

## Assessing Homeowner Perspectives and Barriers to Maintenance of On-Lot Septic Systems in Rural Pennsylvania

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A survey of septic system users was conducted to assess maintenance practices and barriers to proper septic system management across Pennsylvania. The survey included 656 respondents, with 53 percent located in rural counties and 47 percent in urban counties. Approximately 65 percent of septic systems are over 20 years old, highlighting concerns related to aging infrastructure and potential environmental impacts. While over 75 percent of respondents reported pumping their septic tanks every one to five years, only about 30 percent reported completing routine inspections, and fewer than 30 percent indicated that their municipalities require proof of maintenance or pumping. Municipal ordinances vary widely, with some requiring routine maintenance while others provide vague or non-specific guidance, contributing to inconsistent practices and limiting early detection of system issues. Reported challenges include the cost of repairing or replacing aging systems (43 percent) and routine maintenance expenses (33 percent). Water quality testing of 125 private water sources found that 53 percent, 10 percent, and 3 percent of samples failed to meet federal drinking water standards for coliform bacteria, *E. coli*, and nitrate, respectively. Identified needs include improved education on comprehensive septic maintenance and continued monitoring of private water quality.

### Methods

In 2024 and 2025, the researchers surveyed septic system users across Pennsylvania to assess maintenance practices, barriers, and potential links between septic maintenance and private water quality. Participants were recruited through a two-phase process, beginning with a brief screening survey followed by a detailed follow-up survey completed by 656 respondents across all counties except Cambria, Mifflin, and Philadelphia. The sample included 53 percent rural and 47 percent urban respondents. From this group, 145 participants were selected for private water testing based on reported maintenance practices, and 125 submitted water samples.

### Key Findings

- Septic systems in Pennsylvania are aging, with only 26 percent less than 20 years old, while 38 percent are between 21 and 40 years old and 27 percent exceed 40 years of age. Given an estimated lifespan of 15 to 40 years (U.S. Environmental Protection Agency [EPA], 2025), a large share of systems are approaching or exceeding functional life, increasing the risk of malfunction and associated environmental and public health concerns.

- Septic maintenance practices are inconsistent, with only 32 percent of users reporting adherence to recommended inspection intervals and 60 percent of systems older than 20 years having never been inspected.
- While approximately 75 percent of respondents report pumping their systems every one to five years, inspection practices remain far less consistent, resulting in incomplete maintenance records for many systems.
- Municipal requirements vary widely across jurisdictions, with some requiring inspections and pumping on multi-year cycles, while others rely on discretionary enforcement or complaint-based triggers.
- Awareness and financial barriers are significant, with 43 percent of respondents reporting repair and replacement costs as a challenge and 33 percent reporting routine maintenance costs as a burden.
- Only 35 percent of respondents report actively budgeting for septic system expenses, and fewer than 1 percent have accessed Pennsylvania Housing Finance Agency financial assistance programs.
- Misconceptions persist, particularly the belief that septic tank pumping alone is sufficient

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- maintenance without routine inspections to assess system condition and performance.
- Water quality testing shows measurable contamination in private systems, with total coliform detected in 69 percent of samples, nitrate in 53 percent, and *E. coli* in 8 percent.
  - Health-based drinking water standard violations were observed in 53 percent of samples for coliform, 3 percent for nitrate, and 8 percent for *E. coli*, with additional exceedances for arsenic and lead in a smaller share of samples.
  - Properties with partial maintenance exhibited approximately 30 percent higher total coliform levels than those with full maintenance, while irregular maintenance was associated with nearly double the coliform concentrations.
  - Older systems with irregular maintenance showed elevated levels of total coliform and *E. coli*, while deeper wells and greater separation distances from septic system components were associated with lower contamination levels.

### Policy Considerations

Based on these findings, the research identifies several considerations for policymakers and local stakeholders:

- The findings indicate a need for more consistent statewide septic system maintenance standards, as current variation in municipal ordinances and limited specificity in state guidance contribute to confusion among homeowners and uneven compliance across jurisdictions.
- Strengthening inspection requirements should be

- considered a preventive policy tool, as inspections provide critical diagnostic information on system condition, sludge accumulation, and early signs of failure, particularly in a state where many systems are aging and have never been evaluated.
- Expanded homeowner education is needed to address persistent misconceptions about septic system maintenance, particularly the assumption that routine pumping alone is sufficient without formal inspections to evaluate system integrity and performance.
  - Financial barriers remain a major constraint to compliance, indicating a need for increased awareness and accessibility of existing assistance programs, as well as consideration of additional funding mechanisms to support households facing repair and replacement costs.

- The findings support development of standardized statewide private well construction guidelines, including consistent requirements for sanitary well features and scientifically grounded setback distances from septic systems, to reduce variability in water quality risk across regions.
- Improved transparency and access to qualified service providers are needed, as many respondents report uncertainty about when maintenance is required and difficulty identifying providers, suggesting value in publicly accessible, standardized service listings.
- Municipal ordinance inconsistencies, including vague inspection language and discretionary enforcement practices, should be addressed to improve clarity, strengthen compliance expectations, and reduce variability in implementation across local governments.

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