Property Value Impacts of the SGI Charmian Quarry and Processing Facility in Hamiltonban Township, Adams County PA

Status: Final Report
Date: July 2019
Submitted to:

K&L Gates LLP
Market Square Plaza, 18th Floor
17 North Second Street
Harrisburg, PA 17101

ESI ECONSULT SOLUTIONS INC.
economics | policy | strategy
1435 WALNUT STREET, 4TH FLOOR, PHILADELPHIA, PA 19102 | 215-717-2777 | ECONSULTSOLUTIONS.COM

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About Econsult Solutions, Inc.

This report was produced by Econsult Solutions, Inc. ("ESI"). ESI is a Philadelphia-based economic consulting firm that provides businesses and public policy makers with economic consulting services in urban economics, real estate economics, transportation, public infrastructure, development, public policy and finance, community and neighborhood development, planning, as well as expert witness services for litigation support. Its principals are nationally recognized experts in urban development, real estate, government and public policy, planning, transportation, non-profit management, business strategy and administration, as well as litigation and commercial damages. Staff members have outstanding professional and academic credentials, including active positions at the university level, wide experience at the highest levels of the public policy process and extensive consulting experience.

1. Introduction

Specialty Granules, LLC (SGI) is a national manufacturer of mineral granules for the residential and commercial roofing markets. The SGI Charmian plant was established in 1923 in Hamiltonban Township, Adams County. The location had also been used for mining prior to SGI's ownership. Most of the granules SGI produces are used to manufacture asphalt-based roofing shingles and it is the only granule production facility serving asphalt shingle manufacturers in the Northeast. The Charmian plant produces enough granules to protect approximately 1 million homes (both new and re-roofing) per year with asphalt shingles. The next-closest granule products plants to the northeast market are in Wisconsin and North Carolina.

SGI has applied for a new surface mining permit to continue its currently permitted and operating metabasalt quarry operations through development of an approximately 112-acre mining area referred to as the Northern Tract adjacent to and northeast of the existing Pitts Quarry area. SGI has asked Econsult Solutions, Inc. to estimate the impact, if any, that the quarry has on nearby property values. This report details our analytical approach and findings of our analysis.

2. Background

A common complaint raised by opponents to the development of new quarries or the expansion of existing quarries is the potential impact on near-by residential property values.

It is well recognized that residential property values may be impacted by a variety of factors, including the characteristics of the property itself (e.g., lot size/land area, building square footage, structure condition), general economic and employment conditions (e.g., recession vs. expansion cycles), and characteristics of the surrounding area. The industry standard method used in real estate economics to evaluate the relative importance of each attribute, or variable, on property values involves hedonic regression models (also referred to as hedonic pricing models). Hedonic modeling starts with actual reported sales prices from arms-length transactions and provides, through a set of multiple statistical analyses, estimates of the average impact that any property attribute (e.g., lot size or square feet of residence) or neighborhood attribute (e.g., location in relation to some other land use) contributes to property values seen in market transactions while controlling for the impact of other variables. As discussed below, ESI prepared a hedonic regression model that used actual sale prices reported in Adams and Franklin Counties to evaluate the potential impact of proximity to or distance from the SGI Charmian Facility.

In addition to modeling, we conducted a literature search of the effect of quarries on property value. There is extensive literature applying hedonic regression models to study the effects of certain perceived environmental disamenities on residential property values. The results of the studies with regards to the impact that proximity to landfills, hazardous waste sites, and power plants have on residential property values are mixed depending on each individual circumstance. In contrast, there is relatively limited literature as to whether a negative property value effect results from quarries. In addition, many of the studies that do exist are non-peer-reviewed.

The most commonly cited study of potentially negative residential property value impacts of quarries was a relatively short paper prepared by Professor Patricia Hite of a quarry near Delaware, Ohio.[1] However, as discussed in more detail below, the results of the Hite paper have recently been called into question.[2]

The Hite paper found a positive relationship between residential property values and distance from the Delaware, Ohio quarry, which would imply a negative impact on residential property values – as one moves closer to the quarry, residential property values decline. Additional studies that purported to find a negative impact of quarries, including Erickcek (2006), the Center for Spatial Economics (2009),

[1] D. Hite, Summary of Analysis: Impact of an Operational Gravel Pit on House Values: Delaware County, Ohio, Working Paper (2006) (available at: http://www.accpg.org/docs/Gravel%20Pit%20Interim%20Zoning/Storey%20Pit/exhibit_b.pdf)

[2] See: Ford and R. Seals, Quarry Operations and Property Values: Revisiting Old and Investigating New Empirical Evidence , The Phoenix Center (March 2018) (available at: http://www.phoenix-center.org/pcpp/PCPP53Final.pdf) for a criticism of the Hite paper.

and Smith (2014)[3] among others, did not conduct their own econometric modelling, but rather extrapolated the results of Hite's report to different locations. As such, these additional studies do not supply any additional support for the notion that quarries have a negative impact on property values. In contrast, as discussed below, two recent studies did not find a negative impact of quarries.

A recent paper from the Phoenix Center (2018)[4] points out many of the shortcomings of the Hite paper, including the length of the paper (250 words), no details regarding the modeling methodology used and little information on data used in the analysis. The Phoenix Center attempted to replicate the results of the Hite study using data from the same quarry and the same methods as the original paper (e.g., using price rather than the log of price[5] and using non-linear least squares[6]). The Phoenix Center study found that reported transaction prices of residential properties decreased as the distance from the quarry increased. The coefficient for distance from the quarry from the regression model (-.141) was similar in size but had the opposite sign from the results reported in the Hite paper (.125). These coefficients represent the average impact of a given housing or neighborhood attribute on property valuations, while controlling for the impact of other variables. Thus, one model utilizing non-standard methodology purported to find a decrease in property values near the Ohio quarry, while a second model prepared using better documented and more accepted methodology showed an increase in property values near the Ohio Quarry.

In additional to attempting to replicate the results of the Hite study, the Phoenix Center analysis also analyzed the data using a variety of model specifications[7]. The Phoenix Center analysis looked at a variety of alternative specifications to test the impact of distance from the quarry on property values. Across all alternative model specifications, the price-distance relationship was negative, that is, controlling for other variables, properties further away from the quarry tended to have lower prices and that relationship was statistically significant. The negative price-distance relationship is robust to estimation method and distance specifications.

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[3] G.A. Erickcek, An Assessment of the Economic Impact of the Proposed Stoneco Gravel Mine Operation on Richland Township, W.E. Upjohn Institute for Employment Research (August 15, 2006) (available at: http://www.stopthequarry.ca/documents/US%20Study%20on%20the%20impact%20of%20pits% 20quarries%20on%20home%20prices.pdf); The Potential Financial Impacts of the Proposed Rockfort Quarry, Center for Spatial Economics (February 26, 2009) (available at: http://wcwrpc.org/FinancialImpacts_RockfortQuarryCanada.pdf);
G. Smith, Economic Costs and Benefits of the Proposed Austin Quarry in Madera County, Report (October 23, 2014) (available at: http://www.noaustinquarry.org/wp-content/uploads/2016/08/Austin-Quarry-Economics- Report.pdf).

[4] G. Ford and R. Seals, Quarry Operations and Property Values: Revisiting Old and Investigating New Empirical Evidence , The Phoenix Center (March 2018) (available at: http://www.phoenix-center.org/pcpp/PCPP53Final.pdf)

[5] "Log of price" involves translation of a series of prices into their respective natural-log value, which makes it easier to evaluate the average percentage change.

[6] The functional form of the model chosen by Hite is highly irregular in hedonic house price models. The model is non-linear which required the use the non-linear least squares estimation technique to estimate the model, rather the ordinary least squares estimation technique which is standard practice in the hedonic house price literature. The Phoenix Center paper was unable to find an instance in the literature where the specification used by Professor Hite is used and in addition, they were able to find a number of other studies by Professor Hite where ordinary least squares techniques and the more common functional forms were used rather than the non-linear least squares technique.

[7] A "model specification" is part of the process of building a statistical model: specification consists of selecting an appropriate functional form for the model and choosing which variables to include.

The Phoenix Center study also undertook a similar analysis for properties surrounding the Rogers Group Quarry near Murfreesboro, Tennessee. Across all model specifications the price-distance relationship was negative, controlling for other variables, properties a further distance from the quarry tended to have lower prices and statistically significant.

In addition, Grant (2017)[8] analyzed the impacts of quarries on property values in Wellington County, Ontario. The analysis found a small positive impact associated with being close to a quarry, meaning prices were slightly higher near the quarry .

[8] A. Grant, Estimating the Marginal Effect of Pits and Quarries on Rural Residential Property values in Wellington County, Ontario: A Hedonic Approach. (June 2017). (available at: https://atrium.lib.uoguelph.ca/xmlui/bitstream/handle/10214/10903/Grant_Alison_201706_MSc.pdf?sequence=3&isAllowed=y)

3. Property Value Impact of SGI's Quarry in Hamiltonban, Adams County PA

To determine the residential property value impact of SGI's Quarry in Hamiltonban, ESI undertook a rigorous statistical analysis of 561 arms-length residential property transactions in Adams and Franklin Counties located within three miles of the quarry over the 2000 to 2019 period.[9] Data on reported property transactions was obtained from the Adams County Tax Services Department and the Franklin County Geographic Information Services Department.[10] This data set is large enough to allow for statistically significant findings.

3.1. Analytical Approach

Hedonic regression models are an industry-standard technique used to statistically estimate the effects of property characteristics on residential property values. Hedonic modeling can provide estimates of the average impact that any housing or neighborhood attribute contributes to property valuations while controlling for the impact of other variables. Hedonic modeling offers valuable information about the relative contribution of property characteristics, such as proximity to the SGI quarry, to the value of real property controlling for the other variables that impact prices.

The hedonic regression model used is as follows:

$$House\ Value_i = f(S, N, T, Quarry)$$

Where:

S is the vector of structural characteristics of the house, including total square feet of the house, and lot size.

N is a vector of neighborhood socioeconomic characteristics measured at the Census Tract level. These include household income and percentage of houses that are owner occupied and other demographic variables.

***T** is a vector of indicator variables for year of sale to control for overall market conditions in each year.*

Quarry is distance of the quarry to each of the individual houses

[9] We also did the analysis using data from all 35,310 arms-length transactions in Adams and Franklin Counties. We found the results to be similar to the model results using data from within three miles of the quarry.

[10] The property transaction data and property characteristics data was purchased from the appropriate departments in each county in May 2019.

This hedonic model allowed us to isolate the impact of being close to the quarry on the value of residential properties located near the quarry, while controlling for the impact of other variables.

The regression model was estimated using data from 561 arms-length transactions of single-family homes in Adams and Franklin counties that are located within 3-miles of the SGI facility. The property transaction data was carefully screened and cleaned to remove non-arms-length sales such as transactions between family members. In addition, transactions with missing or unusual characteristics were also excluded. Specifically, we excluded transactions that involved structures that were less than 500 or more than 5,000 square feet in size, had sales prices that were less than $10,000 or greater than $5,000,000, or that were missing the sale date, sale price, square footage, or acreage data.

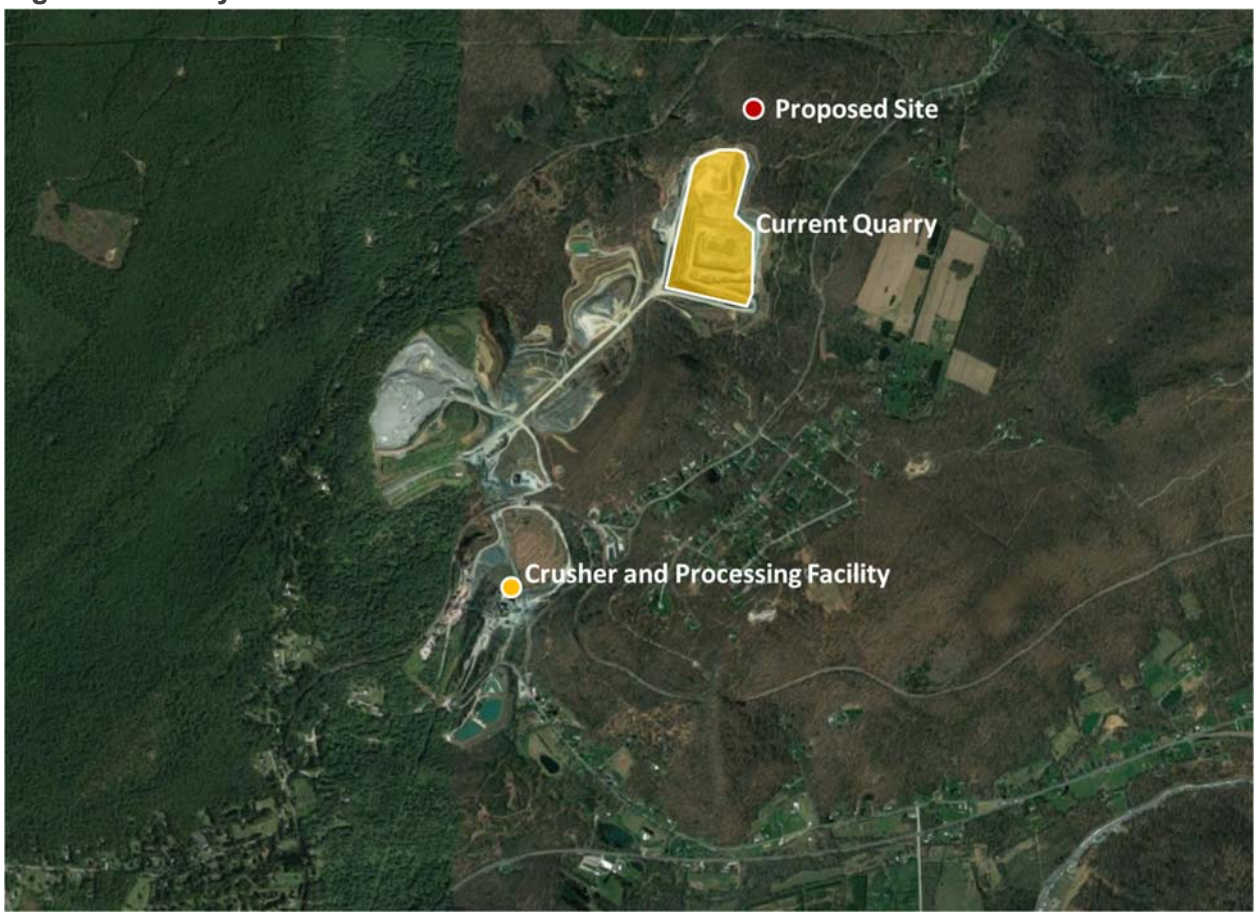
The transactions span the 2000 to 2019 period which covers the period before and after the housing crash in 2007. The impact of the housing crash and other market-wide temporal influences on house prices was accounted for by including a series of time variables that are equal to 1 if a transaction occurred in a given year, and 0 otherwise. This allowed us to control for the impact of factors, such as the housing market crash, that would impact all residential properties that transact in a given year.

Each transaction was geo-coded (assigned a unique latitude and longitude) based upon its address and assigned a spatial location. The data was read into ArcView GIS along with a shapefile of the location of the quarry. For each transaction, the distance to the SGI quarry was calculated using Geographic Information System (GIS) tools. Given the size of the quarry we calculated the distance of each residential parcel to three different locations on the quarry site. The locations include:

1. crusher and processing facility,
2. the area where current quarrying is occurring, and
3. the proposed expansion site.

The sites are illustrated in Figure 1.

Figure 1: Quarry Locations



The regression model used the natural log of residential property price as the dependent variable, which is the most commonly used specification in the hedonic house price literature. By using the natural log of price, rather than price itself, as the dependent variable, the coefficients have the interpretation of being the percent change, rather than dollar change, in the price of the residential property as a result of a change in the independent variables. For example, if the size of th lot were to increase by one unit (acre), the residential property value would increase by X.X percent. In addition, using the natural log of house prices assumes a nonlinear relationship between the price of the residential property and their inherent attributes (e.g. square footage or lot size). The implicit price is not a constant, but a function of the quantity of the attribute being bought – the value of additional square foot of house size or acre of lot size depends on the how big the house or the lot is.

3.2. Findings

Figure 2 summarizes the results of the hedonic regression model. The regression model was estimated using four different distance measures – once for each of the distance variables described above as well as for the minimum value of the three distance variables.

Figure 2: Regression Results

	Model 1		Model 2		Model 3		Model 4	
Log of distance to processing facility	-0.049							
Log of distance to the current quarry			-0.056					
Log of distance to the proposed quarry					-0.086			
Log of the minimum distance to the quarry							-0.033	
Living area	0.001	***	0.001	***	0.001	***	0.001	***
Living area squared	0.000	***	0.000	***	0.000	***	0.000	***
Lot size	0.032	***	0.032	***	0.032	***	0.032	***
Percent of owner-occupied homes (Census Tract)	-0.140		-0.045		-0.096		-0.169	
Population density (Census Tract)	0.001		0.001		0.001		0.001	
Median hold income (000's $)	0.018		0.018	*	0.020	*	0.020	
Adams County	0.050		0.035		-0.008		0.048	
Sale year 2001	0.076		0.072		0.078		0.077	
Sale year 2002	0.144		0.142		0.146		0.147	
Sale year 2003	0.406	***	0.405	***	0.408	***	0.408	***
Sale year 2004	0.557	***	0.554	***	0.552	***	0.560	***
Sale year 2005	0.719	***	0.716	***	0.720	***	0.722	***
Sale year 2006	0.697	***	0.695	***	0.700	***	0.699	***
Sale year 2007	1.148	***	1.149	***	1.142	***	1.146	***
Sale year 2008	0.864	***	0.861	***	0.865	***	0.866	***
Sale year 2009	0.769	***	0.771	***	0.764	***	0.772	***
Sale year 2010	0.954	***	0.954	***	0.957	***	0.954	***
Sale year 2011	0.748	***	0.746	***	0.747	***	0.750	***
Sale year 2012	0.823	***	0.821	***	0.820	***	0.826	***
Sale year 2013	0.792	***	0.787	***	0.791	***	0.796	***
Sale year 2014	0.565	***	0.563	***	0.568	***	0.568	***
Sale year 2015	0.747	***	0.746	***	0.744	***	0.748	***
Sale year 2016	0.790	***	0.785	***	0.789	***	0.792	***
Sale year 2017	0.805	***	0.801	***	0.806	***	0.807	***
Sale year 2018	0.941	***	0.938	***	0.937	***	0.944	***
Sale year 2019	0.977	***	0.976	***	0.979	***	0.978	***
Intercept	8.971	***	8.923	***	8.885	***	9.002	***
Observations	561		561		561		561	
R-squared	0.2532		0.2535		0.2539		0.2530	

**** statistically significant at the 1% level, ** at the 5% level, and * at the 10% level*

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In a hedonic regression model, the average impact of a given housing or neighborhood attribute on property valuations, while controlling for the impact of other variables, is given by the coefficients from the regression model. The coefficients from our analysis are presented in Figure 2.

The effect of the quarry on house values is obtained from the estimated coefficients on the quarry variables in the regressions. The coefficients give the % change in residential property values, given a unit change in the distance from the quarry. For example, the estimated coefficients from the model variables indicates what the average % change in residential property prices for each additional mile further from the quarry, controlling for other housing characteristics.

The model results indicate that the coefficients on the distance variables range from -0.033 to -0.086. Translated, for each mile that a house is located further away from the quarry, residential property prices **decrease** by between 3.3 percent and 8.6 percent.

For example, the average sales price for houses located nearby the quarry is $156,000 and the median value is $164,000. If those houses were moved so that they were one mile away from the quarry, their value would decrease between 3.3 percent and 8.6 percent. For the average house, this would amount to a reduction in value of between $5,070 and $13,400 and for the median house a reduction of between $5,330 and $14,100.

The t-values of each variable indicate the strength of the statistical association between residential property values and the independent variables, in this case distance to the quarry. A value greater than 1.96 or less than -1.96 indicate a "statistically significant" (i.e. strong and non-random) relationship. The t-values for the quarry distance variables range from -0.40 to -0.89, which indicates that the relationship between residential property values and distance to the quarry is weak and that the quarry does not have a statistically significant impact on nearby property values.

The r-squared of the regression models in Figure 2 is similar in size to the r-squared values from the Hite study and the analysis undertaken by the Phoenix Center. This means that models presented in Figure 2 have a similar "fit" as the models estimated by Hite and the Phoenix Center.

In addition to using data from within three miles of the quarry, we also estimated the models using data for all transactions in Adams and Franklin Counties over the 2000 to 2019 time period.[11] Across all distance specifications the price distance relationship was negative and statistically significant. To examine the potential for the distance relationship to be non-linear in nature, we classified properties into one of the following distance bands, less than one mile, one to two miles, two to three miles, and greater than three miles. Across the less than one, one to two miles, and two to three-mile distance bands, the regression coefficients from the models were not statistically significant.

Based on our analysis, we find that the SGI quarry has not had a negative impact on nearby property values based upon actual reported sale price data and analysis that controls for other property

[11] The regression models using data from the entire county used 35,310 observations.

variables. The results are robust to the data used (properties only within three miles of quarry vs from both counties) and distance specification (linear distance vs. distance bands). Given the fact that the intensity of the operations of the quarry is not going to change, the continued operations of the quarry should not have a negative impact on near-by property values.