	<.0001
BATHTQ2	0.053	0.002	22.490	<.0001
BATHTQ3	0.119	0.008	15.260	<.0001
BATHTQ4	0.344	0.025	13.540	<.0001
BATHTQ5	0.753	0.104	7.230	<.0001
BATHTQ6	0.820	0.104	7.920	<.0001
BED_1	-0.097	0.007	-13.470	<.0001
BED_2	-0.008	0.004	-1.850	0.064
BED_3	0.006	0.004	1.620	0.106
BED_4	0.007	0.004	1.960	0.050
BED_5	0.002	0.004	0.480	0.630
BED_6	0.009	0.004	2.380	0.017
TotFamRm	-0.002	0.001	-2.470	0.014
TotFire	0.017	0.001	25.070	<.0001
TotFormal	0.008	0.005	1.560	0.119
TotKitch	-0.002	0.001	-2.340	0.019
TotLdy	0.014	0.002	9.020	<.0001
TotSemi	0.002	0.001	2.110	0.035
LNHOUSINGST	0.021	0.003	6.960	<.0001
UNEMPLOYMENT_RATE	0.028	0.182	0.150	0.879
LISTTYPE_EAL	-0.006	0.003	-2.040	0.041
AUCTION	-0.158	0.012	-12.790	<.0001
ASISFIXER	-0.070	0.002	-41.510	<.0001
FORECL_NBO	0.015	0.008	1.980	0.048
LNSQFT	0.387	0.003	150.680	<.0001
LNACRES	0.134	0.001	108.710	<.0001
LNAGE	-0.094	0.001	-112.760	<.0001
NEWHOME	0.018	0.003	6.470	<.0001
SHORTSALE	-0.055	0.002	-27.070	<.0001
HASBAR	0.011	0.001	11.190	<.0001

Appendix *(continued)*

Variable	Parameter Estimate	Standard Error	*t* -Value	*Pr* > |*t*|
BsmntFin	0.000	0.000	25.030	<.0001
HASDECK	0.007	0.001	7.550	<.0001
GaragCap	0.002	0.000	15.240	<.0001
STYLE_RAMBLERRANCH	-0.067	0.003	-20.980	<.0001
STYLE_2STORY	-0.056	0.003	-17.230	<.0001
STYLE_BUNGALOW	-0.061	0.003	-18.320	<.0001
STYLE_TRIMULTI	-0.053	0.003	-15.390	<.0001
STYLE_SPLITENTR	-0.063	0.004	-18.060	<.0001
STYLE_MANUFMOD	-0.363	0.009	-41.410	<.0001
STYLE_CABIN	0.060	0.027	2.230	0.026
STYLE_TUDOR	0.079	0.006	13.620	<.0001
STYLE_MOBILE	-0.562	0.015	-37.670	<.0001
STYLE_VICTORIAN	0.004	0.006	0.670	0.503
STYLE_AFRAME	-0.141	0.030	-4.770	<.0001
STYLE_CAPECOD	0.019	0.010	1.840	0.066
ACCESS_ASPHALT	0.009	0.003	3.290	0.001
ACCESS_DIRT	-0.047	0.008	-6.100	<.0001
ACCESS_GRAVEL	0.004	0.005	0.850	0.395
ACCESS_CIRCULAR	0.056	0.014	4.100	<.0001
ACCESS_CONCRETE	0.006	0.001	4.620	<.0001
ACCESS_COMMONDRIVE	0.009	0.006	1.550	0.121
OWNER_BANK	-0.030	0.002	-12.880	<.0001
OWNER_HOMESTEPS	-0.049	0.005	-10.430	<.0001
HEAT_FRCAIR_CENTGAS	0.001	0.001	0.910	0.362
HEAT_CENTGAS	0.005	0.002	2.840	0.005
HEAT_FRCAIR	0.007	0.002	4.260	<.0001
AMEN_SOLARPANELS	0.092	0.034	2.740	0.006
AMEN_HEATDRIVE	0.073	0.015	5.010	<.0001
AMEN_TREXDECK	0.009	0.004	2.150	0.032
AMEN_MUDROOM	0.025	0.008	3.220	0.001
AMEN_SKYLIGHT	0.016	0.005	3.320	0.001
AMEN_WICLOSET	0.003	0.003	1.220	0.221
AMEN_GARDENTUB	-0.012	0.004	-3.120	0.002
AMEN_JETTEDTUB	-0.015	0.002	-6.140	<.0001
AMEN_ELECTRICDRYER-HOOKUP	-0.002	0.001	-2.470	0.013
AMEN_CABLETVWIRED	0.001	0.001	1.460	0.145
AMEN_CABLETVAVAILABLE	0.000	0.001	0.020	0.981
AMEN_GASDRYERHK	0.003	0.001	2.730	0.006
AMEN_HOMEWARR	0.001	0.001	0.590	0.552
AMEN_PARKPLAY	-0.014	0.002	-7.130	<.0001
AMEN_POOL	0.024	0.004	6.260	<.0001

Appendix *(continued)*

Variable	Parameter Estimate	Standard Error	*t* -Value	*Pr* > |*t*|
AMEN_WORKSHOP	0.002	0.002	1.060	0.290
AMEN_EXERCRM	0.027	0.003	9.290	<.0001
AMEN_CLUBHOUSE	0.014	0.004	3.700	0.000
AMEN_TENNISCOURT	0.016	0.005	3.460	0.001
AMEN_SAUNASTEAM	0.043	0.005	8.140	<.0001
AMEN_GATEDCOMM	0.032	0.009	3.480	0.001
AIR_CENT_ELEC	0.030	0.001	28.340	<.0001
AIR_CENT_GAS	0.031	0.002	13.990	<.0001
INCL_RANGE	0.001	0.001	1.060	0.291
INCL_MICROWAVE	0.017	0.001	16.420	<.0001
INCL_CEILINGFAN	-0.004	0.001	-4.310	<.0001
INCL_WINDOWCOVRS	0.003	0.001	3.270	0.001
INCL_FRIDGE	0.017	0.001	17.430	<.0001
INCL_RANGEHOOD	0.006	0.001	5.980	<.0001
INCL_STORAGESHED	-0.006	0.001	-4.950	<.0001
INCL_ALARMSYS	0.018	0.001	13.690	<.0001
INCL_SATDISHOREQ	-0.002	0.001	-2.330	0.020
INCL_FIREPLACEINS	-0.009	0.002	-6.140	<.0001
INCL_DWPORT	0.003	0.002	1.860	0.063
INCL_BASKETBALLST	0.003	0.002	2.020	0.044
INCL_SWINGSET	-0.000	0.002	-0.060	0.949
INCL_HUMID	0.009	0.002	4.210	<.0001
INCL_TVANTENNA	-0.004	0.002	-2.130	0.033
INCL_HOTTUB	0.009	0.002	4.420	<.0001
INCL_WOODSTOVE	-0.020	0.002	-8.830	<.0001
INCL_DOGRUN	-0.000	0.002	-0.150	0.883
INCL_COMPACTOR	0.017	0.003	6.300	<.0001
INCL_FREEZER	-0.004	0.004	-1.050	0.295
INCL_WORKBENCH	0.014	0.004	3.190	0.001
INCL_GASGRILLBBQ	0.006	0.004	1.590	0.111
INCL_ELEAIRCLNR	0.012	0.004	3.060	0.002
INCL_GAZEBO	0.002	0.004	0.580	0.563
INCL_TRAMPOLINE	0.018	0.008	2.100	0.035
INCL_PLAYGYM	0.019	0.008	2.300	0.022
INCL_WATERSOFT	0.005	0.001	4.090	<.0001
INCL_PROJECTOR	0.052	0.016	3.270	0.001
INCL_DRYER_ONLY	-0.003	0.003	-0.770	0.442
INCL_WASHER_ONLY	0.008	0.003	2.470	0.014
FINT_OAKCAB	-0.008	0.003	-2.640	0.008
FINT_MAPLECAB	-0.003	0.003	-0.980	0.325
FINT_ALDERCAB	0.020	0.003	7.690	<.0001
FINT_CHERRYCAB	0.053	0.006	8.380	<.0001

Appendix *(continued)*

Variable	Parameter Estimate	Standard Error	*t* -Value	*Pr* > |*t*|
FINT_CSTMKITCHEN	0.046	0.004	11.180	<.0001
FINT_CANLIGHTS	0.007	0.006	1.150	0.249
FINT_MAHOGWDWK	0.044	0.026	1.690	0.090
FINT_CORIANCNTR	0.009	0.005	1.810	0.070
FINT_RADIANTHEAT	0.021	0.010	2.140	0.032
FINT_TANKLESS	0.042	0.016	2.720	0.007
FINT_WINECELLAR	0.095	0.019	5.100	<.0001
FINT_OPENFLOOR	0.002	0.002	1.110	0.267
FINT_TILEBATH	0.002	0.006	0.290	0.771
FINT_NEWCARPET	0.025	0.001	16.750	<.0001
FINT_DW	0.014	0.001	10.810	<.0001
FINT_DISP	0.000	0.001	0.150	0.878
FINT_MASTERBATH	-0.014	0.001	-11.780	<.0001
FINT_WICLOSET	0.003	0.001	2.490	0.013
FINT_VCEILING	-0.003	0.001	-2.980	0.003
FINT_UPDTKITCHEN	0.030	0.001	27.830	<.0001
FINT_GASLOG	-0.001	0.001	-0.450	0.656
FINT_BATHSEPTUB	0.013	0.001	9.510	<.0001
FINT_DENOFFICE	0.019	0.001	15.990	<.0001
FINT_JETTUB	0.011	0.001	7.390	<.0001
FINT_GASRANGE	0.013	0.001	8.710	<.0001
FINT_FRDOORS	0.015	0.001	11.170	<.0001
FINT_RANGEBLT	0.001	0.001	0.530	0.597
FINT_GASOVEN	0.002	0.002	1.210	0.228
FINT_RANGECTOP	-0.008	0.002	-3.850	0.000
FINT_DOUBLEOVEN	0.045	0.002	19.010	<.0001
FINT_CENTRALVAC	0.052	0.002	24.850	<.0001
FINT_SECKITCHEN	0.003	0.003	1.070	0.286
FINT_WETBAR	0.022	0.002	10.750	<.0001
FINT_GRANCNTR	0.045	0.002	25.160	<.0001
FINT_WALLOVEN	0.005	0.003	1.950	0.051
FINT_GREATROOM	0.022	0.003	6.500	<.0001
FINT_ALARM	0.018	0.004	5.110	<.0001
FINT_INTERCOM	0.015	0.003	4.660	<.0001
FINT_LAUNDCHUTE	-0.004	0.003	-1.460	0.144
FINT_DRYBAR	-0.002	0.003	-0.610	0.544
FINT_FLOORDRAIN	0.012	0.004	2.640	0.008
FINT_FIREALARM	0.015	0.004	3.460	0.001
FINT_RANGEDVENT	0.004	0.005	0.700	0.485
FINT_THEATERROOM	0.022	0.009	2.490	0.013
FINT_SILECOUNTER	0.050	0.011	4.710	<.0001
FINT_APT	-0.027	0.003	-9.620	<.0001

Appendix (*continued*)

Variable	Parameter Estimate	Standard Error	*t* -Value	*Pr* > |*t*|
BASEMNT_FULL	-0.022	0.002	-14.580	<.0001
BASEMNT_PARTIAL	0.007	0.002	4.180	<.0001
BASEMNT_NONECRAWLSPACE	0.064	0.002	26.070	<.0001
BASEMNT_DAYLIGHT	0.001	0.001	0.750	0.456
BASEMNT_WALKOUT	0.004	0.002	2.470	0.013
BASEMNT_ENTRANCE	-0.002	0.002	-1.350	0.177
LANDSCAPE_FULL	0.029	0.001	21.210	<.0001
LANDSCAPE_MATURETREES	0.005	0.001	4.600	<.0001
LANDSCAPE_FRUITTREES	-0.010	0.001	-9.040	<.0001
LANDSCAPE_VEGGARDEN	0.001	0.001	1.150	0.249
LANDSCAPE_PART	-0.018	0.002	-11.120	<.0001
LANDSCAPE_PINES	0.005	0.001	3.710	0.000
LANDSCAPE_TERRYARD	0.002	0.002	0.990	0.324
LANDSCAPE_SCRUBOAK	0.018	0.003	5.960	<.0001
LANDSCAPE_STREAM	0.082	0.005	18.010	<.0001
LANDSCAPE_WATERFALL	0.035	0.007	4.710	<.0001
LANDSCAPE_XERISCAPED	0.048	0.007	6.560	<.0001
FEXT_DOUBLEPANEWINDOWS	0.010	0.001	10.000	<.0001
FEXT_SLIDINGGLASSDOORS	-0.012	0.001	-11.800	<.0001
FEXT_BAYBOXWINDOWS	0.006	0.001	5.220	<.0001
FEXT_OUTDOORLIGHTING	0.005	0.001	4.740	<.0001
FEXT_PORCHOPEN	-0.005	0.001	-4.690	<.0001
LOT_CITYVIEW	0.023	0.007	3.280	0.001
LOT_SIDEWALKS	-0.004	0.001	-3.810	0.000
LOT_SPRINKLERAUTO	0.019	0.001	17.170	<.0001
LOT_TERRAINFLAT	0.003	0.001	3.090	0.002
LOT_VIEWMOUNTAIN	-0.003	0.001	-3.130	0.002
LOT_FENCEDFULL	0.004	0.001	2.690	0.007
LOT_ROADPAVED	-0.002	0.001	-2.610	0.009
LOT_FENCEDPART	0.000	0.001	0.310	0.759
LOT_SECLYARD	0.008	0.001	7.280	<.0001
LOT_CULDESAC	-0.010	0.002	-6.230	<.0001
LOT_PRIVATE	0.008	0.002	5.380	<.0001
LOT_CORNERLOT	-0.010	0.001	-8.010	<.0001
LOT_VIEWVALLEY	-0.006	0.002	-3.570	0.000
LOT_TERRGRADSLOPE	0.001	0.002	0.660	0.509
LOT_WOODED	0.027	0.002	10.920	<.0001
LOT_SPRINKRMAN	0.008	0.002	3.870	0.000
LOT_VIEWLAKE	0.027	0.004	7.120	<.0001
LOT_TERRMTN	-0.014	0.005	-2.820	0.005
LOT_TERRHILL	-0.010	0.005	-2.120	0.034
LOT_TERRSTEEPSLP	-0.027	0.005	-4.950	<.0001

Appendix *(continued)*

Variable	Parameter Estimate	Standard Error	*t* -Value	*Pr* > |*t*|
LOT_DRIPIRRIG	0.030	0.005	5.880	<.0001
LOT_ADDTLLANDAVL	0.017	0.008	2.150	0.031
LOT_ADJTOGOLFCRS	0.046	0.018	2.520	0.012
LOT_DRIPIRRMAN	0.005	0.018	0.300	0.764
EXTR_ALUMINUMVINYL	-0.009	0.001	-8.680	<.0001
EXTR_BRICK	0.006	0.001	5.510	<.0001
EXTR_STUCCO	0.012	0.001	8.980	<.0001
EXTR_STONE	0.026	0.002	17.120	<.0001
EXTR_CEDARREDWOOD	-0.007	0.002	-3.160	0.002
EXTR_FRAME	-0.013	0.002	-6.280	<.0001
FLOOR_CHERRY	0.038	0.011	3.530	0.000
FLOOR_OAK	0.014	0.007	2.040	0.042
FLOOR_MAPLE	0.006	0.008	0.790	0.430
FLOOR_HICKORY	0.040	0.010	3.810	0.000
FLOOR_HANDSCRAPE	0.008	0.011	0.700	0.485
FLOOR_CARPET	0.009	0.002	5.180	<.0001
FLOOR_TILE	0.017	0.001	17.350	<.0001
FLOOR_HARDWOOD	0.023	0.001	23.000	<.0001
FLOOR_LINOLEUM	-0.022	0.001	-20.210	<.0001
FLOOR_LAMINATE	-0.003	0.003	-1.060	0.290
FLOOR_VINYL	-0.028	0.004	-7.490	<.0001
FLOOR_MARBLE	0.079	0.003	25.110	<.0001
FLOOR_TRAVERT	0.059	0.004	14.040	<.0001
FLOOR_SLATE	0.029	0.005	6.180	<.0001
FLOOR_BAMBOO	0.045	0.007	6.760	<.0001
FLOOR_NATROCK	0.043	0.014	3.000	0.003
FLOOR_CORK	0.091	0.019	4.650	<.0001
FLOOR_HEATED	0.061	0.017	3.520	0.000
ROOF_ASPHALTSHIN	-0.005	0.002	-1.890	0.059
ROOF_ASBESTOSSHIN	-0.012	0.004	-3.210	0.001
ROOF_TARGRAVEL	-0.029	0.003	-8.670	<.0001
ROOF_TILE	0.024	0.005	5.090	<.0001
ROOF_WOODSHAKESH	0.031	0.004	7.200	<.0001
ROOF_ALUMINUM	-0.010	0.005	-2.010	0.044
ROOF_RUBBEREPDM	0.007	0.004	1.660	0.097
ROOF_FLAT	-0.005	0.013	-0.410	0.682
ROOF_COMPOSITION	-0.019	0.005	-4.080	<.0001
ROOF_PITCHED	0.007	0.004	1.880	0.060
ROOF_ROLLEDSILVER	-0.030	0.007	-4.140	<.0001
POOL_INCLUDED	0.026	0.003	8.300	<.0001
WINDOW_WOOD	0.027	0.013	2.080	0.037
WINDOW_VINYL	0.004	0.003	1.270	0.204

Appendix *(continued)*

Variable	Parameter Estimate	Standard Error	*t* -Value	*Pr* > |*t*|
WINDOW_BLINDS	0.002	0.001	1.630	0.104
WINDOW_FULL	0.003	0.002	1.310	0.192
WINDOW_DRAP	0.000	0.004	0.010	0.993
WINDOW_PART	-0.002	0.002	-1.090	0.274
WINDOW_NONE	-0.009	0.002	-5.200	<.0001
WINDOW_SHUTTER	0.044	0.003	16.570	<.0001
WINDOW_SHADES	0.074	0.020	3.610	0.000
GARAGE_2CARDEEP	0.002	0.001	1.460	0.145
GARAGE_ATTACHED	0.007	0.001	6.850	<.0001
GARAGE_RVPARKING	-0.006	0.001	-5.380	<.0001
GARAGE_BUILTIN	0.006	0.002	3.800	0.000
CITY_ALTA	0.945	0.049	19.420	<.0001
CITY_BINGHAMCANYON	0.145	0.179	0.810	0.417
CITY_BLUFFDALE	0.054	0.038	1.400	0.162
CITY_BRIGHTON	0.367	0.044	8.380	<.0001
CITY_COPPERTON	0.035	0.147	0.240	0.812
CITY_COTTONWOODHEIGHTS	-0.008	0.007	-1.170	0.241
CITY_DRAPER	-0.071	0.103	-0.690	0.491
CITY_EMIGRATIONCANYON	-0.184	0.032	-5.780	<.0001
CITY_HERRIMAN	-0.035	0.038	-0.920	0.356
CITY_HOLLADAY	0.055	0.007	7.660	<.0001
CITY_KEARNS	-0.004	0.007	-0.650	0.515
CITY_MAGNA	-0.009	0.031	-0.270	0.786
CITY_MIDVALE	-0.053	0.023	-2.330	0.020
CITY_MURRAY	0.030	0.007	4.220	<.0001
CITY_RIVERTON	0.012	0.038	0.310	0.757
CITY_SALTLAKECITY	0.005	0.006	0.940	0.345
CITY_SANDY	-0.060	0.012	-5.070	<.0001
CITY_SOLITUDE	0.528	0.063	8.410	<.0001
CITY_SOUTHJORDAN	0.034	0.036	0.950	0.340
CITY_SOUTHSALTLAKE	-0.045	0.011	-4.210	<.0001
CITY_TAYLORSVILLE	0.034	0.006	5.400	<.0001
CITY_UNION	-0.028	0.075	-0.370	0.712
CITY_WESTJORDAN	0.010	0.012	0.850	0.394
CITY_WESTVALLEYCITY	-0.009	0.006	-1.390	0.164
CITY_WHITECITY	-0.074	0.044	-1.670	0.094
SEWER_CONN	0.003	0.001	2.070	0.038
SEWER_PUBLIC	0.001	0.001	0.690	0.490
SEWER_GASCON	0.019	0.006	3.410	0.001
SEWER_WATERCON	0.013	0.004	3.040	0.002
SEWER_POWERCON	-0.002	0.006	-0.330	0.743
SEWER_WATERAVL	-0.013	0.008	-1.770	0.077

Appendix *(continued)*

Variable	Parameter Estimate	Standard Error	*t* -Value	*Pr* > |*t*|
SEWER_POWERAVL	-0.011	0.009	-1.270	0.204
SEWER_SEWERAVL	0.020	0.008	2.390	0.017
SEWER_GASAVAILABLE	-0.011	0.008	-1.330	0.185
SEWER_SEWERPRI	-0.013	0.006	-2.350	0.019
SEWER_SEWERSEPTIC	-0.046	0.007	-6.870	<.0001
SEWER_GASNC	-0.019	0.015	-1.280	0.199
SEWER_WATERNC	-0.056	0.021	-2.590	0.010
SEWER_SEWERNC	-0.046	0.025	-1.850	0.064
SEWER_POWERNC	-0.035	0.032	-1.080	0.279
SEWER_GASNA	-0.009	0.029	-0.300	0.764
SEWER_WATERNA	-0.001	0.038	-0.030	0.975
SEWER_SEWERNA	-0.050	0.039	-1.280	0.201
SEWER_POWERNA	-0.189	0.104	-1.820	0.068
YQ2001_2	0.015	0.004	3.400	0.001
YQ2001_3	0.019	0.004	4.380	<.0001
YQ2001_4	0.021	0.005	4.550	<.0001
YQ2002_1	0.025	0.006	4.440	<.0001
YQ2002_2	0.031	0.005	5.890	<.0001
YQ2002_3	0.035	0.005	6.660	<.0001
YQ2002_4	0.025	0.005	5.100	<.0001
YQ2003_1	0.043	0.006	7.700	<.0001
YQ2003_2	0.040	0.005	7.740	<.0001
YQ2003_3	0.047	0.005	9.250	<.0001
YQ2003_4	0.056	0.005	11.770	<.0001
YQ2004_1	0.071	0.005	13.450	<.0001
YQ2004_2	0.083	0.005	17.450	<.0001
YQ2004_3	0.099	0.005	20.770	<.0001
YQ2004_4	0.108	0.004	24.250	<.0001
YQ2005_1	0.137	0.005	29.450	<.0001
YQ2005_2	0.171	0.005	36.560	<.0001
YQ2005_3	0.212	0.005	45.790	<.0001
YQ2005_4	0.252	0.005	54.860	<.0001
YQ2006_1	0.302	0.005	63.570	<.0001
YQ2006_2	0.362	0.005	70.810	<.0001
YQ2006_3	0.422	0.005	82.620	<.0001
YQ2006_4	0.445	0.006	79.190	<.0001
YQ2007_1	0.478	0.005	90.480	<.0001
YQ2007_2	0.509	0.006	92.520	<.0001
YQ2007_3	0.513	0.005	95.700	<.0001
YQ2007_4	0.483	0.006	83.550	<.0001
YQ2008_1	0.476	0.006	85.160	<.0001
YQ2008_2	0.466	0.005	92.110	<.0001

Appendix *(continued)*

Variable	Parameter Estimate	Standard Error	*t* -Value	*Pr* > |*t*|
YQ2008_3	0.450	0.005	87.180	<.0001
YQ2008_4	0.414	0.006	71.890	<.0001
YQ2009_1	0.378	0.009	44.180	<.0001
YQ2009_2	0.346	0.008	44.380	<.0001
YQ2009_3	0.344	0.008	40.850	<.0001
YQ2009_4	0.332	0.008	39.410	<.0001
YQ2010_1	0.317	0.010	33.290	<.0001
YQ2010_2	0.292	0.008	34.840	<.0001
YQ2010_3	0.250	0.009	28.730	<.0001
YQ2010_4	0.218	0.008	26.730	<.0001
YQ2011_1	0.178	0.008	21.060	<.0001
YQ2011_2	0.172	0.007	24.110	<.0001
YQ2011_3	0.177	0.007	25.210	<.0001
YQ2011_4	0.146	0.007	21.330	<.0001
YQ2012_1	0.152	0.007	21.700	<.0001
YQ2012_2	0.200	0.006	33.360	<.0001
YQ2012_3	0.230	0.006	38.420	<.0001
YQ2012_4	0.253	0.006	42.420	<.0001
YQ2013_1	0.293	0.006	46.800	<.0001
YQ2013_2	0.351	0.005	65.570	<.0001
YQ2013_3	0.373	0.005	68.020	<.0001
YQ2013_4	0.356	0.006	59.330	<.0001
YQ2014_1	0.369	0.006	58.380	<.0001
YQ2014_2	0.397	0.006	70.200	<.0001
YQ2014_3	0.407	0.006	72.410	<.0001
YQ2014_4	0.399	0.007	59.430	<.0001
IRR_LOT	0.001	0.001	0.660	0.508
P1_LAUNDRY	-0.008	0.001	-7.500	<.0001
P1_BEDROOM	0.009	0.002	3.860	0.000
P1_FULLBATH	-0.009	0.002	-4.060	<.0001
P1_FORMALDINING	0.021	0.005	4.010	<.0001

Additional Reading

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Wilson, Albert R. "Proximity Stigma: Testing the Hypothesis." *The Appraisal Journal* (Summer 2004): 253–262.

Additional Resources

Suggested by the Y. T. and Louise Lee Lum Library

Appraisal Institute

Lum Library External Information Sources [Login required]

Information Files—Real Estate Damages, Proximity Impact

Electric Power Research Institute

http://my.epri.com

Federal Energy Regulatory Commission—Transmission Line Siting

http://www.ferc.gov/industries/electric/indus-act/siting.asp

US Department of Energy

http://www.energy.gov

US Energy Information Administration

http://www.eia.gov/