

ABSTRACT

This article reports on a study of 2000–2010 sales of properties located along 500 kV transmission lines that stretch across most of Montana. A combination of 49 individual transactions and an even larger number of lot sales in 7 subdivisions were studied using personal interviews, sales comparison, and paired sales techniques. The transactions are categorized into seven property types, representing a combination of agricultural, residential, and recreational uses. Results are summarized for each property type, and the conditions that make properties vulnerable to transmission line impact are identified. At the most general level, the dominant considerations affecting any impact are use, property size, and the availability of substitutes.

High-Voltage Transmission Lines and Rural, Western Real Estate Values

by James A. Chalmers, PhD

There is considerable interest across the northern Rocky Mountain/ Intermountain West region in new sources of electrical generation and in additions to the transmission grid necessary to get that electricity to its ultimate market. Despite the extensive professional literature on the impact of high-voltage transmission lines (HVTL) on real estate values, there is no literature that addresses HVTL impact in the context of the mix of land uses that characterize this portion of the country.

This study pursues a case study approach using a combination of techniques, including paired sales and sales comparison analyses.¹ Results are reported for 56 cases across 7 property types. The number of cases is too small to support statistical conclusions; however, for some property types there is a sufficient number of cases and sufficient similarity of conclusions across the cases to draw some useful generalizations. It is possible at the end of the article to draw some useful generalizations across property types.

The case study approach presented also addresses an important methodological gap in the professional literature. Statistical analysis of large numbers of property sales is the definitive approach to answering the question of whether there is a well-defined, consistent effect of transmission lines on property values. As discussed in the next section, the literature concludes that, in terms of statistical significance, the effects are usually nonexistent or small. But, this simply means that there is no consistent relationship in the data. It does not rule out the possibility that some individual properties are significantly affected, nor does it provide any insight into the conditions shared by those individual properties that make them vulnerable to transmission line impact. This study, through the analysis of case studies, allows generalizations to be made about impact, but also identifies the exceptions to these generalizations and the particular conditions apparently responsible for the exceptions.

1. This research was carried out under contract to NorthWestern Energy during March 2010–December 2011. This article is a summary of findings in the research report, James A. Chalmers, *Final Report: High Voltage Transmission Lines and Montana Real Estate Values* (January 12, 2012), which is available upon request from NorthWestern Energy by contacting pat.asay@northwestern.com.

This article begins with a very brief overview of the extensive national literature on the subject of the impacts HVTL have on real estate values. Then the discussion addresses in more detail studies that appear to have relevance to rural environments similar to those that characterize the western United States. Finally, some of the unique characteristics of the western mountain states are compared to other areas that previously have been studied. Based on these observations, the overall approach and procedures followed in this study are outlined.

Literature Review

Beginning in the late 1960s, there has been in excess of 100 studies that in one way or another address the effect of HVTL on real estate values, and several recent publications review the literature in detail. The interested reader is referred to a 2009 article by Chalmers and Voorvaart,² a recently published review by Jackson and Pitts,³ and a review prepared by Thomas Priestly for the Montana Department of Environmental Quality.⁴

The conclusions reached in these reviews indicate that multiple regression analysis is increasingly recognized as the most reliable technique to investigate whether HVTL systematically impact property values and, if so, to what extent. The results of these studies can be generally summarized as follows:

- Over time, there is a consistent pattern, with about half of the studies finding negative property value effects and half finding none.
- When effects on value have been found, they tend to be small; almost always less than 10% and usually in the range of 3% to 6%.
- Where effects on value are found, they decline rapidly as distance from the lines increases and usually disappear at about 200 to 300 feet.
- Two of the studies investigated behavior of the effect over time and found that, if there were effects, they tended to dissipate over time as well.

The relatively small effects on property value attributed to the proximity of HVTL in the published literature do not mean that the direction of the effect of transmission lines on property values is not negative. The general interpretation is that, even though transmission line issues have been a prominent concern in most of the communities studied, and even though the direction of effect on real estate value is generally negative, their presence is apparently not given sufficient weight by buyers and sellers of real estate to have had any consistent, material effect on market value.

The studies referenced above, and the overwhelming majority of the studies performed to date, analyze the effect of HVTL on improved residential properties in urban or suburban settings. The published studies in the professional literature that address the effect of HVTL on raw land are quite limited.⁵

Brown published an article in 1976⁶ that used paired sales analysis to look at sales of farm parcels from 156 acres to 350 acres in size in southeastern Saskatchewan. He found no negative influence of number of towers or the presence of HVTL relative to otherwise similar parcels without HVTL. Rigdon published a study in 1991⁷ in which he used multiple regression analysis to analyze the effect of a 136 kV line on recreational parcels ranging from 10 to 160 acres in size in Marquette County, Michigan. Based on 46 sales in the period from 1986 to 1991, he concluded there were no land value effects associated with proximity to the HVTL.

Finally, Jackson recently published an analysis of sales of rural land parcels in Wisconsin.⁸ He studied the sale of 88 properties in Wisconsin, occurring over the period 2002–2008, that were encumbered by a transmission line easement. The properties averaged 50 acres in size. Local appraisers then selected unaffected property sales that were otherwise similar to the affected properties. The analysis controlled for

2. James A. Chalmers and Frank A. Voorvaart, "High-Voltage Transmission Lines: Proximity, Visibility, and Encumbrance Effects," *The Appraisal Journal* (Summer 2009): 227–245.

3. Thomas O. Jackson and Jennifer Pitts, "The Effect of Electric Transmission Lines on Property Values: A Literature Review," *Journal of Real Estate Literature* 18, no. 2 (2010): 239–259.

4. Thomas Priestly, *Transmission Lines and Property Values: Review of the Research and Summary of Key Findings* (report prepared for the Montana Department of Environmental Quality, July 2009).

5. *Ibid.*, 3-1–3-4. Priestly references five research reports that may have some relevance, but they do not appear in the professional literature and are very difficult to obtain and evaluate.

6. Dean J. A. Brown, "The Effect of Power Line Structures and Easements on Farm Land Values," *Right of Way* (December 1975/January 1976): 33–38.

7. Glenn J. Rigdon, "138 kV Transmission Lines and the Value of Recreational Land," *Right of Way* (December 1991): 8–19.

8. Thomas Jackson, "Electric Transmission Lines: Is There an Impact on Rural Land Values?" *Right of Way* (November/December 2010): 32–35.

time, location, mix of land classification (agricultural, wooded, open, wetland), whether the purchaser was a government agency, and whether the property was transitioning to a higher use. His results indicate a small (1.1% to 2.4%), but statistically insignificant, effect for the sale of properties crossed by HVTL relative to uncrossed properties. When the sales were grouped by location of the line on the property, properties with edge locations showed no effect, while properties crossed by the line showed a small price effect of -2.1% to -3.4%.

Based on these studies, there are several important considerations that influence the need for, and the approach to, this study. First, contrary to the commonly expressed, but unsubstantiated opinion that there must be a significant effect of HVTL on real estate values, the professional literature makes it clear that one cannot start from a presumption of effect. That is not to say that there cannot be an effect, but rather that assertion of an effect must be grounded in market data specific to the circumstances in question. Second, if there is an effect of HVTL on real estate values, one would expect raw land values to be more sensitive than improved property values and there has been very little research to date on land value effects.⁹ Finally, review of the literature shows a complete void of study in the northern Rocky Mountain states.

In the context of the western mountain states, the predominant land uses affected are large acreage, unimproved land tracts with some mix of agricultural, residential, and recreational highest and best uses as opposed to improved, small lot, residential properties. Existing research is largely silent on possible value effects on these types of properties. Their distinguishing characteristics relative to those examined in previous studies include the following:

- Land value is a much larger proportion of total property value.
- Natural features and amenities may be a more significant determinant of overall property value.
- Western viewsheds are often more susceptible to visual intrusion than those of urban residential subdivisions.

- Recreational value is often a component of the overall value of both agricultural and residential properties.
- Buyers of these properties presumably have different criteria for their purchases, depending on the type of property purchased.

The bottom line is that the national literature provides generalizations that provide a useful starting point, but it has little to say about conditions specific to the western context. Our approach to filling that void is outlined in the next section.

Study Approach

The essence of any approach to studying the effect of HVTL on real estate values is to identify existing HVTL, identify sales of properties crossed by or near the HVTL, and then analyze the sale price relative to otherwise similar properties not affected by the HVTL. The approach followed here takes advantage of the fact that beginning in the early 1980s, 500 kV lines were constructed from Montana Power's Colstrip power plants in eastern Montana to a location in central Montana where they connected to another 500 kV line built by the Bonneville Power Administration (BPA). These BPA lines then continue west to a substation near the Idaho border with the total distance from the Colstrip origination being 588 miles. An additional BPA 500 kV line segment runs 54 miles back to the northeast. In total, these lines cross 15 Montana counties that are broadly representative of western terrain and land uses. The route of the lines along their distance of over 640 miles is shown in Figure 1.

Procedures

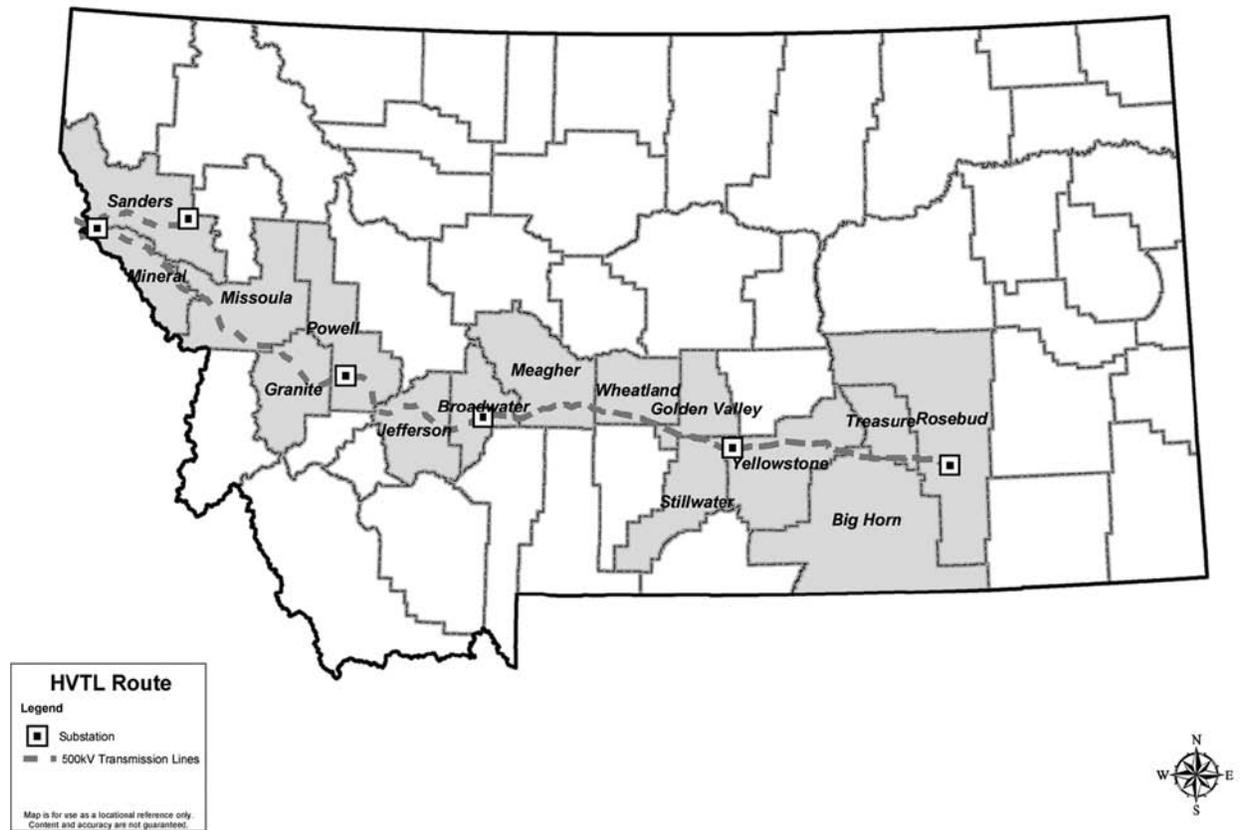
The general approach of the study was to identify and examine all arm's-length transactions that had occurred in 2000–2010 and involved properties within 500 feet of the approximate centerline of the 500 kV lines.¹⁰ There were eight steps in the general approach to the study:

1. Identify all real estate parcels within +/- 500 feet of the centerline of the 500 kV lines.
2. Aggregate identified parcels into common property ownerships.

9. If HVTL are a material locational detriment to value, it presumably would be capitalized into the value of the land, not the improvements. For example, if lot value were typically 30% of the value of improved residential property, even a relatively large HVTL effect on land value, say 20%, would only show up as a 6% effect on the value of the improved residential property and might be difficult to identify in the data.

10. Both the 500 feet and the Year 2000 criteria are arbitrary. At the outset of the study, it was not known how many transactions these criteria would identify. In fact, the study began by looking at all transactions from 1990 or later, but the number of transactions was unmanageably large so the criterion was revised. The criteria ultimately used provided a representative, yet still manageable, number of sales.

Figure 1 Route of 500 kV Transmission Lines across Montana



3. Retain a local title company to research public records and capture all significant recorded documents with respect to the identified ownerships.
4. If the recorded documents suggest a transfer of ownership occurred in 2000 or later, capture the chain of title for the property.
5. Review the recorded documents associated with the chain of title and identify those transactions that appear to be arm's-length transactions.¹¹
6. Inspect the properties involved in these arm's-length transactions.
7. Contact the parties to these transactions and confirm as many of the details of the transactions as possible, including price, buyer and seller motivation, and role played by the 500 kV lines in the sale, if any.¹²

8. Assuming a sale price can be determined for the transaction, research comparable sales for the same land uses and determine whether the market evidence appears to be consistent with the interview evidence with respect to transmission line impact.¹³

Assuming a transaction was a legitimate arm's-length sale and that the sale price was determined, this process was then documented in what was called a "Sale Analysis Report." The Sale Analysis Reports were typically five to eight pages in length; the reports described the subject property and the location of the 500 kV lines relative to the property; summarized the interviews of parties to the transaction; identified comparison sales unaffected by the transmission lines; discussed each comparison sale; adjusted each

11. Foreclosures, intrafamily transactions, and changes in the form of ownership were the most common exceptions.

12. Montana is one of fourteen nondisclosure states, so interviews of the parties to the transaction were necessary to establish the terms of the sale.

13. It would not be practical to do a complete retrospective appraisal since most of the transactions, especially on the eastern half of the line, involved large farm and/or ranch properties. A full appraisal would require consideration of water rights; fencing; condition of improvements, if any; weed issues; threatened and endangered species issues; etc. Therefore, we initially relied on the interviews with the buyers and sellers and then looked at whether market data on a price/acre basis for the land classes involved for that area was consistent with the interview results.

comparison sale for market conditions and for land-class mix on the property; and drew conclusions with respect to the impact of the transmission lines on the subject by comparing value per acre by land class to the unaffected comparison properties. In some cases, it was possible to interview participants and get useful insights into a transaction, but the sale price could not be determined. This made it impossible to complete a Sale Analysis Report; but, an “Interview Summary Report” was prepared instead.

Finally, there were cases where no information was available beyond that provided by the public record search, and therefore, no report was possible. These properties were inspected, but attempts to make contact with any of the parties to the transaction and to obtain any third-party information were unsuccessful.

The procedures described resulted in the identification of 1,151 parcels, representing approximately 708 ownerships. The subsequent chain of title research on these ownerships identified a total of 74 cases where there appeared to be an arm’s-length transaction occurring in 2000–2010. Of these transactions, there was sufficient information to prepare 37 Sale Analysis Reports and 12 Interview Summary Reports; in 25 cases it was not possible to complete a report because parties to the transactions could not be contacted.

The procedure described was followed for the sale of individual properties. There were several cases, however, where the unit of analysis was a subdivision, not an individual sale. The first occurred at the Aspen Valley Ranches (AVR) subdivision in Jefferson County, and several more occurred along the Clark Fork River in Sanders County. The procedures followed in these cases are described below.

The AVR subdivision is a 156-lot rural subdivision that was platted in 1985. The 500 kV lines pass through the middle of the subdivision, and the right-of-way easement encumbers 26 of the lots. There are a sufficient number of sales at AVR to support statistical analysis, but additional data collection and analysis are still in progress and will be reported at a later date.

The second area of subdivision analyses was in Sanders County, where the Clark Fork Valley

serves both as a highly scenic locale for recreational subdivisions as well as a transportation and utility corridor with three HVTL passing through much of the valley. Although the subdivisions had some commonalities, the real potential for research lay in comparing the experience of lots within a given subdivision that were affected by the HVTL with lots in the same subdivision that were not (or at least less) affected. A total of 12 residential subdivisions were identified of which 7 had sufficient sales to be included as case studies. For each of these, the timeframe of the analysis was extended back to their original platting dates.

The research of individual sale transactions combined with the subdivision analyses of the Sanders County developments resulted in a total of 56 case studies, which were then grouped into one of seven property types:¹⁴

1. Production Agricultural Lands
2. Agricultural Lands with Recreational Influence
3. Agricultural Lands with High Amenity Recreation and Natural Features
4. Rural Residential Subdivisions—Lot Size Less than 5 Acres
5. Rural Residential Subdivisions—Lot Size 5 Acres or Greater
6. Large Acreage Rural Residential Tracts
7. Rural Recreational Tracts/Cabin Sites

The following sections of this article address each of the property types individually.

Findings

Production Agricultural Lands

A total of 19 transactions were identified that involved Production Agricultural Lands. The results of these investigations are summarized in Table 1. The largest number of these transactions occurred in locations where the 500 kV lines pass through the farm and ranch country of central and eastern Montana. Eight of the transactions were over 1,000 acres, with the remainder 640 acres or fewer. About half of the properties consisted entirely, or predominantly, of native range, while the others are a mix of range and cropland or predominantly cropland.¹⁵

14. Property type is generally synonymous with highest and best use.

15. In the few cases where there was irrigated land, the irrigation systems were not affected by tower locations. Tower locations could, however, significantly affect center-pivot and wheel-line irrigation systems.

Data was generally available on these transactions, and a total of 15 Sale Analysis Reports were prepared along with 4 Interview Summary Reports. Important conclusions drawn from those analyses are as follows:

- The interviews with individuals involved in these transactions uniformly asserted that there was no influence of the 500 kV lines on the price at which the property sold.
- The Sale Analysis Reports were uniform in their conclusion that there was no market evidence to support a claim of adverse effect of the transmission lines on sale price.
- The dominant considerations motivating the behavior of the buyers were the variety of factors influencing the productivity and operating costs of the property. Assemblage also played a very important role, especially when the smaller cropland properties became available.
- In general, negative comments with respect to the lines tended to regard them as a “nuisance,” with the nuisance factor more significant to farm operations than livestock operations.
- Nuisance complaints mentioned in interviews included the following:
 - The HVTL corridor provides an unauthorized access route for trespassers.
 - Utility vehicles tear up farm and ranch roads when they are wet.
 - Trailers, gates, etc. near the lines pick up an electric charge.
 - The lines and towers attract lightning strikes, which can arc to the ground and start fires and injure livestock.
 - The utility access roads are a source of weed introduction.
 - Towers and guy lines are a nuisance to farm around.
 - The transmission lines, towers, and guy lines present an aviation hazard.
- Interestingly, there was no indication of adjustment to the sale price for the extent of the encumbrance of the property by the transmission line easement. The implication is that the owner at the time of construction gets compensated for the easement by the utility, but does not have to make a corresponding adjustment in the subsequent sale

of the property. Presumably this is because the overall agricultural productivity of the property is not affected by the transmission lines.

Agricultural Lands with Recreational Influence

There were four transactions in the study that involved agricultural properties that, because of their location and natural amenity features, are recreationally influenced. They are all large acreage properties, ranging from about 3,000 to 7,900 acres and are predominantly comprised of native range. In two cases, the Yellowstone River is the principal amenity in question. In the third transaction, the property is located at the easternmost edge of the Crazy Mountain foothills in Wheatland County. The property in the fourth transaction has a small amount of Bitterroot River frontage and is a well-known elk wintering range. Table 2 presents information on each of these transactions.

The conclusions from the analyses of these transactions include the following:

- The interviews on the two large Yellowstone River properties indicate no adverse effects on price from the 500 kV lines. In fact, one of the buyers saw a major enhancement to his property from river bank stabilization designed to protect tower footings. This is a good example of the kind of site-specific issues that need to be considered when analyzing a particular property and that can importantly influence the effect on value of the transmission lines.
- The seller of the Wheatland County parcel attributed significant market resistance and ultimately a reduced sale price due to the 500 kV lines. Interviews with other parties familiar with the transaction agree that the transmission lines may have been a negative factor, but the property had other, more significant problems including, most importantly, that it was priced well above market and that the entry to the property was very cluttered and unattractive. This was complicated further by the fact that the market was generally aware that the seller was under financial duress.
- Although much smaller at 3,000 acres, the buyer of the Missoula County property said the location of the 500 kV lines across the northern part of the ranch had no effect on his purchase decision. The conservation easement allows the buyer to develop six residential lots on the Bitterroot River, and the buyer said that if the 500 kV lines

Table 1 Production Agricultural Lands

	Transaction Reference	Acres	Native Range Lands	Crop Lands	Report	Evidence Supporting Price Effect	Comments
1	Rosebud Trx 1	5,278	100%		Sale Analysis	no	No evidence of HVTL effect on price.
2	Treasure Trx 1	640	100%		Interview Summary	no	Buyer said no effect on operations or purchase price.
3	Treasure Trx 2	4,480	85% to 90%	10% to 15%	Interview Summary	no	Buyer said HVTL are a pain to farm around. Requires extra care in flying Super Cub when checking stock water. HVTL affected relocation of historic cabin.
4	Yellowstone Trx 32	1,441	28%	72%	Sale Analysis	no	Buyer said HVTL had "absolutely no effect" on transaction.
5	Yellowstone Trx 50	160		100%	Interview Summary	no	"Farming around and under the guy wires is a nuisance."
6	Yellowstone Trx 59	300	8%	92%	Sale Analysis	no	"Guyed towers are a bigger problem to farm around than self-supporting towers. Transmission lines create a nuisance for farming, but not for grazing." No effect on sale price.
7	Yellowstone Trx 61	320	16%	84%	Sale Analysis	no	"Farming under guy wires is a nuisance," but said did not affect price he was willing to pay.
8	Yellowstone Trx 79	160	100%		Sale Analysis	no	"Trailers and gates near or under the transmission lines need to be grounded"
9	Yellowstone Trx 108	10,988	100%		Sale Analysis	no	"Transmission lines create an unwanted access route for hunters." But, no effect on acquisition price or use.
10	Yellowstone Trx 128	250	5%	95%	Sale Analysis	no	"Towers are a nuisance for farming." But, no effect on sale price.
11	Stillwater Trx 2	2,104	82%	18%	Sale Analysis	no	Two ranches on the market at the same price, one crossed by the HVTL and one not; buyer chose property not crossed and said would not pay same price for one that was.
12	Stillwater Trx 5 & 6	1,302	87%	13%	Sale Analysis	no	Buyer sensitive to view shed issues, but this transaction not affected. "Transmission lines may have had an impact on Big Coulee as a whole," but not on the buyers' specific purchase.
13	Stillwater Trx 7	332	33%	67%	Sale Analysis	no	"Wouldn't typically have paid this much for a half section crossed by transmission lines, but motivated by assemblage."
14	Stillwater Trx 10	3,400	75%	25%	Interview Summary	no	Major concern with lightning hitting HVTL and then arcing to the ground and starting fires.
15	Stillwater Trx 12	1,059	4%	96%	Sale Analysis	no	Buyer said HVTL did not influence his decision.
16	Golden Valley Trx 8	640	100%		Sale Analysis	no	Buyer complained that service vehicles impacted wet roads; but no effect on purchase price paid.
17	Golden Valley Trx 13	638	100%		Sale Analysis	no	Buyer uses as grazing land and said HVTL had no effect on price.
18	Golden Valley Trx 17	160	12%	88%	Sale Analysis	no	No effect on price according to buyer.
19	Wheatland Trx 9	314	100%		Sale Analysis	no	Buyer concerned with lightning strikes killing cattle close to the HVTL, but no effect on purchase price.

had impacted these building sites, his purchase decision would definitely have been affected. This reinforces the point that, despite the recreational/residential interest, the size of the property is critical in determining the likelihood of impact. Size does not eliminate the possibility of effect; it just makes it increasingly unlikely.

- The Sale Analysis Reports on three of these properties and the Interview Summary Report on the fourth found no indication of adverse effect of the transmission lines on sale price.
- Even though there is recreational influence here, recreational use is small (and largely speculative) relative to agricultural use. The current use is still production agriculture, which tends to define the set of property attributes most relevant to the market.
- Size of the property is critical. All four properties are large (greater than 3,000 acres), which dilutes the overall impact of the HVTL on recreational use. If there is contemplated recreational use, the probability of there being a conflict with views of the transmission lines in the siting of residential improvements goes down rapidly as the size of the property increases.
- As soon as there is some recreational influence, the transmission lines are likely to result in some reduction in the size of the potentially interested buyer pool. The larger the recreational influence, the

larger the likely reduction in the buyer pool. Since all properties studied here had a relatively small recreational influence, the influence on the buyer pool appears to have been correspondingly small.

- For this property type, the larger the property and the smaller the recreational influence, the less likely are negative price effects and extended marketing periods.

Agricultural Lands with High Amenity Recreation and Natural Features

The previous property type, Agricultural with Recreational Influence, represents properties where, because of some combination of location and amenity, there is recreational influence but the agricultural use continues to dominate. The property type Agricultural Lands with High Amenity Recreation and Natural Features represents the case where these two influences begin to even out; or, in some cases, the recreational use may even come to dominate. This property type sometimes may be referred to as *recreational ranch* or *trophy ranch*, and the recreational amenity or natural feature(s) will frequently be the defining feature of the property. Examples might include a property with frontage on a famous Montana river or a property with important historic attributes.

Table 2 Agricultural Lands with Recreational Influence

	Transaction Reference	Acres	Native Range Lands	Crop Lands and/or Other	Report	Evidence Supporting Price Effect	Comments
1	Yellowstone Trx 1	3,863	76%	24%	Sale Analysis	no	Buyer commented that river bank stabilization undertaken to protect HVTL tower provides major benefit to his property; but stated, "Transmission lines are a hazard for aerial applicators."
2	Yellowstone Trx 9	7,943	85%	15%	Sale Analysis	no	Buyer said HVTL are a hazard when flying his helicopter. No other effect on operations or purchase.
3	Wheatland Trx 4	4,380	93%	7%	Sale Analysis	no	HVTL probably thinned the buyer pool, but property suffered from several other, more serious issues at time of sale.
4	Missoula Trx 22	3,000	99.5%	0.5%	Interview Summary	no	Given specific location of the HVTL on the property, no effect on the transaction.

The three transactions shown in Table 3 represent properties of this type. The first transaction involved the purchase of 332 acres south of Townsend in Broadwater County with over two miles of Missouri River frontage. The second involved the purchase in Powell County of two parcels totaling about 1,200 acres with mountain views and Little Blackfoot River frontage. The third was a very large transaction in southern Powell County which involved the transfer of approximately 50,000 deeded acres together with nearly 30,000 acres of public land leases.

Sale Analysis Reports were prepared for two of the three properties and an Interview Summary Report was completed for the third. The conclusions based on these transactions are as follows:

- The Broadwater County property sold in 2006, and there was conflicting interview evidence on the effect of the 500 kV lines on the transaction. The market data, however, was consistent with the interview of the individual that had operated the property for 30 years and is a real estate broker. He indicated no effect of the transmission lines on the 2006 sale price or marketing period.
- The smaller of the two Powell County transactions was analyzed, and there is no evidence suggesting adverse effect of the transmission lines in the purchase by the current owner.
- The sheer size and complexity of the larger Powell County transaction swamps any transmission line effects. The broker in the transaction said the 500 kV lines were not an issue in the sale.

- In summary, the probability of HVTL effects on these properties is low because:
 - The properties tend to be large.
 - The properties tend to have unique combinations of natural features and attributes, making them scarce with few substitutes.
 - There are so many other property attributes important to their buyers that the transmission line effects become diluted.
- There do not appear to have been any transmission line effects in the three transactions studied here.

Rural Residential Subdivisions—Lot Size Less Than 5 Acres¹⁶

The fourth property type encountered along the 500 kV lines was Rural Residential Subdivisions—Lot Size Less Than 5 Acres. There were two properties of this type that sold in the Town of Colstrip in Rosebud County and then multiple transactions were studied in four subdivisions in Sanders County. Table 4 identifies these transactions. The conclusions from these transactions are as follows:

- There was no sale price or absorption effect on the two Colstrip transactions. Parties to both transactions indicated that the housing market there was very tight and that the transmission lines were not a consideration.
- The four Sanders County small lot subdivisions demonstrate the conditions where property values are most vulnerable:

Table 3 Agricultural Lands with High Amenity Recreation and Natural Features

	Transaction Reference	Acres	Native Range Lands	Crop Lands and/or Other	Report	Evidence Supporting Price Effect	Comments
1	Broadwater Trx 65	332	15%	85%	Sale Analysis	no	Conflicting interview evidence, but market evidence is consistent with interviewee indicating no effect of HVTL on price.
2	Powell Trx 13	1,171	81%	19%	Sale Analysis	no	Purchase not affected by HVTL.
3	Powell Trx 18	50,000	65%	35%	Interview Summary	no	HVTL had no effect on transaction according to selling broker.

16. Analysis of the Sanders County subdivisions was a substantial research undertaking and required considerable documentation to fully assess the procedures followed and the findings. It is only possible to provide a very brief summary of results here. The interested reader is referred to Chalmers, *Final Report: High Voltage Transmission Lines and Montana Real Estate Values* available from NorthWestern Energy.

- The lots are small implying little flexibility in siting improvements.
 - The use is exclusively residential, i.e., no related rural uses such as livestock, farm or hay plots, pasture, exclusive hunting or fishing access, etc.
 - The lots are relatively homogeneous so there are substitutes similar in most respects except for the transmission lines. Another way of saying this is that the transmission lines are a conspicuous differentiator of the lots.
- Cove View Estates had the clearest price effect where the lot adjacent to the lines sold for 50% of the sale price of the lot of the same size immediately next to it.
 - In the Salish Shores Subdivision, the lines pass over two lots which sold at the same price as unaffected lots. Net of the easement area, however, the two lots are from 50% to 100% larger than the other lots in the subdivision. From the developer’s perspective the loss is proportional to the extra land required to sell these lots at the same price. From a market perspective, buyers would not likely be willing to pay double for a 1.2 acre lot relative to a .6 acre lot, so directly applying the size allowance would overstate the purchase price effect. Nevertheless, the purchase price effect of doubling the lot size as a measure of impact would be significant.
- In Panorama Estates, the implied listing price discount is on the order of 30% which aligns with the extent to which the lots are encumbered.
 - Absorption effects were evident at Panorama Estates, with marketing time doubled for affected lots relative to unaffected lots. Salish Shores was interesting in that it was hugely successful, selling out 44 lots in two years. Nevertheless, the 8 lots closest to the transmission lines took an average of 10 months to sell, while the other 36 lots sold in an average of 2 months. Cove View and Waterfront Estates had a much smaller number of lots and there was no absorption effect.
 - In general, with these smaller lots, encumbrance was more of an issue because of siting constraints, as was adjacency, although it was surprising that no proximity effects on sale price were found beyond the adjacent lots. Proximity did impact marketing time at Salish Shores and at Panorama Estates.
 - A 100% impact on the absorption period may not be a serious consideration in a very active market, but in the more distressed market of today it could mean an increased holding period of many years.

Table 4 Rural Residential Subdivisions—Lot Size Less Than 5 Acres

	SubD/Lot#	Lot Size (acres)	Report	Evidence Supporting Price Effect	Evidence Supporting Absorption Effect	Comments
1	Rosebud Trx 2	0.240	Sale Analysis	no	no	Buyer concerned with health effects and radio reception interference.
2	Rosebud Trx 3	0.246	Interview Summary	no	no	Broker commented that housing is so tight in Colstrip that HVTL have no impact on value.
3	Panorama Estates (Sanders Cty)	approx 1.0	SubD Study	yes	yes	Evidence of price effects is sketchy; but absorption period for encumbered lots is at least 2 times that for unencumbered lots.
4	Cove View Estates (Sanders Cty)	approx 3.0	SubD Study	yes	no	Lot abutting HVTL sold for 50% less than adjacent two lots of about the same size. No absorption effect.
5	Waterfront Estates (Sanders Cty)	1.5 to 3.5	SubD Study	no	no	Sold out 11 riverfront lots in one year; no evidence of price or absorption effects.
6	Salish Shores #1 (Sanders Cty)	approx 1.0	SubD Study	yes	yes	The two encumbered lots are about twice the size (net of the easement) of the other lots and sold at the same price. Lots closest to the line sold more slowly.

Rural Residential Subdivisions—Lot Size 5 Acres or Greater

The analysis of Rural Residential Subdivisions—Lot Size 5 Acres or Greater is based on three properties in rural subdivisions south of Missoula and on three Sanders County Subdivisions. Each of these is identified in Table 5.

Although the property type is the same here, the study methodology varied across the two locations. The Missoula area properties were studied using comparable unaffected sales as summarized in Sale Analysis Reports. The three Sanders County subdivisions were studied with a combination of paired sales, interviews, and absorption studies.

The conclusions based on these transactions are as follows:

- The two Missoula subdivisions provide a good example of how the visual intrusion of the lines can be highly variable depending on site-specific considerations. The lots are of similar size (+/- 10 acres), but at Evans Ridge they pass below the subdivision at the base of an elevated knob and the developer of the subdivision had only the vaguest recollection that they were even there. At Avery Acres on the other hand, the lot and the lines are on the same grade, and broker

interviews attribute a considerable discount to the sale price due to the lines. The Sale Analysis Report concludes that the price effect may be on the order of 20% to 25%. It also appears that there was an extended marketing period.

- Two of the three Sanders County subdivisions showed sale price effects, and one showed an adverse effect on marketing time.
- Brown's Estates, the first of the Sanders County subdivisions is a 34-lot subdivision with most of the lots between 5 and 10 acres in size. It has open, unobstructed views of a 350-foot wide corridor containing the 500 kV line and two 230 kV lines. The adjacent lots have clearly suffered both a sale price effect of 25% to 30% and, at a minimum, a doubling of the marketing time relative to nonadjacent lots. This is pretty much a worst case, where the lots are relatively small, the use is primarily residential, there are good substitutes with much less influence from the lines, and the lines dominate the landscape in their immediate vicinity.
- Riverside Estates is another Sanders County Subdivision that sold out very quickly in 2001. There are two very similar lots, each 9.5 acres in size but one has 3.4 acres encumbered by the 500 kV line

Table 5 Rural Residential Subdivision—Lot Size 5 Acres or Greater

	SubD/Lot#	Lot Size (acres)	Report	Evidence Supporting Price Effect	Evidence Supporting Absorption Effect	Comments
1	Evans Ridge Lots 7 & 8 Missoula Trx 14 & 15	8.12 & 7.65	Sale Analysis	no	no	No indication of HVTL impacting price.
2	Avery Acres Lot 1 Missoula Trx 20	10.78	Sale Analysis	yes	yes	Evidence indicating 20% to 25% price effect on 10-acre lot.
3	Missoula Trx 58	approx 30.0	Sale Analysis	no	no	Buyer apparently secured a favorable price; but no evidence suggesting it was related to the HVTL.
4	Brown's Estates (Sanders Cty)	approx 5.0	SubD Study	yes	yes	Lots abutting the HVTL had at least 2 times the absorption period and sold for 25% to 30% less.
5	Riverside Estates (Sanders Cty)	approx 10.0	SubD Study	yes	no	Lots fully discounted for extent of the encumbrance.
6	Elk Park Estates (Sanders Cty)	approx 5.0	SubD Study	no	no	No indication of HVTL impacting price.

easement and its sale price was fully discounted in the same proportion as it was encumbered.

- The third Sanders County subdivision studied was Elk Park Estates. No sales data was available but the developer was adamant that there were no discounts for the lots closest to the transmission lines and there was no absorption effect evident in the timing of the original lot sales.

Large Acreage Rural Residential Tracts

There are four properties that are Large Acreage Rural Residential Tracts; these are identified in Table 6. They range in size from 60 acres to 591 acres with a residential use that can be either seasonal or year around. A distinguishing feature of these properties is that they represent a broader set of uses often including some farming, livestock grazing, horse pasture, hay ground, etc. Further, even though they may have been carved out of larger holdings, they tend to be one-of-a-kind properties with no subdivision feel. Of the four property transactions identified in the study, Sale Analysis Reports were able to be prepared for three and an Interview Summary Report was able to be prepared for the fourth.

The conclusions for these transactions include the following:

- These properties are much less vulnerable to transmission line effects than the smaller lot residential subdivisions for three principal reasons:
 - The properties are larger, providing more flexibility in building site location.
 - The intended uses are more diverse, with residential use still important but considerations relevant to other rural property uses playing an important role.

- The properties have their own unique characteristics with no immediate supply of close substitutes not affected by HVTL. To the extent there are substitutes, the transmission lines are not likely to be the principal differentiator.

That being said, the properties are of a scale where the transmission lines are still a conspicuous attribute of the tract, and there is likely to be some thinning of the potential buyer pool as a result. For the four sales researched here, however, the transmission lines do not appear to have affected either the sale price or the marketing period.

Rural Recreational Tracts/Cabin Sites

Rural Recreation Tracts/Cabin Sites are distinguished from the Large Acreage Rural Residential Tracts by the fact that their primary orientation is recreation not residential. They are more common in the western counties and frequently are small inholdings within national forests.

Access is often seasonal and the tracts are typically densely timbered. Many remain unimproved although some have modest cabin type residential improvements. Utilities may or may not be available to these tracts.

Table 7 identifies the 14 transactions involving properties of this type that were close to, or crossed by, the 500 kV lines. These properties ranged in size from 16 acres to 197 acres. Sale Analysis Reports were able to be prepared for 10 of the 14 properties, with Interview Summary Reports for the four remaining properties.

The conclusions from these transactions are as follows:

- Buyer criteria are quite different for these tracts than for rural residential property and generally are less sensitive to transmission line effects. The

Table 6 Large Acreage Rural Residential Tracts

	Transaction Reference	Acres	Report	Evidence Supporting Price Effect	Evidence Supporting Absorption Effect	Comments
1	Stillwater Trx 14	60	Sale Analysis	no	no	No effect on purchase decision or use of the property.
2	Broadwater Trx 21	591	Sale Analysis	no	no	No market evidence of HVTL effects.
3	Broadwater Trx 39	160	Sale Analysis	no	no	Has oriented built improvements so as to face away from the lines. HVTL did not impact purchase decision.
4	Jefferson Trx 2	143	Interview Summary	no	no	Based on seller interview only.

buyers are less focused on year-round residential use and more focused on seasonal recreational use, often related to access to public lands for purposes of exploration, hunting, and fishing,

- The effect of the lines will depend on the location of the lines relative to access routes and the location of potential building sites. Given the size of many of these tracts and the screening effect of topography and tree cover, the effects of the lines on the site may not be significant.
- The unique recreational character of the site will frequently dominate considerations relative to the transmission lines. This will often relate to hunting or access to public lands for other recreational purposes. Some of these inholding tracts provide exclusive access to vast areas of National Forest land, and in this context, the transmission lines may be an insignificant consideration.
- Adverse sale price effects may have occurred in 2 of the 14 transactions, but the evidence is far from conclusive. In the remaining 12 transactions, both interview results and sale price analysis indicate no effect of the 500 kV line on the price at which these transactions occurred.

Summary

This article summarizes findings from analysis of 49 individual transactions plus the analysis of 7 residential subdivisions in Sanders County. The properties studied stretch over 640 miles of Montana countryside and represent a wide range of terrain, character, and land use. When trying to generalize about the considerations that stand out when considering the potential effect of transmission lines on these properties, three issues are dominant.

- **Use.** The more heavily oriented the property is toward residential use, the more vulnerable it is to transmission line impact. Properties oriented more toward purely recreational use are much less vulnerable to HVTL impact, and properties with pure agricultural use show no price effects of transmission lines whatsoever.
- **Size.** The larger the property, the less vulnerable it is to transmission line impact. Larger properties have a greater likelihood that the location of the lines will not interfere with the use of the property; or, if they do interfere, that there are siting alternatives for dwelling or recreational improvements, which can mitigate the impacts.

- **Substitutes.** The availability of otherwise comparable substitutes is a third factor affecting the vulnerability of a property to transmission line effects. If there are alternative properties very similar to the subject except for the transmission line, there can be significant price and absorption effects. On the other hand, if a property is relatively unique and the transmission lines are but one of several differentiating factors, the property is less vulnerable to price and absorption effects.

As summarized earlier, there has been extensive research on the effects of high-voltage transmission lines on improved residential properties. However, the locations and development patterns of the areas previously studied are so different from the rural West that it is difficult to determine how much applicability they have in the West. In particular, it has been uncertain how the recreational influence on agricultural lands and residential properties would influence their vulnerability to transmission line effects. The suspicion was that this would increase their sensitivity.

Surprisingly, this seems not to be the case. When moving from residential subdivisions to large acreage rural residential tracts and rural recreational tracts/cabin sites, three significant things change. First, the range of uses is broadening, the properties are getting larger, and the properties tend to have their own unique combination of attributes, i.e., there are fewer close substitutes. Whenever the intended use of the property goes beyond pure residential, additional property attributes become relevant (horse pasture, access to hunting or fishing, all season access, specific viewsheds, etc.), which can outweigh the influence of the transmission lines. Second, the properties are getting larger, which reduces the extent of influence of the transmission lines. Finally, the transmission lines become one of many differentiating factors as opposed to the dominant differentiating factor as is the case in some residential subdivisions.

In the case of agricultural lands, the situation is a little different; but again, the effects of increasing recreational influence are not what might be expected. In this case, the starting point is production agricultural property whose value is unaffected by the lines. With modest levels of recreational influence added, there is some speculative interest beyond agricultural use that may be influenced by the transmission lines, but the basic agricultural characteristics of the property continue to dominate

Table 7 Rural Recreational Tracts/Cabin Sites

	Transaction Reference	Acres	Report	Evidence Supporting Price Effect	Evidence Supporting Absorption Effect	Comments
1	Yellowstone Trx 3	176	Sale Analysis	no	no	Buyer said not planning to build home on site, therefore HTVL had no effect; purely a recreational property for hunting and fishing.
2	Broadwater Trx 33	160	Sale Analysis	no	no	Property purchased for hunting and access to adjacent public lands. HVTL had no effect on transaction or price.
3	Broadwater Trx 53	130	Interview Summary	no	no	No effect of HVTL on purchase decision or transaction.
4	Broadwater Trx 56	69	Interview Summary	no	no	Buyer assumed the HVTL had no effect as property was already heavily impacted by mining and off-road vehicle use.
5	Jefferson Trx 42	16	Interview Summary	possible	no	No effect on purchase decision according to buyer, as they can orient built improvements to avoid the HVTL. Selling broker maintains HVTL have negative impact on sale price, but did not supply market data to support his opinion.
6	Granite Trx 2	71	Sale Analysis	no	no	No evidence of price effect. "Absolutely no effect," according to seller.
7	Granite Trx 4	79	Sale Analysis	no	no	HVTL are just one of many issues impacting the property.
8	Granite Trx 8	20	Sale Analysis	no	no	Buyer not happy that utility crew cleared brush in right of way, but no effect on purchase.
9	Granite Trx 16	20	Sale Analysis	no	no	Using property strictly as a recreational retreat. No HVTL effect on purchase price.
10	Missoula Trx 45	40	Interview Summary	no	no	Based on interview with the seller.
11	Mineral Trx 9	160	Sale Analysis	possible	no	Based on selling broker input, there may have been a price effect; buyer says principal motivation was recreation and hunting, as well as timber, and HVTL were not an issue.
12	Mineral Trx 10	160	Sale Analysis	no	no	No evidence of price effect.
13	Mineral Trx 11	160	Sale Analysis	no	no	No evidence of HVTL impact on transaction.
14	Mineral Trx 32	197	Sale Analysis	no	no	No evidence of HVTL price effect. Buyer said they had no impact on transaction or price.

which are indifferent to the lines. As we get to agricultural lands with high amenity recreation and natural features, the combination of very large size and the importance of the amenity and natural features reduce the probability that the lines will have a material effect on value.

Part of what may seem surprising or counter-intuitive to many is explained by psychologists as the framing effect. When transmission lines are discussed in the abstract as an attribute of property with some recreational use, it will almost universally be a negative factor. But the effect on a transaction (price and marketing time) will depend on the full set of positive and negative attributes of a property. As a property transitions from either pure agriculture or pure residential, and assumes some recreational use, the number of relevant attributes increase that may have the effect of diluting the transmission line effect. This will be reinforced if the average size of the properties is increasing as well.

The second unanticipated result was the relative unimportance of the extent to which a property is encumbered by a transmission line easement. It would appear, for example, in the case of agricultural property that the purchase of the easement is a windfall benefit of sorts to the current owner, who will not have to make any discount in sale price for the easement if the property is sold.

Finally, over the past several years, multiple regression analysis has become the dominant methodology applied to the question of transmission line impact on real estate values. And indeed, if the objective is to determine whether there is a generalizable, statistically significant relationship between transmission lines and real estate value, multiple regression over a large number of observations is unquestionably the definitive methodology. But, it must be recognized that the result is essentially an average. It addresses the question of whether there is a consistent effect between the variables in

question. The absence of an effect in this context can be misinterpreted to mean that transmission line impact is a nonissue. On the contrary, transmission lines may be a big problem under certain specific circumstances, but those circumstances are sufficiently rare that they do not show up in the statistical analysis. Further, the statistical analysis does not help identify those circumstances where transmission lines may have an impact.

The research reported here is certainly consistent with the findings in the published literature that property value effects cannot be presumed and are generally infrequent. On the other hand, the current research reminds us that transmission lines can create significant price and absorption effects and provides guidance in identifying circumstances where these effects are most likely to occur.

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Web Connections

Internet resources suggested by the Y. T. and Louise Lee Lum Library

AGAlert, The Weekly Newspaper for California Agriculture

<http://www.agalert.com/story/?id=1054>

Electric Power Research Institute

<http://my.epri.com>

Electric Transmission Line Construction Standards and Policies, Illinois Department of Agriculture

<http://www.agr.state.il.us/Environment/LandWater/electrictransmissionlineconstructionstds.pdf>

Environmental Impacts of Transmission Lines, Public Service Commission of Wisconsin

<http://psc.wi.gov/thelibrary/publications/electric/electric10.pdf>

Federal Energy Regulatory Commission—Transmission Line Siting

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

U.S. Department of Energy

<http://www.energy.gov>

U.S. Energy Information Administration

<http://www.eia.gov/>