138Kv Transmission Lines and the Value of Recreational Land

by Glenn J. Rigdon

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Introduction

Does the location of a 138Kv (kilovolt) transmission line impact the value of proximate recreational real estate? Utilities, real estate appraisers and right-of-way professionals have all noted the difficulty of determining an enhanced or a diminished value due to the effects of a transmission line. "The Puzzle of the Power Line," an article written by Louie Reese and published in the *Appraisal Journal*, states that when analyzing property with uncommon characteristics as those traversed by transmission lines, "... the appraiser's tools of valuation lose their edge, and the range of property value widens perceptibly." (Reese, 1967:555) To answer the question of transmission line impact on the value of recreational acreage in Marquette County, Michigan, a study was undertaken to investigate a number of recreational land sales.

The comparable sales approach (market approach) and the before and after valuation methodology outlined by uniform federal appraisal standards for eminent domain acquisitions (U.S. Government, 1973:24) are two appraisal tools often used to estimate the value of transmission line easements, underlying fee interests, and the value of a remainder. Appraisers using these methods rely on comparable property sales in the marketplace to determine the cash value of transmission line effects. Each case is somewhat unique, however, and the accuracy of an appraisal is dependent on the availability and accuracy of market based comparable property information. Craig L. Solum noted that, "In the real market place, there are sales of encumbered properties." Critical to the appraisal process, however, is the fact that, "An extremely limited number of hundreds (of properties) analyzed will document a loss in value attributable to (a) partial acquisition." (Solum, 1985:15) I would add that even fewer sales may be available that document a loss due to the proximity of transmission line effects.

Appraisal professionals use a systematic approach, but they realize that the appraisal of real estate is an inexact science. They also admit that some subjective and judgmental elements may find their way into a final appraisal report. Appraisals focusing on transmission line impact are unusually complex, and when insufficient market data is available, the valuation process can become somewhat arbitrary.

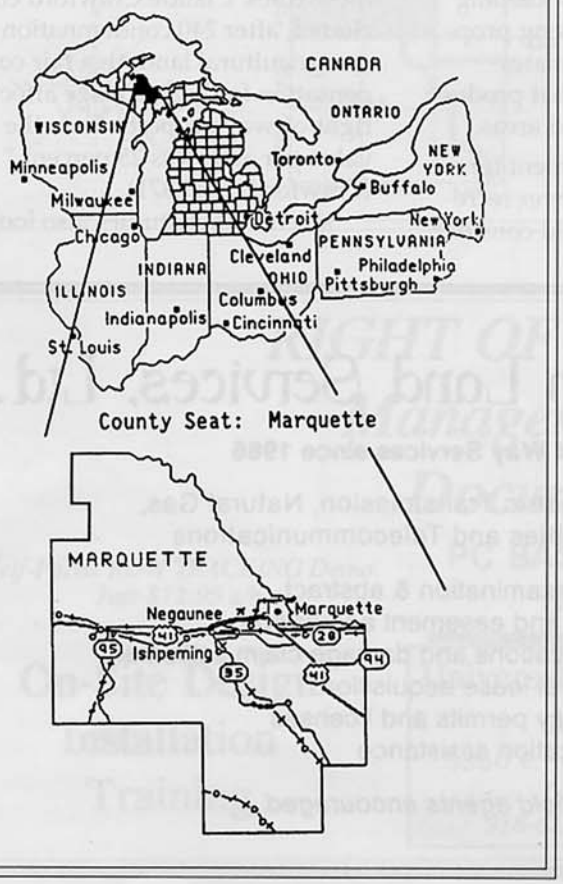
This paper has as its focus the estimation of the proximate effects of a 138Kv transmission line on recreational acreage values in Marquette County, Michigan. One hundred and sixty-six recorded deeds on property sales were identified in two large "neighborhoods." Subsequent research allowed for the exclusion of several of the property sales due to

their non-homogeneous factors. Excluded parcels either had improvements, were more suitable for a non-recreational use, were over three miles from an established transmission line, or were evaluated as having a substantial timber value. The remaining 46 acreage parcels included in the study ranged from 10 acres to 160 acres in size. The parcels had all been recorded as sold in Marquette County records between January 31, 1986, and January 30, 1991–a period of five years.

The properties under study shared many common physical and economic attributes. All the parcels closed were sold on cash terms. Land contract sales were rare (deeds of trust are nonexistent), and a review of land contract sales instruments provided no sales price information. Individuals in Marquette County, Michigan recorded only "memorandum of land contract" instruments on term sales, and not the land contract documents themselves. Thus, none of the available contract sales included sales price information, nor were specific sales terms available.

Similar zoning was an attribute shared by the selected properties in the study. Zoning was either for seasonal dwelling, a single family residential dwelling, forestry, or a recreational use. An analysis of each determined its highest and best use. Physically possible, legally permissible, and financially feasible uses were similar for each of the parcels. All parcels reviewed were determined to be best suited for a recreational use.

FIGURE 1
MARKET AREA–MARQUETTE COUNTY, MICHIGAN



The recreational acreage parcels studied were all located in the central portion of Michigan's Upper Peninsula in Marquette County. Marquette County (see Figure 1) is the state's largest county inland area (1,873 square miles), and based on recent census data, it has approximately 81,000 residents. The county boasts clean air, a long shoreline with the near pristine waters of Lake Superior, acres and acres of rolling wooded recreational land, and a quiet, small town atmosphere. The Marquette County area possesses an economic base that is controlled by iron ore mining. The forest products industry, tourism, a regional medical facility, state and local government, and a state funded university (Northern Michigan University) also contribute to the economic base.

A statistical analysis of the data collected on the comparable properties noted herein was undertaken to test whether a relationship could be established between their sales prices and their proximate distances to an established 138Kv transmission line. The quantification of any such relationship could provide a measurable percentage of positive or negative impact and possibly furnish compensation figures for con-demnations on recreational acreage.

LITERATURE

Academics, appraisal practitioners and right-of-way professionals have taken diverse approaches to the measurement of transmission line effects on real property values over the years.

An extensive literature search yielded only a few studies concluding that any negative impact of transmission line proximity on real property values exists. The bulk of published work on transmission line effects on value reports findings similar to those recently noted in *Right of Way*, a forum for professional right-of-way agents. The trade publication states that, "For residential properties…it does not appear that the public recognizes a substantial detriment to value due to proximity to power lines." (Beasley, 1991:9)

A group of prominent appraisers and academics including Dr. Peter F. Colwell, Claude O. Crawford, W.N. Kinnard, Jr., Louie Reese, Craig L. Solum and others have studied transmission line impact on real estate

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values. Due to the relatively high value and density of improved residential properties, far more studies have been conducted on the impact and effects of high voltage lines on residential real estate as compared to agricultural and recreational acreage.

Kinnard notes in a study of 791 residences in 17 subdivisions located in Hartford, Connecticut that, "Sales prices did not vary perceptibly with closeness to a tower line right of way." (Kinnard, 1967:279) He further states that, "...the individual property owner contemplating the purchase of a residence close to a tower line right of way (could) anticipate no special difficulty in disposing of his property at a later date." (1967:279)

Dr. Colwell, a professor of real estate and urban economics at the University of Illinois, Urbana-Champaign, takes a theoretical econometric modeling approach to solving the transmission line valuation problem. In two studies he indicates a slight negative impact on residential (improved) properties that have a transmission line easement located in the immediate vicinity. (Colwell, 1979, 1990:117) The results of Dr. Colwell's most recent study indicate that transmission lines may have negative effects on property value. His estimates indicate a value loss of 2 to 3 percent of total property value at distances of 200 feet or more from transmission line towers. Colwell's studies also show the impact of transmission line proximity on residential property continue to decrease as distances from transmission lines increase.

Research conducted by Solum provides insight into the opinions of transmission line-affected land owners. After easements had been taken and transmission lines constructed on their acreage parcels in northwest Wisconsin, Solum polled the owners regarding their valuation expectations. His basic observations about reducing the effects of transmission line construction on recreational properties included:

- Minimizing the imposition of locating a right of way on recreational properties where there is no other alternative but to remove the timber for the transmission line can be accomplished by keeping the transmission line along property borders. This eliminates diagonal installations that produce non-continuous forested areas.
- The compensation payment for easement acquisitions over recreational properties should consider the premise of future value of timber discounted to present day value, as this is a major area of concern for recreational property owners. (Solum, 1985:18)

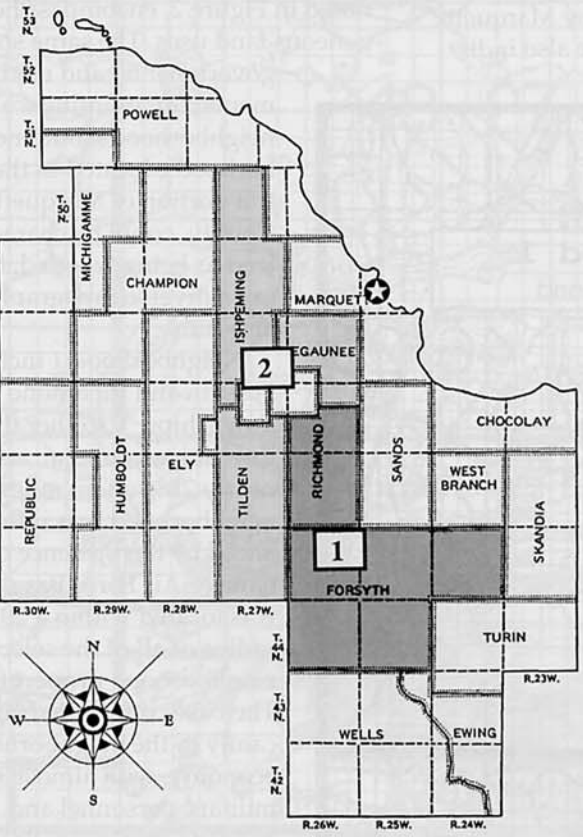
Solum notes that, in the opinion of northwest Wisconsin acreage owners, the impact of transmission lines on recreational properties "...appears to be less (than the impact on) ...residential property." (1985:17) He also states, "The major concern with recreational property owners (was) the loss of future timber value caused by the clearing of the right of way. Aesthetic loss and the fear of lower resale prices (was) a secondary concern to the recreational property owner." (1985:17)

In contrast to accepted appraisal methodology, many studies and articles offer their own subjective rule of thumb for valuing takings and remainders. The size of the acquisition or taking is typically the only factor taken into account when using these rules. Claude Crawford concluded, after 240 condemnation cases on agricultural land, that fair compensation for high voltage affected right-of-way property "...is the fee value per acre, less 25 percent." (Crawford, 1955:371).

Several other studies also look at

compensation based on the loss of crop production (or the present value of timber). The opinion survey even includes questions regarding an owner's perceived loss of aesthetics. Some results offer an indication that a negative way of thinking was attached to the land after transmission line tower construction. It is reasonable to assume that the compensable loss to an owner for an easement is some percentage less than 100 percent of the fee. Clearly each transmission line situation is different. The appraisal literature is full of theoretical models and subjective offerings; it portrays the before and after valuation technique most often used by right-of-way appraisers to estimate takings and remainder as weak.

FIGURE 2
STUDY NEIGHBORHOODS—MARQUETTE COUNTY, MICHIGAN



One problem that remains with the use of experiential and analytical real estate models to solve general real estate valuation questions is that "Many of the factors associated with land values, especially sales prices, are parcel (or transaction) specific." (Johnson and Ragas, 1987:338) Both simplistic and supercomprehensive rational models have very limited application in the real world. Real estate markets, like Marquette County's, can be very autonomous.

MARKET FACTS—NEIGHBORHOODS

Distance isolates Marquette County. Its real estate market has remained relatively distinct and unaffected by major population centers several hundred miles away. Considerable supply and nominal demand for recreational land have been evident in Marquette County since the late 1970s. Real estate sales professionals have documented a low property turnover rate for recreational acreage. Inflation has not seemed to influence Marquette County land prices over the last several years. The weak demand and slow absorption rate noted in the market may be a

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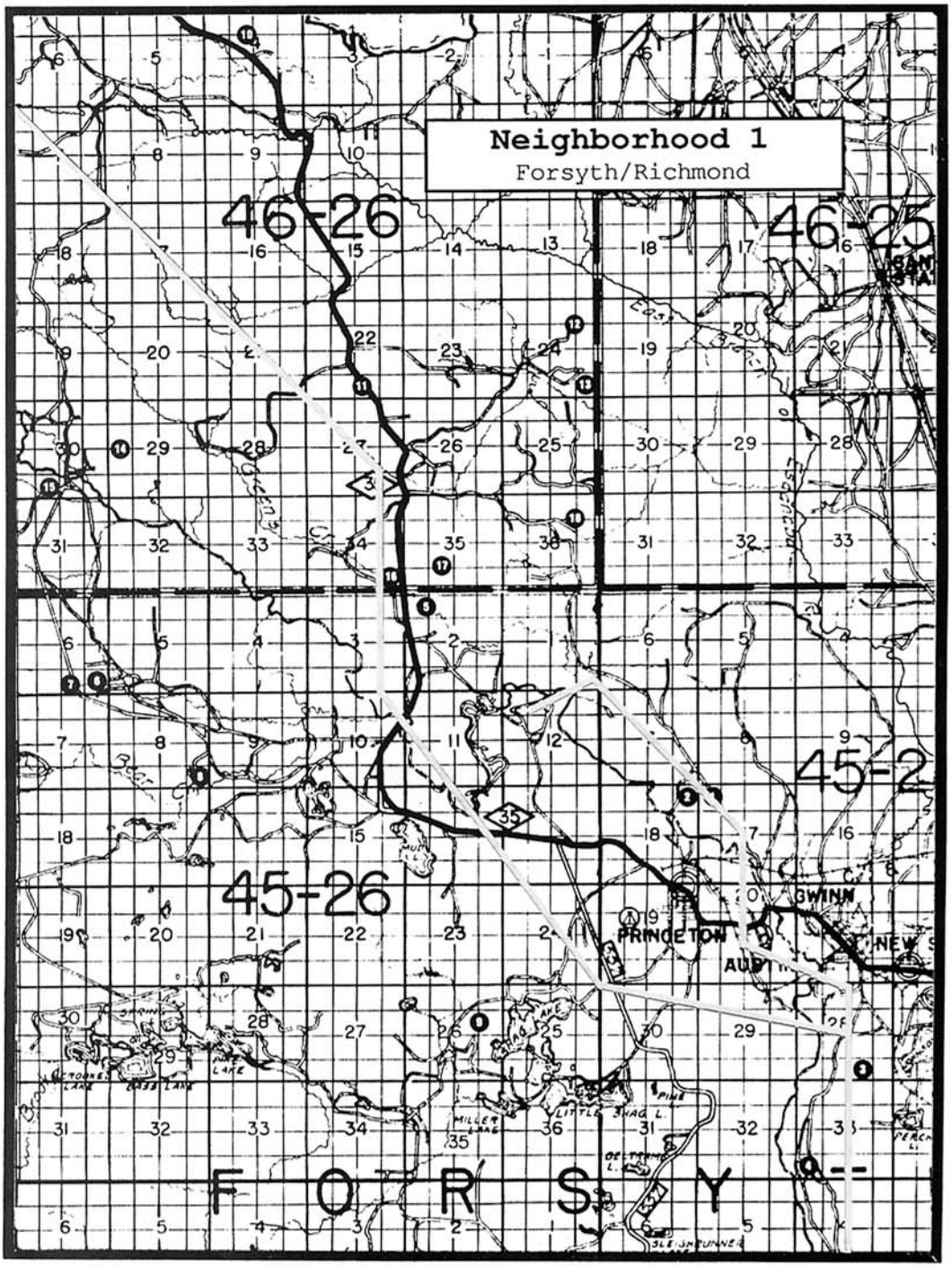
direct result of the 3 percent net population loss noted for the county between 1980 and 1990, which was verified by 1990 census figures.

Relatively high real property tax rates in Marquette County may have also negatively influenced market demand. Michigan Technological University's (MTU) Bureau of Industrial Development newsletter noted, "Property (tax) rates are relatively high in the Upper Peninsula ...significantly higher than (other places) around the country." (Tieder, 1989:1)

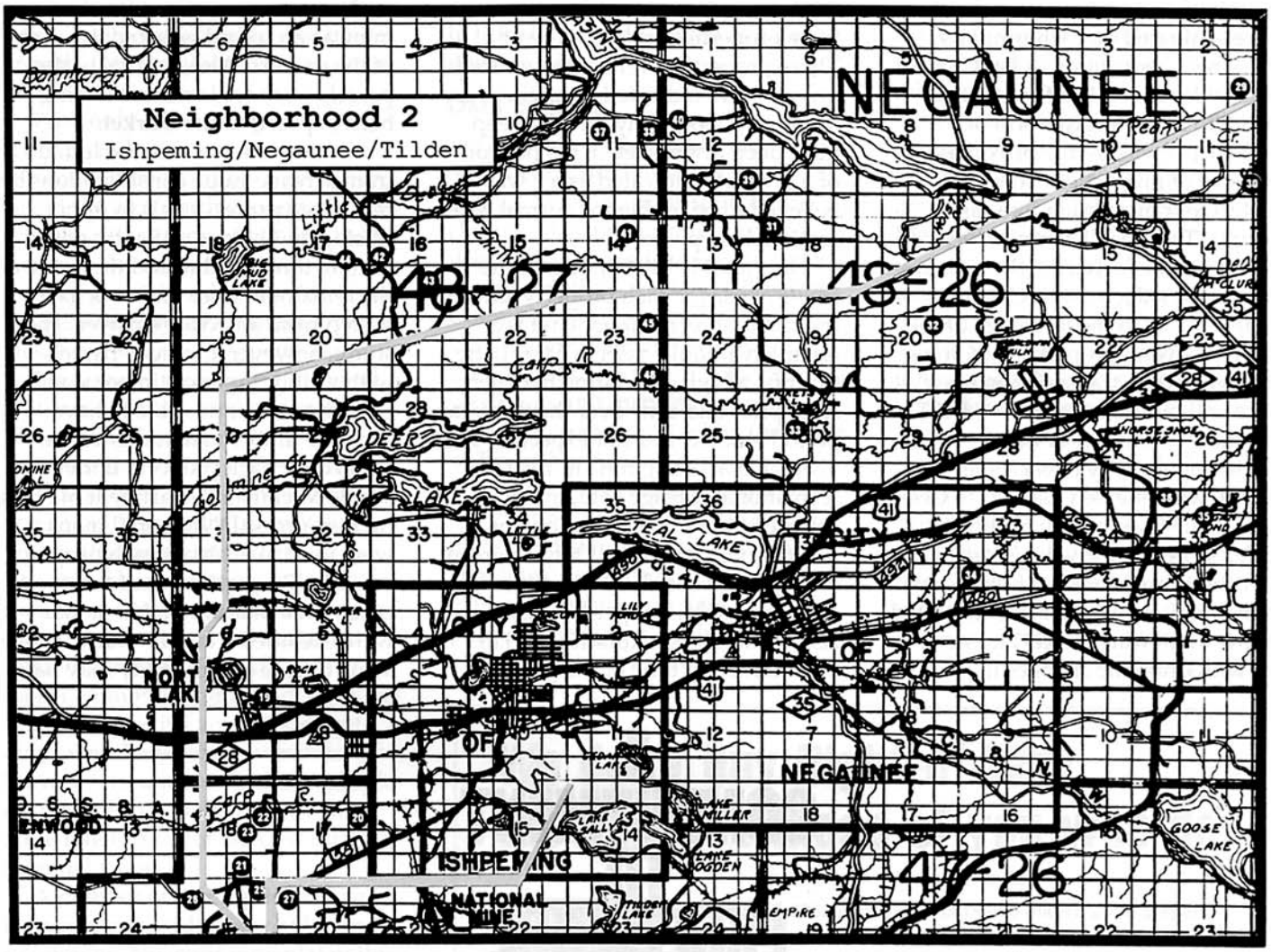
MTU's regional Upper Peninsula economic index and real estate market statistics published by Marquette County Realtors(R) have also indicated a modest growth rate for the county in the future. There is no reason to believe that a major market shift will occur in the short term that would influence the selected neighborhoods.

The two large neighborhoods, noted in Figure 2, encompass homogeneous land uses. The same social, governmental and environmental forces influence the neighborhoods. Both neighborhoods, located in the central portion of Marquette County, could be characterized as being wooded, having a diverse topography, and rural.



Neighborhood 1 includes Forsyth and Richmond Townships. Together these townships bound an area of nearly 238 square miles. The neighborhood was influenced by the presence of K.I. Sawyer Air Force Base, which was located within a 20 mile radius of all of the selected neighborhood properties. The base contributed significantly to the neighborhood's economy, with almost 3,500 military personnel and 1,400 civilians employed. Base economics have been noted by Marquette County Realtors to directly influence the market demand for recreational land in the neighborhood.

The Negaunee/ Ishpeming/Tilden Township neighborhood is noted as Neighborhood 2. The three townships in the neighborhood comprise a similar 224 square mile area. This neighborhood, however, adjoined two small cities, Negaunee (population 5,100) and Ishpeming (population 7,800). The city of Marquette (population 23,000), located 10 to 20 miles to the east, influences the economy of



this neighborhood. Ishpeming and Negaunee are heavily influenced by the employment of Cleveland Cliffs Iron Company (CCI) which employs near 1,800 individuals.

Variables

Six common elements of comparison, or independent variables, are noted for real property in the American Institute of Real Estate Appraisers Appraisal of Real Estate reference textbook and include:

1. Real property rights conveyed
2. Financing terms
3. Conditions of sale
4. Date of sale
5. Location
6. Physical characteristics (Heuer, 1987:316)

An attempt to adjust the variability of several of the elements and focus on transmission line effects was made. Only the property sales that included the conveyance of the fee rights (except minerals) were considered. Also, all the sales used were considered "arms-length" transactions as no duress or special relationships could be determined. Sales that were excluded also included those that were made from estates as well as those made to parties with the same sir name. All of the recorded sales were also cash sales. Market conditions and location were analyzed and somewhat neutralized as a variable as noted in the "Market–Neighborhood" section of this report.

Physical characteristics that were studied include:

SIZE – Size of acreage parcels

TOPO – Topography

1/ADIST – Reciprocal of distance to plowed and county maintained road (year round access)

1/DIST – Reciprocal of distance of parcels to a 138Kv transmission line easement

Improvements (none on selected properties), infrastructure and timbe stands were all considered controlled variables in that little variability between the selected parcels existed.

Functional and economic variable including adaptability, location for highest and best use, environment,

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neighborhood and nuisance factors were evaluated on each property.

Using a convention of Dr. Colwell, a variable named DIST was introduced in its reciprocal form of 1/DIST to measure the proximate distance of properties (from their center) to transmission line easements. "Thus, as distance to the easement and line increases, the proximity variables decrease." (Colwell, 1990:120) Given the large size of the parcels, several properties adjoining or traversed by transmission lines were still indicated as having DIST distances of 660 feet or more.

The topography of each site, TOPO, was assessed using U.S. Geological Survey maps on a 10-point scale. A property given a score of 10 was considered to be entirely usable for recreation with no areas indicated as low (high water table) and no areas with dramatic changes in grade. At the opposite end of the spectrum were properties given a score of 1. These properties were either entirely low, or were indicated as having very dramatic topography (bluffs, steep hills, deep ravines, etc.). No portion of a property indicated as a 1 was believed to be usable for normal recreational purposes.

The variable MOS indicates the *month of sale* for each property. Given the fact that recreational land is a relatively illiquid asset in Marquette County, a high correlation between sales price and time over the five year period studied was not expected. The average marketing time in 1989 for recreational acreage sold, in the "above 10 acre" classification, by Realtors was 345 days. Only 6 percent of all parcels listed with Realtors in 1989 were sold. (Upper Peninsula Association of Realtors(R), 1989:8) The marketing time of the parcels under study was impossible to determine as no record was kept by many of the owners. Also, several of the parcels were sold without having been exposed to the market.

Timber value is often excluded from acreage value considerations by real estate professionals in upper Michigan. There is difficulty determining timber value and the value of the remainder once timber is harvested from an acreage parcel. The study, however, excludes parcels with visibly superior timber stands. Since it was not possible to have separate timber valuations accomplished for each property under study, Michigan Department of Natural Resources (DNR) aerial maps were used to evaluate each property visually. Properties found to have exceptional mature timber stands were excluded from the study. While some degree of variability may have

existed between the remaining properties due to varying stages of timber growth, this variability was assumed minimal.

With only a few exceptions, properties included in the study were sold subject to mineral rights reservations. Given the area's rich geological assets, the reservation of mineral rights has been the norm for Marquette County property sales. The Michigan DNR's Real Estate Division perpetuates this fracture of property rights in that it reserves mineral rights on all of its tax reverted property sales throughout the state.

A nominal value of $75 to $100 per acre usually exists for undeveloped acreage in Marquette County. Even where little or no infrastructure exists, and where no immediate productive use has been found for property, this base value has remained a relative constant. The existence of most common man-made determents (highly restrictive zoning, tree cutover, abandoned improvements, etc.), burn effects, and extreme topographical features (i.e., swamps, ravines, large hills) have not affected this nominal value.

A number of assumptions have been made regarding variables and unknowns. No environmental pollution of studied properties, or in the general vicinity of studied properties, was known and it was assumed that none existed. The relative distance of studied properties to other negative externalities–like dump sites, abandoned farms, mining operations, and junk yards–were considered, and an assumption was made that there were no impact from these externalities. The effect of time on land value during the five year period was assumed to be nominal. Thus when inflation, opportunity costs, taxes, and the present value of money were considered, it was assumed that holding recreational land in Marquette County during the noted period implied a loss.

The sales price of each property (SPRICE) was considered as an effect in this study, and is noted as a dependent variable.

Data Sources

Data collected on land sales in the Marquette County market area was obtained from various sources including Marquette County records or deeds (Register of Deeds Office), local appraisers, the Cleveland Cliffs Iron Company, and from personal interviews. Land characteristic information was obtained from personal observations and inspections, and from appraisal cards supplied by the office of Township Assessors.

Plat book maps were used to lay out existing 138Kv lines and to estimate the distances to the transmission lines. Locational information on existing transmission lines was supplied by the Upper Peninsula Power Company, the owner of most of the existing lines and rights of way studied. Only common single, double and triple circuit 138 thousand volt transmission lines, which were supported by wooden H-type frames, were considered.

The disclosure of sales price information on a real estate transaction to Marquette County is a voluntary act. Several hundred additional recorded deeds were found on property sales in each of the neighborhoods under study. Sales price and terms of sale information, however, were not obtainable on most properties. An estimated 65 percent of the deeds indicated an amount of one dollar or 10 dollars. While information on approximately 35 percent of all transactions was available, it is possible that those individuals who voluntarily provided information on their deeds were not a representative group. An

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assumption has been made that there is no difference between those individuals who report voluntarily and those who do not.

Registered land surveys were not normally conducted on land sales transactions in the Marquette County area, and no record of any real property survey was found for any of the properties under study.

Analysis

The systematic method of data collection and property characteristic comparison used herein parallels the sales comparable approach, or market comparable approach, used by real estate appraisers to value individual undeveloped properties. The method stresses an impartial, unbiased and objective analysis of relevant market data and the skillful application of appraisal techniques.

The statistical technique of multiple regression analysis is considered an accepted appraisal technique, and its use "... is increasing in appraisal practice." (Heuer, 1987:631) In seeking to explain the variation in the sales price variable, SPRICE, and test whether a relationship exists between the proximate distance of transmission lines and sales price, the data collected was processed using Statworks(TM), an advanced, computerized statistical software program.

Basic descriptive statistics were calculated from the property characteristic information collected on each neighborhood and are provided for review in Table 1.

The recreational acreage information collected on Neighborhood 1 is quite similar to that of Neighborhood 2. The average selling price of properties in the two neighborhoods is only $632 apart. The average parcel size in Neighborhood 1 is considerably larger, at 65.21 acres, than that of Neighborhood 2 at 51.71 acres. As the neighborhoods are in many ways comparable, it isn't surprising to find

Table 1 Descriptive Statistics

Neighborhood 1

Variable	Max.	Min.	Std. Dev.	Mean
SPRICE	26,000	3,000	6,944	11,014
ACRES	160.00	10.00	49.07	65.21
1/DIST	.002	.00005	.001	.0005
MOS	56.07	0.23	16.52	22.59
TOPO	10	2	2.16	6.06
1/ADIST	.005	.0003	.002	.001

Neighborhood 2

Variable	Max.	Min.	Std. Dev.	Mean
SPRICE	34,500	3,000	6,541	11,646
ACRES	140.00	18.11	28.93	51.71
1/DIST	.01	.00005	.001	.003
MOS	56.7	0	16.23	26.32
TOPO	9	2	2.03	4.86
1/ADIST	.01	0	.002	.001

the variables within the neighborhoods provide similar statistics.

A multiple regression analysis was performed on all of the independent variables previously reviewed. The results produced the correlation coefficients noted in Table 1. The objective of the regression analysis is to account for sales price variations, and to determine if a relationship existed between the sales price variable, SPRICE, and the proximity to transmission line variable 1/DIST.

The minimum correlation value required for significance, taking no more that a 5 percent chance of declaring a correlation significant when the correlation is actually zero, (using Pearson's r) is r = .44 for 20 observations, and r = .40 for 25 observations.

The data analyzed on Neighborhood 1 variables yields only two statistically significant relationships that are identified at the .05 level. The relationship between the sales price variable, SPRICE, and the acreage size variable, ACRES, produces an r value of r = .847. The coefficient of determination, or r2 (r squared), explains how much of the variance of the dependent variable is explained by this relationship, which in this case is a large 70 percent.

Another statistically significant relationship is noted between the variable for acreage size, ACRES and the distance to access variable 1/ADIST in Neighborhood 1. The correlation between these variables is expressed in the statistic r = .55.

The analysis of Neighborhood 2 data yields only one statistically significant relationship at the .05 level. A correlation coefficient of r = .719 was calculated for the relationship between the sales price variable (SPRICE) and the acreage size variable (ACRES).

When grouped, the data provides the statistics noted in Table 2.0. It is interesting to note that no long term upward or downward sales price

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TABLE 2 DESCRIPTIVE STATISTICS

Neighborhood 1

Year	No. Parcels	Avg. Acres	Avg. $ P/A
1986	1	80.0	$200.00
1987	3	73.5	149.87
1988	3	43.3	262.92
1989	6	69.6	181.43
1990	3	72.0	219.84
1991	2	55.0	145.83

Neighborhood 2

Year	No. Parcels	Avg. Acres	Avg. $ P/A
1986	4	46.9	$265.01
1987	4	87.7	194.85
1988	7	51.2	237.66
1989	6	42.3	246.21
1990	6	42.8	239.36
1991	1	40.0	375.00

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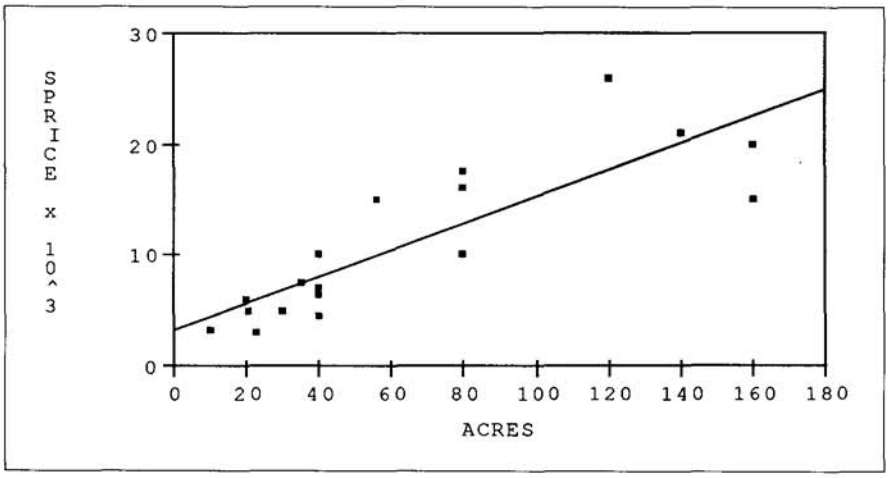
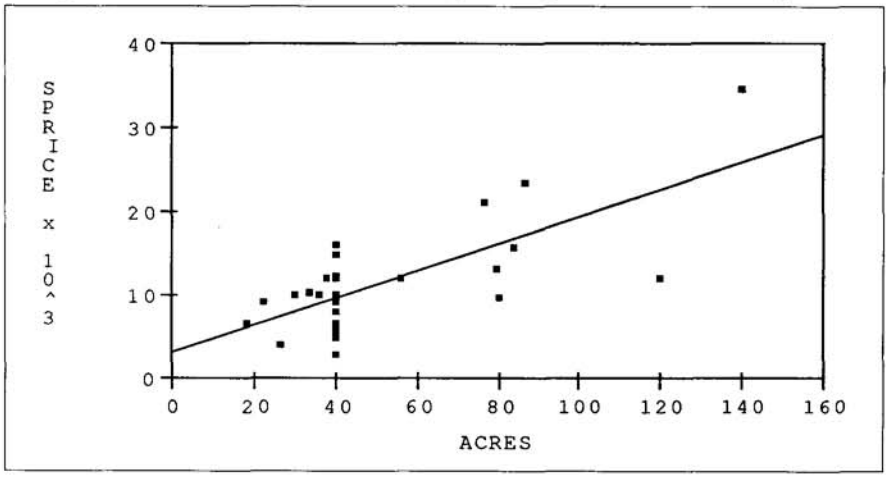
FIGURE 3 SALES PRICE TO ACREAGE SIZE RELATIONSHIP

Neighborhood 1-Forsyth/Richmond Township Area



Neighborhood 2-Negaunee/Ishpeming/Tilden Township Area



trends were ascertainable for recreational acreage sales in either of the two neighborhoods. A review of Upper Peninsula Association of Realtors Multiple Listing Service information for all acreage sales between 1986 and 1991 provides the same erratic sales price statistics.

Neighborhood statistics indicate that the average size of recreational property sales consistently averaged 40 acres or more in each of the years studied. The price per acre paid fluctuated between $149.87 and $262.92 in Neighborhood 1 and $194.85 and $375 in Neighborhood 2.

RESULTS

The multiple regression techniques used herein allows for the statistical analysis of property data to test the relationships between the sales price variable and the other selected explanatory variables (physical characteristics) to determine which have statistical significance. It is clear from the outcome of the data analysis that sales prices and acreage sizes are highly correlated variables in both Neighborhood 1 and Neighborhood 2. The relationship between size and sales price is an expected one. When buying real estate with a similar use, it is often assumed that the larger th parcel, the higher the sales price. There is, however, normally a dimir ishing price per acre paid for property as the sizes of properties increase. The price to size relationship becomes an inverse one and become curvi-linear in nature. The data stud ied, however, provide a linear relationship between the two variables. The relatively small size of the properties under study may account for the high degree of linear correlation between the variables.

The statistically significant relationship that is noted between the acreage size variable, ACRES, and tl distance to access variable, 1/ADIST in Neighborhood 1 makes intuitive sense. One would expect acreage sizes in sales transactions to become larger as the distance from a year-round county road increases. There an economy of scale principle at wo with large acreage tract sales. Sales statistics validate the fact that small acreage parcels which are located a considerable distance from year-round access roads have a longer marketing time than large acreage tracts that are held for timber production.

The inverse of the proximate distance of the properties to a power line, or the 1/DIST variable, was not found to be correlated with sales price in either neighborhood. Thus, no relationship was established between sales price and the proximate distance of properties to transmissio lines in Marquette County. Even when grouped, neither properties traversed by power lines, those in proximity of power transmission lines, nor those located over three miles away showed a statistically significant relationship with sales price.

SUMMARY AND CONCLUSION

Solum notes that recreational property owners in northwest Wisconsin are most concerned with transmission lines causing the loss o future timber value (30 percent of

respondents), and/or a lower resale price for their land (22 percent of respondents). (1985:16) The fact that no relationship was established between sales price and the proximate distances to a power line in this study could indicate that the fears expressed by proximate owners are not substantiated by acreage buyers in the market place. While not confirmed in the same northwest Wisconsin study, fears were not transformed into expected losses or damages in other areas.

Kinnard found in his studies that, "Proximity to a tower line is not nearly so important to buyers ...as the other locational and amenity considerations." (Kinnard, 1967:280) An amenity to recreational acreage parcels—primarily used for hunting, cross country skiing, snow machine trails, etc.—is access. And access may be enhanced by the clearing of an access road by a utility company as part of the transmission line construction process. It may be conjectured that the value of a recreational property is enhanced by transmission line access routes. Owners may be effectively compensated for timber production losses or negative aesthetic impact by having an improved or newly created access route created where none previously existed.

The results of this study, together with a distillation of the available literature, favor a reasoned conclusion that a strong relationship between the sales price of recreational acreage and the proximate distance of a power transmission line cannot be easily established. The fact that the average price of all acreage in Marquette County showed no upward or downward trend between 1986 and 1991 is important. Time, often noted as a significant factor in determining the value of real estate, is noted to have little effect over the period studied. Only parcel size is shown to have a high correlation with price. Given the number of variables that could influence the sales price of a recreational acreage parcel, it is not surprising to find that transmission line effects alone are not very influential or readily measurable. (IRWA)

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