Pipelines and Property Values: An Eclectic Review of the Literature

Louis Wilde, Christopher Loos, and Jack Williamson

February 15, 2012

[Forthcoming in Journal of Real Estate Literature, Vol. 20, No. 2, Fall 2012]

1 Louis Wilde is a Director at Gnarus Advisors LLC and Visiting Associate in Economics at the California Institute of Technology. Christopher Loos is a Director at Gnarus Advisors LLC. Jack Williamson is President of Almost Convex Economics, Inc. Portions of this review are adapted from a project funded by the Kern River Gas Transmission Company. The authors thank the editors and referees for helpful comments and discussions.
I. Introduction

The incidents involving natural gas pipelines in September 2010 in San Bruno, California and in February 2011 in Allentown, Pennsylvania, have brought widespread media attention to the risks associated with natural gas pipeline systems. This paper concerns whether proximity to pipelines, especially natural gas pipelines, has any effects on residential property values. As such, it is part of a broad literature on the effects of proximity to disamenities on property values, particularly hazardous or potentially hazardous sites. Generally that literature can be divided into studies dealing with mere proximity to a hazardous or potentially hazardous site and studies dealing with the actual presence of a hazard or potential hazard.

A comprehensive bibliography of studies of the effects of proximity to airports, high-voltage transmission lines ("HVTLs"), transportation corridors, and landfills and hazardous waste facilities as of the mid-1990s can be found in Bell (1999). That book also includes a comprehensive bibliography of studies of the effects of contamination on both residential and non-residential property values as of the mid-1990s. Review articles include Farber (1998), Boyle and Kiel (2001), Jackson (2001), Palmquist and Smith (2002), and Kiel (2006).

This paper falls in the former of the two categories described above, that is, studies dealing with proximity to a hazardous or potentially hazardous site. Within that category is a sub-class of studies dealing with utility corridors, particularly HVTLs, which includes a relatively small set of studies dealing

---


3 See, e.g., Kiel and Williams (2007).

4 See, e.g., Dotzour (1997) or Rogers (2000).

5 Bell (1999), pages 89-97.

6 Bell (1999), pages 142-151.

7 Some of the papers referenced in these articles can be found in Roddewig (2002). See also the bibliographies in Simons (2005), especially chapters 4 and 5.
with the effects of proximity to pipelines as well as the effects of pipeline releases or ruptures on property values.\(^8\)

This literature review is eclectic for at least two reasons. It focuses primarily on pipelines and on studies using actual sales data.\(^9\) As noted above, there are a limited number of such studies, and many are not published in peer reviewed journals. The inclusion of non-peer reviewed studies in a review such as this is not uncommon; in fact, many of the studies, review articles, and bibliographies cited in this paper include references to such studies. Among these are so-called “working papers” by academicians, “white papers” by researchers at public and private institutions, and papers presented at meetings of professional societies or conferences. Some of the studies we discuss fall into these categories. In addition, they also include work produced by researchers acting as expert witnesses in the context of litigation, which we also herein discuss. Such work is worthy of consideration for several reasons. Most obviously, to the extent that it adds to the body of knowledge regarding a particular issue, it should not be ignored a priori. Furthermore, while not always peer reviewed in the strict sense of the term,\(^10\) studies relied upon by expert witnesses typically are subject to scrutiny by experts retained by opposing parties and must pass muster with respect to admissibility.\(^11\) This said, it is important to remember when discussing the results of a study produced by an expert witness in a lawsuit, that there often exist antipodal results produced by another expert witness retained by an opposing party in the lawsuit.\(^12\)

\(^8\) Early work on the effects of high voltage transmission lines on property values includes Colwell (1990) and Delaney and Timmons (1992). For later studies see Des Rosiers (2002) and Wolverton and Bottemiller (2003).

\(^9\) We assume that property value equals market price. A discussion of when, if ever, this fails to be true is beyond the scope of this paper. See, however, section III.D below which provides references related to the question whether real estate markets are informationally efficient.

\(^10\) The peer review process varies significantly across publications, but even for the most demanding academic journals it is far from perfect. This is not the place to debate the meaning of peer review; we simply note that because a study has been “peer reviewed” does not imply that it is error free or that any remaining errors do not have a significant impact upon the conclusions drawn from the study. Furthermore, in the authors’ view, when a researcher retained as an expert witness for one party in a lawsuit publishes a study based on that work but the researcher retained as an expert witness by the opposing party does not, this should not subsequently be viewed as a reflection on the relative validity of the two studies or the conclusions based upon them by the two researchers.

\(^11\) Recent court rulings on the admissibility of expert witness testimony emphasize that it must rely on the same techniques and meet the same standards as non-expert witness work. For a discussion of the issues and examples of excluded testimony regarding claims of damages from property value diminution due to contamination see Wilde (2009).

\(^12\) All of the material cited in this paper has been provided to the editor. It is also available upon request from the authors.
The eclectic nature of this literature review also is reflected in the discussion of “related literature” offered in section III.D. This discussion, while not intended to be comprehensive, covers a handful of papers related to various themes introduced by the studies reviewed in sections III.A through III.C, and offers several avenues of future research suggested by them.

Our review of studies of the effects of pipelines on property values indicates that there is no systematic evidence, based on actual sales data, that proximity to pipelines reduces property values. In addition, there is no systematic evidence, based on actual sales data, that pipeline ruptures, even catastrophic ones, reduce property values. However, the extant literature is limited, so it should not be presumed without future analysis of actual sales data, that such incidents as in San Bruno and Allentown, for example, have no effect on property values. Furthermore, the reviewed research suggests that hypothetical surveys of actual or potential market participants may not be a good substitute for systematic analysis of market data, as they may overstate the effects, if any, of proximity to disamenities, including pipelines, on property values. Whether this is, in fact, true remains an open question pending further research.

The remainder of this paper is organized as follows: Section II overviews the nature of natural gas pipeline risks, Section III provides an extensive review of the available literature, published and unpublished, and Section IV offers a brief summary and conclusions.

II. Natural Gas Pipeline Risks

As noted above, the topic of pipeline safety has surfaced dramatically on the national scene as a result of the incidents in September 2010 in San Bruno, California and in February 2011 in Allentown, Pennsylvania. Thus, a brief discussion of natural gas pipeline safety is in order even though the literature reviewed below deals with other kinds of pipelines as well. Overall, while the public concern is understandable, an informal review of the data tends to suggest that such events are relatively rare.

Natural gas supplies 25 percent of the total energy consumed in the US.\textsuperscript{13} To service that demand, the country has developed significant pipeline infrastructure. There are over 2.1 million miles of natural gas pipeline in the US, consisting of gathering lines, transmission lines, and distribution lines.\textsuperscript{14}

\textsuperscript{13} See PHMSA General Pipeline FAQs, http://www.phmsa.dot.gov.

\textsuperscript{14} See PHMSA General Pipeline FAQs, http://www.phmsa.dot.gov.
transmission line was involved in the recent San Bruno incident, while a smaller distribution line was involved in the Allentown incident.

Given their broad geographical reach and the volatile nature of the product conveyed, there is understandable interest in the safety of natural gas pipelines. The Department of Transportation ("DOT") Pipeline and Hazardous Material Safety Administration ("PHMSA"), acting through the Office of Pipeline Safety ("OPS"), administers the national regulatory program to assure safe natural gas transportation by pipelines. The OPS is responsible for regulating the safety of design, construction, operation, maintenance, testing, and emergency response of these systems. According to the PHMSA, “pipelines are the safest and most cost-effective means to transport the extraordinary volumes of natural gas” and “[r]elative to the volumes of products transported, pipelines are extremely safe when compared to other modes of energy transportation.”

Safeguards notwithstanding, there are numerous contributors to pipeline failures. The PHMSA tracks all incidents by pipeline type and collects extensive information on each incident and the physical characteristics of the line involved. Data compiled by the agency generally indicate that corrosion, material/weld flaws, and excavation damage are the three main causes of pipeline failure. Other causes of pipeline incidents include construction error, operator error, and malfunction of control systems or relief equipment. The media, in commenting on the recent San Bruno and Allentown accidents, has noted in particular that a pipeline’s age, configuration, and type of material play important roles in the likelihood of failure.

While empirical analysis of the data regarding pipeline incidents might be of independent interest, it is not the focus of this paper. Nevertheless, OPS statistics indicate a declining trend in the failure frequency from all causes. For example, the number of overall leaks due to corrosion from 2002 to 2009 decreased from 1,179 to 608, with significant incidents – defined as those resulting in property

---

15 Other agencies like the Department of Homeland Security ("DHS") Transportation Security Administration ("TSA"), the Department of Energy ("DOE"), and the Federal Energy Regulatory Commission ("FERC") also regulate these systems.


18 See, for example, the Arkansas Public Service Commission, Pipeline Safety Office, http://www.apscservices.info/PSOIndex.asp.

damage greater than $50,000 – averaging less than 10 a year, while serious incidents – those resulting in death and injuries – averaging around 1 per annum.\textsuperscript{20}

\section*{III. Literature Review}

\subsection*{A. Overview}

The empirical literature on the effects of proximity to oil and natural gas pipelines on property values based on sales data is small in terms of the number of papers (published or unpublished) and narrow in terms of subject matter. As far as we have been able to determine, it consists of (1) three published papers by Robert Simons, one of which is co-authored, dealing with oil pipeline leaks or ruptures;\textsuperscript{21} (2) three inter-related papers by William Kinnard, without and with Sue Dickey and Mary Geckler, only one of which has been published, dealing with the effects of proximity to natural gas pipelines on property values;\textsuperscript{22} and (3) miscellaneous other papers including a paper by Boxall, Chan, and McMillan (2005) on the effects of proximity to sour gas wells and flaring oil batteries on property values. The next three subsections of this paper deal with each of these sets of papers.

\subsection*{B. Oil Pipeline Leaks and Ruptures}

We begin with the papers dealing with the effects oil pipeline leaks or ruptures on property values. Chronologically, the first of these is Simons (July 1999). This paper deals with the effects on property values of an oil pipeline rupture in Fairfax County, Virginia in 1993 that caused the release of approximately 430,000 gallons of petroleum product. The release caused a surface spill, “with no evidence of groundwater contamination,” which flowed down a creek, “eventually ending up in the Potomac River several miles away.”\textsuperscript{23}

As described in Simons (1999), “Very few properties along the pipeline right-of-way were directly contaminated by the rupture, but a number of mostly residential downstream properties along the creek

\textsuperscript{20} See brochure titled “Pipeline Safety” prepared by the INGAA, http://www.ingaa.org/cms/6211/11402.aspx. In this context, “property damage” refers to injury to physical property, not property value diminution associated with raw land or improved properties.

\textsuperscript{21} Simons (1999), Simons (Summer 1999), and Simons, Winson-Geideman, and Mikelbank (2001).

\textsuperscript{22} Kinnard (1993), Kinnard, Dickey, and Geckler, (1994a); and Kinnard, Dickey, and Geckler (1994b). These three papers are closely related and are cited in Bell (1999) at page 90.

\textsuperscript{23} Simons (1999), page 256.
were impacted as the petroleum passed by their homes."\textsuperscript{24} Thus, the study deals with single family residences and townhouses which were encumbered by pipeline easements but were not actually contaminated by the 1993 release. The methodology was a “before and after” analysis using hedonic regression techniques.\textsuperscript{25}

For single-family residences, Dr. Simons began first with an analysis of 19 subject properties in North Fairfax County encumbered by pipeline easements that sold between 1990 and 1997. His control group for these properties consisted of 768 sales of other homes in the same subdivisions as the subject properties that were not encumbered by pipeline easements.\textsuperscript{26} The results of his hedonic regression model for these sales are shown in Table 2 on page 260 of Simons (1999). As shown there, the coefficient on the variable “sale on pipeline post-1993 rupture (0-no, 1-yes)” is -0.055 with a t-statistic of -1.68. Dr. Simons concludes that this “indicates a 5.5% reduction in the sales price, holding all other variables in the model constant.”\textsuperscript{27} Leaving aside the fact that the relevant coefficient is not statistically significant at the 95% level, a critical problem with this conclusion is that the hedonic regression model underlying it omits a key variable.\textsuperscript{28} In particular, Dr. Simons’ model includes variables for whether a sale was for a property encumbered by a pipeline easement and for whether such a sale occurred after the 1993 rupture, but it does not include a variable for whether a sale, encumbered or not by a pipeline easement, occurred after the 1993 rupture. As a result, the coefficient on the variable “sale on pipeline post-1993 rupture (0-no, 1-yes)” compares such sales to all sales not encumbered by a pipeline, not just those that occurred after the 1993 rupture. In other words, at best one can say that sales of properties encumbered by a pipeline easement after 1993 were lower, other things equal, than sales of all properties not encumbered by a pipeline easement, both before and after the 1993 rupture. The relevant question, however, is whether sales of properties encumbered by a pipeline easement after

\textsuperscript{24} Simons (1999), page 256.

\textsuperscript{25} Hedonic regression analysis is used to explain the value of a good by decomposing its market price into individual effects associated with the characteristics of the good. In the context of real estate, for example, these characteristics typically include such items as the number of bedrooms, the number of bathrooms, presence of a swimming pool, and, proximity to amenities or disamenities. See, e.g., the various books, reviews, and articles cited above.

\textsuperscript{26} Simons (1999), page 258. No information is given on how many of the subject homes sold before the rupture (March 1993) versus after.

\textsuperscript{27} Simons (1999), page 260.

\textsuperscript{28} The typical criterion for statistical significance is based on whether the 95% confidence interval for the estimated coefficient includes zero. A technical discussion of this standard is beyond the scope of this review.
1993 were lower, other things equal, than sales of properties not encumbered by a pipeline easement after 1993. It is impossible to answer the question using Dr. Simons’ model.  

Besides analyzing single-family residences in North Fairfax County, Simons (1999) also conducts separate hedonic regression analyses of the effects of the rupture on single-family residences and townhouses in all of Fairfax County. With respect to single-family residences, he reports no statistically significant results. However, the actual hedonic regression model is not shown, making it impossible to ascertain if the omitted variable problem which greatly limits the generalizability of his results for single-family residences in North Fairfax County also applies to his results for single-family residences in all of Fairfax County. Of course, this leaves open the possibility that the model does omit the key variable and that if it were included, statistically significant results would be obtained. On the other hand, the results of the hedonic regression model for townhouses in all of Fairfax County are shown in Table 4 on page 262 of Simons (1999), and in this case there is no omitted variable problem. The results shown there indicate a decrease in the value of townhouses encumbered by pipeline easements after the 1993 rupture as compared to before of 2.6%, controlling for changes in the value of townhouses not encumbered by pipeline easements. While this effect is relatively small, it appears to be based on sound methodology.

Chronologically, the second Simons paper is Simons (Summer 1999). This paper analyzes the terms and results of a property buy-out and settlement agreement resulting from a lawsuit alleging long-term leakage from a pipeline carrying petroleum products in northeast Ohio. Because the transactions do not represent arms-length transactions between typically motivated buyers and sellers, the paper provides only very limited insight into the actual impacts of the leakage, if any, on the market value of properties adjacent to the pipeline. As such, we offer no further discussion of it in this paper.

The final paper dealing with the effects of oil pipeline ruptures on property values is Simons, et al. (2001). This paper deals with the effects of an oil pipeline rupture in Prince George County, Maryland, in April 2000. The released oil initially flowed in a creek and surrounding marsh area. It subsequently

---

29 This is an example of an omitted variable misspecification and is discussed at length in Rogers (2000). The issue is not simply one of interpretation. A proper “before and after” hedonic regression analysis of the effects of a contamination event requires proper model specification as therein outlined.

30 The additional variable that eliminates the problem is labeled “TH sale post-1993 rupture (0-no, 1-yes)” in Table 4. As discussed above, no analogous variable is present in Table 2. Both specifications cannot be correct.

31 Simons identifies 21 properties that were bought and then resold by the responsible party. Of the 21, 11 were resold at or very close to 20% less than the purchase price. No evidence is offered that either the initial purchase prices or the re-sale prices reflect market value.
spread to the Patuxent River where it had a potential impact on up to 10 miles of shoreline. Simons, et al. (2001) reports the results of a hedonic regression model analyzing the effects of the release on both impacted waterfront properties and those “interior” properties with “ownership rights to an impacted beach area.” There were three of the former and 32 of the latter. The reported results indicate no statistically significant effects on waterfront properties but did show a statistically significant average decrease in the value of “interior” properties of approximately 11%.

Even within the confines of Simons, et al. (2001), it is clear from the specification shown in Table 2 on page 415 that the key hedonic regression model in the paper omits key variables. But there is an additional, significant problem with the reported analysis which goes beyond the paper itself. In particular, although the authors never acknowledge it in the paper, the analysis reported was part of a consulting assignment associated with a class action lawsuit. This case ultimately was captioned Anthony Williams, et al. v. Potomac Electric Power Company, et al. (“PEPCo”). In the course of that litigation, certain problems with the analysis described in Simons et al. (2001) were identified, and in response additional analyses were conducted by Dr. Simons that were not subsequently published. As next described, Dr. Simons’ revised results fail to support, and ultimately contradict, his initial conclusions.

Specifically, between the time Dr. Simons conducted the analysis reported in Simons, et al. (2001) and the time he testified in PEPCo, he updated his analysis with additional sales data. In the process of doing so, among other things, Dr. Simons also eliminated certain non-arms length sales that were

33 Simons, et al. (2001), page 413.
34 See Simons, et al. (2001). Table 2 and discussion page 415.
35 A number of needed area dummy variables are omitted as per Rogers (2000). The authors analyze two subject areas, waterfront properties with beaches that were impacted and interior properties with ownership rights in beaches that were impacted. Simple dummy variables for each of these types of properties as well as dummy variables which are interacted with these with a post-spill time dummy variable are needed.
37 Issues related to the conclusions reached in Simons, et al. (2001) were first reported in Wilson (2004).
38 “[W]e did two rounds of research. One was from the first year’s sales season, which included sales from May 15, 2000 up until October 4, 2000. We found there there [sic] were 32 oiled interior properties with access rights in waterfront property and three waterfront sales over that time period. Then we recently redid our analysis and now we have a total of 65 sales, of which seven waterfront sales have occurred up from three and a total now of about 58 interior properties with access in waterfront property.” Motions Hearing before the Honorable Peter J. Messitte, United States District Judge, Anthony Williams, et al. v. Potomac Electric Power Company, et al., In the United States District Court for the District of Maryland Southern Division, Civil No. PJM-00-1429. October 9, 2001, page 169. (“PEPCo Hearing”).
previously included in his analysis.\textsuperscript{39} As a result of these changes, at least one specification of Dr. Simons’ hedonic regression model showed a statistically significant decrease in the value of waterfront properties of 12% – 13% but no statistically significant effects on interior properties, essentially flipping the published results.\textsuperscript{40} The details of this revised model are not published and are not available for review.

\textbf{C. Proximity to Natural Gas Pipelines}

In the final analysis, given the limitations on data and the technical problems, little can be definitely concluded from the published papers dealing with the impacts of oil pipeline ruptures on property values. The situation is somewhat better, but not ideal, regarding the three Kinnard papers dealing directly with the effects of proximity to natural gas pipelines on property values: Kinnard (1993) and Kinnard, et al. (1994a, 1994b). Kinnard (1994b) is merely a published summary of the results obtained in Kinnard (1993), so our discussion is restricted to Kinnard (1993) and Kinnard et al. (1994a). Kinnard (1993) reports the result of two “market research assignments” conducted by Dr. Kinnard’s firm, Real Estate Consulting Group of Connecticut, Inc. (“RECGC”), to “test claims that proposed high-pressure natural gas transmission pipelines would result in substantial decreases in the market value of single-family residential properties ‘near’ the proposed pipelines and their rights of way.” One of these assignments involved a “1440-pounds per square inch (psi) natural gas transmission pipeline proposed to transverse” Southwestern Connecticut. The other involved a “1000/1200 psi transmission pipeline circling the Northern and Western boundaries of Las Vegas, Nevada.”\textsuperscript{41}

In both studies, properties were categorized according to their distance from the pipeline under consideration. These Distance Zones were as follows:

- **T:** Lot is traversed by pipeline right of way
- **O:** Lot abuts pipeline right of way
- **A:** Lot is 200 feet or less from right of way

\textsuperscript{39} PEPCo Hearing, pages 174-177, 184. Non-arms length sales typically are excluded, to the extent possible, from hedonic regression models of property values since they run the risk of not reflecting market value.

\textsuperscript{40} PEPCo Hearing, pages 180, 214. These results make much more economic sense than the authors’ initial results – the effect on waterfront properties with impacted beaches should be greater than the effect on interior properties with access rights to impacted beaches. But since there were only three of the former, even these results should be viewed with caution.

\textsuperscript{41} Kinnard (1993), page 3.
B: Lot is 201-400 feet from right of way
C: Lot is 401-800 feet from right of way
D: Lot is 801-1300 feet from right of way
E: Lot is 1301-2600 feet from right of way
F: Lot is 2601-5280 feet from right of way

For the Connecticut study, Distance Zone E was used as a control area, and for the Las Vegas study, Distance Zone F was used as a control area.

In the Connecticut study, two natural gas transmission line right of ways were analyzed, jointly and in separate models. One, the Algonquin right of way, contains two natural gas pipelines and traverses four towns from which sales data was used in the study. The other, the Tennessee right of way, contains a single natural gas pipeline and traverses five towns from which sales data was used in the study. All three natural gas pipelines were built in the 1960s. In the Las Vegas study, one natural gas pipeline right of way, which was new as of the time of the study (late 1991), was analyzed. Sales data for the Las Vegas study were from a master planned community called The Lakes.

The complete hedonic regression models estimated are not given in Kinnard (1993). Rather, the results shown focus on the dummy variables related to the Distance Zones. As summarized in the paper, two of the primary conclusions reached are:

1. No pattern of measurable and significant negative impacts on sales prices of residential properties close to an existing or proposed high-pressure natural gas transmission pipeline was observed. None should be expected in future, similar situations.

2. No systematic pattern of variations in sales price effects was observed. None should be expected in future, similar situations. No correlation was observed between price levels (total or per square foot) and distance from the pipeline.42

The second of the Kinnard papers herein discussed, Kinnard, et al. (1994a), was presented at the 1994 Annual Conference of the American Real Estate Society, and was in some ways ahead of its time. The focus of the paper is on the divergence between estimates of the market impacts of proximity to

---

42 Kinnard (1993), page 16.
allegedly hazardous land uses based on surveys, especially so-called Contingent Valuation Methodology surveys, as compared to actual market data, in particular sales prices.

Contingent Valuation Methodology ("CVM") surveys are distinct from informal canvasses of market participants often relied upon by appraisers. Initially, CVM surveys were designed to be formal surveys that attempt to elicit valuations for non-market goods or services in response to a hypothetical injury scenario. They have been adopted for use in property value diminution cases from Natural Resource Damage Assessment ("NRDA"), but even in the context of NRDA they are controversial. 43

The core of Kinnard, et al. (1994a) consists of two new case studies, but the authors mention two prior papers in a section entitled “Early Proximity Impact Study Results: Market Fact v. Expert Opinion.”

The first of these was an unpublished report prepared by RECGC dealing with the effects of proximity to HVTLs on property values. 44 The key results of that report are described as follows:

In the course of conducting interviews with local real estate brokers, real estate appraisers and mortgage lenders active in the local residential real estate market, we discovered the intriguing fact that the price or value impact opinions of locally active residential real estate professionals were substantially more negative than those of residents living on properties that abutted the HVTL. In turn, the attitudes and opinions about value impacts expressed by the abutting property resident were markedly more negative than the facts of the marketplace indicated. This particular study was based on an analysis of over 700 sales of single-family residences in proximity to the HVTL being studied. Both Paired Sales and Multiple Regression Analyses (MRA) in the Hedonic Pricing Model format were applied to this data set. 45

43 For a discussion of issues related to the use of the CVM in the context of NRDA, see, for example, Diamond and Hausman (1994). For a defense of the use of such surveys in property value diminution cases, see Mundy and McClean (1998) and for a critique of same, see Wilson (2006). For a recent comprehensive review of the literature on the use of the CVM in real estate damage estimation, see Lipscomb, et al. (2011). We thank a referee for pointing us to a study prepared by Industrial Economics, Incorporated for the OPS that includes discussions of the use of the CVM in the cost benefit analysis of OPS’s regulations and programs. See The Joint OPS Stakeholder Workgroup (1999) at http://www.phmsa.dot.gov/staticfiles/PHMSA/DownloadableFiles/Files/cba_rpt.pdf.


The second prior paper summarized by Dr. Kinnard and his co-authors, Delaney and Timmons (1992), also surveys real estate professionals regarding the impact of proximity to HVTLs on property values. They conclude that “the mean decline in value noted by respondents who had appraised residential property subject to the influence of [HVTLs], and depending on geographic region, ranged from 7.77% to 15.5%, …” However, they also observe that “[t]his finding is in contrast to much of the research conducted to date that finds little or no impact from high voltage power lines on residential property values.” Furthermore, as noted by Dr. Kinnard and his co-authors, “[a]n interesting footnote to that study is that those respondents who had no experience in appraising HVTL-impacted properties had much stronger negative feelings about the price impacts of such proximity than did designated residential appraisers experienced in valuing such properties.

The two new case studies analyzed in Kinnard, et al. (1994a) stem from condemnation actions involving a transportation corridor for nuclear waste and fuel and a high-pressure natural gas transmission line. The first of these was a partial taking related to a by-pass highway intended, in part, for shipments of nuclear fuel and nuclear waste to and from Los Alamos in New Mexico. A telephone survey was used by experts retained on behalf of the plaintiffs to estimate severance damages for certain undeveloped residential property adjacent to the actual taking. Dr. Kinnard and his co-authors conducted a post-trial face-to-face survey and an analysis of market data using various techniques including hedonic regression analysis. Like the hedonic regression analysis in Kinnard (1993), described above, a series of Distance Zones were defined, ranging from less than one-quarter mile to more than two miles from the highway right of way. The latter was used as the control area for purposes of evaluating the impacts, if any, of proximity to the highway right of way.

As summarized in Kinnard, et al. (1994a), “[t]he estimated negative impact in [the survey conducted by the plaintiffs] ranged from slightly less than 10% up to 40%. Within this range of impact, 71% of the respondents … forecast a negative impact.” Their analysis of market data, “on the other hand, showed

47 Delaney and Timmons (1992), page 324.
48 Delaney and Timmons (1992), page 323.
49 Kinnard, et al. (1994a), page 2.
50 “When the United States acquires only part of a unitary holding, federal law requires that compensation be made not only for the property interest acquired, but also for the diminution, if any, in the value of the remainder directly caused by the acquisition and/or by the use to which the part acquired will be put. This diminution in the value of the remainder is often and ‘somewhat loosely’ referred to as severance damage.” The Appraisal Institute, 2000, Uniform Appraisal Standards for Federal Land Acquisitions, page 47, emphasis in the original, citing United States v. Miller, 317 U.S. 369, 376 (1943).
little effect from proximity to the highway right of way, whether the focus of the analysis was single-family residential properties or residential lots."\textsuperscript{51}

The second case study analyzed in Kinnard, et al. (1994a), the high-pressure natural gas transmission line study, is entirely distinct from the New Mexico transportation corridor study, but is based on the same condemnation action analyzed in Kinnard (1993). As with the New Mexico transportation corridor study, the focus of the high-pressure natural gas transmission line study in Kinnard, et al. (1994a) is on the comparison between survey results, which are driven by responses to hypothetical scenarios, and hedonic regression results, which are driven by actual sales data.\textsuperscript{52}

According to the results summarized in Kinnard, et al. (1994a), 57% of the survey respondents said they would not buy property within 240 feet of the subject natural gas transmission pipeline right of way. This percentage fell monotonically with distance to 33% for property within 1240 feet of the subject natural gas transmission pipeline right of way. The median discount expected by those willing to buy was 10.5%.\textsuperscript{53} On the other hand, the hedonic regression models showed no systematic negative effect on property values of proximity to the pipeline.\textsuperscript{54}

The key overall findings of Kinnard, et al. (1994a) are as follows:

1. Ex ante opinions of interviewees not necessarily involved in buying (or considering buying) in areas claimed to be affected by proximity to a source of fear or hazard to human health and safety are not a substitute of proxy for market sales transactions in identifying and measuring the impact of sales prices of residential properties. The opinions are much more negative than the reflections of actual market behavior of individuals [sic] buyers ex post.

\textsuperscript{51} Kinnard, et al. (1994a), page 10.

\textsuperscript{52} The authors know of no other published or unpublished studies using CVM type surveys to estimate the effects of pipelines on property values. For studies related to leaking underground storage tanks ("LUSTS"), see Simons (2005), chapter 5.

\textsuperscript{53} Kinnard, et al. (1994a), Table 2, page 15.

\textsuperscript{54} As in Kinnard (1993), the actual hedonic models are not reported in Kinnard, et al. (1994a). The latter case study models are distinct from the former in that they involve two potentially affected communities and a broader time period.
2. Actual market behavior is an unequivocal fact, especially when it is possible to construct price indexes of standardized houses or lots for comparative purposes.\textsuperscript{55}

3. There is no consistent, systematic market pattern of lower sales prices per square foot of living area as properties become closer to the source of the fear of hazards to human health and safety.\textsuperscript{56}

D. Related Research

A number of papers related to the issues raised above have appeared, both published and unpublished. Some of these are discussed in this subsection.

Boxall, at al. (2005) reports upon a technically sophisticated analysis of the effects of oil and natural gas facilities, including wells and pipelines, on rural residential property values in Alberta, Canada. A particular focus of the study is on the differential impacts of “sweet” wells versus “sour” wells, the distinction being wells that contain gas without or with the presence of hydrogen sulfide, which imposes a potential health risk. For purposes of this paper, the key result is that the “presence of wells, especially sour gas wells, was found to depress property values but the number of pipelines carrying sour gas variable did not have a significant coefficient.”\textsuperscript{57}

In another paper dealing with the effects of proximity to oil production facilities, Flower and Ragas (1994) use hedonic regression techniques to analyze the effects of two refineries in St. Bernard Parish, Louisiana, on nearby residential property values. They find examples of no effects, short-term effects (based, e.g., on catastrophic events), and permanent effects associated with proximity to the petroleum refineries.\textsuperscript{58}

\textsuperscript{55} A referee has pointed out that this finding is not uniformly accepted by all real estate professionals. The issue is whether real estate markets generally are semi-strong form efficient. See footnote 9 above and text supra, as well as the discussion and references below in this section.

\textsuperscript{56} Kinnard, et al. (1994a), page 12.

\textsuperscript{57} Boxall (2005), page 266.

\textsuperscript{58} While one might presume that refineries are associated with pipelines, there is no explicit mention of pipelines in Flower and Ragas (1994).
Next, Simons (1999) references an unpublished study of the impacts a petroleum release that occurred during a flood event in Harris County, Texas. According to Dr. Simons, the author of the study (Dr. Barton Smith) “concluded that the net effect of the release was associated with a 10% reduction in value for the affected residential subdivision.” No further details are provided in Simons (1999), including whether Dr. Smith’s study was prepared in the context of litigation resulting from the release and, if so, whether any other studies were performed in the context of that litigation. 59

Regarding the issue of hypothetical surveys versus the analysis of actual sales data, Frankel (1991) reports on the results of a survey of realtors and appraisers in 35 communities surrounding O’Hare Airport in Chicago, Illinois. While not related to pipelines per se, the author finds a significant disparity between estimates of reductions in property values due to noise from O’Hare Airport based on the surveys versus estimates of reductions in property values due to noise from other airports based on hedonic regression models, the former being substantially higher than the latter.

Finally, Skantz and Strickland (1987) find that there was no market reaction in terms of property values to a major flood event, allegedly due to the availability of low-cost flood insurance, but that a subsequent increase in insurance rates was followed by an immediate and significant decrease in property values. These results, according to Skantz and Strickland, are consistent with a semi-strong form efficient real estate market; that is, that prices in the real estate market reflect all publicly available information. 60 This raises the obvious question whether similar results hold for catastrophic events related to pipelines, such as the incidents in San Bruno and Allentown; that is, whether the market has already discounted for the likelihood of a catastrophic event. 61

IV. Summary & Conclusions

At least one conclusion and one research hypothesis follow from a review of the existing, limited literature on the effects of proximity to pipelines on property values. The conclusion is that there is no credible evidence based on actual sales data that proximity to pipelines reduces property values. The research hypothesis is that hypothetical surveys of actual or potential market participants should not be

59 Simons (1999), footnote 4 and text supra.

60 For classic discussions of market efficiency, see Fama (1970, 1991).

61 The point is whether the market had already discounted for the possibility of an event that would have a negative impact on properties. For a comprehensive review of the literature on the efficiency of real estate markets as of the early 1990s, see Gatzlaff and Tirtiroglu (1995).
used as a substitute for the systematic analysis of market data as they may overstate the effects, if any, of proximity to disamenities, including pipelines, on property values.

In fact, both of these observations suggest areas for further research. One problem with much of the existing literature on the effects of disamenities such as potential sources of contamination or catastrophic incidents on property values is a failure to control for other negative factors. This issue was put succinctly as follows by two leading researchers in the field:

Where environmental degradation is caused by emissions from polluters, the spatial distribution of environmental quality may be highly correlated with the spatial distribution of emitters. If the emitters themselves are undesirable, then it will be difficult to separate the effects of environmental quality variation from the effects of proximity to these emitters.62

Studies of the effects of proximity to pipelines should be relatively immune to such methodological issues since most of the geographical location of pipelines is not in proximity to other potential disamenities. As well, in situations such as the San Bruno incident, issues of whether and/or when the relevant information about the potential risk to owners of property in proximity to the pipelines became public largely are moot since the incidents are significant and well-publicized. What are needed now are before-and-after studies of the effects of these incidents on directly affected properties as well as indirectly affected properties.

With respect to valuations based on hypothetical surveys versus actual market data, the issue is not new, nor is it confined to the effects of pipelines on property values. What is needed at this point is a comprehensive review of existing results as well as new research comparing past predictions of effects on value based on surveys to actual market outcomes as reflected in sales prices.63

---


