

10-29-15

## Oshtemo Township Sewer System Impact Analysis

The staff of the W.E. Upjohn Institute (Institute) examined several factors and used statistical analysis in an attempt to quantify the impact of the Oshtemo Township (Township) sewer system on residential property values. Institute used parcel data supplied by the Township as the primary data and parcel data supplied by the City of Portage as supporting data.

### Methodology and Results

1. Using the parcel data supplied by the Township, Institute sorted the parcels into two main groups, those connected to the sewer system and those not connected to the sewer system.
2. Institute then used statistical software to sort the parcels into like groups based on the attributes of the parcel. Institute grouped the parcels based on acreage, size of the home on the parcel (square footage), and the number of bedrooms in the home on the parcel.
3. The groups of like parcels were then compared based on their connection to sewer status. For example, a set of three bedroom, ~2,000 square foot homes that each reside on approximately half an acre of land and are connected to the sewer system were compared to a set of three bedroom, ~2,000 square foot homes that each reside on approximately half an acre of land and are not connected to the sewer system.
4. Institute performed a regression analysis on the sorted data. The analysis held the attributes of the parcels constant while looking for a change in assessed value when comparing the parcels with homes connected to the sewer system to those not connected to the sewer system.
5. The analysis revealed that parcel with homes connected to the sewer system were no more or less valuable than those not hooked into the sewer system.
6. To verify the results, Institute performed a similar analysis on each of the parcel attributes (acreage, home size, and number of bedrooms). Predictably, an increase in each of the attributes resulted in a statistically significant increase in assessed value; e.g. an increase in the number of bedrooms while holding the square footage and acreage constant resulted in an increase in SEV. Increases in acreage and home size also had a predictable and statistically significant increase.

7. Since the results were inconclusive in demonstrating an impact of sewer connection on assessed value, Institute examined another variable. Institute used geographic information system software (GIS) and data provided by the Township to determine the parcels that have access to the sewer system regardless of connection status. Institute then assigned each parcel an attribute that demonstrated access, or lack of access to the sewer system.
8. A regression analysis was performed on the parcel data using access to the sewer system as the variable in place of sewer connection status; other parcel attributes were once again held constant.
9. The results demonstrated a statistically significant difference in assessed value between parcels with sewer access and those without sewer access across all property classes. This means that the data demonstrated a strong connection between access to sewer and increases in parcel values. Institute found that this connection diminishes when looking at individual property classes; additional information would help to pinpoint the reasons for this outcome. In general and across all property classes, parcels are more valuable when they have access to sewer.

### **Analysis**

The data revealed that a link between sewer connection status and assessed value does not exist; a home that is connected to the sewer system is no more or less valuable than a comparable home not connected to the sewer system. Conversely, the data revealed a link between access to the sewer system and assessed value; a home that is located adjacent to sewer lines is more valuable than one that is not located adjacent to sewer lines. According to the data, homeowners will not see an increase in home value upon connecting to the sewer system but will realize an increase when sewer lines are installed adjacent to their homes. There are many possible explanations for these results; unfortunately, the limited nature of the available data does not allow for further examination. Direct surveys of homeowners who have, and have not, connected to the sewer system as well as interviews with local appraisers could help in developing meaning explanations for the differences in value.

### **Long Term Costs**

There are long term costs associated with disposal of waste, regardless of the system that a homeowner chooses to employ. Use of a septic system typically is associated with infrequent major expenses, whereas use of a municipal sewer system typically bears frequent minor expenses. Many homeowners in Oshtemo Township have access to the municipal sewer system

but continue to use their own personal septic system. Many homeowners choose continued use of their septic system because of the major up from costs associated with hooking into the municipal system.

The long terms costs associated with ownership and maintenance of a septic system are fairly comparable to those associated with connecting to the municipal sewer system and the related user fees. The costs depart when examined at different points in time. The costs associated with each system of waste management have high front end expenses and lower annual expenses. The cost to replace a septic system and the cost to connect to the sewer system are near \$10,000; the cost to maintain and pump a septic system and the quarterly sewer user fees are around or less than \$200 per year.

Septic systems need routine (typically bi-annual) service. This service is estimated at \$220 per occurrence; or an annual cost of \$110. On average, and with proper maintenance, a septic system typically last around 20 years. A septic system can have various levels of usefulness and years of service remaining; this analysis examines the fiscal impact of decisions made at the point of septic failure. The cost of replacement was gleaned from the Township Sanitary Sewer Strategy Study and verified through cursory research.

In the analysis, the Institute assumes that the Township will delay much of the individual up-front costs associated with connecting to the municipal sewer system through debt financing. The annual percentage rate charged to the homeowner assumed in this analysis was 3%. This rate is not indicative of the rate given to resident through the Township, this rate is more indicative of favorable private home refinance rates or home equity lines of credit; exact rates will vary based on a number of conditions. The annual payments were calculated using a 15-year, 20-year, and 30-year term. Annual payments for the 15-year, 20-year, and 30-year debt service are \$980.60, \$798.62, and 607.11 respectively.

The estimated annual user fee was calculated using actual user fees collected over the past 12 months. The Institute collected actual user fees for randomly selected homes in the township; nine samples were taken, three each from four bedroom, three bedroom, and two bedroom houses. The results of the samples were then weighted to account for the relative share of each type of house that is connected to sewer in the Township. The average quarterly user fee is \$50.50; an annual expense of \$202.01.

Institute calculated the long-term costs associated with sewage disposal using the payment amount, cost to replace a septic system, and estimated annual expenses (applying a 2% annual inflation rate to annual expenses). Over the course of 20 years, the cost to own and maintain a septic system is \$10,622 (again, this assumes system replacement in year one), whereas the costs to connect to sewer are \$20,284 (15-year), \$21,381 (20-year), or \$17,551 (30-year). The 40-year costs associated with septic system ownership were \$26,327 (this total assumes two

septic replacements); the 40-year costs to connect to sewer are \$27,578 (15-year), \$28,674 (20-year), or \$30,915 (30-year). The cost to own and maintain a septic system is slightly lower than those associated with connecting to the sewer system over 20 and 40 years. Over the course of 60 years, connecting to a sewer system is substantially less expensive. The cost to own and maintain a septic system for 60 years is \$49,664. The cost to connect to the sewer system is \$38,416 (15-year), \$39,512 (20-year), or \$41,753 (30-year). See Table 1 for more detail.

The net present values of the four scenarios were calculated. Net present value (NPV) calculates the current value or cost of income streams or a series of costs using a discount rate. In this analysis, NPV was used to calculate the value (in today's dollars) of costs incurred in the future. NPV will favor delayed costs over higher early expenses because the funds used to pay the higher early expenses could be invested elsewhere at an assumed rate (discount rate). A relatively conservative eight percent (8%) discount rate (as a comparison, the most recent 20-year average of the S&P 500 Index was 9.63%) was used in this analysis. The NPV of maintaining a septic system over 20 years was \$-8,633.77; this means the expenses of owning the septic system over 20 years is equal to paying \$8,633.77 today. Even though the total expenses over 20 years are \$10,622 the NPV is \$-8,633.77, this is due to the fact that many of the expenses are incurred in the future and therefore discounted. The 20-year NPV calculations for connecting to the sewer system are as follows: \$-11,304.46 (15-year), \$-10,597.40 (20-year), \$-8,717.12 (30-year). The 30-year payback for a sewer connection is competitive with owning a septic over the course of 20 years; neither the 15-year nor the 20-year payback schedules are competitive with owning a septic over the course of 20 years. See Tables 1 and 2 for comparisons over 20, 40, and 60 years.

Table 1

	Septic	Sewer (15 Yr)	Sewer (20 Yr)	Sewer (30 Yr)
20 Yr Total	\$ (10,622.46)	\$ (20,284.29)	\$ (21,380.72)	\$ (17,550.51)
40 Yr Total	\$ (26,327.33)	\$ (27,577.78)	\$ (28,674.22)	\$ (30,915.10)
60 Yr Total	\$ (49,663.94)	\$ (38,415.53)	\$ (39,511.96)	\$ (41,752.85)

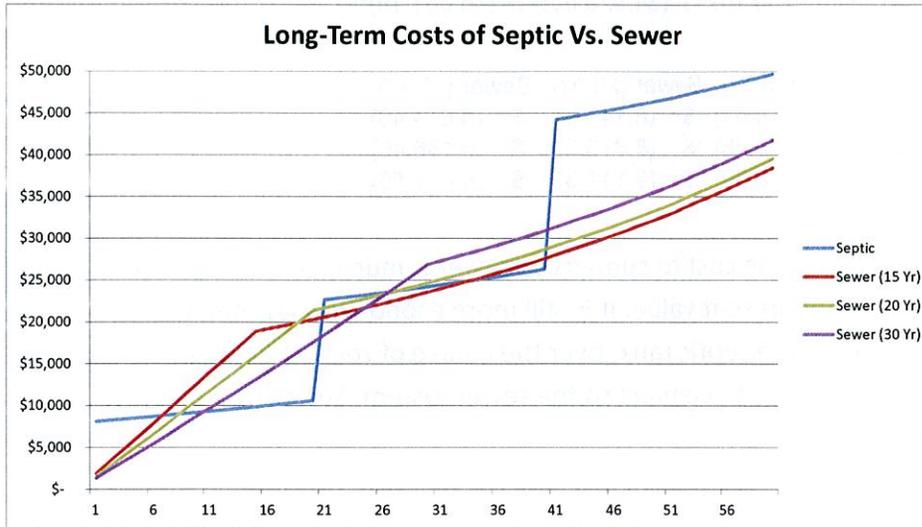
Table 2

	Septic	Sewer (15 Yr)	Sewer (20 Yr)	Sewer (30 Yr)
20 Yr NPV	\$ (8,633.77)	\$ (11,304.46)	\$ (10,597.40)	\$ (8,717.12)
40 Yr NPV	\$ (11,377.99)	\$ (12,035.64)	\$ (11,328.57)	\$ (10,322.31)
60 Yr NPV	\$ (12,252.87)	\$ (12,268.74)	\$ (11,561.68)	\$ (10,555.41)

As you can see in Tables 1 and 2 sewer is more competitive over a longer period of time. Unfortunately, many, if not most, homeowners will not make decisions based on their financial impact over the course of 40 or 60 years. What Table 1 does not show is the competitiveness of sewer over the course of the first seven years, see Chart 1. Sewer is very competitive with septic ownership at the point of septic system failure and for about seven years after the point of failure. At the time of septic failure, sewer connection, with a delayed cost model, may seem

attractive to a homeowner who may not have large cash reserves to cover the high up-front cost of septic replacement.

Chart 1



### A Second Scenario

The Township could help to offset some of the costs associated with connecting to the sewer system by installing sewer leads when roads are reconstructed. About 30% of the cost to connect to the sewer system is realized in the demolition and reconstruction of the road above the connecting pipes. The Township is contemplating a policy that call for the installation of sewer leads to each parcel when a road is reconstructed and sewer mains installed. This would significantly reduce the cost of connecting individual parcels to the sewer system. The Township would need to realize the additional costs of installing the sewer leads through some other mechanism. Nonetheless, the following calculations in tables 3 and 4 are based on the reduced individual expense. The same methodology was uses as before, only the cost to connect to sewer was changed.

**Table 3**

	Septic	Sewer (15 Yr)	Sewer (20 Yr)	Sewer (30 Yr)
20 Yr Total	\$ (10,622.46)	\$ (15,622.86)	\$ (16,389.34)	\$ (13,756.07)
40 Yr Total	\$ (26,327.33)	\$ (22,916.35)	\$ (23,682.84)	\$ (25,223.44)
60 Yr Total	\$ (49,663.94)	\$ (33,754.10)	\$ (34,520.58)	\$ (36,061.19)

**Table 4**

	Septic	Sewer (15 Yr)	Sewer (20 Yr)	Sewer (30 Yr)
20 Yr NPV	\$ (8,633.77)	\$ (8,644.51)	\$ (8,147.09)	\$ (6,854.40)
40 Yr NPV	\$ (11,377.99)	\$ (9,375.68)	\$ (8,878.27)	\$ (8,186.46)
60 Yr NPV	\$ (12,252.87)	\$ (9,608.78)	\$ (9,111.37)	\$ (8,419.56)

As you can see in tables 3 and 4, the cost to connect to sewer is much more competitive both in terms of actual costs and in net present value. It is still more economical, in actual costs, over the course of 20 years to reinstall a septic tank; over the course of roughly 8-13 years or longer than 20 years it is more economical to connect to the sewer system. See chart 2 below for a graphic representation.

**Chart 2**

