

# An Assessment of Failing Septic Systems in the Saginaw Bay Region

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## EXECUTIVE SUMMARY

Throughout Michigan and in the Saginaw Bay region, failing septic systems are often identified as a potential source of pollution that contributes to public and environmental health concerns. However, information is often lacking to determine the extent to which septic systems are impacting the environment.

When properly designed, sited, installed, and maintained, septic systems provide cost-effective and environmentally safe disposal of wastewater. Similar to other household infrastructure, like a furnace or roof, septic systems have an expected service life and require periodic maintenance. Many septic systems are designed to operate for approximately 30 years, depending on individual use and upkeep. When septic systems outlive their useful service life, they may no longer effectively treat wastewater and can discharge sewage into the environment.

While the impact of an individual failing septic system may seem marginal, in regions where many systems fail, the cumulative effect can be significant. These systems can contribute pathogens into the environment that cause diseases such as giardia, hepatitis, and cholera (MDEQ 2018). When pollution levels are too high, the result can be closing beaches and rivers to recreational access.

## PROJECT PURPOSE AND APPROACH

The Saginaw Bay Watershed Initiative Network (WIN) hired Public Sector Consultants (PSC) to research the potential impact of failing septic systems on the Saginaw Bay to help communities in the region have a more informed conversation. The study focuses on the five counties along the bay:

- Arenac County
- Bay County
- Huron County
- Iosco County
- Tuscola County

As part of the study, PSC estimated the total number of septic systems in these counties as well as the number that may be failing, and coordinated with the local health departments to better understand current septic management practices in the region and discuss the needs they may have to more effectively administer septic regulations. The results of this information were discussed with community leaders through a series of one-on-one interviews to better understand their views regarding septic management practices and identify paths toward a cleaner and healthier environment.

## RESULTS

Coastal counties along the Saginaw Bay are predominately rural. Aside from Bay County, which has the highest population, most of the region relies on septic systems to treat household wastewater. In total, more than 60,000 homes in the region have septic systems, representing approximately 50 percent of all the houses in the region. By comparison, there are more homes with septic systems in these five counties than the total number of houses in Bay County.

## How Many Septic Systems Are Failing?

Estimating the number of systems that may be failing is a challenging task because many variables can affect how well an individual system works. Furthermore, definitions of what constitutes a system failure vary from one jurisdiction to the next. Failure rates of 10 and 25 percent were established as the upper and lower bounds of a range that may be realistic for Michigan communities. These estimates suggest that there may be between approximately 6,000 and 15,000 failing septic systems in Arenac, Bay, Huron, Iosco, and Tuscola Counties.

## How Much Pollution Is Generated from Failing Systems?

Building from the estimated failure rates, PSC calculated the amount of wastewater generated from houses that may have failing septic systems. While some of these systems may continue to provide partial treatment, the analysis shows that households with failing septic systems generate between 505 million and 1.26 billion gallons of sewage annually that may be entering the environment. This constitutes enough sewage to:

- Cover 4.24 to 10.61 acres in a foot of sewage every day
- Cover 2.42 to 6.05 square miles in a foot of sewage every year
- Cover all of Bay City in 2.6 to 6.1 inches of sewage every year
- Fill 764 to 1,910 Olympic swimming pools every year

By comparison, permitted wastewater treatment facilities in these counties have largely eliminated discharges of untreated sewage into the Saginaw Bay from combined sewer overflows (CSOs). CSOs were historically a significant contributor of sewage into the Saginaw Bay and its tributaries. Sewer systems in most of Michigan's older cities transport sanitary sewage as well as stormwater to treatment plants before it is discharged into the environment. During severe storm events, systems that are undersized can become overwhelmed, resulting in discharges of untreated wastewater. Communities along the Saginaw Bay, and particularly those in Bay County, have made substantial investments in wastewater infrastructure to retain large volumes of water during severe rain events. These retention basins enable wastewater treatment plants to prevent untreated discharges of sewage into the environment. In 2017, for example, no CSOs were reported in the five counties along the Bay.<sup>1</sup> This suggests that failing septic systems may be a larger pollution contributor than municipal sources in these five counties.

## ADMINISTRATION OF SEPTIC REGULATIONS

Septic systems are regulated by local health departments at a county or regional level. Each of the five counties along the Saginaw Bay are served by a different health department; however, Huron and Tuscola Counties share an environmental health director. PSC met individually with representatives of each health department via conference call to gain a better understanding of current septic management practices in the region and investment needs the health departments may have to more effectively manage septic systems and protect public and environmental health.

Health department representatives identified the need to upgrade information technology systems. New software systems have been developed that can integrate more elements of administering environmental

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<sup>1</sup> In the same year, approximately 332 million gallons of wastewater received primary treatment before it was legally discharged through retention basins. These discharges, however, are required to meet water quality standards.

services regulated through the health departments. Information technology upgrades have the potential to enhance public and environmental health outcomes by integrating record keeping (including digitizing historic records) with permitting workflow processes and parcel-level geographic information systems (GIS). These technology systems have the potential to streamline administrative systems, enhance accessibility to information, and enable detailed data analysis that can be used to address public health concerns.

## WHAT DO COMMUNITY LEADERS THINK?

PSC shared the results of this research with a group of community leaders that represent a broad spectrum of interests in the region and other opinion leaders with interests in the management and/or protection of the Saginaw Bay watershed. These community leaders were invited to participate in one-on-one interviews to understand their views and perception of septic management and water quality conditions in the Saginaw Bay.

There was consensus among the interviewees that failing septic systems constitute a problem for the Saginaw Bay that should be addressed. However, these interviewees suggested that the public does not perceive septic management or failed systems to be a problem and there is insufficient data available to change public perception. These community leaders suggested using a data-driven approach to quantify pollution levels, identify sources, and develop educational and regulatory approaches accordingly. Furthermore, interviewees highlighted the relatively high cost of repairing or replacing a septic system, especially for residents of limited means. Interviewees suggested that financial support mechanisms should be developed and augmented to assist residents with demonstrated needs.

Interviewees generally believed that current septic regulations adequately protect public and environmental health when new systems are installed. However, most suggested that the health departments should have more tools to ensure systems continue to function after they are initially permitted. Consensus did not emerge regarding the ideal approach to more proactive septic management practices.

## RECOMMENDATIONS

Community leaders who participated in the interviews as well as representatives from the health departments provided a wealth of information and valuable insight regarding septic management practices in the Saginaw Bay region. Building on these conversations and the research regarding the potential impact of failing septic systems, community partners should consider:

- **Enhancing collaborative efforts:** consider advancing the recommendations that follow in a coordinated and collaborative manner by integrating multiple perspectives as community partners continue to address water quality and public health concerns.
- **Improving information management:** Working with and supporting the health departments to address their information management needs, including modernizing information management systems to more effectively and efficiently administer septic system regulations in the region.
- **Understanding the scope of the problem:** Continuing to collect water data to identify areas where *E. coli* levels exceed water quality standards. Sampling should not be limited to swimming beaches and should use a watershed-based approach, and when *E. coli* levels are high, source tracking should be conducted. To the extent possible, sampling approaches should be coordinated to enable

better comparison of data within and among watersheds. This also has the potential to simplify messaging to the public and decision makers.

- **Raising public awareness:** Designing and implementing education and outreach strategies to enhance public awareness of septic management practices, the results of water quality sampling, and how failing septic systems can affect the community.
- **Developing and augmenting financial support mechanisms:** The cost of repairing or replacing a septic system can be substantial. Financial support mechanisms should be further developed and promoted to reduce the burden on residents who may need to invest in their septic system.
- **Evaluating updates to the sanitary code:** Consensus emerged through interviews that health departments should have additional tools to ensure that septic systems continue to function after they are initially installed. Community partners should continue to work collaboratively to find the best solutions for the Saginaw Bay region. Advancing the recommendations above, prior to or concurrently with conversations about updates to the sanitary code, will position the region for greater success.

## CONCLUSION

Well-functioning septic systems pose little threat to the environment; however, when these systems are used beyond their useful service life, or are improperly sited, installed, or maintained, they become less effective at treating wastewater. Estimates suggest that failing septic systems may be contributing substantial amounts of untreated or partially treated wastewater into the environment, which has the potential to threaten public health. The practical effect of these conditions is that lakes, rivers, and streams become unsafe to use for recreational and other purposes. Beaches are closed, tourism suffers, and quality of life is diminished for residents. Community partners have an opportunity to address these challenges. By working collaboratively, there is exciting potential to build a foundation for greater success.

## BACKGROUND AND PROJECT PURPOSE

In the Saginaw Bay region and throughout the rest of the state, failing septic systems are commonly identified as a source of contamination to Michigan's lakes, rivers, and streams that can create public and environmental health concerns. However, information is sometimes lacking about how significant of a problem the issue is locally.

To help communities in the Saginaw Bay region have a more informed conversation, the Saginaw Bay Watershed Initiative Network hired Public Sector Consultants to:

- Coordinate with the local health departments to better understand septic management practices in the region
- Estimate the total number of septic systems in the region and the number that may be failing
- Discuss this information with community leaders to better understand their views regarding septic management practices

The results of this study are intended to inform discussions regarding the extent to which septic systems are impacting public and environmental health in the region and, as appropriate, to identify possible paths toward a cleaner, healthier environment.

## MANAGING HUMAN WASTE

Managing human waste is a centuries-old problem that was one of the driving factors that contributed to the development of the modern public health profession. Discharges of untreated sewage into the environment can introduce diseases to communities, threatening public health. These risks magnify as population density increases.

## DEVELOPING SEWER SYSTEMS

Wastewater treatment approaches and technologies have advanced over the centuries. Before sewers were prevalent, household waste was frequently disposed of in ways that would turn our stomachs by modern standards. Hundreds of years ago it was common to dispose of household waste directly into the streets or ground, which would run off to rivers when it rained. In the 1800s, household waste was diverted to nearby creeks along with stormwater. As more households connected to these early open sewers, local governments enclosed the system to transport the unhealthy and offensive sewage to discharge points. These practices in the early development of our communities at times led to public health crises, such as outbreaks of diseases like cholera. As communities grew, large pipes (interceptor sewers) were used to transport untreated wastewater for discharge further downstream. Eventually, these locations became the sites for wastewater treatment facilities (PSC 2000).

Over time, as cities expanded and the amount of sewage grew, systems' ability to transport and treat wastewater remained relatively constant for a period. During large storm events, systems were routinely overloaded, resulting in combined sewer overflows. To address these problems, communities in the Saginaw Bay region have made substantial investments in infrastructure by separating storm and sanitary sewers in some areas and building large retention basins that can hold large volumes to reduce the amount of untreated sewage that enters waterways. These investments in infrastructure have substantially reduced pollution levels and public health concerns in the Saginaw Bay.

## ONSITE TREATMENT APPROACHES

In areas where population density is too low to support sewers, onsite wastewater treatment systems were developed. Generally known as septic systems, when properly designed, sited, installed, and maintained, these systems provide cost-effective and environmentally safe disposal of wastewater.<sup>2</sup> Many septic systems are designed to function for approximately 30 years with periodic maintenance. On a statewide basis, approximately 30 percent of Michigan residents are served by septic systems and an estimated half of new home construction uses septic systems (MDEQ 2016). In total, the state has an estimated 1.3 million household septic systems.

There is a growing body of evidence that suggests Michigan's septic systems contribute to environmental and public health concerns that are reflected by exceedance of state water quality standards. The practical effect of these conditions is that lakes, rivers, and streams become unsafe for recreational and other purposes. Beaches are closed, tourism suffers, and quality of life is diminished for residents.

In the Saginaw Bay and its tributaries, the frequency and severity of beach closings have reduced over time, but several beaches continue to experience closures. Under the Areas of Concern Program, the Partnership for the Saginaw Bay Watershed, the local public advisory council, and the Michigan Office of the Great Lakes recently adopted new restoration targets for the "Beach Closing" Beneficial Use Impairment. These criteria identify seven beaches along the bay as having repeated sampling results that exceed "partial body contact" standards.<sup>3</sup> In other words, by standards set under the Clean Water Act, it is considered unsafe to touch the water. While these beaches may be representative of the worst conditions in the bay, other beaches continue to experience occasional closures. For example, Bay City State Recreation Area has been closed nine times for a total of 23 days from 2014 to the first day of summer in 2018 (MDEQ 2018). As the recreation season continues, this number could rise.

These conditions are monitored by local health departments, the state, and other organizations. While efforts to identify pollution levels and sources of contamination continue, additional information is necessary to definitively determine the extent to which septic systems contribute waste that may be impacting the Saginaw Bay and its tributaries.

## SEPTIC SYSTEMS: BY THE NUMBERS

In the Saginaw Bay region, the environmental community routinely identifies septic systems as a source of pollution that threatens environmental quality and public health. However, in many areas, information is lacking regarding the number of systems, their age, condition, location, and potential impact to public and environmental health.

To better understand the extent of septic systems in the Saginaw Bay region, WIN asked PSC to estimate the number of households connected to sewers and serviced by septic systems in the five counties that are adjacent to the bay (Arenac, Bay, Huron, Iosco, Tuscola). While portions of these five counties extend outside of the Saginaw basin, substantially more rigorous data and GIS analysis would be needed to

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<sup>2</sup> For the purpose of this report, the term "septic system" refers to all onsite wastewater treatment systems, including alternative treatment systems, unless otherwise noted.

<sup>3</sup> The Saginaw River/Bay Area of Concern Beach Closing Beneficial Use Impairment restoration criteria identifies Whites Beach, Singing Bridge, South Linwood Beach, Brissette Beach, Wenona Beach, and Bird Creek County Park as having sampling results that repeatedly exceed water quality standards.

delineate the number inside and outside the Saginaw basin for these counties. Regardless of whether an individual system is within the Saginaw basin, they are still within the Lake Huron watershed and can pollute the environment, decrease water quality, and threaten public and environmental health.

The method developed draws on information from the most recent census, and data submitted to the Michigan Department of Environmental Quality by wastewater treatment plants regarding the size of the population they serve. A more detailed methodology is provided in Appendix A.

The results of the analysis estimate that there are 124,116 housing units in the five counties along the bay and more than 60,000 septic systems, representing 49 percent of the houses in the region. These estimates should be considered a starting point to inform community discussions about septic management practices and public and environmental health but should not be considered a definitive figure. These estimates were reviewed by representatives of the health departments that serve each county. Absent better local data, the health departments indicated these estimates reasonably represent their respective counties. Exhibit 1 shows the estimates for each county.

**EXHIBIT 1. Estimated Number of Septic Systems in Saginaw Bay Counties**

County	Housing Units	Households with a Septic System	Households with a Septic System (%)
Arenac	9,803	8,326	84.9%
Bay*	48,220	7,130	14.8%
Huron	21,199	14,111	66.6%
Iosco	20,443	14,130	69.1%
Tuscola	24,451	17,211	70.4%
<b>Total</b>	<b>124,116</b>	<b>60,908</b>	<b>49.1%</b>

\* PSC reviewed the preliminary estimates with representatives of each health department. Staff at Bay County suggested that these results may underestimate the number of septic systems in the county.

## HOW MANY SEPTIC SYSTEMS ARE FAILING?

When properly designed, installed, and maintained, septic systems are a cost-effective and environmentally friendly way of preventing pollution from entering the environment. However, throughout the state, there is growing body of evidence that some systems do not continue to operate as designed. In these circumstances, the systems may have exceeded their useful life or have been improperly maintained but continue to be used despite their failing condition.

Estimating failure rates is a challenging task. Local soil conditions, individual siting, system age, homeowner maintenance, and other factors can substantially influence conditions. Furthermore, what constitutes a system failure can greatly affect the results. On a national basis, the United States Environmental Protection Agency (U.S. EPA) estimates a failure rate of 10 percent, using what could be considered a narrow definition of system failure. In Michigan, some counties have enacted septic inspection ordinances that require systems to be inspected when they are sold and offer information about failure rates in the state. The Barry-Eaton Health Department tracked failure rates over a ten-year period and found that more than 25 percent of systems did not meet standards. Similarly, the Shiawassee County Health Department tracked rates of nonconformance over a 16-year period and found that almost

30 percent of systems did not meet standards. Some stakeholders have critiqued some county programs as having too broad of a definition of failure, which may overstate conditions.

Using a narrow definition of failure from the U.S. EPA and a broader definition of failure from county programs as the low and high ends of a range, it is estimated that there may be a total of 6,091 to 15,227 failing septic systems within the five Saginaw Bay counties.

## HOW MUCH POLLUTION IS GENERATED FROM FAILING SYSTEMS?

Building from this information, PSC then estimated the amount of sewage that may be entering the environment in coastal counties along the Saginaw Bay from failing septic systems. On average, an American individual uses 88 gallons of water per day (U.S. EPA n.d.). In Michigan, the average household size is just over 2.5 people per house, meaning that, on average, households generate approximately 225 gallons of wastewater every day, totaling more than 82,000 gallons annually (U.S. Census 2010). If homes are relying on a septic system that is not operating as designed, this effluent can contribute sewage to the environment, increasing public and environmental health risk. In counties along the Saginaw Bay, households with failing septic systems generate between approximately 1.4 million and 3.5 million gallons of sewage each day. Annually, these households generate approximately 505 million and 1.26 billion gallons of sewage, assuming a 10 percent and 25 percent failure rate. While these estimates represent a substantial amount of sewage that may be entering the environment, some systems may provide partial treatment, which decreases pollution levels making their way to the environment. Similarly, not all the discharges immediately reach waterways, but they can still be present in the environment. Exhibit 2 depicts the estimated failure and discharge rates by county from failing septic systems.

By comparison, permitted wastewater treatment facilities in these counties have largely eliminated discharges of untreated sewage into the Saginaw Bay from CSOs, which were historically a significant source of pollution to the Saginaw Bay. In 2017, for example, no CSOs were reported.<sup>4</sup>

### EXHIBIT 2. Estimated Septic System Failure Rates

County	Estimated Households with a Septic System	10 Percent Failure Rate	25 Percent Failure Rate	Estimated Daily Sewage Discharge (gallons)	Estimated Annual Sewage Discharge (gallons)
Arenac	8,326	833	2,082	189,000–473,000	68,997,000–172,493,000
Bay	7,130	713	1,783	162,000–405,000	59,086,000–147,715,000
Huron	14,111	1,411	3,528	320,000–801,000	116,937,000–292,343,000
Iosco	14,130	1,413	3,533	321,000–802,000	117,095,000–292,737,000
Tuscola	17,211	1,721	4,303	391,000–977,000	142,627,000–356,567,000
<b>Total</b>	<b>60,908</b>	<b>6,091</b>	<b>15,227</b>	<b>1,383,000–3,458,000</b>	<b>504,742,000–1,261,855,000</b>

Totals may not sum due to rounding.

<sup>4</sup> In the same year, approximately 332 million gallons of wastewater received primary treatment before it was legally discharged through retention basins. These discharges, however, are required to meet water quality standards.

These estimates represent a significant amount of sewage that may be entering the environment. Describing these figures differently shows that failing septic systems in the five counties along the bay generate enough wastewater to:

- Cover 4.24 to 10.61 acres in a foot of sewage every day
- Cover 2.42 to 6.05 square miles in a foot of sewage every year
- Cover all of Bay City in 2.6 to 6.1 inches of sewage every year
- Fill 764 to 1,910 Olympic swimming pools every year

## ADMINISTRATION OF SEPTIC REGULATIONS

Septic systems are regulated by local health departments at a county or regional level. Each of the five counties along the Saginaw Bay are served by a different health department; however, Huron and Tuscola Counties share an environmental health director.

To gain a better understanding of the current state of septic management in the region, PSC met individually with representatives of each health department via conference call. These discussions focused on understanding how septic system regulations are administered, identifying the current state of septic management in each county, use of information technology systems to enhance management and decision making, integration with geographic information systems, and the public accessibility of information. Finally, PSC and the health departments discussed investment needs that would enable the departments to more effectively manage septic systems to protect public and environmental health. These discussions provided a wealth of information about current septic regulatory practices and opportunities to advance public and environmental health in the region.

While there are many differences among the five counties, there are striking similarities as well. Each of the health departments has some form of a database used to track septic installation permit information, although the depth of information stored varies. Each health department identified digitization of historic paper records as being valuable to administering septic system regulations. However, at this point, only two counties have completed digitization of their records. One of the remaining counties has digitized some records in priority areas, one is taking steps to digitize their records, and one has no plans to digitize at this time due to funding availability. Two of the five counties have an integrated GIS system, and three do not.

The health department representatives drew a distinction between basic databases and more robust information management systems. As technology continues to advance, new software systems have been developed that can integrate more elements of administering environmental services regulated through the health departments. Some health departments expressed that information technology upgrades have the potential to enhance public and environmental health outcomes by integrating record keeping (including historic permit information) with permitting workflow processes and parcel-level GIS systems. These technology systems have the potential to streamline administrative systems, enhance accessibility to information, and enable detailed data analysis that can be used to address public health concerns. For example, if water quality conditions show high pollution levels that are attributed to failing septic systems in a certain watershed, GIS analysis and integration of historic records can enable robust analysis that could be used to identify properties that may pose a greater risk to the environment. This information could support focused outreach and information activities to respond to public health concerns. Exhibit 3 provides more detail about the current state of septic management activities for each of the counties.

### EXHIBIT 3. Health Department Needs in Saginaw Bay Coastal Counties

	Arenac	Bay	Huron	Iosco	Tuscola
<b>Information Management System</b>	Yes (Custom IBM Lotus database)	Yes (HealthSpace)	Yes (HealthSpace)	Yes (Hedgerow)	Yes (HealthSpace)
<b>Historic Records Integrated with IT System</b>	No	Some records digitized; HealthSpace system does not enable effective integration	Digital copies of paper records; HealthSpace does not enable effective integration	Digitization of records underway	Digital copies of paper records; HealthSpace doesn't enable effective integration
<b>Integrated GIS</b>	Recently purchased FetchGIS to integrate with database	Yes (FetchGIS)	No	No	No
<b>Available to Public Online</b>	No	No	No	Once Hedgerow system fully launched	No
<b>Needs</b>	Digitized historic information  Support for writing more code/queries to run analytics  System where health department could create its own reports and be able to search for the fields based on each individual data point	New FetchGIS-compatible, Web-enabled software system that integrates workflow management aspects, such as permits, records, and historic information; enables analytics; and provides a platform to share pumping information  County-wide digitized historic records	FetchGIS	GIS-integrated system with surveys conducted in the field	FetchGIS

## ADDRESSING FAILING SEPTIC SYSTEMS IN MICHIGAN

As more communities in Michigan recognize the potential impact of failing septic systems, various approaches have been considered to address maintenance after septic systems are first installed. The two leading models under consideration are the time-of-sale and the operating permit approaches.

The time-of-sale approach requires an inspection of the septic system when a property transaction occurs. Systems identified as failing need to be repaired or replaced before a sale can be finalized. The operating permit approach requires all developed properties to have their septic systems inspected on a periodic basis to verify the system is functioning as designed.

### TIME-OF-SALE APPROACH

The time-of-sale approach is currently implemented in ten counties in Michigan. Under this approach, any property with a septic system must be inspected during the property transaction to ensure that it is functioning as designed. The principle benefit of this approach is that it prompts an inspection at a time

when money is changing hands during the sale and financing is generally available. When an inspection identifies a failure, the buyer and seller can negotiate the terms of the replacement. In some instances, the purchase price may be reduced. Sometimes buyers incorporate a portion of the replacement costs into a mortgage. When significant financial investments are needed, this approach can lessen the immediate financial burden on residents affected.

Time-of-sale ordinances are sometimes critiqued by some stakeholders as having too strict of requirements and too broad a definition of failure. In other words, what some people may consider as an insignificant deficiency can garner a determination of “system failure.” This approach is often criticized by members of the real estate community (Realtors, brokers, etc.) for complicating and potentially delaying home sales. Furthermore, in the wake of the Great Recession, which reduced property values, some homeowners found themselves underwater when faced with a system replacement. Finally, through the time-of-sale approach, only a relatively small portion of properties are affected by the ordinance, and there is no consistency with which they are inspected. Some properties may be bought and sold many times, others less frequently, some may never sell but are transferred within families. For instance, a recent survey of residents with septic systems in the Maple River Watershed found that people in the region stay in their homes an average of 25 years (PSC 2018). While this watershed is outside of the Saginaw Basin, it demonstrates that time-of-sale programs have the potential to overlook many properties. However, in jurisdictions with a time-of-sale requirement, the number of properties identified as failing typically declines over time and water quality conditions improve.

## **OPERATING PERMIT APPROACH**

Under the operating permit approach, all properties with a septic system would need to demonstrate that they continue to treat wastewater effectively through a periodic inspection. The frequency of inspections has varied as different jurisdictions have considered the approach, but it generally ranges from five to ten years. Some jurisdictions have also considered integrating a risk-based approach that would set a longer baseline inspection frequency for all properties but enable more frequent inspections when conditions suggest that a system may have a higher probability of failure or a negative impact on public and environmental health (older systems, those adjacent to waterways, etc.).

The principle benefit of this approach is that it addresses all properties with septic systems and sets a standard to ensure all systems continue to treat wastewater effectively. Integrating a risk-based approach has the potential to strike a balance of reducing the burden on property owners and addressing public and environmental health concerns. This approach addresses many concerns expressed about the time-of-sale program but is a significantly larger program for health departments to administer.

To date, no communities in Michigan have implemented an ordinance to require all properties to demonstrate they effectively treat wastewater on a periodic basis through an operating permit approach. At least two health departments have given significant consideration to the approach. Bay County has drafted ordinance language but has not yet adopted it, and the Mid-Michigan District Health Department serving Clinton, Gratiot, and Montcalm Counties is in the process of drafting ordinance language for approval by its member counties.

## STATEWIDE SANITARY CODE

In 2018, a series of bills was introduced into the Michigan House of Representatives to develop a statewide sanitary code. Michigan is often identified as the only state in the country without a statewide code; however, this does not mean that Michigan doesn't have any sanitary code. Under the existing policy framework, sanitary codes are developed and implemented by local health departments, and subject to review by the Michigan Department of Environmental Quality. The statewide bill, as currently written, would implement an operating permit model throughout the state and repeal local time-of-sale ordinances. The current iteration of the bill has been met with mixed reactions from different stakeholders and has not received the endorsement of the Michigan Environmental Health Association.

While the current bill has garnered more interest in the legislature than previous iterations, the likely outcome remains uncertain. Multiple attempts to update Michigan's septic regulations have been considered and introduced at a statewide level but have yet to garner sufficient support from the legislature to be implemented.

## ASSESSING COMMUNITY LEADERS' VIEWS

The WIN-PSC team identified community leaders representing a broad spectrum of interests in the region and other opinion leaders with responsibilities and interests in the management and/or protection of the Saginaw Bay watershed. These community leaders were invited to participate in one-on-one interviews to understand their views and perceptions of septic management and water quality conditions in the Saginaw Bay. Prior to the conversations, participants received a briefing document summarizing preliminary research regarding the number of septic systems in coastal counties (see Exhibit 2) and an interview guide that included the following questions.

- In your view, how significant of an issue do you think failing septic systems may be to communities in the Saginaw Bay?
- To what extent do you think current septic regulations adequately protect public health and the environment?
- Multiple approaches have been examined to better ensure septic systems continue to treat wastewater, and there have been discussions of acting at the county level, at a regional level, or on a statewide basis. What are your views on each of these approaches? What do you feel are their strengths and weaknesses?
- If partners were to pursue a septic management strategy, what barriers or challenges would you anticipate in pursuing enhanced septic management practices?
- Is there anything that we haven't discussed that would be helpful for WIN to consider?

PSC then completed one-hour phone interviews with 11 stakeholders and opinion leaders within the community. To enable a more candid discussion, the interviews were treated as confidential such that responses were not attributed to an individual. After the interviews were complete, PSC analyzed the results to identify common perspectives and differing points of view.

## WHAT DO COMMUNITY LEADERS THINK?

The results of the interviews are summarized below.

### **How big of a problem are failing septic systems to communities in the Saginaw Bay?**

Interviewees were in near unanimous agreement that failing septic systems in the region are an issue that should be addressed. While interviewees believe failing septic systems to be a problem, many were quick to note that public perception may not support further regulations at this time. Additional data and research is critical in defining the scope of the problem. Interviewees suggested that water quality monitoring and source tracking should be a priority. Sampling programs should be developed to delineate the relative significance of failing septic systems to other known and suspected sources of pollution, such as agricultural runoff associated with manure management, CSOs from municipal discharges, and naturally occurring bacterial contamination from wildlife. Interviewees suggested that this information should be used to further refine priority actions and develop a public awareness campaign. Most interviewees also suggested that a campaign should frame water quality impairments around negative impacts that people experience in the region to raise awareness of how septic management practices can contribute to beach closings and other issues in the bay.

### **Are current septic regulations adequately protective of public health and the environment?**

There was general consensus that current siting and installation regulations are adequately protective of public health and the environment. Some interviewees suggested that siting and installation regulations could be improved by creating uniformity across political jurisdictions to reduce regulatory burdens for septic installers. Some interviewees also suggested that local regulations could be strengthened by better integrating new and emerging alternative treatment technologies. The current system requires approval by each health department, which can create challenges when implementing new designs.

One interviewee suggested that local health departments make too many exceptions for properties that are located directly on the bay by allowing systems to be installed too close to the waterfront. The interviewee suggested that people who own high-value properties were able to get variances through local government offices even if they threaten water quality and public health. While one interviewee held this view, health department officials disagreed.

While interviewees believe that siting and installation regulations are adequately protective of public health for new systems, most people interviewed felt that current regulations should be strengthened to ensure that systems continue to operate as designed after they are installed. Some interviewees quickly noted that the Saginaw Bay region has many older homes that likely have aging septic systems that may not be effectively treating wastewater. Under the current codes, the health departments are only able to effectively respond to an issue when there is a complaint, even though almost all interviewees believe failing septic systems to be a problem in the region.

Some interviewees also suggested that health department codes could be strengthened by developing a certification process for professional septic inspectors, which could have the potential to better ensure that systems are functioning after they are installed. For example, many septic systems are inspected during a home transaction, but there is no baseline standard for what is included within the inspection.

## Is it better to address septic management issues at the county level, at a regional level, or on a statewide basis?

Consensus did not emerge as to whether a county-based, regional, or statewide approach would be the best path forward if more proactive septic regulations were to be advanced. Interviewees recognized that each approach has relative advantages and disadvantages that are summarized in Exhibit 4 below. Many interviewees suggested that while one approach or another may be ideal from a hypothetical perspective, partners in the region should remain pragmatic and focus their attention where there is greater probability for success.

### EXHIBIT 4. Advantages and Disadvantages of County, Regional, and Statewide Approaches

	Advantages	Disadvantages
<b>County</b>	<ul style="list-style-type: none"> <li>• Maintains greater control at the local level and allows programs to be more tailored to local needs</li> </ul>	<ul style="list-style-type: none"> <li>• May place new expenses or regulation on constituents, so local elected officials may hesitate to pass the ordinance</li> </ul>
<b>Regional</b>	<ul style="list-style-type: none"> <li>• Offers a more comprehensive solution for Saginaw Bay water quality</li> <li>• Could create consistent regulations that decrease the cost of doing business for professionals who need to navigate multiple standards</li> <li>• Better supports integration of emerging technologies by having a regional approval process rather than many county processes</li> <li>• May better account for regional hydrogeologic conditions than a statewide approach</li> </ul>	<ul style="list-style-type: none"> <li>• Needs to be passed by each county, which may be unlikely at this time. The pragmatic view may be to work at the county level in communities that have leadership willing to support a more proactive approach.</li> </ul>
<b>Statewide</b>	<ul style="list-style-type: none"> <li>• Brings consistency across the state</li> <li>• Addresses water quality problems throughout the Saginaw basin, not just counties along the bay</li> <li>• Best supports integration of emerging technologies by having one approval process for the whole state</li> </ul>	<ul style="list-style-type: none"> <li>• May not sufficiently allow for regional variation for different hydrogeologic conditions</li> <li>• Decreases local control and autonomy</li> </ul>

## What barriers or challenges may there be to pursuing enhanced septic management practices?

The interviews identified a few common themes regarding barriers or challenges that would be anticipated in pursuing enhanced septic management practices. Political leaders and residents are less likely to be supportive of a more proactive regulation unless there is indisputable data that failing septic systems are causing public and environmental health concerns. As one interviewee suggested, “There needs to be a smoking gun before the public will be supportive.” Furthermore, community members highlighted that repairing or replacing a septic system can be expensive, especially for residents of limited means. Interviewees suggested that ensuring that residents have access to financial support mechanisms that can lessen this burden would help address water quality concerns and enhance public support. Finally, interviewees discussed the importance of raising public awareness in multiple ways. First, they suggested that a campaign should be developed to grow awareness of septic management practices, which would help reduce the failure rate and the amount of wastewater effluent entering the environment. Second, interviewees suggested that a campaign should be developed to share results of water quality

sampling and help residents understand how their septic system can impact the Saginaw Bay and other lakes, rivers, and streams in the region. Until the public understands what the impact of failing septic systems is, they will be less likely to support new regulations.

### **What additional information would the public and decision makers want before pursuing a strategy?**

Themes identified by interviewees as potential barriers or challenges were often reiterated as opportunities to address concerns from the public and decision makers. Greater efforts need to be focused on defining the scope of water quality concerns in the Saginaw Bay. While interviewees presumed failing septic systems to be a problem, they noted there is not irrefutable data that this is the case. Every interviewee identified the need to collect more data. Interviewees also suggested that water quality sampling needs to be more robust than just showing E. coli levels, and must also answer the question of the relative E. coli contribution of septic systems compared to other sources. In other words, regional partners should be able to answer the question of the proportion of water quality concerns that are attributable to failing septic systems, agricultural runoff, CSOs from municipal sources, naturally occurring wildlife, and other potential sources. The results of this sampling should guide strategies to address water quality concerns. Without building this case, the public and decision makers will be less likely to support a more proactive approach to septic management. Interviewees suggested communicating the results of water quality testing to residents and decision makers to enhance their understanding of pollution sources in the bay. In addition to communicating results of the water quality sampling, interviewees suggested that education and outreach activities could also grow residents' awareness of how to properly maintain a septic system.

Most interviewees noted that septic systems needing repair or replacement can create a financial burden on residents, especially those of limited means. Most people want to do the right thing and do not want to pollute their community, but they may not understand how a failing septic system can contribute to pollution and may not have the financial resources to correct a problem. Interviewees suggested that developing, expanding, and promoting financial support mechanisms should be an essential element of a strategy to lessen the financial burden and reduce contamination from failing septic systems in the Saginaw Bay.

## **RECOMMENDATIONS**

Over the course of the interviews, community leaders identified many opportunities to improve public and environmental health in the Saginaw Bay region. Representatives of the health departments with jurisdiction over the five counties along the bay also offered valuable insight and perspectives on septic management practices. Building from these conversations and research regarding the potential impact of failing septic systems, community partners should consider enhancing collaborative efforts, working to improve information management as it relates to septic systems, building greater understanding of water quality conditions and the potential impact of failing septic systems, raising public awareness of water quality conditions and septic management practices, developing and augmenting financial assistance mechanisms for residents, and evaluating updates to the sanitary code. Recommendations to advance each of these priorities are provided below.

## ENHANCE COLLABORATIVE EFFORTS

- Leaders in the community should consider advancing the recommendations that follow in a coordinated and collaborative manner that integrates multiple perspectives regarding water quality and septic management. Potential partner organizations may include watershed groups; environmental and conservation groups; the agricultural community; the business community; Realtors; septic system professionals; regional planning bodies; and municipal, county, and state government agencies. Enhancing these relationships and building a network of people working to reduce public health and water quality concerns has the potential to position the region for greater success.

## IMPROVE INFORMATION MANAGEMENT

- Regional partners should work with and support the health departments to address their information management needs. This should include modernizing information management systems to:
  - Integrate record keeping and permitting processes with GIS systems
  - Include a Web-based component that makes records and information available publicly
  - Digitize and integrate historic records into the information management system
  - Include robust data analysis, such as system location, age, and conditions

Updating health departments' information management systems with these elements could provide a wealth of information about current conditions and inform action strategies to further develop priorities. For example, this information may enable health departments to identify properties for which no septic records are available and those with systems that may have exceeded their useful lifespan that could be prioritized for focused outreach and education.

## UNDERSTAND THE SCOPE OF THE PROBLEM

- Water quality data should continue to be collected to identify areas where *E. coli* levels exceed water quality standards. Sampling should not be limited to swimming beaches and should use a watershed-based approach. To the extent feasible, water quality sampling approaches should be coordinated within and among watersheds so they consistently support like comparisons and simplify education and outreach to the public and decision makers.
- When sampling shows that *E. coli* levels are higher than acceptable, source tracking should be conducted. Watershed groups in other parts of the state have found a paired sampling approach using canine sampling and DNA analysis to be a more cost-effective method to identify sources, as canine sampling can serve as a relatively inexpensive and effective preliminary screen. DNA analysis is more expensive but can serve to corroborate the results of canine sampling (allaying concerns of people who are skeptical of the approach) and indicate the relative contribution from human sewage and other sources.
- Sampling approaches should be designed to identify the relative contribution from failing septic systems and other sources such as agricultural and municipal inputs as well as naturally occurring background levels from wildlife. As data continues to become available that better defines pollution levels and sources, regional partners should adjust their approach accordingly. For example, if

sources other than failing septic systems are determined to be a primary contributor, septic management practices may not be the first priority to advance.

## **RAISE PUBLIC AWARENESS**

- Regional partners should enhance outreach and education to residents and decision makers. The education and outreach strategy should include multiple elements, such as enhancing awareness of septic management practices, results of water quality sampling and source tracking, and how failing septic systems can impact the community. A wealth of material already exists regarding maintenance approaches for septic systems. Partners should not need to develop new content in this regard, but should instead disseminate existing materials. Community impacts include contributing to beach closings, which may negatively affect recreation and tourism and the regional economy and potentially decrease property values in areas with water quality exceedances.

## **DEVELOP AND AUGMENT FINANCIAL SUPPORT MECHANISMS**

- Repairing or replacing a septic system can be an expensive endeavor, especially for residents of limited means. Some financial support mechanisms are already in place. The United States Department of Agriculture (USDA) Rural Development Office operates a housing repair loan and grant program that may provide funding to assist residents.<sup>5</sup> Similarly, the Michigan State Housing Development Authority (MSHDA) operates the Property Improvement Program that uses a public-private partnership model to finance necessary home improvements for qualifying individuals.<sup>6</sup> Locally, Bay County established a revolving loan fund to assist homeowners in need, which was partially capitalized by WIN. While the program has been successful, the cost of replacements is high, and the payback period is long, which has limited the number of people who have been able to participate in the program.

Community partners should evaluate establishing programs that enhance awareness of existing federal and state assistance programs and proactively assist residents in accessing this funding since state and federal programs can be cumbersome to navigate. Community partners should also seek to further develop local financial support mechanisms, such as Bay County's revolving loan fund, or credit enhancement mechanisms, such as a loan loss reserve program.

## **EVALUATE UPDATES TO THE SANITARY CODE**

Stakeholders who participated in the interviews generally believed that current septic regulations are adequate for siting and installing new systems. However, some suggested that additional resources could be allocated to updating codes to better include alternative treatment systems as new technologies become available to treat household wastewater.

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<sup>5</sup> More information about the USDA Rural Development Single-family Housing Repair program is available online at <https://www.rd.usda.gov/programs-services/single-family-housing-repair-loans-grants>

<sup>6</sup> More information about the MSHDA Property Improvement Program is available online at [https://www.michigan.gov/mshda/0,4641,7-141-45866\\_47906\\_49317-187374--,00.html](https://www.michigan.gov/mshda/0,4641,7-141-45866_47906_49317-187374--,00.html)

Interviewees reached consensus that current septic regulations are inadequate after initial installation. There was consensus that health departments should have more tools to ensure that systems continue to effectively treat wastewater after they are first installed.

Interviewees did not reach consensus on the best approach to pursue. A range of opinions were offered, suggesting action on a county, regional, or statewide basis. Many interviewees suggested that an ideal approach may include a regional component, but some were quick to note the administrative complexities of pursuing this option. The five counties that straddle the bay are covered by five different health departments, and under this administrative framework, each county board of commissioners would be required to approve any ordinance changes, which may be an unrealistic goal at this time. If community partners were to pursue enhanced septic management, they may want to consider focusing activities at a county level, despite the benefits of a regional approach, because it progress may be more feasible. As one interviewee suggested, “With septic or anything else, it is (usually) best done at the regional level . . . but for this issue, approach it county by county when local leadership is willing to support it. Take a win where you can get a win.” If partners in the region decide to pursue more proactive septic regulations, they should work collaboratively with community members that would be affected by new approaches to design new strategies.

Finally, while there was consensus among the interviewees that current septic management policies and practices are a concern in the region and more proactive ordinances may be appropriate, taking steps to enhance information management, improve understanding of the scope of the problem, increase education and outreach, and grow financial support mechanisms are important precursors to pursuing new regulations. The extent to which these recommendations can be implemented will better position the region for success if community members decide to pursue ordinance revisions.

## CONCLUSION

Throughout Michigan and in the Saginaw Bay region, a growing body of evidence suggests that failing septic systems may be threatening public and environmental health. Estimates show that there are more than 60,000 septic systems in the five counties that line the bay. On average, each of these homes generate 82,000 gallons of wastewater annually. While it is difficult to estimate the precise number that may not be functioning as designed, using failure rates experienced nationally and within Michigan as the upper and lower ends of a range suggests that there may be between approximately 6,000 and 15,000 failing septic systems in Arenac, Bay, Huron, Iosco, and Tuscola Counties. Every year, these systems may be contributing between 505 million and 1.26 billion gallons of sewage into the environment. The amount of wastewater generated by households with failing septic systems could cover about four to ten acres in a foot of sewage every day. Annually, this represents enough sewage to blanket all of Bay City in 2.6 to six inches of sewage.

Community leaders who participated in interviews agreed that failing septic systems represent an environmental and public health problem for the Saginaw Bay region that should be addressed. However, there was also agreement that the public does not perceive failing septic systems to be a concern. While there may be interest in advancing septic management approaches, community leaders will need to bring the public along in this process. Greater attention should be focused on building a foundation for growing success. This should include working collaboratively with multiple community interests to support the health departments in upgrading their information management systems, building greater understanding

of water quality conditions and the potential impact of failing septic systems, raising public awareness of water quality conditions and septic management practices, and developing and augmenting financial assistance mechanisms for residents who need to repair or replace their septic systems. Taking steps to advance these efforts has the potential to reduce the amount of pollution in the environment and position the region to manage septic systems effectively.

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## APPENDIX A: METHODOLOGY TO ESTIMATE THE NUMBER OF SEPTIC SYSTEMS

To better understand the potential impacts of septic systems on waterways, the Michigan Department of Environmental Quality recently developed the Michigan *E. coli* Pollution and Solution Mapper. This interactive tool enables anyone to access available *E. coli* sampling data from Michigan's waterways and information about potential sources of pollution, such as the number of septic systems.

To estimate the number of septic systems in Michigan, the MDEQ conducted an analysis that overlays geospatial data and other information. The MDEQ compiled:

- Housing data from the 2010 census at the block level
- Available geospatial data that identifies areas connected to municipal sewers
- Permit data that identifies the number of households served by every wastewater treatment plant or a permitted community system (e.g., a septic lagoon)
- Aerial photography to identify the number of households in limited circumstances where information was lacking

These data points served as inputs to a simple formula that estimates how many homes have a septic system:

[Total households] – [households on a sewer system] = estimated number of septic systems

Public Sector Consultants requested information from the MDEQ for each county along Saginaw Bay to inform ongoing discussions regarding septic management.

These estimates were reviewed with representatives of the environmental health departments for coastal counties along the Saginaw Bay. Staff at the Bay County Health Department suggested that these results may underestimate figures in the county.



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