PERCIEVED RISK, PROPERTY VALUES, AND THE NATIONAL PRIORITY

LISITNG: A CASE STUDY OF BRIO REFINING

AND THE SOUTHBEND SUBDIVISION

THESIS

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CHAPTER 1

INTRODUCTION TO THE STUDY

The impact of perceived risk on property values, both quantitatively and

qualitatively, has important economic and legal implications. Compensation for property

value reductions caused by risk perception is not easy to determine because of the

unobservable nature of public risk perceptions. There is a distinct difference between

scientifically assessed risk and perceived risk although both can, and often do, cause

decreases in property values near hazardous waste sites (Jenkins-Smith and Basset,

1994).

Reviews of recent literature indicate that public perception of health risk in close

proximity to hazardous waste sites by residents outside of the waste-site communities

have not only raised perceived risk, but also lowered property values (McCluskey and

Rausser, 2001). The Comprehensive Environmental Response, Compensation and

Liability Act (CERCLA) requires the government to scientifically assess public health

risk and establish criteria to prioritize sites based on risk to health, environment, and

welfare. All too often, the hazardous waste sites examined through CERCLA are in areas

near residential neighborhoods, can initiate health problems, and may negatively affect

property values. The National Priorities List (NPL) identifies locations throughout the

US where hazardous wastes have been found in the environment. NPL-listed sites are the most serious uncontrolled or abandoned hazardous waste sites that have been identified for possible long-term remedial action under Superfund. The list is based primarily on the score a site receives from the Hazard Ranking System (HRS). A site must be on the NPL to receive money from Superfund for long-term remedial action. Long-term remedial action is defined as action that stops or substantially reduces a release or threat of a release of hazardous substances, where such a threat is serious but not an immediate threat to public health.

Evidence published by the EPA has suggested that placing sites on the NPL list has no effect on the prices of nearby homes, or may actually raise them (EPA 2004). This is in direct contrast to the results of studies performed in the last several years that have found that significant reductions in property values are directly correlated with proximity to hazardous waste sites (McCluskey and Rausser, 2001; Smith and Desvousgous, 1986). According to the EPA, a closer look at how real estate markets work shows that information about hazardous materials at a given site (usually from local media) can be used by real estate markets fairly quickly, well before the government has time to "list" a site on the NPL. The real problem is the uncertainty and delay between the discovery of the hazardous materials and the decision to clean up the site, complicated by media attention, the public participation process, and who will pay for this process. Since site assessment and remediation usually take several years to complete and given conflicting evidence from both the EPA and scholarly research about property values near these sites, it is justified to assume that there may be an evolution of perceived risk, as shown

indirectly through a change in property values, from the time the hazardous waste site is discovered and listed on the NPL until the site is considered an official Superfund site.

Research Question

Due to the amount of time required to fully assess and complete a hazardous waste site assessment, coupled with the conflicting evidence from the EPA and past studies, it is worth while to ask: To what extent has the public's perceived risk (due to environmental concerns) contributed to changes in average property value in an area near an NPL site (from the time before the hazardous waste site was listed on the NPL until its official listing)?

In order to answer this question with certainty, I must also analyze the economic trends in the study area as a whole to compare normal market changes in property values in an effort to isolate the hazardous waste site as the cause of change in property values. Further, it is important to create a timeline of public and governmental events during this time period to qualitatively assess factors (through documentation of media events and governmental correspondence letters) that may contribute to the amount of perceived risk in the neighborhood. I will also address sub-questions to gain a comprehensive understanding of the contemporaneous events that may have contributed to changes in average property values due to environmental concerns. The sub-questions to consider are:

- What other economic factors may have affected property values during this time in the study area?

● What other factors, such as increased media attention and government involvement, may have played a part in any fluctuation in property values or altered risk perception?

CHAPTER 2

LITERATURE REVIEW

Methods for valuing environmental amenities, important to understanding how to estimate perceived risk near hazardous waste sites, are categorized as either indirect or direct. Indirect methods, such as the hedonic-price technique and travel-cost model, use actual consumer decisions to model consumer preferences. This empirical information allows for researchers and economists to view revealed preferences of goods, both market and non-market, from various fluctuations in prices. Direct methods, such as contingent valuation, ask people what they would be willing to pay or accept for a change in some environmental amenity. Direct methods are commonly criticized because of the hypothetical nature of the questions and because actual behaviors are not observed (Mitchell and Carson, 1993; Schulze, d'Arge, and Brookshire, 1981). The proponents of direct measures, such as Adamowicz, Louviere and Williams (1994), criticize indirect methods on the basis that the behavioral models developed are based upon assumptions about the structure of preferences that may or may not be testable.

Many authors have used property values to evaluate environmental attributes and, more specifically, study the impact of hazardous waste sites. Researchers, such as Smith and Desvousges (1986) and Thayer, Albers, and Rahmatain (1992), have consistently

found that proximity to hazardous waste sites and other locally undesirable land uses

(LULUs) have negative impacts on property values. Land prices reflect the location-

specific characteristics of the site as well as any unique structural characteristics of the

land itself. In fact, the price of urban residential land depends primarily on its location,

features, or amenities. This relationship has been exploited through regression analysis to

learn more about the values people place on the advantages or disadvantages of a site's

location (Alonso, 1964; Hayes, 1957). A theoretical framework that uses hedonic models

and hedonic regression analysis to evaluate property values in relation to hazardous waste

sites is employed here to evaluate the relationship. McCluskey and Rausser (2001) were

able to conclusively correlate property values to perceived risk by indirectly using

housing prices around hazardous waste sites from 1979 to 1995. They conclude that

media coverage and high prior risk perceptions increased perceived risk in their study

area in Boston, Massachusetts. Furthermore, increased perceived risk surrounding the

site lowered property values.

Diamond's (1980) research concludes that bid-price theory strengthens the

empirical relationship between land prices and location amenities or, in this case, the

effect of disamenities on property values in a specific location. Diamond found that

modifications of the "naive" specification have proven to be statistically important and

reveal further information about the values people place on amenities. To build upon

Diamond's research, this study attempts to clarify how perceptions of amenities translate

into fluctuations of property values due to the emergence of environmental concerns.

Analysis and discussion will elaborate upon and evaluate possible explanations

behind fluctuations in property values in Southbend that may be attributable to risk

communication practices employed in this case. Risk communication research has shown that there is often a disparity between scientifically assessed risk by experts on one hand, and the general public understanding on the other (Leiss, 1996; Slovic, 1987). This public's distrust of information provided through constituents (academic experts, regulatory practitioners, interest groups, etc.) may account for inaccurate perceptions of the amount of scientifically assessed risk that actually exists at hazardous waste sites before remedial action is taken. This disparity, compounded with media attention or sensationalism, may account for a higher rate of public risk perception which may, in turn, have adverse affects on the average property values near these sites (Rohrmann, et al. 1990).

CHAPTER 3

BACKGROUND

The EPA's Superfund is the federal government's program to clean up the nation's uncontrolled hazardous waste sites. Over the past 20 years, this program has located and evaluated tens of thousands of hazardous waste sites to protect public health from contamination at the worst sites. This work continues through the NPL of hazardous waste sites throughout the country. The NPL sites are those proposed for Superfund cleanup through the *Federal Register*.

These NPL sites must meet several requirements to be listed. Under Section 300.425(c) of the NCP, the federal regulation by which CERCLA is implemented (55 FR 8845, March 8, 1990), provides three mechanisms for placing sites on the NPL. The first mechanism is the EPA's Hazardous Ranking Score HRS which is the principal mechanism used to place uncontrolled waste sites in the listing. It is a numerically based screening system that uses information from initial, limited investigations to assess the relative potential of sites to pose a threat to human health or the environment. The second mechanism allows the listing of a site if it meets three designated requirements: if the Agency for Toxic Substances and Disease Registry of the U.S. Public Health Service has issued a health advisory that recommends that people be removed from the site; the

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EPA risk assessment determines that the site poses a threat to public health; and that the EPA anticipates it will be more cost-effective to use remedial authority, available only to NPL sites, than to use its emergency removal authority to respond to the site's hazard. The third mechanism for placing sites on the NPL allows states or territories to designate one top-priority site regardless of its score. This allows for the EPA to compensate for media coverage and perceptions of risk to outweigh those that may actually pose direct and immediate health threats. This is one of the key policy issues currently contested by the scientific community because it allows media attention and/or sensationalism to trump actual health risk.

Study Area

Of the fourteen NPL sites in Harris County, Texas, only seven are within one mile of a residential neighborhood and therefore only seven were considered for evaluation for this study (Table 1). From these initial areas, I determined the 5 sites that, according to the EPA, affect the most residents in nearby neighborhoods: Brio Refining, Crystal Chemical, Dixie Oil, Geneva Industries, and the Highland Acid pit. After visiting these five sites, it became clear that most of the neighborhoods affected are not suited for this type of analysis for two reasons: the residential development followed the NPL listing, and some residential structures were apartment complexes, limiting the longitudinal data (and property value data) that are needed for this type of study. This preliminary vetting led me to select the Brio Refining site because it was a highly publicized hazardous waste site, it has available historical data from before the contamination was discovered by the

Table 1. Superfund sites in Harris County and population within one mile

| NPL Site:	Number of people within 1 mile radius
Brio Refining	5,000
Crystal Chemical	20,000
Dixie Oil	5,000
Geneva Industries	35,000
Highlands Acid Pit	5,000
Sol Lynn/Industrial Transformers	2,100
South Cavalcade	4,500

public, and it was surrounded primarily by older single-family homes that contain easily quantified property values (the Southbend subdivision).

The Brio Refining site was added to the NPL based on this third mechanism for listing a hazardous waste site to be slated for Superfund cleanup. The CERCLA act explicitly expects cleanup cost litigation to be extremely costly and time-consuming because of the often large number of potentially responsible parties involved at each site. Furthermore, the significant sums generally involved give each defendant a compelling incentive to put forth a vigorous defense. These contentions increase the length of time it takes to remediate the site. In my study area in Harris County, Texas, the average time for a site's proposed listing until completed cleanup and removal form the NPL was 13 years. The fastest cleanup was 5 years for the Dixie Oil site and the longest was 21 years at Crystal Chemical. The site chosen for this study, Brio Refining, was initially proposed on the NPL list in October of 1984, listed as an NPL in 1985 and finally considered a Superfund site, March 31, 1989.

Brio Refining and the Southbend Subdivision

In 1981, a new 522 house subdivision, called Southbend (Sageland Section 3), was built in suburban Houston directly off of the Gulf Freeway adjacent to the defunct Brio Refining Company, a hazardous waste facility (Figure 1). Shortly after its establishment, the Southbend subdivision was populated by young families endemic to suburban Houston during this time. Southbend residents soon realized that their new

Figure 1. Aerial photo of Southbend subdivision prior to NPL listing (October, 1984)
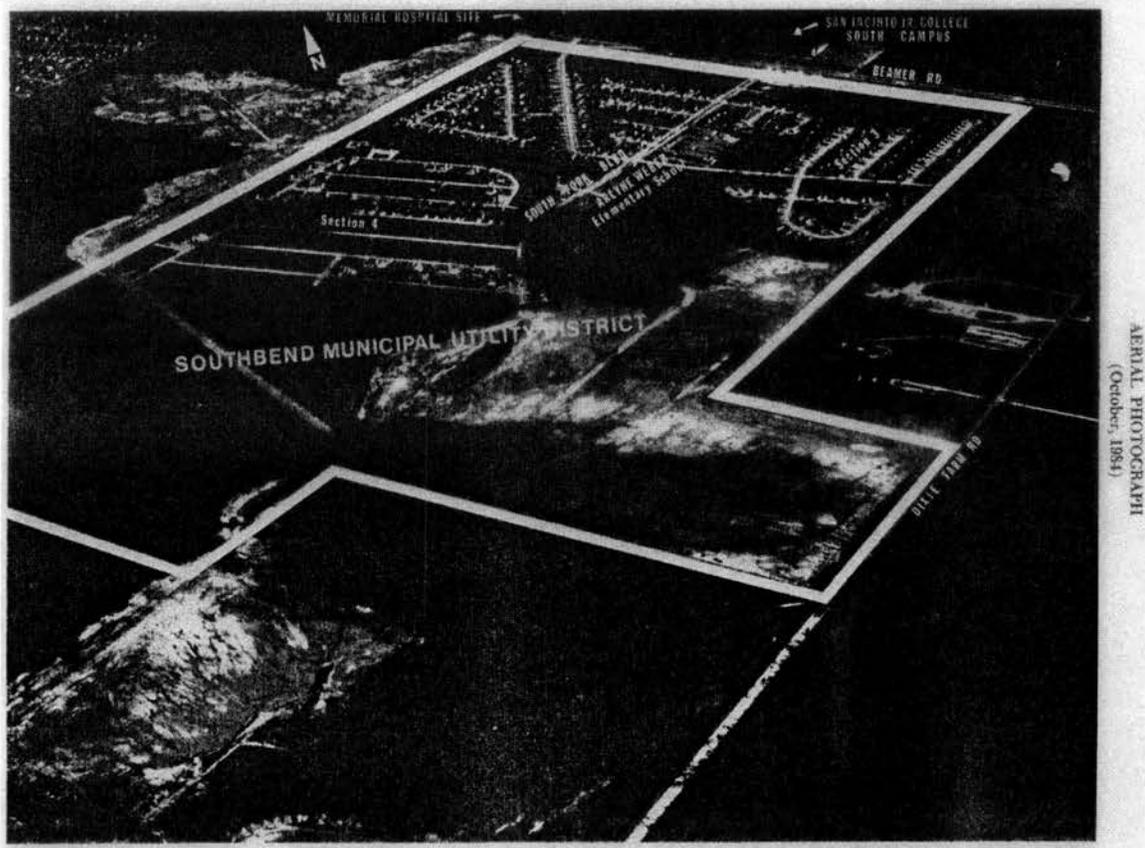
homes were built within feet of a hazardous waste site and in 1983, residents began to

attribute unusual illnesses to the hazardous waste site, and the first of many law suits was

filed by 150 home owners against the subdivision developers Pulte Homes, Ryland

Homes, Campbell Homes, and Park Avenue Homes. The developers insisted that they

did not know about the contaminated Brio site until 1983, after the homes were built.

The Brio site was proposed for the NPL list in October of 1984, and the EPA organized

the Brio Task Force, funded by past owners and operating companies of the site, to

investigate, in tandem with the EPA, the amount of scientifically measured risk that was

present to the Southbend community.

The Brio site consists of approximately 12 closed pits on 50 acres of land (Figure

2). The facility was operated from the late 1950s to December 1982 (Figure 3). Earlier

operations carried out at the site included copper catalyst regeneration, oil blending and

refining, and hydrocarbon styrene cracking. Previous owners or operators of the facility

have included Hard Lowe Chemical, Lowe Chemical, Phoenix Chemical, JOC Oil

Aromatics, and Friendswood Refining. Spills are known to have entered nearby Mud

Gulley and subsequently, via Clear Creek, Galveston Bay. An inspection by EPA in

1983 indicated that shallow ground water is potentially contaminated with copper, vinyl

chloride, fluorine, styrene, and ethyl benzene. In January 1984, EPA detected toluene,

benzene, and other aromatic organic chemicals in the air. Signs warning of hazardous

waste were put up and a chain-link fence was erected around the site by the Brio Task

Force in February of 1985. According to residents these actions stifled economic growth

in the area (Cobb, 1985).

Figure 2. Map of Brio Refining site and the identified 12 closed pits under investigation
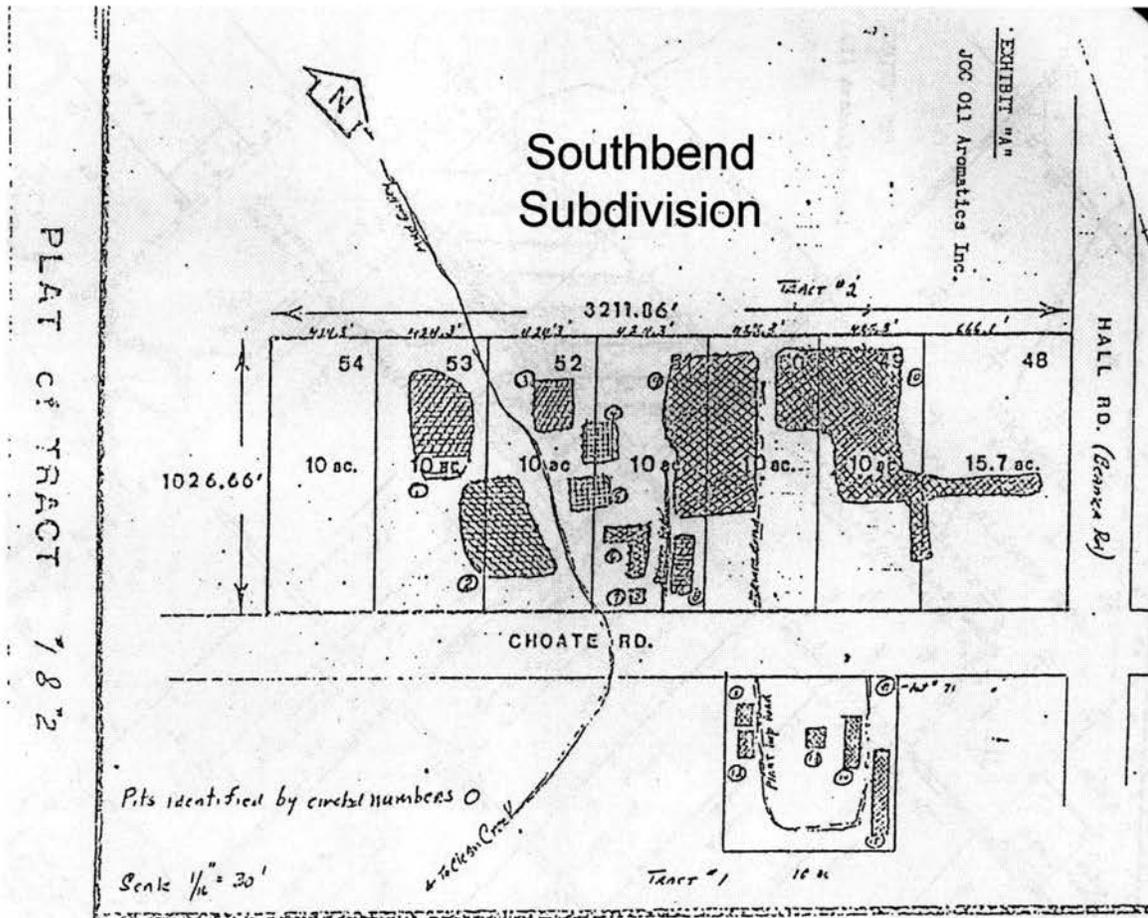
Figure 3. Map of Sagebend subdivision (Southbend) in proximity to the Brio Superfund site
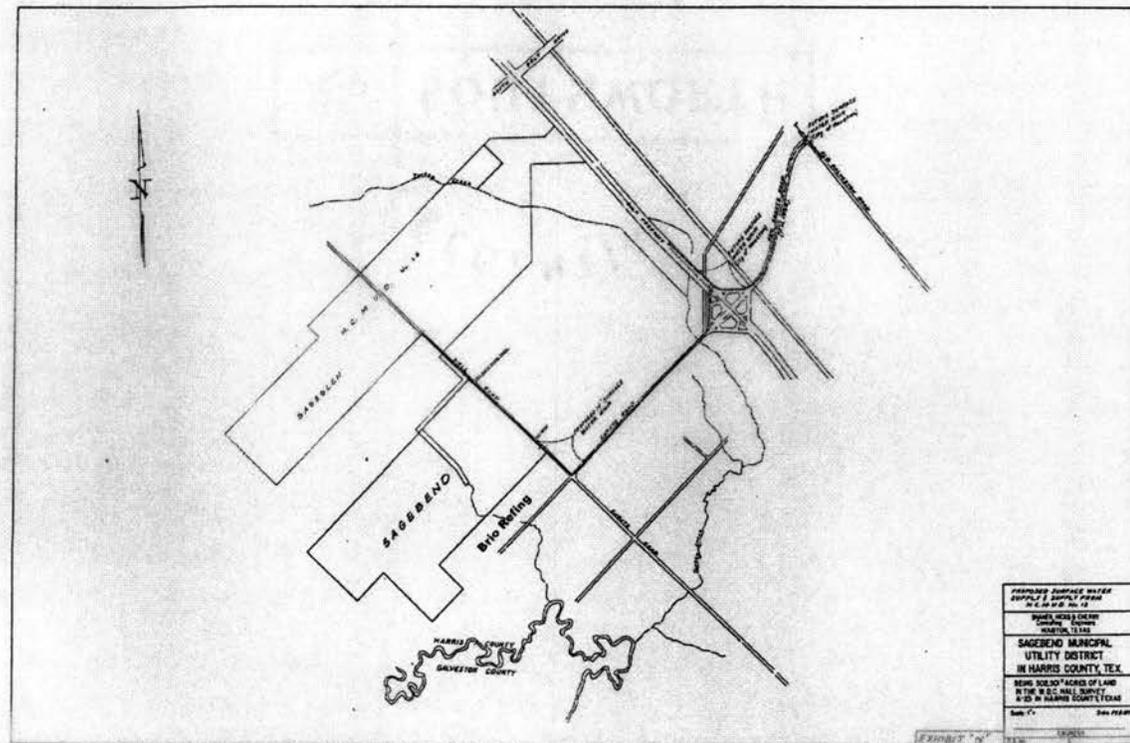
After several initial tests, the EPA, along with the Brio Task Force, concluded in 1985

that the site did not bear any "substantial risk to human health" (EPA, 1985). These

findings by the EPA were published in newspapers and discussed in several public

meetings held in Southbend, but they did little to comfort the community which still

contended that the site was the source of abnormally high illness rates (Scarlett, 1984;

Buynoski, 1984). After 6 years of examining the scientifically measured contaminant

that pose immediate threat to human health, the record of decision, signed on March 31,

1989 by EPA, the state of Texas, and the Brio Task Force, officially listed Brio as a

Superfund site for remediation even though scientific experts concluded public health

risks associated with living near the site were extremely low or nonexistent.

CHAPTER 4

METHODOLOGY

In order to determine the extent to which the public's perceived risk (due to environmental concerns) has contributed to changes in average property value in the Southbend subdivision, I collected data on house sales in Southbend from the years before the site was listed on the NPL and after the site was officially listed. This information was obtained from an economist at the University of Houston, Dr. Ronald Welch, who served as an expert witness during some of the litigation proceedings regarding the Brio site in 1989. Housing sale values from the years 1983-1984 (522 houses), before the site was listed, and 1987-1988 (314 houses) after the NPL listing in the Southbend subdivision were collected by Ronald Welch for use in site litigation and are still on record in his personal archives. While the original data are no longer available or on record with the Harris County Appraisal District, the data obtained from Dr. Welch contain the average value of each variable and regression results for the years needed for this analysis. The data used for the analyses for these initial years of the subdivision (1983-1988) came from the Sage Financial Group, Inc. and were originally compiled in October of 1988. The property sales values from 1983-1984 were compared to the values from 1987-1988 using two sample t-test to determine if the mean difference

was statistically significant. The average price values were then compared with information from the U.S. Bureau of Labor Statistics (BLS) annual price index for housing in Houston. This comparison of the house values with the BLS annual price index was conducted in an effort to isolate the environmental concerns in Southbend as the primary cause of price fluctuation and address any other economic factors that may have had an affect on property values in Houston during this same time period.

Since this quantitative analysis deals wholly with housing values, further refinement is needed to control for dispersion among housing attributes. To account for the fluctuation of housing values by housing characteristics, hedonic price regression was employed to make the comparisons more precise. Hedonic least-squares regression breaks down the "bundle price" of a good (such as housing) into an atomistic form and calculates the implicit price for each characteristic, while controlling for dispersion. Hedonic pricing has often been used to value housing markets in relation to environmental quality (McCluskey and Rausser 2001). The data were further analyzed using this regression analysis, which relates the price of the Southbend properties to their characteristics and the proximity to the Brio site. The regression results indicate how much property values will change for a small change in each characteristic, holding all other characteristics constant.

The second part of this study evaluates possible explanations behind fluctuations in property values in Southbend that may be attributable to factors such as risk communication. To address this issue, a timeline of events was constructed by reviewing qualitative data found in newspapers, Southbend community newsletters, and governmental communication letters were used to empirically assess reasons behind

fluctuations in property values in Southbend. All major events included on the timeline

are those that deal with governmental communication to the community, the EPA's

record of decision about the site, and any various governmental actions in the

community.

CHAPTER 5

RESULTS

In 1983-1984, the mean sale price of a house in Southbend was $83,470 and in 1987-1988 the mean sale price of a house was $58,282. This shows a clear and sudden depreciation of housing values of up to 30 percent from the time period before until after the NPL listing. To ensure this 30 percent decrease was not attributable to other economic trends in Houston during this same period, I compared the amount of depreciation in Houston over the same time period using the US Bureau of Labor Statistics for the area (Table 2). While it is true that in the 1980s Texas moved into a recession due to a global reduction in oil prices which had a direct impact on the Houston-area economy (Houston, Galveston, Brazoria), only about 2.5 percent of the 30 percent decrease is attributable to Houston's economic recession. This isolates roughly 27.5 percent deflation at Southbend attributable to other factors that affected the area.

Welch Modified Two-Sample t-test

In 1983-1984, the sale prices of 522 Southbend houses had a mean of $83,470 with a standard deviation of $25,916. In 1987-1988, the sale prices of 314 Southbend houses had a mean of $58, 282 with a standard deviation of $21,693. Since the two

Table 2. Average house price per year in Houston-Galveston-Brazoria, Texas - Bureau of Labor Statistics (RAND Texas Inflation Statistics)

Year	BLS Housing Price Index
1978	64.7
1979	74
1980	83.1
1981	91.7
1982	100
1983	100.3
1984	99.9
1985	100.1
1986	98
1987	97
1988	98.2
1989	100.6
1990	105
1991	109.7
1992	113.3

sample periods differ with respect to the number of houses and the size of the standard

deviations, the appropriate statistical analysis to determine whether there is a significant

difference between these two populations is the Welch Modified Two-Sample t-test. The

equation for this is: t = (58282 − 83470) / √ (21693 ^{2} / 314 + 25916 ^{2} / 522) or t = -15.09.

In this expression, the numerator is the mean difference in sales price and the

denominator is the standard deviation of the mean difference. This equation normally

indicates that the hypothesized value is reasonable when the t-statistic is close to zero.

Alternately, the hypothesized value is not large enough when the t-statistic is large and

positive. In this case, however, the hypothesized value is large and negative, which favors

the alternative hypothesis. The null hypothesis (that the results are members of the same

population) is not supported by the results of this t-test. This appropriate variation on the

two-sample t-test at a .05 confidence level favors the alternative hypothesis that the mean

differences of house values for the two time periods are statistically significant.

T-test using Regression Results

Although the sale-price standard deviations ($25,916 in 1983-84 and $21,693 in

1987-88) are fairly large, most of the dispersion found is attributable to housing

characteristics (hedonic pricing) such as size, number of bathrooms, and age (Table 3).

When a regression model is used to control for these characteristics, the residual standard

deviations are $8,044 in 1983-84 and $9,660 in 1987-1988. This adjusted regression

analysis, which controls for dispersion of housing characteristics, yields greater precision

Table 3. Hedonic least squares regression accounts for dispersion when comparing individual characteristics of the houses sold between 1983-1984 and 1987-1988

| | The dependent variable is the house price in dollars | | | |
| | 1983-1984 | | 1987-1988 | |
	Coefficient	Significance	Coefficient	Significance
Subdivision 1	-3543.75	0.00	-13611.80	0.00
Year	814.32	0.25	-936.20	0.41
Area (square feet)	41.00	0.00	29.25	0.00
Number of bedrooms	-3351.08	0.00	-1281.50	0.25
Number of bathrooms	3473.17	0.01	9007.45	0.00
Age of house (years)	-1955.53	0.00	-869.43	0.00
Intercept	-50388.20		83649.00	
Number of houses	522		314	
Standard error of estimate	8043.83		9659.84	
R-squared	0.91		0.81	
Significance of F test	0.00		0.00	

and is expressed as: t = (58282 − 83470) / √ (9660 ^{2} / 314 + 8044 ^{2} / 522) or t = -38.81.

Again, the null hypothesis is rejected and in a more resounding way than before.

A History of Brio and Southbend

A timeline of events was established to account for the approximate 27.5 percent

depreciation found in Southbend from the years before the NPL listing to the years

immediately afterward (1983-1988) but not including the 2.5 percent depreciation from

Houston's economic recession. This was done to offer possible reasons behind declines

in property values in Southbend after initial tests performed by the EPA and the

independent laboratory, the Brio Task Force, determined there to be no significant threat

to human health in the area. Newspaper articles and communications letters between

government agencies (EPA, HUD, etc.) from the years 1983 until 1988 were used to

create a timeline (Figure 4).

In September of 1983, District 7 of the Texas Department of Water Resources

observed that waste material by Brio Refining was surfacing at numerous on-site landfill

locations (Kreps, 1988). During the same month, the housing developers of the

Southbend subdivision (Pulte Homes, Ryland Homes, Paradise Homes and Travis

Campbell Homes) and the EPA were notified of the contamination found on the Brio Site

(Stephens, 1984). In 1984, initial test samples from the site and nearby area were

conducted by the EPA which found no substantial threat to human health from the

toxicology information collected. A community involvement plan was first developed

Figure 4. Timeline of events at the Brio Site and Southbend subdivision

| Developers start building the Southbend subdivision on the border of Brio (1981) | EPA begins initial testing to determine threat to Southbend residents and discover "no immediate threat exists" (1984) | All homes in Southbend removed from receiving FHA federal mortgage insurance due to the subdivision's proximity to Brio (Jan. 1985) |

Developers of Southbend are notified of the subdivision's proximity to Brio

Brio Officially Listed as an NPL Site (1985)

Brio Task Force finds no threat to public health (Jan 1987)

Due to public concern, Brio is proposed as an NPL site (Oct. 1984)

Harris County civil court rules against developers of Southbend (April, 1985)

FHA federal mortgage insurance is revoked for the houses on Orchard Street, which directly borders Brio (Jan. 1987)

Brio Refining files bankruptcy (Dec. 1982)

| 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 |

| 1980 – 1984 time period before NPL status | 1985 – 1989 time period after NPL status |

| 1983-84 average house price $83,470 | 1987-88 average house price $58,282 |

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two months later in December of 1984 by the EPA with the goal of abating the risk

perception in the community and to accurately explain the amount of assessed risk that

existed at Brio (Fenwick, 1988). However, spurred by community outcry and media

attention, the Brio site was placed on the NPL list by the EPA for two reasons: 1) the

houses adjacent to the site (Southbend subdivision) were built very recently and

represented a large financial investment and 2) the site had so many owners and operators

since its establishment, no single party could easily be found culpable for contamination

and therefore could be held responsible for the site's cleanup (Southbend Community

Newsletter, 1984).

Due to the publicity of the area, in January of 1985, all homes in Southbend were

removed from the Federal Housing Administration (FHA) only to be reinstated a month

later after the government was threatened with a community law suit (HUD, 1985;

Thweatt, 1985). In February of that same year, the EPA ordered a remedial investigation

and cleanup plan for Brio (Kreps, 1988). In April 1985, a Harris County Court found in

favor of the Southbend community in a civil law suit against the developers which

allowed residents to leave their homes with no financial retribution from the developers

(Cobb, 1985). In September, the Brio Task Force publicly produced the first independent

laboratory study that stated that the drinking water was safe for consumption and had

never posed a threat to human health (Barinaka, 1988; Brio Task Force, 1985). Finally,

in January of 1987, FHA legally revoked mortgage insurance to properties in Southbend

that bordered the Brio site (Figure 5) due to the number of vacant homes in the area and

also acknowledged the problem with the marketability of properties in Southbend due to

the Brio site (HUD, 1987). In total, the EPA organized four EPA-led open houses and

Figure 5. Southbend subdivision's South Orchard Drive In 1987, the FHA legally revoked mortgage support for this street because most of the houses had been abandoned due to their proximity to the Brio Site.
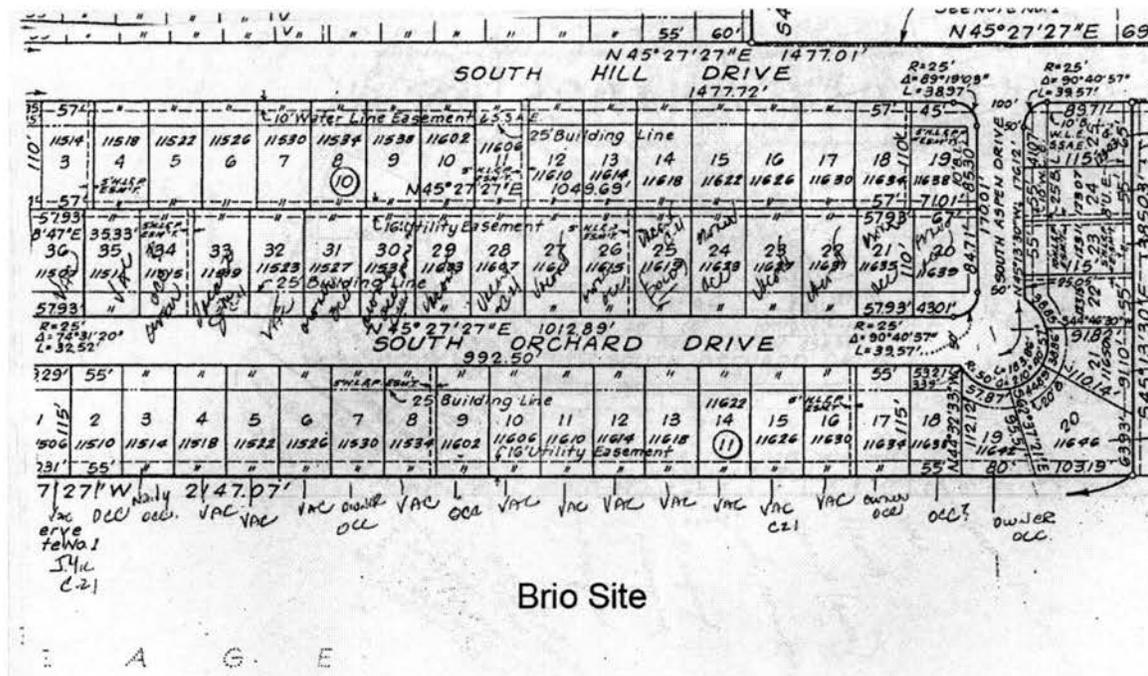
workshops about the Brio site between 1983 and 1988 (10/84, 5/85, 4/86, 12/88) and had

827 citizens that were listed on a governmental mailing list. These community

meetingsand the mail-out campaign were meant to effectively relay information about the

site and the EPA's decisions to the citizens in the area to bolster community involvement

and participation (Hickam, 1988).

CHAPTER 6

DISCUSSION

The Southbend subdivision was eventually demolished and the Brio site fence

was expanded to include the subdivision in 1997. We can assume this later action that the

property values in Southbend eventually depreciated from normal market value in 1981

to virtually zero in 1997. It important, to effectively evaluate community risk perception

and the Superfund process, to document and quantify the beginning of these property

value fluctuations in Southbend that eventually led to the demolition of these structures.

Further, it is also important to offer possible reasons behind this trend to link the Brio

management timeline to the subsequent depreciation of property values in the area. T-

test and regression analyses have shown a 30-percent depreciation of the housing values

in Southbend from before the NPL status (1983-84) until after the Brio site's official

listing (1987-88). Some 2.5 percent of this depreciation is attributable to Houston's

economic recession during the time period, which leaves an unaccounted for 27.5 percent

of property value depreciation. The history of events over this five-year period suggests

that there are two main reasons behind the depreciation of home values in Southbend: 1)

the initial revocation of FHA mortgage insurance for Southbend following the NPL

listing and the EPA finding no scientifically assessed risk to human health in the area,

and 2) the Harris County civil court decision that allowed residents to abandoned their property with no legal retribution from the developers of Southbend.

The site's hazardous waste contamination was first discovered two years after the subdivision of Southbend had been built on the border of the Brio Refining site. This accounts for the initial marketability of the houses during 1981-1982 at normal market prices to home buyers before the subdivision discovered their proximity to a hazardous waste facility. In the year following the discovery of the site, the EPA determined that Brio held no immediate health threat to any neighborhood in its nearby vicinity. Shortly after initial tests were completed, the EPA held the first of many community meetings to discuss their findings with the Southbend community to help alleviate risk perception in the area and to publicize Brio's newly determined status as an NPL site to be remediated under the EPA's Superfund program.

I suggest that conflicting actions from the EPA and the FHA might be responsible for the depreciation of homes in Southbend and may have exacerbated the disparity between the amount of scientifically assessed risk by professionals and the public's understanding and perceptions of that risk. Shortly after the NPL listing was announced, the FHA legally refused mortgage insurance to all residents of Southbend in January of 1985. I suggest that removing homes of an entire subdivision from federal mortgage insurance may have played an integral role in property value reduction in the area by increasing buyers' perceived risk even though the EPA had determined there was no risk to human health. This decision by the FHA, under HUD, may have indicated disagreement between the two government agencies that might have conveyed conflicting information to the community: on one hand, the EPA is communicating to Southbend that

no risk exists, while on the other hand, FHA is revoking federal mortgage insurance that was available leading up Brio's status as an NPL site. Even though the FHA reinstated Southbend's eligibility for FHA coverage and assistance, I contend that this move further destabilized an already unstable and untrusting community near Brio.

Secondly, I attribute further property value depreciation to the Harris County court decision that allowed Southbend residents to abandon their homes with no legal retribution from the developers. Although clear records documenting how many residents actually abandoned their residences are not available, it can be inferred that so many residents left their property that the FHA legally revoked federal mortgage insurance on the properties on South Orchard Drive (those that directly bordered the Brio site).

Other possible explanations for why property values depreciated in Southbend during this time period do exist. This study has already compared the economic state of the Houston area as a whole during this same time period to isolate the property value fluctuation in Southbend as abnormal, but this particular part of south Houston may have been viewed as undesirable real estate during this time. However, this is unlikely given that the houses in Southbend were relatively new and housing development construction continued in the area leading up to the time of Southbend's demolition. For example, the city of Friendswood, which is located half of one mile west of Brio on Dixie Farm Road, saw an population increase of eleven percent from 1980 until 1990, and a increase of twenty-seven percent from 1990 to 2000 (U.S. Census Bureau, 2000). Evaluating this type of growth quantifiably for the region through property values is difficult since the Harris County Appraisal District does not keep records for more than five years and other longitudinal data on surrounding subdivisions is difficult to collect.

Assuming that the depreciation of prices in Southbend can be linked to environmental concerns at Brio, other possibilities might elevate perceived risk in the area. Rumors about health illnesses resulting from living near the site, although perhaps unfounded, may have led to the stigmatization of Southbend, thereby raising perceived risk. However, using a direct method of measuring risk perception, such as conducting survey research in Southbend to evaluate this type of stigmatization is not a possibility. Perceptions expressed through verbal expression require timely personal interviews conducted during the time period of evaluation. This period of opportunity has passed.

CHAPTER 7

CONCLUSIONS

According to evidence published by the EPA, placing a hazardous waste site on the NPL may have no affect on property values, or may even raise them (EPA, 2004). This is in direct contrast to other studies that have shown hazardous waste sites to adversely affect on property values (McCluskey and Rausser, 2001; Smith and Desvousgous, 1986). In the case of Southbend and the Brio Refining site, it has been shown through t-tests and regression analysis that the Southbend subdivision suffered approximately 27.5 percent loss in property values from before the site's listing on the NPL to after its official NPL status. By evaluating the history of events, I suggest that there are two possible reasons behind property value fluctuations in Southbend: 1) conflicting information to the public from the EPA's community meetings and explanation of no health risk and HUD's revocation of FHA mortgage insurance in the area and 2) the Harris County civil court's decision to allow residents to abandon their property with no financial retributions, even though no health risks were found by the EPA or the Brio Task Force. This research highlights the importance of accurately relaying scientifically assessed risk during the community involvement process and remedying inconsistencies across governmental agency actions.

REFERENCES

Adamowicz W., J. Louviere, and M. Williams. "Combining Revealed and Stated Preference Methods for Valuing Environmental Amenities." *Journal of Environmental Economics and Management* 26 no. 3 (1994): 271-92.

Alonso, William. *Location and Land Use*. Cambridge, Mass.: Harvard University Press, 1964.

Barinka, Lou. "Re: Brio Refining Site, Houston, Texas" Letter to James Wilson, Manager of the Federal Housing Administration. August 29, 1988.

Blacke, William. "Superfund Settlements: The Failed Promise of the 1986 Amendments." *Virginia Law Review* 74, no. 1 (1988): 123-157.

Buynoski, George. "Breo Refinery- Air data." Letter to Russell Bartley Operations Section Superfund Branch EPA Region 6. May 29, 1984.

Diamond, Douglas B. "The Relationship between Amenities and Urban Land Prices." *Land Economics* 56, no. 1 (1980): 21-32

Environmental Protection Agency. 2004. What does the evidence say about NPL listings and home prices?[on-line]. Available from: http://www.epa.gov/superfund/programs/recycle/property.htm. internet: accessed Sept. 15, 2005.

Fishburn, Peter and Ariel Rubinstein. "Time Preference." *International Economic Review* 23, no. 3 (1982): 677-694.

Hayes, C.R. "Suburban Residential Land Values Along the C. B. and Q. Railroad. *Land Economics* 33 (1957): 177-81.

Hickam, Carl. "Subject: Southbend Subdivision, Houston, TX." Letter to Betty Williamson Community Relations Coordinator EPA 6. August 26, 1988.

Jenkins-Smith, Hank and Gilbert Basset. "Perceived Risk and Uncertainty of Nuclear Waste: Differences Among Science, Business, and Environmental Group Members." *Risk Analysis* 14, no. 5 (1994): 851-856.

Leiss, William. "Three Phases in the Evolution of Risk Communication Practice" *Annals of the American Academy of Political and Social Science, Challenges in Risk Assessment and Risk Management* 545 (1996): 85-94.

McCluskey Jill J. and Gordon C. Rausser. "Estimation of Perceived Risk and Its Effects on Property Values." *Land Economics* 77, no. 1 (2001): 42- 55.

Schulze, William, Ralph C. d'Arge, and David S. Brookshire. "Valuing Environmental Commodities: Some Recent Experiments." *Land Economics* 57, no. 2 (1981): 151-172.

Slovic, Paul. "Risk Perception" *Science.* New Series 236 no. 4799 (1987): 280-285.

Smith, V. Kerry and William H. Desvousgous. "The Value of Avoiding A LULU: Hazardous Waste Disposal Sites" *The Review of Economics and Statistics* 68 (1986): 293-99.

Stephens, Kenneth. "Re: Southbend Subdivision Ground Contamination." Letter to Ed Woerz, Chief Apraiser HUD, FHA November 26, 1984.

Southbend M.U.D. "Southbend Community Newsletter." Brio Refining Co., Inc. Friendswood, Texas. November, 1984.

Thweatt, Robert. "Re: Southbend Subdivision, Harris County, Texas." Letter to Allen Novosad of the FHA. January 25, 1985.

U.S. Census Bureau. 2000. U.S. *Census Bureau State and County Quick Facts.* Available from: http://quickfacts.census.gov/qfd/states/48000.html. Internet. accessed April 16, 2006.

U.S. Department of Housing and Urban Development, Federal Housing Administration. "Information Regarding HUD procedures: Circular Letter 84-9. Letter to Employees and Persons having business with HUD. January 15, 1985.

U.S. Department of Housing and Urban Development, Federal Housing Administration. "Information Regarding HUD procedures: Circular Letter 87-1. Letter to Employees and Persons having business with HUD, January 6, 1987.

Newspaper Articles Examined

Houston Post. "Residents told waste pits no threat." Harold Scarlett. December 11, 1984.

Houston Chronicle. "Owners can flee homes near dump" Kim Cobb. April 25, 1985.

Houston Chronicle. "Folks doubt Brio Safety." Delores Fenwick. May 25, 1985.

Houston Chronicle. "EPA details plan to dispose of Brio toxic waste," Mary Ann Kreps. February 10, 1988. Section 1.

VITA

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