

**Southwest Michigan Water  
Resources Council  
(SWMWRC)**

**Final Report**

**April 15, 2014**

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## **Background**

Southwest Michigan has some of the most abundant groundwater and surface water resources in Michigan, the largest demand for water resources, and a diversity of stream types are present in the Kalamazoo and St. Joseph River Watersheds. Between 2009 and 2011, there were 710 large quantity wells registered through the water withdrawal assessment tool (WWAT) process statewide and 370 of these were in the Kalamazoo and St. Joseph Watersheds. As of November 2013, there have been five site specific review (SSR) Zone D denials; although none in the Kalamazoo or St. Joseph Watersheds. However, it is expected that SSRs, Zone C and Zone D denials will become more commonplace in the St. Joseph and Kalamazoo Watersheds.

## **Mission Statement**

Michigan Department of Environmental Quality staff provided the following mission statement for the Council:

To provide a refined analysis of the water resources in the St. Joseph and Kalamazoo River watersheds, and review the application of Michigan's Water Withdrawal Screening Tool and assessment process at this regional scale. Also, to incorporate the unique characters of the region's geomorphology, water flow and regimes, and include the regional characteristics of farmland irrigation.

## **Structure**

The Southwest Michigan Water Resources Council was formed in the fall of 2011. About 20 people were appointed by MDEQ Director Dan Wyant to serve on the council. The Council members represent diverse stakeholders such as agricultural interests (seed corn industry, potatoes and others), municipal water supplier, well drillers, water dependent businesses, conservation/watershed groups, economic development, state agencies, and foundations. The council also benefitted from the participation of experts from USGS and Western Michigan University, although these representatives were not considered full members. (See Appendix 1.)

Ben Russell and Marcy Colclough were selected to be co-chairs of the Council. MDEQ organized the meetings with input and assistance from the co-chairs and representatives from MDARD and MDNR. MDEQ and MDARD staff assisted with taking and distributing meeting summaries. Early on, the Council formed two committees. The data committee was formed to address information and data collection and the funding committee was formed to assist with finding funding for potential projects of research.

## **Process and Results**

The council began meeting and shared experiences with the WWAT. Through these meetings, many misconceptions about the model, the law and process were eliminated. The Council

collectively increased the understanding of how the WWAT works and its limitations. Council members also gained a better understanding of the unique geology and water resources in southwest Michigan.

The Council invited many experts to come speak including, Jon Bartholic (MSU, Institute of Water Research), Jeremiah Asher (MSU, IWR), Howard Reeves (US Geological Survey), Lyndon Kelley (MSUE), DEQ staff, Scott Hanshue (MDNR), Steve Miller (MSU), Abbott Nutrition (industrial use), Pat Norris (MSU, water use conflict) and Todd Feenstra with Tritium who is working with farmers in St. Joseph County on a new regional model for better understanding groundwater surface water interaction in that area. The Council also invited actual applicants' to come and talk about their experiences with the WWAT. Our Council experts, Al Kehew and Chris Hoard, did an excellent job explaining what we know and don't know about geology and the connection between ground and surface water in the area. Most presentations can be viewed here <http://www.swmpc.org/swmwrc.asp>.

The data committee helped the Council understand the existing data and regional models that could help inform the SSR process or improve the WWAT. The data committee worked on identifying priority data needs and suggested areas for data collection. (see Data Working Sheet, Data Availability Map and Targeted Areas for Groundwater Monitoring in Appendix 2). The data committee also developed an SSR process flow chart (see Appendix 3). The funding committee brought several ideas to the group about funding opportunities. However, a specific project was never proposed for the funding committee to work on finding sources.

After sharing, learning and increasing understanding, the Council started working in early 2013 to develop consensus items. Consensus was reached when a statement was developed that that everyone supported, even if it was not the "favorite" of each individual. The consensus items represent the Council's solidarity of belief or sentiment.

## **Consensus Items**

1. Ground and surface water is a vital and valuable resource for southwest Michigan.
2. Most groundwater withdrawals are sustainable and renewable in southwest Michigan.
3. There are areas in southwest Michigan where streams are hydraulically connected to groundwater aquifers used for large quantity withdrawals.
4. There are areas in southwest Michigan where streams are not hydraulically connected to aquifers used for large quantity withdrawals.
5. There are areas in southwest Michigan where stream index flows are at risk of being depleted by large quantity groundwater withdrawals.

6. There are areas in southwest Michigan where stream index flows are not at risk of being depleted by large quantity groundwater withdrawals.
7. Data collected by private individuals or firms according to industry or USGS standards that are submitted to MDEQ will be considered during the Site Specific Review (SSR) process.
8. The site specific review (SSR) process must be continually improved by the collection, evaluation and incorporation of additional hydro-geological data.
9. The SWMWRC supports MDEQ approval (a pass from the WWAT) of withdrawals in areas where it has been proven that a potential ARI will not occur based on the collection and analysis of field data using industry methodology and practices.
10. Regional models should be developed that better fit southwest Michigan that can be used in the screening process and during the SSR.
11. There is an urgent need for more data. The top priority data need for the WWAT is baseflow index and for SSR it is aquifer characteristics.
12. There is a need to develop a process to systematically collect data by prioritizing areas based on ARI or anticipated high water use growth areas. Data collected could include but is not limited to: additional stream flow measurements (stream gauges), stream temperature, groundwater elevation, aquifer pumping tests, stream bed conductance, grain size analysis, glacial geology, groundwater use, fish populations and stream classifications.
13. A systematic study of aquifers (geology) is needed in Michigan (similar to studies done in other Great Lakes states). The data would provide multiple benefits to many sectors of Michigan's economy (such as water resources, aggregate, land use development, minerals, hazardous and solid waste disposal).
14. The State has an obligation to participate in funding data collection and studies.
15. Public-private collaborations and partnerships should be developed to support data collection and studies.
16. Greater accuracy of actual withdrawal volumes is needed so that available groundwater volumes are more accurately portrayed in the state's database and consequently unused volumes are not inappropriately/unnecessarily "banked" preventing new withdrawals from being approved.
17. Unregistered wells for which pre-2008 use can be documented should be included in baseline calculations of the index flow and those withdrawals should not be counted towards the available water in the WWAT.
18. The SWMWRC supports the State developing methods to screen for potential ARIs for all surface water bodies (rivers, streams, lakes, wetlands).
19. The industry, universities and state agencies need to further invest in irrigation management technical assistance (including scheduling, system maintenance, conservation, etc).

- 20. With current legislation, the conflict resolution process is adequate for agricultural water users and the same process should be considered for other water users.
- 21. The SWMWRC supports the state projecting future water use trends on a statewide and regional level for the next 5, 10, 20, and 30 years, with updates every five years.

**Items Under Discussion – No Consensus Reached**

- 22. The parameters and constants used by the model for the WWAT do not fit the geology in many areas of southwest Michigan.
- 23. Intensive studies in zone D watersheds should be performed to validate an SSR determined ARI.
- 24. It should be determined what a reasonable expectation/burden (scientific and financial) is to be placed on an applicant when there is an SSR denial.
- 25. With the recognition that there is inadequate data and a need for more studies, agricultural irrigation at current levels to date have not resulted in a documented ARI.
- 26. The SWMWRC supports the work of the state council to determine how MDEQ will substantiate that an ARI has occurred.

**Items for Water Use Advisory Council Consideration**

Many of the preceding consensus and non-consensus items are issues that the Council urges the statewide Water Use Advisory Council (WUAC) to consider. The following table identifies which items the WUAC work groups are addressing or might consider addressing. It is recognized that several of these items are already being discussed by the WUAC’s work groups or are included in their scopes of work.

<b>Work Groups</b>	<b>Item # (from sections above)</b>
Monitoring	7, 8, 11, 12, 13, 14, 15, 23, 26
Technical Underpinnings	8, 9, 10, 16, 17, 22, 24
Inland Lakes ARI	18
Water Conservation	19, 21

## Summary

There is now a diverse group in southwest Michigan that has an in depth understanding of the WWAT and the SSR process. There has been good dialogue with increased understanding and trust building occurring. The council felt that there has been great value in meeting regionally and many council members expressed a desire to continue to meet. Potential topics for stakeholders in southwest Michigan to cover periodically in meetings with MDEQ, USGS, MDNR and other agencies might include:

- Updates on additional data collection in SW MI;
- Status of watershed depletions;
- Water Use Advisory Council's final recommendations;
- Changes to the Water Withdrawal Assessment Tool;
- Use of site specific & regional data in Site Specific Reviews;
- Use of site specific & regional data to update the models used by the WWAT;
- Development of regional & site specific groundwater models;
- Discussion about what additional data should be collected by property owners, well drillers and irrigation equipment suppliers and what data, if any, should be collected by DEQ, DNR & USGS;
- Formation of Water User Committees; and
- Other topics of interest.

The Council provided valuable feedback to MDEQ with ideas to improve the tool's interface and communication (especially with the SSR) making the process more clear for the applicant. There was discussion about standardizing the SSR process, such as using existing guidance like the aquifer test guidelines. There was also much discussion about what is a "fair" burden for an applicant in the SSR process to continue to collect data and perform studies because of our limited knowledge of the groundwater/surface water for each specific site.

Key Council recommendations include advancing our understanding of groundwater and surface water in southwest Michigan, developing regional models and identifying opportunities for public – private collaboration in data collection (for example measuring well levels). The Council feels that SSRs are going to become more common and more complex in southwest Michigan. There are still unanswered questions about how this will affect the growth and expansion of water-based industries and agriculture. There is also uncertainty about future conflicts between water users and if the WWAT will ensure that the water resources are protected for future generations. The Council believes that more refined, alternative regional models (such as the one being developed by Tritium for farmers in St. Joseph County) can play a role in the future of water management decisions in southwest Michigan. Much work remains to develop and finance these models.

## Appendix 1 - Council Members

Representing	Name	Organization	Address	Funding Committee	Data Committee
Seed Corn Irrigators	Ben Russell**		66164 Constantine St., Constantine, MI 49042		Member
Seed Corn Irrigators	Larry Walton		25466 M-86, Sturgis, MI 49091		Member
Other Agricultural Irrigators	Jon White		62764 M-40, Jones, MI 49061		
Other Agricultural Irrigators	Jason Walther	Walther Farms	52944 US 131, Three Rivers, MI 49093		
Seed Corn Company	Phil Meister	Pioneer Hi-Bred International	P.O. Box 98, Constantine, MI 49042		
Seed Corn Company	Kirk Moyer	Syngenta	62942 Constantine Rd., Constantine, MI 49042		Member
Local Government/Municipal Water Supplier	John Paquin	City of Kalamazoo	Department of Public Services, 1415 N. Harrison St., Kalamazoo, MI 49007-8737		Member
Conservation or Natural Resources Interest Group	Doug Gerow	Trout Unlimited	32 Lynwood Drive, Battle Creek, MI 49015		
Environmental/Watershed Group	Robert Whitesides	Kalamazoo River Watershed Council	408 E. Michigan Ave., Kalamazoo, MI 49007	Chair	
Land Conservancy Group	Peter Ter Louw or Nate Fuller	Southwest Michigan Land Conservancy	6851 S. Sprinkle Rd., Portage, MI 49002		
Well Drillers	Joel Annable	Peerless Midwest Inc.	55860 Russell Industrial Parkway, Mishawaka, IN 46545		Member

Well Drillers/Users Group	Aaron Rice	Prairie Water Users Group	135 Baseline Road, Battle Creek, MI 49017	Member	
Economic Development Group	Marcy Colclough**	Southwest Michigan Planning Commission	185 E. Main Street, Suite 701, Benton Harbor, MI 49022		Member
Non-agricultural Business (self-supplied water user)	Roger Hill	Abbott Nutrition	901 N. Centerville Road, Sturgis, MI 49091-6195		
Foundation/Non-profit	Mike McCuiston	Edward Lowe Foundation	58220 Decatur Road, P.O. Box 8, Cassopolis, MI 49031-0008		Chair
Tribes	Mark Parrish	Pokagon Band			
State Agencies	Scott Hanshue	DNR	Plainwell Field Office, 621 N. 10th Street, Plainwell, MI 49080		Member
State Agencies	Josh Appleby	DARD	521 E. Bitely, Lawton, MI 49065	Member	
State Agencies	Jim Milne	DEQ	P.O. Box 30458, Lansing, MI 48909-7958	Member	Member
Facilitator	Fred Henningsen	MSU Extension (retired)	23600 Findley Rd., Sturgis, MI 49091		
Federal Agencies*	Chris Hoard	USGS	6520 Mercantile Way, Suite 5, Lansing, MI 48911-5991		Member
University Researcher*	Dr. Alan Kehew	WMU	3325 Rood Hall, Western Michigan University, Kalamazoo, MI 49008		Member
* Expert participants, not full members	** Co-Chairs				

## Appendix 2 - Data Committee - Working Sheet, Data Availability Map, Target Area Map

One could begin to rank the data needs based on these criteria by using a high, medium, low scale.

Information/Data	Notes on Progress/ Status/Ideas/Opportunities	Cost	Time	Ease	Value to Improve	Funding Opportunities
<b>Improve Subsurface Geology</b>						
Well Logs – more consistency	Josh Appleby might be able to work on this?					
Collect existing engineering borings						
Gamma Ray existing wells						
Gamma Ray new wells						
Improve transmissivity map	How?					
Improve storage coefficient	How?					
Identify confined aquifers	WMU work on 3-D mapping will help with this					
3-D geological maps of the glacial materials	WMU is working on this. Berrien County complete; Calhoun in progress					
<b>Improve Index Flows</b>						
Install new gages	2 new gages to be installed on Dowagiac River and Mill Creek (Mottville)					
Streamflow measurements	Proposed 25 locations, measured 3 times each – summer/fall 2012					
Augment with information from IN gages						
Look at discharge flows/historical data						
Develop a regional index flow for the model						
<b>Improve Stream Classification</b>						
Determine if intermittent or perennial						
Monitor temperature and flow	Proposed work by MDNR in ___??___ subwatershed(s)					
<b>Improve Understanding of Baseline Water Budget and Hydro-geologic data</b>						
Irrigation/return flow to aquifer						

Information/Data	Notes on Progress/ Status/Ideas/Opportunities	Cost	Time	Ease	Value to Improve	Funding Opportunities
Evapotranspiration						
Recharge						
More accurate water use reporting and use of data						
Collect existing data from wellhead delineation areas	Mostly in urban areas					
LUST sites – aquifer pumping tests, slug tests, etc	Mostly in urban areas					
Well abandonment programs information						
Existing monitoring wells						
Superfund site information	Mostly in urban areas					
MDOT borings along highways						
Oil and gas well logs (depth to bedrock)						
Monitor existing wells	Proposed continuously monitor 5-15 wells and quarterly synoptic measurements on 40-100 wells					
<b>Tool Validation</b>						
Measure groundwater levels and compare to water withdrawals						
Demo/Study site – account for current water use (pre-2006), measure water usage, groundwater levels, stream flow and temperature, monitor fish populations	Possible site – Swan Creek Watershed					
<b>Data needed to Improve SSR process</b>						
Hydrologic connection between surface/ ground water						
Perennial/Intermittent stream classification*	Problem with dams					
Stream Classification (cold, warm, transitional)						
Transmissivity						
Storitivity* (aquifer test guidelines)						
3D glacial geology						
Index flows* (flow measurements)						

\*biggest bang for the buck according to MDEQ

## Data Availability Map

This map was developed to highlight the data that are available in Southwest MI. This is not an exhaustive list of all data available as there are likely many university and private studies not represented on this map. There also may be state data from MDNR, from MDOT such as test borings, and from landfills and other environmental response studies. Finally, data and studies from Indiana are not included.

Streamflow monitoring in the area provides information on how streams respond to various stresses. There are 24 active streamgages in the Southwest MI study area (note 2 are in Indiana) that continuously monitor streamflow. The data from these can be accessed at the following URL <http://waterdata.usgs.gov/mi/nwis/rt> . In addition, there are many discrete stream discharge measurements made at various stream locations in this study area. Measurements were made at 27 locations this past year. Within the study area there are also discrete discharge measurements collected from 134 other locations prior to the recent measurements.

Groundwater level monitoring provide information on how the aquifers within the region respond to various stresses to the groundwater system. In this study area there are 106 well locations that USGS has measured at least once. Of those 106, 37 have been measured at least once in the past 2 years. 36 of the 106 were abandoned and are no longer available to be measured but do have some historic water level records associated with them. There are also 33 wells listed as inactive, which are wells that have not been measured in the past 2 years. USGS groundwater data can be accessed at <http://waterdata.usgs.gov/mi/nwis/gw> .

An aquifer test is a method to estimate the hydraulic properties of an aquifer by pumping a well that is screened or open in that aquifer and measuring the water level response in neighboring wells. The State of Michigan Department of Environmental Quality maintains a database of aquifer tests performed for water supply or well-head protection studies. As of 2005, there were 131 different aquifer tests performed in the SW Michigan area.

Geologic maps provide information on the distribution, age and nature of geologic materials as well as any structural features associated with those materials. This information assists in developing the geologic framework of an area which can help identify what the geologic controls on groundwater flow might be. There is a general surficial geologic map for the entire state of Michigan located at [http://www.michigan.gov/documents/deq/1982\\_Quaternary\\_Geology\\_Map\\_301467\\_7.pdf](http://www.michigan.gov/documents/deq/1982_Quaternary_Geology_Map_301467_7.pdf) . While this information is valuable, at local scales the resolution may be too coarse to understand the geologic controls of the system. An effort to get more detailed local scale information, a 3-D geologic mapping effort of Berrien County is in development. The geophysical data used to assist in developing the map is available here <http://pubs.usgs.gov/of/2002/of02-117/> . A revised 2-D geologic map of Berrien County is available at <http://pubs.usgs.gov/of/2001/ofr-01-0156/> .

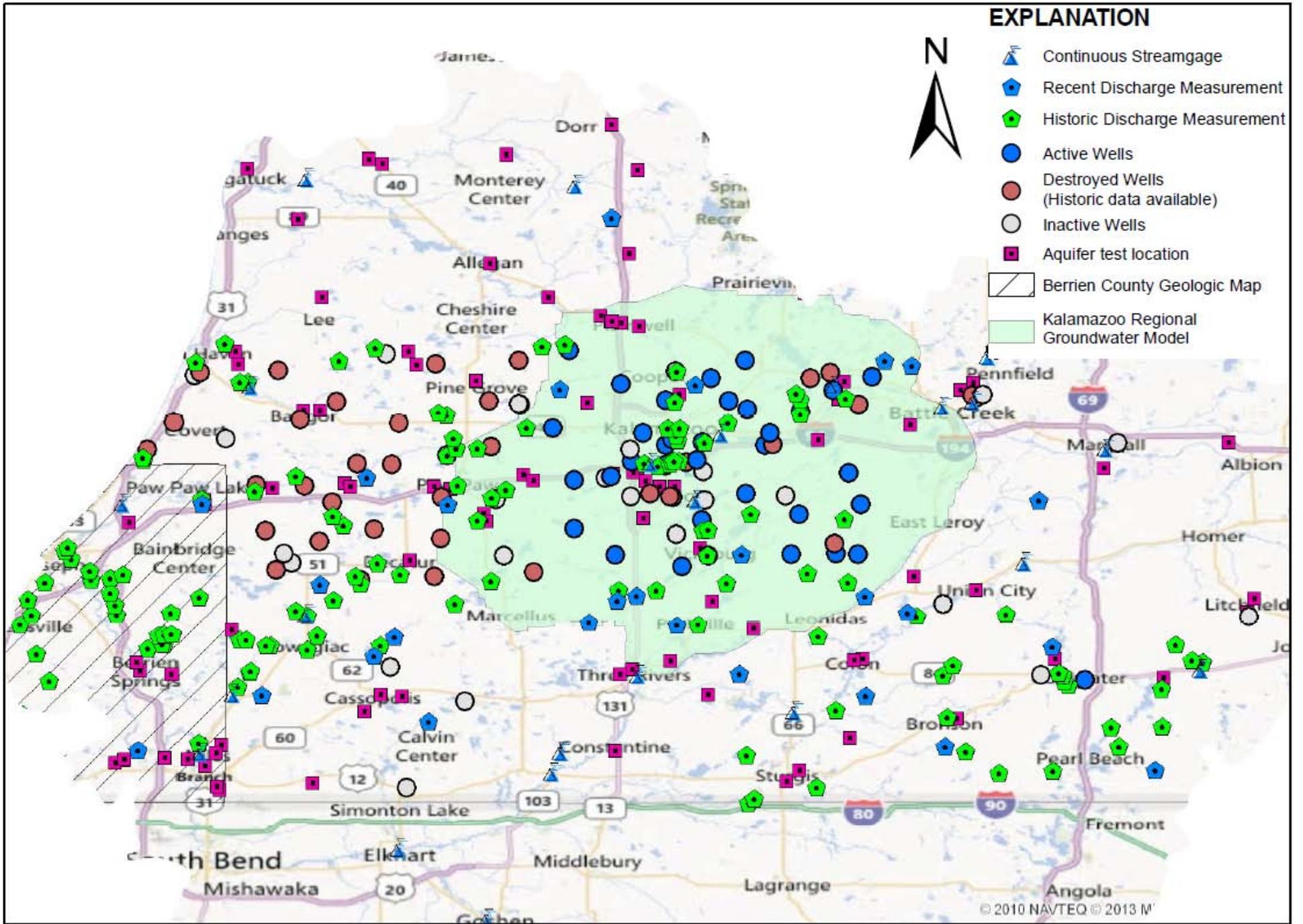
Regional groundwater flow models are tools that simulate a physical system through a mathematical representation of that system. Information including, but not limited to the regions hydrogeologic framework , water use, aquifer characteristics, climate, groundwater and surface water is needed to develop these models. The Kalamazoo regional groundwater model (Luukkonen and others, 2004) , shown in green on the map, was constructed to assist with management of the water resources in the greater Kalamazoo area. The Lake Michigan basin regional groundwater flow model (Feinstein and others, 2010) includes all of SW Michigan within the model boundary. A groundwater flow model is being developed by Southwest Michigan Farmers for Responsible Water Use for part of St Joseph County.

A bibliography of historical studies in SW Michigan can be accessed at <http://gwmaphinfo.rsgis.msu.edu/>

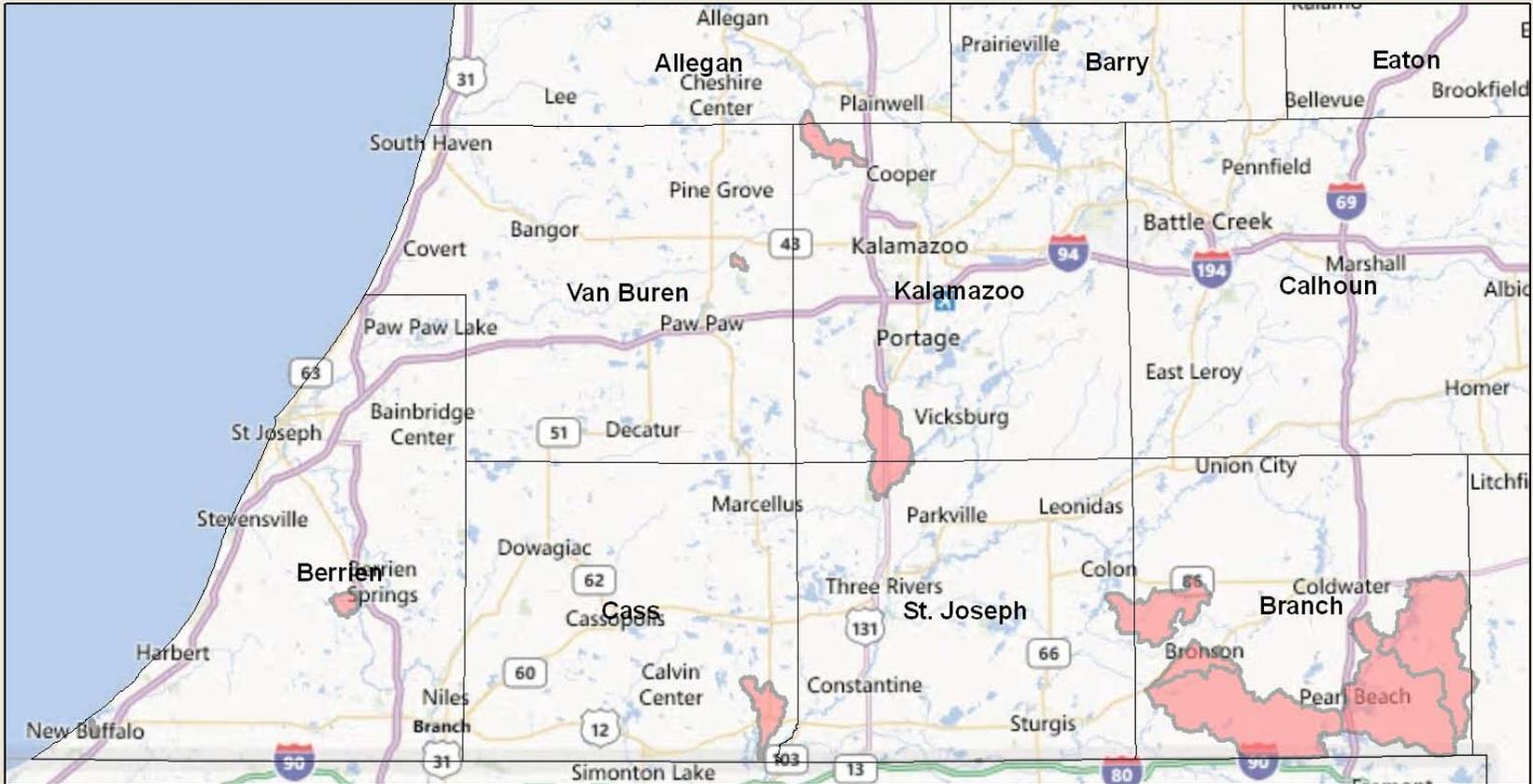
#### References:

[Feinstein, D.T., Hunt, R.J., and Reeves, H.W., 2010, Regional groundwater-flow model of the Lake Michigan Basin in support of Great Lakes Basin water availability and use studies: U.S. Geological Survey Scientific Investigations Report 2010–5109, 379 p.](#)

[Luukkonen, C.L., Blumer, S.P., Weaver, T.L., and Jean, J., 2004, Simulation of the Ground-Water-Flow System in the Kalamazoo County area, Michigan, Scientific Investigations Report 2004-5054, 65 p.](#)



This map displays the locations of various monitoring points in Berrien County, Michigan. The legend identifies symbols for continuous streamgages (blue triangles), recent discharge measurements (blue pentagons), historic discharge measurements (green pentagons), active wells (blue circles), destroyed wells with available historic data (red circles), inactive wells (white circles), and aquifer test locations (pink squares). The map also shows the Berrien County Geologic Map (hatched area) and the Kalamazoo Regional Groundwater Model (green shaded area). Major roads and towns are labeled, and a north arrow is provided. The map is copyrighted by NAV/TEQ in 2010 and M in 2013.



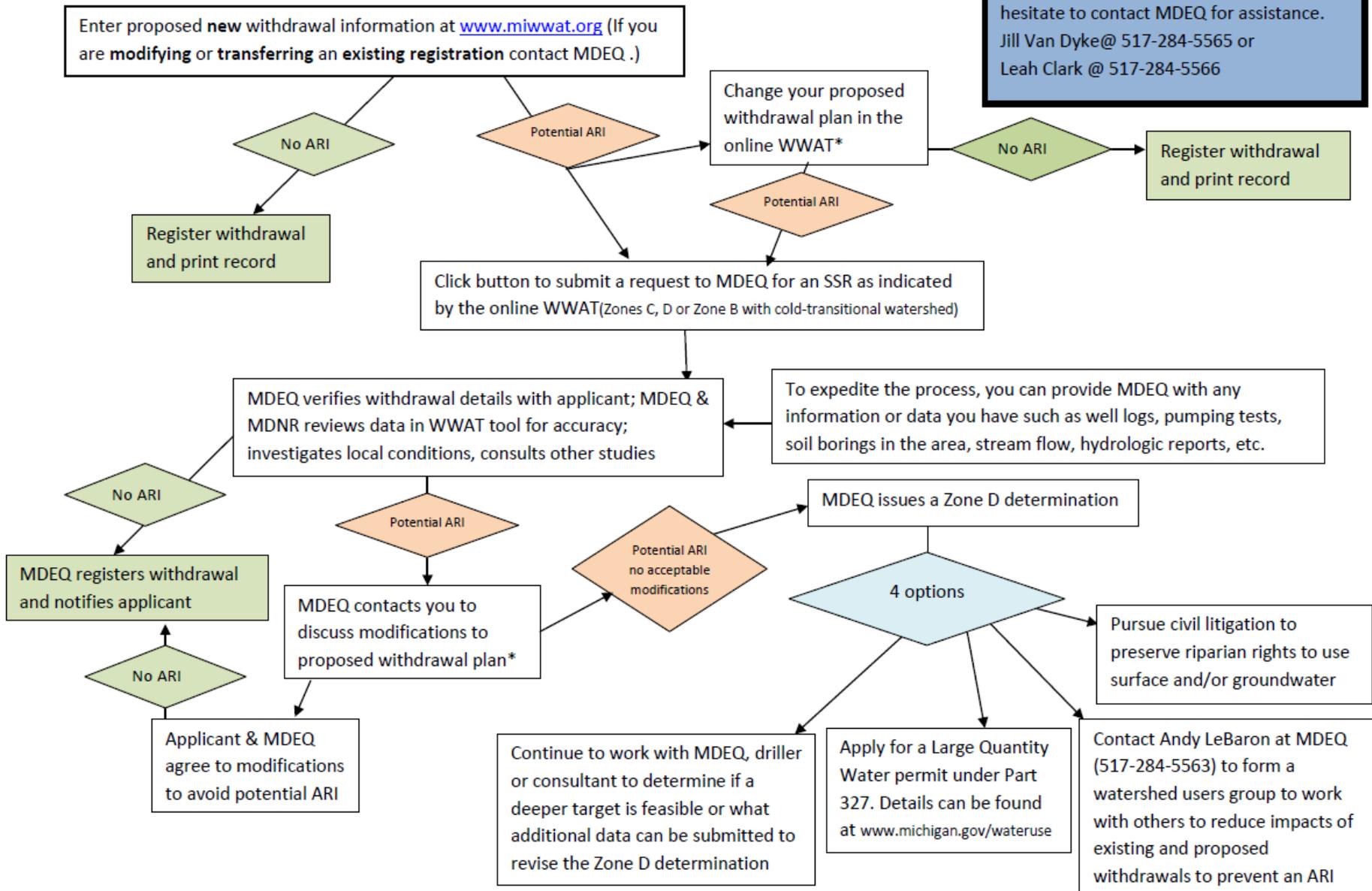
### Explanation

Target area for groundwater monitoring

## Appendix 3 – SSR Process

### Site Specific Review Process for the Water Withdrawal Assessment Tool (WWAT)

At any time in the process, please do not hesitate to contact MDEQ for assistance.  
 Jill Van Dyke@ 517-284-5565 or  
 Leah Clark @ 517-284-5566



\*You can consider changing one or more of the following variables - switch from surface water to well, reduce pump frequency; reduce pump capacity, increase well depth, relocate well further from stream/drain. You can change variables and run the proposed withdrawal through WWAT as many times as you want.

**Acronyms:** ARI – Adverse Resource Impact; SSR – Site Specific Review; MDEQ – Michigan Department of Environmental Quality