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George Erickcek

W.E. Upjohn Institute for Employment Research, erickcek@upjohn.org

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August 15, 2006

George A. Erickcek
Senior Regional Analyst
W.E. Upjohn Institute for Employment Research

W.E. Upjohn Institute for Employment Research

**300 South Westnedge Avenue • Kalamazoo, Michigan 49007-4686 • U.S.A.
Telephone (269) 343-5541 • FAX (269) 342-0672**

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Executive Summary/Introduction

This report, which was completed at the request of the Richland Township Planning Commission, provides an estimation of the economic impact of the proposed Stoneco Gravel Mine Operation on Richland Township.¹ The following impacts are assessed in this study:

1. The potential impact on residential property values in Richland Township.
2. The potential employment impact of the proposed gravel mine on the area's economy.

In addition, we carefully reviewed the economic impact reports provided by Stoneco for consideration.

In the preparation of this impact analysis we used nationally-recognized modeling techniques that are the standard for academic research.

We estimate that the proposed gravel mine will have a significant negative impact on housing values in Richland Township. Once in full operation, the gravel mine will reduce residential property values in Richland and Richland Township by \$31.5 million dollars, adversely impacting the values of over 1,400 homes, which represent over 60 percent of the Richland residences.

In addition, the mining operation will have an insignificant impact on area employment and personal income. At most, we estimate that only 2 additional jobs will be created in Kalamazoo County due to the mining operation. The mining operation serves the local

¹ The report was completed without charge as part of the W.E. Upjohn Institute's community service commitment. The Institute has prepared requested reports and analyses for the City of Kalamazoo, the City of Hastings, the City of Battle Creek, the City of Grand Rapids as well as other local governmental units and school districts.

market, and analysis based on the Institute's econometric regional model for the Kalamazoo region shows that it will bring in an insignificant amount of new income into the area's economy, \$58,000. Although the mine will employ an estimated 5 to 10 workers and require drivers to haul an estimated 115 to 120 truck loads of gravel per day, most all of these jobs would simply "displace" any employment growth in the county's 15 existing gravel pits.

Stoneco has not established a need for new aggregate capacity. Kalamazoo County is currently serviced by 15 gravel operations, and in recent years, employment in the county has been shrinking and the population has been stagnant. Consequently, there is no *prima facie* case that new capacity is needed. To definitively determine whether such a need exists, we would need to have information on projected demand for aggregated material in the county and capacity of the gravel pits currently servicing the county.

Finally, a careful evaluation of the five impact studies presented by the Stoneco finds that their methodologies are seriously flawed, and thus conclusions drawn from the analyses are invalid.

Qualifications

The W.E. Upjohn Institute for Employment Research is an internationally-recognized independent, non-profit economic research organization established in 1945 for the sole purpose of conducting research into the causes and effects of unemployment and measures for the alleviation of unemployment. The Institute currently has a staff of 60 including 10 senior-level economists, and its research agenda includes issues on the international, national, state, and local levels.

For the past 20 years the W.E. Upjohn Institute has maintained a strong research focus on west Michigan which includes

- The publication of its quarterly economic report: *Business Outlook for West Michigan*.
- The preparation of short- and long-term employment forecasts for all of the metropolitan areas in west Michigan including Kalamazoo, Battle Creek, Grand Rapids, Muskegon, and Holland.
- The completion of numerous economic impact reports and economic development strategies for communities in Michigan.

George Erickcek, the Institute's Senior Regional Analyst, was the lead researcher for this study. He received his Masters of Economics at the University of Pittsburgh and has been with the Institute since 1987. George has prepared numerous economic impact, benchmarking, and forecasting studies for the west Michigan region, and has conducted research on the national and international level.

Methodological Approach to Estimating the Impact on Housing Values of the Proposed Gravel Mine

Many factors influence housing prices. These include, of course, the characteristics of the house or dwelling unit, such as size, age, lot size, number of bedrooms and bathrooms, as well as its upkeep. In addition, the house's proximity to amenities such as a lake or pleasing neighborhood or "disamenities" (e.g. landfills, pollution sites) can have a substantial impact on its price.²

Economists have found that "hedonic pricing models" are extremely useful in isolating the contribution of specific factors on the price of housing, as well as other goods. First developed by University of Chicago economist Sherwin Rosen in 1974, hedonic pricing models use a statistical regression technique that allows the researcher to estimate the impact of one factor, e.g. the proximity of a neighborhood park, on the value of a house while holding all of the other factors impacting the house's value constant. There is an extensive literature applying hedonic pricing models to study the effects of environmental disamenities on residential property values. These studies generally show that proximity to landfills, hazardous waste sites, and the like has a significant negative effect on the price of a residential property.³

Professor Diane Hite, an economist who has published widely in the area of property value impact analysis, has recently applied hedonic pricing methodology to study the effects of a gravel mine on nearby residential values. This appears to be the only rigorous study to date of gravel mine impacts on property values.⁴ Her study is based on detailed data from Delaware County, Ohio that were collected by the Ohio State University for the purposes of studying land use planning.

Hite examines the effects of distance from a 250-acre gravel mine on the sale price of 2,552 residential properties from 1996 to 1998. Her model controls for a large set of other factors that determine a house's sale price, including number of rooms, number of bathrooms, square footage, lot size, age of home, sale date, and other factors specific to the locality, so that she can focus solely on the effect of proximity to the gravel mine on house values. She finds a large, statistically significant effect of distance from a gravel mine on home sale price: controlling for other determinants of residential value, proximity to a gravel mine reduces sale price. Specifically, Hite reports that the elasticity of house price with respect to distance from a gravel mine is .097, implying that a 10 percent increase in distance from the gravel mine is associated with slightly less than a 1

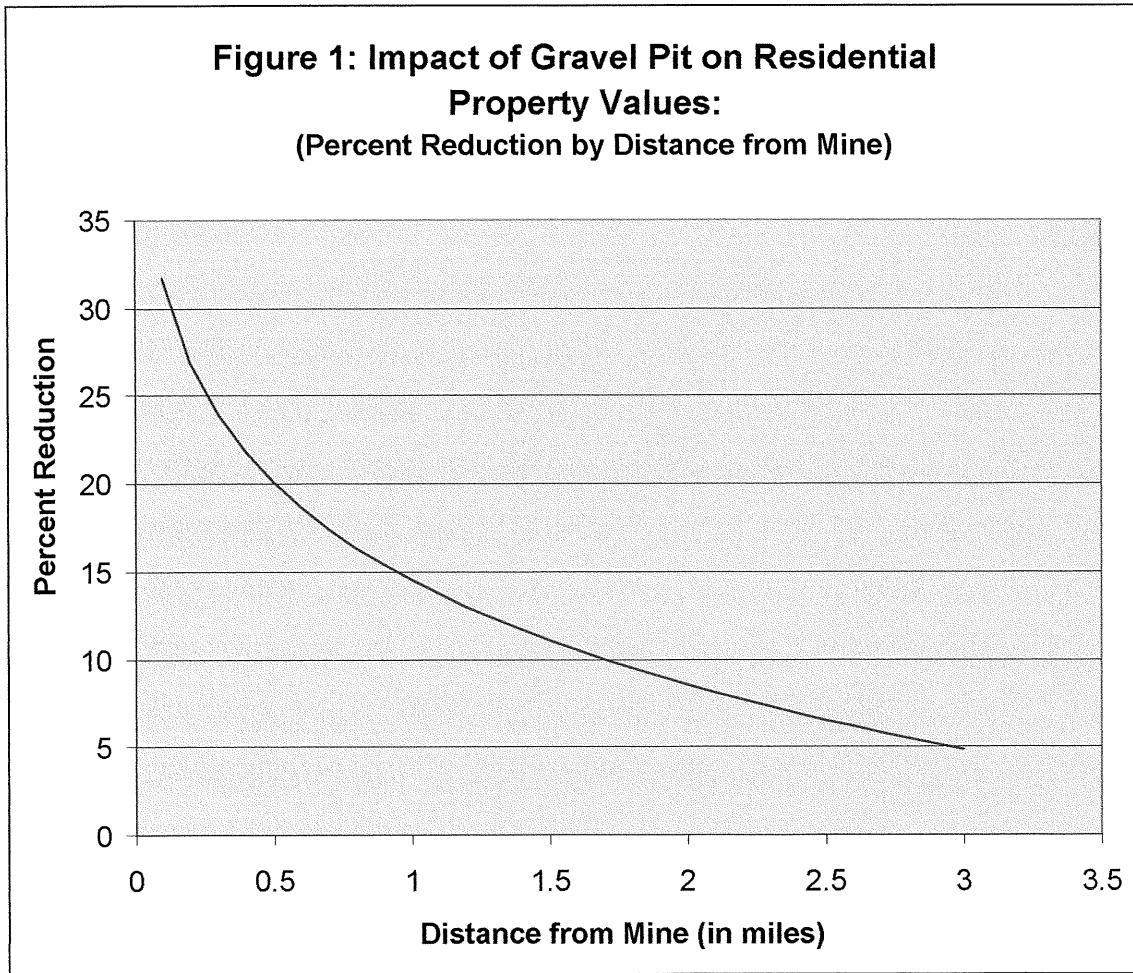
² In a recent study of the impact of housing programs in the City of Kalamazoo, we found that moving a house from one neighborhood to another can add or subtract as much as \$20,000 from its value.

³ For reviews of some of this literature, see Arthur C. Nelson, John Genereux, and Michelle Genereux, "Price Effects of Landfills on House Values," *Land Economics*, 1992 68(4): 359-365 and Diane Hite, Wen Chern, Fred Hitzhusen, and Alan Randall, "Property-Value Impacts of an Environmental Disamenity: The Case of Landfills," *The Journal of Real Estate Finance and Economics* 22, no. 2/3 (2001): 185-202

⁴ Diane Hite, 2006. "Summary Analysis: Impact of Operational Gravel Pit on House Values, Delaware County, Ohio," Auburn University.

percent increase in home value, all else the same.⁵ Conversely, the closer the house to the proximity to the mine, the greater the loss in house value.

Figure 1 displays the estimated effects of distance from the gravel pit on house price. A residential property located a half mile from the gravel mine would experience an estimated 20 percent reduction in value; one mile from the mine, a 14.5 percent reduction; 2 miles from the mine, an 8.9 percent reduction; and 3 miles from the mine, a 4.9 percent reduction. These estimates are similar to estimates published in academic journals on the effects of landfills on nearby property values.



⁵ This estimate is based on a constant elasticity model specification. At the Upjohn Institute's request, Professor Hite tested the sensitivity of these findings to model specification, and in all specifications finds a large, statistically significant negative effect of proximity to gravel pit on house prices. The simulations for Richland Township reported below are based on the estimates from the constant elasticity specification and yield slightly lower estimated negative property value impacts than those based on models using other functional forms. We consider this number to be a conservative estimate.

The loss in property value results from the negative consequences of the mining operation and reflects the deterioration in the area's quality of life due solely to the operation of the gravel mine. In other words, the loss in house value is a way to quantify in dollars the deterioration in quality of life, as capitalized in the price of the house. It captures the price reduction the homeowner would have to offer to induce a new buyer to purchase the property. Even if homeowners do not move as a result of the gravel mine, they will lose homeowner equity as the potential sale price of their house is less.⁶ Therefore, regardless of whether or not a person actually sells their property, it measures the adverse effects in their quality of life in being subjected to the disamenities introduced into the area by the gravel mine.

The policy implications of Hite's study are clear: because property value losses are higher the closer to the gravel mine, all else the same, new sites should be located far from existing residences so as to minimize adverse consequences for homeowners.

Simulation of Gravel Mine on Residential Property Values in Richland

Utilizing the estimates from the Hite study and data on 2006 assessed values provided by Richland Township, the Upjohn Institute simulated the effects of the proposed gravel mine on residential property values in Richland Village and Richland Township. Our analysis is based on 2005 assessed values of single-family homes in Richland Township and Richland Village obtained from the Township's assessor office in June and July. In total 2,319 single-family homes, 88.7 percent of all single-family residences in the township and village, were geo-coded using the ArcView© mapping program, manually matched using Yahoo© maps and, finally, through drive-by inspection of addresses. Once all of the homes were mapped, the distance between each of the residences and the closest boundary of proposal Stoneco gravel mine was determined.

As shown in Table 1, more than 1,400 homes will be negatively impacted by the proposed gravel mine with the total cost reaching \$31.5 million dollars.

⁶ Only those owning property at the time of the establishment of the gravel mine would experience a loss in equity. Those purchasing property near an established mine would not experience an equity loss because any negative effects from the mine's operation would have been incorporated into the purchase price. By implication, few property owners near long-established mines could claim loss of property value from the mine because few would have owned the properties at the time the mine went into operation.

Distance (miles from Stoneco Site)	Number of Houses Affected	Estimated Loss in Value	Distance (miles from Stoneco Site)	Number of Houses Affected	Estimated Loss in Value
0.1	2	\$211,703	1.6	73	\$1,207,011
0.2	3	\$106,428	1.7	128	\$2,500,456
0.3	2	\$134,894	1.8	99	\$1,630,149
0.4	9	\$522,981	1.9	70	\$1,146,761
0.5	3	\$389,319	2	34	\$633,720
0.6	8	\$598,518	2.1	105	\$952,068
0.7	24	\$831,338	2.2	98	\$1,311,040
0.8	25	\$798,108	2.3	99	\$2,843,845
0.9	27	\$1,085,190	2.4	72	\$2,699,584
1	22	\$918,374	2.5	34	\$912,133
1.1	75	\$2,428,602	2.6	12	\$377,548
1.2	62	\$1,688,031	2.7	23	\$373,873
1.3	45	\$1,146,920	2.8	80	\$939,861
1.4	32	\$824,928	2.9	55	\$944,061
1.5	30	\$712,731	3	70	\$655,846
Total				1,421	\$31,526,020

While Hite's original study covered a 5-mile radius from the gravel mine in Ohio, we chose to examine only a 3-mile area from the boundaries of the proposed Stoneco site.⁷ Only properties located in Richland and Richland Township are included. Property values in other townships, notably Prairieville Township, also could be adversely affected by the location of a gravel mine near its border with Richland Township but were not included in the study. In addition, the analysis does not consider possible effects on commercial property. Our estimates do not factor in the likely negative impact on property values along the truck routes used for the mine. Finally, although Stoneco has proposed to reclaim some of the land for a lake and residential development, its proposed timeframe for this development would occur too far into the future to mitigate adverse property value impacts for current Richland area residents.

⁷Hite's statistical analysis intentionally includes homes at a distance deemed unaffected by the gravel operation. Our choice to study the impacts up to 3 miles is based on Nelson, et al. (1992) and the fact that estimated impacts for individual homeowners are still relatively large out to three miles in all of Hite's models.

Employment and Personal Income Impact

Stoneco estimates that 5 to 10 permanent jobs will be created at the proposed mine. In addition, truck drivers will be required for the 115 to 120 truck loads of gravel that will be hauled from the mine daily.

To measure the potential employment and income impact of the gravel mine, we used the Institute's econometric regional model of the Kalamazoo area.⁸ Because of its weight and low-value, gravel is hauled for only short distances. It is not a part of the area's economic base that brings new monies into the area. Therefore, it is an activity that does not generate any significant new income or employment opportunities. We estimate that only 2 additional new jobs will be created in Kalamazoo County due to the gravel mine and personal income in the county will increase by only \$58,000. In short, the jobs created at the gravel mine will displace jobs elsewhere in Kalamazoo County or the immediate region. The proposed mine would not result in any significant net benefit to the area from job or income creation.

Need for the Proposed Mine

Adverse economic effects of the proposed gravel mine to the Richland community must be balanced against the county's broader needs for aggregate material for road construction. Currently, 15 gravel mines operate in Kalamazoo County according to the Kalamazoo County Planning Department (Table 2). Stoneco's application materials do not provide any evidence for the need for additional capacity. Statistics were cited on projected needs, but no evidence was presented as to whether existing capacity could cover anticipated needs.

The need for additional capacity of gravel production is not supported by current and projected population or employment trends in Kalamazoo County. Population growth in Kalamazoo County has been modest during the past five years, and well below the national rate. From 2000 to 2005, population in the county increased annually at a rate of below 0.2 percent, compared to 0.9 percent nationwide.⁹ An analysis of the individual components of population change—births, deaths, net migration—shows that individuals and households, on net, are leaving the county. From 2000 to 2005, the county's population increased by 6,342 individuals due to number of births surpassing the number of deaths. However, on net, 4,150 individuals moved out of the county.¹⁰

⁸ The Upjohn Institute maintains a regional economic impact and forecasting model for the Kalamazoo metropolitan area which was built by Regional Economic Models Incorporated (REMI) especially for the Upjohn Institute. The REMI modeling approach, which incorporates an input-output model with a forecasting model and a relative cost of production model, has been repeatedly reviewed and upheld as the industry standard.

⁹ U.S. Census Bureau.

¹⁰ U.S. Census Bureau. Furthermore, Internal Revenue Service (IRS) data from 2000 to 2004 shows that the majority of the individuals leaving the county are moving outside the greater Kalamazoo region.

Table 2

Kalamazoo County Gravel Pits		
Owner Name	Site Address	Site Township
Aggregate Industries	C Ave. Near 6th St	Alamo
Art Austin	6287 K Avenue	Comstock
Triple B Aggregates	2702 Ravine Rd.	Kalamazoo
Thompson McCully Co	3800 Ravine Rd.	Kalamazoo
Byholt, Inc.	1600 Sprinkle Rd.	Brady
Byholt, Inc.	4th St	Prairie Ronde
Fulton Brothers Gravel	4th St	Prairie Ronde
Balkema Excavating	8964 Paw Paw Lk.	Prairie Ronde
Balkema Excavating	6581 E. K Ave	Comstock
Balkema Excavating	4274 Ravine Rd	Kalamazoo
Balkema Excavating	40th St. & I-94	Charleston
Balkema Excavating	14500 E. Michigan	Charleston
Balkema Excavating	15600 E. Michigan	Charleston
Consumer Concrete	10328 East M-89	Richland
Consumer Concrete	700 Nazareth Rd	Kalamazoo

Source: Kalamazoo County Planning Department July 2006

During the same time period, employment declined by 3.4 percent, a loss of 5,000 jobs. The Michigan Department of Labor and Economic Growth estimates that from 2002 to 2012, total employment in Kalamazoo and St. Joseph counties will increase at a rate of 0.8 percent—substantially below the 1.3 percent rate of growth projected for the nation as a whole. If this rate of employment growth holds true for the future, it will be not until 2010 that the county will reach its 2000 employment level.

Thus, economic projections do not, in and of themselves, indicate a need for expanded aggregate capacity. However, we emphasize that any definitive determination of need would require information on the capacity and life expectancy of existing area gravel pits, to which the Institute does not have access.¹¹

Review of Stoneco's Property Value Impact Analysis

The Environmental Study submitted by Stoneco in connection with its special use permit application concludes that gravel mining operations have no adverse impact on the value of nearby properties. This conclusion is based on five reports included in Appendix J of Stoneco's Environment Study:

¹¹ Note that whether there is a public need for additional capacity and whether it is in Stoneco's interest to develop a new mine are distinctly different issues. Stoneco has indicated that it would reduce its transportation costs by operating at the proposed Richland location. The degree to which any lower transportation costs translate into lower prices of aggregate material—and hence broadly benefit the public—versus increased company profits will depend on the competitive structure of the industry in this region.

1. "Impacts of Aggregate Mine Operations: Perception or Reality?" Anthony Bauer, 2001.¹²
2. "Social, Economic, and Legal Consequences of Blasting in Strip Mines and Quarries," Bureau of Mines, 1981.
3. "Impact of Rock Quarry Operations on Value of Nearby Housing," Joseph Rabianski and Neil Carn, 1987.
4. "Impacts of Rock Quarries on Residential Property Values, Jefferson County, Colorado," Banks and Gesso, 1998.
5. "Proposed Fuquay-Varina Quarry: Analysis of Effect on Real Estate Values," Shlaes & Co., 1998.

These reports, in fact, fail to show that mining operations have no adverse impact on property values. None uses the standard methodology (the hedonic pricing model, described above) for evaluating property value impacts. Four of the five reports are based on flawed logic (as explained below) and hence cannot be used to draw any conclusions about property value effects. Only one report, commissioned by the U.S. Bureau of Mines, used a defensible methodology, although this report also suffers from serious limitations. Notably, this study found some evidence of adverse impacts of gravel mining operations on property values in six out of the seven sites examined.

The Bauer, Rabianski and Carn, Banks and Gesso, and Shlaes & Co. reports rely on one or both of the following types of observations to argue that gravel mining operations have minimal adverse impact on nearby property values:

- Over time, housing and commercial developments have moved closer to and sometimes adjacent to aggregate mine operations.
- For property values in the vicinity of mining operations that have existed for many decades, the rate of growth in property values does not increase with distance from the mining site.

In neither case do such observations have any bearing on the impact of aggregate mine operations on nearby property values.

1. Residential and commercial developments have located closer to and sometimes adjacent to mines over time.

Economic or real estate analysis does not predict that properties near mines have no value or no development potential. Rather, one would expect that nearby property values would be lower to compensate for any costs (e.g. noise, pollution, unsightly landscapes, and traffic congestion) associated with the mine. This reflects the

¹²Bauer (2001) is a two-page statement that in large part summarizes the results of a 1984 study by a Michigan State University student.

common sense observation that property that is near sources of noise, pollution, traffic congestion, and blight will (all other things being equal) be less valuable. Of course, these lower property values, in turn, will help lure development, especially over time, but the development more than likely will include non-residential activities, which are not affected by the disamenities generated by the mine.

Two studies (Bauer 2001; Banks and Gesso 1998) examined aerial photographs taken over the course of several decades that showed housing and commercial developments moving closer to mining operations. As the population has expanded, land values near central cities have increased, and transportation infrastructures have improved, development has fanned out all across the country. Any study would inevitably find that over the course of the last 20, 30, or 40 years, housing developments have moved closer to mines (and any other less desirable location), and such observations have no relevance to the question posed by Stoneco's application—whether the establishment of mining operations will lower nearby property values.

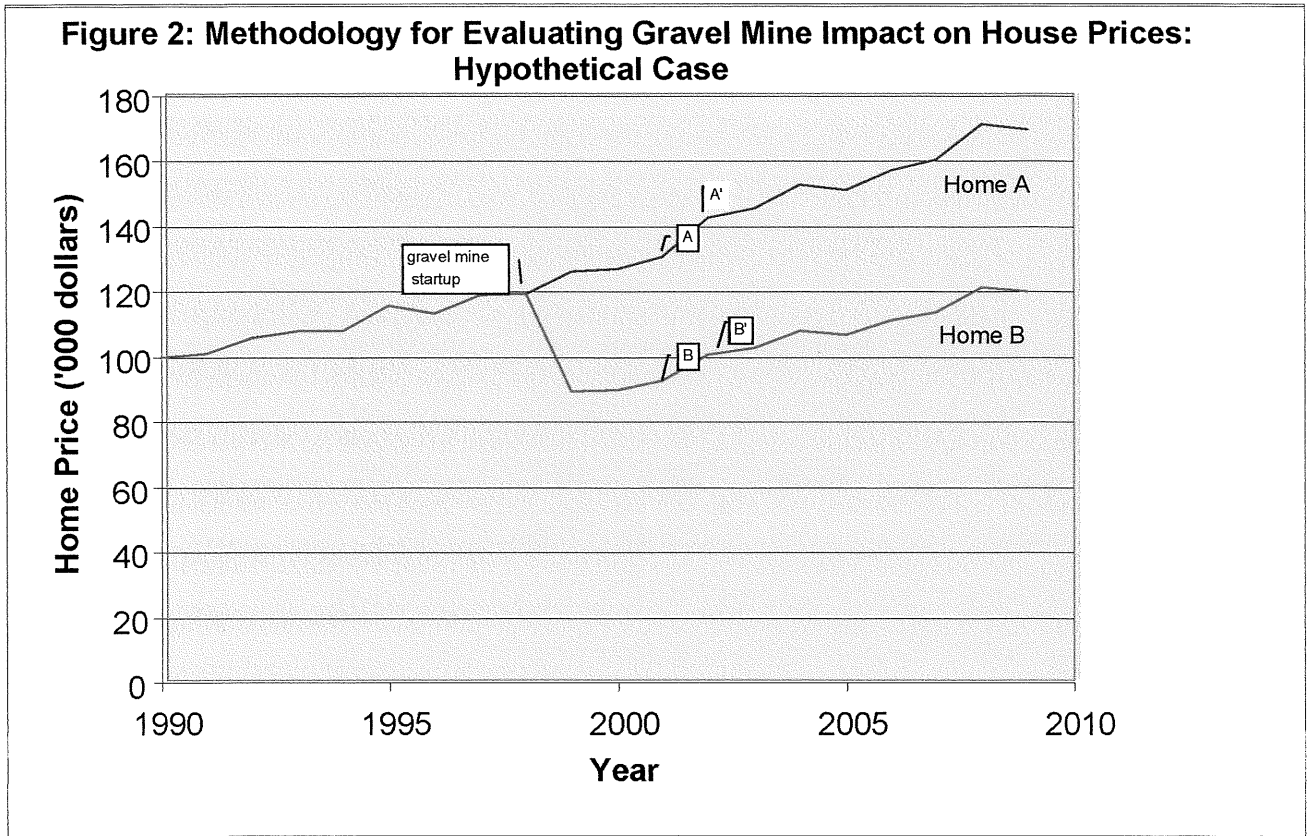
2. Near well-established mines, the year-to-year change of property values is no less for properties located close to mines than for those located somewhat farther away from mines.

The adverse impact that a mine will have on nearby property values will occur within a short period of time following the establishment or announcement of the mine. After the adverse effects of being located near a mine have been capitalized into the property value—that is, after the negative effects of being close to a mine operation has resulted in a decrease in property values—we would not expect the future rate of change of nearby properties to be different from those of other properties, all else the same.

The analyses in Rabianski and Carn (1987), Shlaes & Co. (1988), and Banks and Gesso (1998) look at whether the relative difference in property values between properties close to and farther from a mine continue to widen 30, 50, even 100 or more years after the mine was established. All of these studies conclude that because we do not see continued widening of these differentials many decades after the establishment of mines, mines have no adverse effect on property values. This argument makes no sense: the adverse impact on property values would have occurred decades before. These studies shed no light on possible adverse impacts of mining operations on property values.

Figure 2 illustrates this point. This figure depicts the prices of two hypothetical homes over a 20-year period. Home B is affected by the opening of a gravel mine in the middle of the time period; otherwise the homes are identical. Except in the year when the gravel mine is introduced, the annual *percentage changes* in the prices of the two homes are the same. The methodology used in the reports cited in the Stoneco environmental study compared the percentage change of homes near the gravel mine (percent change from B to B' in Figure 2) to the percentage change in home prices farther from the gravel pit (percent change from A to A' in Figure 2).

But even with adverse property value effects, these percentage differences should be approximately equal. To capture any adverse impact, one must measure the difference in values of otherwise comparable properties close to and farther from the gravel mine at a point in time. In Figure 2, the difference between points A and B or between A' and B' measure the true property value impact, which conceptually is what is measured in the hedonic pricing model used in the analysis reported above.



Only the study commissioned by the U.S. Bureau of Mines attempted to assess how the value of comparable homes varied with distance from the mine. However, the Bureau of Mines study suffered from several serious shortcomings:

- The sample size at each of seven sites was very small, and hence no statistically valid conclusions could be drawn.
- Homes were classified into rough typologies, and hence controls for other factors affecting home prices were crude.
- The study was based on assessed values rather than on more accurate sale price data.
- The study only examined potential property value impacts within approximately a half mile of the mine site. More recent research shows that property value effects

may be significant up to two or three miles from such sites.¹³ Limiting analysis to properties within a half mile of the mine site could lead to a significant understatement of any property value impacts.

- Researchers used subjective assessments to discount findings of adverse impacts on property values.

With these shortcomings in mind, the Bureau of Mines study found some evidence that the value of comparable homes increased with distance from the mine site in six of the report's seven case-study sites. In some cases, the differences in values were described as large.

¹³ See, for example, Arthur C. Nelson, John Genereux, and Michelle Genereux, "Price Effects of Landfills on House Values," *Land Economics*, 1992 68(4): 359-365.