



# Ottawa County

## Groundwater Sustainability Initiative

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Proactive Strategies Index

Fall 2019

*Educate - Integrate - Mitigate - Coordinate*

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# Ottawa County

## Groundwater Sustainability Initiative: *Proactive Strategies Index*

Adopted November 26, 2019



Ottawa County  
*Where You Belong*®

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# Welcome



**Ottawa County**

Planning & Performance  
Improvement

Paul Sachs  
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Dear Reader,

Thank you for being invested in Ottawa County's water sustainability efforts. It is our hope that in reading this document you will reach a better understanding of our groundwater challenges and how we plan to address them.

We are asking for your assistance in championing water sustainability efforts by utilizing and promoting the strategies listed within this document. By working together, we can ensure clean fresh water is abundantly available for future generations.

Sincerely,



Paul Sachs  
Director



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[@miOttawa](https://twitter.com/miOttawa)



[@ottawacountymi](https://www.instagram.com/ottawacountymi)



[www.miottawa.org/groundwater](https://www.miottawa.org/groundwater)

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# Introduction

# Overview



## A Water Shortage in Michigan?

Known as the Great Lakes State, Michigan's abundance of freshwater lakes, streams, and coastlines are tied to the state's identity.

This creates a false perception that clean drinking water will always be readily available at the tap. Most Michiganders have not put much thought into where their water comes from, or considered the possibility that it may one day be at risk.

Nearly half of all Michigan residents rely on groundwater sources to supply their homes and businesses. Many regions of the state utilize deep bedrock aquifers, which can contain salt and mineral deposits in some areas.

Ottawa County is faced with a particularly challenging situation where surface water is unable to recharge the deep aquifer, leading to rapidly declining levels of groundwater and increased mineralization of the water that is available.

Planners from Ottawa County have begun partnering with local scientists, policymakers, and stakeholders to identify practical solutions to ensure water is available for future generations.

# Our Approach

## Mission Statement

To ensure that the residents and stakeholders of Ottawa County have permanent, sustainable access to clean water for reasonable use.

### Overarching Goals

Protect the quality of the aquifer systems and reduce dependency on the bedrock aquifer system.

Manage groundwater consumption and plan proactively to ensure continued access to abundant, clean water.

Provide assistance and solutions to stakeholders to encourage sustainable water practices.

### Strategic Measures

Educate

Integrate

Mitigate

Coordinate

# About this Document

## What Is It?



### A Guidebook

This is, in essence, a “menu” of items that Ottawa County and its current and emerging partners are embarking on as a means to achieve water sustainability. This guidebook is not intended to be an exclusive list; and Ottawa County will continue to form new partnerships for implementation.

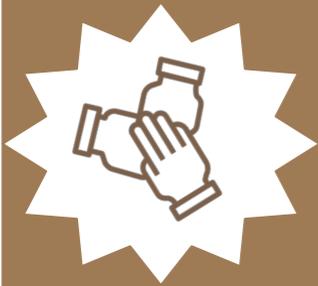
## Who Is It For?

### For Everyone

The strategies listed in this document are intended to be utilized by a widespread audience. This includes planners, policy-makers, homeowners, developers, business owners, farmers, and many more.



## Who Made It?



### Local Experts

We worked with conservationists, researchers, scientists, environmental experts, engineers, local planners and decision-makers, education professionals, concerned citizens, and many more!

## Why Was It Made?

### To Inspire

It is our hope that this document will guide, encourage, and inspire the people of West Michigan to make water conservation a priority.



# Groundwater Challenges at a Glance

➤ Our groundwater comes from:

- shallow aquifer pockets left from glaciers
- deep aquifers within the bedrock

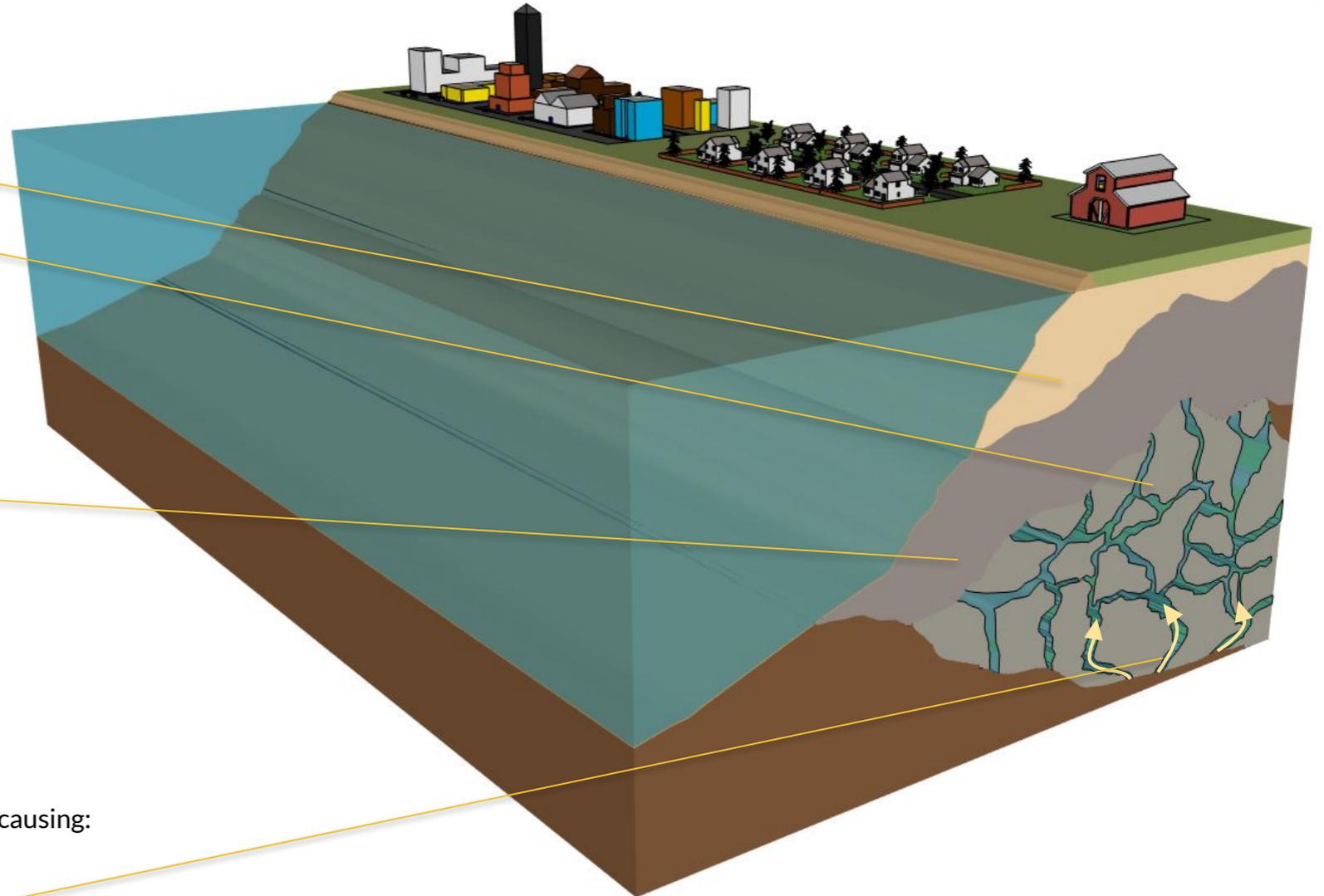
➤ Groundwater is typically replenished by rainfall seeping into the ground

➤ A thick clay layer above our bedrock aquifer prevents it from being replenished

➤ Our bedrock aquifer cannot pull water from Lake Michigan because they are not connected

➤ Our geologic conditions, along with pumping rates, are causing:

- water levels to decline in the bedrock aquifer
- salt to be pulled up from the bottom of the bedrock aquifer



## Did You Know...

More information on the Phase I and Phase II Groundwater Study results and Ottawa County's Groundwater Story can be found in Appendix B, and online at [miottawa.org/groundwater](http://miottawa.org/groundwater)

# Why it Matters

**Falling water levels**  
in our bedrock aquifer system

**Wells dry up**  
leaving homes and farms  
without water

**Crops suffer**  
yield loss and decreased  
quality

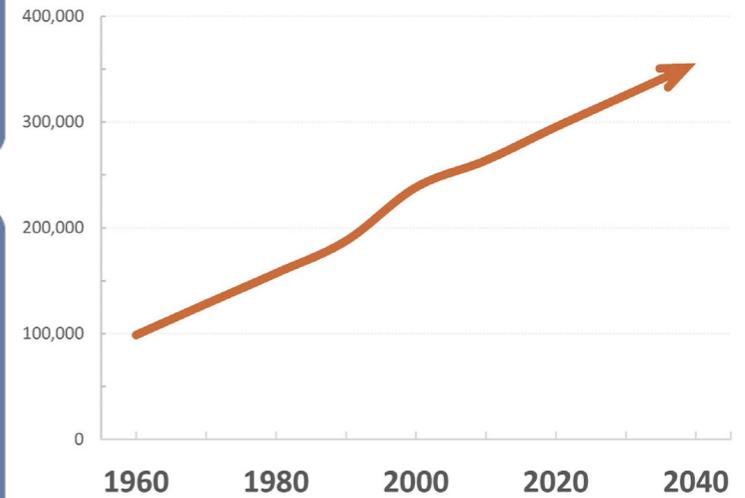
**Rising levels of sodium**  
and other minerals in our bedrock  
aquifer groundwater supply

**Plumbing corrosion**  
can occur, and water may  
have a foul taste

**Health concerns**  
may arise for persons with  
diagnosed heart conditions,  
due to an increased intake of  
dietary sodium



*Ottawa County  
Population Growth*  
(US Census)



If left **unchecked**,  
unmanaged **growth** will  
only **worsen** these issues

# Education Strategies

Advocating for change in regional water conservation perceptions

# Education Strategies

#	Strategy	Summary / Components	Current Partners	Status	Critical Next Steps
1	Outreach Campaign	<ul style="list-style-type: none"> <li>○ Multimedia advertising</li> <li>○ Literature distribution</li> </ul>	<ul style="list-style-type: none"> <li>→ EPA WaterSense</li> <li>→ Ottawa County Department of Public Health</li> </ul>	In Development	<ul style="list-style-type: none"> <li>■ Secure funding</li> <li>■ Hire marketing firm</li> </ul>
2	Online Resources	<ul style="list-style-type: none"> <li>○ County-hosted groundwater website</li> </ul>		Initiated	<ul style="list-style-type: none"> <li>■ Manage ongoing updates to site</li> </ul>
3	Partnerships for Youth Education	<ul style="list-style-type: none"> <li>○ 6th-8th grade curriculum supplement</li> </ul>	<ul style="list-style-type: none"> <li>→ Allendale Christian School</li> <li>→ ODC Network</li> <li>→ Ottawa Area Intermediate School District</li> <li>→ Ottawa County Parks &amp; Recreation</li> </ul>	Initiated	<ul style="list-style-type: none"> <li>■ Pilot supplemental curriculum in local school district</li> <li>■ Consider broader implementation</li> </ul>
4	Partnerships for College Education	<ul style="list-style-type: none"> <li>○ Research collaboration</li> <li>○ Curriculum integration</li> <li>○ Outreach opportunities</li> </ul>	<ul style="list-style-type: none"> <li>→ Grand Valley State University</li> <li>→ Hope College</li> </ul>	Initiated	<ul style="list-style-type: none"> <li>■ Continue developing relationships for educational opportunities</li> </ul>
5	Partnerships for Community Education	<ul style="list-style-type: none"> <li>○ Public lectures</li> <li>○ Informational resources</li> <li>○ Hands-on workshops</li> </ul>	<ul style="list-style-type: none"> <li>→ Allendale Township Library</li> <li>→ Coopersville Area District Library</li> <li>→ Gary Byker Library of Hudsonville</li> <li>→ Georgetown Township Public Library</li> <li>→ Herrick District Library</li> <li>→ Holland-Hope College Sustainability Institute</li> <li>→ Howard Miller Public Library</li> <li>→ Loutit District Library</li> <li>→ Patmos Library</li> <li>→ Spring Lake District Library</li> </ul>	Initiated	<ul style="list-style-type: none"> <li>■ Continue developing relationships for educational opportunities</li> </ul>
6	Community Presence	<ul style="list-style-type: none"> <li>○ Engage the public at key events/locations</li> </ul>	<ul style="list-style-type: none"> <li>→ Grand Valley State University</li> <li>→ Holland-Hope College Sustainability Institute</li> <li>→ Macatawa Area Coordinating Council</li> <li>→ ODC Network</li> <li>→ Ottawa County Parks &amp; Recreation</li> </ul>	Initiated	<ul style="list-style-type: none"> <li>■ Seek opportunities to have a public presence</li> </ul>



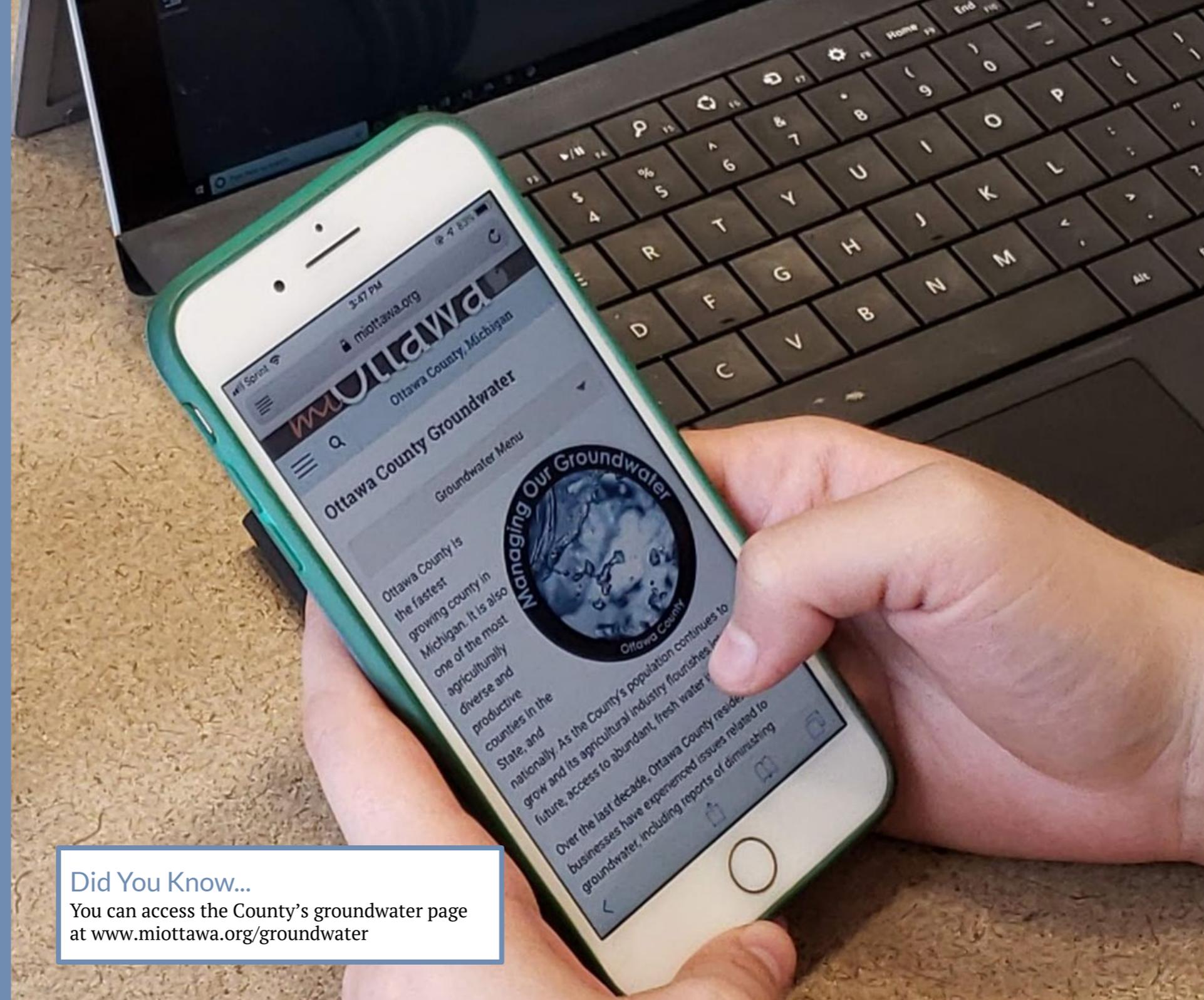
## Online Resources

*Your one-source destination for local groundwater info*

In 2018, the “Ottawa County Groundwater” website was launched to be a place where visitors can access detailed information about the County’s groundwater challenges.

The site also includes information on project partners and an interactive map of groundwater issues across the County.

The website will be continually updated to ensure information is as current, complete, and accurate as possible. As conservation projects and programs launch, updates will be posted to a dynamic “strategy status” page.



### Did You Know...

You can access the County’s groundwater page at [www.miottawa.org/groundwater](http://www.miottawa.org/groundwater)

## Partnerships for Youth Education

*Working with the next generation of water consumers*

Partnerships are being created with local educators to help introduce supplemental materials related to the County's groundwater challenges into existing K-12 curriculum.

The supplemental materials will feature components of regional subsurface geology and impacts of consumptive water use, in addition to including take-home conservation strategies.

Hands-on, experiential learning exercises will also be developed in collaboration with other community partners.

### Current Partners



Photo credit: USACE

# Partnerships for College Education

*Advanced education opportunities*

The County has initiated partnerships with regional colleges and universities to support the development of public awareness efforts, and will be hosting seminars and presentations on groundwater concerns for faculty and staff.

These partnerships are anticipated to evolve into more advanced groundwater outreach programs and research projects to further support the County’s conservation efforts.

Opportunities also exist to implement water conservation practices into vocational trades programs.

### Current Partners



*GVSU Annis Water Research Institute (Muskegon)*  
Photo Credit: Bernadine Carey-Tucker

# Partnerships for Community Education

*Engagement programs for everyone*

The County is developing partnerships to influence adult and general-public educational programming.

These opportunities include offering lectures, informational resources, and hands-on workshops with organizations such as:

- Libraries
- Rotaries
- Chambers of Commerce
- Neighborhood associations
- Environmental groups

## Current Partners



Howard Miller Public Library



Photo credit: Mode Shift

# Community Presence

*We go where you go*

Establishing an influential presence within the community is a critical element in implementing positive change.

The County and its partners have begun to develop a physical presence in the area. Current and future endeavours include:

- Informational kiosks at events
- Educational signage in parks
- Hands-on mobile exhibits

### Current Partners



# Integration Strategies

Partner-managed programs designed to make a difference

# Integration Strategies

#	Strategy	Summary / Components	Current Partners	Status	Critical Next Steps
7	Stakeholder Integration	<ul style="list-style-type: none"> <li>○ Collaborative partnerships to promote conservation</li> </ul>	<ul style="list-style-type: none"> <li>→ Various groups</li> </ul>	In Development	<ul style="list-style-type: none"> <li>■ Identify stakeholder groups</li> <li>■ Initiate meetings</li> </ul>
8	Household Conservation Strategies	<ul style="list-style-type: none"> <li>○ Various tips for general water conservation</li> <li>○ Disseminated through various outlets</li> </ul>	<ul style="list-style-type: none"> <li>→ EPA WaterSense</li> <li>→ Green Michigan</li> </ul>	Initiated	<ul style="list-style-type: none"> <li>■ Explore new outlets to get messaging out</li> </ul>
9	Landscape and Irrigation Practices	<ul style="list-style-type: none"> <li>○ Professionally curated, water-friendly landscape recommendations</li> <li>○ Water saving recommendations for irrigating landscapes</li> </ul>	<ul style="list-style-type: none"> <li>→ GEI Consultants, Inc.</li> <li>→ Macatawa Area Coordinating Council</li> <li>→ Natural Resources Conservation Service</li> <li>→ Ottawa Conservation District</li> <li>→ West Michigan Nursery and Landscape Association</li> </ul>	In Development	<ul style="list-style-type: none"> <li>■ Work with partners to develop recommendations</li> </ul>
10	Service-Provider Training	<ul style="list-style-type: none"> <li>○ Training and credentialing programs for professionals</li> </ul>	<ul style="list-style-type: none"> <li>→ EPA WaterSense</li> <li>→ GEI Consultants, Inc.</li> <li>→ West Michigan Nursery and Landscape Association</li> </ul>	In Development	<ul style="list-style-type: none"> <li>■ Work with partners to develop program guidelines</li> </ul>
11	Landscape Contests and Demonstration Sites	<ul style="list-style-type: none"> <li>○ Contest to inspire water-friendly landscapes</li> <li>○ Public exhibits, showcasing best management practices in landscaping</li> </ul>	<ul style="list-style-type: none"> <li>→ GEI Consultants, Inc.</li> <li>→ West Michigan Nursery and Landscape Association</li> </ul>	In Development	<ul style="list-style-type: none"> <li>■ Identify partner locations</li> <li>■ Work with partners to identify project guidelines</li> </ul>

# Integration Strategies

#	Strategy	Summary / Components	Current Partners	Status	Critical Next Steps
12	Landscape Rebates and Low-Flow Fixture Promotions	<ul style="list-style-type: none"> <li>○ Programs to help consumers offset the cost of installing alternative landscapes</li> <li>○ Advertised list of low-flow fixture types with funding opportunities</li> </ul>	<ul style="list-style-type: none"> <li>→ GEI Consultants, Inc.</li> <li>→ Ottawa Conservation District</li> <li>→ West Michigan Nursery and Landscape Association</li> <li>→ Green Michigan</li> </ul>	In Development	<ul style="list-style-type: none"> <li>■ Secure funding</li> <li>■ Work with partners to develop program guidelines</li> </ul>
13	Certified <i>Blue</i>	<ul style="list-style-type: none"> <li>○ Certification &amp; recognition program to incentivize water conservation practices in the built environment</li> </ul>	<ul style="list-style-type: none"> <li>→ EPA WaterSense</li> <li>→ Green Michigan</li> </ul>	In Development	<ul style="list-style-type: none"> <li>■ Work with partners to develop recommendations</li> </ul>
14	Agricultural Partnerships	<ul style="list-style-type: none"> <li>○ Educational, logistical, and financial resources to help our producers conserve water</li> </ul>	<ul style="list-style-type: none"> <li>→ Michigan Agriculture Environmental Assurance Program</li> <li>→ MSU Extension</li> <li>→ Natural Resources Conservation Service</li> <li>→ Ottawa Conservation District</li> <li>→ Ottawa County Farm Bureau</li> </ul>	In Development	<ul style="list-style-type: none"> <li>■ Work with partners to develop program guidelines</li> </ul>

## Stakeholder Integration

*Custom solutions for groups and organizations*

Many groups play a role in water use and conservation. By establishing partnerships with the unique types of water-user/stakeholder groups, the County can implement specific conservation and awareness measures.

Examples of stakeholder groups include:

- Homeowners
- Landscapers
- Business owners
- Realtors
- Environmental stewards
- Land developers
- Golf course managers



### Did You Know...

A leaky faucet dripping every second wastes roughly 1,660 gallons of water per year! <sup>1</sup>

## Household Conservation Strategies

*Simple ways to start saving water today*

There are many simple ways a person can help to conserve water by adjusting their daily routines.

Ottawa County will collaborate with environmental organizations, homeowners, schools, and other stakeholders to continually promote general water saving tips.

These tips can be communicated via:

- Informational pamphlets and brochures
- Social media messaging/website updates
- Posters and signage
- Public service announcements

### Current Partners



## Landscape and Irrigation Practices

*Promote water-friendly lawns and water-conscious irrigation practices*

Traditional turf-grass lawns require a significant amount of water to maintain a green appearance. Communities with threatened water resources have adopted alternative practices that utilize native (and other) plant species which require less water.

Many techniques have also been developed to maximize efficiency of irrigation systems and even utilize alternative sources of water, such as rain water collection.

The County and its partners are working to promote these practices through:

- Developing best management practices
- Distributing messaging and literature
- Facilitating workshops

### Current Partners



### Did You Know...

Over 8 billion gallons of water are devoted to lawn and landscape irrigation in the United States every year! <sup>2</sup>



## Service-Provider Training

*Credentialing programs to ensure a standard of efficient practices*

Service-provider professionals, such as landscapers, irrigation installers, and homebuilders all have an impact on water consumption through the practices and equipment they use and install.

The County can collaborate with accrediting bodies, training institutions, and stakeholder groups to establish and promote programs to educate and certify these types of professionals to utilize the latest and most appropriate techniques and equipment.

### Current Partners



## Landscape Contests and Demonstration Sites

*Encourage and incentivize awesome examples of landscaping*

Art and design contests have proven to be a successful means of public engagement in West Michigan.

By hosting an annual contest for excellence in sustainable landscape design, Ottawa County and its partners hope to inspire others to participate in sustainable practices and increase the regional popularity and perception of such concepts.

Partnerships are also being pursued with local institutions to exhibit professionally-designed landscape examples. Displayed at libraries, County Parks, and other facilities, these gardens will represent sustainable landscape design possibilities within our communities.

### Current Partners



**Did You Know...**  
Using native plants adapted to the local climate can reduce outdoor water use by 20-50%! <sup>3</sup>

Photo: Ottawa County Nature Center

## Landscape Rebates and Low-Flow Fixture Promotions

*Helping to offset the cost of switching to water-saving household applications, both indoor and outdoor*

The quantity of materials required to convert a turf-grass yard into a water-conscious landscape may pose a financial barrier for some. Ottawa County and its partners plan to explore cost-rebate options by utilizing grants, corporate sponsorships or other funding sources.

The County and its partners support the implementation of water-saving low-flow fixtures (e.g. showerheads, faucets, and toilets) through existing and potential programs. The distribution of these fixtures to homeowners at reduced or no cost depends on available grant funding along with public and private donations.

### Current Partners



### Did You Know...

Toilets are among the biggest indoor water wasters, followed by showers, faucets, and clothes washing machines.<sup>4</sup> A moderate toilet leak can waste 6,000 gallons of clean, drinkable water in a month!<sup>5</sup>

# Certified Blue

*Recognizing water conservation efforts*

The County is exploring options to implement a certification and recognition program for homes and businesses that meet certain water efficiency criteria.

Benefits to certification can include higher resale value of real property, positive corporate imaging, and an overall sense of pride in being water-friendly. Certified establishments can be advertised in County publications.

An annual award can be offered to homeowners and business owners who utilize innovative conservation strategies during their everyday operations.

### Current Partners



## Agricultural Partnerships

*Support and assist our farmers with water conservation*

Farms and farmers are a pillar of our economic, social, and food community, and water is an essential part of their operation.

By partnering with farmers, as well as the various organizations that work directly with them, Ottawa County can help provide:

- Educational materials and guidebooks on modern water saving technology and groundwater recharge techniques
- Logistical support to implement water conservation techniques, including storm and surface water retention/storage for irrigation, and advanced irrigation technologies
- Connections to financial resources to fund water conserving equipment and water storage facilities

### Current Partners



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# Mitigation Strategies

Using policy to enhance groundwater sustainability

# Mitigation Strategies

#	Strategy	Summary / Components	Current Partners	Status	Critical Next Steps
15	Model Zoning Guidelines	<ul style="list-style-type: none"> <li>○ Zoning recommendations to protect groundwater resources</li> </ul>		In Development	<ul style="list-style-type: none"> <li>■ Establish partnerships</li> </ul>
16	Zoning Overlay Districts	<ul style="list-style-type: none"> <li>○ Specifically designed zoning districts to protect groundwater resources</li> </ul>		In Development	<ul style="list-style-type: none"> <li>■ Establish partnerships</li> </ul>
17	County Groundwater Ordinance	<ul style="list-style-type: none"> <li>○ Guidelines for utilizing groundwater resources in certain areas</li> <li>○ Offset-program for developers</li> </ul>	<ul style="list-style-type: none"> <li>→ Ottawa County Department of Public Health</li> <li>→ Ottawa County Road Commission</li> </ul>	In Development	<ul style="list-style-type: none"> <li>■ Work with partners to develop draft ordinance</li> </ul>
18	Health Code Revisions	<ul style="list-style-type: none"> <li>○ Identify and enhance health codes to further protect groundwater</li> </ul>	<ul style="list-style-type: none"> <li>→ Ottawa County Department of Public Health</li> </ul>	In Development	<ul style="list-style-type: none"> <li>■ Work with partner to identify changes</li> </ul>
19	Exploring Other Policies	<ul style="list-style-type: none"> <li>○ Examining current and potential policies for opportunities to enhance groundwater conservation</li> </ul>	<ul style="list-style-type: none"> <li>→ Drummond Carpenter, PLLC</li> <li>→ Michigan Groundwater Association</li> <li>→ Ottawa County Department of Public Health</li> <li>→ Ottawa County Road Commission</li> <li>→ Ottawa County Water Resources Commissioner</li> </ul>	In Development	<ul style="list-style-type: none"> <li>■ Work with partners to explore opportunities</li> </ul>

# Mitigation Strategies

#	Strategy	Summary / Components	Current Partners	Status	Critical Next Steps
20	Water Recycling Strategies	<ul style="list-style-type: none"> <li>Exploring innovative opportunities to utilize alternative water sources</li> </ul>	<ul style="list-style-type: none"> <li>→ Drummond Carpenter, PLLC</li> <li>→ Michigan Geological Survey</li> <li>→ Ottawa County Department of Public Health</li> </ul>	In Development	<ul style="list-style-type: none"> <li>■ Work with partners to identify and test new systems</li> <li>■ Modify regulations, as necessary</li> </ul>
21	Groundwater Monitoring Network	<ul style="list-style-type: none"> <li>Establish a large-scale monitoring system to better understand our hyper-local geology</li> </ul>	<ul style="list-style-type: none"> <li>→ Michigan Geological Survey</li> <li>→ Michigan Groundwater Association</li> </ul>	In Development	<ul style="list-style-type: none"> <li>■ Secure Funding</li> <li>■ Work with partners to develop action plan</li> </ul>
22	Infrastructure Mapping and Planning	<ul style="list-style-type: none"> <li>Countywide water and wastewater infrastructure map; and</li> <li>Expansion recommendation plan</li> </ul>	<ul style="list-style-type: none"> <li>→ Ottawa County Department of Geospatial Insights &amp; Solutions</li> <li>→ Ottawa County Road Commission</li> </ul>	In Development	<ul style="list-style-type: none"> <li>■ Work with partners to map and plan infrastructure</li> </ul>
23	Coordinated Future Land Use Plan	<ul style="list-style-type: none"> <li>Coordinated countywide future land use plan, developed with groundwater considerations</li> </ul>		In Development	

## Model Zoning Guidelines

*Ensuring future development does not come at a cost to groundwater quality and quantity*

Rapidly expanding residential development is adding strain to our groundwater supply.

In order to allow our County to continue its growth, yet also protect our resources, thoughtful zoning practices will need to be implemented.

The County has begun reviewing best practices for groundwater conservation through zoning and land use techniques, including components of Low Impact Development (LID). The compiled strategies and recommendations will be distributed for use at the local level.

The Planning and Performance Improvement Department will be available to provide assistance to local units with implementing any changes.

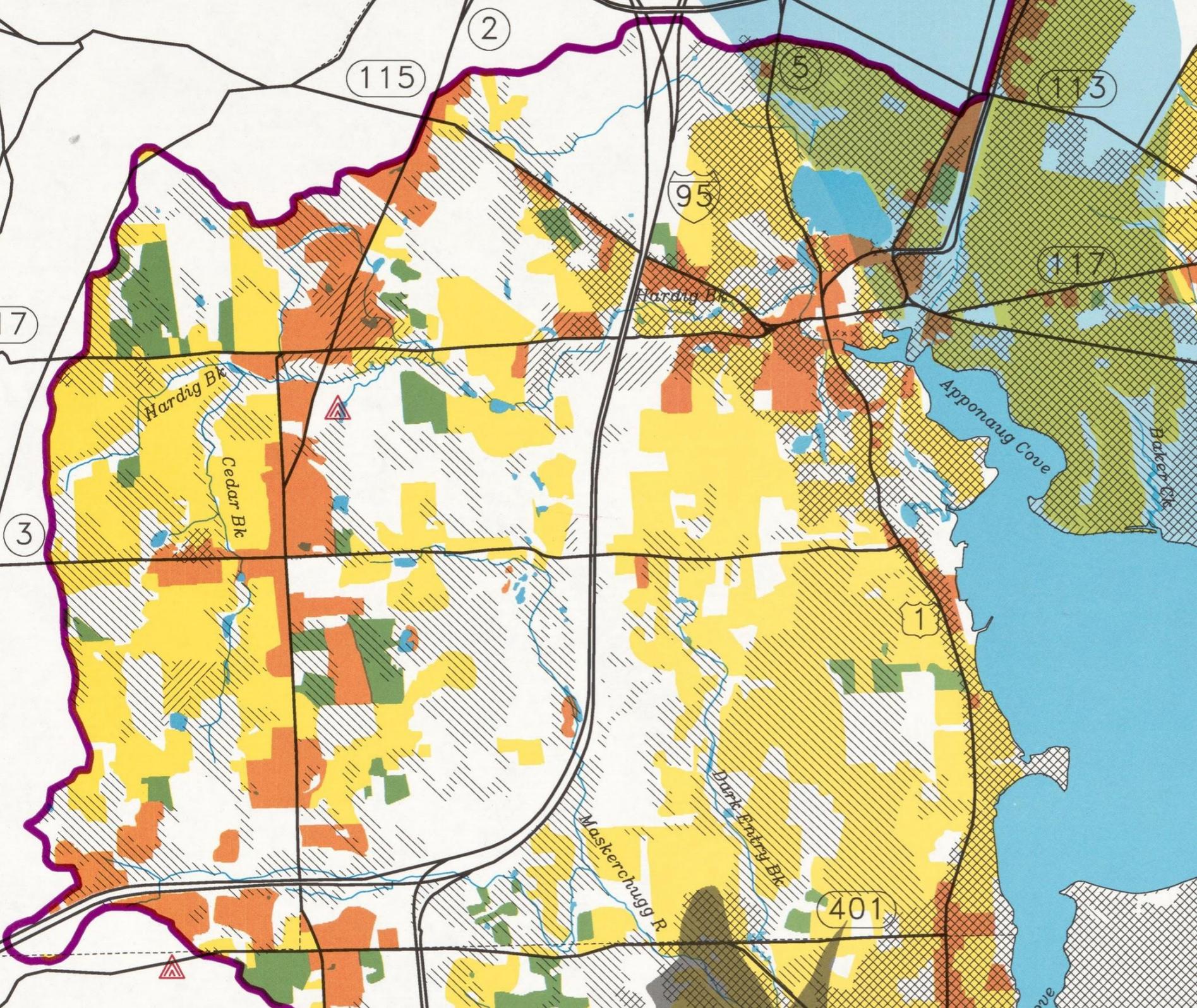
Examples of other modifications may include:

- Lot size/density requirements
- Landscaping requirements
- Allowable uses



### Did You Know...

LID (Low-Impact Development) is an approach to planning and engineering design to mitigate the impact of our built environment on the natural environment.



## Zoning Overlay Districts

*Ensuring future development does not come at a cost to groundwater quality and quantity*

Groundwater challenges present themselves in different ways and in different levels of severity across the County. In other words, our geologic conditions are not confined within political boundaries.

Zoning overlay districts can span across multiple jurisdictions, and be defined by geologic conditions, not political boundaries. The districts would apply specific development and use standards, to address localized groundwater issues.

The County aims to review options with various environmental experts and local representatives, utilizing existing and needed data (e.g. data from the proposed groundwater monitoring network - *Strategy 24*) to define district boundaries and standards.

# County Groundwater Ordinance

*Protecting groundwater through innovative policy*

The County is researching options and examples for implementing an ordinance that would protect groundwater by managing certain aspects of development and enhance municipal water access.

Innovative techniques used by other jurisdictions include:

- Prioritized development credit programs
- Expanding municipal water infrastructure with new funding sources
- Rebate options for connecting to municipal water

## Current Partners

miOttawa Department of  
**Public Health**



## Health Code Revisions

*Strengthening environmental health regulations*

Many state and local environmental health regulations are designed to protect groundwater.

The County is working to revise and enhance some of these existing regulations in order to accommodate for the particularly sensitive nature of our geology.

Some potential revision areas include:

- Minimum separation distances between wells and septic systems
- Minimum distance requirements for new development to connect to municipal water/wastewater infrastructure
- Advanced types of on-site wastewater treatment (e.g. aerobic), where applicable

### Current Partners

miOttawa Department of  
**Public Health**

### Did You Know...

An aerobic treatment system differs from a traditional septic system in that it utilizes oxygenated processes to break down organic matter. This method is cleaner and more efficient.

# Exploring Other Policies

*Examine existing practices for improvement opportunities*

Numerous other policies may have a direct or indirect impact on our groundwater. The County will be reviewing these policies, as they are identified.

Potential policies to review include:

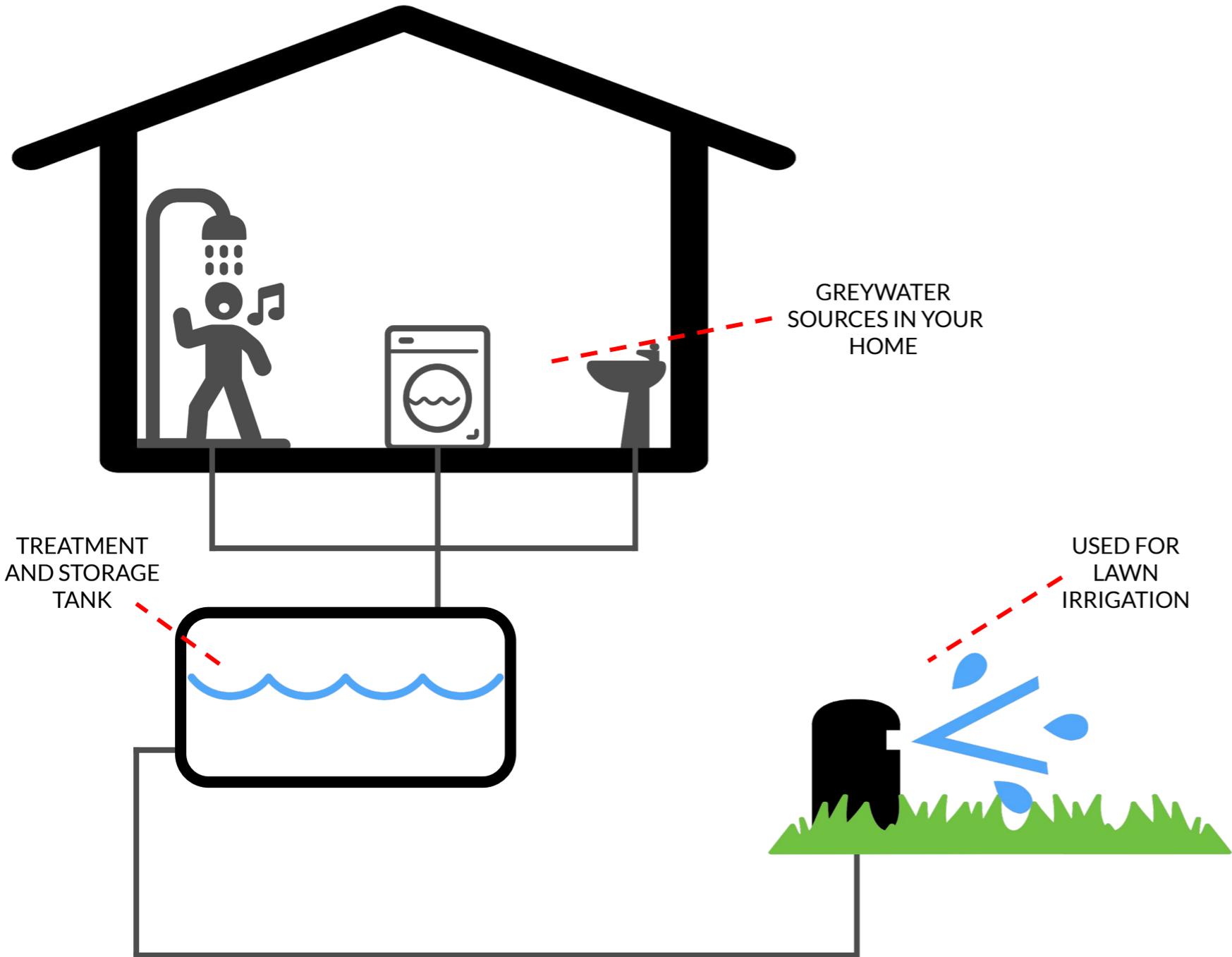
- Road de-icing policy
- Runoff storage solutions
- Development guidelines for stormwater management
- Enhanced well drilling records
- Real Estate Transfer Evaluation Program

### Current Partners



**Did You Know...**  
Permeable Pavers are designed to increase the amount of water infiltrated back into the ground

## EXAMPLE OF A RESIDENTIAL GREYWATER SYSTEM



## Water Recycling Strategies

*Innovative systems & ways to permit them*

Opportunities exist for capturing, storing, and reusing water from various systems that typically discharge water as a waste byproduct. Recycled water from these systems can be used for irrigation, agricultural, or other applications.

These systems, however, may require certain types of approval from health or environmental agencies, and/or require significant coordination to implement.

The County is working with various agencies to facilitate the use and promotion of these systems, and is exploring options for piloting demonstration projects.

Possible sources for water recycling can include:

- Household and industrial greywater systems
- Dewatering bags from various sources
- Sump collection systems
- Stormwater collection & storage

### Current Partners



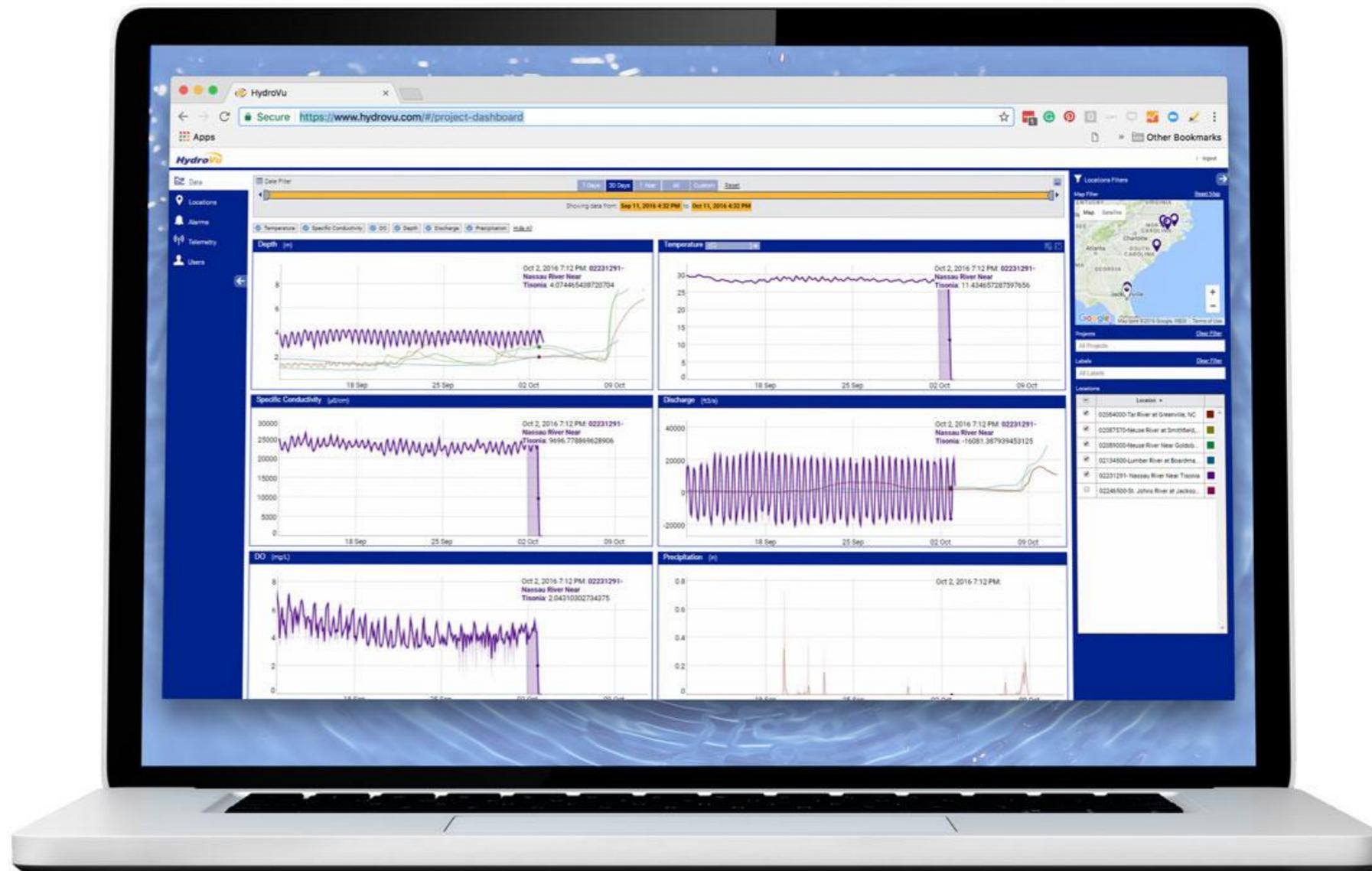
# Groundwater Monitoring Network

*Furthering our understanding of the water beneath our feet*

The studies conducted by Michigan State University illustrated the nature of the groundwater problems and where they are occurring. Now, the County aims to identify what solutions will be most effective.

This will be done by:

- Establishing a substantial network of monitoring wells to track long-term patterns in groundwater flow
- Identifying areas that naturally facilitate bedrock aquifer recharge
- Examining our ability to augment groundwater recharge, by means of injection wells, or other methods
- Calculating our groundwater consumption, then setting benchmarks for improvement through a groundwater budget

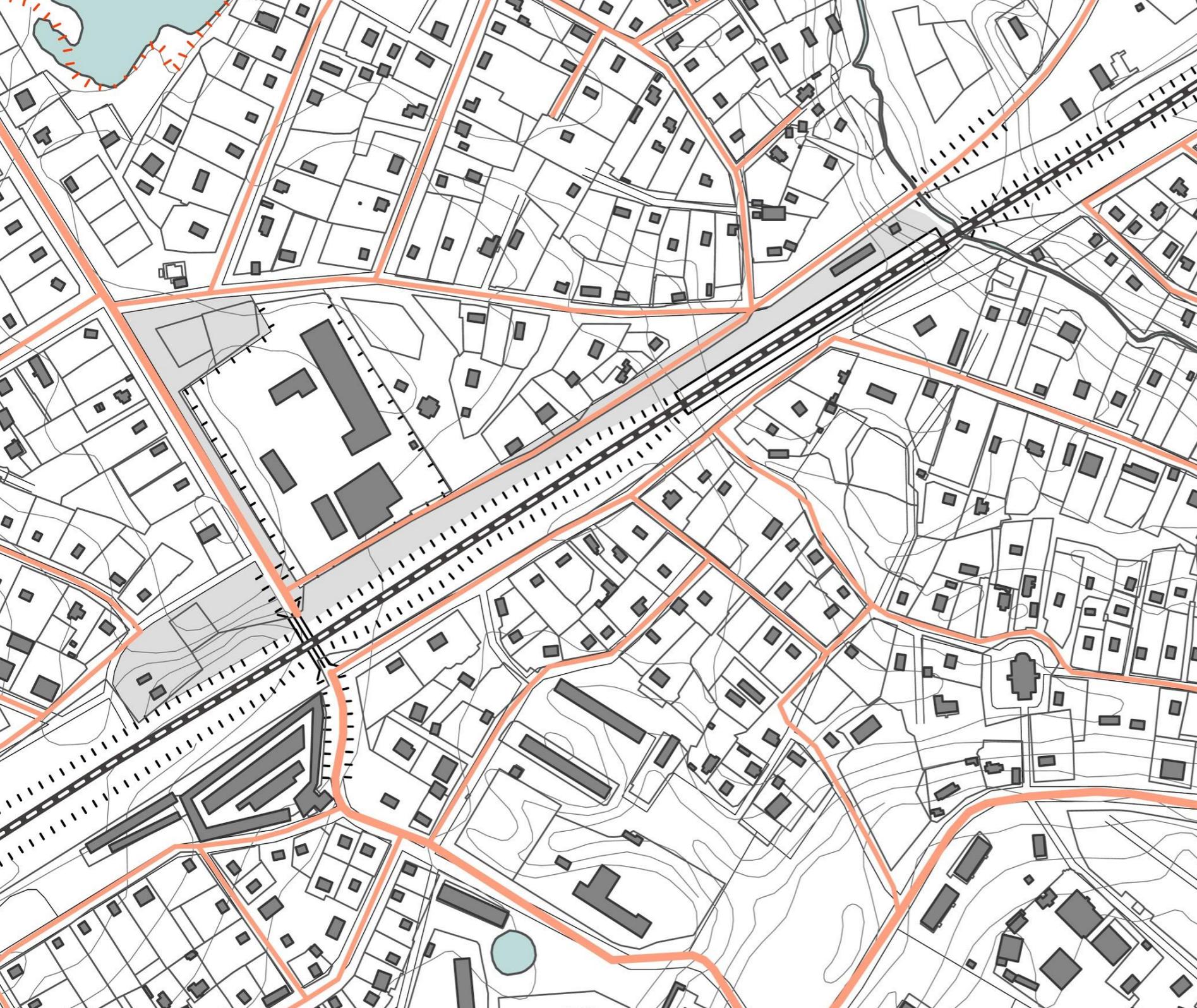


## Current Partners



### Did You Know...

A groundwater budget is similar to a financial budget. It measures how much groundwater is being taken out, versus how much is being put back into the aquifer, in a particular area.



## Infrastructure Mapping and Planning

*Strategic & comprehensive water system planning*

Currently, water and wastewater infrastructure systems are managed by several independent authorities across the County.

As a result, a comprehensive map or database showing the full extent of water and wastewater infrastructure across the County does not exist.

Data collection and mapping efforts are underway to set the framework for:

- Detailed map creation
- Availability and demand analysis
- Strategic planning of future system expansions

### Current Partners



## Coordinated Future Land Use Plan

*Planning for long-term development patterns*

Future land use planning and groundwater management are mutually beneficial strategies.

The Planning and Performance Improvement Department is in the process of developing a framework for a new Countywide future land use plan, in collaboration with local planning practitioners and other community stakeholders.

Areas of groundwater concern will be taken into consideration when designating areas for desired growth. Additionally, water and wastewater infrastructure planning can benefit from future land use modeling.



# Coordination Strategies

Creating accountability through organization structure

# Coordination Strategies

#	Strategy	Summary / Components	Current Partners	Status	Critical Next Steps
24	County Support Personnel	<ul style="list-style-type: none"> <li>Newly created position within the County to manage groundwater efforts</li> </ul>		In Development	<ul style="list-style-type: none"> <li>Allocate funding for new position</li> </ul>
25	Groundwater Technical Advisory Board	<ul style="list-style-type: none"> <li>A group of scientists and policy-makers assembled to assist County efforts and provide technical expertise</li> </ul>		In Development	<ul style="list-style-type: none"> <li>Identify all members</li> <li>Develop board bylaws and mission</li> </ul>
26	Groundwater Commission	<ul style="list-style-type: none"> <li>Formal commission created to ensure the continued pursuit of County and regional groundwater conservation</li> </ul>	<ul style="list-style-type: none"> <li>→ Ottawa County Groundwater Task Force</li> </ul>	In Development	<ul style="list-style-type: none"> <li>Identify all members</li> <li>Develop board bylaws and mission</li> </ul>
27	Collaboration on Existing Efforts	<ul style="list-style-type: none"> <li>County to support the efforts of its partners</li> </ul>	<ul style="list-style-type: none"> <li>→ All partners</li> </ul>	In Development	<ul style="list-style-type: none"> <li>Support our partners!</li> </ul>

## County Support Personnel

*County staff to oversee and assist conservation efforts*

A dedicated groundwater technician and liaison can provide support and assistance to Ottawa County's partners and stakeholders. The groundwater specialist (i.e. land use planner) would be employed by the County, within the Planning and Performance Improvement Department.

Primary responsibilities may include:

- Research & development for various ordinances and policies
- Making recommendations for zoning standards and overlays
- Facilitating communications and programs between various partners
- Managing the implementation of various programs outlined in this document
- Handling public relations

# Groundwater Technical Advisory Board

*Professionals offering technical expertise*

The ad-hoc Groundwater Executive Committee that was formulated to oversee the creation of this plan will be formalized into a permanent advisory board to oversee the plan's implementation process and provide technical and logistical assistance on various groundwater issues across the County.

Responsibilities of the board may include:

- Providing technical support and recommendations
- Helping diagnose and solve unique groundwater challenges
- Advising residents, developers, and business owners on water conservation techniques, technologies, and methods best suited for the area



**Paul Sachs**  
*Director, Planning and Performance Improvement*

**Al Vanderberg**  
*County Administrator*

**John Yellich, CPG**  
*Director, Michigan Geological Survey*

**Pat Staskiewicz, P.E.**  
*Director, Public Utilities*

**T B D**  
*Groundwater Staff/Planner*

**Adeline Hambley**  
*Environmental Health Manager*

**Matt Allen**  
*Environmental Health Supervisor*

**T B D**  
*Well Driller Liaison*

**Al Steinman, PhD.**  
*Director, Annis Water Resources Institute*

**Did You Know...**  
Some of Michigan's most esteemed water systems experts have been involved in the process of identifying the conservation strategies and techniques listed in this document!

## Groundwater Commission

*A stakeholder-led committee providing leadership*

As part of the initial groundwater studies, a task force of qualified individuals with diverse backgrounds was organized to oversee the process. This task force will be transitioned into a formal commission to provide accountability and oversight of groundwater sustainability efforts.

## Collaboration on Existing Efforts

*Supporting our partners and their efforts*

The County recognizes the extensive efforts its partners commit to preserving groundwater through their own programs. In addition to working on its direct water conservation and advocacy efforts, the County will provide ongoing support to partner organizations and their efforts.

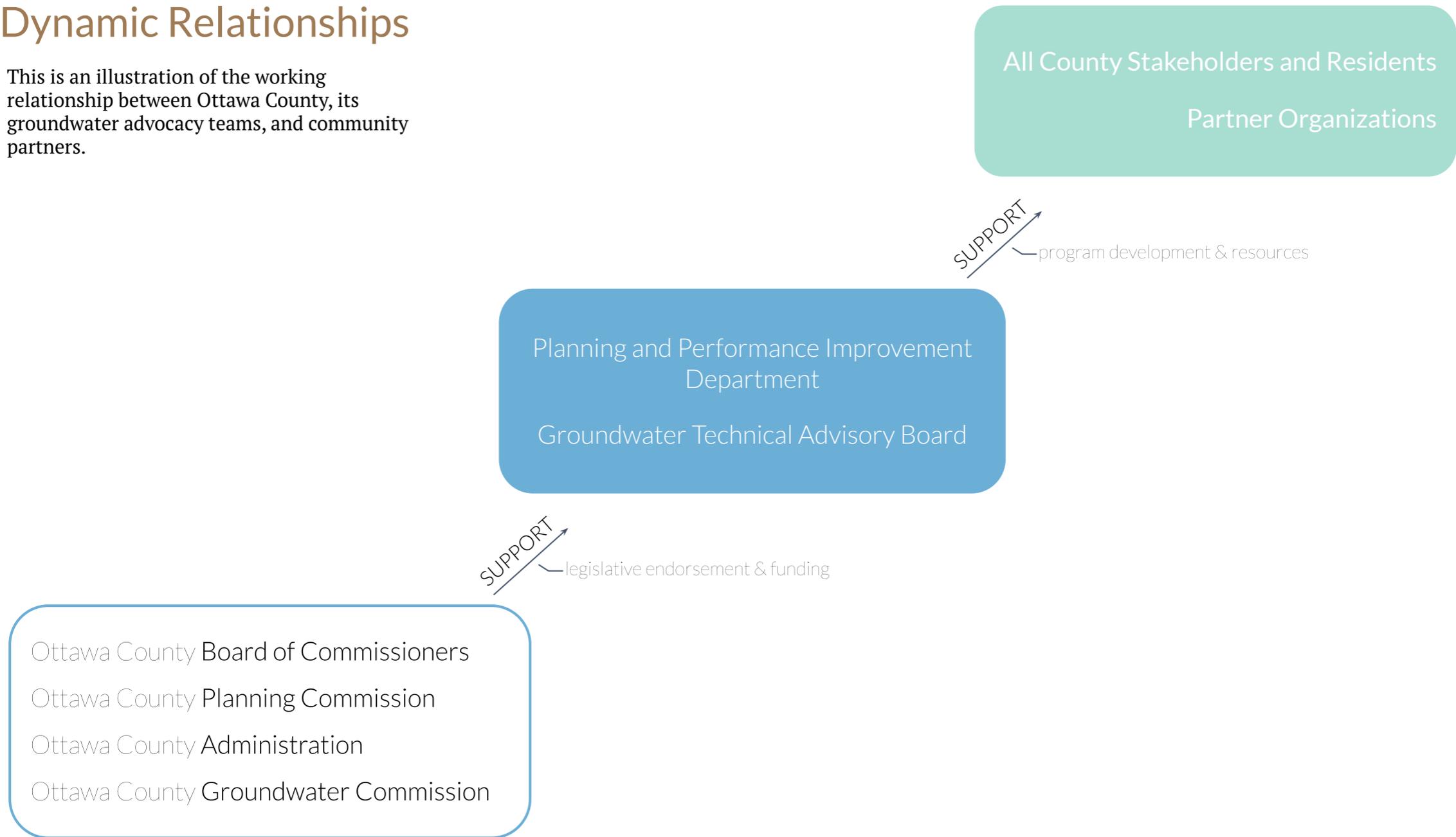
Continued support will come in various forms, such as:

- Logistical coordination
- Resource contribution
- Promotion and collaboration



# Dynamic Relationships

This is an illustration of the working relationship between Ottawa County, its groundwater advocacy teams, and community partners.



# How to Get Involved

*Not already one of our partners?*

*Want to make a difference?*

→ Contact the Ottawa County Planning and Performance Improvement Department today to discover how we can work together!



Photo credit: Mike Lozon



[www.facebook.com/OttawaCounty](http://www.facebook.com/OttawaCounty)



[@miOttawa](https://twitter.com/miOttawa)



[@ottawacountymi](https://www.instagram.com/ottawacountymi)



[www.miottawa.org/groundwater](http://www.miottawa.org/groundwater)



**Ottawa County**  
*Where You Belong<sup>®</sup>*

**Planning and Performance  
Improvement**

12220 Fillmore Street, Room 260  
West Olive, Michigan 49460

[plan@miottawa.org](mailto:plan@miottawa.org)  
[miottawa.org/departments/planning](http://miottawa.org/departments/planning)

(616) 738-4852

# Appendices

# Appendix A - Resolution

COUNTY OF OTTAWA  
STATE OF MICHIGAN

## RESOLUTION

At a regular meeting of the Ottawa County Board of Commissioners, held at the Fillmore Complex in the Township of Olive, Michigan on November 26, 2019 at 1:30 p.m. local time.

PRESENT: Commissioners: Francisco Garcia, Joseph Baumann, Douglas Zylstra, Allen Dannenberg, Randall Meppelink, Kyle Terpstra, James Holtvluwer, Gregory DeJong, Philip Kuyers, Matthew Fenske. (10)

ABSENT: Commissioners: Roger Bergman. (1)

It was moved by Commissioner Kyle Terpstra and supported by Commissioner Randall Meppelink that the following Resolution be adopted:

WHEREAS it is the goal of the Ottawa County Board of Commissioners to contribute to the long-term economic, social and environmental health of the County; and

WHEREAS it has been determined through extensive scientific study that the County is experiencing issues with groundwater depletion and mineralization; and

WHEREAS under current development conditions, the groundwater issues will continue to worsen; and

WHEREAS the groundwater issues pose significant risk to the long-term economic, social and environmental health of the County; and

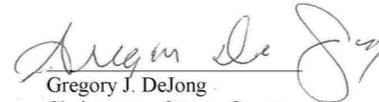
WHEREAS Ottawa County personnel, in partnership with a multitude of area partner organizations, have developed a series of strategies to address the groundwater challenges, entitled "Ottawa County Groundwater Sustainability Initiative: Proactive Strategies Index (Fall 2019)";

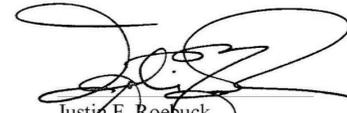
NOW THEREFORE IT BE RESOLVED that the Ottawa County Board of Commissioners endorses and pledges to support, within its resource limitations, the efforts of Ottawa County personnel and their partners to implement groundwater sustainability initiatives, including those listed in the "Ottawa County Groundwater Sustainability Initiative: Proactive Strategies Index (Fall 2019)".

YEAS: Commissioners: Francisco Garcia, Matthew Fenske, Douglas Zylstra, Allen Dannenberg, Kyle Terpstra, Randall Meppelink, James Holtvluwer, Joseph Baumann, Philip Kuyers, Gregory DeJong. (10)

NAYS: Commissioners: None

RESOLUTION DECLARED ADOPTED.

  
Gregory J. DeJong  
Chairperson, Ottawa County  
Board of Commissioners

  
Justin F. Roebuck  
Ottawa County Clerk/Register

# Appendix B - Our Groundwater Story

## Part 1

### Responding to Concern

Ottawa County is the fastest growing county in Michigan. It is also one of the most agriculturally diverse and productive counties in the State, and nationally. As the County's population continues to grow and its agricultural industry flourishes into the future, access to abundant clean water is essential.

Residents, agricultural producers, and businesses in Ottawa County obtain their water from two primary sources: municipal water systems and natural aquifer systems. The County's urbanized areas are served principally by municipal systems that distribute water processed from Lake Michigan, while its rural areas rely on water that is pumped from underground geologic aquifer systems. Since 2005, there have been instances in the County where the aquifer system has not had the capacity to support new withdrawals, mainly due to low water levels.

There have also been instances where extracted groundwater contained elevated levels of sodium chloride. In order to understand the long-term sustainability of the County's aquifer system, the Ottawa County Board of Commissioners requested that a comprehensive, forward-looking study be conducted. One of the primary goals of the study was to identify those areas of the County where continued and/or increased groundwater withdrawals may negatively impact the sustainability and quality of the aquifer system.



#### Did You Know...

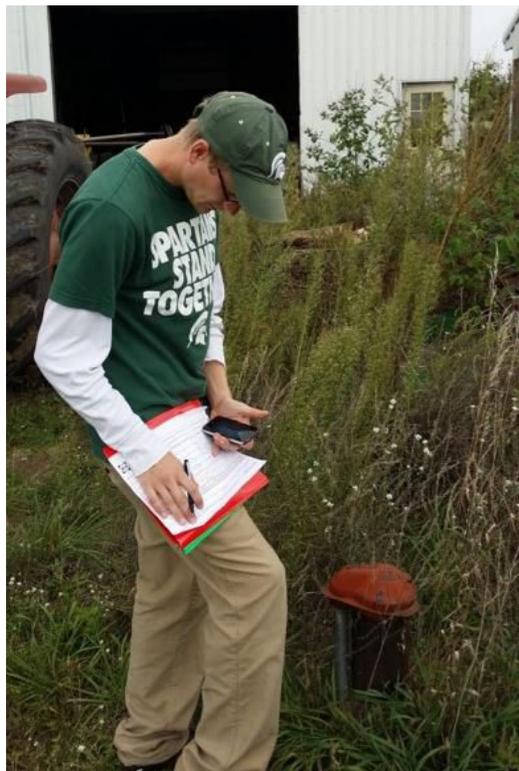
Local farmers have seen their crops become damaged by using groundwater with high levels of sodium chloride.

# Appendix B - Our Groundwater Story

## Part 2

### Groundwater Studies

Michigan State University (MSU) was hired in 2012 to conduct the comprehensive, two-part groundwater study for Ottawa County. An initial Phase I groundwater assessment was completed by MSU in 2013. The assessment validated the anecdotal reports: in certain areas of our bedrock aquifer, water levels have been gradually declining over the last 20 years, and sodium chloride levels are rising above recommended standards for drinking water (>250 mg/L) and agricultural irrigation (>70 mg/L).



The primary reasons for the declining water levels and increasing sodium chloride concentrations are two-fold. First, water in the deep bedrock aquifer is not being replenished as quickly as it is being withdrawn for water consumption. This is occurring mainly because of the unique geology underneath Ottawa County.

A substantial layer of impermeable clay material sits atop the deep bedrock aquifer nearly 100 foot below the land surface. This naturally occurring clay layer prevents water that percolates

down from the surface from recharging back into the bedrock aquifer.

Secondly, the bedrock aquifer, known as the Marshall Formation, is naturally-rich in sodium chloride. Consequently, as water levels decrease, the concentration of sodium chloride increases in the water that is being pumped from the aquifer system.

A Phase II study began in 2014 by MSU to assess how the County's groundwater supply will be impacted as demand for water increases into the future. This study utilized water-demand projections for the years 2020, 2025, and 2035 based on anticipated growth trends countywide. The study results, finalized by MSU in March 2018, provide community officials with the information needed to develop a sustainable action plan for effectively and collaboratively managing our groundwater resources.

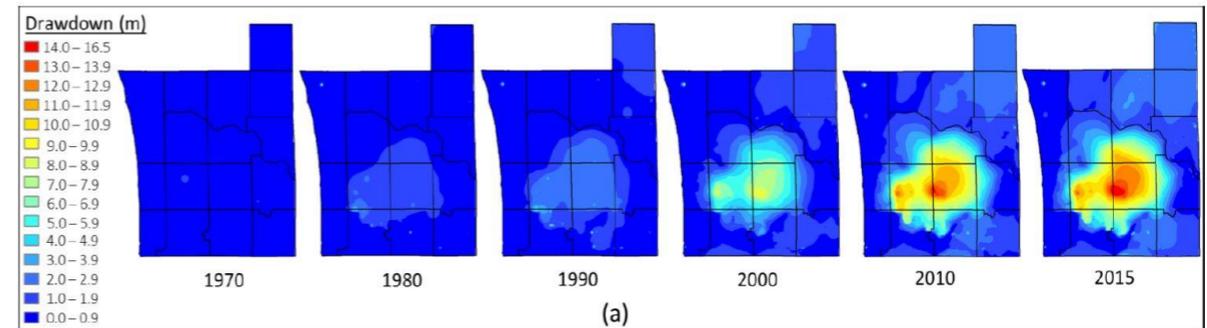


Figure a, above, illustrates the increasing amount of groundwater that is being pumped from the bedrock aquifer, especially in the central portion of the County.

#### Did You Know...

The full scientific study results can be found in the Phase I and Phase II Reports, available online at [miottawa.org/groundwater](http://miottawa.org/groundwater)

# Appendix B - Our Groundwater Story

## Part 3

### The Planning Process & Moving Forward

Since the completion of the Phase II Study in 2018, the County has made it a priority to proactively address our groundwater issues going forward. The Planning and Performance Improvement Department has been working hard to initiate an awareness campaign, and to establish partners to help identify and manage solutions to address the issues. As of fall 2019, the County has held over 50 meetings with various community stakeholder groups and organizations, and has been present at a multitude of community events to spread awareness, garner support, and learn about



the ways in which we can all work together towards a future of water sustainability. This document is a brief summary of partnerships and programs the County has established, or plans to establish.

In order to ensure that groundwater sustainability remains a priority for the County for years to come, its Board of Commissioners have adopted a formal resolution to support the ongoing efforts of its staff and partners.

Moving forward, you can look to see our logo wherever an opportunity exists to promote water sustainability!



# Appendix C - Links

## Partner Organizations

**Allendale Christian School**  
[allendalechristian.org](http://allendalechristian.org)

**Allendale Township Library**  
[allendalelibrary.org](http://allendalelibrary.org)

**Coopersville Area District Library**  
[coopersvillelibrary.org](http://coopersvillelibrary.org)

**Drummond Carpenter**  
[drummondcarpenter.com](http://drummondcarpenter.com)

**EPA WaterSense**  
[epa.gov/watersense](http://epa.gov/watersense)

**Gary Byker Library of Hudsonville**  
[hudsonvillelibrary.org/news-events](http://hudsonvillelibrary.org/news-events)

**GEI Consultants**  
[geiconsultants.com](http://geiconsultants.com)

**Grand Valley State University**  
[gvsu.edu](http://gvsu.edu)

**Georgetown Township Public Library**  
[gtwp.com/186/Library](http://gtwp.com/186/Library)

**Green Michigan**  
[greenmichigan.org](http://greenmichigan.org)

**Herrick District Library**  
[herrickdl.org](http://herrickdl.org)

**Holland-Hope College Sustainability Institute**  
[hope.edu/offices/sustainability/resources.html](http://hope.edu/offices/sustainability/resources.html)

**Hope College**  
[hope.edu](http://hope.edu)

**Howard Miller Public Library**  
[hmpl.org](http://hmpl.org)

**Loutit Public Library**  
[loutitlibrary.org](http://loutitlibrary.org)

**Macatawa Area Coordinating Council**  
[the-macc.org](http://the-macc.org)

**Michigan Agriculture Environmental Assurance Program**  
[maeap.org](http://maeap.org)

**Michigan Association of Conservation Districts**  
[macd.org](http://macd.org)

**Michigan Geological Survey**  
[wmich.edu/geologysurvey](http://wmich.edu/geologysurvey)

**Michigan Groundwater Association**  
[michigangroundwater.com](http://michigangroundwater.com)

**Michigan State University Extension**  
[canr.msu.edu/outreach](http://canr.msu.edu/outreach)

**Natural Resources Conservation Service**  
[nrcs.usda.gov/wps/portal/nrcs/site/national/home](http://nrcs.usda.gov/wps/portal/nrcs/site/national/home)

**Ottawa Area Independent School District**  
[oaisd.org](http://oaisd.org)

**Ottawa County Department of Public Health**  
[miottawa.org/health/ochd](http://miottawa.org/health/ochd)

**Ottawa County Farm Bureau**  
[ottawa.michfb.com](http://ottawa.michfb.com)

**Ottawa County Geospatial Insights and Solutions**  
[miottawa.org/Departments/GIS](http://miottawa.org/Departments/GIS)

**Ottawa County Parks and Recreation**  
[miottawa.org/parks](http://miottawa.org/parks)

**Ottawa County Road Commission**  
[ottawacorc.com](http://ottawacorc.com)

**Ottawa County Water Resources Commissioner**  
[miottawa.org/Departments/Drain](http://miottawa.org/Departments/Drain)

**ODC Network**  
[outdoordiscovery.org](http://outdoordiscovery.org)

**Patmos Library**  
[patmoslibrary.org](http://patmoslibrary.org)

**Spring Lake District Library**  
[sllib.org](http://sllib.org)

**West Michigan Nursery and Landscape Association**  
[wmnla.com](http://wmnla.com)

# Appendix C - Links

## Other Useful Links

**Alliance for Water Efficiency**  
[allianceforwaterefficiency.org](http://allianceforwaterefficiency.org)

**EPA WaterSense**  
[epa.gov/watersense](http://epa.gov/watersense)

**U.S. Geological Survey**  
[usgs.gov/water](http://usgs.gov/water)

**Water Footprint Calculator**  
[watercalculator.org](http://watercalculator.org)

## Appendix D - References

1. Department of Energy (2019). *Reduce Hot Water Use for Energy Savings*. Retrieved from <https://www.energy.gov/energysaver/water-heating/reduce-hot-water-use-energy-savings>
2. Vickers, A. (2006, February). *New Directions in Lawn and Landscape Water Conservation*. American Water Works Association, 98(2), 56-61.
3. Environmental Protection Agency. (2006). *Outdoor Water Use in the United States*.
4. Emrath, P. (2017, October 2). *Residential Water Use*. National Association of Home Builders. Retrieved from <https://www.nahbclassic.org/generic.aspx?sectionID=734&genericContentID=259397>
5. Baltimore County Government. (2019, June 17). *Understanding Water Usage and Water Saving Tips*. *Understanding Water Usage and Water Saving Tips*. Retrieved from <https://www.baltimorecountymd.gov/Agencies/publicworks/utilities/waterusageconservation.html>

Thank You!

