Michigan Water Leak Pilot: Evaluation Report

Introduction

In January 2021 the Michigan Clean Water Public Advocate (CWPA), Nina Sasy, kicked off a multi-party Water Leak Pilot program in two communities – Highland Park in Southeast Michigan and Benton Harbor in Southwest Michigan. The pilot program provided plumbing support to fix leaks that may be contributing to excessive water bills and wasting energy in homes where residents lacked resources to address these issues. In each community, the CWPA recruited a community group to aid in outreach to residents to help them understand and sign up for the program. She also recruited a plumbing contractor in each community and a municipal level organization for the purpose of coordinating support for residents, such as ensuring their homes were properly assessed for leaks, scheduling plumbing visits and following up to ensure the work was complete.

In Highland Park these roles were filled by:

- Community Group: Highland Park Human Rights Coalition
- Community Coordination: Metro Consulting Associates
- Plumbing Contractor: Benkari

In Benton Harbor these roles were filled by:

- Community Group: Black Autonomy Network Community Organization (Benton Harbor Community Water Council)
- Community Coordination: City of Benton Harbor
- Plumbing Contractor: RW LaPine Inc

The goal of the pilot project was to provide plumbing services to stop supply-side leaks in up to 100 homes in each community. The budget was to average $800 per home in each community with a total of $160,000 available for plumbing support, $80,000 in each community. Public education and outreach for the program kicked off during the 2021 “Fix a Leak Week,” part of the US EPA WaterSense Program. As part of the effort, additional community partners in Southwest Michigan recruited and engaged high school students to develop public service announcements to speak to the benefits of fixing household leaks.

Finally, the CWPA recruited a team from the University of Michigan Water Center and Safe Water Engineering to provide an overall program evaluation. The evaluation was intended to learn from the pilot process from all perspectives -- residents, plumbers, community-based organizations doing outreach, local media partners, state agency partners, and local governments and organizations. The evaluation includes an analysis of the impact of premise plumbing repair on water loss reduction and corresponding energy savings. Outputs of the evaluation include: identification of lessons learned and best practices, additional observations from the evaluation team, and recommendations for future programs.

Methodology

The table below captures the main elements of the evaluation process. See the appendices for more details from the methodology including survey instruments.

Action	*Evaluation Tool*
Evaluate program materials	Resident surveys and interviews, questions developed in consultation with other project partners
Assess resident/landlord ease of participation and satisfaction with the program	Resident surveys and interviews, questions developed in consultation with other project partners
Assess plumber satisfaction with the program	Plumber surveys and interviews, questions developed in consultation with other project partners
Assess all other pilot project partner satisfaction with the program	Interviews with all other program participants asking a specific set of questions developed by the evaluation team in consultation with other project partners.
Assess impact of premise plumbing repair on water loss reduction and corresponding energy savings	Tools developed by Rebuild Michigan

Summary Evaluation Statistics

Table 1: Water Leak Pilot Summary Data for Highland Park and Benton Harbor

Summary Data	Highland Park	Benton Harbor
Total visits	106	70
Unique addresses	96	70
Dates	June 1-Sept 27	April 15 - November 30
Maximum per home cost	$ 1,078.50	$ 2,840.11
Average cost per home	$ 644.26	$ 921.38
Minimum per home cost	$ 100.00	$ 47.50
Median cost per home	$ 789.50	$ 922.72
Total Spent	$ 61,848.50	$ 64,496.31
Unspent	$ 18,151.50	$ 15,503.69

Table 1 provides summary data for each water leak pilot program community. In Highland Park, 96 unique homes received services under the program, 38% more than in Benton Harbor where

70 homes received services. There was likely more than one visit per home in Benton Harbor but that data was not available. The maximum, average, and median cost per home was larger in Benton Harbor than in Highland Park. The maximum spent in Benton Harbor was more than twice the maximum spent in Highland Park. Despite servicing 38% more homes in Highland Park, slightly more funds were left unspent in Highland Park compared to Benton Harbor. This dataset indicates that the cost of plumbing repairs per home can vary widely and may be tied to plumbing characteristics in the community or the setup of the program.

Table 2: Water Leak Pilot plumbing fixture repairs and replacements in Highland Park and Benton Harbor

	Highland Park		Benton Harbor	
Plumbing Fixture	**Replaced**	**Repaired**	**Replaced**	**Repaired**
Toilet(s)	29	84	61	0
Supply Line	19	2	4	0
Kitchen faucet	39	5	22	1
Lav Faucet	22	16	17	1
Laundry Faucet	4	1	4	1
Diverter	8	29	0	0
Tub Faucet	10	0	0	0
Showerhead	14	2	18	4
Outdoor spigot	4	2	4	5
Valve(s)	17	23	3	5
Pipe	5	3	5	2
Water Heater	0	7	0	1
Totals	**171**	**174**	**138**	**20**
Filters for pull down faucets	40		15	

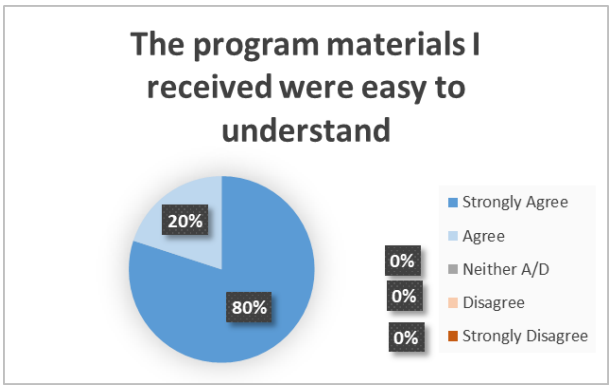
Table 2 shows the total number of plumbing replacements and repairs in each community. Toilets were the most frequently addressed plumbing fixture addressed in both communities. In Highland Park, 84 toilets were repaired and 29 were replaced. In Benton Harbor, 61 were replaced and none were repaired. Kitchen faucets came next, where only 5 and 1 were repaired in Highland Park and Benton Harbor respectively and a total of 61 new faucets were installed. There were 171 total replacements and 174 total repairs in Highland Park, while there were 138 total replacements and 20 total repairs in Benton Harbor. The substantially larger number of repairs and replacements in Highland Park is notable given the lower average, median, and maximum cost per home in that community.

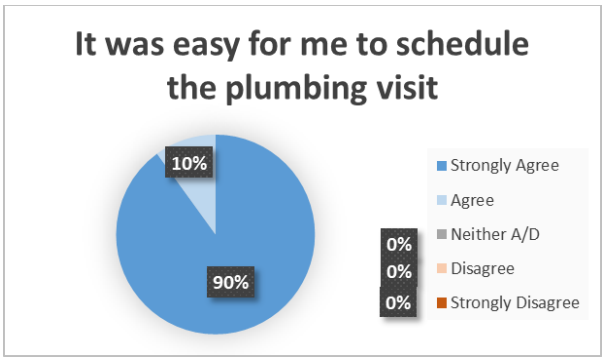
During the program, the Kohler company provided new water efficient faucets to replace existing faucets. The kitchen faucets that were provided were all pull down style faucets that are

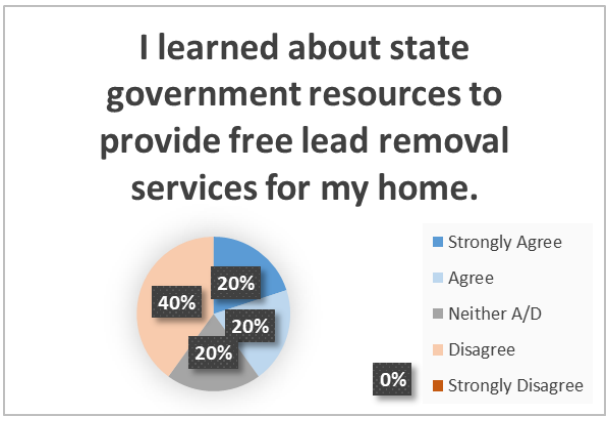
not compatible with faucet mount filters certified for lead reduction. Since both of the communities participating in the Water Leak Pilot Program have had recent and/or ongoing lead action level exceedances, pitcher style filters were provided to homes that had new kitchen faucets installed so these homes continue to have the ability to filter water used for consumption from their kitchen faucets. Per final project tallies, 35 pitcher style filters were delivered in Highland Park where 39 faucets were replaced and 15 were delivered in Benton Harbor where 22 faucets were replaced.

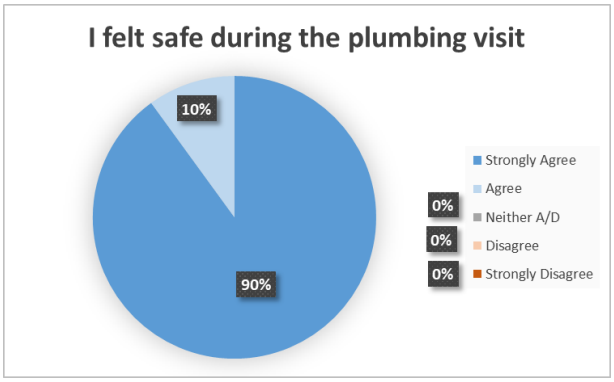
<u>Participant Surveys</u>

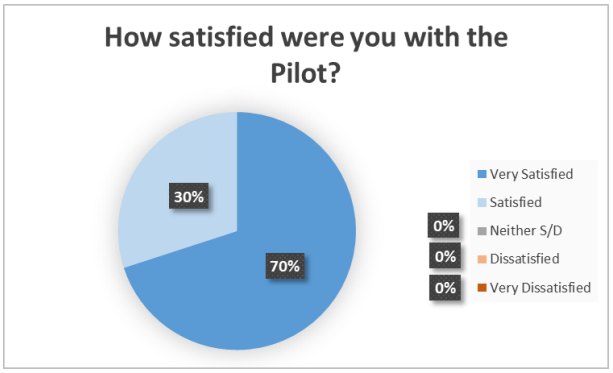
Benton Harbor Customer Survey (n=10)











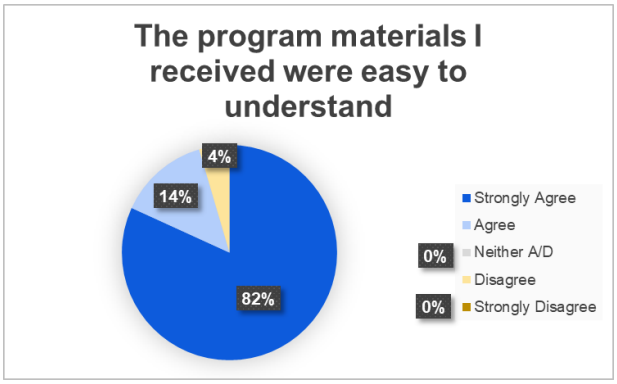
How people learned about the pilot program:

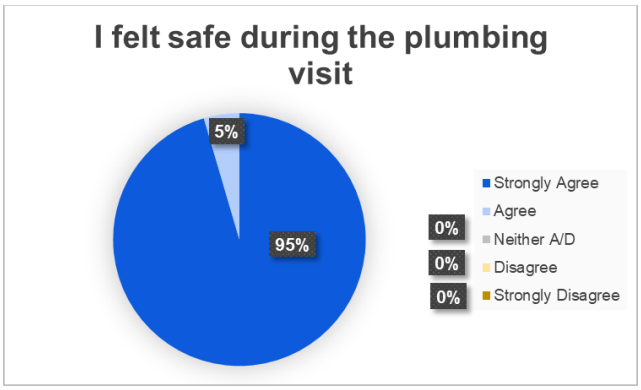
- Billboard/newspaper: 2
- Volunteer came to my door: 6
- Radio/TV:
- Mail/door hanger:
- Other: neighbor; Rev. Pinkney (2)

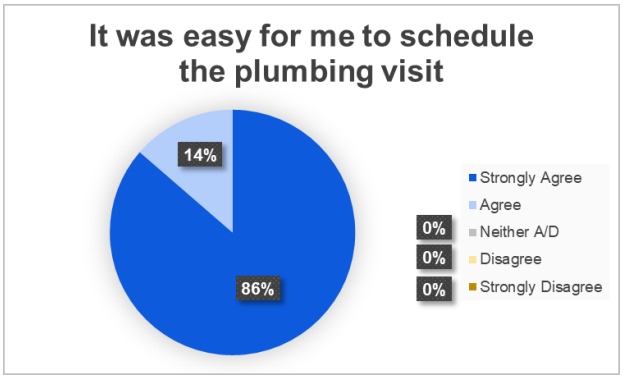
Plumbing work completed?
Yes: 9
Yes, but additional work required: 1
No: 0

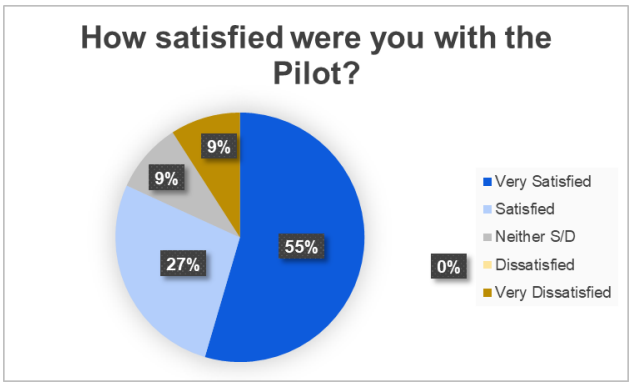
How many visits did it take to complete the work:
One: 8 ; Two: 2

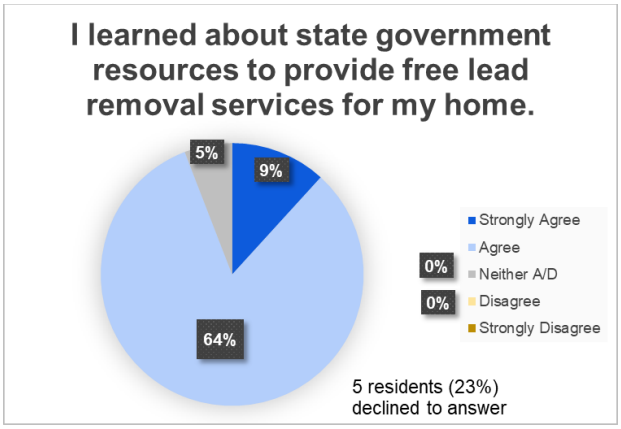
Highland Park Customer Survey (n=22)











How people learned about the pilot program:

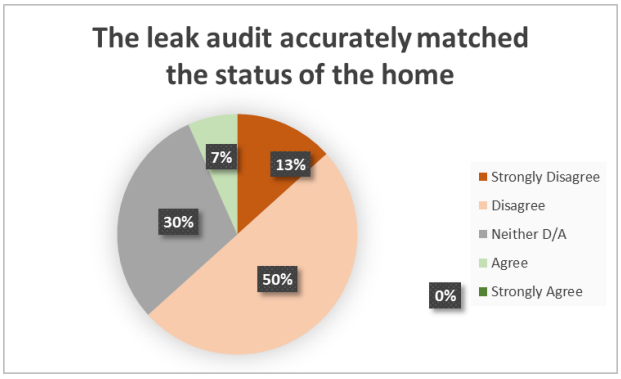
- Billboard/newspaper: 16
- Volunteer came to my door: 10
- Radio/TV: 3
- Mail/door hanger: 5
- Other: 2 (no answer offered)

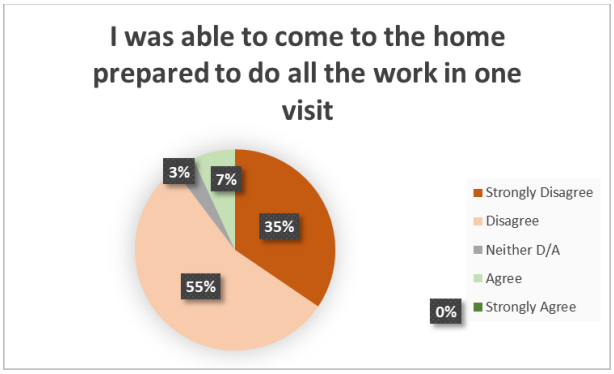
Plumbing work completed?
Yes: 12
Yes, but additional work required: 10
No:0

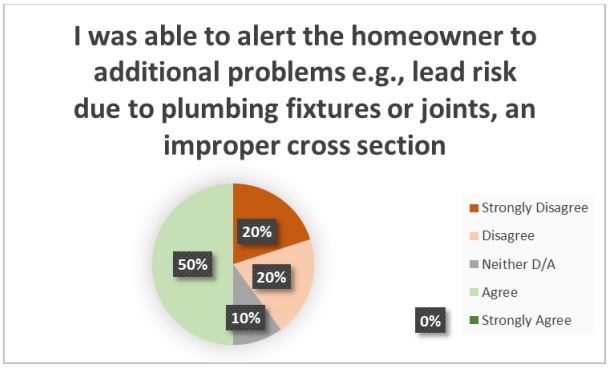
How many visits did it take to complete the work:
One: 22
Two: 0

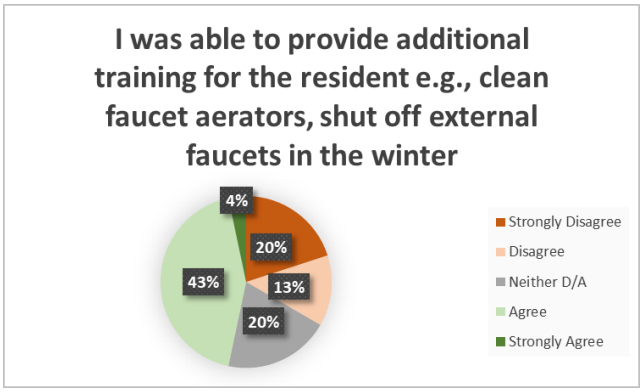
Plumber Surveys

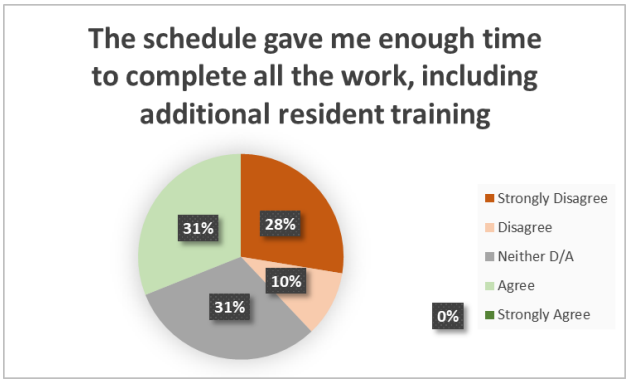
Benton Harbor (n=30)

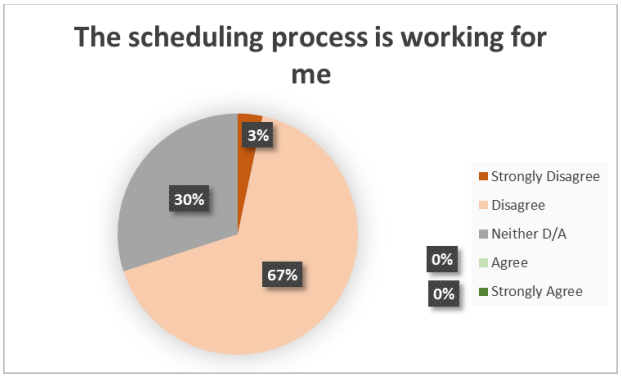












Out of Scope:
Drain issues that did not qualify for repairs under this program, noted in 5 of 30 reports.

Benton Harbor Plumber Comments:

Drainage Issues

Called him to make him an appointment and he said the only thing he has is a drain leaking nothing else so I had to explain to him what the water saving program was for and he said he didn't want it done then

The only thing they wanted fixed was a bunch of drainage leaks so I had to explain to him what this water saving program was for so he told me there was nothing I could do for him then

Customer had a few drain issues, but no fixtures needed repaired or replaced.

Customer had one drain problem, but had no water supply issues.

Customer had a few drain issues, and supposedly had an issue with the kitchen faucet, but the sink was full of dirty dishes and under the sink was full of nasty bottles and boxes. It appeared to be a drain issue. He also had a water heater problem, but it was inaccessible in the basement due to excessive clutter.

Home Not Ready for Work

The bathroom floor was not ready for a new toilet. We had to pull out some flooring for new toilet to fit. Wasn't able to go into basement.

The house was a complete mess and we should not have performed any work here. All fixtures were completely inaccessible and the toilet needed to be shimmed over half an inch due to rotted floor. It took the resident nearly an hour just to clear enough space for us to work and even get a toilet in and out through the door due to clutter and garbage everywhere.

It took additional time to make repairs and clean up surfaces for the new fixtures.

Faucets and fixtures were inaccessible due to excessive clutter. The customer had to move boxes and bags of things just to give us enough room to work around the toilet. She also had to widen the path from the front door to the stairs so that we could get the toilets in and out. It was made clear that we were replacing fixtures with same-as or similar items. We replaced her standard height, round bowl toilet with a new standard height, round bowl toilet and she became very unhappy with it. I had to explain again that our instructions were to replace fixtures with similar or same items, but she claimed she was promised otherwise. She made an inappropriate comment about what this program was about, so we cleaned up and left before things could get worse.

Repairs Beyond Scope of Program

The entire house needs to be replumbed. While the fixes and repairs made stopped dripping faucets and leaks, the lav in the bathroom still doesn't work and the hot side on the shower barely works. The old galvanized water pipes are likely plugged due to corrosion over time. The new shower cartridges immediately plugged up when turning the water back and continued to drip until I was able to clean enough debris out of the shower valve to get a proper seal. The basement needs to be sealed and insulated to prevent pipes from freezing again.

Pests, other issues

This house has a terrible cockroach infestation and the basement is full of toilet

paper and fecal matter. This home is condemnable

The first toilet was completely full of cigarette butts. The house was filthy and infested with cockroaches and bed bugs

Extra time was needed to repair the stool flange.

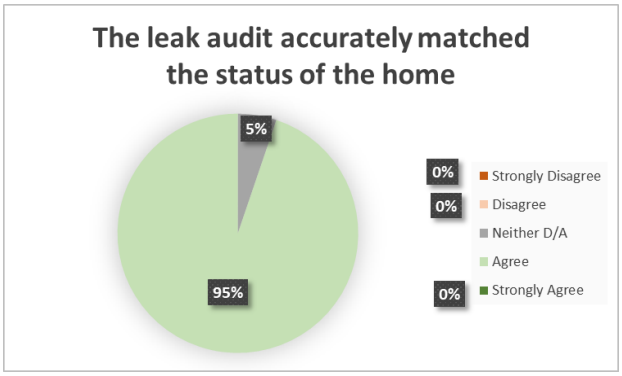
Toilet flange needed to be repaired. Extra time was needed to drill the tile floor to install repair flange. Customer later mentioned a toilet upstairs that needed to be changed too that we came back a second day to take care of.

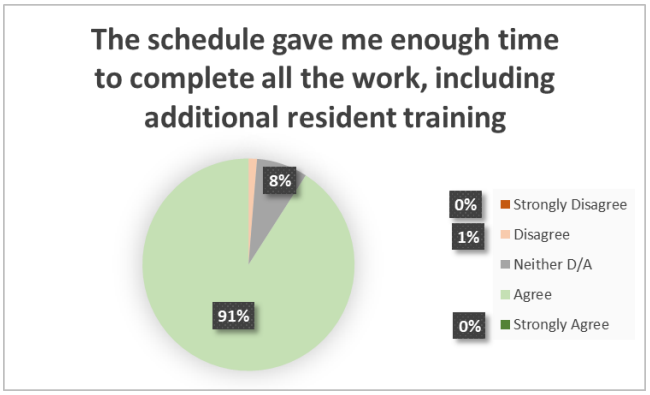
Customer forgot about our initial scheduled appointment. He didn't answer the phone and when we arrived, he said that it wasn't a good time. We rescheduled for the following week. He again didn't answer the phone when we called ahead of time. When we arrived, we knocked on the door 2 or 3 times, it wasn't until we were about to leave that he finally came out. The shower cartridges would not come out and would have likely broke if I continued trying, so I told him that we couldn't service it. We had to repair the stool flange for the toilet.

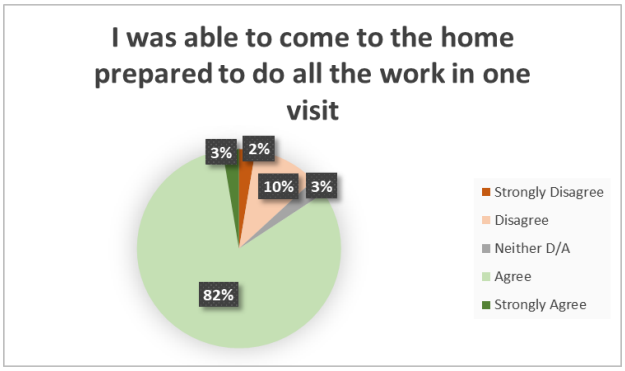
Everything went well, customer was very nice and house was clean

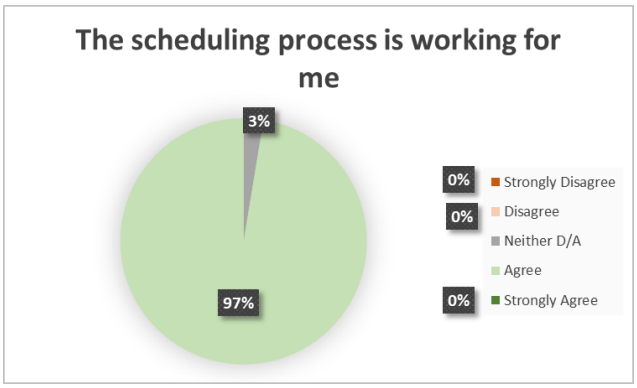
We had a lot of trouble getting the old lav faucets out. They were rusted and corroded in place really bad. When changing the tail pieces on the sinks for the new lavs, the old S-Traps broke on both sink drains. The basement toilet was just bolted to the floor, so a new repair flange had to be installed. There was a lot of extra time in repairs just to make the new fixtures work.

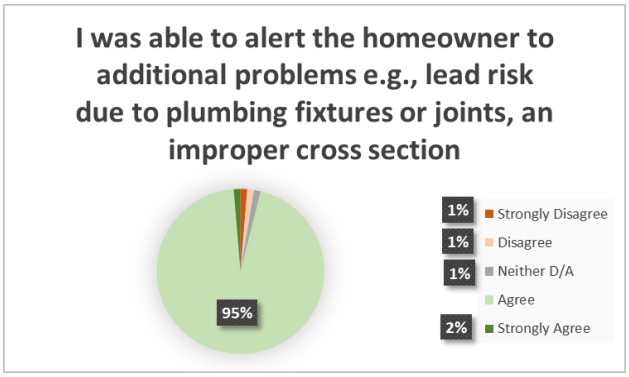
Highland Park (n=77)



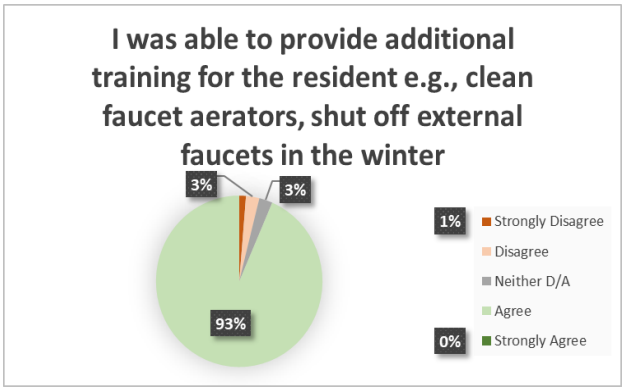








Out of Scope:
Drain issues that did not qualify for repairs under this program, noted in 7 of 77 reports.



Highland Park Plumber Comments:

Drainage Issues

Leaks from above the kitchen cabinet. Seems to be coming from lav drain.

Leak at lav drain line on 1st floor.

Laundry tub needs to be replaced along with drain line. Stack in basement has leaks at tappings.

Kitchen ceiling inside cabinet needs to be opened to find leaks.

Toilet needs to be replaced. Drain line leaks in basement.

Home Not Ready for Work

Toilet needs to be replaced. Could not get toilet through house due to lack of pathway. Cannot repair Lav faucet drain line because sink bowl is cracked.

Due to flooded basement was not able to get full assessment of house. Was able to do enough repairs to be close to budget

Repairs Beyond Scope of the Program

Hub on cast iron pipe makes me unable to install flange for toilet correctly

Advised Customer should get 1st floor toilet replaced. Calcium buildup is not allowing a proper flush.

Water heater flue pipe is undersized

Lav drains slow. Needs snaking.

Stack cracked in basement

Main drain was backed up.Need snaking/not a covered item.

Floor around toilet needs fixing.

Diverted needs to be changed. Not enough budget.

Customer needs new laundry tub faucet or new stems for laundry tub faucet.

Lav faucet needs replacing in basement

Pests and Other Issues

This was a revisit. Client called back for an additional leak that occurred after we left.

Customer had roaches

Had to stop work due to large roaches being found in basement. Basement toilet repair was the only piece of work not to be completed.

Plumber surveys in Benton Harbor indicated many more “disagree” answers than in Highland Park in both number and percentage of responses. Similar challenges were identified in the plumber's comments in both communities. It appears that Highland Park may have developed a more effective system for identifying the work needed in advance so that the work was completed more efficiently.

Water loss and energy savings assessment

EGLE contracted with Rebuild Michigan to provide a tool to quantify energy savings from water leak savings, and the evaluation team intended to use this tool to determine energy savings as a result of leaks repaired for the project. However the tool was not available in time to use for this assessment. Some high level estimates may be available in the future based on the report "Energy-Saving Potential of Water Service Line Lead Reduction in Michigan." (Appendices "Miscellaneous") This Energy-Water Nexus report quantifies water leaks in service lines, before the water meter, which was not within the scope of plumbing repairs for this project. At this time, the evaluation team is unable to provide a quantification of energy savings resulting from leak repairs as was envisioned in the original project scope.

While rough energy savings can be estimated using different water loss factors for repairs and replacement of household plumbing, additional analysis to calculate the energy cost of water loss within a home is necessary. The most chronic household supply side leaks go directly to wastewater piping (e.g., running toilet, leaking faucet, leaking showerhead), and this is why they can continue for so long without being recognized or repaired. In many cases, leaks that do not drain directly to wastewater cause immediate recognizable damage. Therefore the energy costs of water production, pumpage, collections, and wastewater treatment must be considered in the energy savings of water loss reduction.

Separately, MCA provided water meter data from Highland Park from locations where appointments were completed through August 5. This analysis shows that 30% of the homes visited had a 50% or greater reduction in water usage when comparing August 2020 and August 2021 usage. However, 33% of homes had a water use increase when comparing the same months ranging from 7-213%. Based on the dates of appointments and water meter data available, this is only a one-month to one-month comparison and not an analysis of water use and water use reductions over time. Additional water use and home occupancy data from time periods before and after repairs are necessary to reach any conclusions about the magnitude of water loss reductions and subsequent energy savings through this program.

Water meter data were unavailable from Benton Harbor to quantify water and energy savings.

Lessons Learned

The lessons learned come from interviews with pilot participants, and surveys of residents who participated in the pilot and the plumbers who implemented the pilot.

Overall, the pilot program was successful and residents had positive experiences. What follows are the top ten lessons learned that will improve future programmatic success:

1. There needs to be a community education component in any future iterations, and it should be provided at every participating residence. This is especially true regarding lead, even if team members believe the residents have received this information before. Repetition is an important component of developing new and protective habits. In person events and face-to-face interaction is important and should be increased in non-COVID environments.

2. The inclusion of community groups, as liaison to residents and advisors to other team members with roles in implementing the program, is very important. These groups understand community norms, concerns and culture. They can identify the best ways to engage their communities and advise on which strategies will be most successful. Their role should be clearly defined and recognized by all project partners.
3. The project manager's departure (and lack of quick replacement) was detrimental to the pilot. Future rounds need a central point of contact/authority for the duration, as well as a secondary contact for times when the point of contact is unavailable for emergency and contractual matters. This individual needs to be empowered to coordinate across state agencies to provide all services in one location/visit so that other contractors or residents do not have to navigate these challenges. If there is a transition, it needs to be transparent to all involved parties. Everyone with a role in implementing the program needs to be informed as it occurs and provided guidance about who is assuming point of contact / authority roles and responsibilities.
4. Programmatic transparency is also important. With the program manager's departure, program participants lacked an understanding of each other's roles and responsibilities. This meant that key contractors did not know each other's roles, which led to both duplication of effort and lapses in responsibility that resulted in some key gaps in service.
5. While a pilot program implies there will be learning through the effort, there were too many changes to the process during the pilot period, for example, changing resident survey method from phone calls to pre-stamped postcards left behind by plumbers, decision makers on prioritization and participants, field tech reports. There was insufficient time spent refining contact processes and vetting communication tools in advance of rolling out the program. When processes changed, some contractors were not informed or did not fully understand their changing role as a result. If processes are changed over the course of the project, these changes must be captured in writing and clearly articulated to all parties.
6. The pilot program needed a conflict resolution process designed/agreed upon prior to the start before conflicts were encountered.
7. Individuals responsible for implementing the program should not be eligible to participate in the program. This will avoid any real or perceived conflicts of interest and ensure that there are appropriate boundaries between those implementing the program and program participants.
8. The $800 maximum per household was too little for many of the homes in the program, or could not address very significant plumbing issues, e.g., drainage issues. The program lacked a clear process for deciding whether and when to go over the dollar cap on a given home.This contributed to resources being left on the table in each community.
9. The pilot program needed a full-time community coordinator in each community for the duration of resident engagement and the plumbing service period. This individual should be someone known and trusted by the community, whose job is to follow residents from outreach/initial sign up through plumbing completion. When plumbers come from another community, this function would facilitate the introduction and ensure comfort on the part of both the resident receiving service and the plumber providing it. This individual could also be engaged in helping determine whether and when per residence caps can be exceeded.

The lack of a single coordinator contributed to resources being left on the table in each community.

10. Whichever agency supports this program in the future needs to make the program's purpose and scope very clear to the contractors and in the outreach/engagement materials. There needs to be clarity on whether this is a leak repair, fixture replacement, or whole household plumbing service program.

Best Practices

- Highland Park residents were referred to the DHHS Healthy Homes Lead Abatement Program.
- In Benton Harbor, Rev Pinkney met plumbers at the home and introduced them to residents. Having the community coordinator present made it easier to introduce plumbers who were not part of the community.

Evaluation Team Observations

- In a multi-sector, multidisciplinary project one person cannot be the sole keeper of information because there may be implications or project decisions that input from other team members will help identify and address. An important example from this project is the Kohler kitchen faucets: While Kohler's contributions of fixtures helped stretch project resources further than they would otherwise have gone, we realized only by chance, when reviewing the Kohler product list, that the kitchen faucets provided were of a design that did not allow faucet filters to be installed. Both Highland Park and Benton Harbor are very high risk lead communities, with Benton Harbor experiencing several lead action level exceedances in the recent past, so using this particular faucet introduced another intervention to the effort. The EGLE project team then needed to follow up with each home and provide a pitcher type water filter.
- The original project objective of quantifying energy savings from water loss reductions was not achieved because the necessary tools were not developed during the project period. Further, it is not clear that the independent project was ever designed in a way that could have achieved the objective of quantifying energy savings due to water loss past the meter. Where the output of one contract is a critical input to meeting the primary objectives of another project, there must be coordination and collaboration between the two projects.
- All outreach materials need to be reviewed by the project manager to ensure they properly represent the project. If any organization's logo is to be used on outreach materials, that organization must also sign-off on the material.
- The larger number of repairs and replacements at lower costs in Highland Park compared to Benton Harbor indicate that it is worth digging in further to determine whether programmatic structure resulted in lower cost, or if the cost differences were related to the scope of water leak challenges in individual homes and the cost of labor in each community.

- Future projects would benefit from some standard operating procedures related to prioritizing work at a home and plans for exceeding budget. It was not clear how repairs were prioritized at a given residence. Having a process for allowing work to exceed budget would also be very useful.
- It is important to be clear about who gets to participate in the program, how they qualify, and how residents are prioritized for participation. We heard concerns both about who would apply and who would select participants. In the end it seems like whoever answered the door/phone and would allow people into their home participated.
- There should be a community coordinator that keeps each participant moving through the process, and is the primary communication point for the resident and able to resolve any potential issues with multiple parties.
- The project manager must ensure that each contractor in the project understands their role and responsibilities and how they relate to the other contractors. An organizational chart will help communicate this to all project participants. Individual parties were working within their own conception of the project, they did not know the content of other participant's scopes and made assumptions about the scope of other partners given the lack of information. In the future, all parties need to be in the same room to discuss expectations and how implementation will work. For example, we heard different things from different participants about whether the project was over or under budget and about how effectively the plumbers were using their funding.
- Water Leak Evaluation - if the project is intended to provide quantified results, an evaluation framework must be in place prior to work starting. Further, a robust data collection plan must be designed and implemented to capture before/after comparison data and household data (e.g., number of people, time outside the home, etc.)

Recommendations for Future Programs

This set of recommendations is appropriate for any similar project that involves working closely with community members, accessing their homes, providing repairs or upgrades, and/or seeking specific behavior changes.

- The sponsoring agency should appoint an overall program manager with authority to work across agencies, ensure all contractors know their roles/responsibilities and those of their colleagues, and coordinate among all contractors. This individual should provide regular updates to all contractors, especially when processes are updated or changed in any way.
- The program manager should work with community groups to find the appropriate education/engagement outlets for a given community/audience, trusted messengers, and use those outlets regularly throughout the program. Repetition is key to adopting behavior change.
- The program manager should establish a program flow chart for the whole process to ensure all contractors know where they fit in the process. This flow chart should be specific to each community and may change with each community.

- All contracted parties must fully understand and accept the entire program scope, their specific roles/responsibilities and how they are expected to interact with other contracted parties.
- The program manager should appoint community organizers to shepherd residents through the entire process of the program. This individual or organization should be known and trusted by the community. They will be in position to help community members who have experienced successful participation in the program to communicate and encourage their neighbors to participate.
- The program manager should build in and enforce review processes that quickly identify and address barriers and other challenges that emerge over the course of the project. This would be aided by regular all-hands meetings that allow everyone to hear and respond to emerging needs.
- The program manager should be responsible for ensuring that all project contractors include the appropriate knowledge of the content area, and technical expertise -- skills and experience -- to conduct their work.
- Program managers need to be in the room with community members and they need to listen to each other to understand what is working and not working.

Specific to future water leak project work.

- The individual home dollar cap should match the community profile and may differ between communities. Important considerations include age of housing stock, plumber hourly rates, etc.
- There should also be a clearly delineated and equitable process for 1) determining how to prioritize work and 2) how to determine if and when the per house budget cap can be exceeded. It is critical that the plumbers and community coordinator develop this process with the program manager.
- Find an appropriate source of funding that will enable the program to focus on the program objectives. The source of funding for this project was not a good match given the emphasis on energy savings which meant that important leaks, e.g., on the drainage side, were not eligible for the program.

Recommended pieces of a revised workflow:

1. Resident completes water audit (give them an opportunity to identify all known plumbing challenges in advance)
2. Plumbing contractor uses resident water audit to complete their own audit to prepare for the work.
3. Provide a checklist of all eligible services so residents have the opportunity to take advantage of all, and also clarify expectations of the resident. The resident must be present for the full time that the plumber is working in the home.
4. Before work starts, the resident reviews the audit with the plumber, the plumber identifies everything they intend to do in the house with the allotted budget, and the resident signs off.
5. After the work, the resident signs off with a hold-harmless document.

Appendices follow

Table of Contents

Benton Harbor Water Leak Pilot

City of Benton Harbor - Project Coordination

Update Benton Harbor Water Leak Tracking Table

1. Check QuestionPro for new records each day at beginning of shift

> **QuestionPro Login information:**
> Username: MICleanWaterLD@gmail.com
> Password: MICleanWater21!

   a. Download survey results as Excel sheet
   b. Sort Excel sheet by location ['City' field in the sign-up form]
   c. Copy and paste new Benton Harbor records into Benton Harbor Water Leak Resident Tracking Table
   d. Check records for completeness. If any additional information is needed, reach out to residents by phone first, and then by email if no response.

2. Send an email to MDHHS Healthy Homes Program contacts for lead abatement assessment. Indicate that the Benton Harbor Water Leak Resident Tracking Table has been updated.

> **The following MDHHS contacts have been given access to the Tracking Table:**
> Courtney Wisinski – wisinskic@michigan.gov
> Alex Archambeault – archambeaulta@michigan.gov
> Daniel Sweeny – sweenyd4@michigan.gov

   a. Update Benton Harbor Water Leak Resident Tracking Table to indicate that latest version of the table has been shared with MDHHS; list date shared in the 'DATE RECEIVED BY MDHHS' field

Provide Resident with Water Leak Pilot Resource Documents

- ☐ **1.** Contact residents via phone to provide an overview of water leak assessment. Script is provided.
- ☐ a. Send follow-up email with water leak assessment checklist, video, and contact information.
- ☐ b. If email isn't available, update draft letter template with resident's name and address, email letter to Lesia to have it mailed along with water leak assessment checklist.
- ☐ **2.** Update Benton Harbor Water Leak Resident Tracking Table indicating that you have spoken with resident and include date/ time; also indicate when email is sent, or letter is mailed
- ☐ **3.** Report any issues regarding process or from residents to EGLE-CleanWater@Michigan.gov and Leisa Osler as well as document in table

Processing Water Leak Assessments

- ☐ **1.** Check email for water leak assessments from residents.
  - a. Review water leak assessments for completeness
  - b. Contact resident if additional information is needed; if additional help is needed beyond assistance over the phone to complete the water leak assessment then contact the Benton Harbor Community Water Council to assist resident
  - c. Update Benton Harbor Water Leak Resident Tracking Table
- ☐ **2.** Send completed assessments and copy of spreadsheet that only includes residents that have completed the assessment to RW LaPine contacts every week:

> **RW LaPine Contacts:**
> Bill Brown – bbrown@rwlservice.net
> Josh Dragomir – jdragomir@rwlservice.net

  - a. Update Benton Harbor Water Leak Resident Tracking Table
- ☐ **3.** Save resident files to Google Drive; create a folder for resident with their last name and first initial and include water assessment checklist, any images, and additional information provided

Processing Payments for Plumbing Invoices

- ☐ **1.** Review plumbing invoices on Fridays
    - a. RW LaPine Plumbing will provide outstanding invoices via email
    - b. Verify that the address on the Benton Harbor Water Leak Resident Tracking Table matches the address on the invoice
    - c. Contact resident via phone to confirm that repairs were made
        - i) Inform resident that they will receive a customer service satisfaction survey via email or mail based on their preference
- ☐ **2.** Send verified invoices to EGLE-CleanWater@Michigan.gov for payment
- ☐ **3.** Update Benton Harbor Water Leak Resident Tracking Table

Benton Harbor Water Leak Pilot

Benton Harbor Community Water Council

Resident Recruitment for Pilot

1. Recruit Benton Harbor residents online using social media, in-person (while practicing COVID-19 risk mitigation strategies), and/ or using other strategies that work best in your community.
    a. The City of Benton Harbor will provide you with a list of homes that have high water usage; please distribute Water Leak Pilot door hangers on these doors first.
    b. A promotional toolkit with a door hanger, social media messages, and a flyer has been created for use. You can access these materials by clicking the links below:

    Door Hanger | Social Media Images and Messages | Benton Harbor Flyer

    c. If ads, billboards, or any other media resources are utilized to recruit residents, please share for pre-authorization if the material(s) reference the Office of the Clean Water Public Advocate or the Focus on Water Initiative. Send request to SasyN@michigan.gov.
2. Direct residents to sign-up online or have them complete paper copy of sign-up form.
    a. Online sign-up form: Water Leak Pilot Sign-Up
    b. Paper copy of sign-up form: Water Leak Pilot Sign-Up (for printing)
3. ***Lead abatement work*:** The sign-up form also captures information that will be helpful to pre-screen for the MDHHS Healthy Homes Program. If you have questions about the program, please send an email to the contacts below. Indicate that you are from the Benton Harbor Community Water Council.

MDHHS Healthy Homes Program Contacts:
Courtney Wisinski – wisinskic@michigan.gov
Alex Archambeault – archambeaulta@michigan.gov
Daniel Sweeny – sweenyd4@michigan.gov

4. To confirm if a resident has already signed up, you can view the Benton Harbor Water Leak Resident Tracking Table
5. Report any issues regarding the process or from residents to EGLE-CleanWater@Michigan.gov

Key Contacts for Water Leak Pilot in Benton Harbor

☐ **1.** City of Benton Harbor

   a. Remi Gonety | Phone: (517) 480-4717 | Email: gonetyb@michigan.gov
   b. Brandon Williams | Phone: (269) 519-0413 | Email: WilliamsB33@michigan.gov
   c. Lesia Osler | Phone: (269) 351-2729 | Email: losler@bhcity.us

☐ **2.** Office of the Clean Water Public Advocate

   a. Ninah Sasy | Phone: (517) 881-5219 | Email: EGLE-Contact@Michigan.gov

Water Audit

The **Water Leak Pilot** program was commissioned by the Office of the Clean Water Public Advocate as part of the larger **Focus on Water Initiative**. The Pilot was established to reduce water waste and the financial burden associated with it; to increase community education about water leaks, conducting household water audits, and tips for energy savings; and to provide assistance for premise plumbing water repairs.

An important action you can take as a residential water consumer is to maintain a water-efficient home. A water-efficient home helps you minimize your water use, conserve energy, and reduce water and sewer costs. According to the Environmental Protection Agency (EPA), the average household loses more than 10,000 gallons of water each year through leaks. Some water leaks are slow and difficult to detect, yet even the smallest leaks can add up quickly. Fortunately, most leaks are easy to find if you know where to look!

As a resident participating in the Pilot, you will perform a water audit of your home to help identify potential leaks. Once the audit is complete, you will connect with your community coordinator to review the audit and schedule plumbing repairs; these repairs will be at no cost to you.

Your community coordinators can be reached by calling **269-519-0413** (Brandon Williams) or **517-480-4717** (Remi Gonety).

For a water audit video tutorial, please visit the Water Leak Pilot webpage:

www.michigan.gov/WaterLeakPilot

THE PROCESS

01 WATER AUDIT

With assistance, residents perform a water audit to identify potential leaks.

02 AUDIT REVIEW

A community coordinator reviews the water audit and schedules plumbing repairs.

03 PLUMBING REPAIRS

Plumbers review the water audit and perform premise plumbing repairs.

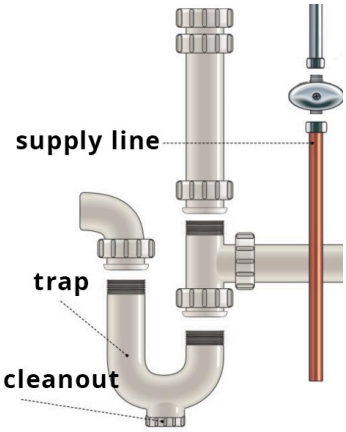
Helpful Tips

These diagrams and images may be helpful in identifying plumbing fixtures and signs of a leak:

AERATOR

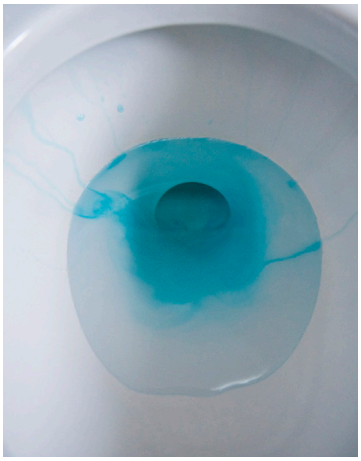
An **aerator** is a device fitted with a screen and attached to the spout; it aerates the water and prevents splashing.

PIPES



Under the sink, you should see a water **supply line**, which is different from the trap (the U-shaped pipe beneath a fixture).

TOILET DYE TEST



If you see dye in the toilet bowl during the toilet **dye test** (like the image above), it indicates a leak.

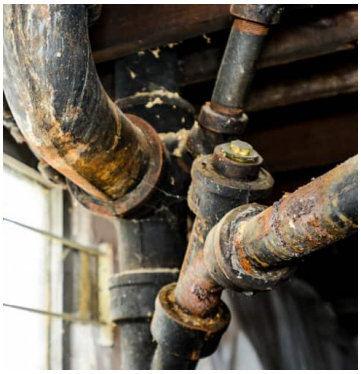
MOISTURE / MOLD

Water leaks can create an environment that allows the growth of **fungi** (mold/mildew); its presence is often accompanied by a bad smell.

DAMAGE FROM LEAKS

If a fixture has been leaking, it may leave behind evidence of **water damage** on walls or cabinets (similar to the image above).

RUSTY PIPES



If you see **rust** on your pipes, especially around joints (similar to the image above), it may indicate a water leak.

Diagrams source: The Visual Dictionary of House & Do It Yourself
https://issuu.com/corporateoffice/docs/the_visual_dictionary_of_house_amp_/65

Water Audit Checklist

Please follow this checklist to perform a water audit for your home. Note all locations that may have a potential leak. If you need assistance, please contact your community coordinators at **269-519-0413** (Brandon Williams) or **517-480-4717** (Remi Gonety).

BATHROOMS

1 **Toilets: Listen for running water**

☐ I **do not** hear running water ☐ I **do** hear running water

2 **Dye tablet test: Put a dye tablet (found in your welcome kit) into the tank at the back of the toilet and let it sit for ten minutes. If color shows up in the bowl, you have a leak. Make sure to flush afterward to avoid staining.** (KEEP AWAY FROM CHILDREN; MAY BE HARMFUL IF SWALLOWED)

☐ I **do not** see any food coloring in the bowl ☐ I **do** see food coloring in the bowl

3 **Faucets: With the water off, listen and look for drips coming from the spout**

☐ I **do not** hear and/or see any drips ☐ I **do** hear and/or see drips

Faucets: Turn on the water; check for water pooling at the base of the spout or under the sink

☐ I **do** not see water pooling ☐ I **do** see water pooling

4 **Shower heads: Turn on and look for drips or stray sprays**

☐ I **do not** see drips or stray sprays ☐ I **do** see drips or stray sprays

5 **Tub: Turn on the water, then switch the water to come out of the shower head to see if there is still water coming from the tub spout**

☐ I **do not** see water coming from the spout ☐ I **do** see water from the spout

6 **Under the sink: Check for pooling water under pipes**

☐ I **do not** see pooling water under pipes ☐ I **do** see pooling water under pipes

Under the sink: Check for rust around joints and edges

☐ I **do not** see rust around joints and edges ☐ I **do** see rust around joints and edges

KITCHEN

7 **Faucet:** **Listen and look for drips**

- ☐ I **do not** see or hear drips
- ☐ I **do** see or hear drips

Faucet: **Screw the aerator onto threads of the faucet to ensure it's tight**

- ☐ The aerator **is** on tightly
- ☐ The aerator **is not** on tightly

8 **Sprayer:** **Check to make sure the water is spraying smoothly**

- ☐ The water **is** spraying smoothly
- ☐ The water **is not** spraying smoothly

9 **Appliances:** **Check for pooling water under dishwashers and refrigerators with ice makers**

- ☐ I **do not** see pooling water
- ☐ I **do** see pooling water

10 **Under the sink:** **Check for pooling water under pipes**

- ☐ I **do not** see pooling water
- ☐ I **do** see pooling water

Under the sink: **Check for rust around joints and edges**

- ☐ I **do not** see rust
- ☐ I **do** see rust

LAUNDRY / UTILITY ROOM / BASEMENT

11 **Under the sink:** **Check for drips or pooling water under pipe connections**

- ☐ I **do not** see drips or pooling water
- ☐ I **do** see drips or pooling water

12 **Appliances (clothes washer, water heater):** **Check for pooling water, rust, or leaking valves**

- ☐ I **do not** see pooling water, rust, or leaking
- ☐ I **do** see pooling water, rust, or leaking

OUTSIDE

13 **Spigots:** **Check for drips and ensure tight connections with the hose**

- ☐ I **do not** see drips and the hose is tight
- ☐ I **do** see drips, despite the tight hose

Throughout the house: Check for signs of moisture, mold, or water damage on your walls, ceilings, floors, and cabinets

Water Audit Report

After completing the water audit checklist, please use the space below to note all locations that may have a potential leak. Once the audit is complete, please contact your community coordinators to review the water audit and schedule plumbing repairs by calling **269-519-0413** (Brandon Williams) or **517-480-4717** (Remi Gonety).

BATHROOMS:

KITCHEN:

LAUNDRY / UTILITY ROOM / BASEMENT:

OUTSIDE / THROUGHOUT THE HOUSE:

Date performed: _____ Date submitted: _____

Address: _____ ☐ Own ☐ Rent

Name of resident performing water audit: _____

Phone number: _____ Email (optional): _____

Benton Harbor Water Leak Pilot

Key Information for R.W. LaPine

Scheduling Plumbing Repairs

1. One a weekly basis, RW LaPine will receive an updated list of residences that have opted into the Water Leak Pilot and completed the water leak assessment in their home.
   a. The spreadsheet will be sent by either Brandon Williams or Remi Gonety. Any questions about the residences listed on the spreadsheet should be directed to Brandon or Remi:

> **Benton Harbor Water Leak Pilot Community Coordinators:**
> Brandon Williams | Phone: (269) 519-0413 | Email: WilliamsB33@michigan.gov
> Remi Gonety | Phone: (517) 480-4717 | Email: GonetyB@michigan.gov

   b. The completed water leak assessment will be included in the email with the spreadsheet that contains the resident's contact information.
   c. Based on the information provided on the water leak assessment, please prioritize and determine which repairs will be made. Attempt to prioritize repairs based on public health implications and water savings associated with repair.
   d. Please provide residents with a window of time that you will be visiting their home. If the resident does not provide adequate notice of cancellation, then notify Benton Harbor community coordinators, Brandon and Remi. If a plumber shows up and the resident is not home, baring extenuating circumstances, their appointment should not be rescheduled.
2. If you receive questions regarding lead abatement work, please refer the resident to one of their community coordinators, Brandon Williams or Remi Gonety (contact information listed above).
3. Please report any issues regarding the process or from residents to EGLE-CleanWater@Michigan.gov

Day of Repair Issues/ Questions

1. If the resident isn't home when you arrive, please attempt to call the contact number included on the spreadsheet sent by Brandon Williams or Remi Gonety.
    a. Also notify Brandon and Remi so that they can update the record:

> **Benton Harbor Water Leak Pilot Community Coordinators:**
> Brandon Williams | Phone: (269) 519-0413 | Email: WilliamsB33@michigan.gov
> Remi Gonety | Phone: (517) 480-4717 | Email: GonetyB@michigan.gov

    b. We respect your time and do not expect for plumbing staff to wait until resident arrives. Please employ your current policy.
2. If a home is deemed unsafe and repairs cannot be completed, please notify Brandon and Remi as soon as possible (contact information listed above).
3. If a plumber decides that the water assessment grossly underestimated the cost that will be needed to repair water leaks identified in home, please contact Ninah Sasy at 517-881-5219 for an exception request if repairs will exceed $800.

Payment Reimbursement

☐ 1. Submit invoices to Remi Gonety and Brandon Williams once plumbing work is completed. They will reach out to residents to confirm and forward to EGLE for payment.
    a. The Office of the Clean Water Public Advocate will notify Brandon and Remi of all approved exception requests (repairs that exceeded $800).
    b. Brandon and Remi will send an email confirmation when invoices have been sent to EGLE for payment.

☐ 2. Questions about payment once sent to EGLE for processing should be directed to Lisa Thomas at thomasl17@michigan.gov.

Highland Park Water Leak Pilot

Highland Park Human Rights Coalition

Resident Recruitment for Pilot

1. Recruit Highland Park residents online using social media, in-person (while practicing COVID-19 risk mitigation strategies), and/ or using other strategies that work best in your community.
    a. Metro Consulting Associates (MCA) will provide you with a list of homes that have high water usage; please distribute Water Leak Pilot door hangers on these doors first.
    b. A promotional toolkit with a door hanger, social media messages, and a flyer has been created for use. You can access these materials by clicking the links below:

    Door Hanger | Social Media Images and Messages | Highland Park Flyer

    c. If ads, billboards, or any other media resources are utilized to recruit residents, please share for pre-authorization if the material(s) references the Office of the Clean Water Public Advocate or the Focus on Water Initiative. Send request to SasyN@michigan.gov.
2. Direct residents to sign-up online or have them complete paper copy of sign-up form.
    a. Online sign-up form: Water Leak Pilot Sign-Up
    b. Paper copy of sign-up form: Water Leak Pilot Sign-Up (for printing)
3. ***Lead abatement work.*** The sign-up form also captures information that will be helpful to pre-screen for the MDHHS Healthy Homes Program. If you have questions about the program, please send an email to the contacts below. Indicate that you are from the Highland Park Human Rights Coalition.

MDHHS Healthy Homes Program Contacts:
Courtney Wisinski – wisinskic@michigan.gov
Alex Archambeault – archambeaulta@michigan.gov
Daniel Sweeny – sweenyd4@michigan.gov

4. To confirm if a resident has already signed up, you can view the Highland Park Water Leak Resident Tracking Table
5. Report any issues regarding process or from residents to EGLE-CleanWater@Michigan.gov

Key Contacts for Water Leak Pilot in Highland Park

☐ **1.** Metro Consulting Associates

- a. Kalaya Thomas | Phone: (313) 495-4089 | Email: kthomas@metroca.net
- b. Damon Garrett | Phone: (734) 217-4697 | Email: dgarrett@metroca.net
- c. Jarion Bradley | Phone: (800) 525-6016 | Email: jbradley@metroca.net
- d. Kimberly Hoyle | Phone: (800) 525-6016 | Email: khoyle@metroca.net

☐ **2.** Office of the Clean Water Public Advocate

- a. Ninah Sasy | Phone: (517) 881-5219 | Email: EGLE-Contact@Michigan.gov

Highland Park Water Leak Pilot

Key Information for Benkari Plumbing

Scheduling Plumbing Repairs

1. On a weekly basis, Benkari will receive an updated list of residences that have opted into the Water Leak Pilot and completed the water leak assessment in their home.
    a. The spreadsheet will be sent by Kalaya Thomas of Metro Consulting Associates (MCA). Any questions about the residences listed on the spreadsheet should be directed to Kalaya:

> **Highland Park Water Leak Pilot Community Coordinator:**
> Kalaya Thomas | Phone: (313) 495-4089 | Email: kthomas@metroca.net

    b. The completed water leak assessment will be included in the email with the spreadsheet that contains the resident's contact information.
    c. Based on the information provided on the water leak assessment, please prioritize and determine which repairs will be made. Attempt to prioritize repairs based on public health implications and water savings associated with repair.
    d. Please provide residents with a window of time that you will be visiting their home. If the resident does not provide adequate notice of cancellation, then notify MCA. If a plumber shows up and the resident is not home, baring extenuating circumstances, their appointment should not be rescheduled.
2. If you receive questions regarding lead abatement work, please refer the resident to their community coordinator, Kalaya Thomas (contact information listed above).
3. Report any issues regarding process or from residents to EGLE-CleanWater@Michigan.gov

Day of Repair Issues/ Questions

1. If the resident isn't home when you arrive, please attempt to call the contact number included on the spreadsheet sent by Kalaya Thomas.
   a. Also notify Kalaya Thomas so that she can update the record:

> **Highland Park Water Leak Pilot Community Coordinator:**
> Kalaya Thomas | Phone: (313) 495-4089 | Email: kthomas@metroca.net

   b. We respect your time and do not expect for plumbing staff to wait until resident arrives. Please employ your current policy.
2. If home is deemed unsafe and repairs cannot be completed, notify Kalaya Thomas as soon as possible at (313) 495-4089.
3. If a plumber decides that water assessment grossly underestimated the cost that will be needed to repair water leaks identified in the home, please contact Ninah Sasy at 517-881-5219 for an exception request if repairs will exceed $800.

Payment Reimbursement

☐ 1. Submit invoices to Kalaya Thomas once plumbing work is completed. She will reach out to residents to confirm and then forward to EGLE for payment.
   a. The Office of the Clean Water Public Advocate will notify Kalaya Thomas of MCA of all approved exception requests (repairs that exceeded $800).
   b. Kalaya Thomas will send an email confirmation when invoices have been sent to EGLE for payment.

☐ 2. Questions about payment once sent to EGLE for processing should be directed to Lisa Thomas at thomasl17@michigan.gov.

Water Audit

The **Water Leak Pilot** program was commissioned by the Office of the Clean Water Public Advocate as part of the larger **Focus on Water Initiative**. The Pilot was established to reduce water waste and the financial burden associated with it; to increase community education about water leaks, conducting household water audits, and tips for energy savings; and to provide assistance for premise plumbing water repairs.

An important action you can take as a residential water consumer is to maintain a water-efficient home. A water-efficient home helps you minimize your water use, conserve energy, and reduce water and sewer costs. According to the Environmental Protection Agency (EPA), the average household loses more than 10,000 gallons of water each year through leaks. Some water leaks are slow and difficult to detect, yet even the smallest leaks can add up quickly. Fortunately, most leaks are easy to find if you know where to look!

As a resident participating in the Pilot, you will perform a water audit of your home to help identify potential leaks. Once the audit is complete, you will connect with your community coordinator to review the audit and schedule plumbing repairs; these repairs will be at no cost to you.

Your community coordinator, Kalaya Thomas, can be reached by calling **313-495-4089**.

For a water audit video tutorial, please visit the Water Leak Pilot webpage:

www.michigan.gov/WaterLeakPilot

THE PROCESS

01 WATER AUDIT

With assistance, residents perform a water audit to identify potential leaks.

02 AUDIT REVIEW

A community coordinator reviews the water audit and schedules plumbing repairs.

03 PLUMBING REPAIRS

Plumbers review the water audit and perform premise plumbing repairs.

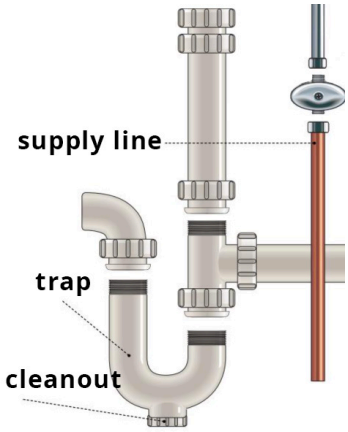
Helpful Tips

These diagrams and images may be helpful in identifying plumbing fixtures and signs of a leak:

AERATOR

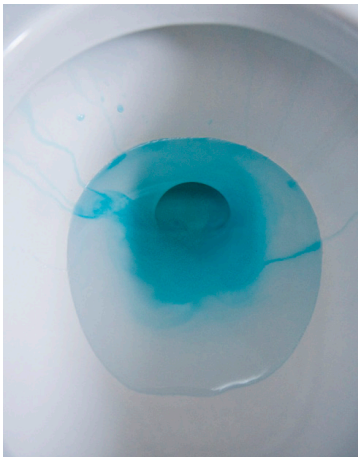
An **aerator** is a device fitted with a screen and attached to the spout; it aerates the water and prevents splashing.

PIPES



Under the sink, you should see a water **supply line**, which is different from the trap (the U-shaped pipe beneath a fixture).

TOILET DYE TEST



If you see dye in the toilet bowl during the toilet **dye test** (like the image above), it indicates a leak.

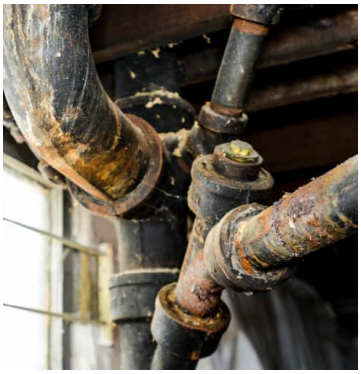
MOISTURE / MOLD

Water leaks can create an environment that allows the growth of **fungi** (mold/mildew); its presence is often accompanied by a bad smell.

DAMAGE FROM LEAKS

If a fixture has been leaking, it may leave behind evidence of **water damage** on walls or cabinets (similar to the image above).

RUSTY PIPES



If you see **rust** on your pipes, especially around joints (similar to the image above), it may indicate a water leak.

Diagrams source: The Visual Dictionary of House & Do It Yourself
https://issuu.com/corporateoffice/docs/the_visual_dictionary_of_house_amp_/65

Water Audit Checklist

Please follow this checklist to perform a water audit for your home. Note all locations that may have a potential leak. If you need assistance, please contact the Highland Park Water Department Customer Service Office at **313-865-1876**.

BATHROOMS

1 **Toilets:** **Listen for running water**

- ☐ I **do not** hear running water
- ☐ I **do** hear running water

2 **Dye tablet test:** **Put a dye tablet (found in your welcome kit) into the tank at the back of the toilet and let it sit for ten minutes. If color shows up in the bowl, you have a leak. Make sure to flush afterward to avoid staining.** (KEEP AWAY FROM CHILDREN; MAY BE HARMFUL IF SWALLOWED)

- ☐ I **do not** see any food coloring in the bowl
- ☐ I **do** see food coloring in the bowl

3 **Faucets:** **With the water off, listen and look for drips coming from the spout**

- ☐ I **do not** hear and/or see any drips
- ☐ I **do** hear and/or see drips

Faucets: **Turn on the water; check for water pooling at the base of the spout or under the sink**

- ☐ I **do** not see water pooling
- ☐ I **do** see water pooling

4 **Shower heads:** **Turn on and look for drips or stray sprays**

- ☐ I **do not** see drips or stray sprays
- ☐ I **do** see drips or stray sprays

5 **Tub:** **Turn on the water, then switch the water to come out of the shower head to see if there is still water coming from the tub spout**

- ☐ I **do not** see water coming from the spout
- ☐ I **do** see water from the spout

6 **Under the sink:** **Check for pooling water under pipes**

- ☐ I **do not** see pooling water under pipes
- ☐ I **do** see pooling water under pipes

Under the sink: **Check for rust around joints and edges**

- ☐ I **do not** see rust around joints and edges
- ☐ I **do** see rust around joints and edges

KITCHEN

7 **Faucet:** **Listen and look for drips**

- ☐ I **do not** see or hear drips
- ☐ I **do** see or hear drips

Faucet: **Screw the aerator onto threads of the faucet to ensure it's tight**

- ☐ The aerator **is** on tightly
- ☐ The aerator **is not** on tightly

8 **Sprayer:** **Check to make sure the water is spraying smoothly**

- ☐ The water **is** spraying smoothly
- ☐ The water **is not** spraying smoothly

9 **Appliances:** **Check for pooling water under dishwashers and refrigerators with ice makers**

- ☐ I **do not** see pooling water
- ☐ I **do** see pooling water

10 **Under the sink:** **Check for pooling water under pipes**

- ☐ I **do not** see pooling water
- ☐ I **do** see pooling water

Under the sink: **Check for rust around joints and edges**

- ☐ I **do not** see rust
- ☐ I **do** see rust

LAUNDRY / UTILITY ROOM / BASEMENT

11 **Under the sink:** **Check for drips or pooling water under pipe connections**

- ☐ I **do not** see drips or pooling water
- ☐ I **do** see drips or pooling water

12 **Appliances (clothes washer, water heater):** **Check for pooling water, rust, or leaking valves**

- ☐ I **do not** see pooling water, rust, or leaking
- ☐ I **do** see pooling water, rust, or leaking

OUTSIDE

13 **Spigots:** **Check for drips and ensure tight connections with the hose**

- ☐ I **do not** see drips and the hose is tight
- ☐ I **do** see drips, despite the tight hose

Throughout the house: Check for signs of moisture, mold, or water damage on your walls, ceilings, floors, and cabinets

Water Audit Report

After completing the water audit checklist, please use the space below to note all locations that may have a potential leak. Once the audit is complete, please contact your community coordinator, Kalaya Thomas, to review the water audit and schedule plumbing repairs by calling **313-495-4089**.

BATHROOMS:

KITCHEN:

LAUNDRY / UTILITY ROOM / BASEMENT:

OUTSIDE / THROUGHOUT THE HOUSE:

Date performed: _____ Date submitted: _____

Address: _____ ☐ Own ☐ Rent

Name of resident performing water audit: _____

Phone number: _____ Email (optional): _____

Water Audit Checklist

Please follow this checklist to perform a water audit for your home.
Note all locations that may have a potential leak.

BATHROOMS

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- ☐ I **do** see rust

LAUNDRY / UTILITY ROOM / BASEMENT

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- ☐ I **do** see drips, despite the tight hose

Throughout the house: Check for signs of moisture, mold, or water damage on your walls, ceilings, floors, and cabinets

Water Audit Report

After completing the water audit checklist, please use the space below to note all locations that may have a potential leak. If you have identified potential leaks, contact a plumber to have them fixed. Fixing leaks can reduce water waste, save money, and make your home safer.

If you need financial assistance paying for plumbing repairs, please see our directory of plumbing assistance programs at: MICleanWater.org/LeakAssistance

To learn more about the health and economic impacts of water leaks, please visit: MICleanWater.org

BATHROOMS:

KITCHEN:

LAUNDRY / UTILITY ROOM / BASEMENT:

OUTSIDE / THROUGHOUT THE HOUSE:

Helpful Tips

These diagrams and images may be helpful in identifying plumbing fixtures and signs of a leak:

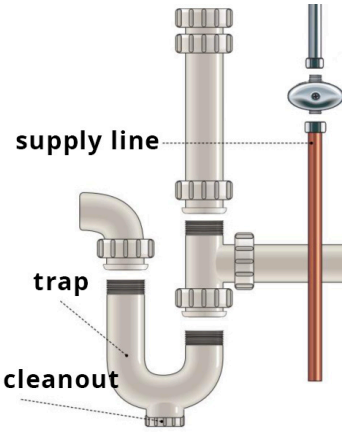
AERATOR

An **aerator** is a device fitted with a screen and attached to the spout; it aerates the water and prevents splashing.

CLEAN AERATORS

To clean an aerator, remove it from the faucet by **unscrewing it**; twist clockwise to loosen, twist counter-clockwise to tighten.

PIPES

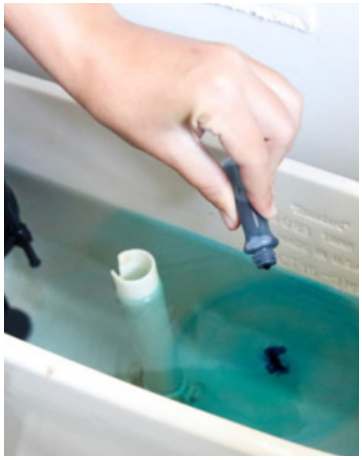


Under the sink, you should see a water **supply line**, which is different from the trap (the U-shaped pipe beneath a fixture).

TOILET

Check around the base of your toilets. If you see any water on the floor, it may indicate a water leak.

TOILET DYE TEST



To test your toilet for leaks, **add a few drops of food coloring** (or a dye tablet) to the toilet tank and wait 15 minutes.

TOILET DYE TEST

If you see dye in the toilet bowl during the toilet **dye test** (like the image above), it indicates a leak.

Diagrams source: The Visual Dictionary of House & Do It Yourself
https://issuu.com/corporateoffice/docs/the_visual_dictionary_of_house_amp_/65

Helpful Tips

These diagrams and images may be helpful in identifying plumbing fixtures and signs of a leak:

MOISTURE

Moisture or a wet spot on ceilings or walls (similar to the image aove) indicates that water could be coming from leaking pipes.

WATER DAMAGE

If a fixture has been leaking, it may leave behind evidence of **water damage** on walls or cabinets (similar to the image above).

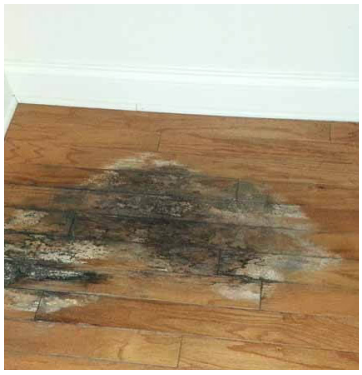
DAMAGE FROM LEAKS

Water leaks can also cause sagging ceilings, peeling or blistering paint (similar to the image above) or wallpaper, or other **damage**.

MOLD

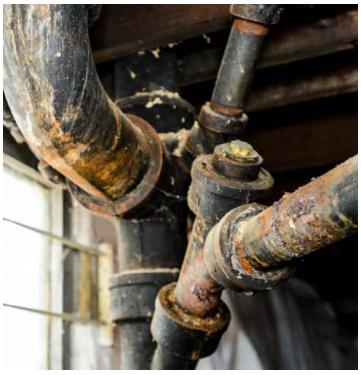
Water leaks can create an environment that allows the growth of **fungi** (mold/mildew); its presence is often accompanied by a bad smell.

DAMAGED FLOORING



If your floor is **warping, staining, or has a soft spot**, a hidden leak from either the toilet, sink, or a pipe under the floor is most likely the cause.

RUSTY PIPES



If you see **rust** on your pipes, especially around joints (similar to the image above), it may indicate a water leak.

Diagrams source: The Visual Dictionary of House & Do It Yourself
https://issuu.com/corporateoffice/docs/the_visual_dictionary_of_house_amp_/65

FOCUS ON WATER INITIATIVE

Sign up for the

Water Leak Pilot

- Get water leaks fixed at no cost to you
- Lower the cost of your water bill
- Keep your family safe by getting lead fixtures replaced
- Learn tips for energy savings

Residents can sign up by calling 1-800-662-9278 or by visiting:

Michigan.gov/WaterLeakPilot

The Water Leak Pilot is part of the Focus on Water Initiative, commissioned by the Office of the Clean Water Public Advocate in September 2020. The Office of the Clean Water Public Advocate does not discriminate on the basis of race, color, national origin, sex, age or disability in any of our services, programs or activities. There is no cost to participate in this program.

Water Leak Pilot Sign-Up

Form also available online at:
https://www.questionpro.com/a/TakeSurvey?tt=EpP3uRpYqxk%3D

FOCUS ON WATER INITIATIVE

Thank you for your interest in the Water Leak Pilot project. The Water Leak Pilot was commissioned by the Office of the Clean Water Public Advocate as part of the larger Focus on Water Initiative. It was established to help provide funding for premise plumbing repairs, reduce water and energy waste (which will also save money on water and energy bills), and help share important information about water and energy savings with residents.

Please fill out the following form to sign up for the Pilot. If you have any questions about the Water Leak Pilot or the sign-up form, please call 1-313-495-4089 for assistance.

Contact Information:

NAME (FIRST AND LAST)		
PHONE NUMBER	EMAIL ADDRESS	
ADDRESS		
CITY	STATE	ZIP

Household:

Number of residents living in the household more than 4 days per week _____

Number of adults over the age of 65 living in the household >4 days per week _____

Number of children under the age of 18 living in the household >4 days per week _____

Number of pregnant people living in the household >4 days per week _____

Do you own or rent your home? ☐ Own ☐ Rent

If you rent your home, please provide contact information for the homeowner:

NAME (FIRST AND LAST)	
PHONE NUMBER	EMAIL ADDRESS

How long have you lived in your home? _____

Are you able to send and receive emails? ☐ Yes ☐ No

Health and safety measures, including mask wearing and social distancing will be taken when water audits and plumbing repairs are performed. Are you comfortable having a water leak audit and plumbing repairs performed in your home at this time?

☐ Yes ☐ No

We want to accommodate any potential challenges to ensure all residents are given the opportunity to participate. Is there anything you would like to share with us that may make your participation in the Pilot difficult?

Please return this form to the Highland Park Water Department Customer Service Center.

Please note that responses do not disqualify residents from participating in the Water Leak Pilot; the information collected will be used to ensure barriers to participation are addressed.

The Water Leak Pilot Program is part of the Focus on Water Initiative, commissioned by the Office of the Clean Water Public Advocate in September 2020. The Office of the Clean Water Public Advocate does not discriminate on the basis of race, color, national origin, sex, age or disability in any of our services, programs or activities. There is no cost to participate in the program.

EGLE
MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY

Metro Consulting Associates
Dynamic. Daring. Diverse. DIFFERENT.

City of Highland Park

WATER CENTER
UNIVERSITY OF MICHIGAN

SAFE WATER ENGINEERING

FOCUS ON WATER INITIATIVE

Is your water bill high?

Worried about lead?

OPEN TO ALL HIGHLAND PARK RESIDENTS

Sign up for the

Water Leak Pilot

- Get water leaks fixed at no cost to you
- Lower the cost of your water bill
- Keep your family safe by getting lead fixtures replaced
- Learn tips for energy savings

Residents can sign up by calling 1-800-662-9278 or by visiting:

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There is no cost to participate in this program.

Metro Consulting Associates

Water Leak Pilot: Information for Residents

Thank you for signing up for the Water Leak Pilot project. We are grateful for your time and willingness to participate. The Water Leak Pilot was commissioned by the Office of the Clean Water Public Advocate as part of the larger Focus on Water Initiative. It was established to help provide funding for premise plumbing repairs, reduce water and energy waste (which will also save money on water and energy bills), and help share important information about water and energy savings with residents.

This letter confirms that we have received your sign-up form. Please review the following helpful information and next steps:

☑ **Step 1:** Sign up for the Water Leak Pilot

☐ **Step 2:** A member of the Water Leak Pilot team will contact you to schedule plumbing repairs

A member of our team will contact you to schedule plumbing repair services, performed by Benkari Plumbing. The Pilot project will cover the cost of the repairs; there will be no cost to you.

Please note that this Pilot was designed to cover the cost of repairing minor premise plumbing water leaks; major plumbing repairs are not included within the scope of work.

What free repairs MAY include: Depending on the results of your water audit, each eligible residence may receive a combination of the following repairs:

- Faucet aerator cleaning or replacement
- Faucet repair or replacement
- Shower head repair or replacement
- Toilet repair or replacement
- Minor plumbing repairs to visible pipes

What this Pilot does NOT include:

- Major plumbing repairs that require walls to be opened up
- Replacement of large, water-using appliances, including dishwashers and hot water heaters (please see information below about additional services)
- Repairing walls or floors due to water damage

www.michigan.gov/WaterLeakPilot

Water Leak Pilot Enhancements

As a participant in this Pilot program, you may be eligible for additional services for your home:

We have partnered with the Michigan Department of Health and Human Services to provide lead assessment and abatement work to qualifying residents. A postcard with more information is included in your welcome kit.

DTE Energy will also provide free, energy-efficient hot water heaters to residents participating in the Pilot. A representative from Solutions for Energy Efficient Logistics (SEEL) will contact you to follow-up.

Thank you again for your time and participation. We look forward to working with you toward a healthy water future for Highland Park residents.

If you need any assistance, please contact your community coordinator:

- **Kalaya Thomas** | Phone: (313) 495-4089 | Email: kthomas@metroca.net

HIGHLAND PARK HUMAN RIGHTS COALTION

The Office of the Clean Water Public Advocate has developed a Water Leak Pilot program to identify Highland Park households that may need assistance with their water bills.

It's the goal of H.P. Human Rights Coalition to curtail excessively high water bills. We want to identify residents that may qualify for help and make sure that every citizen gets fair treatment as an H.P. water customer.

The H.P. Human Rights Coalition will be canvassing the community to do a survey.

A leaflet will be put on your door to contact us, if you desire to receive the survey.

This program will aid in in repairing damaged pipes, possible repairs to your toilet and basic plumbing repair needs.

We have limited slots available.

THIS IS A PILOT PROGRAM

Most of all, to help reduce your monthly bill.

KEY WORD...HELP!

For more information: (313) 753-3886

WATER IS A HUMAN RIGHT ! ! !

We are working in partnership with : Metro Consulting Associates * University of Michigan Water Center * Safe Water Engineering *Highland Park Water Department * Michigan Department of Environment, Great Lakes, and Energy (EGLE) * Office of the Clean Water Public Advocate * People's Water Board Coalition * Michigan Welfare Rights Org.

Funding is provided by the State of Michigan

BENTON HARBOR
Port of Opportunities

Water Leak Pilot: Information for Residents

Thank you for signing up for the Water Leak Pilot project. The goal is to repair water leaks and install new faucets to reduce your water waste and save you money on your water bill. These plumbing services are free!

The Water Leak Pilot was created by the Michigan Department of Environment, Great Lakes and Energy (EGLE) the Office of Clean Water Public Advocate. In Benton Harbor, the Water Leak Pilot is being coordinated by the City of Benton Harbor and the Benton Harbor Community Water Council.

This letter confirms that we have received your sign-up form. Please review the following helpful information and next steps:

☑ **Step 1:** Sign up for the Water Leak Pilot

☐ **Step 2:** Complete and submit a water audit of your home

We have put together a water audit checklist to help walk you through each step of the process. You can complete the water audit online by visiting: https://www.surveymonkey.com/r/WLPWaterAudit

A paper copy of the checklist has also been provided with this letter if you prefer to fill it out that way. Please contact Reverend Pinkney at (269) 369-8257 so that he can pick up your completed form, or email it to gonetyb@michigan.gov.

As you check each area of your home, make notes of any possible leaks you find and if possible, take photos to share with the plumber. If you need any assistance with the audit, please contact one of your community coordinators:

- **Remi Gonety** | Phone: (517) 480-4717 | Email: gonetyb@michigan.gov
- **Brandon Williams** | Phone: (269) 519-0413 | Email: WilliamsB33@michigan.gov

FOCUS ON WATER INITIATIVE
working together to ensure a healthy water future

www.michigan.gov/WaterLeakPilot

☐ **Step 3:** RW LaPine Plumbing will contact you to schedule plumbing repairs after you submit your completed water audit.

The Pilot project will cover the cost of the repairs; there will be no cost to you.

Please note that this Pilot was designed to cover the cost of repairing minor premise plumbing water leaks; major plumbing repairs are not included at this time.

What free repairs MAY include: Depending on the results of your water audit, each eligible residence may receive a combination of the following repairs:

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- Repairing walls or floors due to water damage

Water Leak Pilot Enhancements

You may be eligible for additional services for your home:

We have partnered with the Michigan Department of Health and Human Services (MDHHS) to provide lead assessment and abatement work to qualifying residents. **The MDHHS Healthy Homes Program** will help identify sources of lead in your home and help **remove the lead free** of charge if you qualify. A postcard with more information is included in your welcome kit.

The **Southwest Michigan Community Action Agency** will also provide **free, energy-efficient hot water heaters to residents with damaged water heaters**. If you noted a damaged hot water heater in your water audit, a representative from SMCAA will contact you to follow-up.

Thank you again for your time and participation. We look forward to working with you toward a healthy water future for Benton Harbor residents.

Water Leak Pilot: Highland Park Information

Frequently Asked Questions (FAQ)

CONTENTS

INTRODUCTION

The Water Leak Pilot is a program administered through the Michigan Department of Environment, Great Lakes, and Energy's (EGLE) Office of the Clean Water Public Advocate. The Pilot has partnered with two Michigan cities – Benton Harbor and Highland Park, and their respective community groups – to provide a program to 100 residents in each of the cities that will help them save water and money in their respective homes.

FREQUENTLY ASKED QUESTIONS

What is the Water Leak Pilot?

The Water Leak Pilot was established to reduce water and energy waste and the financial burden associated with water leaks while looking at the water-energy nexus (the relationship between water used for energy production). The Water Leak Pilot will provide funding to support premise plumbing repairs in approximately 100 homes in Benton Harbor and 100 homes in Highland Park.

How do residents sign up?

There are three ways for residents to sign-up. Residents can sign-up at the Water Leak Pilot webpage (www.Michigan.gov/WaterLeakPilot) using the Water Leak Pilot Residential Sign-up form, or by calling EGLE's Environmental Assistance Center at 800-662-9278, or filling out a printed copy of the Water Leak Pilot Residential Sign-up form during the Highland Park Human Rights Coalition neighborhood recruitment event.

Can renters receive water leak repairs?

Yes, renters may receive repairs with approval from the homeowner. When resident's sign-up they can provide the owner's contact information.

Will the program cover all plumbing repairs in the resident's home?

An average of $800 in services and supplies will be provided to cover plumbing costs. The plumber and the Pilot Coordinator will work with the resident to address which repairs are best for their family and home. If it is determined that there are additional repairs, over $800, then the resident will receive a referral for additional monetary assistance.

What is the next step after a resident signs-up?

Our Pilot coordinating partner will reach out to each resident to assist with an initial water leak assessment in March 2021. Plumbing repairs are anticipated to begin in April 2021.

The coordinating partner for Highland Park will assist in connecting the resident with a plumber.

Will residents also receive information and resources about lead in water?

Yes, the Water Leak Pilot has partnered with MDHHS Healthy Homes to provide a free lead assessment and free lead removal for qualifying residents.

What steps are being taken to reduce the spread of COVID-19 during the Water Leak Pilot?

The Water Leak Pilot team has created a video that will guide the resident through the process of completing a water audit. If the resident has any questions or concerns while performing the water audit, they can contact the coordinating partner. The residents will be provided with a disposable mask that must be worn while plumbers are making water leak repairs. The plumber is also required to wear a mask during his/her visit to the resident's home.

Where can a resident find other resources?

Please direct the resident to visit the Water Leak Pilot webpage at www.Michigan.gov/WaterLeakPilot, and for general information on the topic of water leaks please visit the U.S. EPA webpage, WaterSense at www.EPA.gov/WaterSense.

Lead-based paint could be hiding in your home.

Call **1-866-691-5323** to request an application.

Visit Michigan.gov/MiLeadSafe

Lead can cause health problems, especially in children.
Lead services offered by the Michigan Department of Health and Human Services will help protect your household from lead exposure.

You may be eligible for these free or low-cost lead services:

A home lead inspection

Testing for lead in drinking water

Fixing lead hazards

The Michigan Department of Health and Human Services will not exclude from participation in, deny benefits of, or discriminate against any individual or group because of race, sex, religion, age, national origin, color, height, weight, marital status, gender identification or expression, sexual orientation, partisan considerations, or a disability or genetic information that is unrelated to the person's eligibility.

ATENCIÓN: si habla español, tiene a su disposición servicios gratuitos de asistencia lingüística. Llame al 517-335-9390 (TTY: 711).

ملحوظة: إذا كنت تتحدث اذكر اللغة، فإن خدمات المساعدة اللغوية تتوافر لك بالمجان. اتصل برقم 517-335-9390 (رقم هاتف الصم والبكم:-TTY:711).

[Title] Water Leak Pilot - Resident Survey: Benton Harbor [or] Highland Park

How did you learn about the Water Leak Pilot (select all that apply)
I saw a public announcement e.g., flyer, billboard, newspaper story
I heard a public announcement e.g., radio, television
I received an announcement at my home e.g., mail or door hanger
I spoke with a volunteer, such as Benton Harbor Community Water Council, who came to my door
Other: [type response]

I will read a series of statements and ask you if you strongly agree, agree, neither agree nor disagree, disagree, or strongly disagree with each.

1. The program materials I received were easy to understand
2. It was easy for me to schedule the plumbing visit
3. I learned about state government resources to provide free lead removal services for my home.
4. I felt safe during the plumbing visit

Was the plumbing work completed?

Yes, all the worked I expected was completed

Yes, but additional repairs are needed

No

How many visits did it take for the plumbing work to be completed? [type answer]

How satisfied were you with the Pilot?

Very satisfied

Satisfied

Neither satisfied nor dissatisfied

Very dissatisfied

Return Address *(Required)*:

PRSRT STD
U.S.Postage
PAID,
Lansing MI Permit
No. 00

WATER LEAK PILOT PROGRAM

Highland Park, Michigan

http://mywmi.ch/ov9D7

TO:

U-M Water Center
ATTN: Ashley Stoltenberg
625 E. Liberty, Suite 300
Ann Arbor, MI 48104-2013

Thank you for participating in the Water Leak Pilot Program! Please complete this short survey.

The program materials I received were easy to understand

- ☐ Strongly agree
- ☐ Agree
- ☐ Neither agree nor disagree
- ☐ Disagree
- ☐ Strongly disagree

It was easy for me to schedule the plumbing visit

- ☐ Strongly agree
- ☐ Agree
- ☐ Neither agree nor disagree
- ☐ Disagree
- ☐ Strongly disagree

I learned about state government resources to provide free lead removal services for my home

- ☐ Strongly agree
- ☐ Agree
- ☐ Neither agree nor disagree
- ☐ Disagree
- ☐ Strongly disagree

I felt safe during the plumbing visit

- ☐ Strongly agree
- ☐ Agree
- ☐ Neither agree nor disagree
- ☐ Disagree
- ☐ Strongly disagree

How satisfied are you with this pilot program?

- ☐ Very satisfied
- ☐ Satisfied
- ☐ Neither satisfied nor dissatisfied
- ☐ Dissatisfied
- ☐ Very dissatisfied

How did you learn about this pilot program? (Select all that apply)

- ☐ Public announcement (billboard, newspaper story, etc.)
- ☐ Radio or television announcement or ad
- ☐ Mail or door hanger
- ☐ A volunteer told me about it
- ☐ Other _____

_____

Plumbing work completed

- ☐ Yes, all the work I expected was completed
- ☐ Yes, but additional repairs are needed
- ☐ No

How many visits did it take to complete the work?

_____

Are you willing to be contacted for a short, 15-minute phone interview? If so, please provide the best number to reach you.

_____

Return Address *(Required)*:

PRSRT STD
U.S.Postage
PAID,
Lansing MI Permit
No. 00

WATER LEAK PILOT PROGRAM

Benton Harbor, Michigan

http://myumi.ch/YyBnN

TO:

U-M Water Center
ATTN: Ashley Stoltenberg
625 E. Liberty, Suite 300
Ann Arbor, MI 48104-2013

Thank you for participating in the Water Leak Pilot Program! Please complete this short survey.

The program materials I received were easy to understand

- ☐ Strongly agree
- ☐ Agree
- ☐ Neither agree nor disagree
- ☐ Disagree
- ☐ Strongly disagree

It was easy for me to schedule the plumbing visit

- ☐ Strongly agree
- ☐ Agree
- ☐ Neither agree nor disagree
- ☐ Disagree
- ☐ Strongly disagree

I learned about state government resources to provide free lead removal services for my home

- ☐ Strongly agree
- ☐ Agree
- ☐ Neither agree nor disagree
- ☐ Disagree
- ☐ Strongly disagree

I felt safe during the plumbing visit

- ☐ Strongly agree
- ☐ Agree
- ☐ Neither agree nor disagree
- ☐ Disagree
- ☐ Strongly disagree

How satisfied are you with this pilot program?

- ☐ Very satisfied
- ☐ Satisfied
- ☐ Neither satisfied nor dissatisfied
- ☐ Dissatisfied
- ☐ Very dissatisfied

How did you learn about this pilot program? (Select all that apply)

- ☐ Public announcement (billboard, newspaper story, etc.)
- ☐ Radio or television announcement or ad
- ☐ Mail or door hanger
- ☐ A volunteer told me about it
- ☐ Other _____

_____

Plumbing work completed

- ☐ Yes, all the work I expected was completed
- ☐ Yes, but additional repairs are needed
- ☐ No

How many visits did it take to complete the work?

_____

Are you willing to be contacted for a short, 15-minute phone interview? If so, please provide the best number to reach you.

_____

[Title:] **Water Leak Pilot - Plumber Visit Survey: Benton Harbor [or] Highland Park**

Please take 5 minutes to complete this short survey at the end of each appointment.

Please enter the street address of the house where the work was completed. [type response]

Please enter your name: [type response]

The following 6 questions will ask for a response on a 5 point scale: strongly disagree, disagree, neither disagree nor agree, agree, strongly agree

1. The leak audit accurately matched the status of the home
2. I was able to come to the home prepared to do all the work in one visit
3. I was able to alert the homeowner to additional problems e.g., lead risk due to plumbing fixtures or joints, an improper cross section
4. I was able to provide additional training for the resident e.g., clean faucet aerators, shut off external faucets in the winter
5. The schedule gave me enough time to complete all the work, including additional resident training
6. The scheduling process is working for me

Please share any additional comments: [type response]

Were you able to make all the needed plumbing repairs under the project budget? Y/N

If no, please describe the needed plumbing repairs that you were not able to complete: [type response]

SUBJECT: EVALUATION: State Water Leak Pilot Program
FROM: Jen cc Ashley

Dear <<Name>>,

As the end of the state's Water Leak Pilot Program approaches, the evaluation team from the University of Michigan Water Center and Safe Water Engineering are reaching out to set up interviews with key participants.

The goal of these evaluation interviews is to capture best practices, lessons learned, and recommended next steps from all perspectives. We will focus on some of the following:

- Effectiveness of the processes used to inform residents about the opportunity;
- Overall resident response to this opportunity;
- Strategies to improve the outreach and engagement processes;
- Strategies to improve the internal processes of the program e.g., scheduling water audits, plumber work, and capturing this data; and
- Suggestions for improvements to the program generally.

We will be interviewing key participants from community coordinator teams, state agency personnel, plumbing contractors (and plumbers), local government/utilities, and participating local media outlets. Your interview should be approximately <<15 or 30 minutes>>.

To schedule your interview, please schedule a time on Ashley's calendar in an appointment slot titled "Water Leak Pilot Interview". If these times do not work for you, let me know and I can provide you with alternative times.

Thank you.

Email to Princella and Desmond

SUBJECT: EVALUATION: State Water Leak Pilot Program
FROM: Jen and Elin (cc Ashley)

Commented [1]: I'm sure they have full inboxes, so might get an open if they recognize your names.

Commented [2]: @jenread@umich.edu what do you think?

Commented [3]: Sure, I can send that, can do right now if you like

Princella & Desmond,

I hope you are both doing well. As the end of the state's Water Leak Pilot Program approaches, the team from the University of Michigan Water Center and Safe Water Engineering are reaching out to begin our evaluation process. We have a list of several questions for the both of you that can be responded to via email (please reply-all to this message) or can be answered over the phone with our colleague Ashley Stoltenberg (please schedule a time on Ashley's calendar in an appointment slot titled "Water Leak Pilot Interview").

If you have any questions prior to your response, please let us know. The questions are provided below; if you have any data associated with your answers e.g., video hits, please share that with the evaluation team.

- Briefly describe your role in the project
- For the informational PSA videos:
    - Did you collect any promotion/submission statistics?
    - How many submissions did you receive? From which cities/areas?
    - How/where did you promote the opportunity?
    - How many schools/administrators and students did you speak to?
- How did you share out the PSA winning videos? To what outlets?
- Observations about what they would do differently next time?
- Additional comments/feedback you'd like to convey

Thank you

Benkari LLC

- Adrienne Bennett, abennett@benkari.net
- Johnetta Barry, jbarry@benkari.net

RW Lapine

- Bill Brown, bbrown@rwlservice.net

Metro Consulting Associates

- Kalaya Thomas, kthomas@metroca.net
- Jarion Bradley, jbradley@metroca.net

Building Excellence in Science in Technology (Media)
Contractors unavailable

Highland Park Human Rights Coalition (frontline)

- Marian Kramer, kramerm0060@gmail.com
- Linda Wheeler, lgwheel106@gmail.com
- Sylvia Orduno, smorduno@, gmail.com
- Gracie Wooten, cwooteng@gmail.com

Black Autonomy Network Community Organization (frontline)

- Reverend Pinkney, banco9342@sbcglobal.net

City of Benton Harbor (EGLE contractors)
Contractors unavailable

State agency personnel

- Ninah Sasy, sasyn@michigan.gov
- Jake Wilkinson, wilkinsonj8@michigan.gov

Utilities

- Rick Bunch, rick@mi-maui.org

Good morning/afternoon <<name>>,

Self-introduction: [as a reminder] I'm Ashley from the U-M Water Center, working with Jen and Elin on the evaluation of the state's water leak pilot program. Thanks for setting this up with me. We are interviewing several people from community coordinator teams, state agency personnel, plumbing contractors and individual plumbers, and participating media outlets. Our goal is to compile perspectives, best practices, and lessons learned to help shape our final evaluation and recommendations. This should take about 15/30 minutes.

Before we begin the interview I need to go over a few details:

- We will be recording and transcribing the interview
- We will summarize findings from this evaluation in a report for EGLE
- In the report, we will provide a list of all people interviewed including name, position, and organization. We will NOT attribute direct quotes to any individual, but potentially to their role in the project e.g., "a plumber said…"

Do you have any questions?

Permission to record:
As I mentioned, we would like to record our conversation today so that we can focus on the discussion but also be able to go back and ensure we got the details correct.

Do we have your permission to record?
<<if given, turn on recording>>

Interview Guide for LaPine and Benkari

1. First, please tell me about your role in the pilot
2. Please describe the overall process of scheduling the work of plumbers
    a. What worked well?
    b. Did you change your scheduling/plumbing process at all during the work? How? Why?
3. Did the $800 limit/household provide enough support to complete all the necessary work?
4. Did the state provide guidance about how to prioritize leak repairs vs faucet/toilet replacement?
5. Did you refer residents to the Department of Health and Human Services Lead abatement program?
6. How were your interactions w/ residents?
7. How were your interactions with the other teams contracted for the pilot?
8. How can the process be improved?
9. Do you have any additional comments/feedback you'd like to convey

Interview Guide for Community Coordinators: MCA/Brandon and Remi

1. First, please tell me about your role in the pilot
    a. Please describe the process you oversaw
    b. Did the process change over time? How? Why?
2. What challenges did you encounter?
3. How can the process be improved?
4. How were your interactions with the other teams contracted for the pilot?
5. Do you have any additional comments/feedback you'd like to convey
6. MCA only:
    a. Did you create any materials for residents as a part of your SOW? What were they? I will follow up requesting copies.
    b. Value of Neptune 360 software use?
    c. (potential question: did you evaluate energy savings? Elin revisit after reading Jake's report)

Interview Guide for Community Groups

Start the conversation focused on the work you were contracted to do. We will close the conversation by focusing on your experience working with other contractors in the pilot.

1. First, please tell me about your role in the pilot
2. Please tell me how residents were informed about the opportunity? How did they get signed up?
    a. How did you participate in this process? (if not detailed already)
    b. Do you know how many residents in total were contacted? Can we have any copies of informational packets that were distributed?
    c. About how many people signed up? Did more than 100 people try to sign-up?
        i. What happened with these individuals? e.g., waitlist
    d. Did you ever receive final reporting of how many people (and who specifically) participated in the pilot?
3. How would you improve the outreach and engagement process you just described?
4. How was your interaction with the other contractors, MCA (HP) and the plumbing team
5. Additional comments/feedback you'd like to convey

Interview Guide for Media

- PSA videos - did you collect any promotion/submission stats?
    - How/where did you promote the opportunity?
    - How many schools/administrators and students did you speak to?
    - How many submissions did you receive? From which cities/areas?
- How did you share out the PSA winning videos? To where? Associated data?
- Observations about what they would do differently next time?
- Additional comments/feedback you'd like to convey

https://bentonspiritnews.com/linna-and-aidan-are-michigan-fixaleak-top-winners-p6743-156.htm

Interview Guide for EGLE

1. (Ninah) Please tell us about the origin of the idea and how it was developed.
2. First, please tell me about your role in the pilot
    a. How did this role change over time?
    b. How did this change impact the work?
3. What went well?
4. What, if any, barriers did you encounter?
5. What did you find most challenging?
6. Was there anything that surprised you during the project?
7. How were your interactions with the teams contracted for the pilot?
    a. How did you track progress in each community? Did you find that effective?
8. What materials did you develop? Please provide a copy
9. (Jake) Are you satisfied with the energy savings calculations from the project?
10. (Jake) Are you satisfied with the robustness of the energy savings calculation methodology? Do you think it's reliable to calculate energy savings using this methodology at the household scale? Did the project collect the right household data?
11. How would you structure this opportunity differently if it becomes a program?
    a. What would you keep?
    b. What needs further development? How?
    c. Would you make any changes to the dollars available per home?
        i. Flexibility? Not fixed?
12. Given that the program was required to have an energy outcome when it's really meant to reduce water bills by fixing leaks, does this feel like the right format and approach going forward or should there be a different framing and source of funding?
13. Additional things we are interested in:
    a. How many residents were referred to the MDHHS lead abatement program?

Interview Guide for Plumbers

1. Please describe the overall process of completing the work - from the initial audit, all the way to completing your final survey
    a. What worked well?
    b. How much work were you forced to leave unfinished? Why (scope, budget, time, other)? Were you able to tell residents about any work that needed to be done but was outside the scope of the program?
    c. Faucet replacement vs leak repair - pressured to replace faucets and toilets?
    d. How were your interactions w/ residents?
    e. Did you have sufficient information to answer resident questions? (possible probe, what kinds of questions did residents ask?)
    f. Did you refer residents to the Department of Health and Human Services Lead abatement program?
    g. How can this process be improved?

Water Leak Pilot

Benton Harbor and Highland Park

Project Scope:

Water leaks, through plumbing, faucets, and appliances within a residential home may result in higher water and energy bills. In addition, water leaks may adversely impact water quality by introducing contaminates into the water system.

At the system level, water consumption requires large amounts of energy for three main purposes: water supply, water heating, and wastewater disposal. Energy is required to supply potable water and to heat water for washing and other applications. Addressing system and premise plumbing leaks can help both the resident and local water supplier save water and energy which leads to overall cost savings. Cost savings could be reinvested in the water system to continue to monitor and improve water quality; savings could also be utilized to ensure that already vulnerable residents aren't overburdened with an increase in water rates.

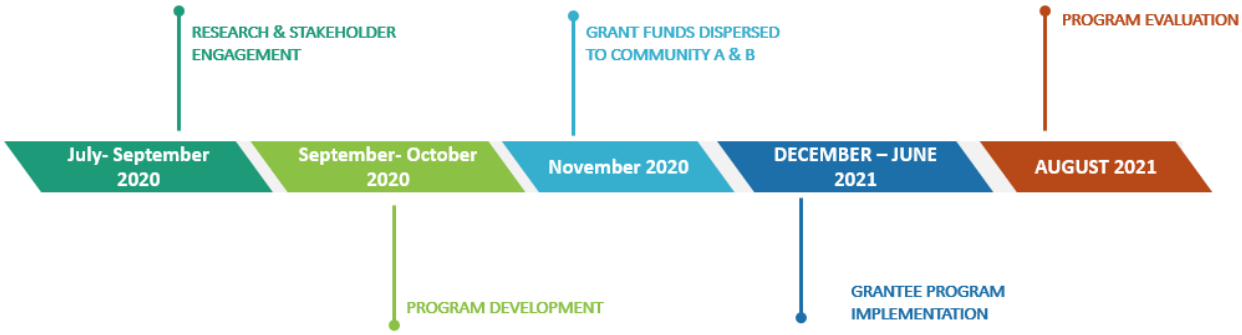
Conserving water or using water more efficiently reduces energy consumption. In communities with a lead action level exceedance, like Benton Harbor and Highland Park, residents are not afforded the option to conserve water by reducing the amount of water consumed. Communities with a lead action level exceedance require routine flushing to reduce lead exposure in their water. Addressing premise plumbing and system leaks has public health implications in addition to its water and energy cost-savings. An investment must be made in repairing the water leak within the home and removing sources of lead including older faucets and lead service lines which may also contribute to leaks and leaching of lead contaminants in water. This pilot will address these concerns by leveraging both energy and public health programs from EGLE and MDHHS.

The water-energy linkage means that efficiency programs that save water will also save energy and vice versa. If utilities and stakeholders recognize this intersection and work together on joint programs, they could learn from one another, document savings, share costs, and potentially achieve greater savings. This pilot brings together state and local partners in water and energy sectors, with guidance from community residents, to

leverage a multitude of resources that can be used to protect public health and adopt water and energy cost-saving measures.

There are three primary project objectives: (1) increase community education about system leaks and conducting household water audits, (2) increase community education on water and energy, and (3) reduce the number of residential leaks by offering free premise plumbing water repairs as conditional incentive of residents participating in water and energy educational program.

Timeline:



Timeline, continued:

1) Research: Look at data from community A & B
2) Stakeholder Engagement: Drives core concepts of the pilot and ensures that community perspective is incorporated in the development of the workshops
3) Program Development: Two workshops/online modules will be developed focused on water conservation and lead in water sampling workshops will be developed
4) Grant funds dispersed to Community A & B
5) Grantees (Community A & B) begin implementing pilot- a) promotion of workshops and incentives, b) recruitment of residents to participate, c) host workshops…
6) Program evaluation based on feedback from grantees, community residents, and data captured during pilot; model developed that can be shared that can be adapted to other Michigan communities

Office of the **Clean Water Public Advocate**

EGLE MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY

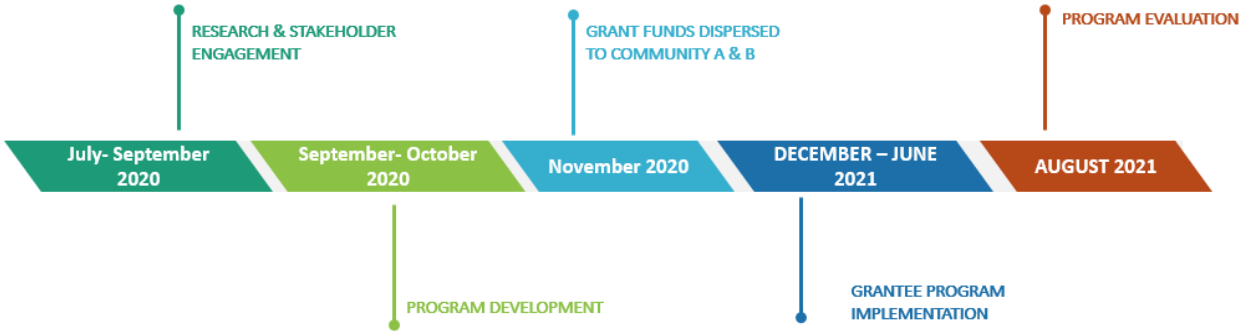
Water Education Pilot

Benton Harbor and Highland Park

Project Scope:

This project seeks to address the drinking water infrastructure problems and financial distress of the community through two outreach programs supported by conditional direct financial aid for program participants. There are three primary project objectives: (1) increase community education about system leaks and conducting household water audits, (2) increase community education on water sampling (lead) and build a sampling pool, and (3) incentivize participation in both programs through conditional direct assistance and assistance for premise plumbing water repairs.

Timeline:



Timeline, continued:

1) Research: Look at data from community A & B
2) Stakeholder Engagement: Drives core concepts of the pilot and ensures that community perspective is incorporated in the development of the workshops
3) Program Development: Two workshops/online modules will be developed focused on water conservation and lead in water sampling workshops will be developed
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5) Grantees (Community A & B) begin implementing pilot- a) promotion of workshops and incentives, b) recruitment of residents to participate, c) host workshops…
6) Program evaluation based on feedback from grantees, community residents, and data captured during pilot; model developed that can be shared that can be adapted to other Michigan communities

Stakeholder Engagement:

The following agencies and representatives have been identified as stakeholders in the Water Education Pilot:

Agency	Representative(s)
Benton Harbor Community Water Council	Reverend Edward Pinkney
Brightmoor Connection Food Pantry	Reverend Roslyn Bouier
City of Benton Harbor	Ellis Mitchell
Highland Park Human Rights Coalition	Marian Kramer, Pat Harris, Linda Wheeler
Highland Park Water Department	Damon Garrett, Jarion Bradley

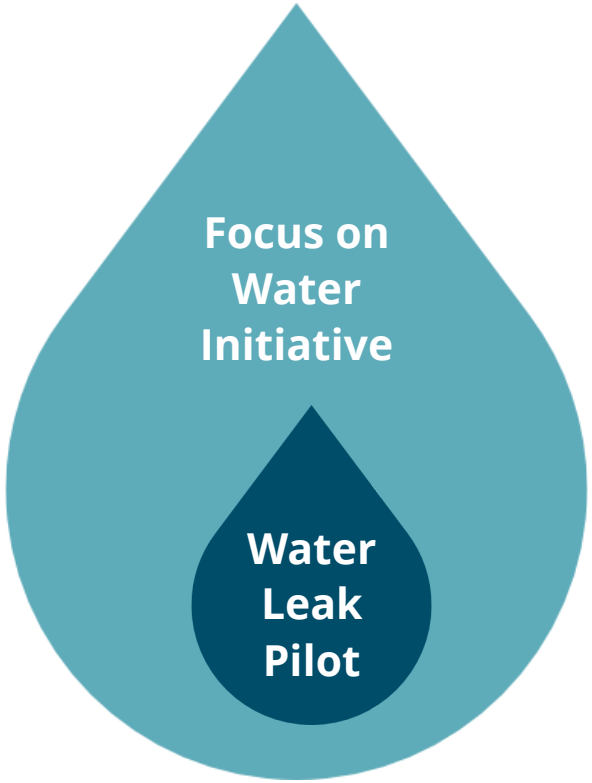
Michigan Energy Efficiency Contractors Association (MEECA)	David Gard
Michigan Minority Contractors Association (Detroit Chapter)	
Michigan Municipal Association for Utility Issues (MI-MAUI)	Rick Bunch
Michigan Welfare Rights	Sylvia Orduno, Nicole Hill
Retired Engineer Technical Assistance Program (RETAP)	David Herb
Safe Water Engineering	Elin Betanzo
University of Michigan	Jennifer Read, Alexandra Haddad
Wayne County Health Department	Carol Austerberry, Waddah Saeed
Wayne Metropolitan Community Action Agency	Jerome Drain
Wayne Metro Water Residential Assistance Program (WRAP)	Patrick Gubry, GLWA and DWSD WRAP program managers

Water Leak Pilot

A **Focus on Water Initiative** Project

Office of the **Clean Water Public Advocate**

EGLE MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY



FOCUS ON WATER INITIATIVE

working together to ensure a healthy water future

- The **Water Leak Pilot** is part of a larger **Focus on Water Initiative**, commissioned by the Office of the Clean Water Public Advocate.
- The Initiative brings together multi-sector partners to address water concerns in Michigan communities.

Office of the **Clean Water Public Advocate**

EGLE MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY

Water Leak Pilot: Background

- Premise plumbing and system leaks trouble many disadvantaged communities.
- Aging infrastructure and older homes contribute to energy and water waste, as well as public health concerns.
- Overall, water infrastructure and premise plumbing leaks are costly for residents and community water suppliers.

Office of the **Clean Water Public Advocate**

EGLE MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY

Water Leak Pilot: Overview

The **Water Leak Pilot** was established to reduce water and energy waste and the financial burden associated with water leaks while looking at the **water-energy nexus** (the relationship between water used for energy production).

Water Leak Pilot: Overview

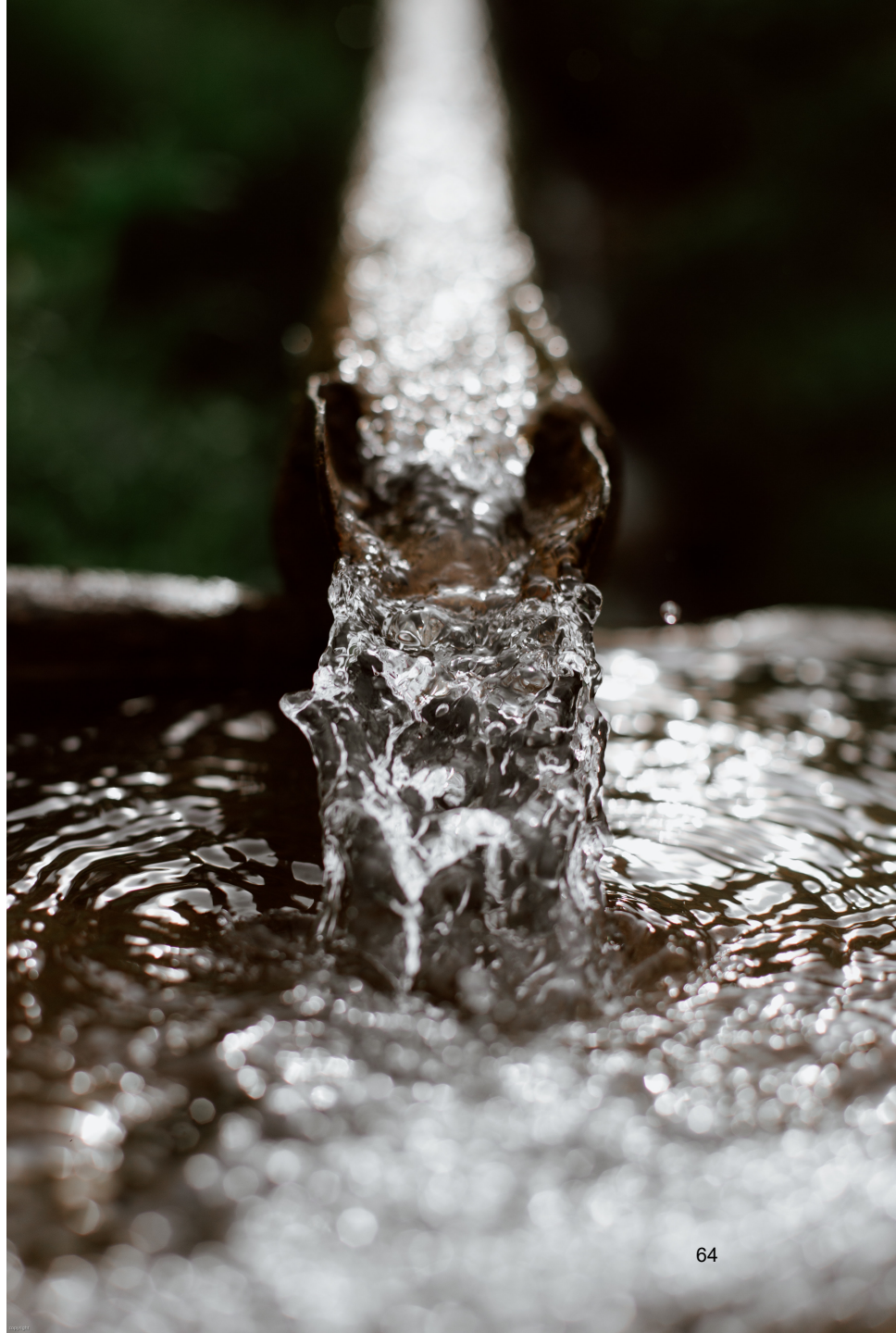
- The Water Leak Pilot will provide funding to support premise plumbing repairs in approximately 100 homes in Benton Harbor and 100 homes in Highland Park, as well as program development and implementation of the Pilot.
- Local and community partners will support the dissemination of educational materials to residents participating in the Pilot.

Office of the **Clean Water Public Advocate**

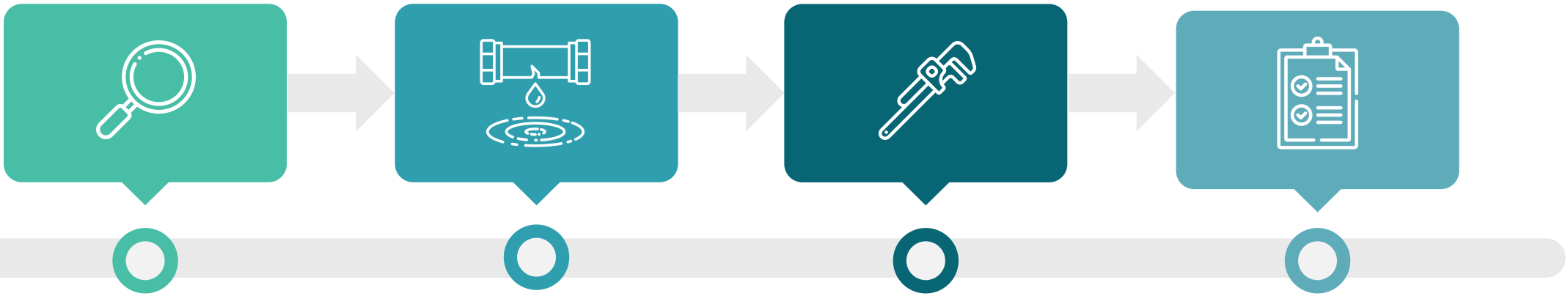
EGLE MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY

Enhancement

- An enhancement to this effort includes a partnership with the Michigan Department of Health and Human Services' Healthy Homes Program to provide **lead assessment and abatement work** to qualifying residents who participate in the Pilot.
- This partnership expands the funding and resources available to residents to ensure a greater impact.



Pilot Phases



Research & Stakeholder Engagement

Program Development

Program Implementation

Program Evaluation

Office of the **Clean Water Public Advocate**

Program Implementation

January-February 2021

Resident recruitment

Local partners will begin recruiting residents for the program

Water Audits

Residents will be provided with a checklist and video to perform a home water leak audit*

Starting February 2021

Concurrent with water audits

Enhancement

Water audit teams refer households to MDHHS lead abatement services

Premise plumbing repairs

Plumbers repair water leaks in homes to improve health, and save water and energy

Starting February 2021

March 2021

Education

Dissemination of educational materials during Fix a Leak Week **March 16-22, 2021**

*Community coordinators will be available to assist families over the phone and in-person if needed.

Fix-A-Leak Week

- Michigan Governor Gretchen Whitmer will proclaim **March 16-22** as Fix-A-Leak Week in Michigan, in conjunction with National Fix-A-Leak Week
- Fix-A-Leak Week was designated to help broaden public understanding of the critical impact of water leaks, especially in low-income communities
- Fix-A-Leak Week will be launched by the Office of the CWPA
- Community partners are encouraged to join the Fix-A-Leak Partnership and promote the week as well as offer resources to assist with water leak repairs if possible

Water Leak Pilot Timeline

Research & Stakeholder Engagement

Program Development

Program Implementation

Program Evaluation

July – Dec. 2020	Sept. – Dec. 2020	January – June 2021	August 2021

Office of the **Clean Water Public Advocate**

EGLE MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY

Program Implementation in Benton Harbor

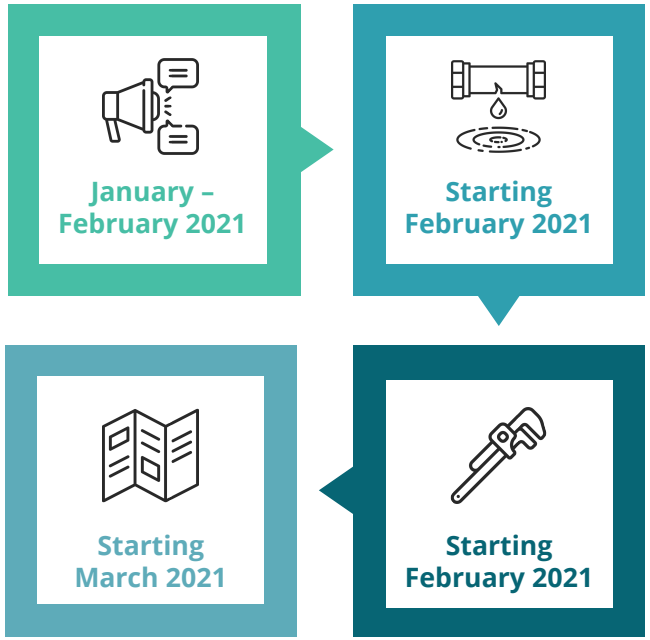
Enhancement (concurrent): Qualifying residents will be referred to the **Michigan Department of Health and Human Services (MDHHS)** Healthy Homes Program for lead abatement services.

1 - Resident Recruitment

- The **Black Autonomy Network Community Organization (BANCO)** and the **Benton Harbor Water Council** will utilize social media and a door-to-door campaign to recruit residents for the Pilot.
- Residents will complete a sign-up form, available online or as a paper copy.

4 – Education

- Educational materials will be developed by **Building Excellence in Science and Technology (BEST)**.
- An educational campaign will be centered around **Fix-A-Leak Week** on March 16-22.



2 - Water Audits

- Residents that sign up will receive Welcome Packets that include a Water Audit Checklist from the **City of Benton Harbor** (Remi Gonety and Brandon Williams).
- Once water audits are completed, information is sent to the plumbers and premise plumbing repairs are scheduled.

3 - Premise Plumbing Repairs

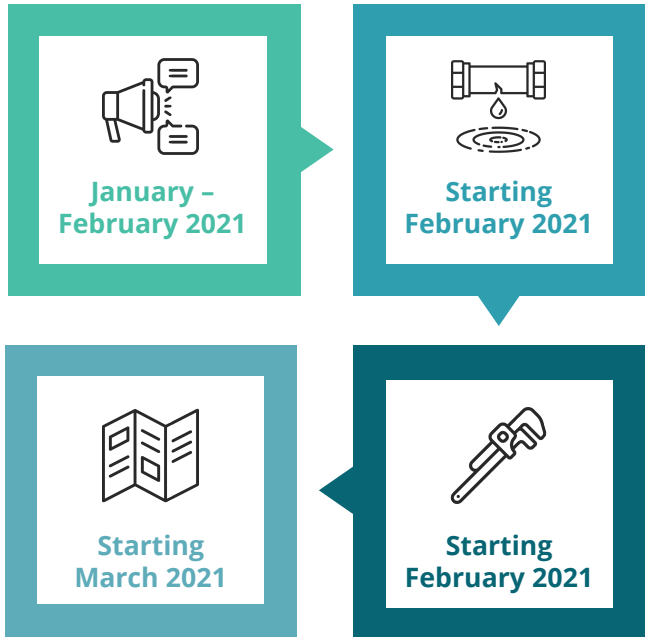
- Premise plumbing repairs will be performed by **RW LaPine** plumbers.
- Plumbers will submit invoices to the **Michigan Department of Environment, Great Lakes, and Energy (EGLE)** to confirm work has been completed.

Program Implementation in Highland Park

Enhancement (concurrent): Qualifying residents will be referred to the **Michigan Department of Health and Human Services (MDHHS)** Healthy Homes Program for lead abatement services.

1 - Resident Recruitment

- **Metro Consulting Associates (MCA)** and the **Highland Park Human Rights Coalition** will utilize social media and a door-to-door campaign to recruit residents for the Pilot.
- Residents will complete a sign-up form, available online or as a paper copy.



2 - Water Audits

- Residents that sign up will receive Welcome Packets that include a Water Audit Checklist from **Metro Consulting Associates (MCA)** (Kalaya Thomas).
- Once water audits are completed, information is sent to the plumbers and premise plumbing repairs are scheduled.

3 - Premise Plumbing Repairs

- Premise plumbing repairs will be performed by **Benkari** plumbers.
- Plumbers will submit invoices to the **Michigan Department of Environment, Great Lakes, and Energy (EGLE)** to confirm work has been completed.

4 – Education

- Educational materials will be developed by **Metro Consulting Associates (MCA)** and the **Highland Park Human Rights Coalition**.
- An educational campaign will be centered around **Fix-A-Leak Week** on March 16-22.

Program Evaluation

- Overall Program Evaluation:
  - Learn from the process from all perspectives – residents, plumbers, community-based organizations doing outreach and local media partners, state agency partners, local governments, water utilities/MCA – including addressing specific program questions from potential future implementers, e.g., understanding the efficacy of outreach materials on willingness to participate; compile best practices, lessons learned and recommended next steps.
  - Review, revise and augment outreach materials to incorporate findings
- Repair Analysis: Rebuild Michigan (Compile data regarding audit results and plumbing inspection for final reporting purposes, conduct post-repair analysis of water and energy use)

Water Leak Pilot: Stakeholder Responsibilities

The **Water Leak Pilot** program was established to reduce water waste and the financial burden associated with it; to increase community education about water leaks, conducting household water audits, and tips for energy savings; and to provide assistance for premise plumbing water repairs. The Pilot brings together a diverse group of stakeholders to optimize limited resources for a greater impact in communities.

Michigan Department of Environment, Great Lakes, and Energy (EGLE)

- Communication Team: can help with press releases; can connect with radio and media sources
- Community Engagement Team: can help post information on community sites, reach out to faith-based leaders, etc. to promote the pilot
- Outreach Team: can help design program materials and record videos
- Office of the Clean Water Public Advocate: will review all educational materials and ensure EGLE SMEs approve; establish grants with partners; coordinate pilot overall

Michigan Department of Health and Human Services (MDHHS)

- Will perform lead assessment and abatement work for Benton Harbor and Highland Park residents

University of Michigan/ Safe Water Engineering

- Initial Stakeholder Engagement, preceding program development, through proxy (Benton Harbor Community Water Council, Michigan Welfare Rights, and Highland Park Human Rights Coalition) regarding scope program delivery and barriers due

to COVID-19; provide program design recommendation based on initial stakeholder engagement
- Pilot evaluation: develop report following pilot that includes best practices, lessons learned and recommended next steps
- Final educational materials after pilot has been evaluated

Rebuild Michigan

- Compile data regarding audit results and plumbing inspection for final reporting purposes
- Conduct post-repair analysis of water and energy use

Metro Consulting Associates (MCA)

- Program development for Benton Harbor and Highland Park
    - Establish mechanism for residents to sign-up for pilot
- Program coordination in Highland Park
    - the SPC will work with Highland Park Human Rights Coalition to register program participants, including evaluating criteria and survey data from each potential participant
    - the SPC will perform daily analysis of water usage for participants
    - the SPC will coordinate with the city's billing staff weekly on various BS&A related matters including meters reads, work orders, or other account activity that could impact the Pilot Program
    - the SPC will work with Highland Park Human Rights Coalition to coordinate and schedule regular virtual townhalls, in person meetings, and other public outreach campaigns. This specific task will be in coordination with other Pilot Program stakeholders to ensure participants (and possibly other community members) are well informed on the progress of the pilot, leaks, and lead related matters.
    - the SPC will share the list of residents who sign-up for the program with the Office of the CWPA so that this information can be coordinated with MDHHS for testing and other programs offered by the MDHHS and the community
    - the SPC will coordinate with program participants on scheduling of initial audit and plumbing inspection of each participant's home
    - the SPC will daily compile data regarding audit results and plumbing inspection for final reporting purposes
    - the SPC will coordinate with community partners, as well as other stakeholders on Pilot Program progress in the City of Highland Park
    - the SPC will be responsible for ensuring all recommended repairs and fixture/appliances are scheduled and replaced
    - the SPC will provide the Office of the CWPA a weekly list of all repairs completed so that plumbing invoices can be audited
    - the SPC will be responsible for documenting through written and video media the Pilot Program for start to finish, including collecting feedback from participants and other stakeholders
- Initial program support for Benton Harbor (3 weeks)

- the SPC will train Lesia and student assistants on software and data needed for pilot

Highland Park Human Rights Coalition

- To support recruitment of participants- will coordinate and schedule virtual meetings, in person meetings, and other outreach efforts in Highland Park; will coordinate capturing resident's information for MDHHS Healthy Homes referral
- Will support registration of program participants and collection of feedback from each participant in Highland Park
- Will help support getting participants scheduled for water leak repairs if MCA is unable to reach them
- Can provide participants with welcome package with education materials, PPE, and additional outreach materials in Highland Park

Benton Harbor Community Water Council

- To support recruitment of participants- will coordinate and schedule virtual meetings, in person meetings, and other outreach efforts in Benton Harbor; will coordinate capturing resident's information for MDHHS Healthy Homes referral
- Will support registration of program participants and collection of feedback from each participant in Benton Harbor
- Will help support getting participants scheduled for water leak repairs if City of Benton Harbor is unable to reach them
- Provide participants with welcome package with education materials, PPE, and additional outreach materials in Benton Harbor

Benton Spirit Newspaper

- Ads in newspaper to support recruitment of Benton Harbor residents in pilot
- Ads that provide education to Benton Harbor residents about water leaks

Andrews University

- Help recruit students for two student assistant roles with the City of Benton Harbor

Water Leak Pilot

Stakeholder Contacts

Benton Harbor

Benton Harbor Community Coordinators:

- Brandon Williams | Phone: (269) 519-0413 | Email: WilliamsB33@michigan.gov
- Remi Gonety | Phone: (517) 480-4717 | Email: GonetyB@michigan.gov

City of Benton Harbor:

- Lesia Osler | Phone: (269) 351-2729 | Email: losler@bhcity.us

Local Partner (assisting with resident recruitment):
BANCO and Benton Harbor Community Water Council

- The Reverend Edward Pinkney | Phone: (269) 369-8257 | Email: banco9342@sbcglobal.net
- Eugene Anderson | Phone: (269) 944-9157 | Email: eugene_anderson62@yahoo.com
- Carmela Patton | (269) 248-2897 | Email: pattoncarmela@yahoo.com
- Gershon Clay | (269) 759-8998

Plumbing Services: RW LaPine

- Bill Brown | Phone: | Email: bbrown@rwlservice.net
- Josh Dragomir | Email: jdragomir@rwlservice.net

Education Partner: Building Excellence in Science and Technology (BEST)

- Desmond Murray | Phone: (269) 757-1641 | Email: murrayd@andrews.edu

Highland Park

Highland Park Community Coordinator:

- Kalaya Thomas | Phone: (313) 495-4089 | Email: kthomas@metroca.net

Project Coordination: Metro Consulting Associates (MCA)

- Damon Garrett | Phone: (734) 217-4697 | Email: dgarrett@metroca.net
- Jarion Bradley | Phone: (800) 525-6016 | Email: jbradley@metroca.net
- Kimberly Hoyle | Phone: (800) 525-6016 | Email: khoyle@metroca.net

Community Partner (assisting with resident recruitment and education):
Highland Park Human Rights Coalition

- Marian Kramer | kramerm0060@gmail.com
- Sylvia Orduño | smorduno@gmail.com

Office of the Clean Water Public Advocate / Dept. of EGLE

Clean Water Public Advocate:

- Ninah Sasy | Phone: (517) 881-5219 | Email: EGLE-Contact@Michigan.gov

Evaluation

University of Michigan Water Center / Graham Sustainability Institute:

- Jen Read | Phone: (734) 769-8898 | Email: jenread@umich.edu

Safewater Engineering

- Elin Warn Betanzo | Phone: (248) 326-4339 | elin@safewaterengineering.com

MDHHS Enhancement (Lead Abatement Services)

- Courtney Wisinski – wisinskic@michigan.gov
- Alex Archambeault – archambeaulta@michigan.gov
- Daniel Sweeny – sweenyd4@michigan.gov

Water Leak Pilot Stakeholder Meeting

Tuesday, March 2, 2021 | 11:00am-12:00pm

Agenda Item	Presenter	Time
Introductions	All	5 minutes
Check in with Communities	Benton Harbor Highland Park	10 minutes
Pilot Assessment and Evaluation	**Elin Betanzo,** Safe Water Engineering **Jennifer Read**, University of Michigan	15 minutes
Fix-a-Leak Week	**Ninah Sasy,** Clean Water Public Advocate	15 minutes
Group Discussion	All	10 minutes
Review of Action Items Identified and Next Steps	**Ninah Sasy**, Clean Water Public Advocate	5 minutes

Link to join meeting: WLP Stakeholder Meeting

Call-in: +1 248-509-0316 | Conference ID: 103 224 720#

Water Leak Pilot Partner Meeting

Tuesday, March 2, 2021 from 11:00am-12:00pm

Attendees: Ninah Sasy (OCWPA), Sylvia Orduño (People's Water Board), Marian Kramer (Highland Park Human Rights Coalition), Linda Wheeler, (HPHRC), Kim Hoyle (MCA), Kalaya Thomas (MCA), Reverend Edward Pinkney (BHCWC), Lesia Osler (City of Benton Harbor), Remi Gonety (OCWPA and City of Benton Harbor), Jennifer Read (Water Center at UM), Elin Betanzo (Safe Water Engineering), Adrienne Bennett (Benkari Plumbing and Water Conservation), Laura Drayton (OCWPA), Julie Staveland (EGLE)

- Welcome and introductions
- Intent of the meeting is to check in, discuss lessons learned

Check in with communities: Benton Harbor

- BHCWC has put together a ground effort with 3-4 people getting information to residents about the Water Leak Pilot; it has been successful
- There are a lot of residents with leaks in their homes
- Focused on ensuring that people are aware of the program and that funding is available to repair leaks
    - Benton Harbor had another Lead Action Level Exceedance; this information is being shared with residents
    - Sharing lead abatement service information
- Dropping off applications and the water audit forms; following up by phone to walk through the water audit with each resident
- Sending information to OCWPA so it can be forwarded to plumbers to schedule plumbing repair
- All COVID precautions are being taken (wearing masks, distancing)
- Residents are concerned; trying to focus on offering help
- A list of residents with potential leaks was provided to Reverend Pinkney to help guide outreach efforts
- Currently have 44 homes that have completed the assessment; information is being sent to LaPine to schedule plumbing repairs
- Will be doing water testing again in the next few months

Check in with communities: Highland Park

- Highland Park Human Rights Coaltion; focusing on the youth (training them to canvas areas with high water usage)

- During Fix-a-Leak Week, students will be focused on outreach and sharing information about the Water Leak Pilot and the Highland Park Human Rights Coalition
- Created a separate flyer for residents; set up a dedicated phone line
- Will be recruiting through April and May
- A list has been compiled of residents with high water use in disadvantaged areas (approximately 180 homes)
    - Link to the map: purple pins are homes that are being focused on in higher poverty areas of the city; blue pins are the remaining high water leak addresses
- MCA is working with HPHRC to distribute informational materials and will send information to Benkari once residents are signed up (and audits are completed)
- Benkari is looking forward to starting repairs

Pilot Assessment and Evaluation

- Would like to identify best practices, lessons learned, and suggested program tweaks for future implementation
- Will be working with partners in both communities to evaluate the Pilot
    - Including the experience of all partners; will be connecting with each partner individually
    - Have a short survey regarding residents that will be distributed
- Think it will be helpful to look at the first 5 residents who complete the process; reach out to them to identify any 'stumbling blocks' to improve the process as implementation progresses
    - Could potentially train them to join the outreach team (peer to peer)

Fix-a-Leak Week

- Overview of Fix-a-Leak Week tentative schedule
- Will highlight the work of the Water Leak Pilot and how to sustain similar programs
- Need to consider structural inequities and barriers that prevent residents from being able to fix leaks in their home
- Would like a representative from Soulardarity to join the discussion on Tuesday; would like to have a discussion regarding their involvement
- Would like to include the water departments from both communities to share information about how they are assessing and responding to water leaks (administrative level; not just system operators)

- Will connect with Ellis Mitchell from Benton Harbor and MCA will connect with the appropriate person in Highland Park

Group Discussion

- What is being done to monitor children with high lead levels?
    - Will connect with MDHHS to discuss lead abatement services
    - An important enhancement to the Water Leak Pilot
    - Need to determine a way to rebuild trust between residents and MDHHS
    - There may be a third party that may be able to facilitate services

Review of Grant Reimbursement Process

- Some partners still need to complete grant agreements
- Once the grant agreement is complete and partners are ready to request payment, will need to fill out Request tabs at the bottom of the payment request spreadsheet; include an update to activities and any supplemental materials (time sheets, etc.)
- Will be processed and paid within a two-week period
- Sales tax is reimbursed
- Travel is typically reimbursed based on mileage (instead of gas)

Additional Discussion

- HPHRC has some concerns about signing up for the Pilot; having an online form provides an opportunity for people with technology and access to sign up
- Want to focus on low-income households to ensure an equitable program
- Both communities should be evaluating the residents that sign up to determine who to prioritize; ensure they meet criteria (high water usage, prioritization guidelines)
- Sign up for the Pilot is not first-come-first-served
- There is not enough funding for all residents in need to participate; want to be conscious of who is able to participate

Wrap-up

- Will be meeting on a monthly basis to check-in

Water Leak Pilot Partner Meeting
Tuesday, March 30, 2021 from 11:00am-12:00pm

Water Leak Pilot Updates

- Partnership with Kohler and Etna to provide fixtures
- Enhancement: Energy-efficient water heaters from DTE Energy, SEEL, Southwest Michigan Community Action Agency
- Fix-a-Leak Week was successful, combining water and energy efforts and doing the work in disadvantaged communities
    - Funding and policy needed
- Dow Fellows will develop a roadmap to implement water and energy conservation efforts across Michigan, with recommendations for policy and resources needed to support the work in small and disadvantaged communities

Urgent Issues

- No urgent issues presented

Check-in with Benton Harbor

- The Benton Harbor Community Water Council has been signing up residents
- Anticipate 200 homes that will need repairs
- Surveying people who may need additional help, not just with leak repairs
    - Discussing energy-efficient water heater enhancement
- Want to ensure that additional resources are available
- Have already signed up 115 residents; there are many more that need help
- Trying to determine how to be most impactful with a limited budget
- Want to ensure information is provided and residents are reading it
- A resident was experiencing an exterior leak: Adrienne Bennett shared her expertise on what may have happened (frozen/burst pipe)
    - Recommendation: Replace outside hose bibs with frost-proof hose bibs
    - Unfortunately, Kohler does not manufacture exterior hose bibs, but Etna supply may be able to provide them
    - Adrienne will share her recommended fixture
- Remi and Brandon have been working with the plumbers to begin repairs
- Benton Harbor Community Forum will be held tomorrow at 3:00pm

Check-in with Highland Park

- A lot of seniors are having issues with their pipes

    - A 97-year-old resident was having issues with freezing pipes; referred to Wayne Metro for additional services
    - Many residents are experiencing high water bills
- Had a kickoff event for the Water Leak Pilot during Fix-a-Leak Week
    - Article
    - Went out to canvas homes; have been receiving calls
- Plan to go out in the next two weeks with a larger canvassing effort
- Will be working with high school students
- Working with additional community partners for outreach (NAACP)
    - Will share contact
- Have some residents in Highland Park experiencing issues with their drain system
    - Also experiencing some additional issues: standing water, sewage
    - Hope to utilize funding for water infrastructure to make these repairs
- Parker Village Newsletter is promoting the Pilot

Water Leak Pilot Evaluation

- Have been developing a survey that will be shared with residents after repairs are completed
    - Currently seeking final input
    - Will be using a Google Form
    - Community Coordinators will facilitate them as a verbal survey when they are wrapping up each home
- Would like to perform some long-form interviews
    - More detailed questions for a few participants
- Will have a Google form for plumbers to fill out after each appointment
    - Will have a follow-up phone call if needed
- Should inform residents that there will be a survey so they feel comfortable

EGLE PILOT | 2021

ETNA Supply | DETROIT (Wixom)

PO# P100633992 (Tub Spouts PO# P100633451)

this faucet is about 22in tall

Product Category	SKU	QTY	SUGGESTED INITIAL XFER to Detroit
Kitchen Faucets	R10651-SD-VS	48	20
	R72247-SD-VS	58	20
	R45350-SD-VS	19	
	R77748-SD-VS	25	
Toilets | ADA, Elongated, Comfort Height	23158-0	100	40
Toilets | ADA, Round Front, Comfort Height	78253-0	50	10
Toilets | ADA, Elongated, Comfort Height	78276-0	48	
Single Control Lav fcts (can be used as a centerset as well)	R22475-4D-BN	57	57
Single Control Lav fcts (can be used as a centerset as well)	R78045-4D-BN	93	
Showerhead & Handhower Combos:	RC26701-BN	131	20
Handshowers Kit:	R75562-BN	4	1
Showerheads Only:	R10282-G-CP	10	5
Showerheads Only:	R75567-G-CP	2	2
Showerheads Only:	R22880-G-BN	10	5
Shower only trim kits:	R78048-4E-BN	2	2
Tub Spouts (in Grand Rapids currently)	*15136-BN*	*97*	*10*

* be mindful that we only have 50 round ADA toilets

Converge

DAWN FISCHHABER | KOHLER CO.
dawn.fischhaber@kohler.com
Mobil: 517.304.9570

EGLE | WATER LEAK PILOT *Updated 3-5-2021*

***Originally from M-H project (Detroit)* *PO# 100508857 *ITEMS PREDOMINENTLY IN KALAMAZOO*

Sku	QTY	Description	Flow Rate	Watersense	Notes
15241-4RA-CP	9	Coralais® Centerset Lav Faucet (1.2 gpm)	1.2gpm	YES	
15261-4RA-CP	1	Centerset Widespread Lav Faucet (1.2 gpm)	1.2gpm	YES	
11637-H-CP	15	Coralais® 1.5gpm Showerhead	1.5gpm	YES	
7395-CP	10	Showerarm & Flange	n/a	n/a	
98771-CP	15	Awaken® handshower cradle	n/a	n/a	
72420-H-CP	15	Awaken®B90 1.5 gpm multifunction handshov	1.5gpm	YES	
45982-CP	15	Awaken® 60" ribbon hose	n/a	n/a	
15270-4-CP	only have (3) no hose coming in 8	Coralais® Laundry Faucet	2.2gpm	n/a	* only have 3 laundry faucet
15136-S-CP	5	Coralais® Slip Fit Bath Spout	n/a	n/a	
15173-F-CP	8	Coralais® three-hole kitchen sink faucet with 8-1/2" spout, matching finish sidespray through escutcheon and lever handle	1.5gpm	n/a	
810T21-5AFA-CP	2	Triton® Bowe® 1.8 gpm kitchen sink faucet with 8-3/16" swing spout, matching finish sidespray, aerated flow and lever handles	1.8gpm	n/a	

EGLE PILOT | 2021

ETNA Supply | DETROIT (Wixom)

PO# P100633992 (Tub Spouts PO# P100633451)

Product Category	SKU	QTY	SUGGESTED INITIAL XFER to Detroit
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Tub Spouts (in Grand Rapids currently)	*15136-BN*	*97*	*10*

DAWN FISCHHABER | KOHLER CO.
dawn.fischhaber@kohler.com
Mobil: 517.304.9570

Internal Communication: For internal partner use only.

DRAFT DRAFT DRAFT

HPHRC SURVEY

Questions for residents after their plumbing work is completed

HPHRC
Highland Park
Human Rights Coalition

Name: _____ Interviewer's name: _____

Address: _____ Interview date: _____

Phone: _____

1. What **DATE** did you receive your first call from the plumber?

2. On the phone call, did the plumber ask you about the type of work you needed done in your home?
   Yes No Can't remember

3. What **DATE** did the plumber arrive at your home?

4. Did the plumber have a written work order? **Yes No Can't remember**

5. When the plumber arrived at your home, did he/she have a conversation with you about the work that would be done in your home? **Yes No Can't remember**

6. Did you agree with the plumber's assessment of the work he/she would do in your home?
   Yes No Can't remember
   a. If no, why not?

7. When the plumber was done, did he/she explain all of the work that was done in your home before he/she left?
   Yes No Can't remember

8. Did the plumber leave or take the plumbing fixtures in your home that were replaced?
   Took them all Left some of them

9. Are you satisfied with the plumbing work that was done by the plumber? **Yes No Somewhat**
   a. If no or somewhat, please explain:

10. Are there any other water leaks in your home that still need to be fixed? **Yes No Not sure**
    If yes or not sure, please describe. (For example, additional toilets or sinks, showers, laundry area, garden hose spigots)

Is there anything else you want to share about your experience in this water leak pilot project?

Energy-Saving Potential of Water Service Line Leak Reduction in Michigan

Rick Bunch and Daniela Tapia
Michigan Municipal Association for Utility Issues

August 2021

Prepared under Michigan EGLE grant MEO-21-026

Contents

Figures

Tables

Introduction

Water service lines burst into the Michigan public consciousness in recent years, when it was discovered that water customers in the City of Flint were being exposed to high levels of lead in drinking water originating in their service lines (SLs). Until then, most people thought about water service lines only on the rare occasion when a nearby homeowner had to excavate their front lawn because a service line leak turned it to mud or flooded their basement.

In the wake of the Flint water crisis, the State of Michigan enacted the Revised Lead and Copper Rule. It requires that water utilities in Michigan within 20 years identify and replace all service lines that are lead or galvanized previously connected to lead (GPCL). While compelling from a public health standpoint, this requirement departs from historical practice by making the water utility responsible for replacement of the service line. Normally, the property owner is responsible for installing and maintaining the service line beyond the curb stop.

Identifying and replacing all service lines covered by the Revised Lead and Copper Rule imposes an enormous contingent financial burden on local water utilities. Many utilities are already burdened by the need to replace aging pumps, treatment equipment and mains, or to improve quality of water and wastewater treatment. Further, lead and galvanized lines generally serve older homes, disproportionately located in core cities like Detroit and Flint that already face financial difficulties. Water utilities serving these cities have severely constrained ability to raise rates to pay for lead service line (LSL) replacements.

However, service lines are financially problematic not only when they need to be replaced for public health reasons. "The majority of both leakage events and leakage volume losses occur on customer service connection piping."[1] Many service lines leak, and many service line leaks go undiscovered at length. Because service lines are "upstream" of the customer's meter, these leaks represent non-revenue water for the utility – a cost that must be passed on to all customers, rather than billed to the customer whose line has broken.

Leaks impose various costs on a water utility and its ratepayers. First, leaks mean that the utility must install and operate expensive sourcing, transmission, treatment, and distribution capacity for more water than its customers need, since some of that water will never reach a customer. Second, locating and fixing leaks can be very costly. Third, leaks may cause damage to public or private property. Fourth – and our concern here – leaks represent waste of all the energy used to produce and supply the water up to the point of the leak.

Costs imposed on water utilities by leaks are not only largely avoidable but can be significant as well. Most local governments use more energy to treat and supply water than for any other purpose. An increasing number of local governments are looking for ways to spend less money on energy, and many are adopting climate change policies and goals that motivate them to use less energy.

The question arises, then, whether there is a case to be made that fixing leaks in service lines can reduce energy waste significantly and measurably enough to justify more aggressive practices for managing and detecting leaks and replacing lines. Certainly, no homeowner wants to wait 20 years to have their LSL replaced with safer material. A utility that finds it can save money by replacing LSLs faster than the law

[1] AWWA. 2016. Manual M36 *Water Audits and Loss Control Programs.* Denver, Colo.: AWWA, 175.

requires will not only reduce costs and possibly avoid rate increases, but also will satisfy its public health obligations more quickly.

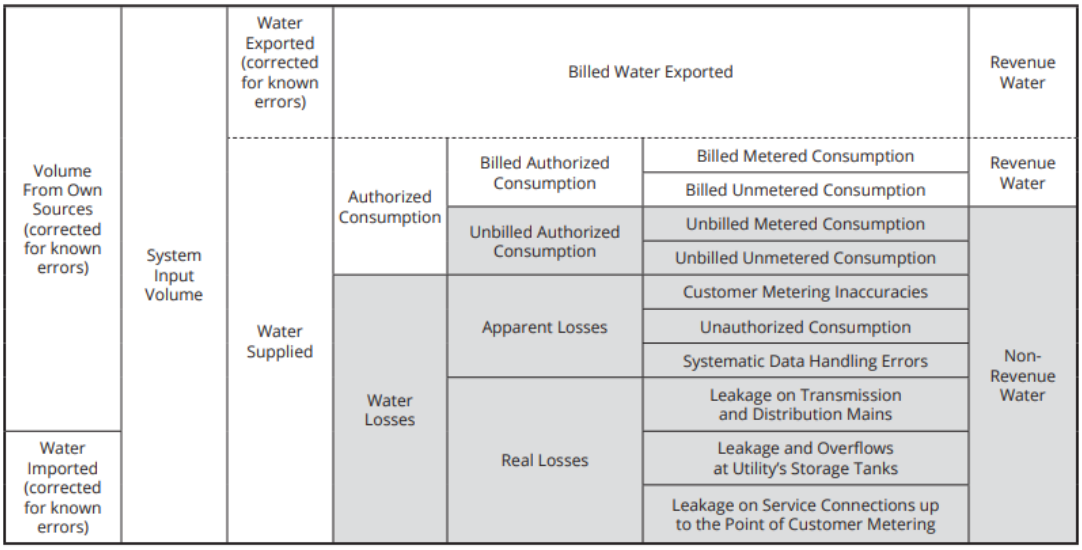
The purpose of this study is to assess how much energy is wasted in the production of water that leaks from water service lines in Michigan and to determine where energy could be saved if SL leaks were reduced. Demonstrating previously unrecognized, or unquantified, may inform water utilities' plans for financing and implementing SL monitoring, management, and replacement programs. Accordingly, our research addressed three questions:

1. How much energy is wasted by leaks from lead service lines in Michigan?
2. How much energy is wasted by leaks from other water service lines in Michigan?
3. Where could water utilities reduce energy use by fixing leaking service lines?

Water Loss

The International Water Association (IWA) and the American Water Works Association (AWWA) have developed standard terminology and methods to assist water systems in tracking water losses and in performing water audits as shown in Figure 1.

Figure 1: Water Balance illustrating different types of losses[2]



- ***Real Losses**, also referred to as physical losses, are actual losses of water from the system and consist of leakage from transmission and distribution mains, leakage and overflows from the water system's storage tanks and leakage from service connections up to and including the meter...*
- ***Non-Revenue Water** (NRW) is water that is not billed and no payment is received. It can be either authorized, or result from apparent and real losses. Unbilled Authorized Consumption is a component of NRW and consists of unbilled metered consumption and unbilled un-metered consumption (e.g., line flushing, firefighting, and street cleaning).*

Average overall real water loss in systems is estimated at 16%, with up to 75% of that being recoverable.[3] In most well-run systems, the greatest annual volume of real losses occurs from long-running, small-to-medium-sized leaks on customer service connections.[4] "Although their leakage rates are low, the annual volume of hidden leakage losses is usually a significant proportion of the total leakage volume and far exceeds the water lost in catastrophic, visible main break events."[5]
Many of these hidden leaks may be addressed by aggressive monitoring and replacement of service lines. In addition, many detectable leaks may be prevented by replacing service lines before they break. This is

[2] AWWA *Manual M36*, 38.
[3] Thornton, J., Sturm, R., and Kunkel, G. *Water Loss Control Manual* (2nd Edition), McGraw-Hill, 2008.
[4] Brown, T.G., D. Huntington, and A. Lambert. Water loss management in North America—Just how good is it? In Proceedings, Technical Session on Progressive Developments in Leakage and Water Loss Management, Distribution System Symposium. Denver, Colo.: American Water Works Association. 2000.
[5] AWWA, *Manual M36*, 172.

a plausible outcome because research has shown a direct relationship between the ages of various service lines, their material composition, and their propensity to develop leaks. Thus, a proactive program of monitoring, managing, and replacing service lines may significantly reduce both hidden and detectable leaks, preventing water waste and the waste of the energy embodied in it.

Energy Use in Drinking Water Production and Supply

Energy is used to extract water at its source, transmit it to treatment works, treat it to satisfy safe drinking water standards, pump it through the distribution system to end users, and pump and treat wastewater. Water that is lost to leaks before it reaches a meter represents waste of the energy used upstream of that point. Because service lines are the endpoint of the distribution system, service line leaks represent a waste of all energy used to source, transmit, treat, and pump the water to that point.

The amount of energy used to supply water varies significantly among utilities. Broadly speaking," …wastewater plants and drinking water systems can account for up to one-third of a municipality's total energy bill. A 10 percent reduction in U.S. drinking water and wastewater systems costs would collectively save approximately $400 million and 5 billion KWh annually".[6]

A study of Wisconsin water utilities done by Focus on Energy found the two most important variables determining energy use were the size of the utility and the water source.[7]

> Utilities in Wisconsin serving more than 4,000 customers used an average of 1.81 KWh/1,000 gallons of water supplied. Utilities serving fewer than 1,000 customers used an average of 2.41 KWh/1,000 gallons.
>
> Utilities sourced from surface water used an average of 2.16 KWh/1,000 gallons and those sourced from groundwater used 2.01 KWh/1,000 gallons.

Other variables that can affect energy use in drinking water systems include transmission and distribution distances, topography, quality of source water and age, condition and control systems of pumps and treatment systems. The Wisconsin study found that "More than 90% of energy consumed in producing and delivering drinking water is used for pumping."[8]

The Wisconsin figures are available because the state's Public Service Commission regulates water utilities and requires them to file annual reports that include energy consumption. Water utilities in Michigan are not required to file similar reports and thus comparable, comprehensive data are not available for Michigan.

Wisconsin's water systems appear to be reasonably comparable to Michigan's, in terms of water sources, climate, and topography. We found, however, that energy use by major water utilities to supply drinking water in Michigan is generally higher than that reported for Wisconsin:

[6] U.S. EPA. ENERGY STAR for Wastewater Plants and Drinking Water Systems. Available: http:// www.energystar.gov/index.cfm?c=water.wastewater_ drinking_water.
[7] "Water & Wastewater Industry Energy Best Practices Guidebook", 4.
[8] "Water and Wastewater Industry Energy Best Practices Guide", 4.

Table 1: Energy Intensity in water supply for some utilities in Michigan

Water Utility	Source Water	KWh/1,000 Gallons
City of Ann Arbor	Surface (~85%) Ground (~15%	2.66[9]
City of Grand Rapids	Surface	2.38[10]
Lansing Board of Water and Light	Ground	2.71[11]
City of Mount Pleasant	Ground	2.22[12]
Kalamazoo Lake, Sewer, and Water Authority	Ground	2.01[13]

According to the Michigan Department of Environmental Quality (now EGLE), 45 percent of the Michigan population is served by groundwater, while 55 percent is served by surface water or water from the Great Lakes.[14]

Table 2: Weighted average energy intensity in Michigan's water supply (KWh/1,000 gallons)

Source	Average	% of state	Weighted Total
Groundwater	2.31	45%	1.04
Surface water	2.52	55%	1.39
Weighted average			**2.43**

We arrive at an estimated statewide weighted-average energy intensity of 2.43 KWh/1,000 gallons of drinking water supplied by municipal systems. Table 2.

Service Line Leaks May Increase Energy Used in Wastewater Treatment

This paper is not directly concerned with energy used to pump and treat wastewater. It is relevant to acknowledge here, though, that "(S)ignificant volumes of leakage drain into community waste or stormwater collection systems and are treated by the wastewater treatment plant—thereby experiencing two rounds of expensive treatment without providing beneficial use."[15] We found no data or methodology to quantify how much leakage drains into wastewater treatment systems, however, and consequently could not quantify marginal energy use in treating that water.

We note, however, that large water utilities in Wisconsin require between 2.3 and 7.3 KWh/1,000 gallons of water treated.[16] This range is up to 3x the energy required to produce and supply drinking water, which we derive below. Thus, if we suppose that one-third of water leaked from service lines drains into and is

[10] Brian Steglitz, Manager of Water Treatment Systems for the City of Ann Arbor, email to author Tapia, May 20, 2021.
[10] Chad Reenders, Water Plant Supervisor at Grand Rapids, email to author Tapia, May 27, 2021.
[11] AWWA Utility Benchmarking Program, 2020.
[12] Jason Moore, Mt Pleasant DPW director, email to author Bunch dated August 2, 2021.
[13] Joseph Bonhomme, Water Resources Division Manager for the City of Kalamazoo, to author Tapia, August 5, 2021.
[14] Michigan Department of Environmental Quality. *DEQ Fact Sheet – Groundwater Statistics.*, January 2018.
[15] AWWA, *Manual M36*, 185.
[16] Wisconsin Focus on Energy. "Water & Wastewater Industry Energy Best Practices Guidebook", 2020, 6.

treated by wastewater systems, and further suppose that treating that water requires 3x the energy required to produce it, then total energy wasted in treating water leaked from service lines is comparable to the energy wasted in producing it.

Reducing energy wasted by treating leaked water is not only a case of reducing those leaks, but also of treatment-works efficiency. In the Wisconsin study, facilities that have the same treatment methods and comparable biochemical oxygen demand vary substantially in energy intensity, suggesting that systems with better equipment or management methods can realize significant energy savings.

However, because we have no method for measuring or estimating what volume of leaked water drains to wastewater collection systems, we can only speculate how much energy is used to treat it. This topic may be worthy of deeper examination, but we do not consider it further in this analysis.

Energy Efficiency Measures Linked to Water Conservation

Michigan's regulated utilities operate energy waste reduction (EWR) programs that, among other things, provide financial incentives to customers to invest in energy efficiency measures. Rebates are tied to the amount of energy the measure is projected to save over its lifetime.

Utilities currently offer rebates for two kinds of water-related efficiency measures. First, they support replacement of water treatment equipment and pumps operated by water utilities with more-efficient equipment. Second, they support measures on the customer side of the meter that reduce energy used to heat water. For example, rebates support installation of low-flow showerheads, which by reducing the total amount of water flowing from the showerhead also reduce the amount of energy used to heat that water.

The showerhead example relates to an exclusion in the EWR rebates scheme: they do not support measures that reduce energy used by a water utility by reducing household leaks and waste of cold water. The showerhead rebates could expand to include energy saved by allowing the water utility to supply less water to the house, in addition to the heating energy saved. No standard measures have been developed in Michigan assigning "deemed savings" to cold-water efficiency investments, either in front of or behind the meter. Energy utilities, or their customers, could propose their own "custom measures" with energy rebates specifically figured for a particular customer, water utility and water-efficiency project. Although Consumers Energy has studied the feasibility of custom measures for cold-water conservation[17], we are not aware that any utility or customer in Michigan has adopted such measures.

Additionally, energy utilities in Michigan currently provide no rebates for water utility programs that reduce water loss on the utility side of the meter, including service lines, for two reasons:

1. **Lack of additionality**: EWR rebates can support only projects that would not happen absent the rebate, or that would be significantly delayed. Repairs to water utility main breaks happen as soon as they are discovered – it is not necessary to offer a rebate to make them happen.
2. **Measurement challenges**: it can be hard to know how much water, and therefore how much energy, is wasted by a leak. It is also problematic to guess how long that leak would continue, which makes estimating lifetime savings difficult.

In the case of lead service lines, the additionality requirement poses an especially high hurdle because projects required by law are not eligible for rebates: they are going to happen anyways and offering the rebate will make no difference. Under the existing statutory provisions, it appears the strongest potential case for including leak-reduction investments in EWR rebate schemes would be to demonstrate that the potential for energy savings motivates the water utility – or their customers – to act sooner than they otherwise would. Conceivably, for example, energy savings from SL leak reduction might motivate a water utility to replace LSLs faster than required under the Revised Lead and Copper Rule.

[17] Cadmus Group (David Molner, Amy Ellsworth, Emily Miller, Shannon Donohue), "Energy Savings from Water Associated Efficiency Measures", memo prepared for Consumers Energy dated February 4, 2020. Attached as Appendix G.

Reducing Water Leaks May Not Reduce the Energy Used to Supply It

Even when it is possible to measure how much water is saved by a given measure – whether behind the meter, or SL or mains replacement– it is not safe to assume that implementing it will save energy "upstream". Supplying less water will allow a utility to use less energy only if it can turn down, or shut down, its equipment. As noted above, about 90% of energy consumed by water utilities in Wisconsin is used in pumping. A pump can use less energy, in proportion to leak remediation efforts, only if it is equipped with a variable frequency drive. This is not the case at Great Lakes Water Authority (GLWA) which, cannot change its pump speeds.[18] If distribution utilities were to reduce how much water they buy from GLWA, the only way GLWA could reduce the amount of water it supplies for distribution would be to partially close valves to reduce outflow from the pumps. The pumps would continue to run at full speed, using just as much energy as ever and possibly more, owing to the inefficiency of forcing the pumps to strain against partially closed valves.

The GLWA example is akin to installing a dimmable lightbulb without also installing a dimmer switch: there is no way to realize the energy efficiency benefits of the dimmable bulb without also installing the necessary controls. Customers of GLWA have straightforward incentives to reduce water waste, allowing them to buy less water from GLWA, and reducing pumping and storage costs in their distribution systems. These efficiencies, however, may not reduce impact of GLWA operations because GLWA cannot set their pumps to run slower.

[18] Eric Griffin, GLWA Energy Program Manager, interview with author Bunch, May 10, 2021.

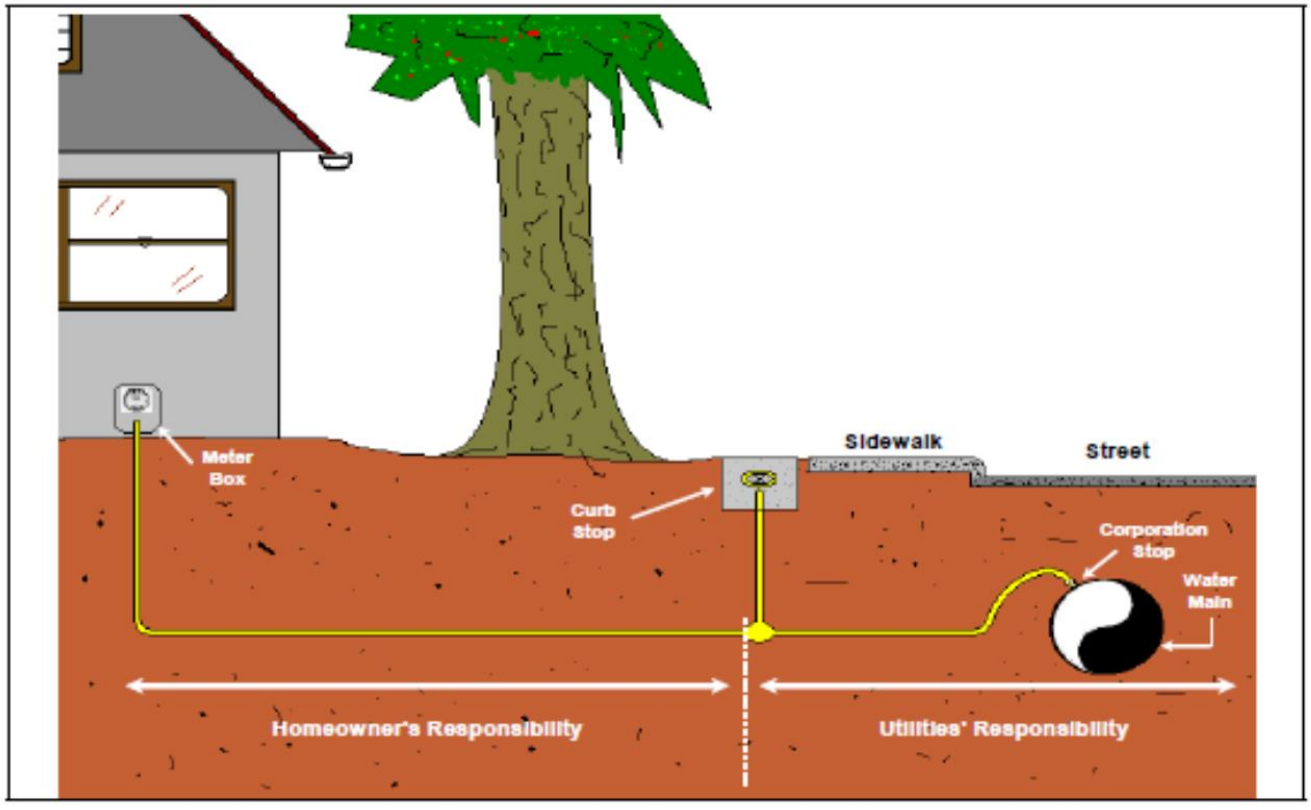
What are water service lines?

Water service lines, or SLs, serve customer premises by spanning the distance from the utility main to just inside the premises. SLs have a public side, spanning from the corporation stop attached to the main to the curb stop at the edge of the customer's property. The private side of the SL crosses the customer's property, from the curb stop to just inside the building. In most cases in Michigan, the SL ends just inside the building at the meter.

The private side of the SL tends to be more problematic for management of leaks or proscribed materials than the public side. A leaking service line normally imposes financial cost on the water utility, in the form of non-revenue water. The property owner has no reason to care about an SL leak unless they notice puddles in the front yard above the SL, or if the water leaks through their building foundation into the basement.

In comparison, the public side of the SL is more likely to be monitored by the water utility, which has both incentive and access to fix leaks or replace lead or galvanized components. Many water utilities also replace or upgrade water lines concurrent with water main or road improvement projects.

Figure 2 Diagram of Typical Water Service Line



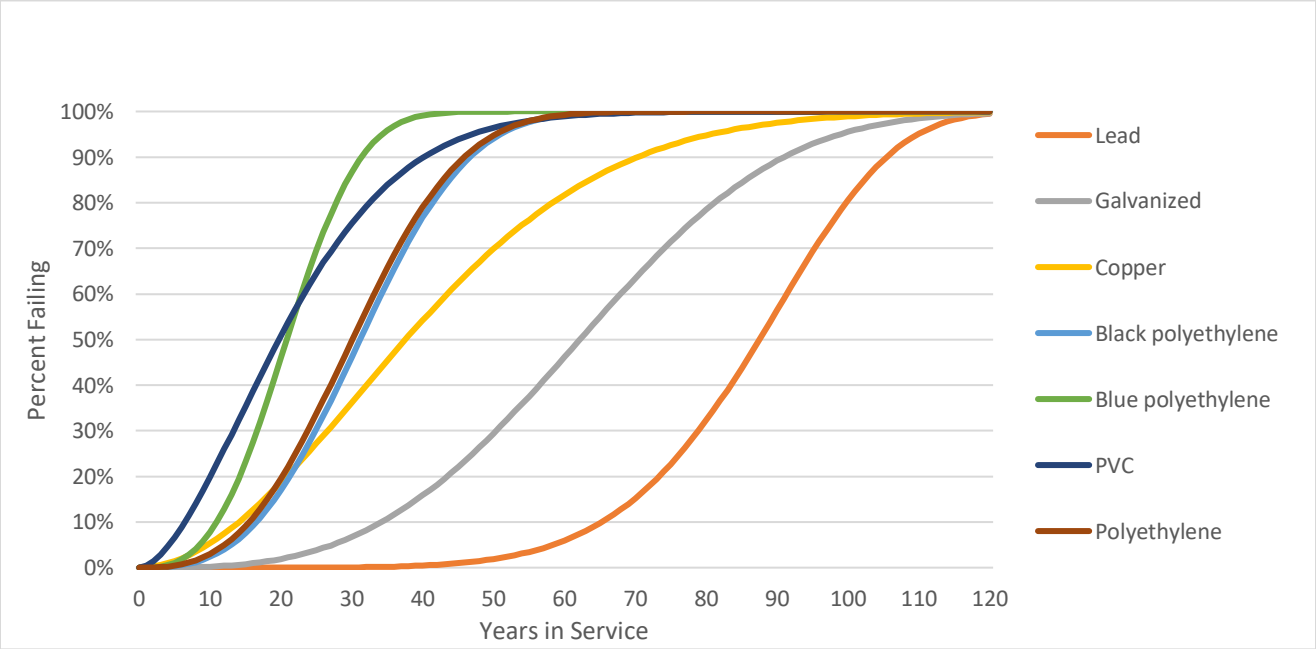
Source: *Installation, Condition Assessment and Reliability of Service Lines*, AWWA Research Foundation, 2007. Figure 4.1

Service Line Leaks

Because property owners are not financially responsible for SL leaks on their property, and often suffer no property damage or other consequences from them, they have reduced incentive to choose durable materials, install them properly and monitor them over time. Common service line materials include copper, PVC, various kinds of polyethylene, and historically lead and galvanized steel.[19] These materials vary in their durability, and in the volume of water they leak once they fail. Ironically, lead was the material of choice for service lines for decades because its flexibility made it more durable than other choices, and less likely to suffer large leaks.

Service lines can develop leaks for a variety of reasons, including freezing, human interference, shifting ground, tree roots and faulty installation. Service lines are more likely to develop leaks as they age. The probability of failure is also related to material composition. Survival analysis of service lines shows, for example, that lead service lines reach 50% failure rate at about 88 years, whereas 50% of PVC lines fail within 20 years of installation.[20] Figure 3 depicts cumulative probability of failure over time for various service line materials.

Figure 3: Cumulative Failure Rates of Various Service Line Materials



Source: Lee and Meehan, 2017. See detailed data in Appendix A.

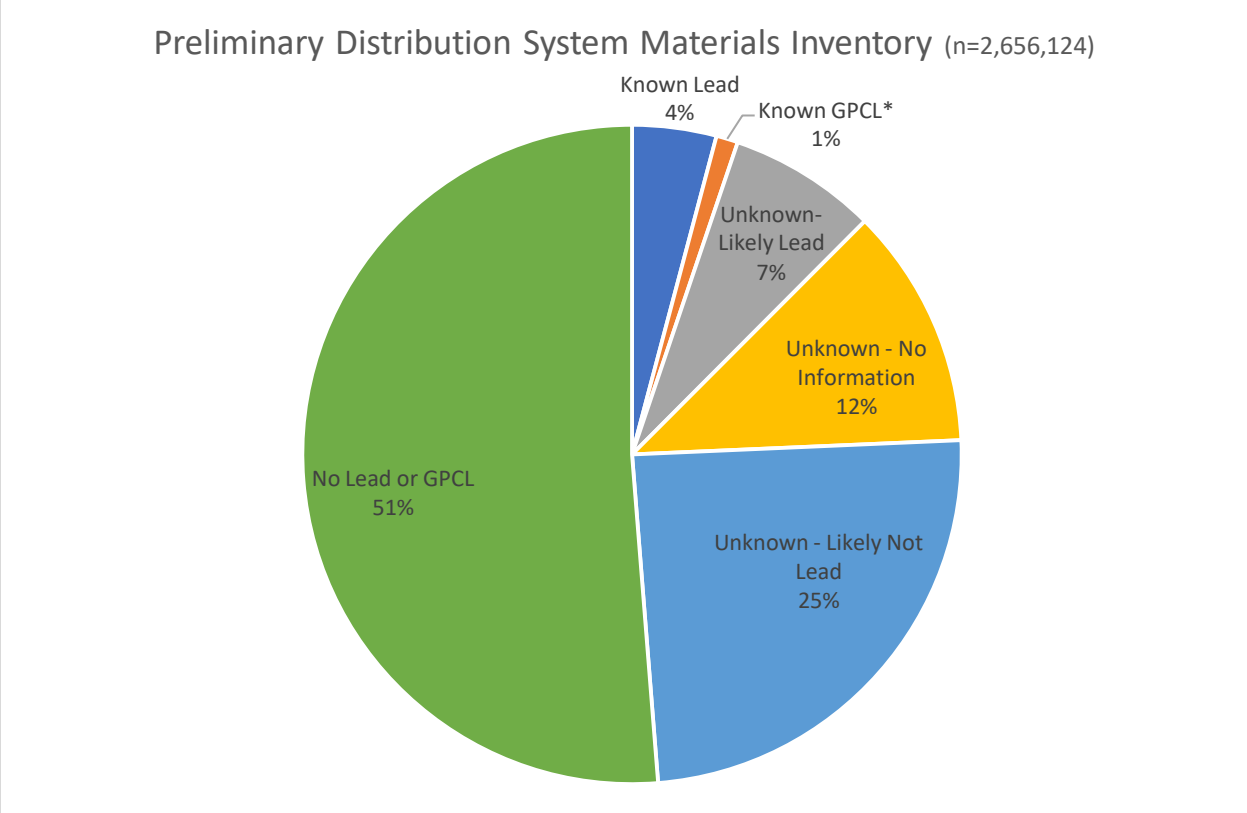
Service Line Materials and Failure Rates

Complete, rigorously verified data on prevalence of service line materials in Michigan will become available in 2025 when water systems are due to submit their Complete Distribution System Materials Inventories (CDSMIs) to the state, per the Revised Lead and Copper Rule. Water systems submitted Preliminary Distribution System Materials Inventories (PDSMIs) to the State in 2020, with detail only on

[19] AWWA Research Foundation. *Installation, Condition Assessment and Reliability of Service Line*s, 2007.
[20] Lee, J. and Meehan, M., "Survival Analysis of Water Service Lines Utilizing a Nationwide Failure Dataset," *AWWA* 109, no. 9 (2017): 13-21. Cumulative failure rates are reproduced in Appendix A.

materials targeted by the Revised Lead and Copper Rule as shown in Figure 4. The PDSMI methodology does not require reporting utilities to distinguish between the public and private sides of service lines, which may be different since the former is installed and managed by the water utility and the latter is installed by the home builder and managed thereafter by the property owner.

Figure 4. Michigan PDSMI breakdown



Source: Michigan EGLE, 2020.

Additionally, the PDSMI reporting standards specify that a service line having any single lead component should be reported as an LSL. For example, the original lead pipes themselves may have been replaced, leaving only an original lead gooseneck connection to the main. Under the PDSMI standards, however, this entire SL assembly counts as an LSL. The mixed-material/date SL will have a different age and composition, and thus different probability of failure, than the complete original lead SL. The PDSMI reports do not distinguish SLs having components of mixed materials and ages. This data limitation may inflate our estimates of failure rates. More comprehensive data may be available when water utilities submit their CDSMIs in 2025.

Although lead service lines appear to be highly durable, remaining LSLs are old. Congress banned lead service lines in 1986 but they had been largely phased out by the 1960s, making most of them over 50 years old. Survival analysis predicts that 50% of LSLs will develop leaks within 88 years of installation (Figure 3 and Appendix A). While we do not have data establishing the age distribution of remaining lead service lines in Michigan, it appears very likely that many of them are very old, leaking at undetected levels and likely to develop detectable leaks soon.

Galvanized service lines were commonly used until the 1960s.[21] The state's Revised Lead and Copper Rule requires replacement of galvanized lines that were previously attached to lead ("GPCL"). Same as with lead lines, therefore, assessing potential energy savings that result from replacing leaking galvanized pipes is of interest. Survival analysis shows that galvanized lines are second in durability only to lead lines, with half of them developing leaks 62 years after installation (Figure 3 and Appendix A). Although reliable data are not available on age distribution of galvanized lines in Michigan, they entered use more than 100 years ago. It is likely that many of them have developed leaks.

PVC and polyethylene have also been used in service lines. Survival analysis shows these materials are the least durable of commonly used service line materials.[22] Half of all PVC and blue polyethylene pipes leak within 20 years. Polyethylene and black polyethylene have 50% failure rates at about 30 years after installation. (Figure 3 and Appendix A).

Based on conversations with water utility staff, the most used materials for new service lines in Michigan are copper and PEX.[22] PEX is a fairly new material, and we did not find survival analysis data for it. Copper has proven to be relatively durable, though less so than lead and galvanized, with 50% failure rate reached at about 37 years. (Figure 3 and Appendix A)

Cumulative and marginal failure rates for different SL materials are drawn from a nationwide academic study of 47,454 service line failures using data from a national home-repair services firm, HomeServe.[22] The authors found that service line leakage occurs owing to various factors, including temperature and soil corrosivity, that vary across the country. National survival data may not fully represent conditions in Michigan.

Complete data on distribution of service line materials in Michigan will not be available until 2025, with submission of CDSMIs by the water utilities. The age of service lines generally relates to when the building was connected to the water supply main, which varies significantly across the state. It also appears that the choice of service line materials has varied from place to place and over time. Furthermore, from our limited sample it is clear that the amount of energy used to produce and supply water varies significantly around the state. These factors make estimation of statewide SL leakage difficult and imprecise.

To test our methodology and the plausibility of results it generates, therefore, we first develop estimates for water and energy waste attributable to service line leaks in the City of Detroit. Detroit is a good test case for two reasons. It is the largest water utility in the state, and its PDSMI reports the most likely LSLs. In addition, all service lines in Detroit are metallic, making it necessary to develop estimates for fewer SL materials.[23] After presenting our estimates for Detroit, we go on to develop collective estimates for all water systems in Michigan.

[21] https://535plumbing.com/2018/08/25/4-signs-its-time-to-replace-your-galvanized-pipes/. Also, https://americanvintagehome.com/advice-for-older-homes/need-swap-galvanized-pipes/#:~:text=What%20are%20galvanized%20pipes%3F,pipe%20for%20water%20supply%20lines.

[22] Lee and Meehan, 2017.

[23] Bryan Peckinpaugh, Public Affairs Deputy Director at the Detroit Water and Sewerage Department, email to author Tapia, July 26, 2021.

Determining Leak Volumes

To determine overall water loss from service lines, we need to know how many are leaking, how much they are leaking and for how long. Survival analysis, along with information about the age of service lines, can yield an estimate of the number of pipes that are leaking.

The volume of water leaked from SLs is more difficult to determine. We have no direct way to measure water loss from service lines, and not enough data to estimate it using AWWA's water loss component analysis approach. Instead, we rely on AWWA's M36 Water Loss Manual for general guidance on leak estimation. AWWA describes methods for estimating loss from reported leaks, unreported leaks, and unavoidable background leaks (UBL). AWWA attributes the majority of UBL and unreported leak volumes to service lines, and because LSL replacements will reduce both kinds of leaks, we estimate both here. Similarly, AWWA provides only very general guidance on leak duration because it is very difficult to know how long before discovery an SL break occurred.

Unavoidable Background Leaks

AWWA provides a methodology for estimating UBL based on length of mains, number of service connections, length of service connections and average system pressure, with adjustment for overall infrastructure conditions.[24] Because we are not concerned here with leaks from mains, we simply omit the mains term from AWWA's formula, leaving terms for the public and private side of SLs. Thus:

$$UBL\ (1{,}000\ gal/d) = [(0.20 * Lm) + (0.008 * Nc) + (0.34 * Lc)] \times (Pav/70) \times ICF^{1.5}$$ becomes

$$UBL\ (1{,}000\ gal/d) = [(0.008 * Nc) + (0.34 * Lc)] \times (Pav/70) \times ICF^{1.5}$$

Where Lm = Length of mains
Nc = number of service connections (known)
Lc = length of service connections (use national average)
Pav = average system pressure (use 70 psi = middle of 60-80 psi recommended range)
ICF = Infrastructure Condition Factor

For the City of Detroit, using AWWA's methodology, we estimate total UBL from service lines to be 2,329,448,148 gallons/year (See **Appendix B** for calculations). This estimate represents an average of 21 gallons per day per service connection – almost one gallon per hour.

To determine the amount of energy embodied in this leaked water, we use the Grand Rapids municipal water system as a proxy. We are unable to calculate total energy consumption for Detroit water because DWSD is a distribution utility only – Great Lakes Water Authority sources, transmits, treats, and delivers the water and its energy costs are rolled into the price it charges DWSD for water. Grand Rapids is a vertically integrated utility and is a good proxy for Detroit water because it is the second biggest water system in the state and, like Detroit, uses only surface water for sourcing. Thus, we use the Grand Rapids embodied energy figure of 2.38 KWh/1,000 gallons.

At 2.38 KWh/gallon, Detroit's estimated UBL embodies 5,544,087 KWh of electricity per year.

Our estimate is adjusted using an Infrastructure Condition Factor (ICF), per AWWA's methodology. A system in optimal condition will have an ICF of 1. ICF multipliers as high as 4 are not unusual and may be

[24] AWWA, *Manual M36*, 199.

appropriate given that more than half of Detroit's mains have been assessed in poor condition[25]. To be conservative but reasonable, we apply an ICF of 2.

In the context of an LSL replacement program, the term "Unavoidable" may be misleading. It describes leaks that cannot be detected by direct observation or sensing technologies, and that may cost more to find and fix than the water that would be saved. If hidden SL leaks account for 85% of UBL, and almost 80,000 LSLs are going to be replaced over the coming decades, then the costs of finding and fixing those leaks become irrelevant. Therefore, we can expect a substantial reduction in UBL resulting from SL replacements, even if we cannot reliably estimate how much.

Detectable Leaks

AWWA states that the average reported service line leak is 6.9 gallons per minute at 70 pounds of pressure per square inch (psi).[26] 60-80 psi is the target range for most water utilities to provide adequate water pressure to their customers[27].

This assumed psi may be conservative because many water systems operate at higher average pressure. AWWA's survey of North American water systems found that 39% reported average system pressures above 80 psi.[28] Because these are system averages, some segments of these systems are likely to be even higher. "…(W)ater distribution systems operating with pressure levels notably higher than 80 psi may encounter a greater opportunity for high leakage and rates of failure on water distribution piping."[29] However, we did not find average system pressure data for Michigan, and we use 70 psi in our calculations, representing the middle of the recommended range.

Further, we assume that SL leaks average 30 days until repair. This assumption is consistent with AWWA's finding that "unreported leaks on customer service connections may also have variable awareness times [depending on whether proactive or reactive leakage management is employed] … the property owners may not notice a leak for some time after it occurs and may not be motivated to act promptly since they can also have variable repair times depending on the utility's policies... Water utilities that conduct repairs on customer service connections or have programs to handle repairs can keep average repair times at a reasonable level, perhaps on the order of several days. For those systems that rely on customer-arranged repairs, the repair time can extend for weeks or months."[30]

[25] "DETROIT DOUBLES DOWN ON ASSESSMENT OF WATER INFRASTRUCTURE WITH EPULSE", Water & Wastes Digest, July 13, 2021. Accessed at https://www.wwdmag.com/channel/casestudies/detroit-doubles-down-assessment-water-infrastructure-epulse

[26] AWWA, *Manual M36*, 249.

[27] Water Supply Committee of the Great Lakes–Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers, *Recommended Standards for Water Works*, 2007.

[28] AWWA, *Manual M36*, 178

[29] AWWA, *Manual M36*, 177.

[30] AWWA, *Manual M36*, 185.

Lead Service Lines in Detroit

We focus our analysis of water- and energy waste from leaking SLs on Detroit because it has reported the highest estimated count of LSLs in the State according to the PDSMI. Detroit estimates it has 77,198 service lines that are either lead, unknown-likely lead or galvanized previously connected to lead (GPCL)[31]. The Revised Lead and Copper Rule requires the city to replace lines that fall in these three categories.

Another reason we focus on Detroit is because the State of Michigan has approved the City to replace LSLs on a 40-year timeline rather than the standard 20 years set by the Revised Lead and Copper Rule. With the longer timeline, the city can replace LSLs as it replaces adjacent water mains as part of its Capital Improvement Plan,[32] significantly reducing the unit cost. At the same time, however, the longer timeline extends how long old LSLs remain in the ground, allowing more to develop leaks and increasing cumulative water and energy waste.

Finally, Detroit represents a potentially compelling case in point because it stopped installing LSLs in 1945.[33] Widespread phaseout of LSLs occurred nationally about 20 years later, in the 1960s. While Detroit made a good decision to stop using LSLs, the 1945 cutoff also means all of Detroit's LSLs are 76 years or older and have a much higher predicted failure rate than communities with newer LSLs. A 76-year-old LSL is 24.4% likely to have failed, whereas a 50-year-old LSL has a predicted failure rate of only 1.9% (Appendix A). Detroit's surviving LSLs likely cluster in an age range that has the highest projected marginal annual failure rate according to survival analysis, meaning they are more likely to start leaking over the next several decades than cities with average-younger service lines.

Average Loss per Leaking SL in Detroit

SL materials have varying performance characteristics and it is unlikely they all have the same vulnerability to leak or average leak volume. We were unable to locate data on the severity of breaks in relation to service line materials, however, and we use the AWWA figure of 6.9 gallons per minute in our estimate of losses from service lines of all compositions.

First, we must estimate how many leaking service lines are in Detroit. For that, we must estimate how many lines of each material are installed in Detroit, and how old they are.

Ages of Lead Service Lines in Detroit

Installation of LSLs in Detroit ended in 1945.[34] Thus, we assume that their age distribution follows the age distribution of houses built in Detroit before 1945.

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[31] Michigan EGLE, Detroit PDSMI, January 2020.

[32] Smalley, S.A. and Peckinpaugh, B., "Detroit's Robust Full Lead Service Line Replacement Program," Journal AWWA, October 2020, p.43.

[33] Detroit Water and Sewage Department. 2020 Water Quality Report. Detroit's PDSMI report, submitted to EGLE in 2020, estimates 2,240 known lead lines and 77,197 unknown-likely lead. We use the number from the Annual Report because it is more recent and may reflect that some lines have been replaced since the PDSMI was submitted.

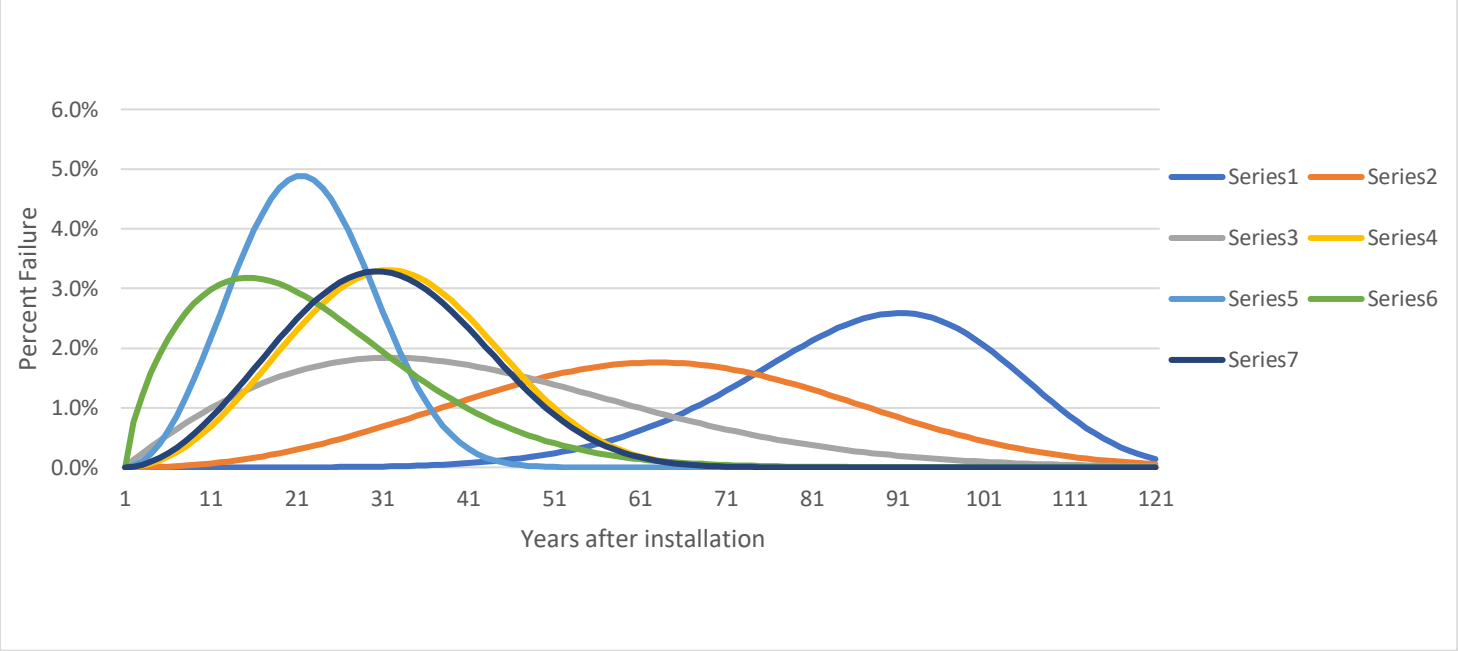
[34] The Detroit LSL ban starting in 1945 may have applied only to the public side of the SL. Homebuilders may have been able to continue using their preferred materials, including lead, for the private side of the SL after that date. CDSMIs, due in 2025, may provide more complete and accurate information.

The US Census Bureau provides housing data going back to 1940 in decadal bundles[35], and cumulative before then. Based on this data we assume that:

- Two-thirds of the 79,736 houses built in Detroit in the 1940s were built in the second half of the decade, during the post-World-War II economic expansion. We assume the other 1/3 were built steadily between 1940 and 1944 (after which LSLs were no longer used).
- 80% of the 117,572 homes built before 1940 were distributed evenly across the 40 years starting in 1900, and the remaining 20% were built before 1900.

We estimate that 120,636 houses were built in Detroit from 1900 to 1944 – greater than the 77,198 LSLs Detroit estimated in its PDSMI. Presumably some of the houses built in Detroit during that era no longer exist, and some have already replaced their original LSLs. We therefore apply an adjustment factor of 0.640 to normalize our calculations to the number of LSLs Detroit currently reports (figured as reported LSLs divided by total homes built). (see Appendix C)

Figure 5. Marginal Annual Failure Rates of Various Service Line Materials



Source: Lee and Meehan, 2017.

For each year, we use the survival analysis probability density function to determine the marginal failure rate of LSLs of that age (Figure 5). These curves show, for example, that blue polyethylene has peak marginal failure rate of 4.9% at 20 and 21 years after installation, whereas LSLs have peak marginal annual failure rate of 2.6% from 88 to 92 years after installation. The summation of marginal failure rates determines the cumulative failure rates shown in Figure 3.

[35] U.S. Census Bureau (2020). *Year Structure Built*. American Community Survey 2019 1-year estimates. https://data.census.gov/cedsci/table?t=Year%20Structure%20Built&g=0400000US26&tid=ACSDT1Y2019.B25034&hidePreview=.

We multiply the marginal failure rate times the number of houses built in that year to determine the total number of LSLs installed in that year that will fail in 2021. We multiply that figure by 6.9 gallons per minute, annualize the result and apply the adjustment factor to find total LSL leakage for 2021.

For 2021, this approach yields estimated leakage from LSLs breaks in Detroit of 390,642,388 gallons (Table 3). This amount does not include Unavoidable Background Leaks.

Table 3. Estimated LSL Leaks and Waste Energy in Detroit, 2021.

LSL leaks (count)	1,311
Leak volume (gallons)	390,642,388
Embodied energy waste (KWh)	929,729

Again using energy intensity of the Grand Rapids water system as a proxy, we estimate energy waste from LSL water leaks of 929,729 KWh. This is about the same amount of electricity as that used by 4,099 54-watt LED streetlights for an entire year. See also Appendix C.

Other Leaking Service Lines in Detroit

In its PDSMI, Detroit reports 231,383 service lines of materials not covered by the Revised Lead and Copper Rule: Unknown-No Information, Unknown-Likely Not Lead and No Lead or GPCL.

Detroit builders, per city code, began using copper pipes for lead service lines after 1945. Furthermore, Detroit has service lines made only of metallic material.[36] Thus, Detroit presents a relatively simple scenario of installing lead SLs before 1945 and copper thereafter. However, we cannot assume that the age distribution of copper service lines will simply follow the age distribution of homes built in Detroit from 1945 onwards. Our allocation of Census Bureau housing data estimates that 215,472 homes have been built in Detroit since 1945 – fewer than the 231,383 copper service lines (CuSLs) we estimate above. Some of the copper service lines may be serving homes built before 1945 that originally had LSLs, or they are serving non-residential customers. To stay conservative with our projections, we assume those replacement SLs are as young as possible. Specifically, we assume they were installed as recently as 2020 and replaced LSLs originally installed 100 years earlier. We allocate these replacement copper SLs working back in time from 2020 until we have at least as many new and replacement copper SLs as the 231,383 non-lead SLs reported by Detroit. This is not a realistic temporal allocation for replacement copper SLs, but it employs conservative assumptions and will thus yield a conservative estimate of leaks and water loss.

For data and calculations, please see Appendix D. We estimate that 1,927 copper service lines in Detroit will develop leaks in 2021. We again assume average leak rate of 6.9 gallons per minute and leak duration of 30 days. These assumptions yield estimated water loss from leaking copper service lines in 2021 of 574,514,784 gallons.

At 2.38 KWh/1,000 gallons of water, this amount of leakage will waste 1,367,345 KWh in 2021.

[36] Bryan Peckinpaugh, Detroit DWSD Communications Deputy Director, email to author Tapia, July 26, 2021

Summary - Detroit

Adding projected LSL and other SL line breaks plus Unavoidable Background Leaks from SLs in 2021, we estimate total leakage of 3,294,605,320 gallons representing 7,841,161 KWh of embodied energy. (Table 4)

Table 4: 2021 Projected SL Leaks in Detroit

	LSL	CuSL	UBL	Total
Number	1,311	1,927	n/a	3,238
Gallons	390,642,388	574,514,784	2,329,448,148	3,294,605,320
KWh	929,729	1,367,345	5,544,087	7,841,161

These estimates may be relevant in assessment of Detroit's plans to replace service lines over a 40-year period, rather than the 20-year standard replacement period under the Revised Lead and Copper Rule. The City currently plans to replace about 2,000 LSLs/year in conjunction with mains replacements as part of its Capital Improvement Plan, at an average cost of $1,600/LSL.[37] The City estimates that replacing LSLs independent of mains replacement would cost $6,000/LSL. To replace all LSLs within 20 years, the City would have to replace about 2,000 more per year than it currently plans, for a total marginal cost of about $12,000,000 (= 2,000 LSLs x $6,000/LSL).

However, the $6,000/LSL cost may assume that the lines would be fully excavated and removed, because current replacements are done in conjunction with excavation and replacement of mains. Many cities plan, instead, to leave LSLs in place and either insert new lines inside the LSLs or horizontal-bore new lines parallel to the LSLs. We understand these techniques are cheaper to implement than excavation[38] and therefore might be preferable if an LSL were replaced as a standalone project, not in conjunction with excavation of adjoining mains.

DWSD does not directly pay all costs of electricity associated with water production. GLWA embeds electricity costs of sourcing, transmitting, treating, and supplying water in the rates it charges DWSD. Furthermore, GLWA cannot currently pump less water if a customer, such as DWSD, uses less water because GLWA's pumps are not variable frequency drives (VFD). If it cannot turn down its pumps in response to reduced demand from customers, then GLWA's energy consumption will not respond to customer demand either. Therefore, we cannot predict how much water-supply cost DWSD would save by reducing service line leaks, nor how much energy would be saved in the GLWA-DWSD system. Our estimate is, therefore, illustrative but by no means definitive.

[37], "Detroit's Robust Full Lead Service Line Replacement Program,".43.

[38] Boyd, G.R. et al, "Lead pipe rehabilitation and replacement techniques for drinking water service—survey of utilities," Tunneling and Underground Space Technology, 2001.

Statewide estimates

To estimate statewide annual water and energy loss from SL leaks, we first estimate how many homes were built in Michigan every year from 1900 onwards. We use US Census housing data, which is generally provided in decadal bundles. We assume the number of houses built in any given year is 10% of the decade total. This assumption does not recognize various recessions and booms that occurred within decades, but we assume those fluctuations even out over time and will not materially affect overall totals for the last 120 years.

Next, we estimate how many service lines of each common material are currently in service. Except for LSLs (known, likely and GPCLs), we do not yet have material distribution data for Michigan. Instead, we start with a nationwide SL material distribution survey conducted by AWWA in 2002.[39] However, the AWWA data must be adjusted to reflect what we do know about SL material prevalence in Michigan. From the PDSMI reports, we know that Michigan has more known and likely lead (11.4%) than in the national sample (lead = 3.6%), so we redistribute the other SL materials across the other 88.6% according to their prevalence in the national sample. See Table 5.

Table 5. Estimated Distribution of Service Line Materials in Michigan.

SL material	% of national total*	% of non-lead total	Estimated % in Michigan	Estimated Michigan count
Copper	60.5%	63.0%	55.8%	1,464,983
Polyethylene	12.4%	12.9%	11.4%	300,261
Galv. Steel (inc. GPCL)	8.6%	9.0%	8.0%	208,246
PVC	6.3%	6.6%	5.8%	152,552
Known & Likely Lead	3.6%	n/a	11.4%	331,523
Polybutylene	2.6%	2.7%	2.4%	62,958
Steel	1.7%	1.8%	1.6%	41,165
Cast Iron	1.3%	1.4%	1.2%	31,479
Asbestos Cement	0.4%	0.4%	0.4%	9,686
Other	2.2%	2.3%	2.0%	53,272

NB: AWWA national survey totals do not sum to 100%

**Source: Installation, Condition Assessment and Reliability of Services Lines, AWWA 2007, Table 2.1.*

The AWWA survey did not provide separate totals for polyethylene, blue and black polyethylene per the Lee/Meehan survival analysis, so we assume the AWWA's estimate for polyethylene comprises all three types. Further, the Lee/Meehan survival analysis research does not cover some of the lesser-used materials included in the AWWA survey, including polybutylene, cast iron, steel and asbestos cement.

[39] AWWA Research Foundation, 2007, *Installation, Condition Assessment and Reliability of Service Lines*, Table 2.1.

Because these materials comprise only about 6% of the national sample, they are unlikely to significantly alter our findings and we exclude them from further analysis (Table 5).

The number of SLs reported by water systems in Michigan for the PDSMI totals 2,656,124, a smaller number than the 4,629,605 homes we estimate were built in Michigan since 1900. Some of the homes built since 1900 no longer exist. Also, 27% of Michigan homes are served by wells or other private water facilities rather than municipal water systems.[40] However, we simply assume that the age distribution of homes with service lines connected to municipal water systems follows the age distribution of all homes in Michigan since 1900. We estimate there are 2,457,564 total lead, copper, galvanized, polyethylene and PVC lines in the state. This is less than the total reported in the PDSMI because of our exclusion of lesser-used materials for which we have no survival analysis data.

Next, we estimate the period over which each common SL material has been in use. Again, very limited data is available regarding history of use in Michigan for these materials. We know that lead was not used in Detroit starting in 1945 but was used elsewhere into the 1960s. Similarly, Detroit began using copper SLs before most other places. Statewide, then, we simply use 1955 as the average phase-out date for LSLs and the initial use date of copper. For history of other materials, we refer to dates when AWWA passed technical specifications, as well as various Internet references.[41] In short, our estimates of periods of use of various materials are not authoritative.

Based on rough periods of use of each material, and total SLs of that material, we can estimate the number of SLs of that material installed in Michigan in each calendar year. Using the survival analysis probability density functions, we can then project how many of those lines will start to leak in 2021. See Appendix E.

To estimate statewide UBL, we use a similar approach as for UBL in Detroit. Statewide, however, we apply an Infrastructure Condition Factor of 1, representing excellent infrastructure condition. This assumption is likely to be very conservative, but we are aware of no overall statewide infrastructure assessment, and conditions likely vary greatly among water systems. Even employing the most conservative ICF, UBL nearly equals projected losses from service line breaks. See Appendix F.

We estimate total losses from all SL breaks and UBL statewide in 2021 will be 21,550,571,040 gallons of water, representing 52,367,888 KWh of embodied energy. Table 6 shows how LSL breaks, other SL breaks and UBL contribute to this total.

Table 6. 2021 Water and Energy Waste Projections from SL Leaks in Michigan.

	Known & Likely Lead SLs	Other SLs	UBL	Total	Units
# of SL Leaks	5,656	33,270	n/a	38,926	count
Volume of SL Leaks	1,686,015,297	9,917,123,056	9,947,432,687	21,550,571,040	gallons/year
Embodied Energy waste	4,097,017	24,098,609	24,172,261	52,367,888	KWh

[40] Cadmus Group, 2.

[41] See prior references. Also, AWWA approved standard for HDPE pipe for water tubes up to 75 mm (3 in.) in diameter in 1978. In 1975, AWWA approved the first edition of AWWA C900, "AWWA Standard for Polyvinyl Chloride (PVC) Pressure Pipe.

We do not attempt to estimate marginal energy use from wastewater treatment of leaked SL water that flows into treatment systems. As discussed above, we have no way to estimate this volume, but it is plausible to suppose it rivals the amount of energy embodied in leaks from SLs.

Recommendations

The American Water Works Association (AWWA) and several water loss experts we spoke with over the course of our research maintain that leaking service lines and their associated curb and corporation stops account for most real water loss at most US water utilities. By applying survival analysis to the estimated ages of service lines in Michigan, we show there are likely significant energy costs associated with service line leaks. Water utility managers will have to assess how these and other costs as well as public health outcomes trade off against replacing LSLs faster than planned or mandated. They must also consider whether the energy costs of leaks from SLs justify implementation of various monitoring and maintenance practices suggested by AWWA.

Utilities now have a valuable opportunity to directly assess the state of service lines and make better-informed decisions about monitoring, maintenance, and replacement. 2021 marks the first year of the 20-year timeline for replacement of LSLs required by Michigan's Revised Lead and Copper Rule. We recommend that LSL replacement contractors be required to note when they encounter wet soil, or other signs of leaks. Leaking LSLs will be most evident for projects that involve excavation and complete line removal. However, replacement by insertion or horizontal bore requires partial underground access to the curb stop and the building foundation, where wet soil may also be noted. We also recommend that utilities, especially those with district meters, carefully track changes in non-revenue water as LSL replacements proceed, to discern any systematic changes. Empirical data of this nature can inform utilities' strategy for LSL replacement going forward, as well as for management of SLs made from other materials.

Given strong indications that leaking SLs are costly to water utilities and their ratepayers, but lacking direct empirical evidence from Michigan, we recommend that both water utilities and regulatory agencies work toward a clearer understanding of water and energy loss attributable to service lines. Specifically, we suggest:

1. Water utilities should:
    a. test a statistically representative sample of service lines to estimate leak frequencies and volumes;
    b. employ AWWA's Water Loss Component Analysis to identify and address sources of real water loss;
    c. investigate subsidized insurance options for service lines, which could both reduce customer out-of-pocket repair costs and losses from unbilled water to the utility.[42]
    d. Replace old pumps with Variable Frequency Drive Pumps to allow them to reduce energy use in response to water efficiency gains. Investments in energy-efficient pumps are eligible for Energy Waste Reduction rebates from regulated utilities.
2. The State of Michigan should:
    a. Gather more accurate data on the amount of lead in reportable LSLs. The PDSMI reporting methodology treats an SL with any single lead component as an LSL. However, if most original lead components have been replaced with other materials, and only a minor lead component remains, the failure rate of that line will be very different than for the full, original LSL.

[42] For examples, see *Installation, Condition, Assessment, and Reliability of Service Lines*, 51-52.

b. Require applicants to the Drinking Water Revolving Fund to estimate real water losses.
c. Require applicants to the Drinking Water Revolving Fund to document their pressure management methods and average system pressure.
d. Request the MPSC to support development of custom measures methodology for EWR rebates for non-lead service line replacements and projects that reduce UBL. Our findings suggest that non-LSL leaks and UBL cause energy waste for water utilities. EWR rebates might motivate utilities to more quickly discover and fix leaks in service lines. While potential energy savings are large, measurement and verification challenges require expert attention.

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This report would not have been possible without the help of many people with expertise and experience in various fields. Many municipal and state government staff members, water loss experts, academics and others generously shared ideas, concerns, priorities, methods, and data with the authors during preparation of this report. The authors wish to express their gratitude for and acknowledge this generosity.

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Appendix A: Cumulative Failure Rates of Various Service Line Materials

Year	Lead	Galvanized	Copper	Black polyethylene	Blue polyethylene	PVC	Polyethylene
10	0.0%	0.2%	5.3%	2.4%	7.7%	19.8%	3.0%
20	0.0%	1.9%	18.7%	17.0%	46.0%	50.8%	19.5%
30	0.1%	6.7%	36.3%	46.2%	86.8%	75.5%	49.8%
40	0.5%	15.8%	54.2%	76.7%	99.1%	89.8%	79.0%
50	1.9%	29.4%	69.8%	94.1%	100.0%	96.4%	94.8%
60	5.9%	46.2%	81.7%	99.2%	100.0%	98.9%	99.3%
70	15.2%	63.5%	89.8%	100.0%	100.0%	99.7%	100.0%
80	32.2%	78.4%	94.8%	100.0%	100.0%	99.9%	100.0%
90	56.4%	89.2%	97.5%	100.0%	100.0%	100.0%	100.0%
100	80.5%	95.5%	98.9%	100.0%	100.0%	100.0%	100.0%
110	95.1%	98.5%	99.6%	100.0%	100.0%	100.0%	100.0%
120	99.5%	99.6%	99.8%	100.0%	100.0%	100.0%	100.0%

Source: Lee and Meehan, 2017.

Appendix B: Unavoidable Background Leaks from SLs in Detroit, 2021

$$UBL = ICF^* [((0.008 * N_c) + (0.34 * L_c)) (P_{av}/70)^{1.5}] \times ICF$$

Abbreviation	Descriptor	Units
UBL	Unavoidable background leakage	1,000 gallons/day
N_c	Number of service connections	
L_c	Total length of private connections	miles
P_{av}	Average system pressure	psi
ICF	Infrastructure condition factor	

Detroit's UBL estimate

Input	Value	Source
Lm	2,700	DWSD website
Nc	311,000	(Detroit PDSMI, EGLE, 2020)
Lc	0.0066288	35 feet/private SL. Lee & Meehan, 2017
Pav	70	PSI. assumed.
Energy intensity (KWh/1,000 gal)	2.38	Grand Rapids proxy
Infrastructure Condition Factor (ICF)	2	AWWA M36 manual

Summary Results

Unavoidable Background Leakage (w/mains)	2,723,907,348	gallons/year
UBL (service lines only)	2,329,448,148	gallons/year
UBL Gallons/SL/day	21	
Energy waste from SL UBL	5,544,087	KWh

Appendix C: Projected 2021 LSL failures in Detroit

Year built	# Built	Projected LSL leaks	
1944	5316	100	
1943	5316	104	
1942	5316	109	
1941	5316	113	
1940	5316	117	
1939	2351	53	
1938	2351	55	
1937	2351	56	
1936	2351	58	
1935	2351	59	
1934	2351	60	
1933	2351	60	
1932	2351	61	
1931	2351	61	
1930	2351	61	
1929	2351	60	
1928	2351	60	
1927	2351	59	
1926	2351	58	
1925	2351	56	
1924	2351	55	
1923	2351	53	
1922	2351	51	
1921	2351	48	
1920	2351	46	
1919	2351	43	
1918	2351	40	
1917	2351	37	
1916	2351	34	
1915	2351	31	
1914	2351	29	
1913	2351	26	
1912	2351	23	
1911	2351	20	
1910	2351	18	
1909	2351	15	
1908	2351	13	
1907	2351	11	
1906	2351	10	
1905	2351	8	
1904	2351	7	
1903	2351	5	
1902	2351	4	
1901	2351	3	
1900	2351	3	
Total homes	120,636		count
Unadjusted 2021 leaks est.		**2,048**	scale to reported # LSLs
House-survival factor		**0.640**	reported LSLs/Total homes built
Adjusted 2021 leaks total		**1,311**	count
2021 Leak volume		**390,642,388**	gallons
Energy waste		**929,729**	KWh
Streetlight benchmark			
Average watts/light		*54*	
Hours lit/year		*4200*	
KWh/year/light		*226.8*	
Energy wasted in street light-years		*4099*	

Appendix D: Projected CuSL leaks in Detroit in 2021

Decade built	New CUSLs	replacement CUSLs	Total CUSLs	CUSL marginal failure count
1945-1949	53,157	0	53,157	276
1950-1959	80,932	0	80,932	612
1960-1969	27,216	0	27,216	308
1970-1979	18,473	0	18,473	279
1980-1989	10,923	0	10,923	194
1990-1999	10,259	0	10,259	183
2000-2009	1,755	0	1,755	25
2010-2020	3,775	8,982	12,757	51
Total	206,490	8,982	215,472	1,927

Leak volume	574,514,784	gallons/year
Energy	1,367,345.19	KWh/year

Appendix E: 2021 Michigan Statewide SL Failures Projections

		Lead		Galvanized		Copper		PVC		Polyethylene	
Build years	Est. # houses built	# SLs installed	projected 2021 failures	# SLs installed	projected 2021 failures	# SLs installed	projected 2021 failures	# SLs installed	projected 2021 failures	# SLs installed	projected 2021 failures
2010-2020	172,765	-	-	-	-	77,294	469	13,009	281	28,614	108
2000-2009	447,095	-	-	-	-	200,029	2,850	33,664	1,037	74,050	1,410
1990-1999	603,050	-	-	-	-	269,802	4,815	45,407	1,050	99,880	3,123
1980-1989	447,907	-	-	-	-	200,392	3,560	33,726	436	74,184	2,052
1970-1979	710,427	-	-	-	-	317,843	4,801	26,746	189	23,533	457
1960-1969	553,159	-	-	-	-	247,481	2,797	-	-	-	-
1950-1959	680,118	-	-	90,845	1,557	152,141	1,281	-	-	-	-
1940-1949	334,358	77,869	1,587	44,661	644	-	-	-	-	-	-
1930-1939	136,145	63,414	1,571	18,185	183	-	-	-	-	-	-
1920-1929	136,145	63,414	1,470	18,185	104	-	-	-	-	-	-
1910-1919	136,145	63,414	813	18,185	47	-	-	-	-	-	-
1900-1909	136,145	63,414	215	18,185	17	-	-	-	-	-	-
Total	4,629,605	331,523	**5,656**	208,246	**2,553**	1,464,983	**20,575**	152,552	**2,993**	300,261	**7,150**
Leak Volume (gal/yr)			**1,686,015,297**					**Galvanized+Copper+PVC+Polyethylene**			**9,917,123,056**
Energy waste (KWh/yr)			**4,097,017**								**24,098,609**

Appendix F: Unavoidable Background Loss from Service Lines, Michigan, 2021

SL UBL (thous gal/d) = (0.008 * Nc) + (0.34 * Lc)] × (Pav/70)1.5 x ICF

source: AWWA M36 Water Loss manual, equation 7-2

Input	Value	Source/comment
Lm	n/a	UBL from mains not estimated for state
Nc	2,656,124	(Detroit PDSMI, EGLE, 2020)
Lc	0.0066288	35 feet/private SL. Lee & Meehan, 2017
Pav	70	PSI. assumed.
Energy intensity (KWh/1,000 gal)	2.43	Statewide average (Table 2)
Infrastructure Condition Factor (ICF)	1	Assume excellent condition

Summary

UBL (service lines only)	9,947,432,687	gallons/year
UBL Gallons/SL/day	10	
Energy waste from SL UBL	24,172,261	kwh

Appendix G: 2020 Cadmus Group Memo on Energy Savings from Water-Associated Efficiency Measures

To: Joe Forcillo, Matt Rife, Jenny Sample, Consumers Energy

From: David Molner, Amy Ellsworth, Emily Miller, Shannon Donohue, Cadmus

Subject: Energy Savings from Water Associated Efficiency Measures

Date: February 4, 2020

This memo outlines proposed savings potential and a calculation methodology to attribute energy savings to water-related measures in the Michigan Energy Measure Database (MEMD) for reduced electric consumption at water supply facilities, wastewater treatment plants, and residential well usage.

Executive Summary

In 2019, Consumers Energy inquired about capturing energy savings benefits that accrue to commercial water supply and wastewater treatment plants and residential well pumps as a result of water-savings measures installed in residences. Water supply facilities pump and distribute clean water to homes and businesses while wastewater treatment plants collect and treat water. Water savings measures such as faucet aerators and low-flow showerheads produce energy savings at the residence by reducing the amount of energy used by water heaters when those measures are in use. Installation of these measures means water supply and wastewater treatment facilities must transport, treat, and process less water, thereby reducing electric energy consumption within those facilities. Additional electric savings can also be found for residential customers with well pumps who install water saving measures. Table 7 shows measures in the Michigan Energy Measure Database (MEMD) currently used in Consumers Energy's residential energy waste reduction (EWR) portfolio that provide energy savings by reducing water consumption. The table also includes the associated calculated gallons per minute (GPM) savings.

Table 7. Water-Saving Measures and GPM Savings used in the Residential EWR Portfolio

Measure Name	GPM Savings
Low Flow Showerheads	1.50 - 1.75
Low Flow Bathroom Aerators	1.00 – 1.50
Low Flow Kitchen Aerators	1.50
Thermostatic Showerheads	1.50
ENERGY STAR Clothes Washer	4.00

Consumers Energy calculated that they conserved over 293 million gallons of water in 2018 through rebating and installing energy-efficiency measures that also conserve water, with lifetime water savings of over 2.9 billion gallons.

Total energy use by both water supply and wastewater facilities can be quantified based on the amount of energy used to treat 1,000 gallons of water and the percentage of Michigan households whose water is provided and treated by municipal infrastructure and wells. In Michigan, electric savings can be calculated using the following inputs:

Municipal Water Facilities (Commercial & Industrial)

- KWh required to supply 1,000 gallons of municipal water: 2.10
- KWh required to treat 1,000 gallons of municipal wastewater: 1.65
- Percentage of customers that use municipal water facilities: 72.9%[43]

Private Water Facilities (Residential)

- KWh required to supply 1,000 gallons of private(well) water: 1.56[44]
- KWh required to treat 1,000 gallons of private water:0[45]
- Percentage of customers that use private water facilities: 27.1%

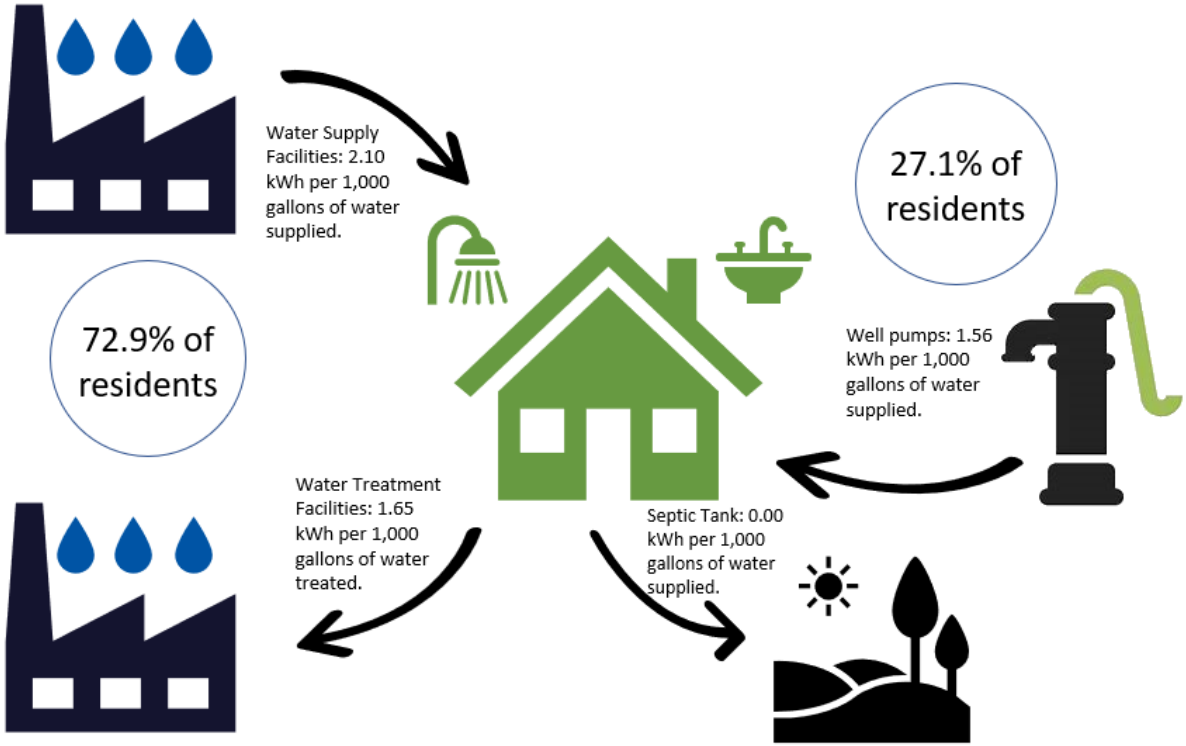
Figure 6 shows the process which derives the additional electric savings from reducing residential water usage.

[43] The other 27.1 percent or 1.25 million Michigan households use well water and would not be included in the reduction to municipal water usage.

[44] Calculated from the average well depth in Michigan from the Department of Environmental Quality and assuming 43% total pumping efficiency and 39PSI supply water pressure.

[45] Homes on private wells use septic systems for treatment, septic is typical gravity powered and requires little or no quantifiable electricity.

Figure 6. Cycle of Electric Savings for Residential Water Usage



Energy savings attributable to 1,000 gallons of water saved at water supply and treatment facilities through the installation of residential water saving measures can be calculated as:

$$(2.1 + 1.65) \times 72.9\% + (1.56) \times 27.1\% = \frac{3.16kWh}{1000\ gallons}$$

The Cadmus team's research indicated that there is the potential for Consumers Energy to claim 3.16 KWh per 1,000 gallons of water saved as energy savings at treatment and supply facilities. For the 2018 program year, this is equivalent to an additional 928,039 net KWh energy saved per year. Due to the higher percentage of municipal water customers and the facilities' higher energy consumption, 86% of water-saving equipment are realized at commercial water supply and wastewater treatment facilities; these savings must be claimed through Consumers Energy's commercial reconciliation process[46]. Table 8 shows the breakout of KWh savings per equipment type and the savings by residential and commercial.

[46] Per 1000 gallons. 2.73KWh is attributable to commercial municipal facilities while 0.42KWh is attributable to the residential customer 2.73/(2.73+0.42)=86%

Table 8. KWh Savings Per Residential Energy-Saving Equipment

Dwelling	Equipment Type	GPM	Annual Gallons of Water Saved	KWh savings per year		
				Residential	Commercial	Total
Single Family	Low Flow Showerheads	1.50	2,881	**1.27**	**7.83**	**9.10**
	Low Flow Bathroom Aerators	1.00	869	**0.38**	**2.36**	**2.75**
	Low Flow Kitchen Aerators	1.50	2,909	**1.29**	**7.91**	**9.19**
	Thermostatic Showerheads	1.50	479	**0.21**	**1.30**	**1.51**
	ENERGY STAR Clothes Washer	4.00	1,518	**0.67**	**4.12**	**4.80**
Multifamily	Low Flow Showerheads	1.50	2,816	**1.25**	**7.65**	**8.90**
		1.75	2,112	**0.93**	**5.74**	**6.67**
	Low Flow Bathroom Aerators	1.00	896	**0.40**	**2.44**	**2.83**
		1.50	523	**0.23**	**1.42**	**1.65**
	Low Flow Kitchen Aerators	1.50	2,104	**0.93**	**5.72**	**6.65**
School Education Kit	Low Flow Showerheads	1.50	4,236	**1.87**	**11.51**	**13.39**
	Low Flow Bathroom Aerators	1.00	1,390	**0.62**	**3.78**	**4.39**
		1.50	811	**0.36**	**2.20**	**2.56**
	Low Flow Kitchen Aerators	1.50	2,909	**1.29**	**7.91**	**9.19**

This memo addresses the following research objectives:

- Assess the potential electric energy savings attributable to water supply facilities and treatment plants from energy-saving equipment in the MEMD that reduce water usage in residential homes.

To assess the potential for additional energy savings at the water treatment and supply level, the Cadmus team reviewed existing data that quantified water supply and treatment facility savings and conducted secondary research for Michigan-specific information. These data are intended to help inform Consumers Energy about the potential to capture commercial electric savings from residential water conservation measures in the MEMD that already produce residential energy savings.

We organized this memo as follows:

- Summary of key findings, conclusions, and recommendations
- Detailed findings from the water facility savings research

Summary of Key Findings, Conclusions, and Recommendations

This section presents the Cadmus team's key findings, conclusions, and recommendations associated with the research objectives for the evaluation activity. The Detailed Findings section of this memo provides further explanation of these findings and the context for our conclusions and recommendations.

Research Objective: Assess the potential electric energy savings attributable to water supply facilities and treatment plants from energy-saving equipment in the MEMD that reduces water usage in residential homes.

Conclusion 1: Energy savings occurs at water supply and water treatment facilities when residential water conservation measures are installed in residential homes that rely on municipal water services.

Cadmus analyzed Michigan-specific energy savings at water supply and treatment facilities and adapted the calculation methodology used in Wisconsin to calculate additional commercial electric savings from the installation of residential water saving measures. Additional commercial savings from residential water-saving equipment comes from the 72.9 percent of Michigan residents that use and rely on municipal water facilities for their supply and collection of water usage.

Cadmus calculated that 2.10 KWh and 1.65 KWh is saved per 1,000 gallons of water reduced in transfer from water supply and wastewater facilities, respectively.

Conclusion 2: Residential water conservation measures produce secondary energy savings in homes that use well water by reducing the demand on well pumps.

Cadmus calculated energy savings for the 27.1 percent of Michigan residents that use a well instead of municipal water supply and commercial treatment facilities. Well users generate electric savings through reducing the need for pumping with reduced demand for well water.

Cadmus calculated 1.56 KWh is saved per 1,000 gallons of water reduced in transfer from a residential well pump to home usage.

Recommendation:

- ***High Priority:*** Cadmus recommends developing a white paper based on the findings outlined in this memo to add water treatment facility savings to the MEMD as additional savings derived from water-saving equipment.

Detailed Findings

This section highlights the secondary research conducted by the Cadmus team for water supply and wastewater treatment plants energy usage based on the capacity output of water supplied or treated. The Cadmus team reviewed national, regional, and local sources to identify best practices in calculating water-savings from supply and treatment facilities.

Water supply and wastewater facility sizes range across municipalities. Different classifications are used to categorize the types of water facilities. Water facilities can be categorized based on three primary metrics.

1. The average daily flow rate (typically defined as millions of gallons of water processed on an average day (MGD)),
2. The population served daily by the facility,
3. Type of water process (e.g. groundwater vs. surface water).

Wastewater facilities typically measure energy savings in MGD while water supply facilities measure in population served or type of water processed.

Water Supply Facilities

Water supply facilities play an important role in the processing and distribution of clean water to municipal residents. Customers that use less water daily due to energy-efficient equipment create secondary energy savings at water supply facilities because they pump and distribute less water.

National studies conducted by the Electric Power Research Institute (EPRI) and American Council for an Energy-Efficient Economy (ACEEE) have demonstrated the potential for reducing energy usage in water facilities. The EPRI study compiled secondary data from a variety of public and private sources and calculated energy usage and water output for nearly all the water facilities in the country based on the facility's daily water output (measured as millions of gallons of water per day or "MGD")[47]. The ACEEE study used a primary survey research method: requesting water facilities self-report data about their energy usage and based their findings on facilities usage of surface water or groundwater as a water source[48]. Table 9 shows the energy use (KWh used to process 1,000 gallons of water) results from the two national studies. EPRI data was not able to be broken out by type of water facilities since it included non-municipal water facilities that purchase water from outside sources.

Table 9. Water Supply Energy Usage, National Averages

Water Supply Facilities by Source and Daily Flow Rate	KWh/1,000 Gallons of Water
ACEEE[49]	
Surface water source	1.80
Groundwater source	2.40
EPRI[50]	
Less than 3 MGD	2.00
3 to 5 MGD	1.40
5 to 20 MGD	1.60
20 to 600 MGD	1.50

The two national studies, while informative, did not produce a pertinent savings value for the state of Michigan. However, two state-wide studies have been conducted by NYSERDA for New York state and Focus on Energy for Wisconsin; both have been instrumental in establishing best practices for analyzing energy usage at water facilities and serve as a more applicable approach for Michigan. Both studies used a survey approach, reaching out to water facility representatives and asking about their energy usage and number of customers served by the facility. Table 10 shows energy use per 1,000 gallons of water processed based on the studies conducted by Focus on Energy and NYSERDA. Results from both studies are broken out by number of customers served per facility and Focus on Energy results are additionally broken out by water source.

47 *Electricity Use and Management in the Municipal Water Supply and Wastewater Industries*. Electric Power Research Institute, November 2013.
48 *A Survey of Energy Use in Water Companies.* American Council for an Energy-Efficient Economy, June 2015.
49 *Ibid*
50 *Electricity Use and Management in the Municipal Water Supply and Wastewater Industries*. Electric Power Research Institute, November 2013.

Table 10. Water Supply Energy Usage, Statewide Averages

Water Supply Facilities by Customer Population and Source	KWh/1,000 Gallons of Water
Focus on Energy[51]	
Less than 4,000 customers	1.81
1,000 – 4,000 customers	1.94
Greater than 1,000 customers	2.41
Surface water source	2.16
Groundwater source	2.01
NYSERDA[52]	
Less than 3,300 customers	1.08
3,330 – 50,000	0.98
50,000 – 100,000	0.81
Greater than 100,000	0.25

The Focus on Energy survey in Wisconsin[53] is a good proxy for Michigan due to its similar population characteristics, topography, and use of the Great Lakes as a major source of water supply. The NYSERDA study included water supply facilities that serve large, concentrated populations in New York State that are less comparable to Michigan water facilities, especially those in Consumers Energy's service territory.

According to the Michigan Department of Environmental Quality, 45 percent of the Michigan population is served by groundwater, while 55 percent is served by surface water or water from the Great Lakes[54]. Table 11 shows the weighted average energy use for Michigan's population based on the equivalent energy use per water source as analyzed in the Wisconsin study. Cadmus calculated the weighted average for water supply energy usage in Michigan as 2.10 KWh/1,000 gallons.

51 *Energy Best Practice Guide: Water & Wastewater Industry.* Focus on Energy, 2016.

52 *Importance of Energy Efficiency to the Water and Wastewater Sector.* Matthew Yonkin, Katherine Clubine and Kathleen O'Connor, New York Water Environmental Association. Spring, 2008.

53 Michigan and Wisconsin have similar mean elevations 900ft and 1,050ft respectively and population 10 million and 5.8 million respectively and withdrew 268 and 311MGal/day of water from Lake Michigan for public water.

54 *DEQ Fact Sheet – Groundwater Statistics.* Michigan Department of Environmental Quality, January 2018.

Table 11. Water Supply Energy Usage in Michigan, Weighted Average

Water Supply Facilities by Source	KWh/1,000 Gallons of Water	MI Percent of Population Supplied	Weighted KWh/1,000 Average
Surface water source	2.16	55%	1.19
Groundwater source	2.01	45%	0.91
Total			**2.10**

Wastewater Treatment Plants

Wastewater treatments plants account for over one-fourth of energy used by local governments, and that share of energy usage has continued to grow each year for over a decade[55].

Studies conducted by EPRI, NYSERDA, and Focus on Energy have had varied results for wastewater treatment facilities. Additionally, a study conducted in 2017 by the Michigan Water Environmental Association (MWEA) on behalf of the Michigan Department of Environmental Quality looked at energy use by wastewater treatment plants in Michigan using methods like the studies completed by NYSERDA and Focus on Energy[56]. These studies all provided energy use broken out based on facility size in terms of million gallons treated per day (MGD). Finally, An ACEEE report noted that the data available from wastewater treatment facilities was limited and therefore ACEEE did not publish the results, instead opting to highlight other studies completed in 2012 or earlier, including an EPRI study conducted in 2002[57].

Table 12 shows energy usage per 1,000 gallons of water treated from the national EPRI study, broken out by facility processing size in MGD. The nationwide EPRI study used dissimilar binning compared to the NYSERDA, Focus on Energy, and Michigan Water Environmental Association (MWEA) studies but still offers insights on the national average energy consumption in comparison to statewide averages.

55 *Electricity Use and Management in the Municipal Water Supply and Wastewater Industries*. Electric Power Research Institute, November 2013.
56 *Michigan's Wastewater Treatment Plants Energy Survey and Estimate of Energy Baseline*. Michigan Water Environment Association, April 15, 2017.
57 *A Survey of Energy Use in Water Companies.* American Council for an Energy-Efficient Economy, June 2015.

Table 12. Wastewater Treatment Energy Usage, National Averages

Wastewater Treatment Facilities by Daily Flow Range	KWh/1,000 Gallons of Water
EPRI[58]	
Less than 2 MGD	3.30
2 to 4 MGD	3.00
4 to 7 MGD	2.40
7 to 16 MGD	2.00
16-100 MGD	1.70
101-303 MGD	1.60

Table 13 shows the energy usage in KWh per 1,000 gallons treated at wastewater facilities from the NYSERDA, Focus on Energy, and Michigan Water Environmental Association (MWEA) studies, broken out based on similar facility size categories.

Table 13. Wastewater Treatment Energy Usage, Statewide Averages

Wastewater Treatment Facilities by Daily Flow Rate	NYSERDA[59]	Focus on Energy[60]	MWEA[61]
	KWh/1,000 Gallons of Water		
Less than 1 MGD	4.62	5.44	N/A
1 to 5 MGD	1.58	2.50	2.50
5 to 20 MGD	1.74	2.29	2.36
20 to 75 MGD	1.70	2.29	1.80
Greater than 75 MGD	1.10	2.29	1.40

As shown in Table 13, wastewater facilities capture measurable economies of scale: energy use declines significantly in facilities that produce more than one million gallons of water per day compared to facilities that treat less than one million gallons of water. A facility's energy use per 1,000 gallons continues to trend downwards as the daily flow rate increases.

58 *Electricity Use and Management in the Municipal Water Supply and Wastewater Industries*. Electric Power Research Institute, November 2013.

59 *Importance of Energy Efficiency to the Water and Wastewater Sector.* Matthew Yonkin, Katherine Clubine and Kathleen O'Connor, New York Water Environmental Association. Spring, 2008.

60 *Energy Best Practice Guide: Water & Wastewater Industry.* Focus on Energy, 2016.

61 *Michigan's Wastewater Treatment Plants Energy Survey and Estimate of Energy Baseline*. Michigan Water Environment Association, April 15, 2017.

MWEA used an energy intensity model originally developed by the Environmental Protection Agency (EPA) to calculate a statewide mean energy use value of 1.65 KWh per 1,000 gallons of wastewater treated in Michigan[62]. This value likely reflects the most accurate estimate of energy savings impacts at water treatment plants resulting from reduced water usage associated with water conservation measures.

Private Water Wells and Septic Systems

Consumers Energy customers that use a well and receive water-savings equipment from a Consumers Energy program cannot claim savings for water supply and treatment at these commercial facilities but can claim pumping energy savings associated with reduced demand for well water. The Michigan Department of Environmental Quality estimates that there are about 1.25 million households in Michigan with a private well[63], based on available census and well drilling data. Additionally, the U.S. Census estimates that there are 4.61 million households in Michigan as of 2018[64]. Homes with private well are typically dispose of wastewater using a septic system with a leech field. These systems are gravity powered and do not consume energy.

A private well uses energy to lift, filter and pressurize a ground water source for a home. The primary energy consumption comes from the pump. Energy required by the pump can be expressed as a function of the total dynamic head from the water source to where it is used and the efficiency of the pump using the follow equation:

$$P_{kWh/1000gal} = \frac{h_{ft} \times 0.746\left(\frac{kW}{hp}\right) \times 1000 gallons}{3960(\frac{GPM * ft}{hp}) \times \eta \times 60(\frac{min}{hr})}$$

Where:

h_{ft} = total dynamic head in feet (included static and dynamic head)

0.746 = kilowatts per horsepower conversion

η = efficiency of the pump and motor

3960 = hydraulic horsepower unit conversion

62 *Ibid.*

63 *DEQ Fact Sheet – Groundwater Statistics.* Michigan Department of Environmental Quality, January 2018.

64 *Quick Facts Michigan.* U.S. Census Bureau (2018). https://www.census.gov/quickfacts/fact/table/MI/HSG010218#HSG010218.

The Michigan Department of Environmental Quality keeps records on well details throughout the state. The average well depth in Michigan is 114 ft[65] with the deepest wells located around Clinton, MI. We calculated the total dynamic head for an average Michigan home with a well to be 209ft.[66]

Household well pump efficiency is not typically published by manufacturers or government agencies. Research by Kenny/Jenks consultants show pump efficiencies of municipal scale pumps of 65-81%[67] and efficiency increases with the size of the pump. An article published in MDPI[68] estimated the global average efficiency of all submersible pumps to be 48%. We estimate typical residential well pumps in Michigan to have a pump efficiency of 60% with a motor efficiency of 70% for a total efficiency of 42%. Using the energy equation outlined above, 1.56 KWh of energy is consumed per 1000 gallons of water pumped by a residential well pump on average.

[65] Found as the average well depth from 636,102 well records where well depth was reported. From: http://gis-michigan.opendata.arcgis.com/search?q=Wellogic

[66] Assuming a home with 2 bathrooms and a total piping length from the well to the home of 173 ft and a household water pressure of 39 PSI.

[67] http://www.energy.wsu.edu/LinkClick.aspx?fileticket=t3ubiA8D8A4%3D&tabid=692&mid=1345

[68] https://www.mdpi.com/2073-4441/10/10/1310/pdf