

March 4, 2016

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Re: Comments on MPAC Deputation to Grey County Planning and Development
Committee, February 16, 2016

I spoke with each of you following Kelan Jyhla's deputation. I indicated I would like to comment on his presentation. While addressing the Committee Mr. Jyhla said MPAC had not found any statistically significant effect of IWT (Industrial Wind Turbines) on the market value of neighbouring homes. He was referring, I believe, to the study that MPAC has published Re-sales Analyses - Lansink and MPAC (hereafter called the MPAC study) regarding the Lansink study on the effect of IWT on nearby properties (hereafter called the Lansink study). The study by MPAC, however, does not support his statement.

I have undertaken an analysis of the issue that follows below. My findings are summarized as follows.

1. Economic theory identifies several effects that we may expect following an IWT or a pit application.
2. Economic theory says the application will likely cause a Market Value Loss to the neighbouring homes, which is expected immediately following an application.
3. After the application effect, further increases or decreases to the Market Value Loss on the neighbouring homes are directly related to the direction of the real estate market. Market change will either add to the application Market Value Loss when the market goes up or subtract from that when the market goes down.

4. Economic theory cannot identify how large the Market Value Loss following a pit application may be. That must come from an examination of the data.
5. Lansink has identified a significant Market Value Loss caused by either IWT or a gravel pit using a paired sale and valuation analysis.
6. MPAC, using a different approach has identified a fairly large Market Value Gain caused by the same IWT installation that was studied by Lansink.
7. The methodological issues with the MPAC study are significant enough to cast doubt on their conclusion especially when their conclusion runs counter to economic logic.
8. MPAC uses a MRA (Multiple Regression Analysis) to determine the effect of an IWT. This approach is an accepted approach to studying the questions. However, the MPAC methodology contains several problems that will likely cause their results to be incorrect.
9. Academic economists have also used MRA approaches and some have identified market value *losses* to the neighbours' properties. Their studies are rigorous and unbiased because they are subject to academic peer review.
10. Using the results of one of the academic papers, I estimated the Market Value Loss incurred by the immediate homes surrounding the proposed Bumstead pit to be \$14,000,000.

I will support the above summary by reviewing three topics in more detail:

- A. A theoretical discussion of how a gravel pit or an IWT application might affect the market value of a neighbouring house.**
- B. Two different approaches used to calculate the market value loss of neighbouring houses – one by Lansink and one by MPAC.**
- C. A Better MRA Approach Adopted by my study of the Bumstead Pit Application**

A. A theoretical discussion of how a gravel pit or an IWT application might affect the market value of a neighbouring house.

A theoretical discussion is important because it will identify what effects might take place and when. While a theoretical discussion usually does not address how large those effects are likely to be, it does set the stage to calculate the numerical impact. In essence the data is used to verify the theory. The theoretical effects are best identified with a hypothetical example.

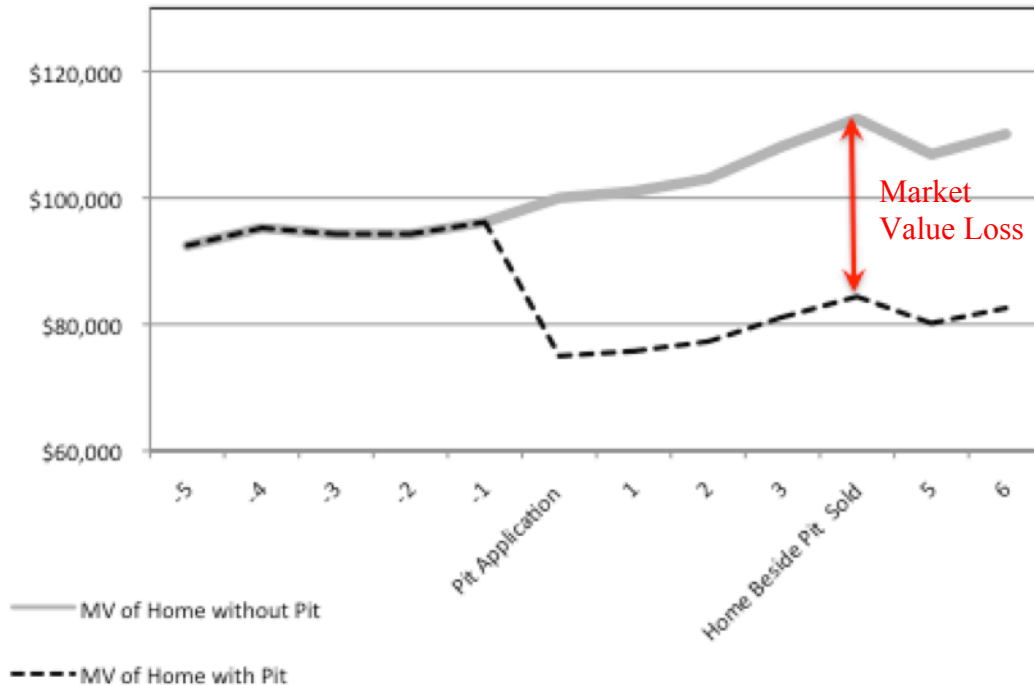
Assume 2 homes are identical in every way *except* that they are situated 5 kms from one another. Furthermore, assume both owners list their houses at the same time, for the exact same amount, and that amount is considered to be fair. Lastly, assume that shortly after the listings come out the immediate neighbour of one of the two homes makes an application to rezone their property and construct a gravel pit.

Prior to the application, an economist would expect that both houses will sell for the same amount and the sales will take the same amount of time. After the pit application, however, one house now has an *additional* factor to consider. And, assuming we can agree living next to a gravel pit has a negative connotation in the mind of a buyer, an economist now must struggle to answer “will the price of the home beside the pit fall and by how much” and “will that sale take longer and by how much”?

To determine if the price will fall, we must come up with a hypothetical theory of what we expect the impact to be. The theory is outlined below:

- There is no market value loss prior to the announcement of the pit application.
- The market value loss is the amount the home beside the pit sold for versus how much the identical home sells for (assuming they sold on the same day).
- Once the pit application is announced there is likely to be an immediate market value loss suffered by the home next to the potential pit with no impact on the identical home located further away.
- Subsequent to the application, the market value loss will vary slightly dependent on the change in the overall market. If the market goes up, the market value loss will increase or if the market goes down the market value loss will decrease.
- The market value of the home beside the pit will decline whether the home is sold or retained by its current owner.

Our theoretical view of the Market Value Impact of a pit application looks like this:



Once the theory has been identified we need to turn to actual data to determine if the Market Value Loss exists and derive an estimate as to how large it actually is. Using data to verify economic theory is a common approach in economic literature. We may find the Market Value Impact is negligible or we may find it to be very significant, but it's **actual data** that determines the Market Value Loss. Once we have an estimate of the size of the Market Value Loss we will know if the Loss is relevant or inconsequential.

How do we now apply "actual data" to our hypothetical theory? It is a challenge because we do not have an identical home to compare against let alone one that sold on the same day.

However, economists can use one of two means to gain an estimate of this Market Value Loss (MVL). In the next section, I discuss these two approaches to estimating the Market Value Loss; one is used by Lansink in his study and the other is used by MPAC in their study.

B. Two different approaches used to calculate the market value loss of neighbouring houses – one by Lansink and one by MPAC

Below is a summary of the methodology behind the two approaches with the challenges and the problems faced by each.

Lansink's uses a General Market Approach (GMA). The GMA takes the market value of the specific property before the pit is announced. That price is then increased or decreased by the actual change in the overall market to calculate a hypothetical price for the home as if the pit did not exist. This hypothetical price for the home is then compared to the actual sale price and the difference is the Market Value Loss due to the pit. This is shown in the following table.

Market Value of home before pit application	\$100,000
% Increase in general real estate market	10%
Hypothetical Market Value of home	\$110,000
Actual Sale Price	\$85,000
Market Value Loss due to pit application	\$25,000

The data problems that can occur with this approach are threefold:

1. Frequently we do not have a market valuation of the home immediately prior to the pit application date. The longer the valuation occurs prior to the pit application, the more suspect are the results. Researchers (including Lansink) will frequently use MPAC's most recent CVA (Current Value Assessment). If the CVA is not accurate, this may cause either an upward or downward bias to the Market Value Loss estimate with equal probability.
2. The overall market is sometimes viewed as too broad. The solution is to utilize a market index that pertains to the local market. Sometimes those indices exist but other times they do not exist. Using an inappropriate market index may cause either an upward or downward bias to the Market Value Loss estimate with equal probability.
3. The actual sale of the home may occur long after the pit application date. Again the longer the time the home is on the market, the more other factors may come to affect the overall market of the specific home. This may cause either an upward or downward bias to the Market Value Loss estimate with equal probability.

In general, this is a very solid approach to determining the Market Value Loss. The issues that are encountered are generally small and would not introduce a specific directional bias to the results. Studies that I have seen that utilize this approach usually conclude there is a Market Value Loss and that loss is significant.

MPAC uses a Multiple Regression Analysis (MRA). MPAC uses a different approach. Rather than utilize a general real estate market index, MPAC derives their own. MPAC derives their index via a Multiple Regression Analysis model.

In a MRA model the value of a home is determined as the sum of its attributes, most importantly location, size, age, and quality of home. MPAC also includes time factors as an attribute in their MRA. The time factors are then used to develop market growth rates. From their market growth rates MPAC essentially constructs their own real estate market index.

Using their own real estate market index, MPAC then conducts the same experiment as Lansink except they replace the general market index with their own index for the real estate market index. Based on their results, they concluded proximity to an IWT does not generate a Market Value Loss. Indeed they find there is actually a gain in the market value of the houses closest to the IWT.

Since the methodology is the similar for both studies yet the conclusions are diametrically opposed, the difference must be the result of using different market indices. Indeed the real estate market index used by Lansink is different than the index developed by MPAC. I have already reviewed the issues with the General Market Index and now I want to focus on the problems with the MPAC index and their derivation of that index. I have identified 5 major issues with the MPAC index construction and utilization. They are listed below.

1. **IWT Application versus proximity to an IWT.** The economic logic outlined upfront identifies that the lion's share of the Market Value Loss will likely occur when the IWT is announced. It appears that the data MPAC collected was to test proximity to an IWT and not the application for the IWT. This is apparent in their conclusion where they state "*... indicate that re-sales of properties closest to wind turbines are experiencing greater market increases than their respective market area.*" The theoretical analysis revealed proximity to a IWT or pit may result in a Market Value Loss depending on the general direction of the market but the theory also suggests that amount will likely be small relative to the application effect. This misapplication may bias their estimate of the Market Value Loss to be

significantly lower than it should actually be.

2. **Inclusion of Time Factors.** Including time factors in the MRA is a dubious strategy given the problem we are analyzing. Time factors tend to smooth out the market ups and downs which is not required if the analysis is meant to determine the effect at one specific point in time. Also by including time factors, MPAC may be biasing the effect of all the other variables included in their MRA. MPAC needs to have time factors in their model for their purpose, which is to develop assessed valuations for all homes that are fair and consistent across different homes and over different time periods. This is not the case for this issue and hence their model may not be appropriate for the question being asked. The effect of the including time factors will likely bias their estimate of the Market Value Loss to be lower than it should actually be.
3. **Missing variable.** The MPAC study does not specify proximity to an IWT application or an IWT as a variable in their model at all. The best way to determine if an IWT application impacts the Market Value Loss is to include that attribute directly into the MRA. By excluding the required variable, MPAC has misspecified their MRA model for this specific question. Their misspecification is likely to cause a bias to their estimate of the Market Value Loss.
4. **Poor fit of the MPAC generated Index.** The MPAC generated real estate Index is meant to be a better Index than the general market Index used by Lansink. It appears to fail in that regard. Table 4 in the MPAC study reports that 62.1% of the valuations have a positive effect. If the index were a “good” index, that figure should be close to 50% as an economic index is a representation of the average of the population. In addition, Table 4 also reports that the average positive effect is 1.96%. In a properly constructed index where the Market Value Loss is minimal, this number should really be zero. This misrepresentation may bias their estimate of the Market Value Loss to be significantly lower than it should actually be.
5. **Not a Market Value measure.** MPAC creates their own index. Unfortunately their own index is not based on market values at all. Their index is based on assessed values for homes. Because of this it is not possible to conclude anything at all about the Market Value Loss from their analysis. The bias introduced by this issue may be large or small depending on whether the MPAC generated index is a good representation of the overall market.

Outstanding data questions: I forwarded MPAC a series of questions regarding their study and have heard nothing back as yet (as of March 4, 2016). The questions were meant to determine if the data, methodology and interpretation they used were correct. Given the lack of a response, I am concerned about the validity of their study especially knowing that they enter the debate with a strong positional bias. The positional bias is a result of their responsibility for determining assessed values and their clients', municipalities, eagerness to keep those assessed values high. Obviously admitting that IWT or gravel pit applications cause a loss in market values would be a negative outcome for MPAC. In academic circles, these two conditions – poor information exchange and a positional bias – would disqualify the results from any serious consideration.

The Multiple Regression Analysis approach that MPAC used is well respected and regarded in the economics field if used appropriately and with quality data. MPAC's approach and their model is probably very appropriate to determine fair and equitable assessment valuations. However, the MPAC study contains some serious concerns when it is used to analyze the impact of an IWT or a gravel pit application on the market value of neighbouring properties.

Finally, the MPAC approach fails on the basis of common sense. How is it possible that homes that are located close to an IWT or a pit application actually appreciate by more than homes that do not have that externality within their realm? I cannot think of any logical economic reason for this to occur and I challenge MPAC to provide one.

C. A Better MRA Approach Adopted by my study of the Bumstead Pit Application.

Despite the obvious problems with the way MPAC applied the MRA approach, MRA is a very valid means of determining Market Value Loss and indeed, it has been used appropriately in the past.

The question was first analyzed using a MRA approach by Hite in an often quoted paper on the effect of a gravel pit application on housing prices. The paper has been updated and retested on several other occasions. Hite and the others found a statistically significant negative effect on home prices. These studies showed that the homes closest to the pit suffered the greatest decline in market value and that the impact diminished the further the home was from the pit location.

As with the MPAC MRA, these models specifically model the value of homes as the sum of their attributes. However, unlike the MPAC study, proximity to the proposed pit is a variable included in the model. Importantly these studies

would generally be void of any bias because the articles are subject to peer review by other qualified academics.

I used the output from a similar study as the basis on which I estimated a Market Value Loss of \$14,000,000 due to the application to have the Bumstead farm developed into a gravel pit. The following table provides the detail behind the \$14,000,000 total.

Distance from Pit	Number of Homes, Farms or Properties	Average Market Value before Pit Proposal	Economic Model Predicted MV Loss	Loss in Neighbours' Personal Wealth
within 0.5 km	20	\$300,000	-25%	\$(1,500,000)
0.5 to 1.0 km	19	\$300,000	-17.50%	\$(997,500)
1.0 to 1.5 km	31	\$300,000	-14%	\$(1,302,000)
1.5 to 2.0 km	43	\$300,000	-11%	\$(1,419,000)
2.0 to 3.0 km	99	\$300,000	-8%	\$(2,376,000)
3.0 to 5.0 km	243	\$300,000	-6%	\$(4,374,000)
Berkeley	65	\$200,000	-10%	\$(1,300,000)
Townsend Lake	57	\$225,000	-5%	\$(641,250)
Total Market Value Loss (properties within 5km):				\$(13,909,750)

The papers following the Hite approach eliminate many of the issues with the MPAC MRA study. Combined with the academic rigor of having papers published and peer reviewed means this set of papers probably comes closest to the truth about the direction and the magnitude of the Market Value Loss on the neighbouring properties which surround a pit application.

Summary

1. Economic theory identifies several effects that we may expect following an IWT or a pit application.
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4. Economic theory cannot identify how large the Market Value Loss following a pit application may be. That must come from an examination of the data.
5. Lansink has identified a significant Market Value Loss caused by either IWT or a gravel pit using a paired sale and valuation analysis.
6. MPAC, using a different approach has identified a fairly large Market Value Gain caused by the same IWT installation that was studied by Lansink.
7. The fundamental issues with the MPAC study are significant enough to cast doubt on their conclusion especially when their conclusion runs counter to economic logic.
8. MPAC uses a MRA (Multiple Regression Analysis) to determine the effect of an IWT. This approach is an accepted approach to studying the questions. However, the MPAC methodology contains several problems that will likely cause their results to be incorrect.
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