

# Michigan's Source Water Assessment Program (SWAP)





# **1996 Amendments Federal Safe Drinking Water Act**

## **Required States to:**

- **Identify the areas that supply public drinking water**
- **Inventory contaminants and assess water susceptibility to contamination**
- **Inform the public of the results**

# SWAP Advisory Committee

- Consisted of MDEQ, MSU-IWR, USGS, GEM Centers, local health department staff, and others
- Final SWAP submitted in February 1999 and approved in October 1999
- Michigan has approximately 12,000 PWS and over 18,000 sources to assess



# MICHIGAN SWAP

## Water Supply “Assessment” Categories

- **Wellhead Protection Programs – Community systems served by groundwater**
- **Surface Water Assessments – Community systems on:**
  - **Inland lake and river sources**
  - **Great Lakes sources**
- **Source Water Assessments – remaining Community systems served by groundwater sources**
- **Source Water Assessments – Noncommunity systems served by groundwater sources**



# Source Water Assessments

## Groundwater Sources

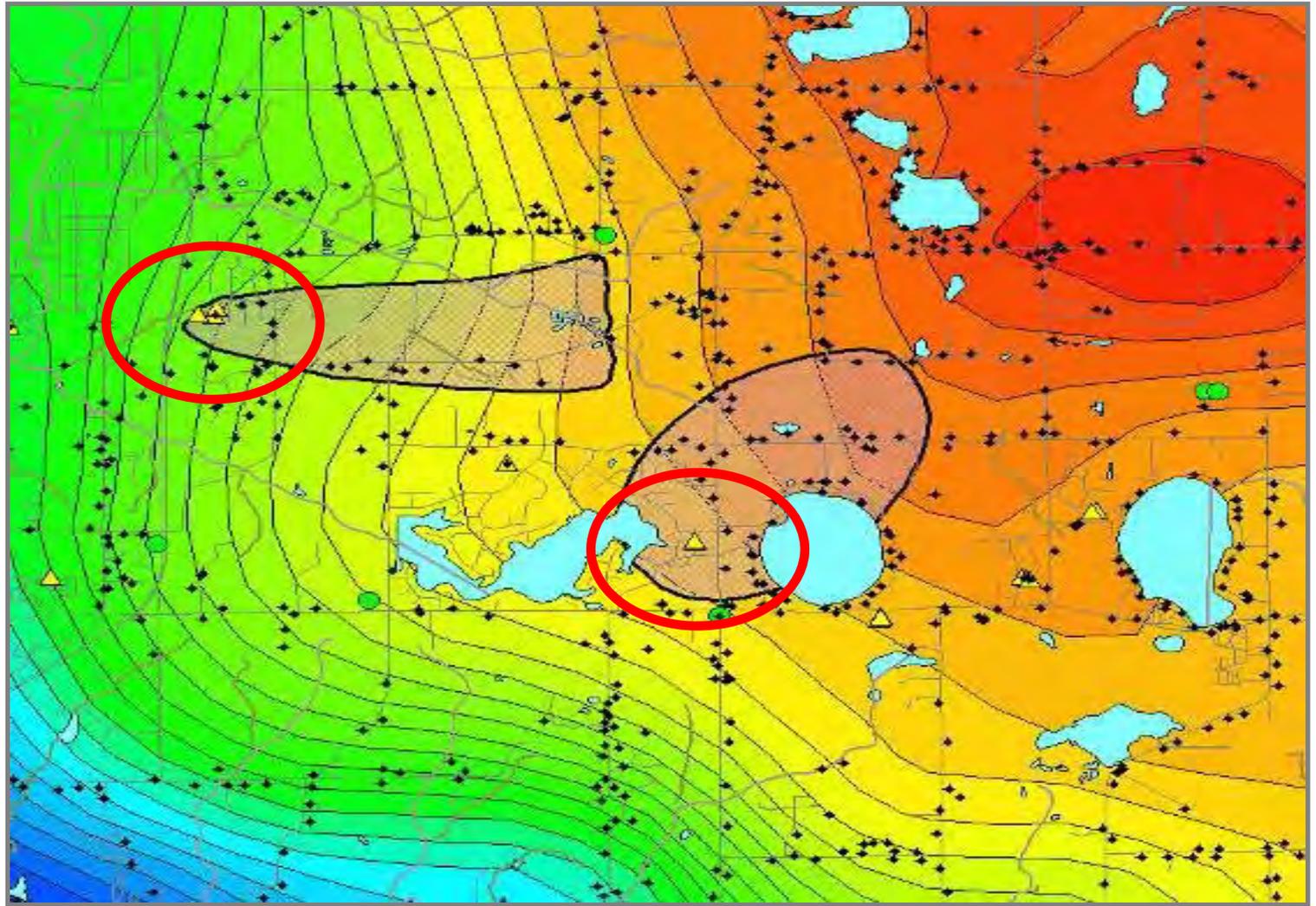
- **Source Water Assessments**
  - **On-site Assessment – Scoring Process**
  - **GPS Locating of Wellheads**
  - **Well Log Verification**
- **Non-community Systems**
  - **Conducted by Local Health Departments**
- **Community Systems**
  - **Conducted by DEQ district staff**

# Why are we updating SWA's?

- **Required by Federal SDWA**
  - **Maintaining state waiver program**
  
- **More information available**
  - **Well logs**
  - **Detection limits have changed**
  - **Change in drinking water standards**
  
- **MGMT Provisionals provide SWPA**
  - **No longer rely on isolation distances**



## GW Flow-Based Delineation vs Fixed Radius

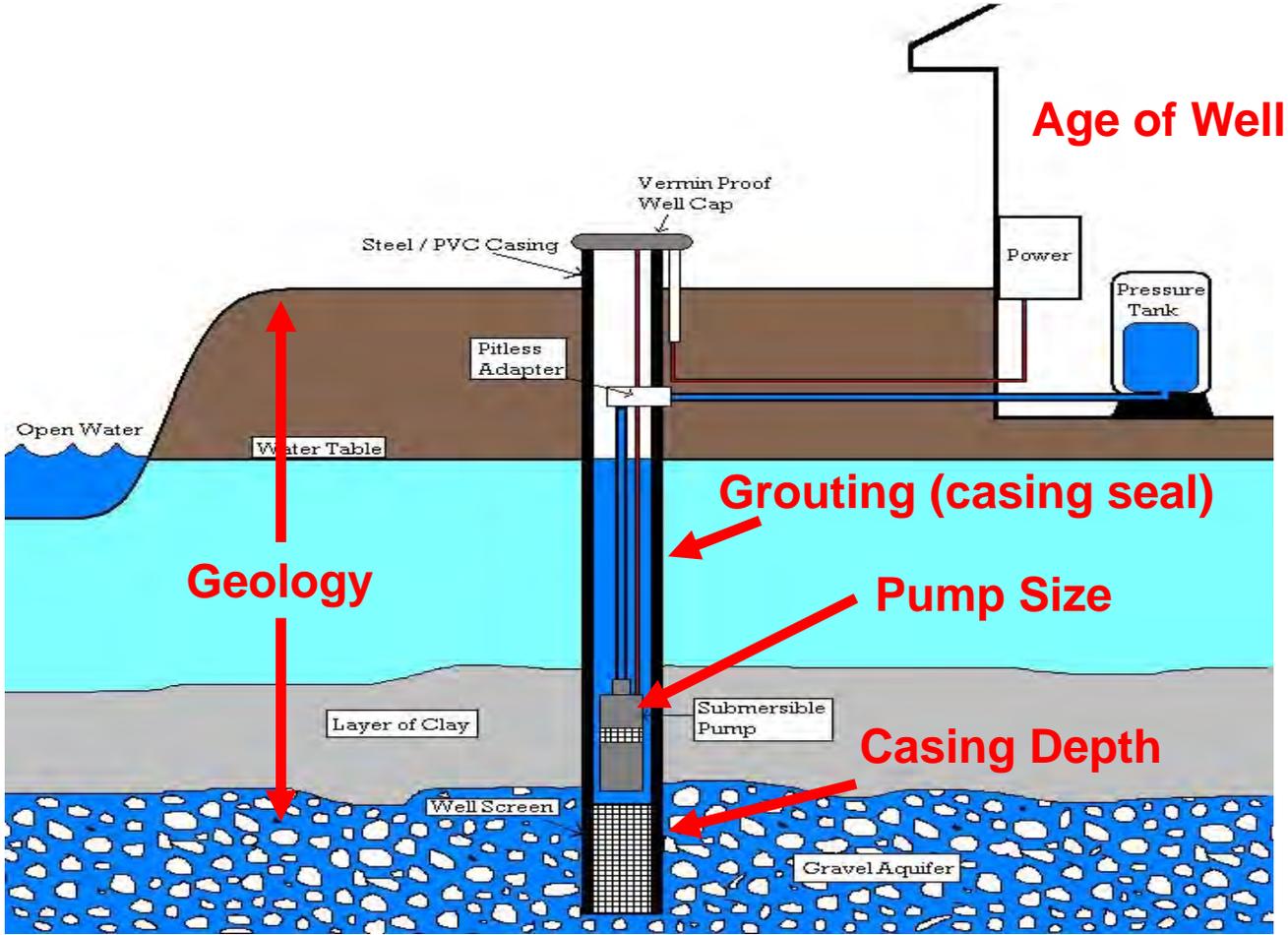


# Source Water Assessment Scores (SWAS)

- Evaluation process critiques:
  - **Geology - SWAS<sub>g</sub>**
  - **Well Construction - SWAS<sub>w</sub>**
  - **Chemical Monitoring - SWAS<sub>c</sub>**
  - **Source of Contamination – SWAS<sub>s</sub>**
  
- **SWAS = SWAS<sub>g</sub> + SWAS<sub>w</sub> + SWAS<sub>c</sub> + SWAS<sub>s</sub>**
  
- **Generally, the lower the SWAS the less susceptible system is to contamination**



# Typical Well Installation





# Geology - SWASg

- Degree of natural protection by geologic materials present
- Presence or absence of “confining” materials
  - Continuous Confining Material (CCM)  
Requires 5 feet or more – clay, shale, etc.
  - Continuous Partially Confining Material (CPCM)  
Requires 10 feet or more – clay & sand, limestone & shale, etc.
- SWASg - 30 minus points for CCM & CPCM
- Geologic Sensitivity Rating (GSR)
  - High: SWASg = 30 (CCM & CPCM absent)
  - Low: SWASg = 0 (Excess of CCM or CPCM)
  - Moderate:  $3 < \text{SWASg} < 27$  (everything in between)



# SWASg - WSSN 2059341

| Formation Description                 | Thickness | Depth to Bottom |
|---------------------------------------|-----------|-----------------|
| Sand                                  | 10.00     | 10.00           |
| Gravel & Clay (- 3 pts) <b>CPCM</b> → | 10.00     | 20.00           |
| Red Clay (- 9 pts) <b>CCM</b> →       | 15.00     | 35.00           |
| Sand Wet/Moist                        | 10.00     | 45.00           |

## Geologic Sensitivity

This score represents the degree of natural protection afforded by the materials overlying the water-bearing formation. Lower scores indicate more protection. Points are deducted based on the thickness and type of geologic material that overlies the source of water. Surface contaminants migrate downward at varying rates dependent upon geological material and thickness. CCM stands for Continuous Confining Material (eg. clay). CPCM stands for Continuous Partially Confining Material (eg. mix of sand and clay). More points are deducted for a thick clay layer than a thick sand layer or a thinner clay layer. Point Range 0-30.

## Geologic Sensitivity - SWAS(G)

CCM Points Deducted: 12  
 CPCM Points Deducted: 0  
 Total SWAS(G) Points: 18  
 Geologic Sensitivity Rating: **Moderate**



# Well Construction - SWASw

- Represents the relative degree of protection afforded by the construction of the well
- Evaluation considers:
  - Grouting of casing – sealing of the well in construction
  - Age – the newer the better
  - Casing Depth – deeper the better
  - Pumping Rate – high pumping rates create greater risk



# SWASw - WSSN 2059341

## Grouting

Well Grouted: No

## Age

Drilling Method: Cable Tool

Well Depth: 45.00 ft.

Well Use: Type II public

Well Type: Replacement

Date Completed: 9/12/1985

## Casing Depth

Casing Type: Steel - black

Height:

Casing Joint: Threaded & coupled

Casing Fitting: Drive shoe

Diameter: 4.00 in. to 40.00 ft. depth

Borehole:

## Pumping Rate

Pump Installed: Yes

Pump Installation Date:

Manufacturer: Other

Model Number:

Drop Pipe Length: 30.00 ft.

Drop Pipe Diameter:

Draw Down Seal Used: No

Pump Installation Only: No

HP:

Pump Type: Submersible

Pump Capacity: 0 GPM

Pump Voltage:

Drilling Record ID:

### Well Construction

Points are added when a well lacks features that help protect the water supply from contamination. These include whether the well was grouted (sealing the annulus that is created between the casing and the soil formations during construction), the well age, how deep the casing extends into the ground, and how much water the well pumps, since larger volumes can pull contaminants from greater distances. Point Range 0-15.

Susceptibility increases one level if well construction reflects an adverse condition.

### Well Construction - SWAS(W)

|                              |           |
|------------------------------|-----------|
| Well Grouting Points:        | 15        |
| Well Age Points:             | 5         |
| Casing Depth Points:         | 10        |
| Pumping Rate Points:         | 0         |
| <b>Total SWAS(W) Points:</b> | <b>30</b> |



# Water Chemistry - SWASc

- **Points are accumulated for chemistry detects**
- **Chemical Parameters**
  - Nitrates and nitrites**
  - Volatile Organic Chemicals**
  - Synthetic Organic Chemical**
- **Point Range**
  - Not detected – 0 points**
  - Present at low levels – 10 points**
  - Present at moderate (action) level – 20 points**
  - **MCL Violation – 50 points**



# SWASc - WSSN 2059341

## System Score Indicates:

- Nitrates and Nitrites – present at low levels
- VOCs – no detects

### Water Chemistry and Isotope Data

Points are added if water sample results indicate detectable levels of nitrates or nitrites, volatile organic chemicals (solvents, fuel components), and/or synthetic organic chemicals (pesticides or herbicides). Tritium monitoring is included as a voluntary means of age-dating water. Generally, the older the water, the more protected the source. Point Range 0-50. (50 points = MCL violation)

Susceptibility is Very High if contaminants exceed the Maximum Contaminant Level (MCL).

### Water Chemistry and Isotope Data - SWAS(C)

Nitrates and Nitrites: 10

SOC.VOC: 0

Tritium Results: 0

Total SWAS(C) Points: 10



# Sources of Contamination - SWASs

- Major Sources within SWPA – 10 points
  - Consists of LUST, 201 sites, Oil & Gas, etc
- Major Sources in Standard Isolation 20 points
  - Community: within 200 feet
  - Regardless of location within SWPA
- Std. Sources in Standard Isolation – 10 points
  - Community: within 200 feet
- **Known Sources within SWPA – 25 points**





# SWASs - WSSN 04754

## System Score Indicates:

- No major potential sources within SWPA
- No major potential sources within 200 ft
- Two standard sources within 200 ft
- One known source within SWPA

### Isolation from Sources of Contamination

Points are added based on the number and type of potential contaminant sources within the source water protection area (SWPA), which is the 10-year time of travel capture zone (delineated area). For wells with no detectable level of tritium, the SWPA is a 2,000 feet radial area around wells. Points are also added if the water supply does not own or control a 200 feet isolation area (or another DEQ approved area). Examples: standard sources are septic tanks, sewer lines, and storm drains; major sources are chemical and fuel storage, landfills, lagoons, and known plumes of groundwater contamination. Point range indefinite.

### Isolation from Contamination - SWAS(S)

|  |             |
|--|-------------|
| Major Sources $\geq$ 200 ft and in SWPA: | 0 x 10 = 0  |
| Major Sources within 200 ft:             | 0 x 20 = 0  |
| Standard Sources within 200 ft:          | 2 x 10 = 20 |
| Known Sources within SWPA:               | 1 x 25 = 25 |
| Control of Isolation Area:               | 10          |
| Delineated Area:                         | Provisional |
| <b>Total SWAS(S) Points:</b>             | <b>55</b>   |



**Inventory within Provisional WHPA could replace the inventory relative to isolation distances**

# SWASs - WSSN 01465

## System Score Indicates:

- No major source in major isolation
- No major sources in standard isolation
- No standard sources in standard isolation
- No known sources in major isolation

### Isolation from Sources of Contamination

Points are added based on the number and type of potential contaminant sources within the isolation distance (75 ft. from standard or 800 ft. from major contaminant sources). Examples of standard sources are septic tanks, sewer lines, and storm drains. Examples of major sources are chemical and fuel storage, landfills, lagoons, and known plumes of groundwater contamination.

### Isolation from Contamination - SWAS(S)

|                                 |            |
|---------------------------------|------------|
| Major Sources from 75 - 800 ft: | 0 x 10 = 0 |
| Major Sources within 75 ft:     | 0 x 20 = 0 |
| Standard Sources within 75 ft:  | 0 x 10 = 0 |
| Known Sources within 800 ft:    | 0 x 25 = 0 |

Total SWAS(S) Points: 0



# **How might the Source Water Assessment Change?**

**Consider  
Woodruff Lake Co-Op Apts.**

# 2005 Source Water Assessment

COMMUNITY, PUBLIC WATER SUPPLY SOURCE WATER ASSESSMENT REPORT FOR  
**Woodruff Lake Co-op Apts #4** **07185**

|  |  |
|--|--|
| <p><b>What is SWAS?</b> - The Source Water Assessment Score (SWAS) is a process that factors geologic and water well attributes, water chemistry, and potential contaminant sources for each drinking water source into a ranking system to determine the relative potential for contamination. Sources with low scores are considered to be less susceptible to contamination than those with high scores. This assessment is required by the Michigan Source Water Assessment Program under the provisions of the 1996 amendments to the Federal Safe Drinking Water Act.</p>  | <p>WSSN: 07185 Well No. 4<br/>                 County: LIVINGSTON<br/>                 Administrative Contact<br/>                 Name: TESSIER, PAUL<br/>                 Address: 5955 Alan Drive<br/>                 Apt. 52<br/>                 City: BRIGHTON State: MI Zip: 48816</p> |
| <p><b>Well Log and Location</b> - A well log is a legal document describing the well location, construction, depth, soil formations penetrated, and capacity. It has been required to be completed by the drilling contractors and copies submitted to the owner, local health department and State since 1967. <b>The lack of information from a well log will increase the SWAS.</b> If no well log was available for this assessment, the SWAS may be higher than if one were available. Wellogic is an electronic database for well logs.</p>  | <p>Wellogic ID Number: N/A</p>   |
| <p><b>Geologic Sensitivity</b> - This score represents the degree of natural protection afforded by the materials overlying the water-bearing formation. Lower scores indicate more protection. Points are deducted based on the thickness and type of geologic material that overlies the source of water. Surface contaminants migrate downward at varying rates dependent on geologic material and thickness. CCM stands for continuous confining material. CPCM indicates continuous partially confining material. Points are deducted for a thick clay layer than a thick sand layer.</p>   | <p><b>Geologic Sensitivity - SWAS (G)</b><br/>                 CCM Pts. Deducted: 21<br/>                 CPCM Pts. Deducted: 0<br/>                 Total SWAS(G) Points: 9<br/>                 Geologic Sensitivity Rating - Moderate</p>   |
| <p><b>Well Construction</b> - Points are added when a well lacks features that help protect the water supply from contamination. These include whether the well was grouted (sealing the annulus that is created between the casing and the soil formations during construction); the well age, how deep the casing extends into the ground, and how much water the well pumps since larger volumes can pull contaminants into the well. Lower scores indicate better well construction. Lower scores indicate better well construction. Lower scores indicate better well construction. Lower scores indicate better well construction.</p> | <p><b>Well Construction</b><br/>                 Well Grouting Points: 15<br/>                 Well Age Points: 10<br/>                 Casing Depth Points: 15<br/>                 Pumping Rate: 0<br/>                 Total SWAS(W) Points: 40</p>   |

**No Well Record**

**Geology a guess**

**Owner Information**



# 2005 Source Water Assessment cont'd

## SOURCE WATER ASSESSMENT REPORT for WSSN 07185 (Continued)

|  |  |                                      |           |           |           |                                |          |             |           |                                   |          |                |           |                                 |           |        |          |                                      |          |  |  |  |          |  |  |   |           |  |  |
|--|--|--------------------------------------|-----------|-----------|-----------|--------------------------------|----------|-------------|-----------|-----------------------------------|----------|----------------|-----------|---------------------------------|-----------|--------|----------|--------------------------------------|----------|--|--|--|----------|--|--|---|-----------|--|--|
| <p><b>Water Chemistry and Isotope Data</b> – Points are added if water sample results indicate detectable levels of nitrates or nitrites, volatile organic chemicals (solvents, fuel components), synthetic organic chemicals (pesticides or herbicides), inorganics (metals) or radionuclides. Tritium monitoring is included as a voluntary means of age dating the water. Generally, the older the water the more protected the source. Point Range 0-50 (each category). <b>Susceptibility is very high if contaminants exceeds the Maximum Contaminant Level (MCL).</b> The MCL used for arsenic and radionuclide scores were those in effect prior to May 2003.</p>                                  | <p><b>Water Chemistry and Isotope Data – SWAS(C)</b></p> <table border="0"> <tr> <td>Nitrate and Nitrites</td> <td><u>0</u></td> <td>Socs:</td> <td><u>0</u></td> </tr> <tr> <td>VOCs:</td> <td><u>0</u></td> <td>Inorganics:</td> <td><u>10</u></td> </tr> <tr> <td>Tritium Results:</td> <td><u>0</u></td> <td>Radionuclides:</td> <td><u>0</u></td> </tr> <tr> <td><b>Total SWAS(C) Points:</b></td> <td colspan="3"><u>10</u></td> </tr> </table>  | Nitrate and Nitrites                 | <u>0</u>  | Socs:     | <u>0</u>  | VOCs:                          | <u>0</u> | Inorganics: | <u>10</u> | Tritium Results:                  | <u>0</u> | Radionuclides: | <u>0</u>  | <b>Total SWAS(C) Points:</b>    | <u>10</u> |        |          |                                      |          |  |  |  |          |  |  |   |           |  |  |
| Nitrate and Nitrites   | <u>0</u>   | Socs:                                | <u>0</u>  |           |           |                                |          |             |           |                                   |          |                |           |                                 |           |        |          |                                      |          |  |  |  |          |  |  |   |           |  |  |
| VOCs:  | <u>0</u>   | Inorganics:                          | <u>10</u> |           |           |                                |          |             |           |                                   |          |                |           |                                 |           |        |          |                                      |          |  |  |  |          |  |  |   |           |  |  |
| Tritium Results:   | <u>0</u>   | Radionuclides:                       | <u>0</u>  |           |           |                                |          |             |           |                                   |          |                |           |                                 |           |        |          |                                      |          |  |  |  |          |  |  |   |           |  |  |
| <b>Total SWAS(C) Points:</b>   | <u>10</u>  |                                      |           |           |           |                                |          |             |           |                                   |          |                |           |                                 |           |        |          |                                      |          |  |  |  |          |  |  |   |           |  |  |
| <p><b>Isolation From Sources of Contamination</b> – Points are added based on the number and type of potential contaminant sources within the isolation distance (200 feet from standard or 2000 feet from major contaminant sources). Sources within the isolation area is substituted for the standard sources. Sources within 200 feet are septic tanks, cesspools, or other small structures. Distance is for chemical lagoons, or known plumes – indefinite. <b>Susceptibility increases an additional level if there is a major source within 200' or a known source within 2000'.</b> Points are also added if the water supplier does not own or control the approved standard isolation area.</p> | <p><b>Isolation from Contamination – SWAS (S)</b></p> <table border="0"> <tr> <td>Major sources from 200 to 2000 feet:</td> <td><u>3</u></td> <td>x 10 =</td> <td><u>30</u></td> </tr> <tr> <td>Major sources within 200 feet:</td> <td><u>0</u></td> <td>x 20 =</td> <td><u>0</u></td> </tr> <tr> <td>Standard sources within 200 feet:</td> <td><u>1</u></td> <td>x 10 =</td> <td><u>10</u></td> </tr> <tr> <td>Known sources within 2000 feet:</td> <td><u>0</u></td> <td>x 25 =</td> <td><u>0</u></td> </tr> <tr> <td>Control of Isolation Delineated Area</td> <td><u>0</u></td> <td></td> <td></td> </tr> <tr> <td></td> <td><u>N</u></td> <td></td> <td></td> </tr> <tr> <td><b>Sum of points from sources of contamination:</b></td> <td colspan="3"><u>40</u></td> </tr> </table> | Major sources from 200 to 2000 feet: | <u>3</u>  | x 10 =    | <u>30</u> | Major sources within 200 feet: | <u>0</u> | x 20 =      | <u>0</u>  | Standard sources within 200 feet: | <u>1</u> | x 10 =         | <u>10</u> | Known sources within 2000 feet: | <u>0</u>  | x 25 = | <u>0</u> | Control of Isolation Delineated Area | <u>0</u> |  |  |  | <u>N</u> |  |  | <b>Sum of points from sources of contamination:</b> | <u>40</u> |  |  |
| Major sources from 200 to 2000 feet:   | <u>3</u>   | x 10 =                               | <u>30</u> |           |           |                                |          |             |           |                                   |          |                |           |                                 |           |        |          |                                      |          |  |  |  |          |  |  |   |           |  |  |
| Major sources within 200 feet:   | <u>0</u>   | x 20 =                               | <u>0</u>  |           |           |                                |          |             |           |                                   |          |                |           |                                 |           |        |          |                                      |          |  |  |  |          |  |  |   |           |  |  |
| Standard sources within 200 feet:  | <u>1</u>   | x 10 =                               | <u>10</u> |           |           |                                |          |             |           |                                   |          |                |           |                                 |           |        |          |                                      |          |  |  |  |          |  |  |   |           |  |  |
| Known sources within 2000 feet:  | <u>0</u>   | x 25 =                               | <u>0</u>  |           |           |                                |          |             |           |                                   |          |                |           |                                 |           |        |          |                                      |          |  |  |  |          |  |  |   |           |  |  |
| Control of Isolation Delineated Area   | <u>0</u>   |                                      |           |           |           |                                |          |             |           |                                   |          |                |           |                                 |           |        |          |                                      |          |  |  |  |          |  |  |   |           |  |  |
|  | <u>N</u>   |                                      |           |           |           |                                |          |             |           |                                   |          |                |           |                                 |           |        |          |                                      |          |  |  |  |          |  |  |   |           |  |  |
| <b>Sum of points from sources of contamination:</b>  | <u>40</u>  |                                      |           |           |           |                                |          |             |           |                                   |          |                |           |                                 |           |        |          |                                      |          |  |  |  |          |  |  |   |           |  |  |
| <p><b>Source Water Assessment Score</b> – The total SWAS factored with the Geologic Sensitivity are used to determine the overall Susceptibility.</p>  | <p><b>Source Water Assessment Score – SWAS</b></p> <p><b>SWAS(G)+SWAS(W)+SWAS(C)+SWAS(S)=SWAS</b></p> <table border="0"> <tr> <td><u>9</u></td> <td><u>40</u></td> <td><u>10</u></td> <td><u>40</u></td> <td><u>99</u></td> </tr> </table>   | <u>9</u>                             | <u>40</u> | <u>10</u> | <u>40</u> | <u>99</u>                      |          |             |           |                                   |          |                |           |                                 |           |        |          |                                      |          |  |  |  |          |  |  |   |           |  |  |
| <u>9</u>   | <u>40</u>  | <u>10</u>                            | <u>40</u> | <u>99</u> |           |                                |          |             |           |                                   |          |                |           |                                 |           |        |          |                                      |          |  |  |  |          |  |  |   |           |  |  |
| <p><b>Susceptibility Determination</b> –Susceptibility is a means to identify the relative potential of contamination for public water supply sources.</p> <p>The Michigan SWAP evaluated 2442 community groundwater sources and determined susceptibility to be <b>Very Low</b> for 1.6%, <b>Low</b> for 16.2%, <b>Moderately Low</b> for 34.5%, <b>Moderate</b> for 26.9%, <b>Moderately High</b> for 15.3%, <b>High</b> for 4.8%, and <b>Very High</b> for .7%.</p>   | <p><b>Susceptibility Determination</b></p> <p>Based on the above compilation of source geology, well construction, water chemistry and potential contaminant sources for this public source of drinking water, this assessment determines its:</p> <p><b>Susceptibility is <u>Moderate</u></b></p>   |                                      |           |           |           |                                |          |             |           |                                   |          |                |           |                                 |           |        |          |                                      |          |  |  |  |          |  |  |   |           |  |  |

**Sources in Isolation (Note "majors")**



# Information from Water Well and Pump Record



## Water Well And Pump Record



Completion is required under authority of Part 127 Act 368 PA 1978.  
Failure to comply is a misdemeanor.

Import ID: 47027634304

|  |            |  |  |
|--|------------|--|--|
| Tax No:  | Permit No: | County: Livingston   | Township: Brighton   |
| Well ID: 47000011474                                 |            | Town/Range: 02N 06E  | Section: 34  |
| Elevation:   |            | Well Status: Active  | WSSN: 7185   |
| Latitude: 42.51701                                   |            | Source ID/Well No: WOODRUFF LAKE                                       |  |
| Longitude: -83.72625                                 |            | Distance and Direction from Road Intersection:<br>WSSN# 07185; ALAN DR |  |
| Method of Collection: GPS Std Positioning Svc SA Off |            | Well Owner: WOODRUFF LAKE CO-OP APTS                                   |  |
|  |            | Well Address:<br>WOODRUFF LAKE COOP APTS<br>WELL#4                     | Owner Address:<br>27250 SANDY HILL<br>NEW HUDSON, MI 48185 |

Age of Well

Pump Size

Casing Depth

Geology

Grouting

Water Well Record now  
In Wellogics database

| Drilling Method: Cable Tool                        | Well Use: Type I public     | Pump Installed: Yes   | Pump Installation Only: No |                       |           |                 |          |       |       |        |       |       |           |       |       |           |       |       |                |       |        |
|--|-----------------------------|---|----------------------------|-----------------------|-----------|-----------------|----------|-------|-------|--------|-------|-------|-----------|-------|-------|-----------|-------|-------|----------------|-------|--------|
| Well Depth: 110.00 ft.                             | Well Completion: 2 for race | Pump Installation Date:   | HP:                        |                       |           |                 |          |       |       |        |       |       |           |       |       |           |       |       |                |       |        |
| Well Type: New                                     | Height:                     | Manufacturer: Other   | Pump Type: Submersible     |                       |           |                 |          |       |       |        |       |       |           |       |       |           |       |       |                |       |        |
| Casing Type: Steel - black                         |                             | Model Number:   | Pump Capacity: 28 GPM      |                       |           |                 |          |       |       |        |       |       |           |       |       |           |       |       |                |       |        |
| Casing Fitting: Drive shoe                         |                             | Drop Pipe Length: 84.00 ft.   | Pump Voltage:              |                       |           |                 |          |       |       |        |       |       |           |       |       |           |       |       |                |       |        |
| Drop Pipe Diameter: 4.00 in. to 0.00 ft. depth     |                             | Drop Pipe Diameter:   | Drilling Record ID:        |                       |           |                 |          |       |       |        |       |       |           |       |       |           |       |       |                |       |        |
| Borehole:  |                             | Draw Down Seal Used: No   |                            |                       |           |                 |          |       |       |        |       |       |           |       |       |           |       |       |                |       |        |
|  |                             | Pressure Tank Installed: No   |                            |                       |           |                 |          |       |       |        |       |       |           |       |       |           |       |       |                |       |        |
|  |                             | Pressure Relief Valve installed: No   |                            |                       |           |                 |          |       |       |        |       |       |           |       |       |           |       |       |                |       |        |
| Static Water Level: 50.00 ft. Below Grade          |                             | <table border="1"> <thead> <tr> <th>Formation Description</th> <th>Thickness</th> <th>Depth to Bottom</th> </tr> </thead> <tbody> <tr> <td>Red Clay</td> <td>19.00</td> <td>19.00</td> </tr> <tr> <td>Gravel</td> <td>10.00</td> <td>29.00</td> </tr> <tr> <td>Sand Fine</td> <td>21.00</td> <td>50.00</td> </tr> <tr> <td>Blue Clay</td> <td>15.00</td> <td>65.00</td> </tr> <tr> <td>Sand Wet/Moist</td> <td>45.00</td> <td>110.00</td> </tr> </tbody> </table> |                            | Formation Description | Thickness | Depth to Bottom | Red Clay | 19.00 | 19.00 | Gravel | 10.00 | 29.00 | Sand Fine | 21.00 | 50.00 | Blue Clay | 15.00 | 65.00 | Sand Wet/Moist | 45.00 | 110.00 |
| Formation Description                              | Thickness                   | Depth to Bottom   |                            |                       |           |                 |          |       |       |        |       |       |           |       |       |           |       |       |                |       |        |
| Red Clay   | 19.00                       | 19.00   |                            |                       |           |                 |          |       |       |        |       |       |           |       |       |           |       |       |                |       |        |
| Gravel   | 10.00                       | 29.00   |                            |                       |           |                 |          |       |       |        |       |       |           |       |       |           |       |       |                |       |        |
| Sand Fine  | 21.00                       | 50.00   |                            |                       |           |                 |          |       |       |        |       |       |           |       |       |           |       |       |                |       |        |
| Blue Clay  | 15.00                       | 65.00   |                            |                       |           |                 |          |       |       |        |       |       |           |       |       |           |       |       |                |       |        |
| Sand Wet/Moist                                     | 45.00                       | 110.00  |                            |                       |           |                 |          |       |       |        |       |       |           |       |       |           |       |       |                |       |        |
| Well Yield Test:                                   | Yield Test Method: Unknown  |   |                            |                       |           |                 |          |       |       |        |       |       |           |       |       |           |       |       |                |       |        |
| Pumping level 100.00 ft. after 0.00 hrs. at 50 GPM |                             |   |                            |                       |           |                 |          |       |       |        |       |       |           |       |       |           |       |       |                |       |        |
| Screen Installed: Yes                              | Filter Packed: No           |   |                            |                       |           |                 |          |       |       |        |       |       |           |       |       |           |       |       |                |       |        |
| Screen Diameter: 4.00 in.                          | Blank: 0.00 ft. Above       |   |                            |                       |           |                 |          |       |       |        |       |       |           |       |       |           |       |       |                |       |        |
| Screen Material Type:                              |                             |   |                            |                       |           |                 |          |       |       |        |       |       |           |       |       |           |       |       |                |       |        |
| Slot Length  | Set Between                 |   |                            |                       |           |                 |          |       |       |        |       |       |           |       |       |           |       |       |                |       |        |
| 10.00 8.00 ft.                                     | 102.00 ft. and 110.00 ft.   |   |                            |                       |           |                 |          |       |       |        |       |       |           |       |       |           |       |       |                |       |        |
| Fixings: No pipe packer                            |                             |   |                            |                       |           |                 |          |       |       |        |       |       |           |       |       |           |       |       |                |       |        |
| Well Grouted: No                                   |                             |   |                            |                       |           |                 |          |       |       |        |       |       |           |       |       |           |       |       |                |       |        |
| Wellhead Completion: Other, 12 inches above grade  |                             |   |                            |                       |           |                 |          |       |       |        |       |       |           |       |       |           |       |       |                |       |        |
| Nearest Source of Possible Contamination:          |                             | Drilling Machine Operator Name:   |                            |                       |           |                 |          |       |       |        |       |       |           |       |       |           |       |       |                |       |        |
| Type Distance Direction                            |                             | Employment: Unknown   |                            |                       |           |                 |          |       |       |        |       |       |           |       |       |           |       |       |                |       |        |
| Septic tank 100 ft. Northeast                      |                             | Contractor Type: Unknown  | Reg No: 20-0398            |                       |           |                 |          |       |       |        |       |       |           |       |       |           |       |       |                |       |        |
|  |                             | Business Name:  |                            |                       |           |                 |          |       |       |        |       |       |           |       |       |           |       |       |                |       |        |
|  |                             | Business Address:   |                            |                       |           |                 |          |       |       |        |       |       |           |       |       |           |       |       |                |       |        |
|  |                             | <b>Water Well Contractor's Certification</b><br>This well was drilled under my supervision and this report is true to the best of my knowledge and belief.  |                            |                       |           |                 |          |       |       |        |       |       |           |       |       |           |       |       |                |       |        |
|  |                             | Signature of Registered Contractor  | Date                       |                       |           |                 |          |       |       |        |       |       |           |       |       |           |       |       |                |       |        |

General Remarks: ORIGINAL WELLID# WAS 34097; WELL HEAD ALSO PITLESS ADAPTER

Other Remarks: Wellhead Completion: 12 inch Above Grade, Pump Manufacturer: DEMING



# 2014 Source Water Assessment

## Community Water Supply Source Water Assessment

WOODRUFF LAKE CO-OP APARTMENT WSSN 07185

LIVINGSTON County

### What is SWAS?

The Source Water Assessment Score (SWAS) is a process that factors geologic and water well attributes, water chemistry, and the potential contaminant sources for each drinking water source into a ranking system to determine the relative potential for contamination. Generally, sources with lower scores are considered to be less susceptible to contamination than sources with higher scores. However, exceptions do exist. This assessment is required by the Michigan Source Water Assessment Program (SWAP) under the provisions of the 1996 amendments to the Federal Safe Drinking Water Act.

Well: WL004 - WELL 4

Date SWA Complete 3/26/2014

### Well Log and Location

A well log is a legal document describing the well location, construction, depth, soil formations penetrated, and capacity. Drilling contractors have been required to complete a well log and submit it to the owner, local health department, and State since 1967. The lack of information from a well log may increase the risk of contamination. An electronic database for well log information.

Welllog ID Number: 47000011474

**Well Record**

### Geologic Sensitivity

This score represents the degree of natural protection afforded by the materials overlying the water-bearing formation. Lower scores indicate more protection. Points are deducted based on the thickness and type of geologic material that overlies the source of water. Surface contaminants migrate downward at various rates. CCM stands for Continuous Confining Material (e.g. mix of sand and clay). More points are deducted for a thick clay layer than a thick sand layer or a thinner clay layer. Point Range 0-30.

#### Geologic Sensitivity - SWAS(G)

CCM Points Deducted: 18

CPCM Points Deducted: 0

Total SWAS(G) Points: 12

Geologic Sensitivity Rating: **Moderate**

**Geology from Well Record**

### Well Construction

Points are added when a well lacks features that help protect the water supply from contamination. These include whether the well was grouted (sealing the space created between the casing and the soil formations during construction), the well age, how deep the casing extends into the ground, and the pumping rate. Points are deducted for wells that are located at greater distances.

#### Well Construction - SWAS(W)

Well Grouting Points: 10

Well Age Points: 10

Casing Depth Points: 5

Pumping Rate Points: 0

Total SWAS(W) Points: 25

Susceptibility increases one level if well construction reflects an adverse condition.

Date Completed: 3/26/2014

# 2014 Source Water Assessment cont'd

Source Water Assessment for: WOODRUFF LAKE CO-OP APARTMENT WSSN: 07185 Well WL004

## Water Chemistry and Isotope Data

Points are added if water sample results indicate detectable levels of nitrates or nitrites, volatile organic chemicals (solvents, fuel components), synthetic organic chemicals (pesticides or herbicides), inorganics (metals), or radionuclides. Tritium monitoring is included as a voluntary means of age-dating water. Generally, the older the water, the more protected the source.  
 \*Sample Type = Raw Water, **Chemistry is same**

Susceptibility is Very High if contaminants exceed the Maximum Contaminant Level (MCL). MCL exceedance caused by naturally occurring chemicals (arsenic, barium, etc.) are indicated as such in this report.

## Water Chemistry and Isotope Data - SWAS(C)

|  |                 |                |    |
|--|-----------------|----------------|----|
| Sample Type:                           | Entry Point Tap |                |    |
| Nitrates and Nitrites:                 | 0               | SOCs:          | 0  |
| VOCs:                                  | 0               | Inorganics:    | 10 |
| Tritium Results:                       | 0               | Radionuclides: | 0  |
| MCL from Natural Source?               | No              |                |    |
| MCL Chemical (if naturally occurring): | No              |                |    |
| Treatment Installed?                   | No              |                |    |
| <b>Total SWAS(C) Points:</b>           | <b>10</b>       |                |    |

## Isolation from Sources of Contamination

Points are added based on the number and type of potential contaminant sources within the 10-year time of travel capture. If the water supply does not own or control a well in the SWPA (approved area). Examples: standard drains; major sources are chemical and fuel storage, landfills, lagoons, and known plumes of groundwater contamination. Point range indefinite.

**Major Sources not in Provisional WHPA**

## Isolation from Contamination - SWAS(S)

|                                      |             |   |    |   |    |
|--------------------------------------|-------------|---|----|---|----|
| Major Sources >= 200 ft and in SWPA: | 0           | x | 10 | = | 0  |
| Major Sources within 200 ft:         | 0           | x | 20 | = | 0  |
| Standard Sources within 200 ft:      | 3           | x | 10 | = | 30 |
| Known Sources within SWPA:           | 0           | x | 25 | = | 0  |
| Control of Isolation Area:           | 20          |   |    |   |    |
| Delineated Area:                     | Provisional |   |    |   |    |
| <b>Total SWAS(S) Points:</b>         | <b>50</b>   |   |    |   |    |

## Source Water Assessment Score (SWAS)

The total SWAS is factored with the Geologic Sensitivity to determine the overall susceptibility to contamination.

## Source Water Assessment Score - SWAS

|           |   |           |   |           |   |           |   |           |
|-----------|---|-----------|---|-----------|---|-----------|---|-----------|
| <u>12</u> | + | <u>25</u> | + | <u>10</u> | + | <u>50</u> | = | <u>97</u> |
| SWAS(G)   |   | SWAS(W)   |   | SWAS(C)   |   | SWAS(S)   |   | SWAS      |

## Susceptibility Determination

Susceptibility is a means to identify the relative potential of contamination for public water supply sources. Of the over 2,400 community groundwater sources evaluated in the early 2000s, the percent of sources in each susceptibility category was:

|                        |                         |
|------------------------|-------------------------|
| Very Low = 1.6%        | Moderately High = 15.3% |
| Low = 16.2%            | High = 4.8%             |
| Moderately Low = 34.5% | Very High = .7%         |
| Moderate = 26.9%       |                         |

## Susceptibility Determination

Based on the above compilation of source geology, well construction, water chemistry, and potential contaminant sources, this public drinking water supply is determined to have a Susceptibility Rating of:

**Moderate**



# SOURCE WATER ASSESSMENT SUSCEPTIBILITY DETERMINATION

- Describes likelihood of a contaminant impacting a source of drinking water
- Susceptibility Determination Categories

Very Low

Low

Moderately Low

Moderate

Moderately High

High

Very High



# SOURCE WATER ASSESSMENT SUSCEPTIBILITY DETERMINATION

- Describes likelihood of a contaminant impacting a source of drinking water
- Source Water Assessment Score – 58 points

## Source Water Assessment Score (SWAS)

The total SWAS is factored with the Geologic Sensitivity to determine the overall susceptibility to contamination.

## Source Water Assessment Score - SWAS

$$\begin{array}{ccccccccc} \underline{18} & + & \underline{30} & + & \underline{10} & + & \underline{0} & = & \underline{58} \\ \text{SWAS(G)} & & \text{SWAS(W)} & & \text{SWAS(C)} & & \text{SWAS(S)} & & \text{SWAS} \end{array}$$

## ➤ Susceptibility Determination

### Susceptibility Determination

Susceptibility is a means to identify the relative potential of contamination for public water supply sources.

### Susceptibility Determination

Based on the above compilation of source geology, well construction, water chemistry, and potential contaminant sources, this public drinking water supply is determined to have a Susceptibility Rating of:

**Moderately High**



# Source Water Assessment Program (SWAP)

- **SWA completed from 2000 to 2005**
  - **13,755 source water assessment reports**
  - **Assessments completed for 12,108  
Community and Noncommunity public  
water supplies**
- **DEQ is now trying to revisit this process as  
part of WHPP efforts using MGMT**



# Moving from Assessments to Protection

- **The Environmental Protection Agency (EPA) is encouraging states to move from Assessments to Protection**
- **The DEQ is using data from the Source Water Assessment Program to target protection efforts**
- **YOU can play a role in protecting your drinking water supply!**

