Supplemental Public Health and Environmental Information on Waukesha Water Supply Alternatives

PREPARED FOR: Wisconsin Department of Natural Resources (WDNR)

COPY TO: City of Waukesha Water Utility

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Purpose

The purpose of this memorandum is to provide additional information requested by WDNR on the public health and environmental impacts of water supply alternatives for the City of Waukesha, Wisconsin.

This memorandum has been updated from a draft provided May 23, 2012 to summarize information included in Section 11 of the Water Supply Service Area Plan (Volume 2 of the Application) and the Environmental Report (Volume 5 of the Application). The changes to impacts are limited to clarification on baseflow reductions in surface water streams and addressing comments on subsequent groundwater modeling. The water supply average day demand has been adjusted from 10.9 million gallons per day (mgd) to 10.1 mgd.

Analysis Approach

The public health and environmental information for evaluation of water supply alternatives were developed to compare the relative impacts of one water supply alternative to another. Documentation of how this information was defined and evaluated is included below.

Public Health

Microbiological

All water sources have some microbiological pathogenic risk. As a result, disinfection is included for all water supply alternatives to reduce this risk and meet drinking water regulations. While data were not available for evaluating microbiological contamination, it was assumed that wells drawing from shallow aquifers rather than deep aquifers are at higher risk for the presence of pathogens. However, the use of disinfection reduces such risk.

Inorganics

Alternatives were evaluated for the presence of arsenic and nitrate with concentrations present compared to the Safe Drinking Water Act (SDWA) maximum contaminant level (MCL) values.

Shallow Aquifer (New Wells) arsenic and nitrate concentrations were based on February and March 2007 SDWA Laboratory Analysis Reports by Davy Laboratories for the Lather Property sample sites TB 7, TB 8, TB 9, and TB 10. Data collected were averaged for each individual site and also collectively for the entire Lather Property. These values are provided in Table 1.

TABLE 1
Lather Property, Average Inorganic Concentrations

Inorganic	MCL	TB 7	TB 8	TB 9	TB 10	Average
Total Arsenic, µg/L	10	10	10	10	7	9
Nitrate as N, mg/L	10	0.006	0.006	0.005	0.030	0.012

Arsenic concentrations at the Lather Property sample sites TB 7, TB 8, and TB 9 equaled the arsenic MCL of 10 µg/L. Consequently, the Shallow Aquifer (New Wells) source is considered at risk and arsenic treatment is required. Nitrate concentrations for the Lather Property did not exceed the nitrate MCL of 10 mg/L. Laboratory results of the Lather Property wells are included as Attachment A.

Shallow Aquifer (Existing Wells) arsenic and nitrate concentrations were based on 2004-2012 data provided by the Waukesha Water Utility for existing wells 11, 12, and 13. Numerous tests were conducted for each contaminant in each well. For certain test dates, concentrations were below the detection limit and were designated as “Non Detect” (ND). In order to include these values in the calculated averages, ND values were conservatively set equal to the level of detection concentration. Data collected were averaged for each individual well and are also collectively averaged for the existing Shallow Aquifer water source. The averages of these measured arsenic and nitrate concentrations are provided in Table 2.

TABLE 2
Existing Shallow Aquifer, Average Inorganic Concentrations

	MCL	Well 11	Well 12	Well 13	Average
Arsenic, µg/L	10	1.5	3.3	3.8	2.9
Nitrate, mg/L	10	0.197	0.057	0.071	0.108

Shallow Aquifer existing wells have arsenic and nitrate concentrations below the MCL. Laboratory results for the Shallow Aquifer (Existing Wells) are included in Attachment B.

Western Unconfined Deep Aquifer and the Multiple Source alternative data are based on the 2011 Consumer Confidence Report (CCR) for the City of Oconomowoc. The 2011 City of Oconomowoc CCR reveals that the average arsenic concentration for the Western Unconfined wells was below the arsenic MCL of 10 µg/L. As a result, arsenic treatment is not required and is not included in the Western Unconfined Deep Aquifer source cost estimate. However, it may be required in the future and would further increase the cost of this alternative. Nitrate concentrations were below the MCL of 10 mg/L; therefore, treatment is not necessary. The municipal water supplies for the City of Delafield and the Village of Dousman may be affected by the drawdown of the proposed 10 mgd capacity well field, as indicated by Unconfined Deep Aquifer groundwater modeling, found in Attachment WS7: Unconfined Deep Aquifer Water Supply Evaluation of the April 2011 *Response to WDNR Regarding Letter to Waukesha Water Utility on Application for Lake Michigan Water Supply*. CCRs for these communities are included in Attachment C. The water quality reported by the City of Delafield and Village of Dousman CCRs is summarized in Table 3.

TABLE 3
Western Unconfined Deep Aquifer Near Municipal Water Supplies—Inorganics Concentrations, per 2011 CCRs

	Arsenic MCL µg/L	Arsenic, µg/L	Nitrate MCL mg/L	Nitrate, mg/L
City of Oconomowoc	10	7	10	4.58[1]
City of Delafield	10	5	10	0.03
Village of Dousman	10	6	10	Not Reported in CCR

[1] The 2011 CCR reported that nitrate concentration for the City of Oconomowoc is moderately high. This originates from Well #4, which has a reported depth of 52 feet and is located on the northern edge the Oconomowoc city limit. Blending with other wells was used in the past to meet the MCL, but nitrate levels have decreased with the decline of the local agriculture industry.

The Fox River Alluvium water supply alternatives for nitrate plus nitrite concentration was provided by *Wisconsin's Long Term Trend Water Quality Monitoring Program for Rivers*, a report prepared by the WDNR Bureau for Land Management for the period of June 2001 to June 2005. This report provided Storet data (Station #683096, Site 31) for the Illinois-Fox River below Waukesha from June 2001 to June 2005. The reported median nitrate plus nitrite concentration was 3.83 mg/L. Therefore the nitrate concentration is below the nitrate MCL of 10 mg/L. Arsenic concentration for the Fox River Alluvium water supply alternative was not available but is expected to be between the range of surface water sources on the low end, which generally have low arsenic concentrations, to the concentration present in the nearby Lather's shallow aquifer source at the high end, which is described above. Select pages of the WDNR Bureau for Land Management report are provided in Attachment D.

Silurian Dolomite Aquifer data are based on the 2011 CCR for the Town of Brookfield Sanitary District #4, which has water supplied from the Silurian Dolomite Aquifer. The concentration of arsenic was 3 µg/L. No concentration for nitrate was reported. Nitrate above the MCL is not expected in the Silurian Dolomite Aquifer. The 2011 CCR for the Town of Brookfield Sanitary District #4 is included in Attachment C.

No data were available for inorganic constituents for the Pewaukee or Lisbon Quarry water sources. Only TSS and pH data were available. Comparing with other shallow aquifer water supply alternatives indicates arsenic and nitrate concentrations are generally below the MCL. Consequently the risk is classified as unknown but unlikely.

Lake Michigan water quality was evaluated based on the 2011 CCR for Milwaukee Water Works. Arsenic was not identified. The nitrate concentration was reported as 0.3 mg/L and is therefore below the nitrate MCL. The CCR is included in Attachment C.

Volatile Organic Compounds

Any alternative that has a known petroleum spill, industrial site, or dry cleaner remediation site within the water supply induced 1-foot groundwater drawdown or 1-mile radius of a well will be listed as a potential contaminant risk.

The presence or absence of volatile organic compounds was determined by assessing GIS data provided by the Waukesha Water Utility from the WDNR Bureau for Remediation and Redevelopment Tracking System (BRRTS). This database provides information to users of contaminated properties and cleanup sites for contaminated soil and groundwater. A search using the web-based BRRTS database, called BRTTS on the Web (BOTW), was narrowed by (1) county and (2) VOC contamination. Comparison of the BRRTS activity names with a filtered GIS list resulted in the identification of VOC-contaminated properties and cleanup sites within the water supply induced 1-foot groundwater drawdown or 1-mile radius for all alternatives (see Attachment E for a tabulated comparison and figures resulting from the GIS analysis). The figures in Attachment E were made with the database called "Remediation and Redevelopment (RR) Sites Map," which is part of the DNR's Contaminated Lands Environmental Action Network (CLEAN). This network of DNR databases tracks information on different contaminated land activities, including brownfield sites, Superfund sites, and completed and ongoing investigations and cleanup efforts of contaminated soil and groundwater. While not every site indicates VOC contamination, many sites are LUSTs (Leaking Underground Storage Tanks) for which volatile organic compounds are a common contaminant. The RR Sites Map database is located at the following web address: http://dnr.wi.gov/topic/Brownfields/rrsm.html.

VOC contaminants listed within BRRTS reports included chlorinated and non-chlorinated solvents, petroleum (diesel, leaded and unleaded gasoline, and engine waste oil), perchloroethylene (PCE), polychlorinated biphenyl (PCB), polynuclear aromatic hydrocarbons (PAH), and Resource Conservation and Recovery Act (RCRA) Subtitle C wastes. The BRRTS database is located at the following web address: http://dnr.wi.gov/botw/SetUpBasicSearchForm.do

The BOTW analysis showed that volatile organic compound contaminated sites exist for all groundwater sources.

Intakes for Lake Michigan source water supplies are approximately one mile or more from the shore. Consequently no VOC contamination is located within a one-mile radius.

Synthetic Organic Compounds

Any alternative that has a known synthetic compound bulk storage, cleanup, or spill site (from DATCP data or the BRRTS database) within a 1-foot drawdown or 1-mile radius of a well will be listed as a potential contaminant risk.

This category evaluated the presence or absence of licensed fertilizer and pesticide bulk storage facilities, fertilizer and pesticide spill sites, and long-term cleanup sites. Active, licensed bulk containment facilities were determined from a DATCP analysis provided by the Waukesha Water Utility and through a GIS analysis of the 1-foot drawdown or 1-mile radius from water supply wells. The GIS analysis was completed by spatially projecting coordinates for active, licensed bulk containment facilities within the GIS program. These facilities are locations where bulk fertilizer or bulk pesticide is stored and/or handled or where non-bulk pesticide is mixed and loaded. Long-term cleanup sites and spill sites were determined by comparing the known zip codes of spill sites and cleanup sites with a zip code list (see Attachment F) derived from a Waukesha Water Utility GIS analysis, indicating the zip codes which overlap the 1-foot drawdown contour or lie within the 1-mile radius of the water supply source. Figures displaying active containment sites, as well as zip code areas overlapping the 1-foot drawdown contour or lie within the 1-mile radius of the water supply source, are provided in Attachment F. The spill sites and cleanup sites may have been active or closed cases, but both were included. In some cases, certain zip codes applied to multiple water source alternatives. Consequently, these sites were included in the site counts for multiple alternatives. Zip codes were used for this analysis because exact coordinates were not available for each site, and zip codes were available for all sites. Counts are summarized for each alternative in Table 4.

TABLE 4
Synthetic Organic Compound Long-term Clean-up, Bulk Storage and Spill Site Counts, by Alternative

Water Supply Alternative	Long-Term Clean-up Sites	Bulk Storage	Spills	Total
Existing Deep Wells	-	1	6	7
Shallow Wells, Fox River Alluvium	3	2	4	9
Western Unconfined Deep Wells	1	-	1	2
2 mgd Near Vernon Marsh	3	-	1	4
Potential Dolomite Wells	-	-	5	5
Pewaukee and Lisbon Quarries	1	1	9	11
Deep and Shallow	3	1	4	8

All of the water supply sources have synthetic organic compound sources as a risk nearby. However, intakes for Lake Michigan source water supplies are approximately one mile or more from the shore. Consequently no synthetic organic compound contamination is located within a one-mile radius.

Radionuclides

Confined Deep Aquifer alternatives that have a known radium concentration that exceeds the radium (226+228) MCL of 5 pCi/L were listed as a potential contaminant risk.

The presence or absence of radium in the Existing Confined Deep and Silurian Dolomite Aquifers and the radium concentrations present were provided from CCRs for municipal water systems.

Although radium was not reported in the Western Unconfined Deep Aquifer alternative in 2011 (as indicated by the 2011 CCR for the City of Oconomowoc), radium was reported in prior CCRs for the City of Oconomowoc, including in 2008 and 2009 at radium (226+228) concentrations of 2.5 and 0.7 pCi/L, respectively. The municipal water supplies for the City of Delafield and the Village of Dousman may also be affected by the drawdown of the proposed well field. The radium (226+228) concentrations reported by the 2011 CCRs for the City of Delafield and the Village of Dousman near the Western Unconfined Deep Aquifer were 3.3 pCi/L and 2.7 pCi/L, respectively. Because the City of Delafield and the Village of Dousman currently (as of 2011) are below the radium (226 + 228) MCL of 5 pCi/L, the source does not require radium treatment.

The Silurian Dolomite Aquifer radium concentration was based on the 2011 CCR for the Town of Brookfield Sanitary District #4. The reported radium (226+228) concentration for 2011 was 1.80 pCi/L. This is less than the MCL. As a result, radium treatment is not required for this water supply source.

The 2011 CCR for Milwaukee Water Works referenced for Lake Michigan source water does report a concentration of radium (226 +228) of 2.0 pCi/L. This concentration is less than the MCL. The shallow well alternatives are known not to have radium concerns.

Municipal water supply CCRs are provided in Attachment C.

Environmental

Aquifer Drawdown

Based upon groundwater modeling of an aquifer under steady state conditions, the total depth of drawdown in feet is reported. Aquifer drawdown was determined from groundwater models from prior submitted reports.

Based on the 2010 *A Regional Water Supply Plan for Southeastern Wisconsin (Planning Report No. 52)* from the Southeastern Wisconsin Regional Planning Commission (SEWRPC), the Existing Deep Confined Aquifer well drawdown levels are currently between 400 and 600 feet below 19th century levels. Groundwater modeling conducted by RJN Environmental Services, LLC, in February 2011 reported that reducing the Existing Deep Confined Aquifer pumping to about 2 mgd would create a rebound in the Deep Confined Aquifer water level of about 50 feet over time near Waukesha. This decreased demand scenario is represented in the Multiple Source alternative, where the estimated drawdown assumes a 50-foot rebound to between 450 and 550 feet. This information has been previously reported in the *Response to WDNR Questions: Regarding Letter to Waukesha Water Utility (December 2, 2010) on Application for Lake Michigan Water Supply (May 2010).*

Groundwater modeling to determine the aquifer drawdown of the proposed Western Unconfined Deep Aquifer and the Existing (Troy Bedrock Valley) Shallow wells was conducted by RJN Environmental Services, LLC, in February 2011 (refer to Attachment WS7: Unconfined Deep Aquifer Water Supply Evaluation of the April 2011 *Response to WDNR Regarding Letter to Waukesha Water Utility on Application for Lake Michigan Water Supply).* This report explains that pumping from the Western Unconfined Deep Aquifer was modeled using the SEWRPC regional groundwater model at flows between 2 mgd and 15 mgd, which resulted in drawdown in the sandstone aquifer ranging from 46 to 240 ft respectively (see Figures 4 and 6 of the RJN Environmental Services report). Subsequent additional groundwater modeling of seven wells instead of two indicated a potential drawdown over 150 feet (RJN Environmental Services Waukesha Water Utility Groundwater Flow Modeling 08/2013 letter). The multi-source alternative of the shallow aquifer near Vernon Marsh results in a shallow aquifer drawdown of approximately 40 feet (see Exhibit 4 in WS10 response).

Groundwater modeling to determine the aquifer drawdown of both new and existing shallow wells within the Fox River and Vernon Marsh areas was also conducted by RJN Environmental Services, LLC, in April 2010 (refer to Scenarios 1-2 and 2-1 in Table 3 of Appendix O of the original May 2010 *Application for Lake Michigan Water Supply*). Scenario 1-2 is the Deep Confined and Shallow Aquifer alternative where an annual average demand of 6.4 mgd is withdrawn from 17 shallow wells. The resulting drawdown was 50 feet. Scenario 2-1 is the Shallow Aquifers and Fox River Alluvium alternative where an annual average demand of 10.9 mgd is withdrawn by an additional four shallow wells (Fox River Alluvium). This scenario resulted in over a 90-foot drawdown.

Aquifer Water Quality Changes

The Confined (St. Peter Sandstone) Deep Aquifer is known to have deteriorating water quality. The reason is twofold: (1) declining well capacity, and (2) decreasing groundwater elevation. Waukesha's confined deep wells vary in age from 30 to 75 years and several have been abandoned due to contamination and decreasing well capacity as the aquifer drawdown has occurred. According to the March 2002 *Report on Future Water Supply*, one well in the sandstone aquifer has had TDS concentrations in excess of 1,000 mg/L and was rehabilitated to reduce TDS. By blocking off part of the well hole, well capacity was reduced to 35 percent. Gross alpha levels have also risen significantly in most sandstone aquifer wells in Waukesha County. Additionally, the *Report on Future Water Supply* warned that many wells were not constructed to current well codes and could experience physical failures, including casing leaks or borehole collapse. The decreasing groundwater elevation also affects the water quality of the Confined Deep Aquifer. This drop in groundwater elevation can lead to increased TDS and radionuclides (radium), as well as exposed sulfide minerals, which when exposed to oxygen can increase arsenic concentrations. Consequently, continued pumping of the existing Confined Deep Aquifer will result in further water quality changes. It is assumed that if the Deep Aquifer water level decline stops, degradation of water quality will stop.

Water quality changes from pumping of other groundwater sources are unknown, but they are assumed not to change.

Trout Streams

Trout streams within the 1-foot drawdown of shallow aquifer sources have baseflow reductions reported.

Trout streams considered were Pebble Brook, Pebble Creek, and Mill Creek. Percent baseflow reductions of these trout streams for the Deep Confined and Shallow Aquifer and Shallow Aquifers and Fox River Alluvium alternatives were determined by RJN Environmental Services, LLC, in April 2010 (refer to Scenarios 1-2 and 2-1 in Table 3 in Appendix O of the original May 2010 *Application for Lake Michigan Water Supply*). Scenario 1-2 is the Deep and Shallow Aquifer alternative. Scenario 2-1 is the Shallow Aquifers and Fox River Alluvium alternative. Baseflow reductions for these scenarios are summarized in Table 5. The baseflow reduction calculations were updated and included in 2013 (RJN Environmental Services Waukesha Water Utility Groundwater Flow Modeling 08/2013 letter).

TABLE 5
Baseflow Reductions for Trout Streams, by Alternative

	Deep and Shallow Aquifers (6.4 mgd)	Shallow Aquifers and Fox River Alluvium (10.9 mgd)	2 mgd Near Vernon Marsh
Pebble Brook	34%	34%	2%
Pebble Creek	1%	2%	2%
Mill Brook	85%	77%	53%
Mill Creek	33%	26%	1%

There are no trout streams affected by the Western Unconfined Deep Aquifer water supply alternative.

The October 2006 document by Daniel Feinstein (USGS) titled “Where do the deep wells in Southeastern Wisconsin get their water?” describes that pumping of the existing confined aquifer has affected stream flows in Southeastern Wisconsin. According to the report, 70 percent of the existing deep confined well withdrawals are replenished by new water that would have flowed to streams in the Mississippi River Basin in the absence of pumping. The remainder of the replenishing water originated from within the Lake Michigan Basin. As a result, stream flows have decreased across the area. Stream characteristics are included in Attachment G.

Outstanding/Exceptional Resource Waters

Those waters within the 1-foot drawdown of shallow aquifer sources and classified as outstanding resource waters (ORWs) or exceptional resource waters (ERWs) according to Wisconsin DNR standards have the distance and flow reduction reported.

No ORWs or ERWs were identified within the 1-foot drawdown of shallow aquifer sources.

Other Surface Waters

Other surface waters or wetland complexes within the 1-foot drawdown have the baseflow reduction reported.

For the shallow aquifer alternatives, surface waters and wetland complexes identified within the 1-foot drawdown were the Fox River and Vernon Marsh. These were identified using a Waukesha County data publication from the Waukesha County GIS Department. Percent baseflow reductions of the Fox River for the Deep and Shallow Aquifer as well as the Shallow Aquifer and Fox River Alluvium alternatives were determined by RJN Environmental Services, LLC, in April 2010 (refer to Scenarios 1-2 and 2-1 in Table 3 in Appendix O of the original May 2010 *Application for Lake Michigan Water Supply*) and updated in 2013 (RJN Environmental Services Waukesha Water Utility Groundwater Flow Modeling 08/2013 letter). Fox River and Vernon Marsh baseflow reductions are summarized in Table 6.

TABLE 6
Baseflow Reductions for the Fox River and Vernon Marsh

	Deep and Shallow Aquifers	Shallow Aquifers and Fox River Alluvium	2 mgd Near Vernon Marsh
Fox River	5%	11%	3%

For the Western Unconfined Deep Aquifer alternative, several surface waters are affected. The 2013 groundwater modeling letter lists surface waters with baseflow reductions. Surface waters with baseflow reduction for the 10 mgd alternative are listed in Table 7 (RJN Environmental Services Waukesha Water Utility Groundwater Flow Modeling 08/2013 letter).

TABLE 7
Baseflow Reductions for Various Surface Waters for the 2 mgd and 10 mgd Western Unconfined Aquifer Alternatives

	2 mgd Western Unconfined	10 mgd Western Unconfined
Bark River	1%	8%
Silver Lake	5%	231%
Genesee Lakes	3%	17%
Duck Lakes	4%	20%
Battle Creek and Laura Lake	3%	14%

Stream characteristics are included in Attachment G.

For alternatives including Lake Michigan as a water source, flows to the Fox River, Underwood Creek, the Menomonee River, and the Root River will change. However, flow changes to these surface waters will be lessened when Lake Michigan is not the only water source.

Springs within Drawdown

The number of springs located within the 1-foot drawdown, along with the range of capacities, is reported.

Springs located within the 1-foot drawdown were identified using GIS software. GIS data were compiled from various sources, including the Wisconsin Geological and Natural History Survey (WGNHS), the University of Wisconsin System, and USGS. See Figures in Attachment H (Figures H-1 through H-5) for spring flow rates and locations within the 1-foot drawdown.

Figure H-1	Shallow Aquifer with Fox River Alluvium, One-Foot Drawdown Area and Springs
Figure H-2	Deep and Shallow Aquifers, One-Foot Drawdown Area and Springs
Figure H-3	Western Unconfined Aquifer at 10 mgd, One-Foot Drawdown Area and Springs
Figure H-4	1 Mile Radius Around the Potential Dolomite Wells and Springs
Figure H-5	Shallow Aquifers at 2 mgd near Vernon Marsh, One-Foot Drawdown Area and Springs

Lakes within Groundwater Drawdown

Distances from wells to lakes within the 1-foot groundwater drawdown are reported.

Lakes located within the 1-foot groundwater drawdown were identified using a Waukesha County data publication from the Waukesha County GIS Department. The GIS figures identify the lakes and provide the distance to the closest well (see Attachment I). Lake characteristics are included in Attachment G.

Wetlands within Drawdown

Wetland analysis considered the effects on wetland acreage by a 1-foot or greater drawdown for shallow well aquifer alternatives, as wells as by changes in wetland type due to pipeline construction.

For a complete, detailed list of wetland acreage effects for the various water supply alternatives, refer to the tables in Attachment J. Table 6-43 provided in Attachment J is excerpted from the City of Waukesha Environmental Report (Volume 5 of the Application) submitted October 2013. For Lake Michigan alternatives, wetland impacts considered pipeline construction for both water supply and return flow routes. For the 2 mgd Near Vernon Marsh alternative, an estimated 2,075 acres of wetlands would be impacted within the 1-foot drawdown.

Based on modeling for Western Unconfined Deep Aquifer, it was determined that drawdowns in the sandstone aquifer will have greater than a 1-ft drawdown in the shallow aquifer for the 10 mgd alternative, but less than a 1-drawdown for the 2 mgd alternative. At 10 mgd an estimated 480 acres of wetlands would be impacted within the 1-foot drawdown.

Municipal, Private and Other Wells within Drawdown

Private residential wells located within the 1-foot or greater drawdown and 5-foot or greater drawdown were provided where information was readily available. Private residential wells were determined using compiled data from the Waukesha Water Utility, WDNR, and the WGNHS. For an accurate count of private wells, tax parcels with improvements not served by municipal water sources were counted. The most recent tax parcel data available were queried for improvements in excess of $20,000 and visually verified using 2010 aerial photography that a house was present on the parcel and was not being served by a municipal source. As a result of this data compilation, several hundred more private wells were identified than data sets provided by the WDNR and WGNHS alone.

Municipal well information was retrieved through WDNR using the WDNR Groundwater Retrieval Network (GRN). However, not all high capacity wells appeared present in the GRN database. Municipal wells affected included City of Waukesha deep wells for shallow aquifer groundwater sources near Vernon Marsh and municipal wells near the Western Unconfined Deep Aquifer alternative. There are six municipal wells located within the 1-foot drawdown of the Shallow and Fox River Alluvium alternative, as indicated in Attachment K. Three of the wells are located in the deep sandstone aquifer and are therefore unaffected by shallow aquifer pumping. Similarly, there are five municipal wells located within the 1-foot drawdown of the Deep and Shallow and Lake Michigan and Shallow Aquifer alternatives. Two of the wells are located in the deep sandstone aquifer and are unaffected by shallow aquifer pumping.

Other wells were identified through the WDNR GRN based on GIS well records from 1987 to 2009. The Other wells included:

a. Other than Municipality Community (OC)
b. Municipal Community (MC)
c. Groundwater Extraction
d. Non-potable Private
e. Non-transient Non-community (NN)
f. Transient Non-community
g. Miscellaneous

A summary of private, municipal and other wells for each alternative is provided in Tables 8 through 10.

TABLE 8
Number of Private Wells Within Drawdown

	Drawdown	
	>1-ft	>5-ft
Deep and Shallow Aquifers	3420	1320
Shallow Aquifer and Fox River Alluvium	3565	1675
Shallow Aquifer (2 mgd) Near Vernon Marsh	1252	237
2 mgd Western Unconfined Deep Aquifer[1]	0	0
10 mgd Western Unconfined Deep Aquifer[2]	158	0

[1] No private wells were identified within the shallow portion of the 2 mgd Western Unconfined Deep Aquifer; drawdowns in this area were less than 1 foot.
[2] Shallow aquifer drawdowns are less than 5 feet.

TABLE 9
Number of Municipal Wells Within Western Unconfined Deep Aquifer Drawdown[1,2]

	Drawdown			
	>10-ft	>15-ft	>50-ft	>70-ft
2 mgd Western Unconfined Deep Aquifer	8	4	-	-
10 mgd Western Unconfined Deep Aquifer			11	9

[1] Blank cells are provided for some alternatives because contours intervals varied for each alternative. Therefore, counts could not be provided within some intermediate contours.
[2] Cells containing a hyphen (-) indicate that a contour does not exist for the given drawdown depth.

TABLE 10
Number of Other (Non-Municipal, Non-Private) Wells Within Drawdown[1,2]

	Drawdown						
	>5-ft	>10-ft	>15-ft	>20-ft	>40-ft	>70-ft	>210-ft
Deep and Shallow Aquifers	11	3		1	-	-	-
Shallow Aquifer and Fox River Alluvium	16	14		5	1	0	-
Shallow Aquifer (2 mgd) Near Vernon Marsh		2		1	-	-	-
2 mgd Western Unconfined Deep Aquifer[3]			105	23	1	-	-
10 mgd Western Unconfined Deep Aquifer[4]						177	1

[1] Blank cells are provided for some alternatives because contours intervals varied for each alternative. Therefore, counts could not be provided within some intermediate contours.
[2] Cells containing a hyphen (-) indicate that a contour does not exist for the given drawdown depth.
[3] Smallest complete drawdown contour available for the 2 mgd Western Unconfined alternative is 15 ft. Additionally, some contours extend into Jefferson County.
[4] Smallest complete drawdown contour available for the 10 mgd Western Unconfined alternative is 70 ft. Additionally, some contours extend into Jefferson County.

Well counts for the Western Unconfined 2 mgd and 10 mgd wells are approximated due to groundwater modeling contour limitations. Drawdown contours extend into a portion of Jefferson County beyond where "other" and "municipal" well information was obtained. Because well data were not available for the wells located in Jefferson County, the number of wells present in the 2 mgd or 10 mgd drawdown of the Western Unconfined Aquifer may be greater than the data reported in Tables 8, 9, and 10. Municipal well counts are not represented in Table 9 for the Deep and Shallow, Shallow and Fox River Alluvium, and Shallow (2 mgd) Near Vernon Marsh alternatives because these wells draw from shallow aquifer sources and are therefore not affected by the drawdowns of the deep municipal wells owned by the City of Waukesha.

See Attachment K for GIS figures displaying the locations of wells within the 1-foot drawdown of each alternative.

A summary of the public health and environmental impacts described in this memorandum is provided in Table 11.

TABLE 11

Supplemental Public Health and Environmental Information

							Public Health Risk Factors			
							Presence of Contaminant Sources			
Alternative	**Water Sources**	**ADD, mgd**	**MDD, mgd**	**Supply Facilities**	**Treatment Facilities**	**Transmission Facilities**	**Inorganics**	**Volatile Organic Compounds**	**Synthetic Organic Compounds**	**Radionuclides**
1. Deep Confined and Shallow Aquifers	Deep Confined Aquifer	4.5	7.6	8 existing wells	3 new Reverse Osmosis treatment plants at wells 6,8,10. Existing Hydrous Manganese Oxide treatment at well 3.	About 5 miles of pipeline to Hillcrest Reservoir pipeline for blending, then pumped throughout distribution system.	No	Yes	Yes	Yes
	Shallow Aquifer (New Wells)	4.9	7.9	12 new wells and about 6 miles of connecting pipeline to the treatment plant.	1 new groundwater treatment plant.	1 new pump station at new water plant and about 10 miles of transmission pipe to Hillcrest Reservoir for blending, then pumped to distribution system with about 4 miles of piping improvements.	Arsenic Treatment Required	Yes	Yes	No
	Shallow Aquifer (Existing Wells)	0.7	1.2	3 existing wells	Existing groundwater treatment plant for wells 11 and 12.	About 1 mile of transmission pipe to Hillcrest Reservoir pipeline for blending, then pumped throughout distribution system.	No	Yes		No
2. Shallow Aquifers and Fox River Alluvium	Shallow Aquifer (Existing Wells)	0.7	1.2	3 existing wells	Existing groundwater treatment plant for wells 11 and 12.	About 1 mile of transmission pipe to Hillcrest Reservoir pipeline for blending, then pumped throughout distribution system.	No	Yes		No
	Fox River Alluvium (Riverbank Inducement)	2.7	4.5	4 new wells and about 1 mile of connecting pipeline to water treatment plant.	1 new groundwater/surface water treatment plant.	1 new pump station at new water plant and about 6 miles of transmission pipe to Hillcrest Reservoir for blending, then pumped throughout distribution system.	Arsenic Data Not Available	Yes	Yes	No
	Shallow Aquifer (New Wells)	6.7	11	12 new wells and about 6 miles of connecting pipeline to the treatment plant.	Treated in same groundwater/surface water treatment plant as Fox River alluvium wells.	Pumped through same pump station and pipeline as above.	Arsenic Treatment Required	Yes		No

TABLE 11
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Alternative	**Water Sources**	**ADD, mgd**	**MDD, mgd**	**Supply Facilities**	**Treatment Facilities**	**Transmission Facilities**	**Inorganics**	**Volatile Organic Compounds**	**Synthetic Organic Compounds**	**Radionuclides**
3. Lake Michigan and Shallow Aquifer	Lake Michigan	4.5	7.6	1 pump station and about 19 miles of transmission pipe (Oak Creek supply) to Hillcrest Reservoir for blending.	Surface water treatment by water supplier.	Pumped to distribution system with about 4 miles of piping improvements. A return flow pump station and about 20 miles of return flow transmission pipe to the Root River.	No	No	No	No
	Shallow Aquifer (New Wells)	4.9	7.9	14 new wells and about 6 miles of connecting pipeline to the treatment plant.	1 new groundwater treatment plant.	1 new pump station at new water plant and about 10 miles of transmission pipe to Hillcrest Reservoir for blending, then pumped throughout distribution system.	Arsenic Treatment Required	Yes	Yes	No
	Shallow Aquifer (Existing Wells)	0.7	1.2	3 existing wells	Existing groundwater treatment plant for wells 11 and 12.	About 1 mile of transmission pipe to Hillcrest Reservoir pipeline for blending, then pumped throughout distribution system.	No	Yes	Yes	No
4. Western Unconfined Deep Aquifer	Western Unconfined Deep Aquifer	10.1	16.7	12 new wells and about 9 miles of interconnecting pipeline. 12 miles of raw water transmission pipeline to the water plant.	1 new groundwater treatment plant.	Pump station at treatment plant and about 7 miles of transmission pipe to Hillcrest Reservoir. Water is pumped to distribution system with about 4 miles of transmission pipelines.	No	Yes	Yes	No

TABLE 11
Supplemental Public Health and Environmental Information

Alternative	Water Sources	ADD, mgd	MDD, mgd	Supply Facilities	Treatment Facilities	Transmission Facilities	Public Health Risk Factors Presence of Contaminant Sources: Inorganics	Volatile Organic Compounds	Synthetic Organic Compounds	Radionuclides
5. Multiple Sources	Deep Confined Aquifer	2.1	3.5	4 existing wells (#3,6,8,10)	3 new Reverse Osmosis treatment plants at wells 6,8,10. Existing Hydrous Manganese Oxide treatment at well 3.	About 3 miles of pipeline to Hillcrest Reservoir pipeline for blending, then pumped throughout distribution system.	No	Yes	Yes	Yes
	Fox River Alluvium (Riverbank Inducement)	1.5	2.5	3 new wells and about 1 mile of connecting pipeline to water treatment plant.	1 new groundwater/surface water treatment plant.	1 new pump station at new water plant and about 10 miles of transmission pipe to Hillcrest Reservoir for blending, then pumped throughout distribution system.	Arsenic Data Not Available	Yes	Yes	No
	Shallow Aquifer (Existing Wells)	0.9	1.5	3 existing wells	Existing groundwater treatment plant for wells 11 and 12.	About 1 mile of transmission pipe to Hillcrest Reservoir pipeline for blending, then pumped throughout distribution system.	No	Yes	Yes	No
	Western Unconfined Deep Aquifer	2.0	3.2	3 new wells and 2 miles of interconnecting pipeline. 12 miles of raw water transmission pipeline to the water plant.	1 new groundwater treatment plant.	About 5 miles of transmission pipe to Hillcrest Reservoir, then pumped throughout distribution system.	No	Yes	Yes	No
	Pewaukee Quarry	0.9	1.5	2 quarries with 2 intakes, 1 pump station and 2 miles of pipe to a new water plant.	1 new surface water treatment plant near the Hillcrest Reservoir.	1 new pump station at new water plant and about 1 mile of transmission pipe to Hillcrest Reservoir for blending, then pumped throughout distribution system.	Data not available	Yes	Yes	Data not available
	Lisbon Quarry	1.5	2.5	2 quarries with 2 intakes, 1 pump station and 7 miles of pipe to a new water plant.	Treated in the same new water treatment plant as the Pewaukee Quarry.	Pumped with the same new pump station above.	Data not available	Yes	Yes	Data not available
	Silurian Dolomite Aquifer	1.2	2	5 new wells, 8 miles of interconnecting pipeline to a new water plant.	1 new groundwater treatment plant.	1 new pump station at new water plant and about 2 miles of transmission pipe to Hillcrest Reservoir pipeline for blending, then pumped throughout distribution system.	No	Yes	Yes	No

TABLE 11
Supplemental Public Health and Environmental Information

							Public Health Risk Factors			
							Presence of Contaminant Sources			
Alternative	Water Sources	ADD, mgd	MDD, mgd	Supply Facilities	Treatment Facilities	Transmission Facilities	Inorganics	Volatile Organic Compounds	Synthetic Organic Compounds	Radionuclides
6. Lake Michigan	Lake Michigan	10.1	16.7	1 pump station and about 17 miles of transmission pipe (Oak Creek supply) to southeast side of the Waukesha distribution system.	Surface water treatment by water supplier.	Pumped throughout distribution system at Hillcrest Reservoir.	No	No	No	No

TABLE 11
Supplemental Public Health and Environmental Information

		Environmental Risk Factors										
		Aquifers		Surface Waters						Wells		
Alternative	Water Sources	Drawdown (feet)	Groundwater Quality Change from Pumping	Trout Streams	Outstanding/Exceptional Resource Waters	Other Streams/Surface Waters	Springs within Drawdown	Lakes within Drawdown	Wetlands within 1-foot Drawdown (acres)	Public Wells within 1-foot Drawdown	Private Wells within 1-foot Drawdown	Other Wells within 1-foot Drawdown
1. Deep Confined and Shallow Aquifers	Deep Confined Aquifer	400 to 600 ft	Continued increase in TDS and radium expected.	Approximately 70% of the water that replenishes existing deep wells once flowed toward streams in the Mississippi River Basin. Therefore, increased withdrawals decrease stream flows across the recharge area.	Approximately 70% of the water that replenishes existing deep wells once flowed toward streams in the Mississippi River Basin. Therefore, increased withdrawals decrease stream flows across the recharge area.	Approximately 70% of the water that replenishes existing deep wells once flowed toward streams in the Mississippi River Basin. Therefore, increased withdrawals decrease stream flows across the recharge area.	No direct connections to shallow aquifers with springs.	None	None	Reduced pumping of the deep aquifer from existing conditions reduces impact on these wells.	Reduced pumping of the deep aquifer from existing conditions reduces impact on these wells.	Reduced pumping of the deep aquifer from existing conditions reduces impact on these wells.
	Shallow Aquifer (New Wells)	50 ft	Quality changes are unknown.	Pebble Brook: 34% baseflow reduction Pebble Creek: 1% baseflow reduction Mill Brook: 85% baseflow reduction Mill Creek: 33% baseflow reduction	None	Fox River: 5% baseflow reduction	Total Number of Springs: 7 Range of Capacities: 5-50 gpm	Saylesville Pond: 10,031 ft Unnamed Lake: 4,919 ft	3,091	3 - located in shallow aquifer 2 - located in deep aquifer	3,420	32
	Shallow Aquifer (Existing Wells)		Quality changes are unknown.		None							
2. Shallow Aquifers and Fox River Alluvium	Shallow Aquifer (Existing Wells)	Over 90 ft	Quality changes are unknown.	Pebble Brook: 34% baseflow reduction Pebble Creek: 2% baseflow reduction Mill Brook: 77% baseflow reduction Mill Creek: 26% baseflow reduction	None	Fox River: 11% baseflow reduction	Total Number of Springs: 12 Range of Capacities: 5-50 (Two are Dry)	Saylesville Pond: 7,990 ft Unnamed Lake: 4,919 ft	4,113	3 - located in shallow aquifer 3 - located in deep aquifer	3,565	35
	Fox River Alluvium (Riverbank Inducement)		Quality changes are unknown.		None							
	Shallow Aquifer (New Wells)		Quality changes are unknown.		None							

TABLE 11
Supplemental Public Health and Environmental Information

		Environmental Risk Factors										
		Aquifers		**Surface Waters**						**Wells**		
Alternative	**Water Sources**	**Drawdown (feet)**	**Groundwater Quality Change from Pumping**	**Trout Streams**	**Outstanding/Exceptional Resource Waters**	**Other Streams/Surface Waters**	**Springs within Drawdown**	**Lakes within Drawdown**	**Wetlands within 1-foot Drawdown (acres)**	**Public Wells within 1-foot Drawdown**	**Private Wells within 1-foot Drawdown**	**Other Wells within 1-foot Drawdown**
3. Lake Michigan and Shallow Aquifer	Lake Michigan	N/A	N/A	None	None	Fox River Menomonee River Root River Underwood Creek	None	None	1 to 7	None	None	None
	Shallow Aquifer (New Wells)	50 ft	Quality changes are unknown.	Pebble Brook: 34% baseflow reduction Pebble Creek: 1% baseflow reduction Mill Brook: 85% baseflow reduction Mill Creek: 33% baseflow reduction	None	Fox River: 5% baseflow reduction	Total Number of Springs: 7 Range of Capacities: 5-50 gpm	Saylesville Pond: 10,031 ft Unnamed Lake: 4,919 ft	3,091	3 - located in shallow aquifer 2 - located in deep aquifer	3,420	32
	Shallow Aquifer (Existing Wells)		Quality changes are unknown.		None							
4. Western Unconfined Deep Aquifer	Western Unconfined Deep Aquifer	over 150 ft	Quality changes are unknown.	None	None	Bark River: 9% baseflow reduction Battle Creek and Laura Lake: 12% baseflow reduction Duck Lakes: 18% baseflow reduction Genesee Lakes: 16% baseflow reduction Silver Lake: 27% baseflow reduction	Total Number of Springs: 1 Capacity: 20 gpm	Duck Lakes: 7,206 ft Laura Lake: 2,540 ft Middle Genesee Lake: 3,440 ft Silver Lake: 4,254 ft Unnamed Lake: 9,735 ft Upper Genesee Lake: 7,275 ft	480	9 - within 70 ft contour	158	11 - 177 depending on whether the deep or shallow aquifer is considered.

TABLE 11

Supplemental Public Health and Environmental Information

		Environmental Risk Factors										
		Aquifers		Surface Waters						Wells		
Alternative	**Water Sources**	**Drawdown (feet)**	**Groundwater Quality Change from Pumping**	**Trout Streams**	**Outstanding/Exceptional Resource Waters**	**Other Streams/Surface Waters**	**Springs within Drawdown**	**Lakes within Drawdown**	**Wetlands within 1-foot Drawdown (acres)**	**Public Wells within 1-foot Drawdown**	**Private Wells within 1-foot Drawdown**	**Other Wells within 1-foot Drawdown**
5. Multiple Sources	Deep Confined Aquifer	350 to 550 ft	Water quality could stabilize.	Approximately 70% of the water that replenishes existing deep wells once flowed toward streams in the Mississippi River Basin. Therefore, increased withdrawals decrease stream flows across the recharge area.	Approximately 70% of the water that replenishes existing deep wells once flowed toward streams in the Mississippi River Basin. Therefore, increased withdrawals decrease stream flows across the recharge area.	Approximately 70% of the water that replenishes existing deep wells once flowed toward streams in the Mississippi River Basin. Therefore, increased withdrawals decrease stream flows across the recharge area.	No direct connections to shallow aquifers with springs.	None	None	Reduced pumping of the deep aquifer from existing conditions reduces impact on these wells.	Reduced pumping of the deep aquifer from existing conditions reduces impact on these wells.	Reduced pumping of the deep aquifer from existing conditions reduces impact on these wells.
	Fox River Alluvium (Riverbank Inducement)	40 ft	Quality changes are unknown.	Pebble Brook: 2% baseflow reduction Pebble Creek: 2% baseflow reduction Mill Brook: 53% baseflow reduction Mill Creek: 1% baseflow reduction	None	Fox River: 3% baseflow reduction	Total Number of Springs: 2 Capacities: 30 gpm, 40 gpm	Unnamed Lake: 4,919 ft	2,075	None	1,252	2
	Shallow Aquifer (Existing Wells)		Quality changes are unknown.		None							
	Western Unconfined Deep Aquifer	46 ft	Quality changes are unknown.	None	None	Bark River: 2% baseflow reduction Battle Creek and Laura Lake: 3% baseflow reduction Duck Lakes: 4% baseflow reduction Genesee Lakes: 3% baseflow reduction Silver Lake: 5% baseflow reduction	None. Shallow drawdown of less than 1 ft.	Distance to lakes is same as 10 MGD alternative.	None. Shallow drawdown of less than 1 ft.	4 - within 15 foot contour	0	0 - 105 depending on whether the deep or shallow aquifer is considered
	Pewaukee Quarry	N/A	Quality changes are unknown.	None	None	None beyond what currently exists.	N/A	N/A	None	None	None	None
	Lisbon Quarry	N/A	Quality changes are unknown.	None	None	None beyond what currently exists.	N/A	N/A	None	None	None	None
	Silurian Dolomite Aquifer	Unknown. Not expected to be significant.	Quality changes are unknown.	Not modeled	None	Wells are located at the headwaters of Mill Brook and Poplar Creek.	Total Number of Springs: 8 Range of Capacities: 8-50 gpm (five are of unknown capacities)	No lakes located within 1 mile of Silurian Dolomite wells.	None. No direct connections to shallow aquifer.	None. No direct connections to shallow aquifer.	None. No direct connections to shallow aquifer.	None. No direct connections to shallow aquifer.

TABLE 11
Supplemental Public Health and Environmental Information

		Environmental Risk Factors										
		Aquifers		Surface Waters						Wells		
Alternative	Water Sources	Drawdown (feet)	Groundwater Quality Change from Pumping	Trout Streams	Outstanding/Exceptional Resource Waters	Other Streams/Surface Waters	Springs within Drawdown	Lakes within Drawdown	Wetlands within 1-foot Drawdown (acres)	Public Wells within 1-foot Drawdown	Private Wells within 1-foot Drawdown	Other Wells within 1-foot Drawdown
6. Lake Michigan	Lake Michigan	N/A	N/A	None	None	Fox River Menomonee River Root River Underwood Creek	None	None	1 to 7	None	None	None

Attachment A

New Shallow Wells (Lather Property) Water Quality Data

DAVY LABORATORIES

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SDWA LABORATORY ANALYSIS REPORT

Waukesha Water Utility
115 Delafield St
Waukesha, WI 53188

Attn: Jeff Detro

Date: April 10, 2007
Client No: 10060

Sample No: 0703070-01
Sample Site: Lather TB7

Date Collected: February 28, 2007

Date Received: March 02, 2007

Parameter	Method	MDL	LOQ	Analyzed	Result	Units	MCL	Qualifier
Inorganic Analysis								
Alkalinity, Total	SM 2320 B	1	3	07-Mar-07	**283**	mg/L	0	
Chloride, Total as Cl	EPA 300.0	0.030	0.095	06-Mar-07	**0.567**	mg/L	0	
Cyanide, Total	SM 4500 CN C/E	0.003	0.010	30-Mar-07	<0.003	mg/L	0.2	H3
Fluoride	SM 4500 F B/C	0.10	0.30	07-Mar-07	**0.60**	mg/L	4	
Hardness, Total	SM 2340 C	5	15	13-Mar-07	**270**	mg/L	0	
Nitrate as N	EPA 300.0	0.002	0.005	02-Mar-07	**0.006**	mg/L	10	
Nitrite as N	EPA 300.0	0.002	0.005	02-Mar-07	<0.002	mg/L	1	
Total Organic Carbon	SM 5310B	0.540	1.70	14-Mar-07	**0.960**	mg/L	0	J
pH, Lab	SM 4500 H B			07-Mar-07	**7.50**	pH Units	0	H1
Nitrate/Nitrite as N	Calculation	0.002	0.005	02-Mar-07	**0.006**	mg/L	10	
Total Dissolved Solids	SM 2540 C	1	3	06-Mar-07	**277**	mg/L	0	
Sulfate as SO4	EPA 300.0	0.150	0.500	07-Mar-07	**8.02**	mg/L	0	

Submitted by:

Davy Laboratories

Paul A. Harris, Laboratory Director

The laboratory analyses reported were determined in accordance with methods from approved authoritative sources. Approved authoritative sources are defined and listed within the respective state certification codes. The results are representative of the samples only; conditions can be expected to vary at different times and under different sampling conditions.

WI Certification Nos. 632021390 and 105000216, MN Certification No. 055-151, IA Certification No. 304

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SDWA LABORATORY ANALYSIS REPORT

Waukesha Water Utility
115 Delafield St
Waukesha, WI 53188

Attn: Jeff Detro

Date: April 10, 2007
Client No: 10060

Sample No: 0703070-01
Sample Site: Lather TB7

Date Collected: February 28, 2007

Date Received: March 02, 2007

Parameter	Method	MDL	LOQ	Analyzed	Result	Units	MCL	Qualifier
Metals Analysis								
Aluminum, Total	EPA 200.7	0.0151	0.0480	14-Mar-07	**0.0242**	mg/L	**0**	J
Antimony, Total	SM 3113 B	0.0007	0.003	09-Mar-07	**0.001**	mg/L	**0.006**	J
Arsenic, Total	SM 3113 B	0.0006	0.002	08-Mar-07	**0.01**	mg/L	**0.01**	A-02
Barium, Total	EPA 200.7	1.84E-4	5.84E-4	14-Mar-07	**0.131**	mg/L	**2**	
Beryllium, Total	EPA 200.7	1.21E-4	3.86E-4	14-Mar-07	<1.21E-4	mg/L	0.004	
Cadmium, Total	EPA 200.7	0.0007	0.002	14-Mar-07	**0.002**	mg/L	**0.005**	
Calcium, Total	SM 3111 B	0.340	1.26	12-Mar-07	**51.1**	mg/L	**0**	
Chromium, Total	EPA 200.7	7.80E-4	0.00248	14-Mar-07	<7.80E-4	mg/L	0.1	
Copper, Total	SM 3111 B	0.00400	0.0160	07-Mar-07	<0.00400	mg/L	1.3	
Iron, Total	SM 3111 B	0.027	0.099	07-Mar-07	**0.265**	mg/L	**0.3**	
Lead, Total	SM 3113 B	0.00026	0.00098	09-Mar-07	**0.00125**	mg/L	**0.015**	
Magnesium, Total	SM 3111 B	0.100	0.400	13-Mar-07	**38.9**	mg/L	**0**	
Manganese, Total	SM 3111 B	0.004	0.013	08-Mar-07	<0.004	mg/L	0.05	
Mercury, Total	EPA 245.1	0.0001	0.0004	16-Mar-07	<0.0001	mg/L	0.002	
Nickel, Total	EPA 200.7	0.00306	0.00973	14-Mar-07	<0.00306	mg/L	0.1	
Selenium, Total	SM 3113 B	0.0003	0.00112	08-Mar-07	**0.00038**	mg/L	**0.05**	J
Silver, Total	SM 3113 B	0.000026	0.000097	07-Mar-07	<0.000026	mg/L	0.05	
Sodium, Total	SM 3111 B	0.160	0.620	12-Mar-07	**6.82**	mg/L	**0**	
Thallium, Total	EPA 200.9	0.0004	0.001	08-Mar-07	<0.0004	mg/L	0.002	

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SDWA LABORATORY ANALYSIS REPORT

Waukesha Water Utility
115 Delafield St
Waukesha, WI 53188

Attn: Jeff Detro

Date: April 05, 2007
Client No: 10060

Sample No: 0703237-01
Sample Site: Lather TB8

Date Collected: March 02, 2007

Date Received: March 07, 2007

Parameter	Method	MDL	LOQ	Analyzed	Result	Units	MCL	Qualifier
Inorganic Analysis								
Alkalinity, Total	SM 2320 B	1	3	08-Mar-07	**297**	mg/L	**0**	
Chloride, Total as Cl	EPA 300.0	0.030	0.095	08-Mar-07	**0.643**	mg/L	**0**	
Cyanide, Total	SM 4500 CN C/E	0.003	0.010	30-Mar-07	<0.003	mg/L	0.2	H3
Hardness, Total	SM 2340 C	5	15	13-Mar-07	**283**	mg/L	**0**	
Nitrate as N	EPA 300.0	0.002	0.005	07-Mar-07	**0.006**	mg/L	**10**	
Nitrite as N	EPA 300.0	0.002	0.005	07-Mar-07	<0.002	mg/L	1	H1
Total Organic Carbon	SM 5310B	0.540	1.70	26-Mar-07	<0.540	mg/L		
Nitrate/Nitrite as N	Calculation	0.002	0.005	07-Mar-07	**0.006**	mg/L	**10**	
Total Dissolved Solids	SM 2540 C	1	3	08-Mar-07	**296**	mg/L	**0**	
Sulfate as SO4	EPA 300.0	0.300	1.00	07-Mar-07	**8.55**	mg/L	**0**	
Metals Analysis								
Aluminum, Total	EPA 200.7	0.0151	0.0480	14-Mar-07	<0.0151	mg/L		
Antimony, Total	SM 3113 B	0.0007	0.003	09-Mar-07	**0.001**	mg/L	**0.006**	J
Arsenic, Total	SM 3113 B	0.0006	0.002	08-Mar-07	**0.01**	mg/L	**0.01**	A-02
Barium, Total	EPA 200.7	1.84E-4	5.84E-4	14-Mar-07	**0.141**	mg/L	**2**	
Beryllium, Total	EPA 200.7	1.21E-4	3.86E-4	14-Mar-07	<1.21E-4	mg/L	0.004	
Cadmium, Total	EPA 200.7	0.0007	0.002	14-Mar-07	**0.002**	mg/L	**0.005**	
Calcium, Total	SM 3111 B	0.340	1.26	12-Mar-07	**52.6**	mg/L	**0**	
Chromium, Total	EPA 200.7	7.80E-4	0.00248	14-Mar-07	<7.80E-4	mg/L	0.1	
Copper, Total	SM 3111 B	0.00400	0.0160	20-Mar-07	<0.00400	mg/L	1.3	
Iron, Total	SM 3111 B	0.027	0.099	22-Mar-07	**0.225**	mg/L	**0.3**	
Lead, Total	SM 3113 B	0.00026	0.00098	09-Mar-07	<0.00026	mg/L	0.015	
Magnesium, Total	SM 3111 B	0.100	0.400	13-Mar-07	**38.6**	mg/L	**0**	
Manganese, Total	SM 3111 B	0.004	0.013	08-Mar-07	<0.004	mg/L	0.05	

Submitted by:

Davy Laboratories

Paul A. Harris, Laboratory Director

The laboratory analyses reported were determined in accordance with methods from approved authoritative sources. Approved authoritative sources are defined and listed within the respective state certification codes. The results are representative of the samples only; conditions can be expected to vary at different times and under different sampling conditions.

WI Certification Nos. 632021390 and 105000216, MN Certification No. 055-151, IA Certification No. 304

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SDWA LABORATORY ANALYSIS REPORT

Waukesha Water Utility
115 Delafield St
Waukesha, WI 53188

Attn: Jeff Detro

Date: April 05, 2007
Client No: 10060

Sample No: 0703237-01
Sample Site: Lather TB8

Date Collected: March 02, 2007

Date Received: March 07, 2007

Parameter	Method	MDL	LOQ	Analyzed	Result	Units	MCL	Qualifier
Metals Analysis								
Mercury, Total	EPA 245.1	0.0001	0.0004	16-Mar-07	<0.0001	mg/L	0.002	
Nickel, Total	EPA 200.7	0.00306	0.00973	14-Mar-07	<0.00306	mg/L	0.1	
Selenium, Total	SM 3113 B	0.0003	0.00112	08-Mar-07	**0.00030**	mg/L	**0.05**	J
Silver, Total	SM 3113 B	0.000026	0.000097	12-Mar-07	<0.000026	mg/L	0.05	
Sodium, Total	SM 3111 B	0.160	0.620	12-Mar-07	**6.90**	mg/L	**0**	
Thallium, Total	EPA 200.9	0.0004	0.001	08-Mar-07	<0.0004	mg/L	0.002	

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SDWA LABORATORY ANALYSIS REPORT

Waukesha Water Utility
115 Delafield St
Waukesha, WI 53188

Attn: Jeff Detro

Date: April 05, 2007
Client No: 10060

Sample No: 0703237-01RE1
Sample Site: Lather TB8

Date Collected: March 02, 2007

Date Received: March 07, 2007

Parameter	Method	MDL	LOQ	Analyzed	Result	Units	MCL	Qualifier
Inorganic Analysis								
Fluoride	SM 4500 F B/C	0.10	0.31	14-Mar-07	**0.63**	mg/L	**4**	
pH, Lab	SM 4500 H B			07-Mar-07	**7.46**	pH Units	**0**	H1

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SDWA LABORATORY ANALYSIS REPORT

Waukesha Water Utility
115 Delafield St
Waukesha, WI 53188

Attn: Jeff Detro

Date: April 05, 2007
Client No: 10060

Sample No: 0703328-01
Sample Site: Lather TB9

Date Collected: March 06, 2007

Date Received: March 09, 2007

Parameter	Method	MDL	LOQ	Analyzed	Result	Units	MCL	Qualifier
Inorganic Analysis								
Chloride, Total as Cl	EPA 300.0	0.030	0.095	14-Mar-07	**0.723**	mg/L	**0**	
Cyanide, Total	SM 4500 CN C/E	0.003	0.010	30-Mar-07	**0.005**	mg/L	**0.2**	H3, J
Fluoride	SM 4500 F B/C	0.10	0.30	14-Mar-07	**0.65**	mg/L	**4**	
Hardness, Total	SM 2340 C	5	15	13-Mar-07	**269**	mg/L	**0**	
Nitrate as N	EPA 300.0	0.002	0.005	09-Mar-07	**0.005**	mg/L	**10**	
Nitrite as N	EPA 300.0	0.002	0.005	09-Mar-07	<0.002	mg/L	1	H1
Total Organic Carbon	SM 5310B	0.540	1.70	16-Mar-07	**0.600**	mg/L	**0**	J
pH, Lab	SM 4500 H B			14-Mar-07	**7.35**	pH Units	**0**	H1
Nitrate/Nitrite as N	Calculation	0.002	0.005	09-Mar-07	**0.005**	mg/L	**10**	J
Total Dissolved Solids	SM 2540 C	1	3	13-Mar-07	**270**	mg/L	**0**	
Sulfate as SO4	EPA 300.0	0.150	0.500	14-Mar-07	**8.48**	mg/L	**0**	
Metals Analysis								
Aluminum, Total	EPA 200.7	0.0151	0.0480	14-Mar-07	**0.0367**	mg/L	**0**	J
Antimony, Total	SM 3113 B	0.0007	0.003	26-Mar-07	**0.001**	mg/L	**0.006**	J
Arsenic, Total	SM 3113 B	0.0006	0.002	27-Mar-07	**0.01**	mg/L	**0.01**	A-02
Barium, Total	EPA 200.7	1.84E-4	5.84E-4	14-Mar-07	**0.130**	mg/L	**2**	
Beryllium, Total	EPA 200.7	1.21E-4	3.86E-4	14-Mar-07	<1.21E-4	mg/L	0.004	
Cadmium, Total	EPA 200.7	0.0007	0.002	14-Mar-07	**0.002**	mg/L	**0.005**	
Calcium, Total	SM 3111 B	0.340	1.26	12-Mar-07	**49.8**	mg/L	**0**	
Chromium, Total	EPA 200.7	7.80E-4	0.00248	14-Mar-07	<7.80E-4	mg/L	0.1	
Copper, Total	SM 3111 B	0.00400	0.0160	20-Mar-07	<0.00400	mg/L	1.3	
Iron, Total	SM 3111 B	0.027	0.099	22-Mar-07	**0.206**	mg/L	**0.3**	
Lead, Total	SM 3113 B	0.00026	0.00098	21-Mar-07	<0.00026	mg/L	0.015	

Submitted by:

Davy Laboratories

Paul A. Harris, Laboratory Director

The laboratory analyses reported were determined in accordance with methods from approved authoritative sources. Approved authoritative sources are defined and listed within the respective state certification codes. The results are representative of the samples only; conditions can be expected to vary at different times and under different sampling conditions.

WI Certification Nos. 632021390 and 105000216, MN Certification No. 055-151, IA Certification No. 304

DAVY LABORATORIES
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SDWA LABORATORY ANALYSIS REPORT

Waukesha Water Utility
115 Delafield St
Waukesha, WI 53188

Attn: Jeff Detro

Date: April 05, 2007
Client No: 10060

Sample No: 0703328-01
Sample Site: Lather TB9

Date Collected: March 06, 2007

Date Received: March 09, 2007

Parameter	Method	MDL	LOQ	Analyzed	Result	Units	MCL	Qualifier
Metals Analysis								
Magnesium, Total	SM 3111 B	0.100	0.400	13-Mar-07	**37.8**	mg/L	**0**	
Manganese, Total	SM 3111 B	0.004	0.013	22-Mar-07	**0.006**	mg/L	**0.05**	J
Mercury, Total	EPA 245.1	0.0001	0.0004	16-Mar-07	<0.0001	mg/L	0.002	
Nickel, Total	EPA 200.7	0.00306	0.00973	14-Mar-07	<0.00306	mg/L	0.1	
Selenium, Total	SM 3113 B	0.0003	0.00112	26-Mar-07	<0.0003	mg/L	0.05	
Silver, Total	SM 3113 B	0.000026	0.000097	12-Mar-07	<0.000026	mg/L	0.05	
Sodium, Total	SM 3111 B	0.160	0.620	12-Mar-07	**7.30**	mg/L	**0**	
Thallium, Total	EPA 200.9	0.0004	0.001	23-Mar-07	<0.0004	mg/L	0.002	

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SDWA LABORATORY ANALYSIS REPORT

Waukesha Water Utility
115 Delafield St
Waukesha, WI 53188

Attn: Jeff Detro

Date: April 05, 2007
Client No: 10060

Sample No: 0703328-01RE1
Sample Site: Lather TB9

Date Collected: March 06, 2007

Date Received: March 09, 2007

Parameter	Method	MDL	LOQ	Analyzed	Result	Units	MCL	Qualifier
Inorganic Analysis								
Alkalinity, Total	SM 2320 B	1	3	14-Mar-07	**279**	mg/L	**0**	

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SDWA LABORATORY ANALYSIS REPORT

Waukesha Water Utility
115 Delafield St
Waukesha, WI 53188

Attn: Jeff Detro

Date: April 05, 2007
Client No: 10060

Notes and Definitions

J	Detected but below the laboratory LOQ; therefore, result is an estimated concentration.
H3	H3-Analysis performed beyond holding time.
H1	H1-Sample received past analysis holding time.
A-02	Exceeds Maximum Contaminant Level (MCL)
MDL	Minimum Detection Level
LOQ	Limit of Quantitation

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SDWA LABORATORY ANALYSIS REPORT

Waukesha Water Utility
115 Delafield St
Waukesha, WI 53188

Attn: Jeff Detro

Date: April 05, 2007
Client No: 10060

Sample No: 0703237-02
Sample Site: Lather TB10

Date Collected: March 05, 2007

Date Received: March 07, 2007

Parameter	Method	MDL	LOQ	Analyzed	Result	Units	MCL	Qualifier
Inorganic Analysis								
Alkalinity, Total	SM 2320 B	1	3	08-Mar-07	**307**	mg/L	**0**	
Chloride, Total as Cl	EPA 300.0	0.030	0.095	08-Mar-07	**2.11**	mg/L	**0**	
Cyanide, Total	SM 4500 CN C/E	0.003	0.010	30-Mar-07	<0.003	mg/L	0.2	H3
Fluoride	SM 4500 F B/C	0.10	0.30	14-Mar-07	**0.43**	mg/L	**4**	
Hardness, Total	SM 2340 C	5	15	13-Mar-07	**309**	mg/L	**0**	
Nitrate as N	EPA 300.0	0.002	0.005	07-Mar-07	**0.030**	mg/L	**10**	
Nitrite as N	EPA 300.0	0.002	0.005	07-Mar-07	<0.002	mg/L	1	H1
Total Organic Carbon	SM 5310B	0.540	1.70	26-Mar-07	**0.670**	mg/L	**0**	J
pH, Lab	SM 4500 H B			07-Mar-07	**7.49**	pH Units	**0**	H1
Nitrate/Nitrite as N	Calculation	0.002	0.005	07-Mar-07	**0.030**	mg/L	**10**	
Total Dissolved Solids	SM 2540 C	1	3	08-Mar-07	**313**	mg/L	**0**	
Sulfate as SO4	EPA 300.0	0.300	1.00	07-Mar-07	**16.2**	mg/L	**0**	

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SDWA LABORATORY ANALYSIS REPORT

Waukesha Water Utility
115 Delafield St
Waukesha, WI 53188

Attn: Jeff Detro

Date: April 05, 2007
Client No: 10060

Sample No: 0703237-02
Sample Site: Lather TB10

Date Collected: March 05, 2007

Date Received: March 07, 2007

Parameter	Method	MDL	LOQ	Analyzed	Result	Units	MCL	Qualifier
Metals Analysis								
Aluminum, Total	EPA 200.7	0.0151	0.0480	14-Mar-07	<0.0151	mg/L		
Antimony, Total	SM 3113 B	0.0007	0.003	09-Mar-07	**0.002**	mg/L	**0.006**	J
Arsenic, Total	SM 3113 B	0.0006	0.002	08-Mar-07	**0.007**	mg/L	**0.01**	
Barium, Total	EPA 200.7	1.84E-4	5.84E-4	14-Mar-07	**0.146**	mg/L	**2**	
Beryllium, Total	EPA 200.7	1.21E-4	3.86E-4	14-Mar-07	<1.21E-4	mg/L	0.004	
Cadmium, Total	EPA 200.7	0.0007	0.002	14-Mar-07	**0.002**	mg/L	**0.005**	
Calcium, Total	SM 3111 B	0.340	1.26	12-Mar-07	**63.7**	mg/L	**0**	
Chromium, Total	EPA 200.7	7.80E-4	0.00248	14-Mar-07	**0.00120**	mg/L	**0.1**	J
Copper, Total	SM 3111 B	0.00400	0.0160	20-Mar-07	<0.00400	mg/L	1.3	
Iron, Total	SM 3111 B	0.027	0.099	22-Mar-07	**0.762**	mg/L	**0.3**	A-02
Lead, Total	SM 3113 B	0.00026	0.00098	09-Mar-07	**0.00035**	mg/L	**0.015**	J
Magnesium, Total	SM 3111 B	0.100	0.400	13-Mar-07	**34.1**	mg/L	**0**	
Manganese, Total	SM 3111 B	0.004	0.013	08-Mar-07	**0.039**	mg/L	**0.05**	
Mercury, Total	EPA 245.1	0.0001	0.0004	16-Mar-07	<0.0001	mg/L	0.002	
Nickel, Total	EPA 200.7	0.00306	0.00973	14-Mar-07	<0.00306	mg/L	0.1	
Selenium, Total	SM 3113 B	0.0003	0.00112	08-Mar-07	**0.00133**	mg/L	**0.05**	
Silver, Total	SM 3113 B	0.000026	0.000097	12-Mar-07	<0.000026	mg/L	0.05	
Sodium, Total	SM 3111 B	0.160	0.620	12-Mar-07	**7.02**	mg/L	**0**	
Thallium, Total	EPA 200.9	0.0004	0.001	08-Mar-07	<0.0004	mg/L	0.002	

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SDWA LABORATORY ANALYSIS REPORT

Waukesha Water Utility
115 Delafield St
Waukesha, WI 53188

Attn: Jeff Detro

Date: April 05, 2007
Client No: 10060

Notes and Definitions

J	Detected but below the laboratory LOQ; therefore, result is an estimated concentration.
H3	H3-Analysis performed beyond holding time.
H1	H1-Sample received past analysis holding time.
A-02	Exceeds Maximum Contaminant Level (MCL)
MDL	Minimum Detection Level
LOQ	Limit of Quantitation

Attachment B

Existing Shallow Well Water Quality Data

WAUKESHA WATER UTILITY EXISTING SHALLOW WELLS 11, 12, AND 13

WATER QUALITY - ARSENIC AND NITRATE

Well #11 - IOC's

Parameter	Unit	Method	LOD	LOQ	MCL	*5/14/2004*	*4/12/2005*	*10/31/2006*	*4/12/2007*	*3/26/2008*	*3/17/2009*	*3/10/2010*	*3/15/2011*	*1/19/2012*	Average
Arsenic, tot. as As by ICP-Trace	ug/L	SM3113B	0.66	2.3	10	2	2.7				1.1	1	0.66	1.6	**1.5**
Nitrate, as N	mg/L	353.2	0.025	0.075	10		0.13		0.117	0.025	0.34	0.317	0.321	0.13	**0.197**

Well #12 - IOC's

Parameter	Unit	Method	LOD	LOQ	MCL	*6/8/2004*	*8/27/2004*	*5/26/2005*	*10/31/2006*	*4/12/2007*	*3/26/2008*	*3/17/2009*	*3/10/2010*	*3/15/2011*	*1/19/2012*	Average
Arsenic, tot. as As by ICP-Trace	ug/L	SM3113B	0.66	2.3	10	4.7	2.3	3.8				2.7	3	3	3.4	**3.3**
Nitrate, as N	mg/L	353.2	0.025	0.075	10			0.025		0.025	0.25	0.025	0.025	0.025	0.025	**0.057**

Well#13 Engler - IOC's

Parameter	Unit	Method	LOD	LOQ	MCL	*5/12/2009*	*9/28/2009*	*3/8/2010*	*2/8/2011*	*3/20/2012*	Average
Arsenic, tot. as As by ICP-Trace	ug/L	EPA200.7	0.5	1	10	4.3		4	3		**3.8**
Nitrate, as N	mg/L	EPA353.2	0.014	0.051	10	0.014	0.062	0.014	0.25	0.014	**0.071**

Note: Highlighted cells were reported as ND. For averaging purposes, values were conservatively assumed to equal the LOD.

Attachment C
Consumer Confidence Reports

2011 Consumer Confidence Report for 26846424 DELAFIELD WATERWORKS

There is some information required in the CCR which DNR does not have in its database. Click the "Customize" button to add the required information. After completing the information and clicking the "Complete" button on that page, a new button called "Printable CCR & Cert" will appear here.

Water System Information

If you would like to know more about the information contained in this report, please contact Mike Obrien at (262) 303-4628.

Health Information

Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the Environmental Protection Agency's safe drinking water hotline (800-426-4791).

Some people may be more vulnerable to contaminants in drinking water than the general population. Immuno-compromised persons such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune systems disorders, some elderly, and infants can be particularly at risk from infections. These people should seek advice about drinking water from their health care providers. EPA/CDC guidelines on appropriate means to lessen the risk of infection by cryptosporidium and other microbial contaminants are available from the Environmental Protection Agency's safe drinking water hotline (800-426-4791).

Source(s) of Water

Source id	Source	Depth (in feet)	Status
1	Groundwater	1215	Active
2	Groundwater	220	Active

To obtain a summary of the source water assessment please contact Mike Obrien at (262) 303-4628

Educational Information

The sources of drinking water, both tap water and bottled water, include rivers, lakes, streams, ponds, reservoirs, springs and wells. As water travels over the surface of the land or through the ground, it dissolves naturally occurring minerals and, in some cases, radioactive material, and can pick up substances resulting from the presence of animals or from human activity.

Contaminants that may be present in source water include:

- Microbial contaminants, such as viruses and bacteria, which may come from sewage treatment plants, septic systems, agricultural livestock operations and wildlife.

- Inorganic contaminants, such as salts and metals, which can be naturally- occurring or result from urban stormwater runoff, industrial or domestic wastewater discharges, oil and gas production, mining or farming.
- Pesticides and herbicides, which may come from a variety of sources such as agriculture, urban stormwater runoff and residential uses.
- Organic chemical contaminants, including synthetic and volatile organic chemicals, which are by-products of industrial processes and petroleum production, and can also come from gas stations, urban stormwater runoff and septic systems.
- Radioactive contaminants, which can be naturally occurring or be the result of oil and gas production and mining activities.

In order to ensure that tap water is safe to drink, EPA prescribes regulations that limit the amount of certain contaminants in water provided by public water systems. FDA regulations establish limits for contaminants in bottled water, which shall provide the same protection for public health.

Number of Contaminants Required to be Tested

This table displays the number of contaminants that were required to be tested in the last five years. The CCR may contain up to five years worth of water quality results. If a water system tests annually, or more frequently, the results from the most recent year are shown on the CCR. If testing is done less frequently, the results shown on the CCR are from the past five years.

Contaminant Group	# of Contaminants
Disinfection Byproducts	2
Inorganic Contaminants	16
Microbiological Contaminants	1
Radioactive Contaminants	4
Synthetic Organic Contaminants including Pesticides and Herbicides	23
Unregulated Contaminants	4
Volatile Organic Contaminants	20

Disinfection Byproducts

Contaminant (units)	MCL	MCLG	Level Found	Range	Sample Date (if prior to 2011)	Violation	Typical Source of Contaminant
TTHM (ppb)	80	0	.1	.1 - .1	08/11/2010	NO	By - product of drinking water chlorination

Inorganic Contaminants

Contaminant (units)	MCL	MCLG	Level Found	Range	Sample Date (if prior to 2011)	Violation	Typical Source of Contaminant
ARSENIC (ppb)	10	n/a	5	3 - 5		NO	Erosion of natural deposits; Runoff from orchards; Runoff from glass and electronics production wastes
BARIUM (ppm)	2	2	.110	.069 - .110		NO	Discharge of drilling wastes; Discharge from metal refineries; Erosion of natural deposits
				0 of			Corrosion of household plumbing

COPPER (ppm)	AL=1.3	1.3	.155	5 results were above the action level.		NO	systems; Erosion of natural deposits; Leaching from wood preservatives
FLUORIDE (ppm)	4	4	.2	.1 - .2		NO	Erosion of natural deposits; Water additive which promotes strong teeth; Discharge from fertilizer and aluminum factories
LEAD (ppb)	AL=15	0	1.75	0 of 5 results were above the action level.		NO	Corrosion of household plumbing systems; Erosion of natural deposits
NICKEL (ppb)	100		2.7000	2.1000 - 2.7000		NO	Nickel occurs naturally in soils, ground water and surface waters and is often used in

							electroplating, stainless steel and alloy products.
NITRATE (N03 - N) (ppm)	10	10	.03	.02 - .03		NO	Runoff from fertilizer use; Leaching from septic tanks, sewage; Erosion of natural deposits
NITRITE (N02 - N) (ppm)	1	1	.020	nd - .020		NO	Runoff from fertilizer use; Leaching from septic tanks, sewage; Erosion of natural deposits
SELENIUM (ppb)	50	50	2	nd - 2		NO	Discharge from petroleum and metal refineries; Erosion of natural deposits; Discharge from mines
SODIUM (ppm)	n/a	n/a	21.00	11.00 - 21.00		NO	n/a

Radioactive Contaminants

Contaminant (units)	MCL	MCLG	Level Found	Range	Sample Date (if prior to 2011)	Violation	Typical Source of Contaminant
COMBINED URANIUM (ug/l)	30	0	0.2	0.2		NO	Erosion of natural deposits
GROSS ALPHA, EXCL. R & U (pCi/l)	15	0	5.0	5.0		NO	Erosion of natural deposits
GROSS ALPHA, INCL. R & U (n/a)	n/a	n/a	5.1	5.1		NO	Erosion of natural deposits
RADIUM, (226 + 228) (pCi/l)	5	0	3.3	3.3		NO	Erosion of natural deposits

Unregulated Contaminants

Contaminant (units)	MCL	MCLG	Level Found	Range	Sample Date (if prior to 2011)	Violation	Typical Source of Contaminant
CHLOROFORM (ppb)	n/a	n/a	.14	.13 - .14	08/11/2010	NO	n/a

Definition of Terms

Term	Definition
	Action Level:

AL	The concentration of a contaminant which, if exceeded, triggers treatment or other requirements which a water system must follow.
MCL	Maximum Contaminant Level: The highest level of a contaminant that is allowed in drinking water. MCLs are set as close to the MCLGs as feasible using the best available treatment technology.

MCLG	Maximum Contaminant Level Goal: The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety.
MFL	million fibers per liter
mrem/year	millirems per year (a measure of radiation absorbed by the body)
NTU	Nephelometric Turbidity Units
	picocuries

pCi/l	per liter (a measure of radioactivity)
ppm	parts per million, or milligrams per liter (mg/l)
ppb	parts per billion, or micrograms per liter (ug/l)
ppt	parts per trillion, or nanograms per liter
ppq	parts per quadrillion, or picograms per liter
TCR	Total Coliform Rule
TT	Treatment Technique: A required process intended to reduce the

	level of a contaminant in drinking water.

2011 Consumer Confidence Report for 26801973 DOUSMAN WATER UTILITY

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Water System Information

If you would like to know more about the information contained in this report, please contact Joe Kitelinger at (262) 965-3302.

Health Information

Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the Environmental Protection Agency's safe drinking water hotline (800-426-4791).

Some people may be more vulnerable to contaminants in drinking water than the general population. Immuno-compromised persons such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune systems disorders, some elderly, and infants can be particularly at risk from infections. These people should seek advice about drinking water from their health care providers. EPA/CDC guidelines on appropriate means to lessen the risk of infection by cryptosporidium and other microbial contaminants are available from the Environmental Protection Agency's safe drinking water hotline (800-426-4791).

Source(s) of Water

Source id	Source	Depth (in feet)	Status
1	Groundwater	1125	Active
2	Groundwater	1094	Active

To obtain a summary of the source water assessment please contact Joe Kitelinger at (262) 965-3302

Educational Information

The sources of drinking water, both tap water and bottled water, include rivers, lakes, streams, ponds, reservoirs, springs and wells. As water travels over the surface of the land or through the ground, it dissolves naturally occurring minerals and, in some cases, radioactive material, and can pick up substances resulting from the presence of animals or from human activity.

Contaminants that may be present in source water include:

- Microbial contaminants, such as viruses and bacteria, which may come from sewage treatment plants, septic systems, agricultural livestock operations and wildlife.
- Inorganic contaminants, such as salts and metals, which can be naturally- occurring or result from urban stormwater runoff, industrial or domestic wastewater discharges, oil and gas production, mining or farming.
- Pesticides and herbicides, which may come from a variety of sources such as agriculture, urban stormwater runoff and residential uses.
- Organic chemical contaminants, including synthetic and volatile organic chemicals, which are by-products of industrial processes and petroleum production, and can also come from gas stations, urban stormwater runoff and septic systems.
- Radioactive contaminants, which can be naturally occurring or be the result of oil and gas production and mining activities.

In order to ensure that tap water is safe to drink, EPA prescribes regulations that limit the amount of certain contaminants in water provided by public water systems. FDA regulations establish limits for contaminants in bottled water, which shall provide the same protection for public health.

Number of Contaminants Required to be Tested

This table displays the number of contaminants that were required to be tested in the last five years. The CCR may contain up to five years worth of water quality results. If a water system tests annually, or more frequently, the results from the most recent year are shown on the CCR. If testing is done less frequently, the results shown on the CCR are from the past five years.

Contaminant Group	**# of Contaminants**
Disinfection Byproducts	2
Inorganic Contaminants	16
Microbiological Contaminants	1
Radioactive Contaminants	4
Synthetic Organic Contaminants including Pesticides and Herbicides	23
Unregulated Contaminants	4
Volatile Organic Contaminants	20

Disinfection Byproducts

Contaminant (units)	MCL	MCLG	Level Found	Range	Sample Date (if prior to 2011)	Violation	Typical Source of Contaminant
HAA5 (ppb)	60	60	8	3- 8	09/22/2010	NO	
TTHM (ppb)	80	0	8.2	7.3- 8.2	09/22/2010	NO	By-product of drinking water chlorination

Inorganic Contaminants

Contaminant (units)	MCL	MCLG	Level Found	Range	Sample Date (if prior to 2011)	Violation	Typical Source of Contaminant
ARSENIC (ppb)	10	n/a	6	4- 6		NO	Erosion of natural deposits; Runoff from orchards; Runoff from glass and electronics production wastes
BARIUM (ppm)	2	2	.120	.078- .120		NO	Discharge of drilling wastes; Discharge from metal refineries; Erosion of natural deposits
CADMIUM (ppb)	5	5	.1	nd- .1		NO	Corrosion of galvanized pipes; Erosion of natural deposits; Discharge from metal refineries; runoff from waste batteries and paints
COPPER (ppm)	AL=1.3	1.3	.15	0 of 10 results were above the action level.		NO	Corrosion of household plumbing systems; Erosion of natural deposits; Leaching from wood preservatives
FLUORIDE (ppm)	4	4	.3	.2- .3		NO	Erosion of natural deposits; Water additive which promotes strong teeth; Discharge from

							fertilizer and aluminum factories
LEAD (ppb)	AL=15	0	.44	0 of 10 results were above the action level.		NO	Corrosion of household plumbing systems; Erosion of natural deposits
NICKEL (ppb)	100		3.3000	1.3000- 3.3000		NO	Nickel occurs naturally in soils, ground water and surface waters and is often used in electroplating, stainless steel and alloy products.
NITRITE (N02-N) (ppm)	1	1	.280	nd- .560		NO	Runoff from fertilizer use; Leaching from septic tanks, sewage; Erosion of natural deposits
SELENIUM (ppb)	50	50	1	nd- 1		NO	Discharge from petroleum and metal refineries; Erosion of natural deposits; Discharge from mines
SODIUM (ppm)	n/a	n/a	17.00	3.20- 17.00		NO	n/a

Radioactive Contaminants

Contaminant (units)	**MCL**	**MCLG**	**Level Found**	**Range**	**Sample Date (if prior to 2011)**	**Violation**	**Typical Source of Contaminant**
COMBINED URANIUM (ug/l)	30	0	0.6	0.2- 0.6	04/14/2009	NO	Erosion of natural deposits
GROSS ALPHA, EXCL. R & U (pCi/l)	15	0	10.9	8.9- 12.6		NO	Erosion of natural deposits

GROSS ALPHA, INCL. R & U (n/a)	n/a	n/a	10.1	5.7- 12.6		NO	Erosion of natural deposits
GROSS BETA PARTICLE ACTIVITY (pCi/l)	n/a	n/a	3.7	2.4- 4.2		NO	Decay of natural and man-made deposits. MCL units are in millirem/year. Calculation for compliance with MCL is not possible unless level found is greater than 50 pCi/l.
RADIUM, (226 + 228) (pCi/l)	5	0	2.7	1.1- 3.9		NO	Erosion of natural deposits

Unregulated Contaminants

Contaminant (units)	**MCL**	**MCLG**	**Level Found**	**Range**	**Sample Date (if prior to 2011)**	**Violation**	**Typical Source of Contaminant**
BROMODICHLOROMETHANE (ppb)	n/a	n/a	2.70	2.10- 2.70	09/22/2010	NO	n/a
BROMOFORM (ppb)	n/a	n/a	.26	.14- .26	09/22/2010	NO	n/a
CHLOROFORM (ppb)	n/a	n/a	4.00	3.40- 4.00	09/22/2010	NO	n/a
DIBROMOCHLOROMETHANE (ppb)	n/a	n/a	1.80	1.10- 1.80	09/22/2010	NO	n/a

Volatile Organic Contaminants

Contaminant (units)	**MCL**	**MCLG**	**Level Found**	**Range**	**Sample Date (if prior to 2011)**	**Violation**	**Typical Source of Contaminant**
TOLUENE (ppm)	1	1	.0001	nd- .0001		NO	Discharge from petroleum factories

Additional Health Information

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Monitoring and Reporting Violations

Contaminant Group	**Sample Location**	**Compliance Period Beginning**	**Compliance Period Ending** Monitoring and reporting violations occur when a water system fails to collect and/or report results for State required drinking water sampling. "Sample location" refers to the distribution system, or an entry point or well number from which a sample is required to be taken.
Inorganic Contaminants	1	01/01/2011	09/30/2011
Radioactive Contaminants	2	04/01/2011	06/30/2011

Inorganic Contaminants that were missed include: Nitrite (N02-N)
Radioactive Contaminants that were missed include: Gross Alpha, Excl. R & U

Definition of Terms

Term	Definition
AL	Action Level: The concentration of a contaminant which, if exceeded, triggers treatment or other requirements which a water system must follow.
MCL	Maximum Contaminant Level: The highest level of a contaminant that is allowed in drinking water. MCLs are set as close to the MCLGs as feasible using the best available treatment technology.
MCLG	Maximum Contaminant Level Goal: The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety.
MFL	million fibers per liter
mrem/year	millirems per year (a measure of radiation absorbed by the body)
NTU	Nephelometric Turbidity Units
pCi/l	picocuries per liter (a measure of radioactivity)
ppm	parts per million, or milligrams per liter (mg/l)
ppb	parts per billion, or micrograms per liter (ug/l)
ppt	parts per trillion, or nanograms per liter
ppq	parts per quadrillion, or picograms per liter
TCR	Total Coliform Rule
TT	Treatment Technique: A required process intended to reduce the level of a contaminant in drinking water.

2011 Consumer Confidence Report for 26802270 OCONOMOWOC WATERWORKS

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Water System Information

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Health Information

Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the Environmental Protection Agency's safe drinking water hotline (800-426-4791).

Some people may be more vulnerable to contaminants in drinking water than the general population. Immuno-compromised persons such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune systems disorders, some elderly, and infants can be particularly at risk from infections. These people should seek advice about drinking water from their health care providers. EPA/CDC guidelines on appropriate means to lessen the risk of infection by cryptosporidium and other microbial contaminants are available from the Environmental Protection Agency's safe drinking water hotline (800-426-4791).

Source(s) of Water

Source id	Source	Depth (in feet)	Status
1	Groundwater	827	Active
2	Groundwater	781	Active
3	Groundwater	731	Active
4	Groundwater	52	Active
6	Groundwater	675	Active
7	Groundwater	1052	Active

To obtain a summary of the source water assessment please contact Steve Roush at (262) 569-3198

Educational Information

The sources of drinking water, both tap water and bottled water, include rivers, lakes, streams, ponds, reservoirs, springs and wells. As water travels over the surface of the land or through the ground, it dissolves naturally occurring minerals and, in some cases, radioactive material, and can pick up substances resulting from the presence of animals or from human activity.

Contaminants that may be present in source water include:

- Microbial contaminants, such as viruses and bacteria, which may come from sewage treatment plants, septic systems, agricultural livestock operations and wildlife.
- Inorganic contaminants, such as salts and metals, which can be naturally- occurring or result from urban stormwater runoff, industrial or domestic wastewater discharges, oil and gas production, mining or farming.
- Pesticides and herbicides, which may come from a variety of sources such as agriculture, urban stormwater runoff and residential uses.
- Organic chemical contaminants, including synthetic and volatile organic chemicals, which are by-products of industrial processes and petroleum production, and can also come from gas stations, urban stormwater runoff and septic systems.
- Radioactive contaminants, which can be naturally occurring or be the result of oil and gas production and mining activities.

In order to ensure that tap water is safe to drink, EPA prescribes regulations that limit the amount of certain contaminants in water provided by public water systems. FDA regulations establish limits for contaminants in bottled water, which shall provide the same protection for public health.

Number of Contaminants Required to be Tested

This table displays the number of contaminants that were required to be tested in the last five years. The CCR may contain up to five years worth of water quality results. If a water system tests annually, or more frequently, the results from the most recent year are shown on the CCR. If testing is done less frequently, the results shown on the CCR are from the past five years.

Contaminant Group	# of Contaminants
Disinfection Byproducts	2
Inorganic Contaminants	16
Microbiological Contaminants	3
Radioactive Contaminants	3
Synthetic Organic Contaminants including Pesticides and Herbicides	23
Unregulated Contaminants	34
Volatile Organic	20

Contaminants	

Disinfection Byproducts

Contaminant (units)	MCL	MCLG	Level Found	Range	Sample Date (if prior to 2011)	Violation	Typical Source of Contaminant
HAA5 (ppb)	60	60	4	3 - 4		NO	
TTHM (ppb)	80	0	16.9	4.1 - 16.9		NO	By - product of drinking water chlorination

Inorganic Contaminants

Contaminant (units)	MCL	MCLG	Level Found	Range	Sample Date (if prior to 2011)	Violation	Typical Source of Contaminant
ARSENIC (ppb)	10	n/a	7	nd - 7		NO	Erosion of natural deposits; Runoff from orchards; Runoff from glass and electronics production wastes
BARIUM (ppm)	2	2	.180	.067 - .180		NO	Discharge of drilling wastes; Discharge from metal refineries;

							Erosion of natural deposits
COPPER (ppm)	AL=1.3	1.3	.56	0 of 30 results were above the action level.		NO	Corrosion of household plumbing systems; Erosion of natural deposits; Leaching from wood preservatives
FLUORIDE (ppm)	4	4	1.0	.1 - 1.0		NO	Erosion of natural deposits; Water additive which promotes strong teeth; Discharge from fertilizer and aluminum factories
LEAD (ppb)	AL=15	0	8.60	1 of 30 results were above the action level.		*	Corrosion of household plumbing systems; Erosion of natural deposits
							Nickel occurs naturally in soils, ground water

NICKEL (ppb)	100		3.6000	1.7000 - 3.6000		NO	and surface waters and is often used in electroplating, stainless steel and alloy products.
NITRATE (N03 - N) (ppm)	10	10	4.58	nd - 4.80		NO	Runoff from fertilizer use; Leaching from septic tanks, sewage; Erosion of natural deposits
SELENIUM (ppb)	50	50	4	nd - 4		NO	Discharge from petroleum and metal refineries; Erosion of natural deposits; Discharge from mines
SODIUM (ppm)	n/a	n/a	66.00	8.50 - 66.00		NO	n/a

* Systems exceeding a lead and/or copper action level must take actions to reduce lead and/or copper in the drinking water. The lead and copper values represent the 90th percentile of all compliance samples collected. If you want information on the NUMBER of sites or the actions taken to reduce these levels, please contact your water supply operator.

Radioactive Contaminants

Contaminant (units)	MCL	MCLG	Level Found	Range	Sample Date (if prior to 2011)	Violation	Typical Source of Contaminant
GROSS ALPHA, EXCL. R & U (pCi/l)	15	0	1.3	1.3	01/19/2009	NO	Erosion of natural deposits
GROSS ALPHA, INCL. R & U (n/a)	n/a	n/a	1.3	1.3	01/19/2009	NO	Erosion of natural deposits

Unregulated Contaminants

Contaminant (units)	MCL	MCLG	Level Found	Range	Sample Date (if prior to 2011)	Violation	Typical Source of Contaminant
BROMODICHLOROMETHANE (ppb)	n/a	n/a	5.20	1.10 - 5.20		NO	n/a
BROMOFORM (ppb)	n/a	n/a	.76	nd - .76		NO	n/a
CHLOROFORM (ppb)	n/a	n/a	6.80	2.20 - 6.80		NO	n/a
DIBROMOCHLOROMETHANE (ppb)	n/a	n/a	4.10	.51 - 4.10		NO	n/a
SULFATE (ppm)	n/a	n/a	26.00	13.00 - 26.00		NO	n/a

Unregulated contaminants

Contaminant (units)	MCL	MCLG	Level Found	Range	Sample Date (if prior to	Violation	Typical Source of Contaminant

					2011)		
METHYL - TERT - BUTYL - ETHER (ppb)	n/a	n/a	.27	.27		NO	n/a

Additional Health Information

While your drinking water meets USEPA's standard for **arsenic**, it does contain low levels of arsenic. USEPA's standard balances the current understanding of arsenic's possible health effects against the costs of removing arsenic from drinking water. USEPA continues to research the health effects of low levels of arsenic, which is a mineral known to cause cancer in humans at high concentrations and is linked to other health effects such as skin damage and circulatory problems.

Definition of Terms

Term	Definition
AL	Action Level: The concentration of a contaminant which, if exceeded, triggers treatment or other requirements which a water system must follow.
	Maximum Contaminant Level: The highest level

MCL	of a contaminant that is allowed in drinking water. MCLs are set as close to the MCLGs as feasible using the best available treatment technology.
MCLG	Maximum Contaminant Level Goal: The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow

	for a margin of safety.
MFL	million fibers per liter
mrem/year	millirems per year (a measure of radiation absorbed by the body)
NTU	Nephelometric Turbidity Units
pCi/l	picocuries per liter (a measure of radioactivity)
ppm	parts per million, or milligrams per liter (mg/l)
ppb	parts per billion, or micrograms per liter (ug/l)
	parts per

ppt	trillion, or nanograms per liter
ppq	parts per quadrillion, or picograms per liter
TCR	Total Coliform Rule
TT	Treatment Technique: A required process intended to reduce the level of a contaminant in drinking water.

2008 Consumer Confidence Report for 26802270 OCONOMOWOC WATERWORKS

Water System Information

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Health Information

Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the Environmental Protection Agency's safe drinking water hotline (800-426-4791).

Some people may be more vulnerable to contaminants in drinking water than the general population. Immuno-compromised persons such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune systems disorders, some elderly, and infants can be particularly at risk from infections. These people should seek advice about drinking water from their health care providers. EPA/CDC guidelines on appropriate means to lessen the risk of infection by cryptosporidium and other microbial contaminants are available from the Environmental Protection Agency's safe drinking water hotline (800-426-4791).

Source(s) of Water

Source id	Source	Depth (in feet)	Status
1	Groundwater	827	Active
2	Groundwater	781	Active
3	Groundwater	731	Active
4	Groundwater	52	Active
6	Groundwater	675	Active
7	Groundwater	1052	Active

To obtain a summary of the source water assessment please contact Steve Roush at (262) 569-3198

Educational Information

The sources of drinking water, both tap water and bottled water, include rivers, lakes, streams, ponds, reservoirs, springs and wells. As water travels over the surface of the land or through the ground, it dissolves naturally occurring minerals and, in some cases, radioactive material, and can pick up substances resulting from the presence of animals or from human activity.

Contaminants that may be present in source water include:

- Microbial contaminants, such as viruses and bacteria, which may come from sewage treatment plants, septic systems, agricultural livestock operations and wildlife.
- Inorganic contaminants, such as salts and metals, which can be naturally- occurring or result from urban stormwater runoff, industrial or domestic wastewater discharges, oil and gas production, mining or farming.
- Pesticides and herbicides, which may come from a variety of sources such as agriculture, urban stormwater runoff and residential uses.
- Organic chemical contaminants, including synthetic and volatile organic chemicals, which are by-products of industrial processes and petroleum production, and can also come from gas stations, urban stormwater runoff and septic systems.
- Radioactive contaminants, which can be naturally occurring or be the result of oil and gas production and mining activities.

In order to ensure that tap water is safe to drink, EPA prescribes regulations that limit the amount of certain contaminants in water provided by public water systems. FDA regulations establish limits for contaminants in bottled water, which shall provide the same protection for public health.

Number of Contaminants Required to be Tested

This table displays the number of contaminants that were required to be tested in the last five years. The CCR may contain up to five years worth of water quality results. If a water system tests annually, or more frequently, the results from the most recent year are shown on the CCR. If testing is done less frequently, the results shown on the CCR are from the past five years.

Contaminant Group	**# of Contaminants**
Disinfection Byproducts	2
Inorganic Contaminants	16
Microbiological Contaminants	1
Radioactive Contaminants	3
Synthetic Organic Contaminants including Pesticides and Herbicides	23
Unregulated Contaminants	34
Volatile Organic Contaminants	20

Disinfection Byproducts

Contaminant (units)	MCL	MCLG	Level Found	Range	Sample Date (if prior to 2008)	Violation	Typical Source of Contaminant
HAA5 (ppb)	60	60	2	1- 2		NO	
TTHM (ppb)	80	0	9.6	3.1- 9.6		NO	By-product of drinking water chlorination

Inorganic Contaminants

Contaminant (units)	MCL	MCLG	Level Found	Range	Sample Date (if prior to 2008)	Violation	Typical Source of Contaminant
ARSENIC (ppb)	10	n/a	7	1- 7		NO	Erosion of natural deposits; Runoff from orchards; Runoff from glass and electronics production wastes
BARIUM (ppm)	2	2	.190	.097- .190		NO	Discharge of drilling wastes; Discharge from metal refineries; Erosion of natural deposits
CADMIUM (ppb)	5	5	.1	.1		NO	Corrosion of galvanized pipes; Erosion of natural deposits; Discharge from metal refineries; runoff from waste batteries and paints
CHROMIUM (ppb)	100	100	4	3- 4		NO	Discharge from steel and pulp mills; Erosion of natural deposits
COPPER (ppm)	AL=1.3	1.3	.72	1 of 30 results were above the action level.		*	Corrosion of household plumbing systems; Erosion of natural deposits; Leaching from wood preservatives
FLUORIDE	4	4	1.2	1.2		NO	Erosion of natural

(ppm)							deposits; Water additive which promotes strong teeth; Discharge from fertilizer and aluminum factories
LEAD (ppb)	AL=15	0	9.90	1 of 30 results were above the action level.		*	Corrosion of household plumbing systems; Erosion of natural deposits
NICKEL (ppb)	100		2.6000	1.4000- 2.6000		NO	Nickel occurs naturally in soils, ground water and surface waters and is often used in electroplating, stainless steel and alloy products.
NITRATE (N03-N) (ppm)	10	10	2.03	.03- 2.90		NO	Runoff from fertilizer use; Leaching from septic tanks, sewage; Erosion of natural deposits
SODIUM (ppm)	n/a	n/a	33.00	9.50- 33.00		NO	n/a

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Radioactive Contaminants

Contaminant (units)	**MCL**	**MCLG**	**Level Found**	**Range**	**Sample Date (if prior to 2008)**	**Violation**	**Typical Source of Contaminant**
GROSS ALPHA, INCL. R & U (n/a)	n/a	n/a	3.6	nd- 3.6		NO	Erosion of natural deposits
RADIUM,	5	0	2.5	.8- 2.5		NO	Erosion of natural

(226 + 228) (pCi/l)							deposits

Unregulated Contaminants

Contaminant (units)	MCL	MCLG	Level Found	Range	Sample Date (if prior to 2008)	Violation	Typical Source of Contaminant
BROMODICHLOROMETHANE (ppb)	n/a	n/a	3.10	.84-3.10		NO	n/a
BROMOFORM (ppb)	n/a	n/a	.52	nd-.52		NO	n/a
CHLOROFORM (ppb)	n/a	n/a	4.00	2.10-4.00		NO	n/a
DIBROMOCHLOROMETHANE (ppb)	n/a	n/a	2.00	.20-2.00		NO	n/a
SULFATE (ppm)	n/a	n/a	22.00	11.00-22.00		NO	n/a

Unregulated contaminants

Contaminant (units)	MCL	MCLG	Level Found	Range	Sample Date (if prior to 2008)	Violation	Typical Source of Contaminant
METHYL-TERT-BUTYL-ETHER (ppb)	n/a	n/a	.23	.18- .23		NO	n/a

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MFL	million fibers per liter
mrem/year	millirems per year (a measure of radiation absorbed by the body)
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pCi/l	picocuries per liter (a measure of radioactivity)
ppm	parts per million, or milligrams per liter (mg/l)
ppb	parts per billion, or micrograms per liter (ug/l)
ppt	parts per trillion, or nanograms per liter
ppq	parts per quadrillion, or picograms per liter
TCR	Total Coliform Rule
TT	Treatment Technique: A required process intended to reduce the level of a contaminant in drinking water.

2009 Consumer Confidence Report for 26802270 OCONOMOWOC WATERWORKS

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Inorganic Contaminants	16
Microbiological Contaminants	2
Radioactive Contaminants	3
Synthetic Organic Contaminants including Pesticides and Herbicides	23
Unregulated Contaminants	34

Volatile Organic Contaminants	20

Microbiological Contaminants

Contaminant	MCL	MCLG	Count of Positives	Sample Date (if prior to 2009)	Violation	Typical Source of Contaminant
Coliform (TCR)	presence of coliform bacteria in >=5% of monthly samples	0	1		NO	Naturally present in the environment

Disinfection Byproducts

Contaminant (units)	MCL	MCLG	Level Found	Range	Sample Date (if prior to 2009)	Violation	Typical Source of Contaminant
HAA5 (ppb)	60	60	4	2- 4		NO	
TTHM (ppb)	80	0	17.4	6.5- 17.4		NO	By-product of drinking water chlorination

Inorganic Contaminants

Contaminant (units)	MCL	MCLG	Level Found	Range	Sample Date (if prior to 2009)	Violation	Typical Source of Contaminant
ARSENIC (ppb)	10	n/a	7	2- 7	03/05/2008	NO	Erosion of natural deposits; Runoff from orchards; Runoff from glass and electronics production wastes
BARIUM (ppm)	2	2	.190	.170- .190	03/05/2008	NO	Discharge of drilling wastes; Discharge

							from metal refineries; Erosion of natural deposits
CADMIUM (ppb)	5	5	.1	.1- .1	03/05/2008	NO	Corrosion of galvanized pipes; Erosion of natural deposits; Discharge from metal refineries; runoff from waste batteries and paints
CHROMIUM (ppb)	100	100	4	3- 4	03/05/2008	NO	Discharge from steel and pulp mills; Erosion of natural deposits
COPPER (ppm)	AL=1.3	1.3	.68	0 of 30 results were above the action level.		NO	Corrosion of household plumbing systems; Erosion of natural deposits; Leaching from wood preservatives
FLUORIDE (ppm)	4	4	1.2	1.2- 1.2	04/07/2008	NO	Erosion of natural deposits; Water additive which promotes strong teeth; Discharge from fertilizer and aluminum factories
LEAD (ppb)	AL=15	0	7.00	2 of 30 results were above the action level.		*	Corrosion of household plumbing systems; Erosion of natural deposits
NICKEL (ppb)	100		1.6000	1.4000- 1.6000	03/05/2008	NO	Nickel occurs naturally in soils, ground water and surface waters and is often used in electroplating, stainless steel and alloy products.
NITRATE	10	10	4.90	nd- 4.90		NO	Runoff from fertilizer

(N03-N) (ppm)							use; Leaching from septic tanks, sewage; Erosion of natural deposits
SODIUM (ppm)	n/a	n/a	13.00	9.50- 13.00	03/05/2008	NO	n/a

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Radioactive Contaminants

Contaminant (units)	MCL	MCLG	Level Found	Range	Sample Date (if prior to 2009)	Violation	Typical Source of Contaminant
GROSS ALPHA, EXCL. R & U (pCi/l)	15	0	1.3	nd- 1.3		NO	Erosion of natural deposits
GROSS ALPHA, INCL. R & U (n/a)	n/a	n/a	1.3	nd- 1.3		NO	Erosion of natural deposits
RADIUM, (226 + 228) (pCi/l)	5	0	.7	nd- .7		NO	Erosion of natural deposits

Unregulated Contaminants

Contaminant (units)	MCL	MCLG	Level Found	Range	Sample Date (if prior to 2009)	Violation	Typical Source of Contaminant
BROMODICHLOROMETHANE (ppb)	n/a	n/a	5.70	1.80- 5.70		NO	n/a
BROMOFORM (ppb)	n/a	n/a	.54	nd- .54		NO	n/a
CHLOROFORM (ppb)	n/a	n/a	7.80	2.90- 7.80		NO	n/a

DIBROMOCHLOROMETHANE (ppb)	n/a	n/a	3.40	1.10-3.40		NO	n/a
SULFATE (ppm)	n/a	n/a	22.00	11.00 - 22.00	03/05/2008	NO	n/a

Unregulated contaminants

Contaminant (units)	**MCL**	**MCLG**	**Level Found**	**Range**	**Sample Date (if prior to 2009)**	**Violation**	**Typical Source of Contaminant**
METHYL-TERT-BUTYL-ETHER (ppb)	n/a	n/a	.24	.15- .24		NO	n/a

Additional Health Information

While your drinking water meets USEPA's standard for **arsenic**, it does contain low levels of arsenic. USEPA's standard balances the current understanding of arsenic's possible health effects against the costs of removing arsenic from drinking water. USEPA continues to research the health effects of low levels of arsenic, which is a mineral known to cause cancer in humans at high concentrations and is linked to other health effects such as skin damage and circulatory problems.

Definition of Terms

Term	**Definition**
AL	Action Level: The concentration of a contaminant which, if exceeded, triggers treatment or other requirements which a water system must follow.
MCL	Maximum Contaminant Level: The highest level of a contaminant that is allowed in drinking water. MCLs are set as close to the MCLGs as feasible using the best available treatment technology.
MCLG	Maximum Contaminant Level Goal: The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety.
MFL	million fibers per liter
mrem/year	millirems per year (a measure of radiation absorbed by the body)
NTU	Nephelometric Turbidity Units

pCi/l	picocuries per liter (a measure of radioactivity)
ppm	parts per million, or milligrams per liter (mg/l)
ppb	parts per billion, or micrograms per liter (ug/l)
ppt	parts per trillion, or nanograms per liter
ppq	parts per quadrillion, or picograms per liter
TCR	Total Coliform Rule
TT	Treatment Technique: A required process intended to reduce the level of a contaminant in drinking water.

2011 Consumer Confidence Report for 26802391 TOWN OF BROOKFIELD SAN DIST 4

There is some information required in the CCR which DNR does not have in its database. Click the "Customize" button to add the required information. After completing the information and clicking the "Complete" button on that page, a new button called "Printable CCR & Cert" will appear here.

Water System Information

If you would like to know more about the information contained in this report, please contact Terry R Heidmann at (262) 798-8629.

Health Information

Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the Environmental Protection Agency's safe drinking water hotline (800-426-4791).

Some people may be more vulnerable to contaminants in drinking water than the general population. Immuno-compromised persons such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune systems disorders, some elderly, and infants can be particularly at risk from infections. These people should seek advice about drinking water from their health care providers. EPA/CDC guidelines on appropriate means to lessen the risk of infection by cryptosporidium and other microbial contaminants are available from the Environmental Protection Agency's safe drinking water hotline (800-426-4791).

Source(s) of Water

Source id	Source	Depth (in feet)	Status
1	Groundwater	350	Active
2	Groundwater	314	Active
3	Groundwater	450	Active
4	Groundwater	370	Active
5	Groundwater	220	Active
6	Groundwater	202	Active

To obtain a summary of the source water assessment please contact Terry R Heidmann at (262) 798-8629

Educational Information

The sources of drinking water, both tap water and bottled water, include rivers, lakes, streams, ponds, reservoirs, springs and wells. As water travels over the surface of the land or through the ground, it dissolves naturally occurring minerals and, in some cases, radioactive material, and can pick up substances resulting from the presence of animals or from human activity.

Contaminants that may be present in source water include:

- Microbial contaminants, such as viruses and bacteria, which may come from sewage treatment plants, septic systems, agricultural livestock operations and wildlife.
- Inorganic contaminants, such as salts and metals, which can be naturally- occurring or result from urban stormwater runoff, industrial or domestic wastewater discharges, oil and gas production, mining or farming.
- Pesticides and herbicides, which may come from a variety of sources such as agriculture, urban stormwater runoff and residential uses.
- Organic chemical contaminants, including synthetic and volatile organic chemicals, which are by-products of industrial processes and petroleum production, and can also come from gas stations, urban stormwater runoff and septic systems.
- Radioactive contaminants, which can be naturally occurring or be the result of oil and gas production and mining activities.

In order to ensure that tap water is safe to drink, EPA prescribes regulations that limit the amount of certain contaminants in water provided by public water systems. FDA regulations establish limits for contaminants in bottled water, which shall provide the same protection for public health.

Number of Contaminants Required to be Tested

This table displays the number of contaminants that were required to be tested in the last five years. The CCR may contain up to five years worth of water quality results. If a water system tests annually, or more frequently, the results from the most recent year are shown on the CCR. If testing is done less frequently, the results shown on the CCR are from the past five years.

Contaminant Group	**# of Contaminants**
Disinfection Byproducts	2
Inorganic Contaminants	16
Microbiological Contaminants	1
Radioactive Contaminants	3
Synthetic Organic Contaminants including Pesticides and Herbicides	23
Unregulated Contaminants	4

Volatile Organic Contaminants	20

Disinfection Byproducts

Contaminant (units)	**MCL**	**MCLG**	**Level Found**	**Range**	**Sample Date (if prior to 2011)**	**Violation**	**Typical Source of Contaminant**
HAA5 (ppb)	60	60	8	2- 8		NO	
TTHM (ppb)	80	0	34.6	15.6- 34.6		NO	By-product of drinking water chlorination

Inorganic Contaminants

Contaminant (units)	**MCL**	**MCLG**	**Level Found**	**Range**	**Sample Date (if prior to 2011)**	**Violation**	**Typical Source of Contaminant**
ARSENIC (ppb)	10	n/a	3	2- 3		NO	Erosion of natural deposits; Runoff from orchards; Runoff from glass and electronics production wastes
BARIUM (ppm)	2	2	.240	.180- .240		NO	Discharge of drilling wastes; Discharge from metal refineries; Erosion of natural deposits
COPPER (ppm)	AL=1.3	1.3	.26	0 of 20 results were above the action level.		NO	Corrosion of household plumbing systems; Erosion of natural deposits; Leaching from wood preservatives
FLUORIDE (ppm)	4	4	.2	.1- .2		NO	Erosion of natural deposits; Water additive which promotes strong teeth; Discharge from fertilizer and aluminum factories

LEAD (ppb)	AL=15	0	7.40	0 of 20 results were above the action level.		NO	Corrosion of household plumbing systems; Erosion of natural deposits
NICKEL (ppb)	100		5.6000	3.4000- 5.6000		NO	Nickel occurs naturally in soils, ground water and surface waters and is often used in electroplating, stainless steel and alloy products.
SELENIUM (ppb)	50	50	6	nd- 6		NO	Discharge from petroleum and metal refineries; Erosion of natural deposits; Discharge from mines
SODIUM (ppm)	n/a	n/a	97.00	61.00- 97.00		NO	n/a

Radioactive Contaminants

Contaminant (units)	MCL	MCLG	Level Found	Range	Sample Date (if prior to 2011)	Violation	Typical Source of Contaminant
COMBINED URANIUM (ug/l)	30	0	0.4	0.3- 0.4	03/10/2009	NO	Erosion of natural deposits
GROSS ALPHA, EXCL. R & U (pCi/l)	15	0	4.3	3.3- 4.3	03/10/2009	NO	Erosion of natural deposits
GROSS ALPHA, INCL. R & U (n/a)	n/a	n/a	4.5	3.6- 4.5	03/10/2009	NO	Erosion of natural deposits
RADIUM, (226 + 228) (pCi/l)	5	0	1.8	.9- 1.8	03/10/2009	NO	Erosion of natural deposits

Unregulated Contaminants

Contaminant (units)	MCL	MCLG	Level Found	Range	Sample Date (if prior to 2011)	Violation	Typical Source of Contaminant
BROMODICHLOROMETHANE (ppb)	n/a	n/a	9.40	4.00-9.40		NO	n/a
BROMOFORM (ppb)	n/a	n/a	6.30	3.50-6.30		NO	n/a
CHLOROFORM (ppb)	n/a	n/a	3.90	1.40-3.90		NO	n/a
DIBROMOCHLOROMETHANE (ppb)	n/a	n/a	15.00	6.70-15.00		NO	n/a
DIBROMOMETHANE (ppb)	n/a	n/a	.25	.25	05/07/2008	NO	n/a
SULFATE (ppm)	n/a	n/a	58.00	51.00-58.00	05/07/2008	NO	n/a

Unregulated contaminants

Contaminant (units)	MCL	MCLG	Level Found	Range	Sample Date (if prior to 2011)	Violation	Typical Source of Contaminant
METHYL-TERT-BUTYL-ETHER (ppb)	n/a	n/a	1.10	.80-1.10		NO	n/a

Definition of Terms

Term	Definition
AL	Action Level: The concentration of a contaminant which, if exceeded, triggers treatment or other requirements which a water system must follow.
MCL	Maximum Contaminant Level: The highest level of a contaminant that is allowed in drinking water. MCLs are set as close to the MCLGs as feasible using the best available treatment technology.
MCLG	Maximum Contaminant Level Goal: The level of a contaminant in drinking water

	below which there is no known or expected risk to health. MCLGs allow for a margin of safety.
MFL	million fibers per liter
mrem/year	millirems per year (a measure of radiation absorbed by the body)
NTU	Nephelometric Turbidity Units
pCi/l	picocuries per liter (a measure of radioactivity)
ppm	parts per million, or milligrams per liter (mg/l)
ppb	parts per billion, or micrograms per liter (ug/l)
ppt	parts per trillion, or nanograms per liter
ppq	parts per quadrillion, or picograms per liter
TCR	Total Coliform Rule
TT	Treatment Technique: A required process intended to reduce the level of a contaminant in drinking water.

2011 Consumer Confidence Report for 24101000 MILWAUKEE WATERWORKS

There is some information required in the CCR which DNR does not have in its database. Click the "Customize" button to add the required information. After completing the information and clicking the "Complete" button on that page, a new button called "Printable CCR & Cert" will appear here.

Water System Information

If you would like to know more about the information contained in this report, please contact Lon Couillard at (414) 286-2226.

Health Information

Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the Environmental Protection Agency's safe drinking water hotline (800-426-4791).

Some people may be more vulnerable to contaminants in drinking water than the general population. Immuno-compromised persons such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune systems disorders, some elderly, and infants can be particularly at risk from infections. These people should seek advice about drinking water from their health care providers. EPA/CDC guidelines on appropriate means to lessen the risk of infection by cryptosporidium and other microbial contaminants are available from the Environmental Protection Agency's safe drinking water hotline (800-426-4791).

Source(s) of Water

Source id	Source	Depth (in feet)	Waterbody Name	Status
1	Surface Water		Lake Michigan	Active
2	Surface Water		Lake Michigan	Active

To obtain a summary of the source water assessment please contact Lon Couillard at (414) 286-2226

Educational Information

The sources of drinking water, both tap water and bottled water, include rivers, lakes, streams, ponds, reservoirs, springs and wells. As water travels over the surface of the land or through the ground, it dissolves naturally occurring minerals and, in some cases, radioactive material, and can pick up substances resulting from the presence of animals or from human activity.

Contaminants that may be present in source water include:

- Microbial contaminants, such as viruses and bacteria, which may come from sewage treatment plants, septic systems, agricultural livestock operations and wildlife.
- Inorganic contaminants, such as salts and metals, which can be naturally- occurring or result from urban stormwater runoff, industrial or domestic wastewater discharges, oil and gas production, mining or farming.
- Pesticides and herbicides, which may come from a variety of sources such as agriculture, urban stormwater runoff and residential uses.
- Organic chemical contaminants, including synthetic and volatile organic chemicals, which are by-products of industrial processes and petroleum production, and can also come from gas stations, urban stormwater runoff and septic systems.
- Radioactive contaminants, which can be naturally occurring or be the result of oil and gas production and mining activities.

In order to ensure that tap water is safe to drink, EPA prescribes regulations that limit the amount of certain contaminants in water provided by public water systems. FDA regulations establish limits for contaminants in bottled water, which shall provide the same protection for public health.

Number of Contaminants Required to be Tested

This table displays the number of contaminants that were required to be tested in the last five years. The CCR may contain up to five years worth of water quality results. If a water system tests annually, or more frequently, the results from the most recent year are shown on the CCR. If testing is done less frequently, the results shown on the CCR are from the past five years.

Contaminant Group	# of Contaminants
Disinfection Byproducts	3
Inorganic Contaminants	17
Microbiological Contaminants	2
Radioactive Contaminants	3
Synthetic Organic Contaminants including Pesticides and Herbicides	26
Unregulated Contaminants	34
Volatile Organic Contaminants	20

Microbiological Contaminants

Contaminant	MCL	MCLG	Count of Positives	Sample Date (if prior to 2011)	Violation	Typical Source of Contaminant
Coliform (TCR)	presence of coliform bacteria in >=5% of monthly samples	0	1%		NO	Naturally present in the environment

Disinfection Byproducts

Contaminant (units)	MCL	MCLG	Level Found	Range	Sample Date (if prior to 2011)	Violation	Typical Source of Contaminant
HAA5 (ppb)	60	60	3	nd- 7		NO	
TTHM (ppb)	80	0	11.6	.5- 17.3		NO	By-product of drinking water chlorination

Inorganic Contaminants

Contaminant (units)	MCL	MCLG	Level Found	Range	Sample Date (if prior to 2011)	Violation	Typical Source of Contaminant
BARIUM (ppm)	2	2	.021	.020-.021		NO	Discharge of drilling wastes; Discharge from metal refineries; Erosion of natural deposits
COPPER (ppm)	AL=1.3	1.3	.034	0 of 53 results were above the action level.		NO	Corrosion of household plumbing systems; Erosion of natural deposits; Leaching from wood preservatives
FLUORIDE	4	4	.1	.1		NO	Erosion of natural

(ppm)							deposits; Water additive which promotes strong teeth; Discharge from fertilizer and aluminum factories
LEAD (ppb)	AL=15	0	6.10	1 of 53 results were above the action level.		*	Corrosion of household plumbing systems; Erosion of natural deposits
NICKEL (ppb)	100		1.4000	1.3000- 1.4000		NO	Nickel occurs naturally in soils, ground water and surface waters and is often used in electroplating, stainless steel and alloy products.
NITRATE (N03-N) (ppm)	10	10	.30	.25- .30		NO	Runoff from fertilizer use; Leaching from septic tanks, sewage; Erosion of natural deposits
SODIUM (ppm)	n/a	n/a	9.00	8.30- 9.00		NO	n/a

* Systems exceeding a lead and/or copper action level must take actions to reduce lead and/or copper in the drinking water. The lead and copper values represent the 90th percentile of all compliance samples collected. If you want information on the NUMBER of sites or the actions taken to reduce these levels, please contact your water supply operator.

Radioactive Contaminants

Contaminant (units)	**MCL**	**MCLG**	**Level Found**	**Range**	**Sample Date (if prior to 2011)**	**Violation**	**Typical Source of Contaminant**
COMBINED URANIUM (ug/l)	30	0	0.2	0.2		NO	Erosion of natural deposits
GROSS ALPHA,	15	0	2.8	2.5- 2.8		NO	Erosion of natural deposits

EXCL. R & U (pCi/l)							
GROSS ALPHA, INCL. R & U (n/a)	n/a	n/a	2.8	2.6- 2.8		NO	Erosion of natural deposits
GROSS BETA PARTICLE ACTIVITY (pCi/l)	n/a	n/a	6.0	4.5- 6.0		NO	Decay of natural and man-made deposits. MCL units are in millirem/year. Calculation for compliance with MCL is not possible unless level found is greater than 50 pCi/l.
RADIUM, (226 + 228) (pCi/l)	5	0	2.0	2.0		NO	Erosion of natural deposits

Unregulated Contaminants

Contaminant (units)	**MCL**	**MCLG**	**Level Found**	**Range**	**Sample Date (if prior to 2011)**	**Violation**	**Typical Source of Contaminant**
BROMODICHLOROMETHANE (ppb)	n/a	n/a	4.08	nd- 5.70		NO	n/a
BROMOFORM (ppb)	n/a	n/a	.30	nd- .60		NO	n/a
CHLOROFORM (ppb)	n/a	n/a	4.90	nd- 9.20		NO	n/a
DIBROMOCHLOROMETHANE (ppb)	n/a	n/a	2.48	.50- 3.20		NO	n/a
SULFATE (ppm)	n/a	n/a	35.00	nd- 35.00		NO	n/a

Definition of Terms

Term	**Definition**

AL	Action Level: The concentration of a contaminant which, if exceeded, triggers treatment or other requirements which a water system must follow.
MCL	Maximum Contaminant Level: The highest level of a contaminant that is allowed in drinking water. MCLs are set as close to the MCLGs as feasible using the best available treatment technology.
MCLG	Maximum Contaminant Level Goal: The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety.
MFL	million fibers per liter
mrem/year	millirems per year (a measure of radiation absorbed by the body)
NTU	Nephelometric Turbidity Units
pCi/l	picocuries per liter (a measure of radioactivity)
ppm	parts per million, or milligrams per liter (mg/l)
ppb	parts per billion, or micrograms per liter (ug/l)
ppt	parts per trillion, or nanograms per liter
ppq	parts per quadrillion, or picograms per liter
TCR	Total Coliform Rule
TT	Treatment Technique: A required process intended to reduce the level of a contaminant in drinking water.

Attachment D

Excerpt from *Wisconsin's Long Term Trend Water Quality Monitoring Program for Rivers, June 2001-June 2005*

Wisconsin's Long Term Trend Water Quality Monitoring Program for Rivers

July 2001 - June 2005

Prepared by the
WDNR Bureau of Watershed Management
River Long Term Trends Work Group
November, 2006

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Cover Photo: Willow River at former site of Burkhart Dam in Willow River State Park (Ken Schreiber).

Acknowledgments

Preparation of this report was an effort of the Wisconsin Department of Natural Resources' Bureau of Watershed Management River Long Term Trend Work Group.

Work Group Members: Jim Ruppel, John Sullivan, Ken Schreiber and Steve Galarneau

Contributors: Dale Robertson (USGS), and contributions from many of our Water Program colleagues. We are grateful for their reviews and insightful comments.

Figures: John Sullivan and Jim Ruppel.

Introduction

Wisconsin has had a variety of water quality monitoring networks over the past 30 years. In 1979, the network consisted of 29 National Ambient Stations (EPA) and 18 other stations for a total of 47 sites. In 2000, the state water quality monitoring network consisted of 24 stations operated by the Wisconsin Department of Natural Resources (WDNR) and 16 stations operated by United States Geological Survey (USGS) and other agencies. As many as 70 stations previously monitored by WDNR have substantial periods of record (Wis. Water Resources Center, 1998). The primary criteria for site selection typically included: broad spatial coverage, representation of a range of land coverage and ecotypes, historic long-term trend sampling locations, and availability of continuous flow data (preferably from a nearby USGS station).

The current Long-term Trend (LTT) water quality-monitoring network, initiated in 2001, consists of 42 sites, with a minimum of one site per major river basin, generally located near the mouth of each river (Figure 1 and Table 1). Most of these sites are part of an earlier trend monitoring effort.

Selection of the 42 trend monitoring sites considered different land coverage in the state varying from urban areas in the southeast, heavy agricultural use in central and southwest and forest cover dominating in the north (Figure 2). Water chemistry is greatly influenced by land cover/ use conditions. Table 2 shows the percentages of various land cover types in drainage areas associated with the LTT monitoring sites. In instances where the drainage areas cross state boundaries, land cover percentages reflect only the portion of the drainage area within the state.

The purpose of this report is to summarize monitoring data that has been conducted since the LTT network was revised in 2001. The report presents site information, water chemistry data summaries and some interpretation of the findings to date. This report does not include trend analysis or constituent loading information. A concurrent report being completed by the USGS will provide loading and trend analysis on a limited number of parameters based on LTT monitoring network data (Robertson et al. 2006). The WDNR Water Quality Sub-team will provide additional trend analysis updates and reports in the future.

Benefits and Goals of the Long-term River Monitoring Network

The long-term, statewide river water quality monitoring network provides the following benefits:

- Basic information to DNR staff to help assess general water quality conditions/trends in basins of interest. Each major river basin has at least one site that serves as a focal point for assessing existing conditions and long-term water quality changes;

- Historical and current water quality data on rivers allowing for statewide assessment of water quality conditions and trends. This information is used in preparing 305(b) reports, 303(d) listings (or de-listings), and other water quality reports and documents;

- Data to help develop water quality-based effluent limits, water quality standards and biocriteria. This monitoring may also identify new water quality problems or issues and evaluate responses to point and nonpoint source pollution abatement activities;

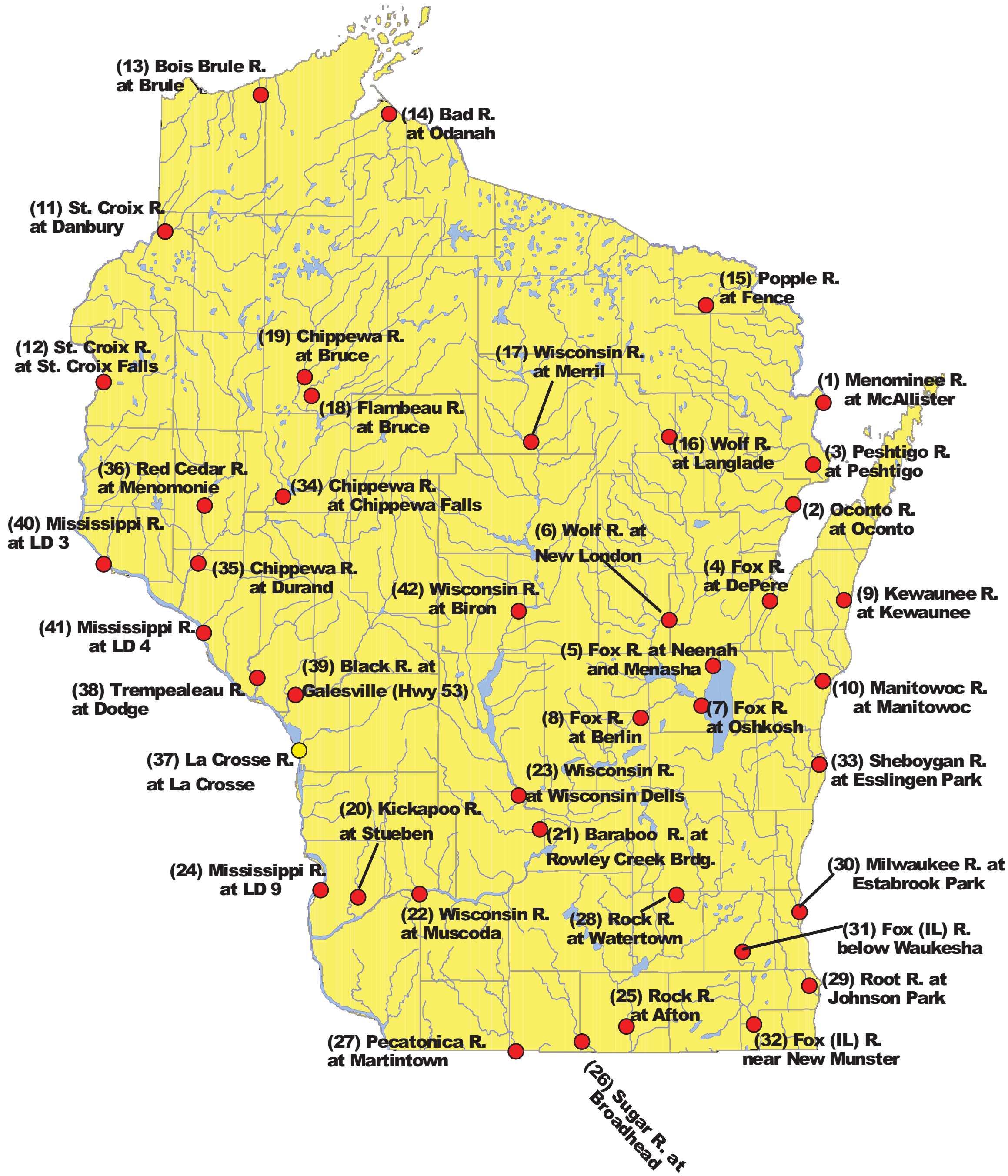


Figure 1. Wisconsin's long term trend river monitoring network (Site numbers shown in parentheses, LD = Lock & Dam).

Table 1. Wisconsin's long term trend river monitoring network.

LTT Site Number	Storet Number	Site Description	Region	Nearest USGS Gauging Site
1	383088	MENOMINEE R. AT MCALLISTER	NE	04067500 MENOMINEE RIVER NEAR MC ALLISTER, WI
2	433002	OCONTO R. AT OCONTO	NE	04071765 OCONTO RIVER NEAR OCONTO, WI
3	383001	PESHTIGO R. AT PESHTIGO	NE	04069500 PESHTIGO RIVER AT PESHTIGO, WI
4	053210	FOX R. AT DEPERE	NE	040851385 FOX RIVER AT OIL TANK DEPOT AT GREEN BAY, WI
5	713002	FOX R. AT NEENAH AND MENASHA	NE	04084445 FOX RIVER AT APPLETON, WI
6	693035	WOLF R. AT NEW LONDON	NE	04079000 WOLF RIVER AT NEW LONDON, WI
7	713056	FOX R. AT OSHKOSH	NE	04082400 FOX RIVER AT OSHKOSH, WI
8	243020	FOX R. AT BERLIN	NE	04073500 FOX RIVER AT BERLIN, WI
9	313038	KEWAUNEE R. AT KEWAUNEE	NE	04085200 KEWAUNEE RIVER NEAR KEWAUNEE, WI
10	363069	MANITOWOC R. AT MANITOWOC	NE	04085427 MANITOWOC RIVER AT MANITOWOC, WI
11	073132	ST. CROIX R. AT DANBURY	NO	05333500 ST. CROIX RIVER NEAR DANBURY, WI
12	493210	ST. CROIX R. AT ST. CROIX FALLS	NO	05340500 ST. CROIX RIVER AT ST. CROIX FALLS, WI
13	163002	BOIS BRULE R. AT BRULE	NO	04025500 BOIS BRULE RIVER AT BRULE, WI
14	023001	BAD R. AT ODANAH	NO	04027000 BAD RIVER NEAR ODANAH, WI
15	193003	POPPLE R. AT FENCE	NO	04063700 POPPLE RIVER NEAR FENCE, WI
16	343033	WOLF R. AT LANGLADE	NO	04074950 WOLF RIVER AT LANGLADE, WI
17	353068	WISCONSIN R. AT MERRIL	NO	05395000 WISCONSIN RIVER AT MERRILL, WI
18	553149	FLAMBEAU R. AT BRUCE	NO	05360500 FLAMBEAU RIVER NEAR BRUCE, WI
19	553003	CHIPPEWA R. AT BRUCE	NO	05356500 CHIPPEWA RIVER NEAR BRUCE, WI
20	123017	KICKAPOO R. AT STUEBEN	WC	05410490 KICKAPOO RIVER AT STEUBEN, WI
21	573051	BARABOO R. AT ROWLEY CREEK BRDG.	SC	05405000 BARABOO RIVER NEAR BARABOO, WI
22	223282	WISCONSIN R. AT MUSCODA	SC	05407000 WISCONSIN RIVER AT MUSCODA, WI
23	573052	WISCONSIN R. AT WISCONSIN DELLS	SC	05404000 WISCONSIN RIVER NEAR WISCONSIN DELLS, WI
24	123016	MISSISSIPPI R. AT LD 9	WC	05389500 Mississippi River at McGregor, IA
25	543001	ROCK R. AT AFTON	SC	05430500 ROCK RIVER AT AFTON, WI
26	233001	SUGAR R. AT BROADHEAD	SC	05436500 SUGAR RIVER NEAR BRODHEAD, WI
27	233002	PECATONICA R. AT MARTINTOWN	SC	05434500 PECATONICA RIVER AT MARTINTOWN, WI
28	285004	ROCK R. AT WATERTOWN	SC	05425500 ROCK RIVER AT WATERTOWN, WI
29	523061	ROOT R. AT JOHNSON PARK	SE	04087240 ROOT RIVER AT RACINE, WI
30	413640	MILWAUKEE R. AT ESTABROOK PARK	SE	04087000 MILWAUKEE RIVER AT MILWAUKEE, WI
31	683096	FOX (IL) R. BELOW WAUKESHA	SE	05543830 FOX RIVER AT WAUKESHA, WI
32	303066	FOX (IL) R. NEAR NEW MUNSTER	SE	05545750 FOX RIVER NEAR NEW MUNSTER, WI
33	603095	SHEBOYGAN R. AT ESSLINGEN PARK	SE	04086000 SHEBOYGAN RIVER AT SHEBOYGAN, WI
34	093001	CHIPPEWA R. AT CHIPPEWA FALLS	WC	05365500 CHIPPEWA RIVER AT CHIPPEWA FALLS, WI
35	473008	CHIPPEWA R. AT DURAND	WC	05369500 CHIPPEWA RIVER AT DURAND, WI
36	173208	RED CEDAR R. AT MENOMONIE	WC	05369000 RED CEDAR RIVER AT MENOMONIE, WI
37	323017	LA CROSSE R. NEAR MOUTH	WC	05383075 LA CROSSE RIVER NEAR LA CROSSE, WI
38	623039	TREMPEALEAU R. AT DODGE	WC	05379500 TREMPEALEAU RIVER AT DODGE, WI
39	623001	BLACK R. AT GALESVILLE (HWY 53)	WC	05382000 BLACK RIVER NEAR GALESVILLE, WI
40	483027	MISSISSIPPI R. AT ABOVE LD 3	WC	05344500 MISSISSIPPI RIVER AT PRESCOTT, WI
41	063029	MISSISSIPPI R. AT ABOVE LD 4	WC	05378500 MISSISSIPPI RIVER AT WINONA, MN
42	723002	WISCONSIN R. AT BIRON	WC	05400760 WISCONSIN RIVER AT WISCONSIN RAPIDS, WI

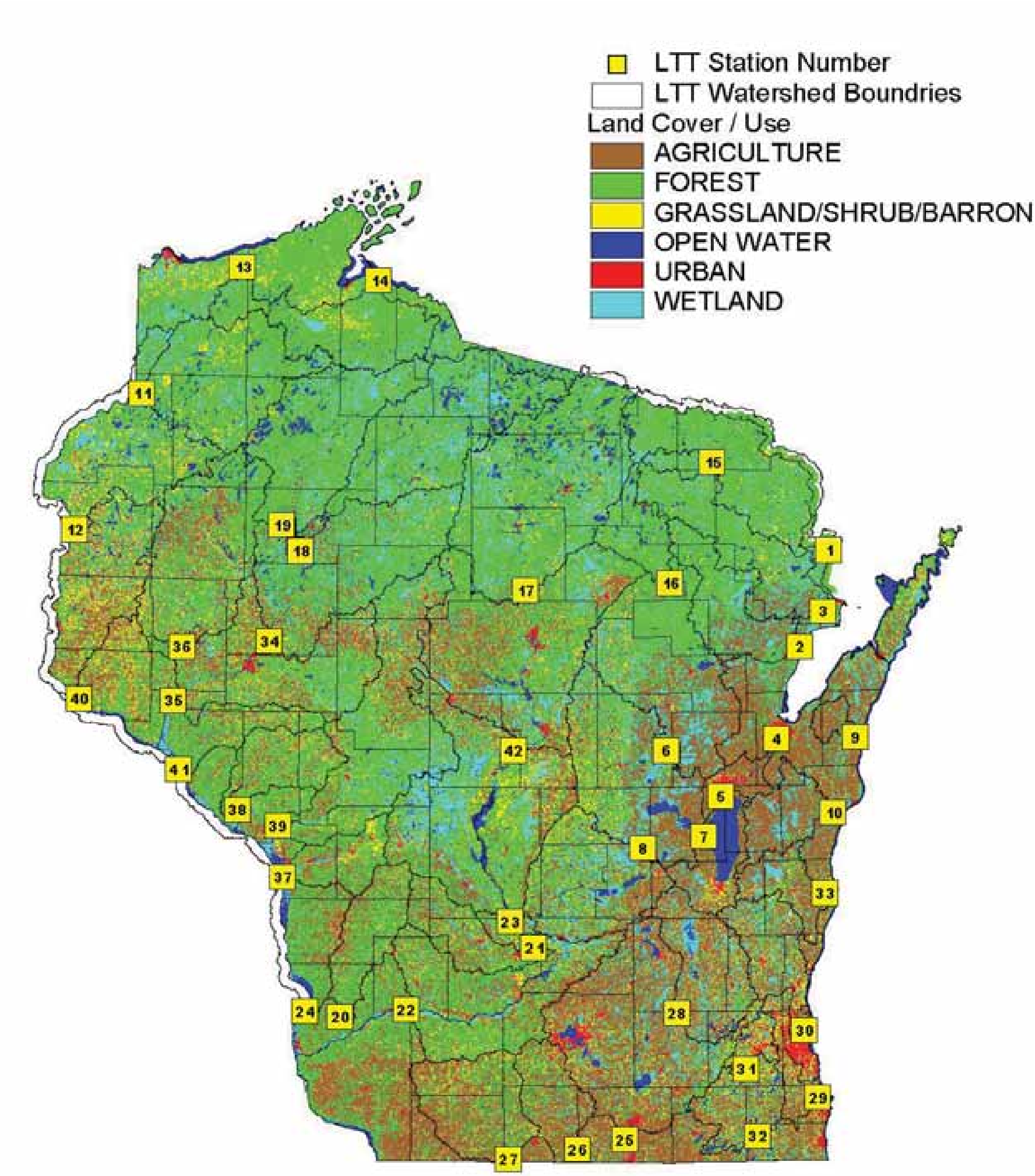


Figure 2. Land Cover in Wisconsin (Source: WISCLAND**)**

Table 2. Summary of land cover in the long term trend watersheds.

LTT Site Number [2]	Site Description	Urban	Forested	Agriculture	Wetlands	Barron, Shrub or Grasslands	Open Water
1	MENOMINEE R. AT MCALLISTER [1]	0.1%	71.4%	2.1%	16.8%	7.0%	2.6%
2	OCONTO R. AT OCONTO	0.2%	46.6%	26.5%	20.3%	4.5%	1.8%
3	PESHTIGO R. AT PESHTIGO	0.2%	53.5%	14.7%	22.1%	7.4%	2.2%
4	FOX R. AT DEPERE	1.7%	27.4%	36.2%	17.0%	11.5%	6.2%
5	FOX R. AT NEENAH AND MENASHA	1.1%	28.3%	35.0%	17.6%	11.7%	6.3%
6	WOLF R. AT NEW LONDON	0.5%	42.0%	28.2%	19.7%	7.3%	2.2%
7	FOX R. AT OSHKOSH	0.8%	31.0%	34.1%	18.9%	12.0%	3.2%
8	FOX R. AT BERLIN	0.9%	24.1%	35.2%	18.5%	17.7%	3.6%
9	KEWAUNEE R. AT KEWAUNEE	0.5%	6.2%	81.6%	7.7%	4.1%	0.0%
10	MANITOWOC R. AT MANITOWOC	0.8%	4.5%	73.9%	17.1%	3.5%	0.1%
11	ST. CROIX R. AT DANBURY	0.1%	65.9%	0.9%	16.1%	12.2%	4.8%
12	ST. CROIX R. AT ST. CROIX FALLS	0.2%	57.7%	3.4%	16.8%	17.2%	4.7%
13	BOIS BRULE R. AT BRULE	0.0%	76.8%	0.1%	12.5%	8.8%	1.8%
14	BAD R. AT ODANAH	0.0%	71.5%	0.8%	16.0%	9.6%	2.1%
15	POPPLE R. AT FENCE	0.0%	67.4%	0.9%	28.9%	1.9%	0.7%
16	WOLF R. AT LANGLADE	0.2%	67.9%	2.7%	18.3%	6.0%	4.9%
17	WISCONSIN R. AT MERRIL[1]	0.5%	57.0%	2.3%	24.4%	9.0%	6.9%
18	FLAMBEAU R. AT BRUCE	0.3%	55.3%	2.6%	28.0%	6.2%	7.6%
19	CHIPPEWA R. AT BRUCE	0.0%	61.7%	4.1%	22.8%	5.7%	5.6%
20	KICKAPOO R. AT STUEBEN	0.2%	41.6%	43.1%	1.8%	13.2%	0.1%
21	BARABOO R. AT ROWLEY CREEK BRDG.	1.3%	31.1%	47.8%	4.2%	15.1%	0.4%
22	WISCONSIN R. AT MUSCODA	1.1%	40.9%	24.7%	16.4%	13.4%	3.7%
23	WISCONSIN R. AT WISCONSIN DELLS	1.1%	42.5%	19.9%	19.4%	12.8%	4.3%
25	ROCK R. AT AFTON	3.6%	7.3%	60.1%	12.5%	12.9%	3.6%
26	SUGAR R. AT BROADHEAD	1.6%	16.1%	65.3%	4.1%	12.6%	0.4%
27	PECATONICA R. AT MARTINTOWN	0.5%	19.7%	64.7%	1.1%	13.7%	0.2%
28	ROCK R. AT WATERTOWN	2.1%	5.9%	58.4%	16.8%	13.6%	3.1%
29	ROOT R. AT JOHNSON PARK	11.5%	10.5%	51.7%	4.9%	20.6%	0.7%
30	MILWAUKEE R. AT ESTABROOK PARK	7.3%	11.7%	45.8%	14.7%	18.3%	1.6%
31	FOX (IL) R. BELOW WAUKESHA	17.2%	10.3%	22.5%	12.8%	34.4%	2.9%
32	FOX (IL) R. NEAR NEW MUNSTER	6.4%	13.4%	41.0%	11.6%	23.1%	4.5%
33	SHEBOYGAN R. AT ESSLINGEN PARK	1.5%	9.5%	61.4%	14.5%	11.7%	0.9%
34	CHIPPEWA R. AT CHIPPEWA FALLS	0.2%	54.2%	9.1%	24.0%	7.2%	5.3%
35	CHIPPEWA R. AT DURAND	0.5%	48.0%	18.5%	18.0%	10.8%	4.1%
36	RED CEDAR R. AT MENOMONIE	0.5%	41.4%	31.2%	7.3%	16.3%	3.3%
37	LA CROSSE R. AT LA CROSSE	2.5%	44.4%	33.0%	4.5%	15.2%	0.4%
38	TREMPEALEAU R. AT DODGE	0.3%	43.9%	31.9%	5.3%	18.4%	0.2%
39	BLACK R. AT GALESVILLE (HWY 53)	0.3%	44.7%	24.9%	15.7%	13.2%	1.2%
42	WISCONSIN R. AT BIRON[1]	1.2%	46.3%	17.6%	19.4%	11.1%	4.5%

1- For instances where the drainage area associated with a monitoring station crosses state boundaries the percentages of land use shown reflect only the portion of the drainage area with the State of Wisconsin.
2- Mississippi River Sites are not shown.

- Information to compare water quality between basins reflecting land cover, hydrology and other anthropogenic impacts/changes. Long-term sites also provide an important reference for assessing other water quality data collected within a basin during more abbreviated monitoring periods. These data may also be used to supplement baseline monitoring activities;

- The network allows statewide evaluation of “contaminants of concern" (e.g. pesticides, heavy metals, etc.) and testing of new water quality evaluation techniques. These data can also be used to assess regional and/or national issues such as nitrogen loading and Gulf of Mexico hypoxia.

Methods

The trend monitoring network currently consists of 42 sites distributed across the state (Figures 1 and Table 1). Just over half the sites (24) are sampled monthly and the other sites are sampled quarterly. Monthly sites are generally located near the mouth of major rivers, whereas, quarterly sites are often located at additional sites on major rivers some distance above the mouth. Sampling at a lower frequency reduces the ability for assessing temporal changes and decreases the power to detect long term trends (Galarneau 1996 and Lubinski et al. 2001). However, a lack of available funding prevented the establishment of a monthly monitoring network across the state. The number of water quality measurements for some sites on the Mississippi River (Lock and Dams (LD) 3 and 4) were reduced due to the availability of monitoring data from other agencies.

Monthly samples are collected approximately every 30 days and are scheduled at least one week in advance to avoid bias from weather conditions. Quarterly sampling is conducted during the following time periods:

Winter – December/January
Spring – March/April
Summer – July/August
Autumn – October/November

The goal of the sampling protocol is to collect water samples in an unbiased fashion with respect to flow, weather and other factors. Samples are collected in free flowing, well-mixed areas of rivers generally between the hours of 8 a.m. and 2 p.m.

Field water quality measurements generally include dissolved oxygen, temperature and pH following field procedure established by the Department (http://intranet.dnr.state.wi.us/int/es/science/ls/fpm/table.htm). Water quality samples are sent overnight on ice to the Wisconsin State Laboratory of Hygiene in Madison, Wisconsin, where they are analyzed for nutrients, solids, specific conductance, pH, hardness, alkalinity, bacteria chlorophyll, and triazine herbicides following approved U.S. EPA methods. Low level metal sampling using "clean hands" and laboratory procedures is conducted quarterly at a subset of the monthly monitoring sites and biannual sampling of triazine is done during winter vs. summer periods. A complete listing of the monitoring design, sampling frequency and analyses are presented in Tables 1 and 3. The data used in this report was extracted from the WI DNR Lab Data System maintained by the WDNR Technical Services Section. The data was screened to remove duplicate entries and records where the result was marked as "Not Verified" by the laboratory. When the sample concentration was below the laboratory limit of detection the detection limit was substituted for the result. Both inorganic and biological lab slips allow field staff to record field observations to be entered into the data bank by laboratory staff. For this report only field information from the inorganic lab slips is included in the data set for data analysis purposes.

GIS land cover information was obtained from the Wisconsin Initiative for Statewide Cooperation on Landscape Analysis and Data (WISCLAND). Metadata information is available online at: (http://www.dnr.state.wi.us/maps/gis/datalandcover.html#metadata).
WISCLAND data is a raster representation of vegetation and land use for the state of Wisconsin. The source of the data were acquired from the nationwide Multi-Resolution Land Characteristics Consortium acquisition of dual-date Landsat Thematic Mapper ™ data primarily from 1992 (http://edc.usgs.gov/products/landcover/nlcd.html). This information was

Table 3 . Sampling frequency and parameters of the long term trend monitoring network.

LTT Site Number	Site Description	Field - pH, DO, Cond	Lab - pH, Alk, & Cond	Turb	TKN	NOx	NH4	TP	DisP	TSS	All Pig, Chla	Fecal	E-coli	Cl	Ca Mg Hard	Low Level Metals	Triazine	Diss Silica
1	MENOMINEE R. AT MCALLISTER	4	4	4	4	4	4	4	4	4	4	4	4	4	0	0	2	0
2	OCONTO R. AT OCONTO	4	4	4	4	4	4	4	4	4	4	4	4	4	0	0	2	0
3	PESHTIGO R. AT PESHTIGO	4	4	4	4	4	4	4	4	4	4	4	4	4	0	0	2	0
4	FOX R. AT DEPERE	12	12	12	12	12	12	12	12	12	12	12	12	12	4	4	2	12
5	FOX R. AT NEENAH AND MENASHA	12	12	12	12	12	12	12	12	12	12	12	12	12	0	0	2	12
6	WOLF R. AT NEW LONDON	12	12	12	12	12	12	12	12	12	12	12	12	12	4	4	2	12
7	FOX R. AT OSHKOSH	12	12	12	12	12	12	12	12	12	12	12	12	12	0	0	2	12
8	FOX R. AT BERLIN	4	4	4	4	4	4	4	4	4	4	4	4	4	0	0	2	0
9	KEWAUNEE R. AT KEWAUNEE	4	4	4	4	4	4	4	4	4	4	4	4	4	0	0	2	0
10	MANITOWOC R. AT MANITOWOC	4	4	4	4	4	4	4	4	4	4	4	4	4	0	0	2	0
11	ST. CROIX R. AT DANBURY	4	4	4	4	4	4	4	4	4	4	4	4	4	0	0	2	0
12	ST. CROIX R. AT ST. CROIX FALLS	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	2	0
13	BOIS BRULE R. AT BRULE	4	4	4	4	4	4	4	4	4	4	4	4	4	0	0	2	0
14	BAD R. AT ODANAH	4	4	4	4	4	4	4	4	4	4	4	4	4	0	0	2	0
15	POPPLE R. AT FENCE	12	12	12	12	12	12	12	12	12	12	12	12	12	4	4	2	12
16	WOLF R. AT LANGLADE	12	12	12	12	12	12	12	12	12	12	12	12	12	0	0	2	12
17	WISCONSIN R. AT MERRIL	12	12	12	12	12	12	12	12	12	12	12	12	12	0	0	2	12
18	FLAMBEAU R. AT BRUCE	4	4	4	4	4	4	4	4	4	4	4	4	4	0	0	2	0
19	CHIPPEWA R. AT BRUCE	4	4	4	4	4	4	4	4	4	4	4	4	4	0	0	2	0
20	KICKAPOO R. AT STUEBEN	12	12	12	12	12	12	12	12	12	12	12	12	12	0	0	2	0
21	BARABOO R. AT ROWLEY CREEK BRDG.	12	12	12	12	12	12	12	12	12	12	12	12	12	0	0	2	0
22	WISCONSIN R. AT MUSCODA	12	12	12	12	12	12	12	12	12	12	12	12	12	0	0	2	0
23	WISCONSIN R. AT WISCONSIN DELLS	12	12	12	12	12	12	12	12	12	12	12	12	12	4	4	2	0
24	MISSISSIPPI R. AT LD 9	12	12	12	12	12	12	12	12	12	12	12	12	12	0	0	0	0
25	ROCK R. AT AFTON	12	12	12	12	12	12	12	12	12	12	12	12	12	4	4	2	0
26	SUGAR R. AT BROADHEAD	12	12	12	12	12	12	12	12	12	12	12	12	12	0	0	2	0
27	PECATONICA R. AT MARTINTOWN	12	12	12	12	12	12	12	12	12	12	12	12	12	0	0	2	0
28	ROCK R. AT WATERTOWN	12	12	12	12	12	12	12	12	12	12	12	12	12	0	0	2	0
29	ROOT R. AT JOHNSON PARK	12	12	12	12	12	12	12	12	12	12	12	12	12	4	4	2	12
30	MILWAUKEE R. AT ESTABROOK PARK	4	4	4	4	4	4	4	4	4	4	4	4	4	0	0	2	4
31	FOX (IL) R. BELOW WAUKESHA	4	4	4	4	4	4	4	4	4	4	4	4	4	0	0	2	0
32	FOX (IL) R. NEAR NEW MUNSTER	4	4	4	4	4	4	4	4	4	4	4	4	4	0	0	2	0
33	SHEBOYGAN R. AT ESSLINGEN PARK	12	12	12	12	12	12	12	12	12	12	12	12	12	4	4	2	12
34	CHIPPEWA R. AT CHIPPEWA FALLS	4	4	4	4	4	4	4	4	4	4	4	4	4	0	0	2	0
35	CHIPPEWA R. AT DURAND	12	12	12	12	12	12	12	12	12	12	12	12	12	4	4	2	12
36	RED CEDAR R. AT MENOMONIE	12	12	12	12	12	12	12	12	12	12	12	12	12	0	0	2	12
37	LA CROSSE R. AT LA CROSSE	12	12	12	12	12	12	12	12	12	12	12	12	12	0	0	2	0
38	TREMPEALEAU R. AT DODGE	12	12	12	12	12	12	12	12	12	12	12	12	12	0	0	2	12
39	BLACK R. AT GALESVILLE (HWY 53)	12	12	12	12	12	12	12	12	12	12	12	12	12	4	4	2	12
40	MISSISSIPPI R. AT LD 3	4	4	0	0	0	0	0	0	0	0	0	0	0	4	4	2	0
41	MISSISSIPPI R. AT LD 4	4	4	0	0	0	0	0	0	0	0	0	0	0	4	4	2	0
42	WISCONSIN R. AT BIRON	12	12	12	12	12	12	12	12	12	12	12	12	12	0	0	2	0

used to evaluate general relationships between a basin's land cover and its associated stream's water quality condition.

Statistix™ 8 (Analytical Software, 2003) was use to conduct basic statistical analyses and prepare graphics. Excel™ 2003 (Microsoft Corp.) spreadsheet software was utilized to store raw data and was also used to prepare graphs relating land cover and water quality. State maps of land cover, site locations were prepared using Arcview ™ 3.3 (Environmental Systems Research Institute, Inc.).

Results and Discussion

Water quality data from 2001 through 2005 were collected from 42 monitoring stations throughout Wisconsin on either a quarterly or monthly basis. All stations are associated with a USGS flow station (Table 1). A brief description of the water quality measurement is provided, followed by a general discussion of the results from a statewide perspective. Monitoring data for each constituent is represented in box plots (Figure 3) that are grouped by WDNR Administrative Regions as a means of illustrating general differences between major geographic areas of the state. It should be noted that box plots were prepared on the entire data set and seasonal differences in water quality were not evaluated. Seasonal water quality changes can be significant and will be considered in future water quality assessments.

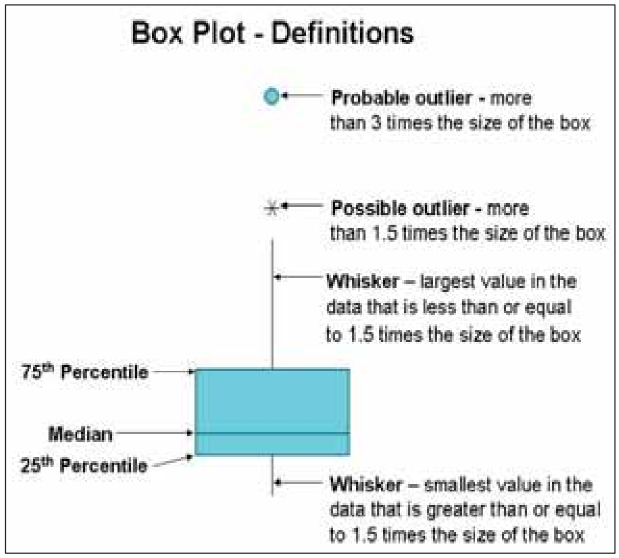


Figure 3. Description of box plot diagrams

Water Temperature

Water temperature is an important physical property that influences the growth and distribution of aquatic organisms and is important factor regulating chemical and biochemical reactions. Surface water temperature is strongly influenced by solar radiation, local climate and groundwater inflows. Differential heating of water induces thermal stratification, which may affect mixing and other water quality conditions. Wisconsin uses water temperature as an important variable in the designation of fish and aquatic life uses.

Long term water temperature data are useful for interpreting temporal variations. Seasonal adjusted data can be particularly useful in interpreting other water quality data and are used for effluent limits calculations.

Water temperature measurements show substantial seasonal changes due to Wisconsin's temperate climate. Monitoring frequency was inconsistent due to the nature of the monitoring design (monthly versus quarterly sampling). A detailed discussion of the temperature data is not warranted due to the variability in frequency and range of temperature measurements reported.

Dissolved Oxygen

Dissolved oxygen (DO) is a gas found in water that is critical for sustaining aquatic life. Dissolved oxygen enters water through mixing with air or through photosynthetic processes by aquatic macrophytes and algae. Decomposition of organic materials from point or nonpoint source inputs, plant respiration and benthic oxygen demand are important factors contributing to DO losses in the aquatic environment. Large fluctuations in diurnal DO levels generally indicate

West Central Region has two streams with high median values of TSS, the Kickapoo (Site 20) and Trempealeau (Site 38) rivers, likely due to steep topography and agricultural land use in the watersheds. Conversely, the Chippewa River sites (34 & 35) and the Red River (Site 36) had fairly low median concentrations of TSS ranging from 2.0 to 7.0 mg/L. The Pecatonica River (Site 27) had the highest median value of TSS in the state at 49.0 mg/L. The two Rock River sites (25 & 28) and the Sugar River (Site 26) also had relatively high TSS median concentrations likely due to agricultural land use. The Rock River sites also exhibited high chlorophyll concentrations, suggesting sestonic algae contributes to high TSS values observed at these sites. The Wisconsin River (Sites 22 & 23) had the lowest median TSS reflecting lower levels of agricultural land use and sediment trapping by large upstream impoundments. Southeast Region sites did not have any high or very low median total suspended solids levels.

Sites with elevated total suspended solids also generally had elevated total phosphorus and nitrogen concentrations indicative of nonpoint source runoff, including the Manitowoc, Kickapoo, LaCrosse, Trempealeau, Baraboo, Rock, Sugar, Pecatonica, Root and Sheboygan rivers.

Nitrogen

Nitrogen in surface water may be present in various organic and inorganic forms and has a complex cycle. Ammonia nitrogen is a reduced form of inorganic N and is usually associated with the decay of organic matter, animal waste runoff or municipal wastewater discharges that lack the nitrification process (conversion of ammonia to nitrate N). Ammonia nitrogen occurs in water as ammonium and un-ionized ammonia N with both forms represented as total ammonia N. Un-ionized ammonia N is toxic to aquatic life and its proportion of total ammonia increases at higher pH and temperature.

Nitrite and nitrate (NOx-N) are oxidized forms of inorganic N that are present in surface runoff or groundwater discharges from areas dominated with agricultural lands and from municipal wastewater inputs that receive advanced treatment (nitrification). Surface waters generally have little nitrite nitrogen.

Organic N includes those forms of nitrogen that are "combined" into various organic molecules such as proteins, amino acids and other cellular materials. Organic N in surface waters may be present as suspended particulate matter or as dissolved organic molecules. In sediments, bacteria may convert organic and inorganic nitrogen to molecular N though a process of ammonification and denitrification.

Nitrogen is an important plant nutrient and has been used in agricultural fertilizers to stimulate the production of agricultural crops. In oxygenated surface waters, the dominant form of nitrogen is normally nitrate nitrogen. As a result, total nitrogen concentrations closely follow the patterns and trends exhibited by nitrate nitrogen. Excessive nitrogen inputs from the Mississippi River basin to the Gulf of Mexico have been implicated in nutrient enrichment and hypoxic problems in the Gulf (CENR, 2000).

Wisconsin has adopted acute and chronic criteria for total ammonia N in Chapter NR 105 (Wis. Adm. Code) that varies as a function of pH, water temperature and aquatic life use. For surfaces waters serving as a source-water for drinking water, the maximum nitrate-N criterion is 10 mg/L. The discussion of nitrogen will focus primarily on NOx-N since this was the dominant form of nitrogen found and it can be linked to agricultural land use and wastewater inputs.

Median NOx-N concentrations at all sites ranged from 0.02 to 5.08 mg/L (Figure 14). The highest observed value in the Northern Region was just under 2 mg/L NOx-N, a single outlier found in the Popple River (Site 15). Most sites in the Northeast Region had maximum values less than 2 mg/L NOx-N except for the Kewaunee (Site 9) and Manitowoc rivers (Site 10) which had maximum values of 7 and 4 mg/L NOx-N, respectively. The Kewaunee River site had a median value of 4.28 mg/L NOx-N. The highest median values of NOx-N in West Central Region were at the Mississippi River at Lock and Dam 9 (Site 24), Red Cedar (Site 36), La Crosse (Site 37) and Trempealeau rivers (Site 38).

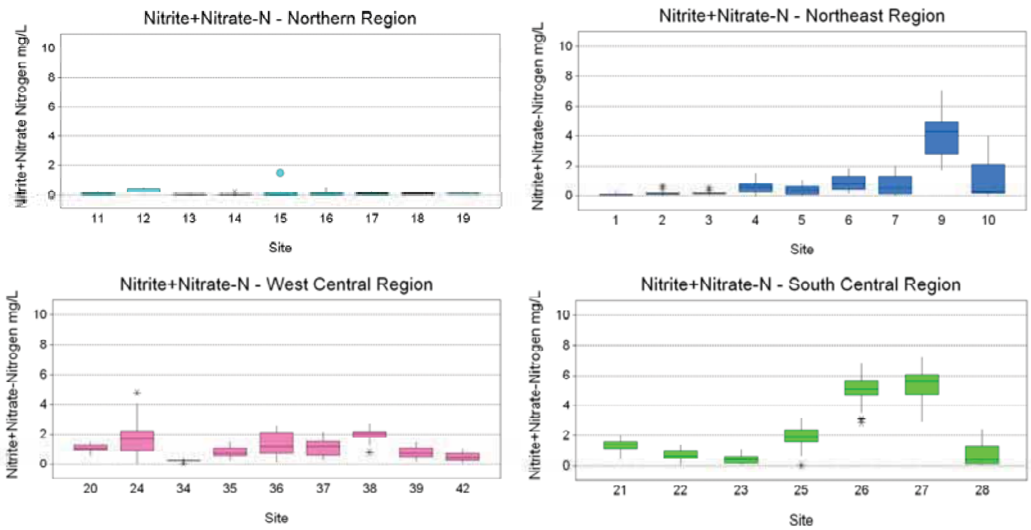
The highest overall nitrogen concentrations were observed in South Central Region in watersheds where agricultural land use is high and forest cover is low. In general, highest NOx concentrations increase as the percentage of agricultural land increases (Figure 15). The Baraboo (Site 21) and Rock rivers (Sites 25 & 28) had maximum NOx-N values near 2 mg/L. The highest nitrogen values in the State were observed in the Sugar (Site 26) and Pecatonica rivers (Site 27) with median NOx-N concentrations of 5.14 and 5.58 mg/L, respectively. The Sugar River site is downstream of a WWTP and likely influenced by the treatment system, whereas the Pecatonica River is predominately influenced by agricultural runoff and is often turbid during late spring, summer and early autumn (Jim Amrhein, WDNR, Pers. Comn.). In Southeast Region, the highest NOx-N concentrations (near 8 mg/L) were observed for the Root River (Site 29) and Fox (IL) River below Waukesha (Site 31). Site 31 is likely influenced by the Waukesha municipal wastewater treatment plant outfall located 5 miles upstream.

Median total ammonia nitrogen (NHx-N) concentrations were relatively low with the highest concentration (0.131 mg/L) found at the Fox River at Depere (Site 4) in Northeast Region (Figure 16). Moderately elevated NHx-N levels exceeding 0.5 mg/L occurred at two sites in West Central Region, Red Cedar (Site 36) and Black rivers (Site 39) and four sites in South Central Region, Baraboo (Site 21), Rock (Sites 25 and 28), Sugar (Site 26) and Pecatonica (Site 27) rivers. A majority of these higher NHx-N values occurred during January or February, a period when the in stream nitrification is low.

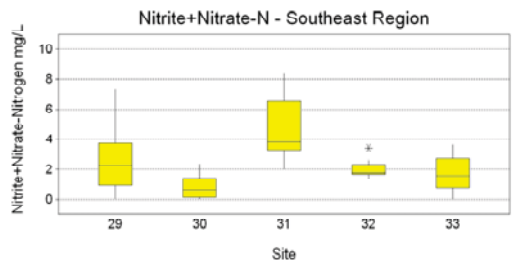
Phosphorus

Like nitrogen, phosphorus is an essential plant nutrient and is normally the major element affecting eutrophication in freshwater systems. Phosphorus can be measured in several forms, but total P and dissolved inorganic P (reactive or ortho-P) are the forms most commonly measured in water quality monitoring programs. Although dissolved inorganic P, is more directly available for plant uptake, this form of phosphorus may cycle quickly in aquatic systems and may often be assimilated by plants in excess of nutritional needs (luxury consumption). Phosphorus sources are similar to those reported for nitrogen. However, phosphorus tends to bind or adsorb to particulate material and is normally not found in high concentrations in groundwater.

The U.S. EPA has previously suggested a total phosphate phosphorus concentration of 0.1 mg/L P as a general goal for protection of flowing waters from “plant nuisances” (Mackenthun, 1973). National and state efforts are currently underway to develop more formal nutrient criteria for lakes and streams (USEPA, 1998).



Site No.	Site Description	Region	Sample Freq.	N	Median mg/L
1	Menominee R. at McAllister	NE	Qtr.	14	0.06
2	Oconto R. at Oconto	NE	Qtr.	14	0.14
3	Peshtigo R. at Peshtigo	NE	Qtr.	15	0.16
4	Fox R. at DePere	NE	Mon.	40	0.54
5	Fox R. at Neenah and Menasha	NE	Mon.	40	0.36
6	Wolf R. at New London	NE	Mon.	36	0.77
7	Fox R. at Oshkosh	NE	Mon.	40	0.49
8	Fox R. at Berlin	NE	Qtr.	1	
9	Kewaunee R. at Kewaunee	NE	Qtr.	7	4.28
10	Manitowoc R. at Manitowoc	NE	Qtr.	7	0.25
11	St. Croix R. at Danbury	NO	Qtr.	7	0.08
12	St. Croix R. at St. Croix Falls	NO	Qtr.	7	0.20
13	Bois Brule R. at Brule	NO	Qtr.	10	0.02
14	Bad R. at Odanah	NO	Qtr.	9	0.03
15	Popple R. at Fence	NO	Mon.	39	0.04
16	Wolf R. at Langlade	NO	Mon.	39	0.09
17	Wisconsin R. at Merril	NO	Mon.	40	0.10
18	Flambeau R. at Bruce	NO	Qtr.	4	0.12
19	Chippewa R. at Bruce	NO	Qtr.	4	0.16
20	Kickapoo R. at Stueben	WC	Mon.	44	1.05
21	Baraboo R. at Rowley Creek Br.	SC	Mon.	31	1.40
22	Wisconsin R. at Muscoda	SC	Mon.	35	0.66
23	Wisconsin R. at Wisconsin Dells	SC	Mon.	34	0.41
24	Mississippi R. at LD 9	WC	Mon.	26	1.71
25	Rock R. at Afton	SC	Mon.	37	1.90
26	Sugar R. at Broadhead	SC	Mon.	37	5.14
27	Pecatonica R. at Martintown	SC	Mon.	33	5.58
28	Rock R. at Watertown	SC	Mon.	37	0.38
29	Root R. at Johnson Park	SE	Mon.	31	2.29
30	Milwaukee R. at Estabrook Park	SE	Qtr.	12	0.65
31	Fox (IL) R. below Waukesha	SE	Qtr.	8	3.83
32	Fox (IL) R. near New Munster	SE	Qtr.	8	1.78
33	Sheboygan R. at Esslingen Park	SE	Mon.	43	1.60
34	Chippewa R. at Chippewa Falls	WC	Qtr.	15	0.27
35	Chippewa R. at Durand	WC	Mon.	42	0.73
36	Red Cedar R. at Menomonie	WC	Mon.	43	1.19
37	La Crosse R. near Mouth	WC	Mon.	22	1.19
38	Trempealeau R. at Dodge	WC	Mon.	42	2.03
39	Black R. at Galesville (Hwy 53)	WC	Mon.	40	0.74
40	Mississippi R. at LD 3	WC	Qtr.	0	
41	Mississippi R. at LD 4	WC	Qtr.	0	
42	Wisconsin R. at Biron	WC	Mon.	44	0.44



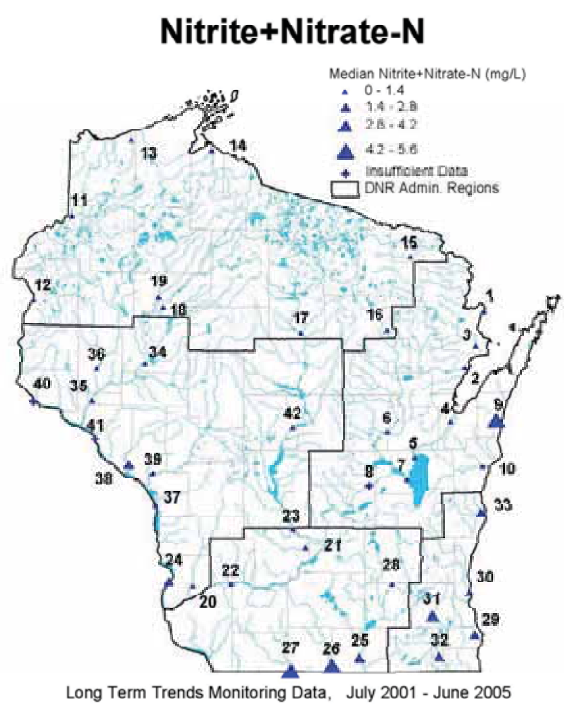


Figure 14. Nitrite+nitrate nitrogen concentrations at Wisconsin's long term trends sites.

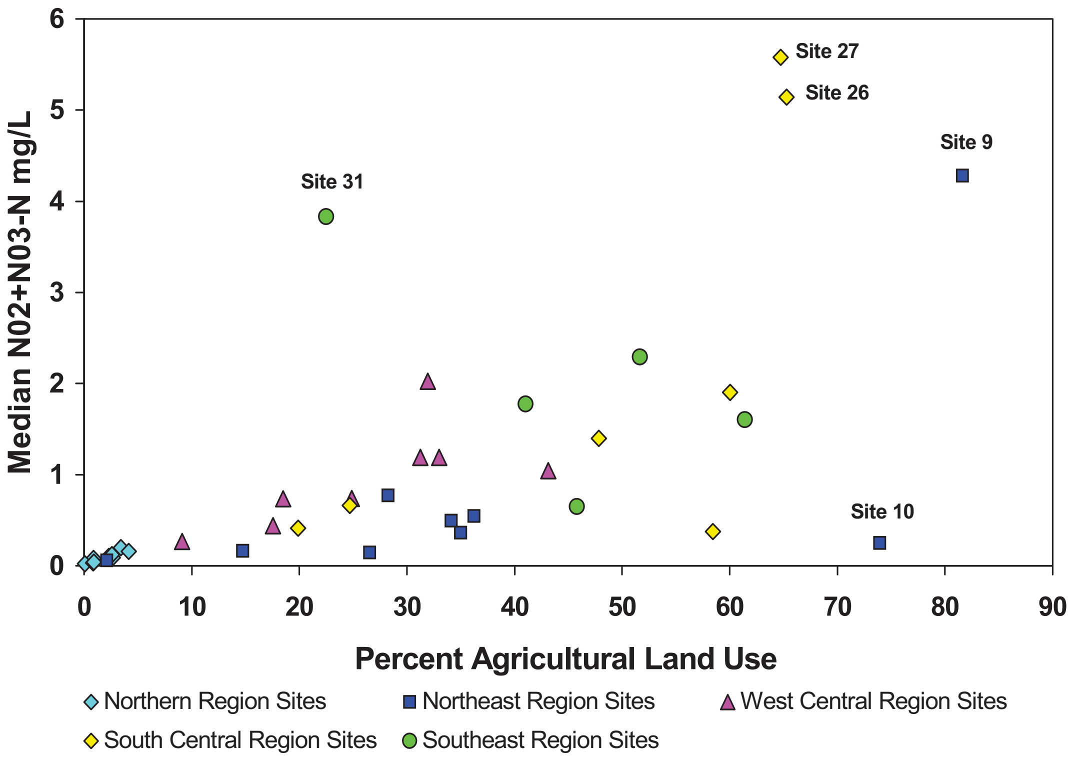


Figure 15. Relationship between median NOx concentrations and percent agricultural land cover at Wisconsin's long term trend sites.

Winter sampling - Sheboygan River at Esslingen Park, (John Masterson).

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Attachment E

BRRTS Results and Diagrams for VOC Contamination Sites

WDNR BUREAU FOR REMEDIATION AND REDEVELOPMENT TRACKING SYSTEM (BRRTS) [1]

BRRTS on the Web Search for VOC-Contaminated Sites

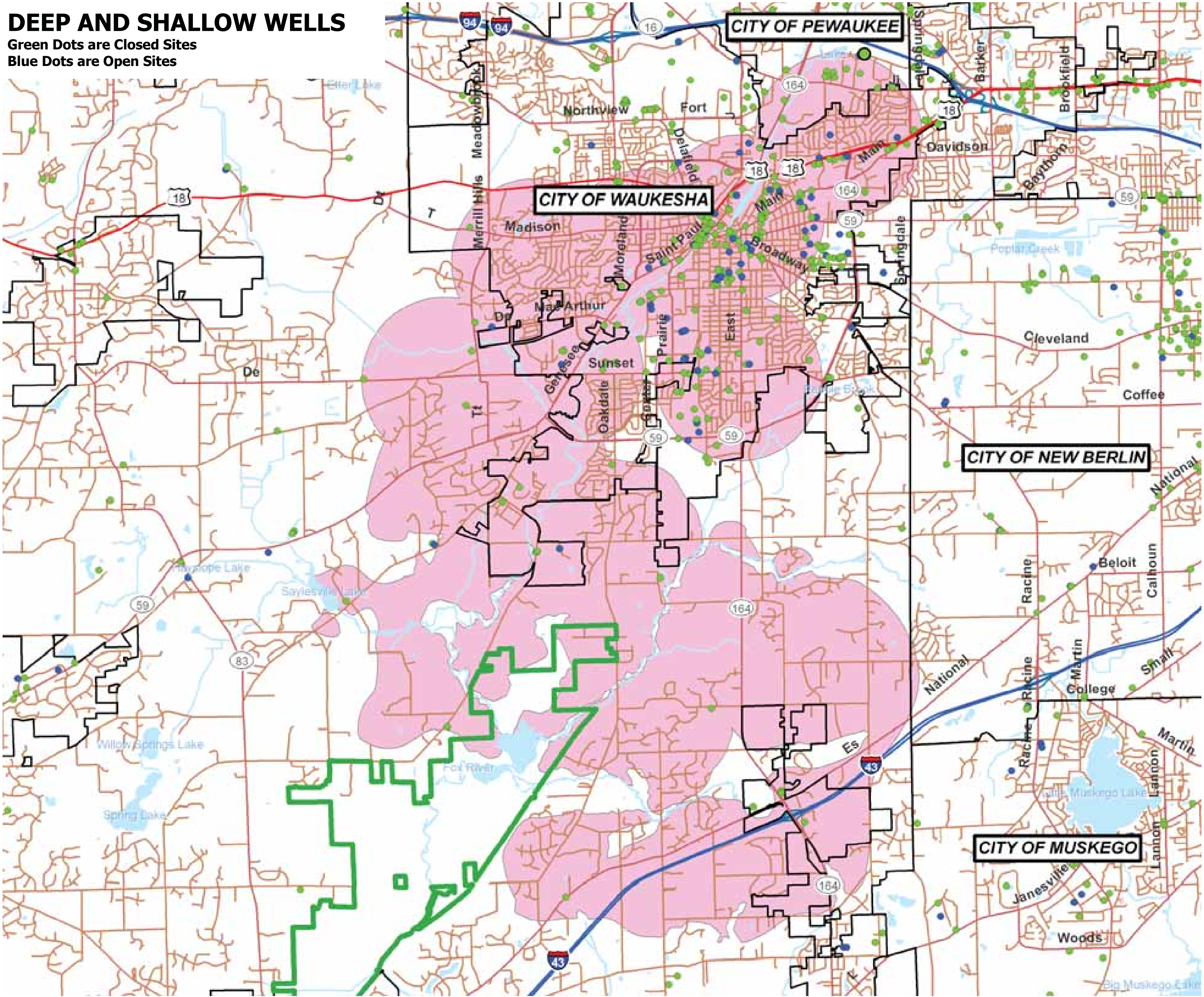
BRRTS No	Activity Name	Address	Municipality	Corresponding Alternative
02-68-543786	1541 N LAWNSDALE RD	1541 LAWNSDALE RD	WAUKESHA	Deep and Shallow Wells
02-68-000916	AKERMAN - FORMER/VME AM-FS	1005 PERKINS AVE	WAUKESHA	Deep and Shallow Wells
02-68-000841	PRAIRIE HOME CEMETERY	605 S PRAIRIE AVE	WAUKESHA	Deep and Shallow Wells
02-68-176424	RIDGEWAY DEVELOPMENT INC	902-906 W ST PAUL AVE	WAUKESHA	Deep and Shallow Wells
02-68-549253	EMERSON BUILDING	311-325 W ST PAUL AVE	WAUKESHA	Deep and Shallow Wells
02-68-001132	U S POSTAL SERVICE	300 E BROADWAY	WAUKESHA	Deep and Shallow Wells
02-68-305374	FABRICARE - FORMER	323 W SUNSET DR	WAUKESHA	Deep and Shallow Wells
03-68-174921	CARROLL COLLEGE SWARTHOUT DORMITORY	211 N EAST AVE	WAUKESHA	Deep and Shallow Wells
02-68-554922	CRETEX CONCRETE PRODUCTS MIDWEST INC LOT 2	2000 S WEST AVE	WAUKESHA	Deep and Shallow Wells
02-68-000841	PRAIRIE HOME CEMETERY	605 S PRAIRIE AVE	WAUKESHA	Deep and Shallow Wells
02-68-556342	5-ACRE PARCEL SOUTH OF ARCADIAN AVENUE	LOT 1 OF CSM	WAUKESHA	Deep and Shallow Wells
02-68-543786	1541 N LAWNSDALE RD	1541 LAWNSDALE RD	WAUKESHA	Fox River Alluvium & Shallow
02-68-543786	1541 N LAWNSDALE RD	1541 LAWNSDALE RD	WAUKESHA	2MGD Near Vernon Marsh
02-68-000916	AKERMAN - FORMER/VME AM-FS	1005 PERKINS AVE	WAUKESHA	Existing Deep Wells Waukesha
02-68-000841	PRAIRIE HOME CEMETERY	605 S PRAIRIE AVE	WAUKESHA	Existing Deep Wells Waukesha
02-68-176424	RIDGEWAY DEVELOPMENT INC	902-906 W ST PAUL AVE	WAUKESHA	Existing Deep Wells Waukesha
02-68-549253	EMERSON BUILDING	311-325 W ST PAUL AVE	WAUKESHA	Existing Deep Wells Waukesha
02-68-001132	U S POSTAL SERVICE	300 E BROADWAY	WAUKESHA	Existing Deep Wells Waukesha
02-68-305374	FABRICARE - FORMER	323 W SUNSET DR	WAUKESHA	Existing Deep Wells Waukesha
03-68-174921	CARROLL COLLEGE SWARTHOUT DORMITORY	211 N EAST AVE	WAUKESHA	Existing Deep Wells Waukesha
02-68-554922	CRETEX CONCRETE PRODUCTS MIDWEST INC LOT 2	2000 S WEST AVE	WAUKESHA	Existing Deep Wells Waukesha
02-68-000841	PRAIRIE HOME CEMETERY	605 S PRAIRIE AVE	WAUKESHA	Existing Deep Wells Waukesha
02-68-556342	5-ACRE PARCEL SOUTH OF ARCADIAN AVENUE	LOT 1 OF CSM	WAUKESHA	Existing Deep Wells Waukesha
03-68-001873	HEBERER GEORGE PROPERTY	S46 W22051 TANSDALE CT	WAUKESHA	Dolomite Wells
02-68-240922	ACTION EXPRESS	2128 S WEST AVE	WAUKESHA	Dolomite Wells

04-68-211001	SAFETY-KLEEN- WAUKESHA	2200 S WEST AVE	WAUKESHA	Dolomite Wells
04-68-211990	SAFETY-KLEEN SYSTEMS INC - WAUKESHA	2200 S WEST AVE	WAUKESHA	Dolomite Wells
04-68-254069	TANK TRANSPORT	2200 S WEST AVE	WAUKESHA	Dolomite Wells
04-68-541421	SAFETY-KLEEN SYSTEMS INC	2200 S WEST AVE	WAUKESHA	Dolomite Wells
02-68-000916	AKERMAN - FORMER/VME AM-FS	1005 PERKINS AVE	WAUKESHA	Quarries
02-68-531730	QUAD GRAPHICS INC	W224 N3322 DUPLAINVILLE SITE 1	PEWAUKEE	Quarries
04-68-552430	ROUNDYS SUPERMARKETS INC SPILL	1111 E DELAFIELD RD	OCONOMOWOC	Western Unconfined Deep Wells
04-68-555965	ROUNDYS SUPERMARKETS INC SPILL	1111 E DELAFIELD RD	OCONOMOWOC	Western Unconfined Deep Wells

[1] This list was compiled by comparing a list of open or conditionally-closed VOC contamination sites for Waukesha County – resulting from an advanced search of the BRRTS on the Web (BOTW) online database – to a list of contaminated sites derived from a WDNR GIS layer. Some sites for a given alternative were also searched for within the BOTW database based on the facility identification (FID) number. This list is not exhaustive and therefore does not include *all* VOC-contaminated sites within the 1-foot drawdown or 1-mile radius of a well. However, it does indicate that VOC-contaminated sites are present within the 1-foot drawdown or 1-mile radius of each water source alternative, except for Lake Michigan.

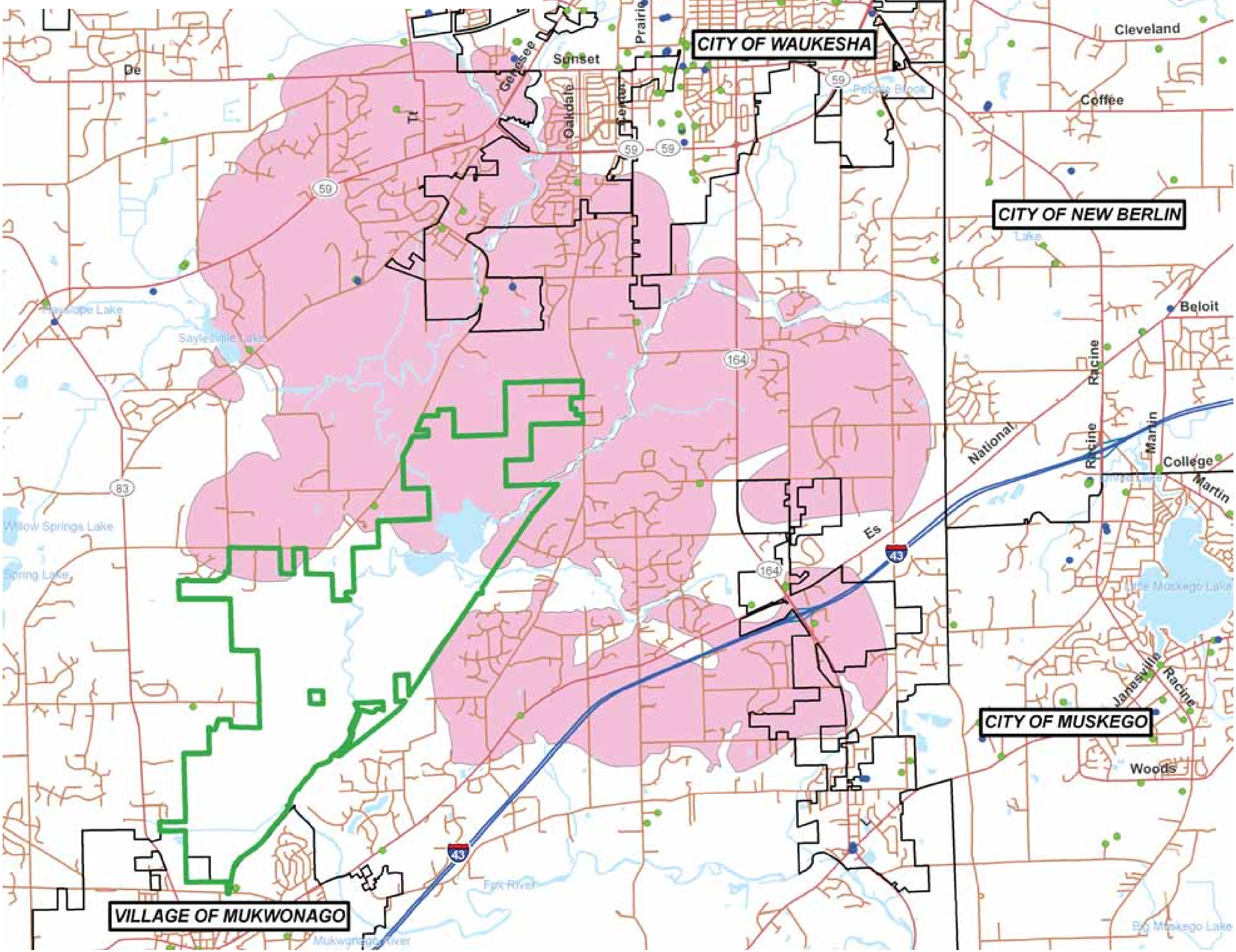
DEEP AND SHALLOW WELLS

Green Dots are Closed Sites
Blue Dots are Open Sites



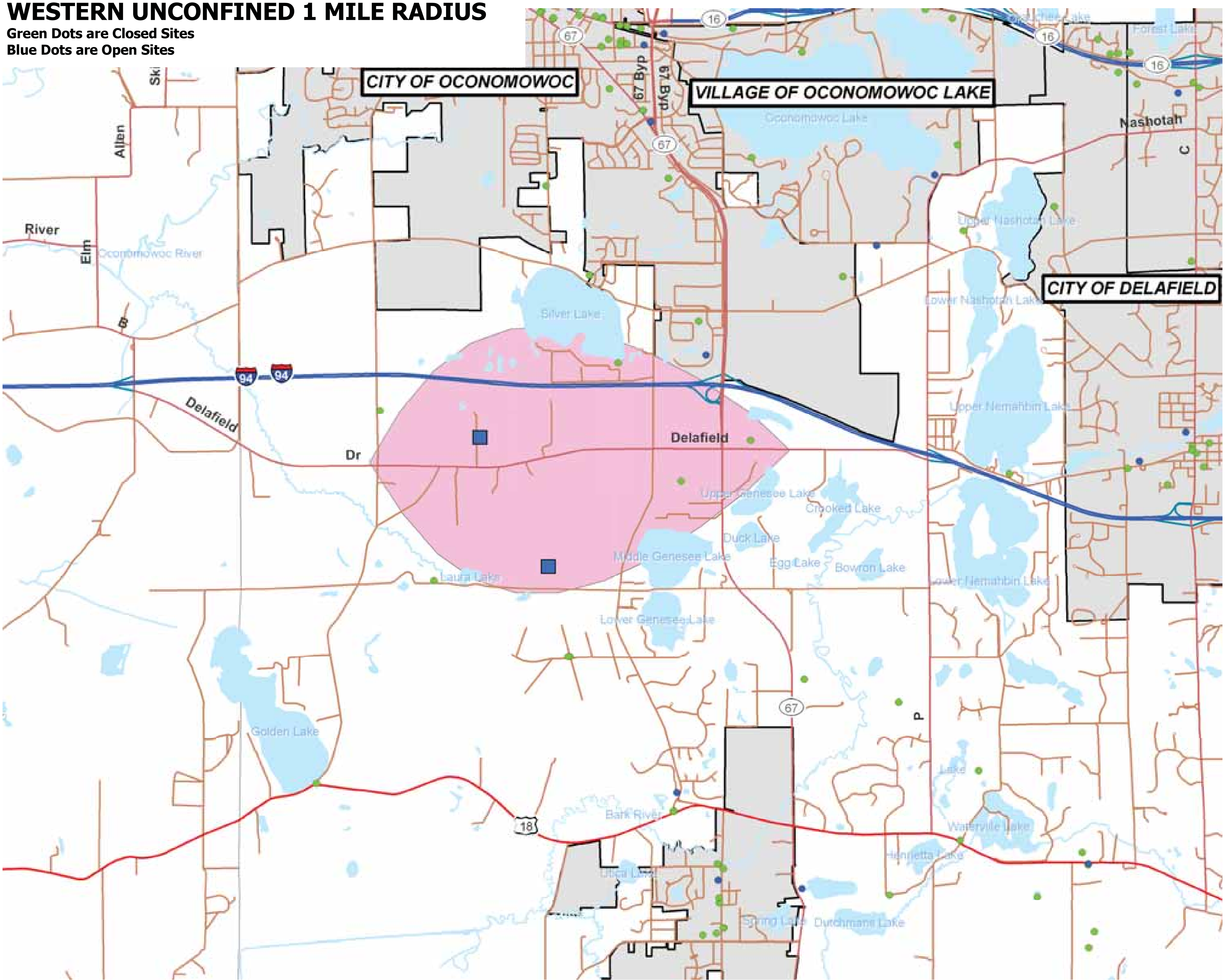
SHALLOW WELLS FOX RIVER ALLUVIUM

Green Dots are Closed Sites
Blue Dots are Open Sites



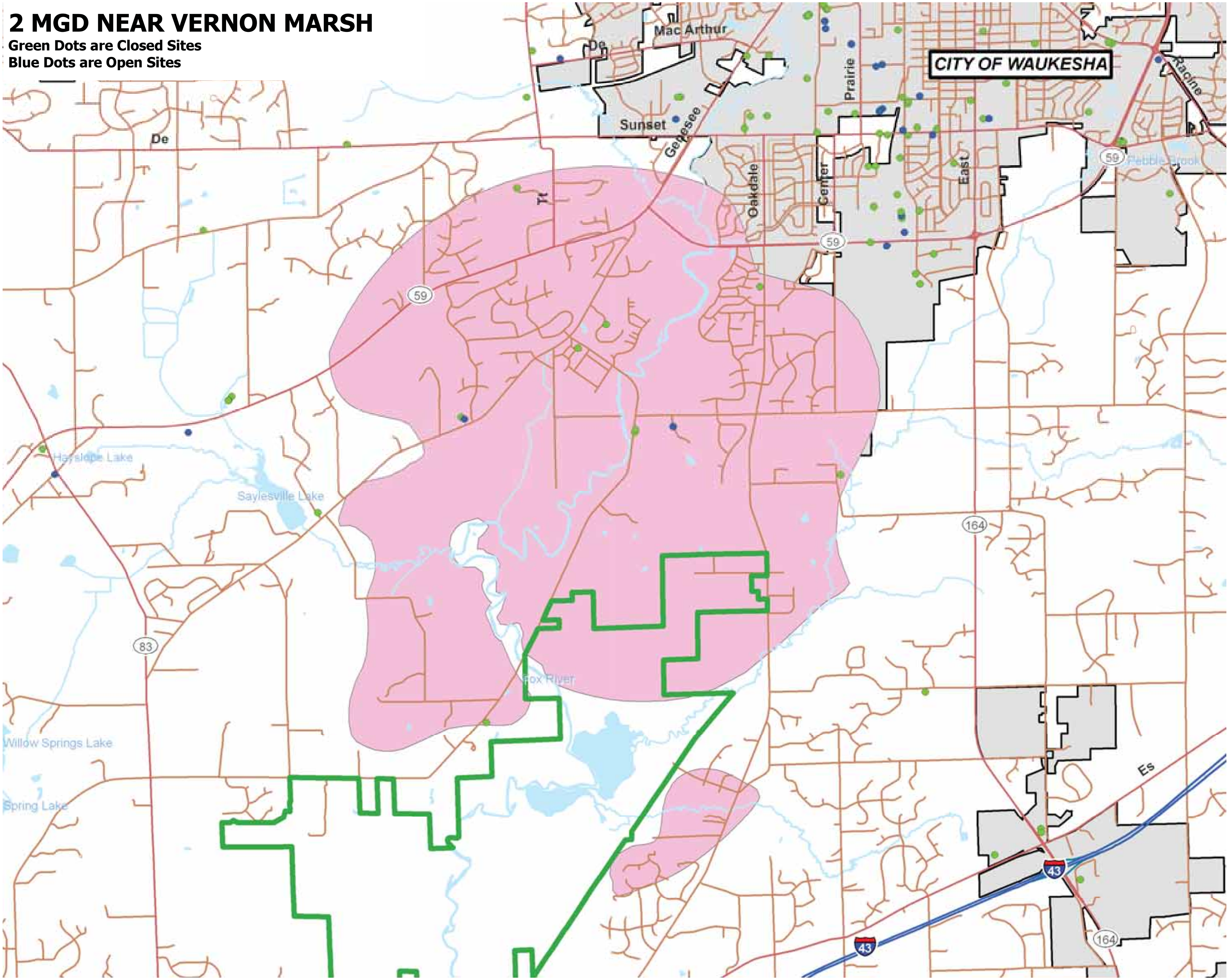
WESTERN UNCONFINED 1 MILE RADIUS

Green Dots are Closed Sites
Blue Dots are Open Sites



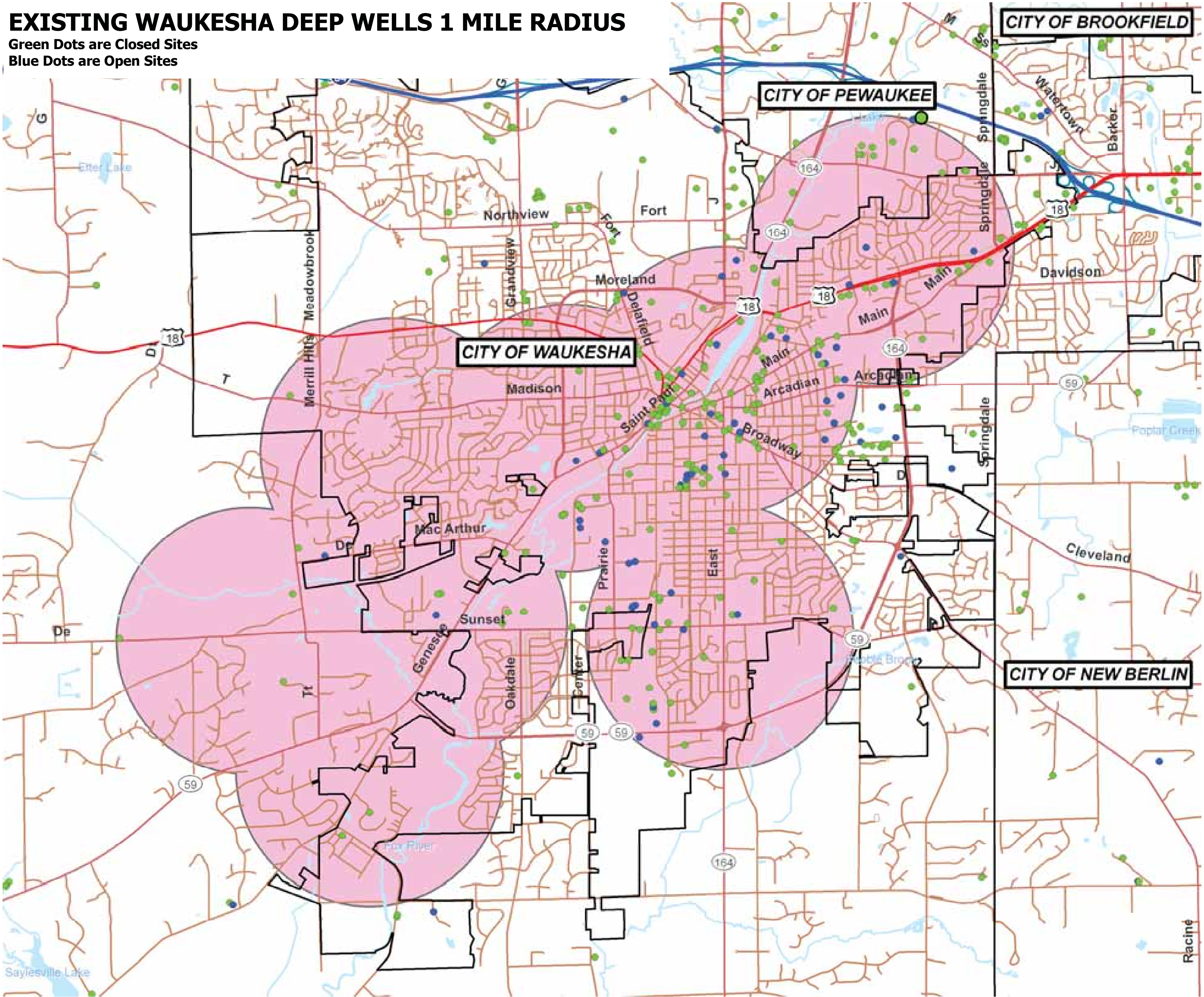
2 MGD NEAR VERNON MARSH

Green Dots are Closed Sites
Blue Dots are Open Sites



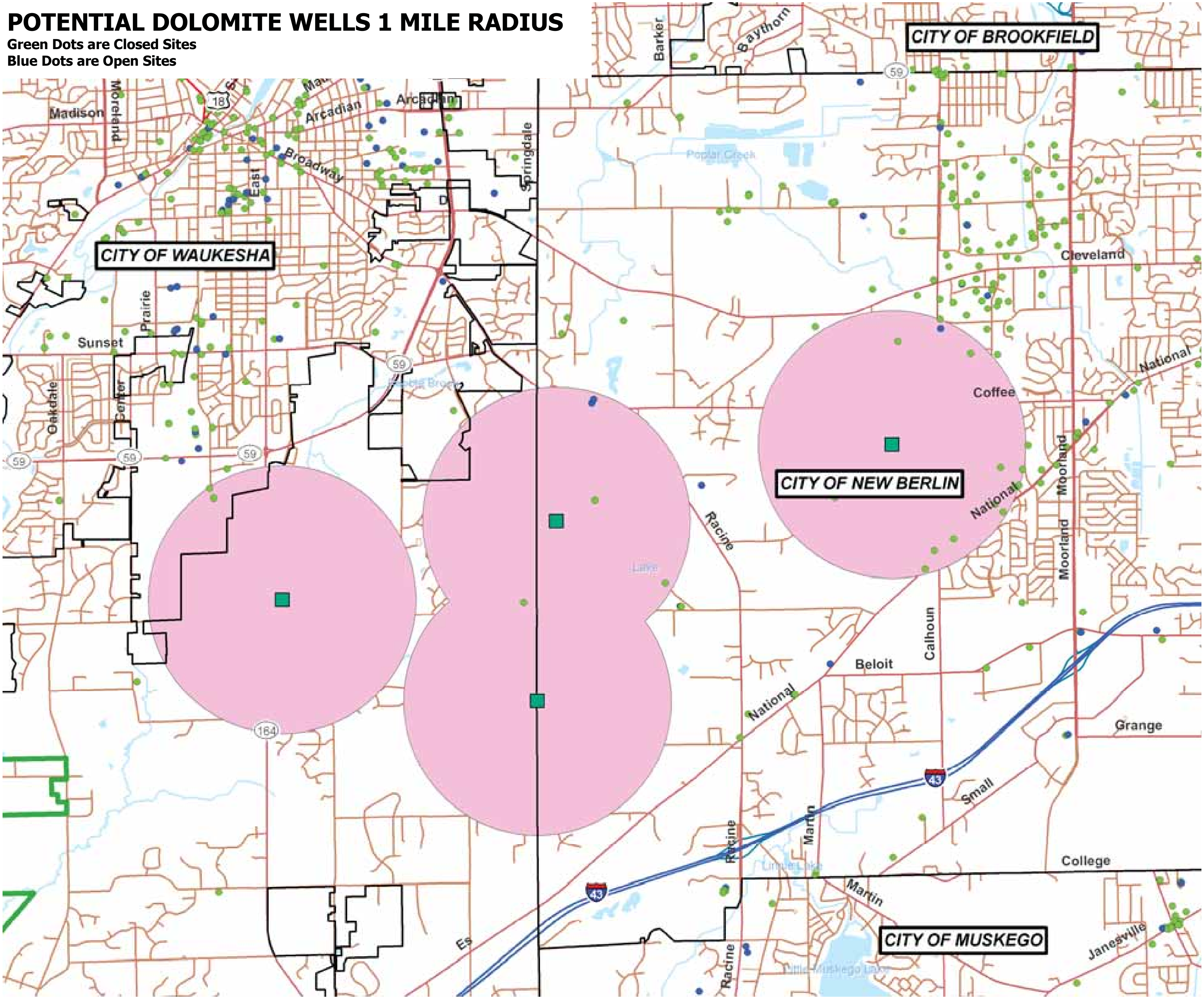
EXISTING WAUKESHA DEEP WELLS 1 MILE RADIUS

Green Dots are Closed Sites
Blue Dots are Open Sites



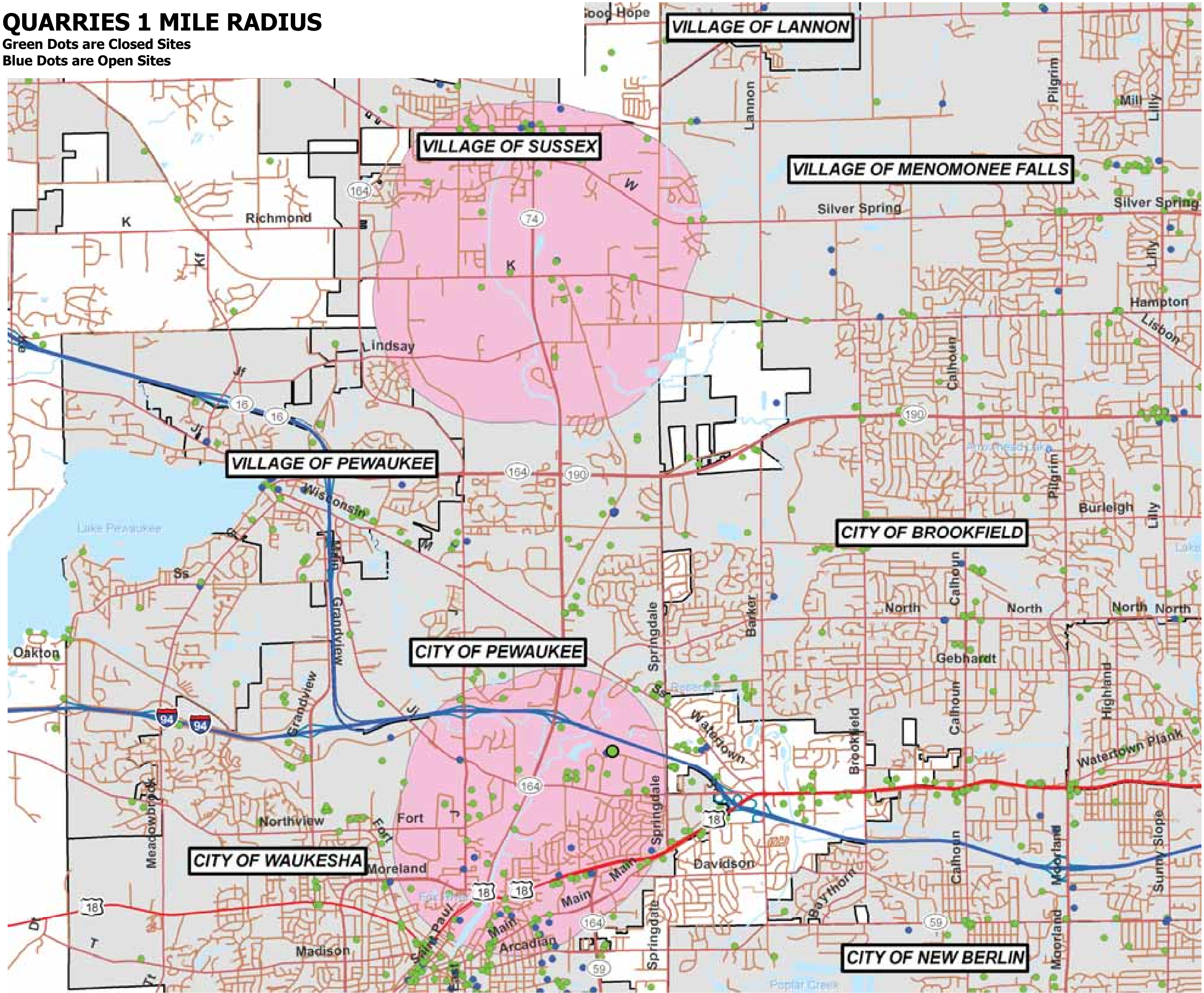
POTENTIAL DOLOMITE WELLS 1 MILE RADIUS

Green Dots are Closed Sites
Blue Dots are Open Sites



QUARRIES 1 MILE RADIUS

Green Dots are Closed Sites
Blue Dots are Open Sites



Attachment F

Results and Diagrams for Synthetic Organic Compound Data Analysis

BULK STORAGE[1]

Case ID	Case Name	Premise ID	Address	City	County Name	Zip Code	Alternative
121	DELUCA & HARTMAN CONSTRUCTION INC	1825	W234S6650 BIG BEND DR	WAUKESHA	WAUKESHA	53189-	DEEP AND SHALLOW 1 FOOT DRAW DOWN
115	ALL GREEN CORPORATION	6475	206 TRAVIS LN UNIT #4	WAUKESHA	WAUKESHA	53189-	EXISTING WAUKESHA DEEP WELLS - 1 MILE RADIUS
121	DELUCA & HARTMAN CONSTRUCTION INC	1825	W234S6650 BIG BEND DR	WAUKESHA	WAUKESHA	53189-	SHALLOW WELLS AND FOX RIVER ALLUVIUM 1 FT DRAW DOWN
139	SCOTTS COMPANY LLC THE	13948	820 CORPORATE CT	WAUKESHA	WAUKESHA	53188	SHALLOW WELLS AND FOX RIVER ALLUVIUM 1 FT DRAW DOWN
NONE	NONE	NONE	NONE	NONE	NONE	NONE	WESTERN UNCONFINED 1 FOOT DRAW DOWN AT 10 MGD
NONE	NONE	NONE	NONE	NONE	NONE	NONE	2 MGB NEAR VERNON MARSH 1 FOOT DRAW DOWN
NONE	NONE	NONE	NONE	NONE	NONE	NONE	POTENTIAL DOLOMITE WELLS 1 MILE RADIUS
140	TRUGREEN LIMITED PARTNERSHIP	3119	N8W22550 JOHNSON DR	WAUKESHA	WAUKESHA	53186	QUARRIES 1 MILE RADIUS

[1] Bulk storage sites for synthetic organic compounds were evaluated from DATCP and GIS analyses performed by the Waukesha Water Utility.

LONG-TERM CLEAN-UP SITES[2]

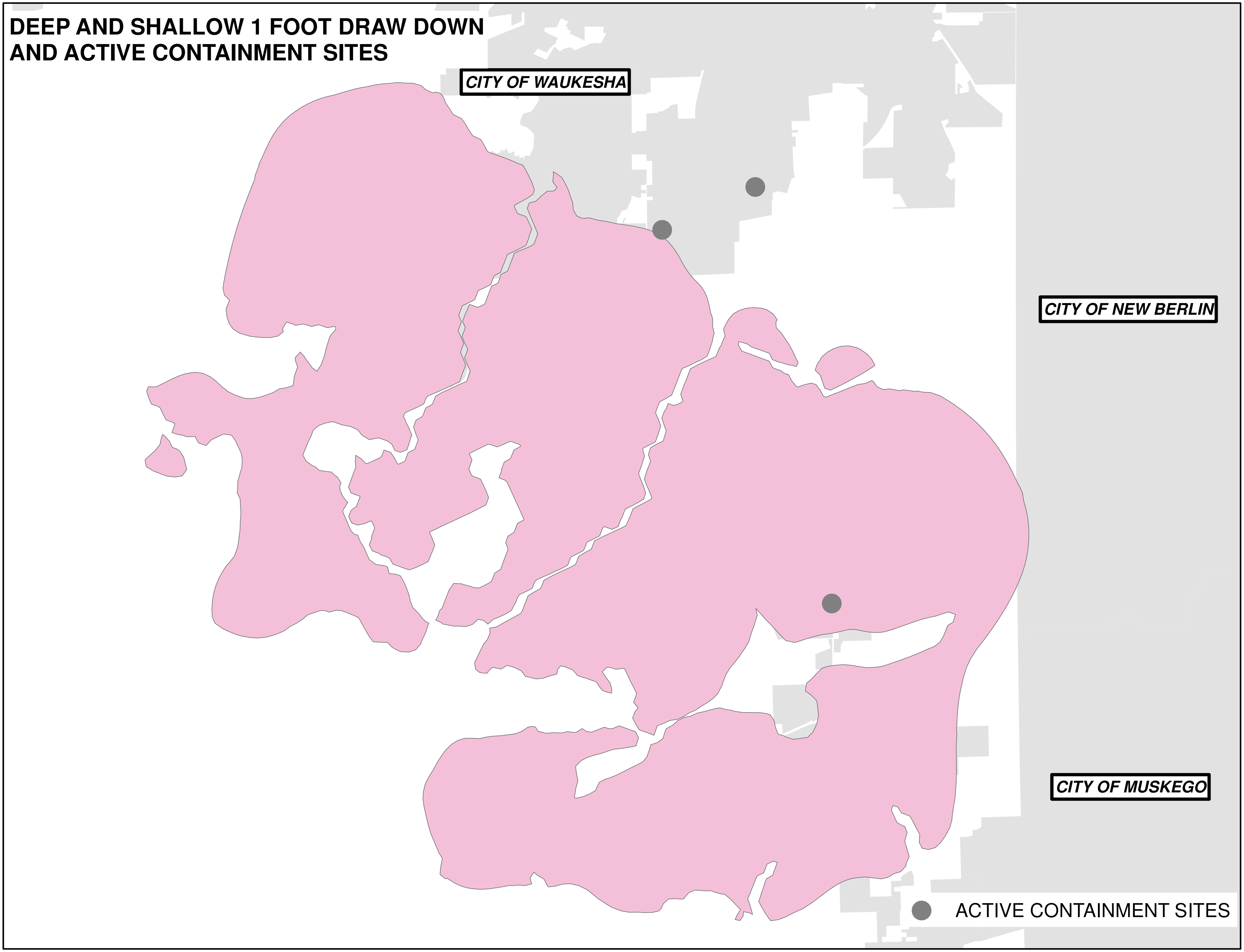
Case ID	Case Name	Premise ID	Address	City	County Name	Zip Code	Status
92410111101	OCONOMOWOC GOLF CLUB	005096	5261 BROWN ST	OCONOMOWOC	WAUKESHA	53066	Closed Remediation Case
05410021801	SCOTTS LAWN SERVICE	009759	N59W16600 GREENWAY CIR A	MENOMONEE FALLS	WAUKESHA	53051	Closed Remediation Case
97410030601	PARKSIDE NURSERY	004327	S69W14105 TESS CORNERS DR	MUSKEGO	WAUKESHA	53149	Closed Remediation Case
99424092301	HORN FEEDS INC	000429	728 CLARENDON AVE	MUKWONAGO	WAUKESHA	53149	Active Remediation Case
94402112301	ROBERT MAJESKI	005082	S62W30507 COUNTY ROAD X	MUKWONAGO	WAUKESHA	53149	Investigated, No Action Required (Closed)

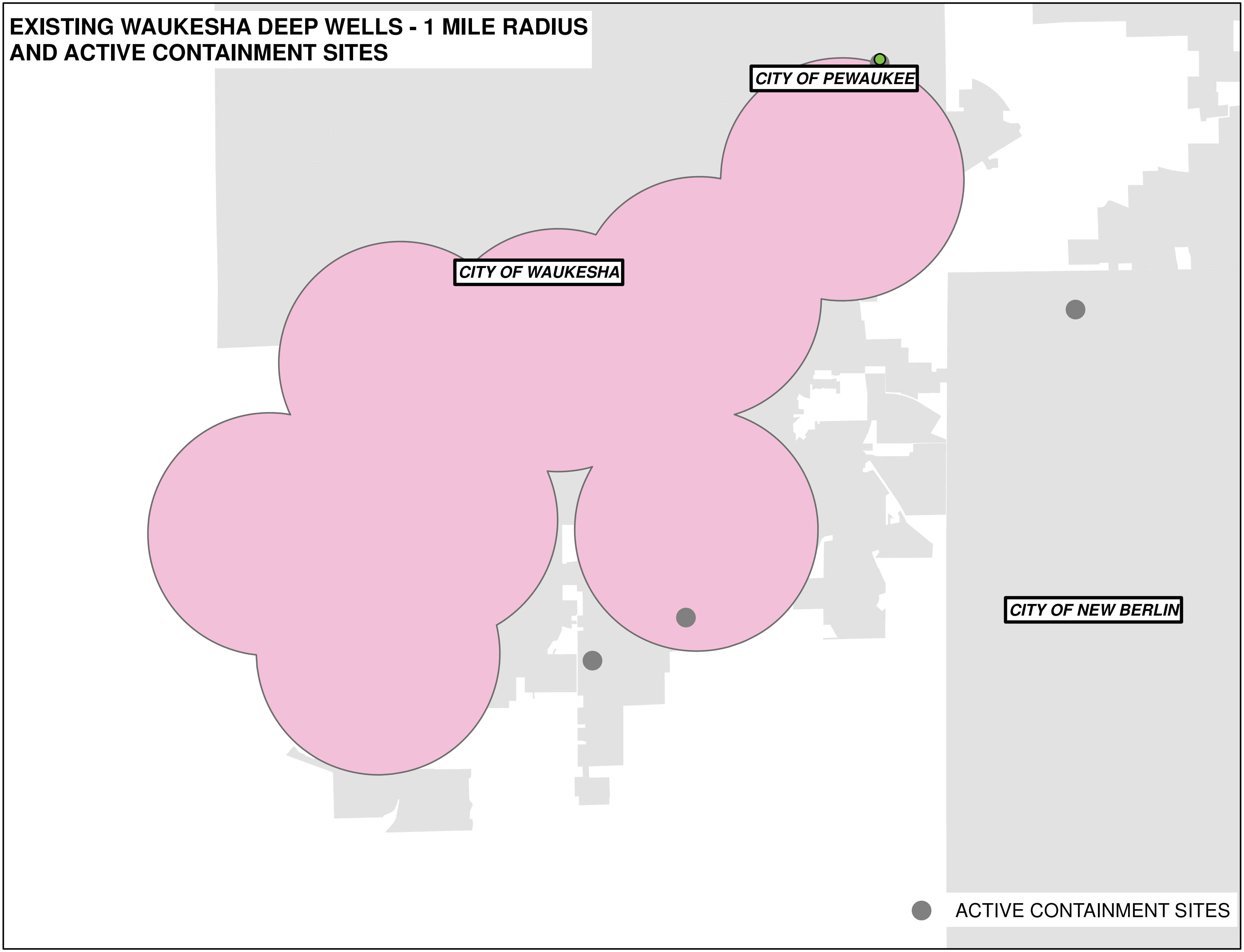
[2] Long-term clean-up sites for synthetic organic compounds were based on comparision of the known zip codes of cleanup sites with a zip code list derived from a Waukesha Water Utility GIS analysis, indicating the zip codes which overlap the 1-foot drawdown contour or lie within the 1-mile radius of the water supply source. The clean-up sites may have been active or closed cases; both were included. Zip codes were used for this analysis because exact coordinates were not available for each site and zip codes were available for all sites.

SPILLS[3]

Case ID	Case Name	Premise ID	Address	City	County Name	Zip Code	Status
04410080301	DEANGELO BROS INC	011639	SUNNYSLOPE RD	NEW BERLIN	WAUKESHA	53151	Closed Spill Cases
05431040501	TRUGREEN LTD PARTNERSHIP	003119	N8W22550 JOHNSON DR	WAUKESHA	WAUKESHA	53186	Open Spill Cases
07431051601	UNITED COOP	013486	W220N8966 TOWNLINE RD	MENOMONEE FALLS	WAUKESHA	53051	Closed Spill Cases
08410050802	WAUKESHA CO HWY DIV	014292	W269N1430 MEADOWBROOK RD	PEWAUKEE	WAUKESHA	53072	Closed Spill Cases
11410050902	TRUGREEN LTD	003119	N8W22550 JOHNSON DR	WAUKESHA	WAUKESHA	53186	Open Spill Cases
11556061701	TRUGREEN LTD	003119	N8W22550 JOHNSON DR	WAUKESHA	WAUKESHA	53186	Open Spill Cases
91410041001	MERRILL HILLS COUNTRY CLUB	006322	W270S3425 MERRILL HILLS RD	WAUKESHA	WAUKESHA	53188-	Closed Spill Cases
94414072003	MANEY	005256	STATE ROAD 164	BIG BEND	WAUKESHA	53103-	Closed Spill Cases
94402112301	ROBERT MAJESKI	005082	S62W30507 COUNTY ROAD X	MUKWONAGO	WAUKESHA	53149-	Closed Spill Cases
97402050901	JEFFERSON CTY FARMCO COOP	000356	N87W36145 MAPLETON ST	OCONOMOWOC	WAUKESHA	53066	Closed Spill Cases
98402052001	WILLIAMS LLOYD	005333	ELMHURST DR	WAUKESHA	WAUKESHA	53188-	Closed Spill Cases
99410060802	MJS LANDSCAPING	001290	W185N7487 NARROW LN	MENOMONEE FALLS	WAUKESHA	53051	Closed Spill Cases
99556092101	ASPLUNDH TREE EXPERTS	007428	EXIT 294 WB INTERSTATE 94	WAUKESHA	WAUKESHA	53186-	Closed Spill Cases

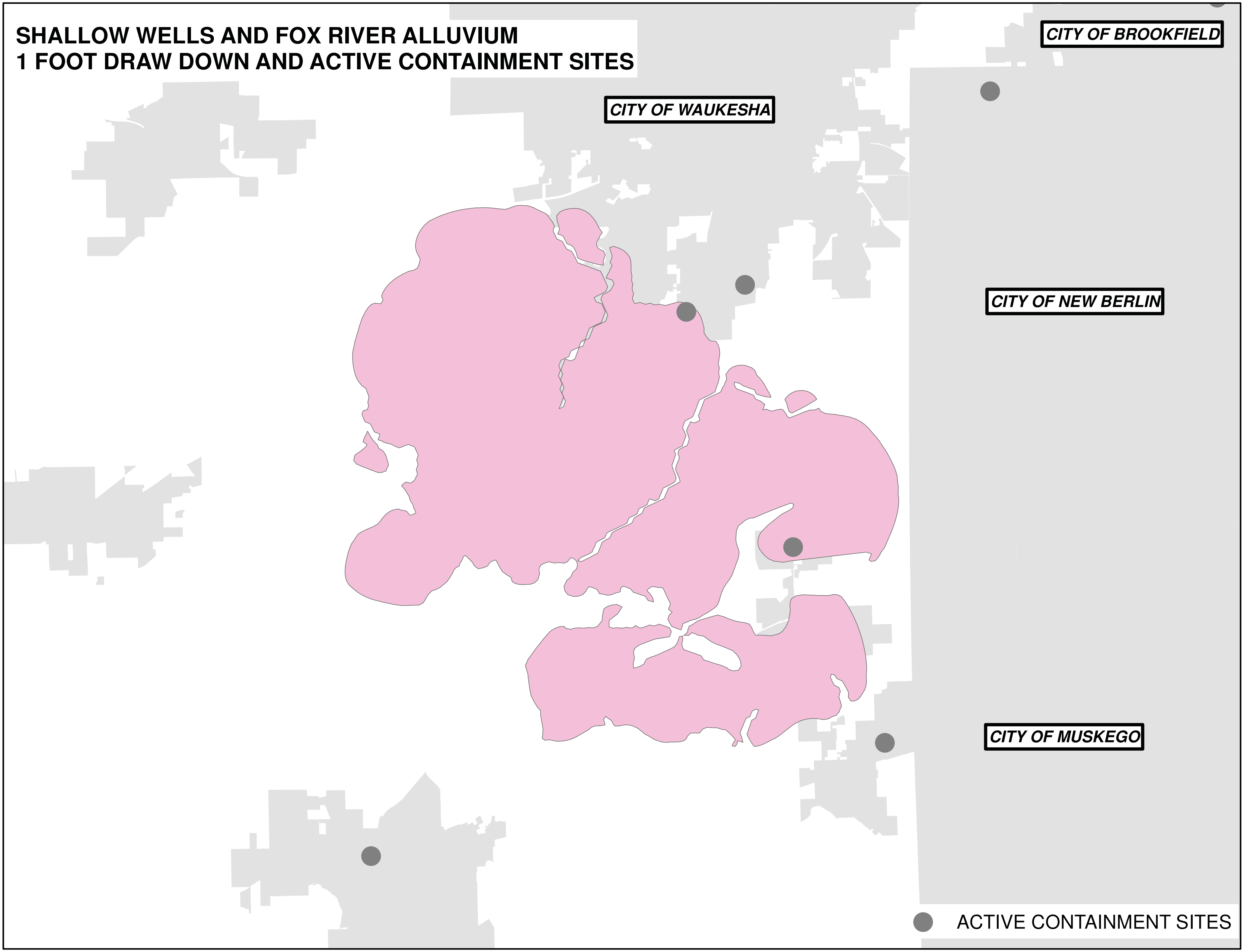
[3] Spill sites for synthetic organic compounds were based on comparision of the known zip codes of spill sites with a zip code list derived from a Waukesha Water Utility GIS analysis, indicating the zip codes which overlap the 1-foot drawdown contour or lie within the 1-mile radius of the water supply source. The spill sites may have been active or closed cases; both were included. Zip codes were used for this analysis because exact coordinates were not available for each site and zip codes were available for all sites.

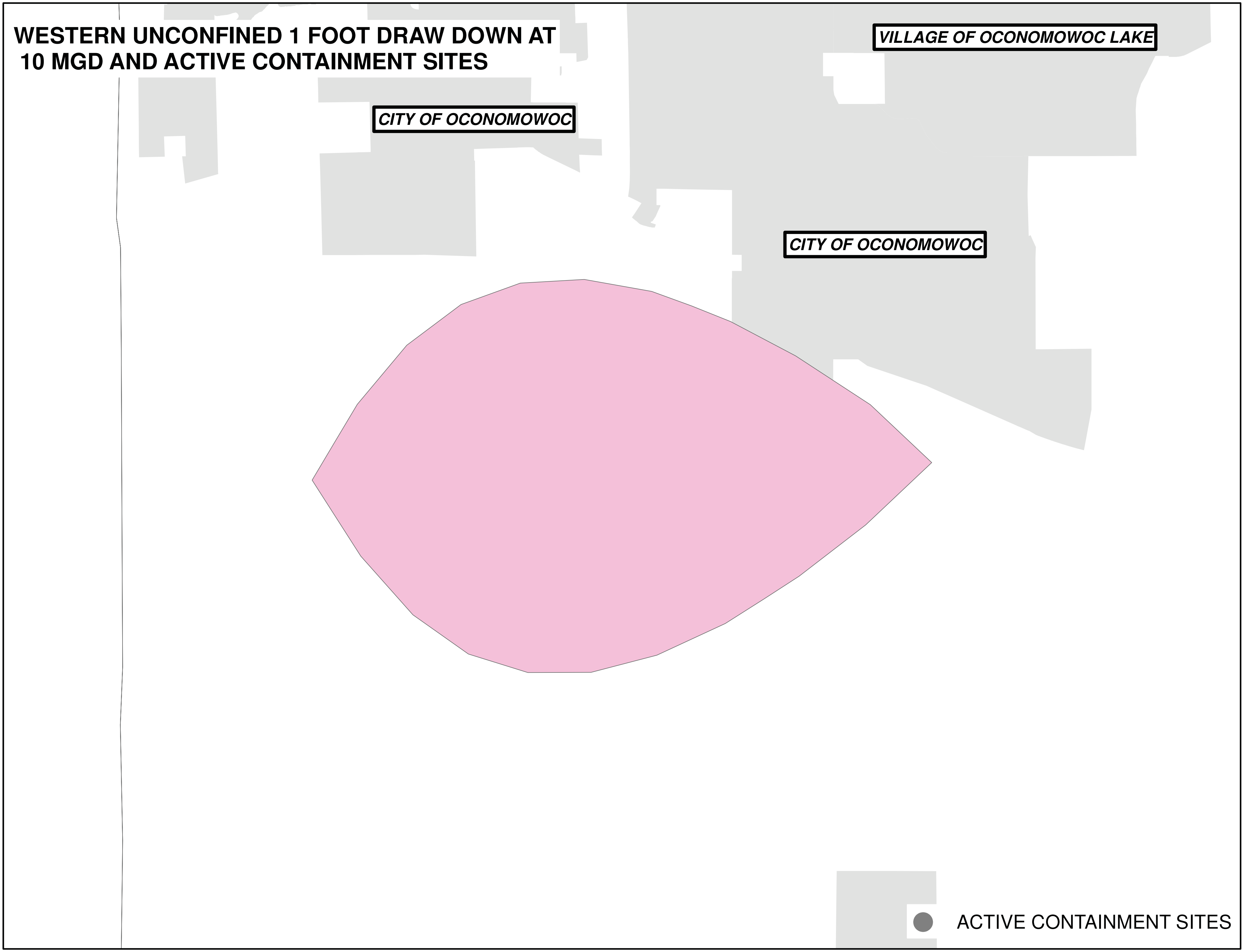

DEEP AND SHALLOW 1 FOOT DRAW DOWN
AND ACTIVE CONTAINMENT SITES
CITY OF WAUKESHA
CITY OF NEW BERLIN
CITY OF MUSKEGO
ACTIVE CONTAINMENT SITES



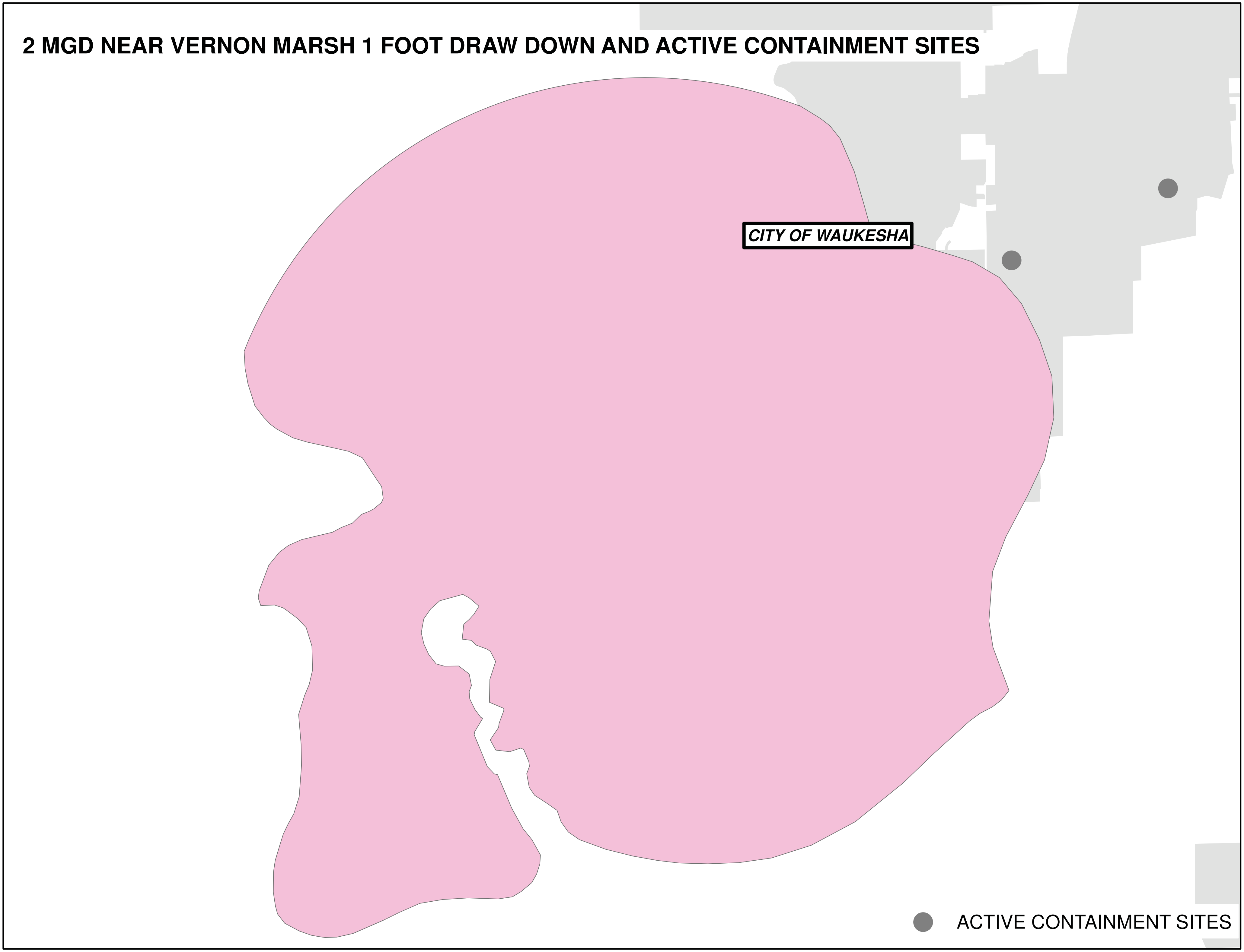
EXISTING WAUKESHA DEEP WELLS - 1 MILE RADIUS
AND ACTIVE CONTAINMENT SITES
CITY OF PEWAUKEE
CITY OF WAUKESHA
CITY OF NEW BERLIN
ACTIVE CONTAINMENT SITES

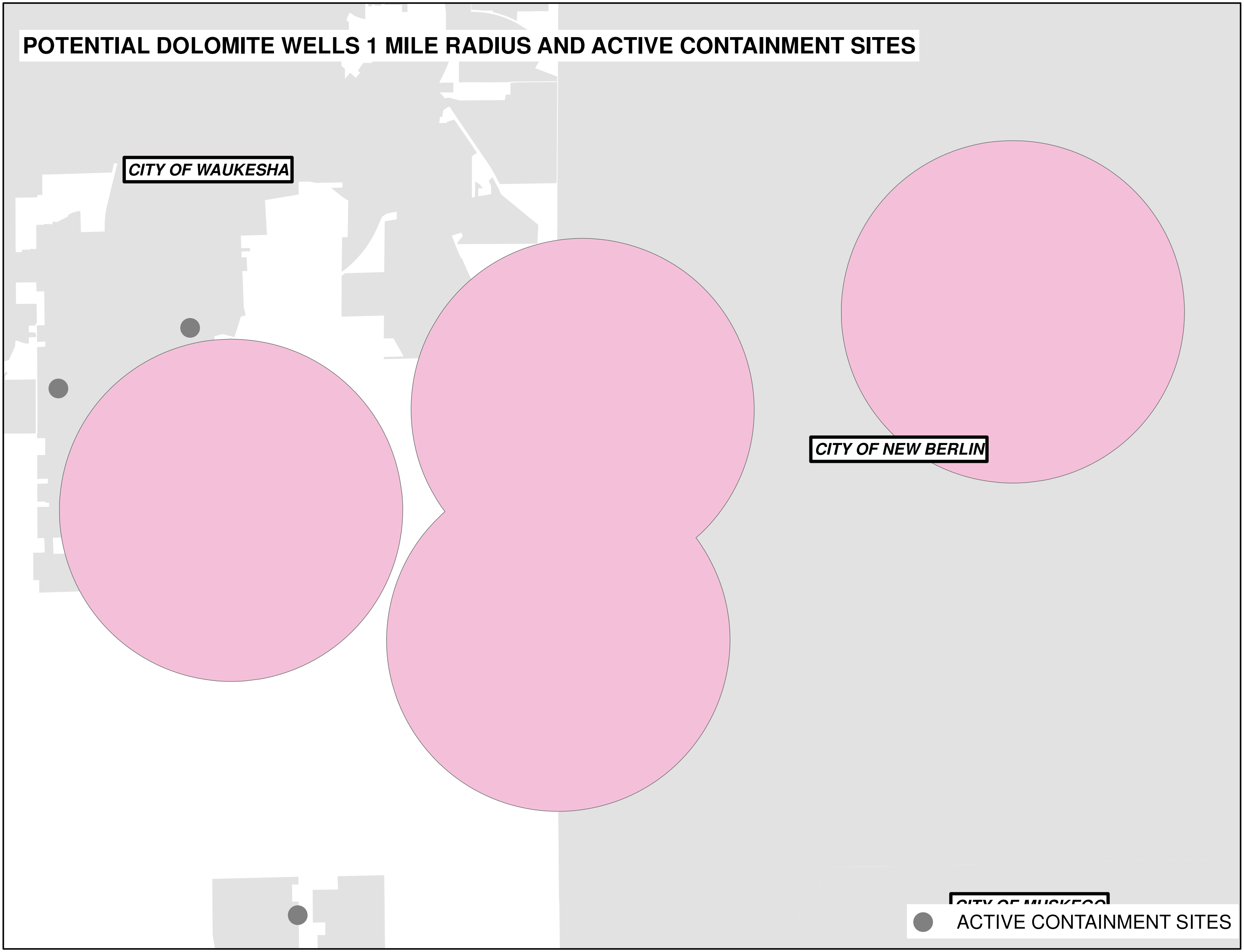
SHALLOW WELLS AND FOX RIVER ALLUVIUM
1 FOOT DRAW DOWN AND ACTIVE CONTAINMENT SITES

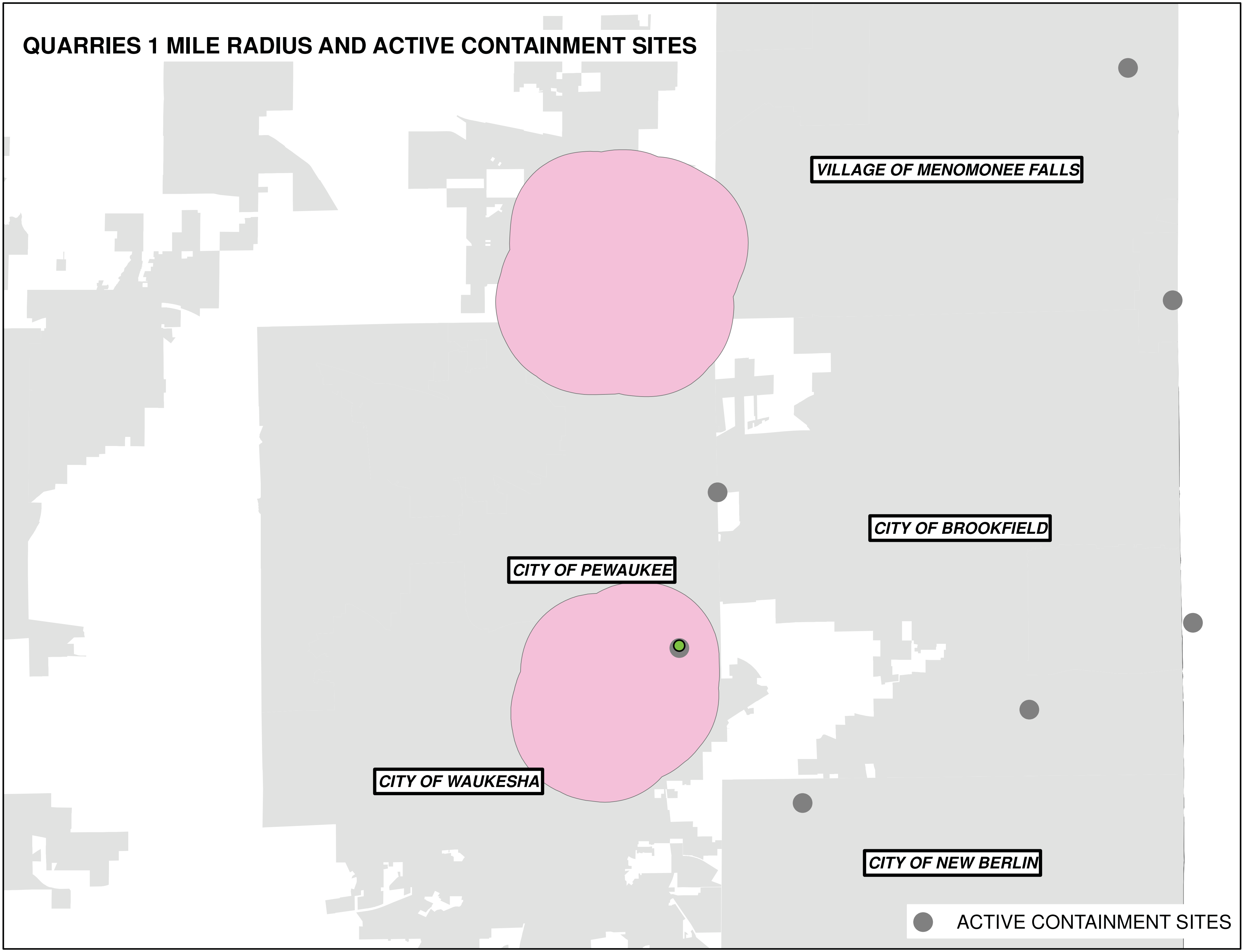


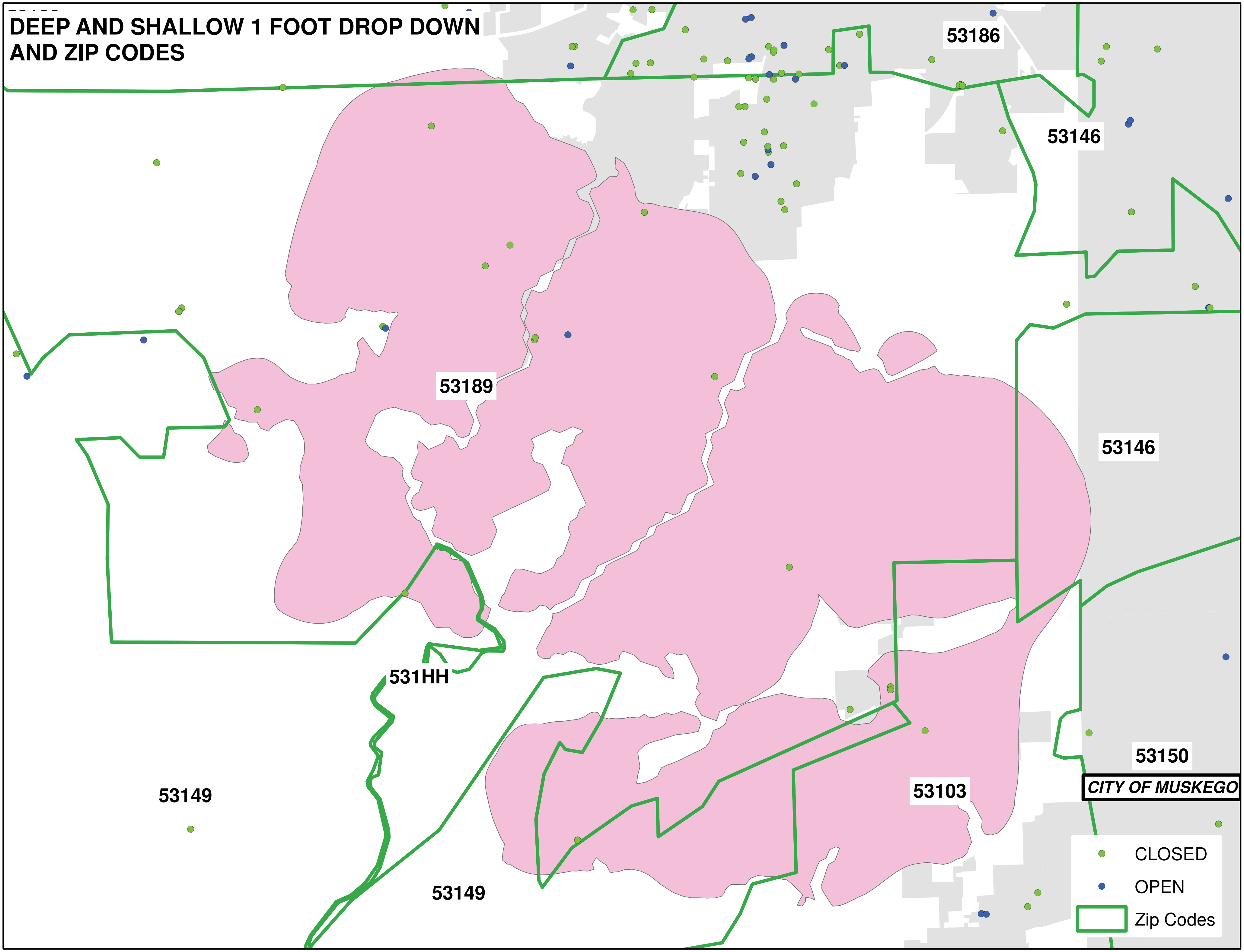

WESTERN UNCONFINED 1 FOOT DRAW DOWN AT
10 MGD AND ACTIVE CONTAINMENT SITES
VILLAGE OF OCONOMOWOC LAKE
CITY OF OCONOMOWOC
CITY OF OCONOMOWOC
ACTIVE CONTAINMENT SITES

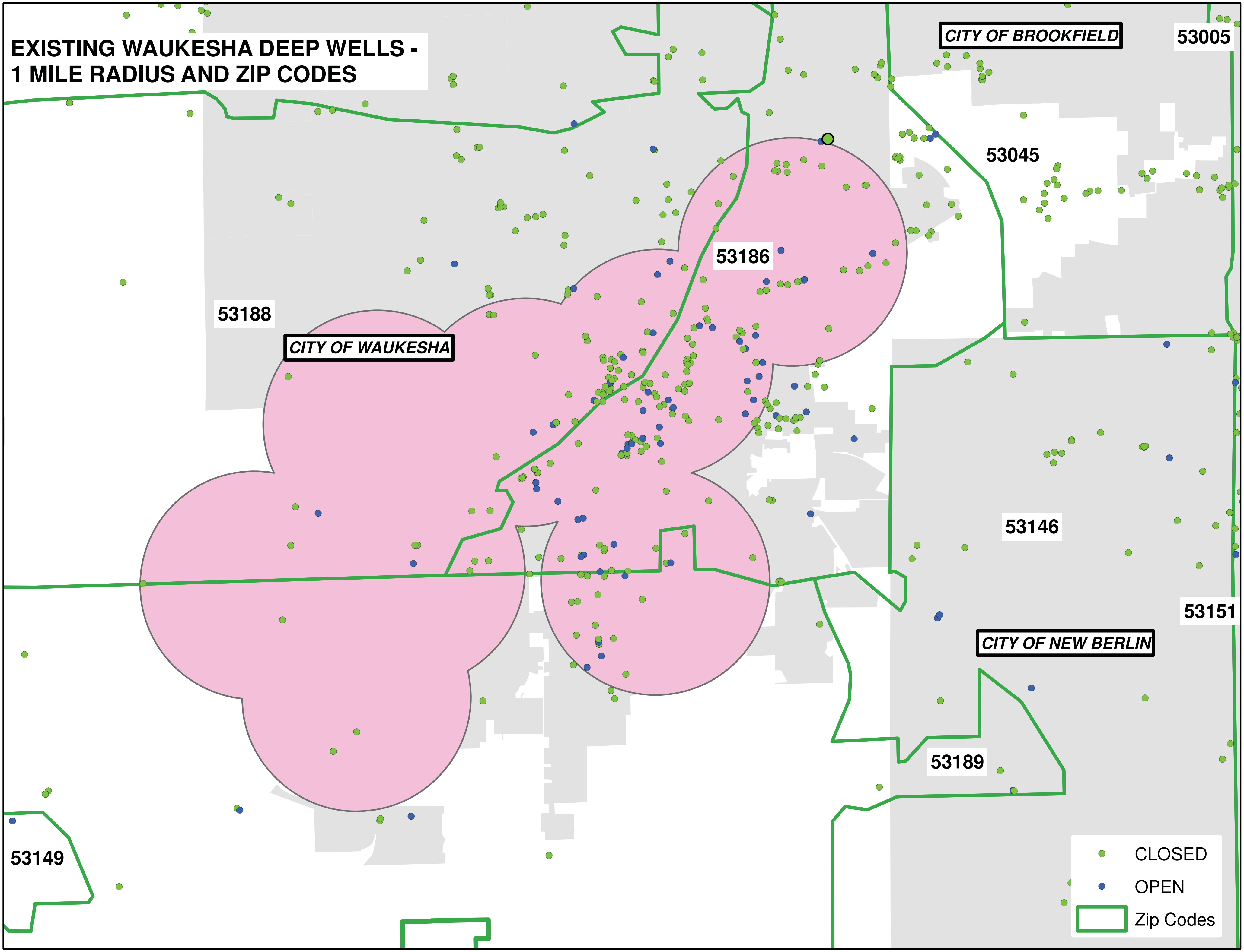
2 MGD NEAR VERNON MARSH 1 FOOT DRAW DOWN AND ACTIVE CONTAINMENT SITES

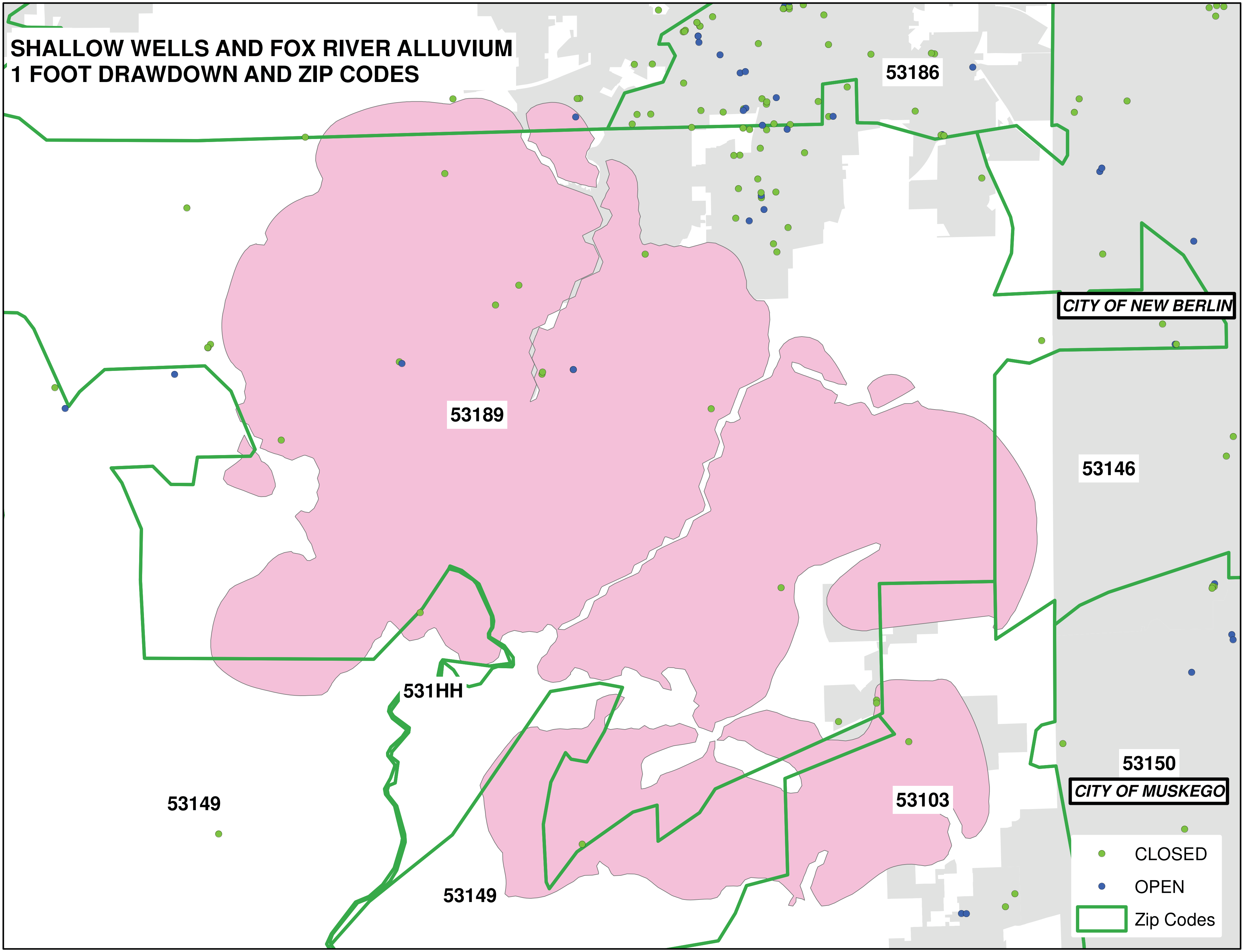


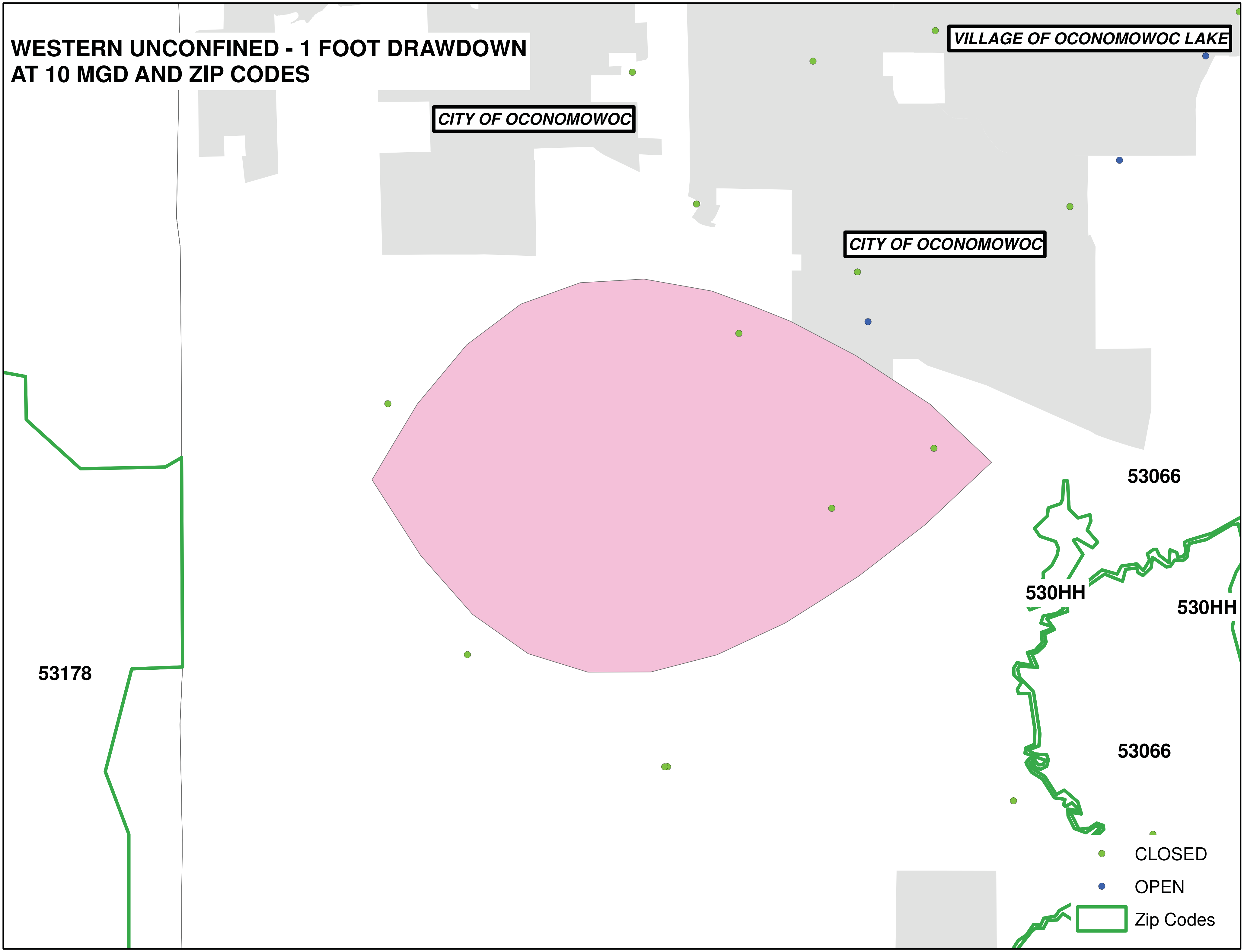

POTENTIAL DOLOMITE WELLS 1 MILE RADIUS AND ACTIVE CONTAINMENT SITES
CITY OF WAUKESHA
CITY OF NEW BERLIN
ACTIVE CONTAINMENT SITES

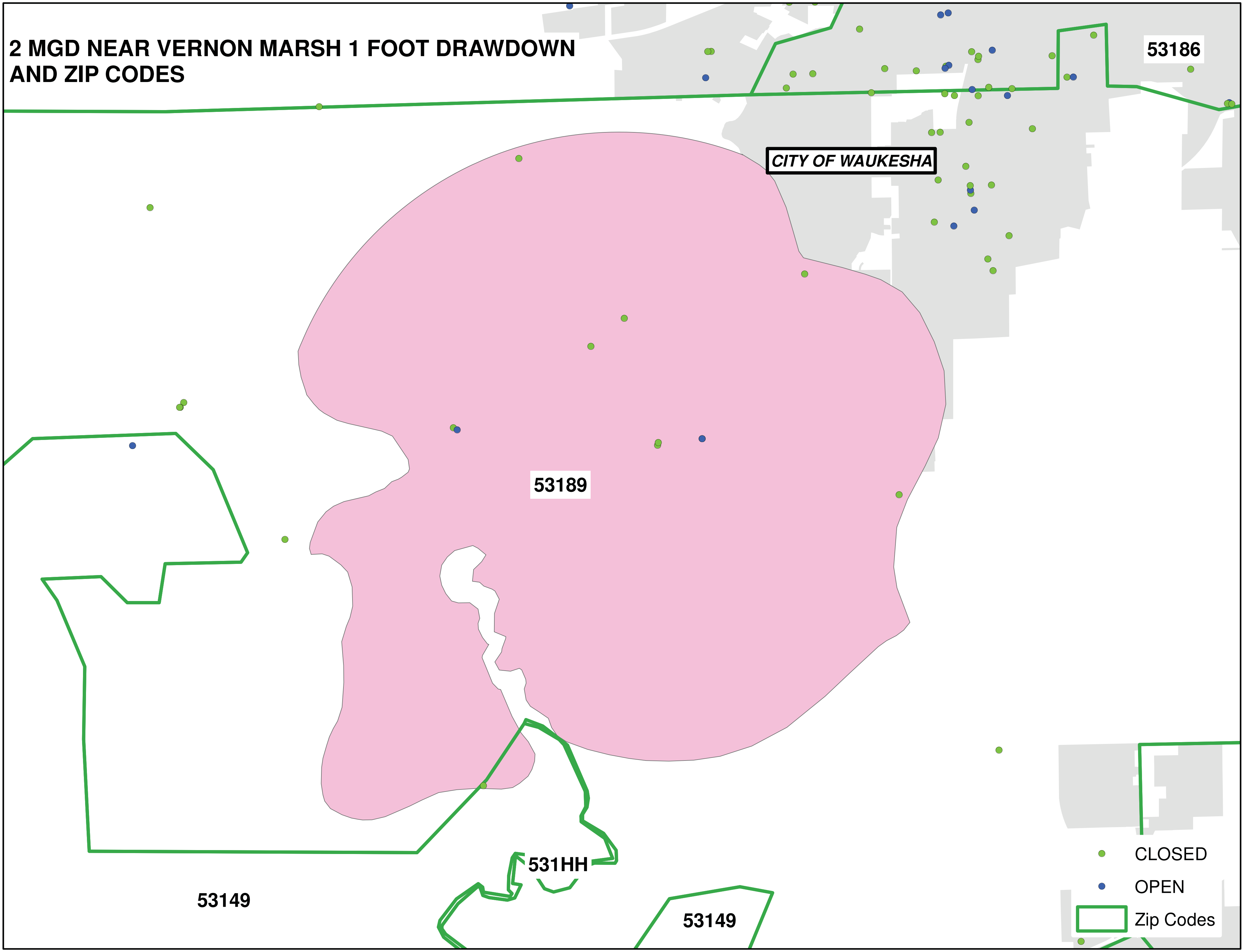

QUARRIES 1 MILE RADIUS AND ACTIVE CONTAINMENT SITES
VILLAGE OF MENOMONEE FALLS
CITY OF BROOKFIELD
CITY OF PEWAUKEE
CITY OF WAUKESHA
CITY OF NEW BERLIN
ACTIVE CONTAINMENT SITES


DEEP AND SHALLOW 1 FOOT DROP DOWN
AND ZIP CODES
53186
53146
53189
53146
531HH
53150
CITY OF MUSKEGO
53103
53149
53149
CLOSED
OPEN
Zip Codes

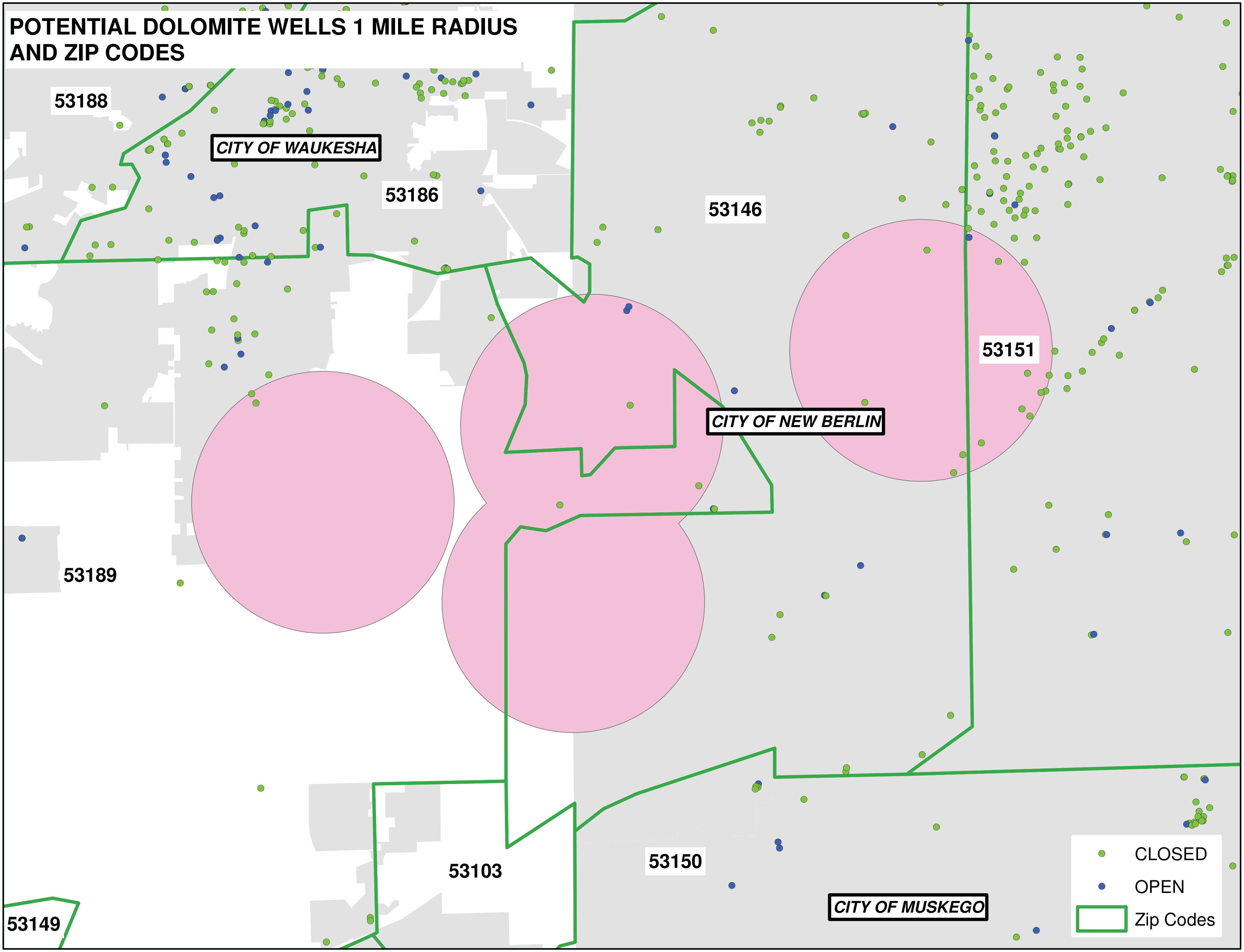

EXISTING WAUKESHA DEEP WELLS -
1 MILE RADIUS AND ZIP CODES
CITY OF BROOKFIELD
53005
53045
53186
53188
CITY OF WAUKESHA
53146
53151
CITY OF NEW BERLIN
53189
53149
CLOSED
OPEN
Zip Codes

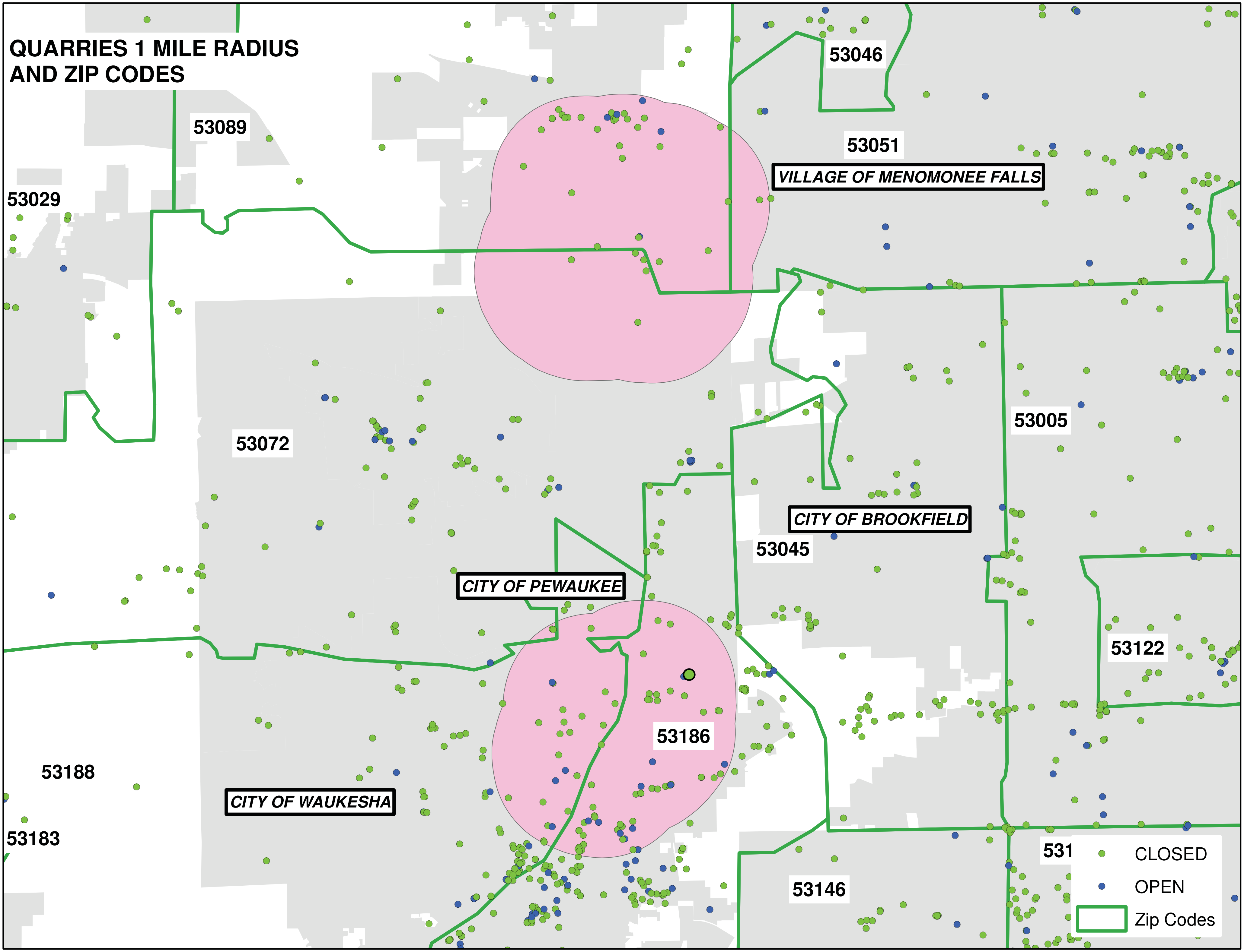

SHALLOW WELLS AND FOX RIVER ALLUVIUM
1 FOOT DRAWDOWN AND ZIP CODES
53186
CITY OF NEW BERLIN
53189
53146
531HH
53150
CITY OF MUSKEGO
53149
53103
53149
CLOSED
OPEN
Zip Codes


WESTERN UNCONFINED - 1 FOOT DRAWDOWN
AT 10 MGD AND ZIP CODES
CITY OF OCONOMOWOC
VILLAGE OF OCONOMOWOC LAKE
CITY OF OCONOMOWOC
53066
530HH
530HH
53178
53066
CLOSED
OPEN
Zip Codes



2 MGD NEAR VERNON MARSH 1 FOOT DRAWDOWN
AND ZIP CODES
53186
CITY OF WAUKESHA
53189
531HH
53149
53149
CLOSED
OPEN
Zip Codes


POTENTIAL DOLOMITE WELLS 1 MILE RADIUS
AND ZIP CODES
53188
CITY OF WAUKESHA
53186
53146
53151
CITY OF NEW BERLIN
53189
53103
53150
CITY OF MUSKEGO
53149
CLOSED
OPEN
Zip Codes



QUARRIES 1 MILE RADIUS
AND ZIP CODES
53046
53089
53051
VILLAGE OF MENOMONEE FALLS
53029
53005
53072
CITY OF BROOKFIELD
53045
CITY OF PEWAUKEE
53122
53186
53188
CITY OF WAUKESHA
53183
531
53146
CLOSED
OPEN
Zip Codes

ALTERNATIVE	ZIP CODE	CITY
Existing Deep Wells - 1 Mile Radius	53186	Waukesha, Vernon
Existing Deep Wells - 1 Mile Radius	53188	Waukesha, Vernon
Existing Deep Wells - 1 Mile Radius	53189	Waukesha
Shallow Wells and Fox River Alluvium - 1 Foot Drawdown	53188	Waukesha, Vernon
Shallow Wells and Fox River Alluvium - 1 Foot Drawdown	53146	New Berlin
Shallow Wells and Fox River Alluvium - 1 Foot Drawdown	53189	Waukesha
Shallow Wells and Fox River Alluvium - 1 Foot Drawdown	53149	Mukwonago
Shallow Wells and Fox River Alluvium - 1 Foot Drawdown	531HH	
Shallow Wells and Fox River Alluvium - 1 Foot Drawdown	53103	Big Bend
10 MGD Western Unconfined - 1 Foot Drawdown	53066	Oconomowoc, Summit
2 MGD Near Vernon Marsh - 1 Foot Drawdown	53189	Waukesha
2 MGD Near Vernon Marsh - 1 Foot Drawdown	53149	Waukesha
Potential Dolomite Wells - 1 Mile Radius	53186	Waukesha, Vernon
Potential Dolomite Wells - 1 Mile Radius	53146	New Berlin
Potential Dolomite Wells - 1 Mile Radius	53151	New Berlin
Potential Dolomite Wells - 1 Mile Radius	53189	Waukesha
Quarries - 1 Mile Radius	53089	Sussex, Lisbon
Quarries - 1 Mile Radius	53051	Menomonee Falls
Quarries - 1 Mile Radius	53072	Pewaukee, Brookfield
Quarries - 1 Mile Radius	53186	Waukesha, Vernon
Quarries - 1 Mile Radius	53188	Waukesha, Vernon
Deep And Shallow - 1 Foot Drawdown	53188	Waukesha, Vernon
Deep And Shallow - 1 Foot Drawdown	53146	New Berlin
Deep And Shallow - 1 Foot Drawdown	53189	Waukesha
Deep And Shallow - 1 Foot Drawdown	53149	Waukesha
Deep And Shallow - 1 Foot Drawdown	531HH	
Deep And Shallow - 1 Foot Drawdown	53103	Big Bend