Appendix N
Environmental Report

Environmental Impact Report

City of Waukesha Water Supply

Prepared for

City of Waukesha Water Utility

May 2010

CH2MHILL

CH2MHILL

Environmental Impact Report

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I. Proposed Project Overview

A. Need
Please refer to Environmental Report (ER) Chapter 1.

B. Project location
Please refer to ER Chapter 1.2 and ER Chapter 1 figures.

C. Diversion proposal
Please refer to the Application.

II. System Alternatives

A. Lake Michigan basin source/return system alternatives

1. Surface water
Please see Application Section 4 and ER Chapter 1.

2. Groundwater
Please see Application Section 4 and ER Chapter 1.

B. Mississippi River basin source/return system alternatives

1. Surface water
Please see Application Section 4 and ER Chapter 1.

2. Groundwater
Please see Application Section 4 and ER Chapter 1.

C. Conservation alternatives (as applied to existing and future water supplies)
Please see Application Section 2, "Waukesha Water Conservation and Efficiency" for information on the City of Waukesha's water conservation program. Water conservation continues to be part of all the water supply alternatives.

D. No-Action Alternative
The City of Waukesha currently obtains water from the deep and shallow aquifers. The "no action" alternative is represented by the Deep and Shallow Aquifer alternative which continues to use both the deep and shallow aquifers.

III. Proposed Project

A. Water supply

Please refer to the Lake Michigan water supply alternative in Application Section 4, and Lake Michigan water supply pipeline information in ER Chapter 1. All of the potential Lake Michigan water suppliers already operate drinking water treatment plants. Please refer to Application Section 2 and the Water Service Area Plan in Appendix D of the Application for information on the water service area plan and projected future water demand.

1. Lake Michigan intake

Included in reference above.

2. Supply pipeline

Included in reference above.

3. Water supply treatment

Included in reference above.

4. Water distribution and use: domestic, industrial, agricultural (including area served, projected future water needs)

Included in reference above.

B. Water return (including wastewater volume and I/I issues)

Please refer to the return flow alternatives in Application Section 5 and ER Chapter 2.3.2.4, Water Quality for information on pipelines and return flow quality. Return flow pipeline information is also provided in ER Chapter 1. Please refer to the Waste Water Facility Plan Amendment in Appendix E of the Application for further details on the evaluation of these alternatives.

1. Wastewater treatment

Included in reference above.

2. Return flow pipeline

Included in reference above.

3. Effluent discharge (including anticipated quality and applicable standards)

Included in reference above.

IV. Authorities and Approvals

The project will be reviewed as required under the Great Lakes-St. Lawrence River Basin Water Resource Compact (Compact).

In Wisconsin, the Compact implementing legislation is Wisconsin Act 227.

Please see ER Chapter 1.5 for additional Federal, State, and local approvals required for the project from the list of entities included below.

A. DNR

B. Great Lakes Compact

C. Other Wisconsin

D. Federal

E. Local

V. Affected Environment and Environmental Effects of the Proposed Project

A. Physical and biological environment

1. Aquatic resources

a. Lake Michigan

1 Location, existing designations/classifications
Lake Michigan background information is found in ER Chapter 2.3.1.7, Lake Michigan.

2 Size, volume, and floodplain
Lake Michigan background information is found in ER Chapter 2.3.1.7, Lake Michigan.

3 Water quality
Lake Michigan water quality impacts from all alternatives are discussed in ER Chapter 2.3.2.4, Water Quality.

4 Geomorphology and sediments
Lake Michigan geomorphology is discussed in ER Chapter 2.3.2.1, Flow and Geomorphology.

5 Flora (including threatened/endangered/special concern)
Vegetation is discussed in ER Chapter 3.2, Wildlife Resources, and species is discussed in ER Chapter 3.4, Endangered and Threatened Species.

b. Fauna (including threatened/endangered/special concern)
Wildlife is discussed in ER Chapter 3.2, Wildlife Resources, and species is discussed in ER Chapter 3.4, Endangered and Threatened Species. Inland waterways (including all affected surface waters)
Background information for inland waterways is found in ER Chapter 2.3, Surface Water Resources.

1 Location, existing designations/classifications
Included in reference above.

2 Size, flows, and floodplain
Included in reference above.

3 Water quality
Water quality is discussed in ER Chapter 2.3.2.4, Water Quality.

4 Geomorphology and sediments (including channel morphology)
Geomorphology and sediments is discussed in ER Chapter 2.3.2, Flow and Geomorphology.

5 Flora (including threatened/endangered/special concern)
Vegetation is discussed in ER Chapter 3.2, Wildlife Resources, and species is discussed in ER Chapter 3.4, Endangered and Threatened Species.

6 Fauna (including threatened/endangered/special concern)
Wildlife is discussed in ER Chapter 3.2, Wildlife Resources, and species is discussed in ER Chapter 3.4, Endangered and Threatened Species.

c. Wetlands
Wetlands are discussed in ER Chapter 2.4, Wetlands.

1 Location, type, size
Included in reference above.

2 Flora (including threatened/endangered/special concern)
Vegetation is discussed in ER Chapter 3.2, Wildlife Resources, and species is discussed in ER Chapter 3.4, Endangered and Threatened Species.
3 Fauna (including threatened/endangered/special concern)
Wildlife is discussed in ER Chapter 3.2, Wildlife Resources, and species is discussed in ER Chapter 3.4, Endangered and Threatened Species.
4 Functional values

d. Groundwater
Groundwater is discussed in ER Chapter 2.1, Groundwater Resources.
1 Occurrence
See above reference.
(i) Bedrock
(ii) Unconsolidated materials
2 Use
Groundwater use is discussed in ER Chapter 2.1, Groundwater Resources and Application Section 3, Waukesha Water Supply Sources.
3 Water Quality
Groundwater quality is discussed in ER Chapter 2.1, Groundwater Resources, Application Section 3, Waukesha Water Supply Sources, and Application Section 4, Water Supply Alternative 2: Shallow Aquifer and Fox River Alluvium.

2. Terrestrial resources

a. Geomorphology and soils
Soils is discussed in ER Chapter 6, Soils.

b. Flora (including threatened/endangered/special concern)
Vegetation is discussed in ER Chapter 3.2, Wildlife Resources, and species is discussed in ER Chapter 3.4, Endangered and Threatened Species.

c. Fauna (including threatened/endangered/special concern)
Wildlife is discussed in ER Chapter 3.2, Wildlife Resources, and species is discussed in ER Chapter 3.4, Endangered and Threatened Species.

3. Air Quality
Air quality in terms of carbon dioxide generation from each of the alternatives considered is discussed in ER Chapter 5.4, Energy Use.

B. Socioeconomic environment (community and region)

1. Population (including age, ethnicity, health, and trends)
Population is discussed in ER Chapter 5.2, Population.

2. Economy (including industries, employment, tax base, and trends)
Economy is discussed in ER Chapter 5.3, Economy.

3. Land use, zoning, and transportation
Land use is discussed in ER Chapter 7, Land Use.

4. Energy use
Energy Use is discussed in ER Chapter 5.4, Energy Use.

5. Recreation and aesthetic resources
Recreation and aesthetic resources are discussed in ER Chapter 7.4, Public Land, Recreation, and Other Designated Areas and ER Chapter 7.6, Visual Resources.

6. Archeological and historical resources
Archeological and historical resources are discussed in ER Chapter 5, Cultural Resources.

7. Public water supplies and uses
Public water supplies and uses for the items listed below are discussed in ER Chapter 1.2.2, Existing Conditions, and Application Section 3, Waukesha Water Supply Sources.

a. Supplies

b. Uses
   1 Residential
   2 Industrial
   3 Recreational
   4 Commercial

VI. Alternatives to the Proposed Project

Impacts to environmental resources for water supply and return flow alternatives are found under the same ER Chapters as the proposed project.

A. Water source
Alternatives to the water supply source are described in ER Chapter 1.2, Proposed Facilities, and Application Section 4.

1. Lake Michigan intake
See reference above.

2. Other surface water sources
See reference above.

3. Groundwater sources
See reference above.

B. Supply pipeline
Alternatives to the water supply source are described in ER Chapter 1.2, Proposed Facilities, and Application Section 4.

C. Water supply treatment
Alternatives to the water supply source are described in ER Chapter 1.2, Proposed Facilities, and Application Section 4.

D. Water distribution and use (domestic, industrial, agricultural, including additional conservation measures)
Water conservation is discussed in Application Section 2, "Waukesha Water Conservation and Efficiency".

E. Wastewater treatment
Wastewater treatment is discussed in ER Chapter 2.3.2.4, Water Quality, and Application Section 5.

F. Return flow pipeline
Return flow pipelines are discussed in ER Chapter 1.2, Proposed Facilities, and Application Section 5.

G. Effluent discharge
Effluent discharged is discussed in ER Chapter 2.3.2.4, Water Quality, and Application Section 5.

VII. Evaluation of project significance

A. Long-term versus short-term effects

Please see Table 8-2, Chapter 8 of the ER. Long term and short term effects have been considered in the evaluation criteria used in Chapter 8 of the ER to determine significant impacts. The Lake Michigan water supply alternative with Underwood Creek return flow has minor adverse impact.

B. Effects on geographically scarce resources

Please see Table 8-2, Chapter 8 of the ER. Relative effects on geographically scarce resources for each of the alternatives is further detailed in other chapters of the ER as described in Table 8-1, Chapter 8 of the ER.

C. Reversibility of effects

Please see Table 8-2, Chapter 8 of the ER. The impacts identified for the Lake Michigan water supply and return flow alternatives are either no adverse impact or minor adverse impacts. The minor adverse impacts for Lake Michigan water supply are for temporary wetland construction impacts (ER Chapter 2.4, Wetlands). These impacts will be eliminated after construction of the pipeline as wetlands affected by the pipeline construction are restored.

The minor adverse impacts for return flow to a Lake Michigan tributary are for water quality changes in the receiving water body (ER Chapter 2.3.2.4, Water Quality), and for temporary wetland construction impacts (ER Chapter 2.4, Wetlands). These minor adverse impacts for water quality will in part lesson over time as more stringent phosphorus standards are regulated by the WDNR. The minor adverse impacts to wetlands during construction will also lesson over time as wetlands affected by pipeline construction as growth is restored after construction. Return flow directly to Lake Michigan in addition to the minor adverse impacts described above for return flow to a tributary also has minor adverse impacts to geomorphology and aquatic habitat. These additional minor adverse impacts are associated with construction in Lake Michigan which is not reversible.

The adverse effects such as groundwater use, aquatic habitat, wetlands, water quality, vegetation and wildlife, and soils from the Deep and Shallow Aquifers and the Shallow Aquifer and Fox River Alluvium alternatives are not reversible because they are associated with construction of above ground structures and on-going operation of these alternatives (e.g. continued pumping of the shallow groundwater). These impacts are not reversible for a water supply alternative that includes pumping shallow groundwater.

D. Cumulative effects

No significant cumulative effects to the chemical, physical, or biological integrity of the Great Lakes basin natural resources occurs with the proposed Lake Michigan diversion as summarized in ER Chapter 8, Table 8-2 and Application Section 6.

E. Risk (including unknowns and problems due to installation and operation)
Risk to public health is minimized with the Lake Michigan water supply alternative compared to the Deep and Shallow Aquifer and the Shallow Aquifer and Fox River Alluvium alternatives as discussed in Section 4 of the Application.

F. Precedence
Please see Section 6 of the Application.

G. Public controversy
The proposed project is the first straddling county diversion application under the Compact and Wisconsin Act 227. Consequently, the project is expected to be closely followed by interested stakeholders throughout the Great Lakes basin. The Compact was developed to allow straddling counties to obtain Great Lakes water, and it was approved by eight states and the U.S. Congress with a parallel approval process in Canada. Consequently, public interest is expected to be high, but many stakeholders across the Great Lakes basin have already developed the process whereby such an application can be proposed.

In Wisconsin, the City of Waukesha has been evaluating water supply alternatives for radium compliance for over 20 years. In recent years, the City of Waukesha has publicly communicated efforts to evaluate Lake Michigan as a water supply source and has communicated with potential Lake Michigan water suppliers and communities that may be affected with a return flow. The City has continued an aggressive public education program that has allowed the public to obtain detailed information about the future water supply alternatives, to ask questions and to provide comments. The City of Waukesha's future water supply will be the single largest capital project ever completed by the City and will subsequently have high public interest. The Compact provides the process for a straddling county diversion evaluation and there are established means for working with neighboring municipalities, obtaining public input, and resolving disputes.

The preparation of the ER is in response to the public interest over this project to provide a method to evaluate impacts to environmental resources comprehensively. This process provides for a method for the public to have an opportunity for input, review, and comment.

VIII. Appendixes

Please refer to ER Chapter 1 Appendix 1-A for information on Example Wetland and Waterway Pipeline Construction Crossing Impact Minimization Techniques.

A. Typical pipeline construction techniques and impacts.

Executive Summary

Overview of Waukesha Water Supply

Current Supply and Issues

The City currently obtains more than 87 percent of its water supply from the deep St. Peter Sandstone Aquifer. Near and beyond the City of Waukesha, this aquifer is confined by a geological feature—the Maquoketa shale layer—that limits natural recharge of the aquifer. Continued use of the aquifer by the City and surrounding communities since the 19th century and the presence of the Maquoketa shale have led to the 500- to 600-foot decline in aquifer water levels.[1] These levels continue to drop 5 to 9 feet per year.[2]

Reduced groundwater levels in southeastern Wisconsin have in turn affected regional surface waters, which now receive about 18 percent[3] less in groundwater contribution as water migrates toward the deep aquifer. Significant water quality issues occur with declining water levels in the deep aquifer, including increased levels of salts and radium (a naturally occurring element in the deep aquifer that can cause cancer). To provide drinking water with low levels of radium, the City treats some deep aquifer water to remove radium and blends some deep aquifer water with water from the shallow Troy Bedrock aquifer.

The City obtains less than 13 percent of its water supply from the shallow aquifer. Increased pumping of it will stress surface water resources by reducing base flows to local streams and wetlands.[4]

Program to Address Issues

The City of Waukesha as studied water supply options for many years and has been working to address the radium contamination for over 20 years. The Southeastern Wisconsin Regional Planning Commission (SEWRPC) has also conducted a regional water supply study that examined the impacts of water supply for the region on the deep and shallow aquifers as well as the use of Lake Michigan as a water supply source. The recommended water supply alternative from SEWRPC's study for the City of Waukesha includes Lake Michigan as a water supply. A Lake Michigan supply is regulated under the Great Lakes-St. Lawrence River Basin Water Resources Compact (Compact) and requires return flow be sent back to the Great Lakes basin.

The City of Waukesha has continued to explore water supply alternatives, including use of the deep aquifer, shallow aquifer wells, water conservation, and a Lake Michigan water supply source. This Environmental Report (ER) examines the environmental impacts associated with the water supply and return flow alternatives.

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[1] *Draft Planning Report on Regional Water Supply Plan for Southeastern Wisconsin,* Southeastern Regional Planning Commission, 2008, pp.102–103.

[2] Waukesha Water Utility 2009 operating data.

[3] U.S. Geological Survey and Wisconsin Geological and Natural History Survey.

[4] *Draft Planning Report on Regional Water Supply Plan for Southeastern Wisconsin,* SEWPRC, 2008, pp. 8–14.

As part of water supply planning process, the City of Waukesha has conducted meetings to solicit comment from City of Waukesha residents and the general public. Four public meetings have been held in 2010 alone, including one in a neighboring community potentially affected by a Lake Michigan return flow alternative, where the public has been asked to provide verbal or written comment regarding Waukesha's water supply alternatives. Many more public meetings have been conducted in prior years. The information gathered from these public meetings and comments from the public has been used to identify issues of concern which have been addressed in this ER. A compilation of comments received from the 2010 meetings and other public involvement processes will be provided to the WDNR as a separate submittal.

Environmental Report

Reason for Preparing

This ER has been developed to meet the Wisconsin Environmental Policy Act (WEPA) as required by the Wisconsin Department of Natural Resources (WDNR) and regulated under NR 150 Environmental Analysis and Review Procedures for Department Actions. The WDNR has indicated they will follow the WEPA process for evaluating the City of Waukesha water supply alternatives considered under the City's Great Lakes Diversion Application.

The WDNR issued a formal scoping request for this ER on February 5, 2010. This request has been issued to interested parties and resources agencies and has also been made available to the general public on the WDNR's website.

Relationship to Other Documents and Programs

The WEPA process calls for interagency coordination, including federal agencies, and references developing reviews consistent with National Environmental Policy Act (NEPA) where multiple agencies are involved. This document is intended to meet the NEPA process should it be required in the future. The City of Waukesha is evaluating water supply alternatives to secure a sustainable, reliable water supply that is protective of public health and provides regional environmental benefits. Despite significant success with an aggressive water conservation program, the City is faced with a declining groundwater supply and worsening water quality conditions. Consequently, the City has been studying water supply alternatives. This ER evaluates the environmental impacts of the water supply alternatives.

This ER references other documents for background purposes, notably the Application for Lake Michigan Water Supply (Application) and Application supporting documents.

Purpose and Need

The City of Waukesha needs a long-term water source that can meet water supply demands, is protective of human health and the environment, and is sustainable. The water supply source will be used for public water supply and consider year 2035 and ultimate build-out water demand.

Alternatives

Water Supply

Water supply alternatives have been studied for the City of Waukesha for many years. In March 2002, the Waukesha Water Utility completed a future water supply study.[5] Stakeholders in this study included representatives from the Utility, City of Waukesha, Wisconsin Department of Natural Resources (WDNR), SEWRPC, U.S. Geological Survey, Wisconsin Geological and Natural History Survey, and the University of Wisconsin–Madison. The study looked at the following 14 water supply sources and combinations of them:

- Deep (confined) aquifer near Waukesha
- Deep (unconfined) aquifer west of Waukesha
- Shallow groundwater south of Waukesha
- Shallow groundwater west of Waukesha
- Dolomite aquifer
- Fox River
- Rock River
- Lake Michigan
- Dam on the Fox or Rock River
- Waukesha quarry
- Waukesha springs
- Pewaukee Lake
- Milwaukee River
- Wastewater reuse

Nine water supply sources were eliminated for various technical reasons. Combinations of alternatives have also been evaluated and screened out. The Application considered four water supply alternatives in detail, chosen on the basis of previous screening[6] and stakeholder feedback. The Application evaluated and compared the following alternatives in detail:

- Deep and shallow aquifers
- Shallow aquifer and Fox River alluvium
- Lake Michigan and shallow aquifer
- Lake Michigan

As discussed in Section 4 of the Application, the *Lake Michigan and shallow aquifer* water supply alternative would utilize the same quantity of shallow groundwater as the *deep and shallow aquifers* water supply alternative. The *Lake Michigan and shallow aquifer* alternative would consequently have the same shallow groundwater impacts as the *deep and shallow aquifers* alternative. The *Lake Michigan and shallow aquifer* alternative would also have similar impacts as the *Lake Michigan* alternative because pipeline construction and the return flow impacts would still occur. Consequently, the impacts of a *Lake Michigan and shallow aquifer* alternative will be greater than the individual impacts of the *deep and shallow aquifers* or the *Lake Michigan* alternatives. The *Lake Michigan and shallow aquifer* alternative will instead have

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[5] *Future Water Supply Report for the Waukesha Water Utility*, CH2M HILL with Ruekert & Mielke, 2002.

[6] SEWRPC (2008); CH2M HILL et al. (2002).

a similar impact as adding the impacts of these two alternatives together. Because the *Lake Michigan and shallow aquifer* alternative has greater impacts, it is not evaluated further in this ER.

The three remaining water supply alternatives have been further divided into five specific sources/corridors including the following:

- Deep and Shallow Aquifers
- Shallow Aquifer and Fox River Alluvium
- Lake Michigan supply—Milwaukee
- Lake Michigan supply—Oak Creek
- Lake Michigan supply—Racine

Return Flow

Five alternatives were considered for return flow to the Lake Michigan source watershed. All of the alternatives are able to return the required quantities back to the Lake Michigan basin.

- Underwood Creek, a tributary to the Menomonee River that flows to Lake Michigan.
- Root River, a tributary to Lake Michigan.
- Directly to Lake Michigan.

Two alternatives were also considered to discharge to the Milwaukee Metropolitan Sewerage District (MMSD). These alternatives were screened out due to operational considerations of the current Waukesha WWTP.

Note that the existing discharge location into the Fox River from the Waukesha WWTP will continue to be used at times and continue to meet existing discharge limits. When flow available at the WWTP exceeds the amount to be returned, the excess flow from the WWTP will be conveyed through the existing outfall to the Fox River.

Similar infrastructure (a pump station and a pipeline of varying length depending on the alternative) was included for each alternative. Additional specific information regarding the various alternatives is included below and in the Application.

Major Issues in Evaluating Alternatives

Exacerbating Existing Groundwater Problems

All water supply sources were reviewed for their ability to not continue to deplete the deep aquifer currently used by the City of Waukesha. Continued use of the aquifer by the City and surrounding communities since the 19th century and the presence of the Maquoketa shale have led to the 500- to 600-foot decline in aquifer water levels.[8] These levels continue to drop 5 to 9 feet per year.[9] Reduced groundwater levels in southeastern Wisconsin have in turn affected regional surface waters, which now receive about 18 percent[10] less in groundwater contribution as water migrates toward the deep aquifer. Significant water

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8 *Draft Planning Report on Regional Water Supply Plan for Southeastern Wisconsin*, Southeastern Regional Planning Commission, 2008, pp.102–103.

9 Waukesha Water Utility 2009 operating data.

10 U.S. Geological Survey and Wisconsin Geological and Natural History Survey.

quality issues occur with declining water levels in the deep aquifer, including increased levels of salts and radium (a naturally occurring element in the deep aquifer that can cause cancer). To provide drinking water with low levels of radium, the City treats some deep aquifer water to remove radium and blends some deep aquifer water with water from the shallow Troy Bedrock aquifer.

Groundwater Drawdown Impacts

Groundwater drawdown from the shallow aquifer and associated impacts to surface waters and other environmental resources is considered in the water supply alternative evaluation. Pumping groundwater from shallow aquifers changes the surface water and groundwater interaction. Previous studies have identified stream baseflow reductions will occur to surface waters, including baseflow reductions to cold water trout streams, when using more shallow groundwater for water supply. Groundwater drawdown from shallow aquifers can also affect wetland and other aquatic resources that depend upon groundwater hydrology for maintaining wetland habitat. The City of Waukesha has utilized a groundwater model to simulate the groundwater drawdown expected with water supply alternatives that use the shallow aquifer.

Wetlands

Wetland impacts occur from temporary construction impacts from pipeline construction, above ground structure construction, and groundwater drawdown. Construction impacts are temporary during construction and are avoided or mitigated through construction or restoration techniques. Operational impacts from above ground structures occur where roads, treatment plants, or well house locations occur in wetlands. Operational impacts also occur from shallow aquifer pumping and resulting groundwater drawdown. Because a wetland is designated by the type of plants, hydrology, and soil type, groundwater drawdown in wetlands can reduce or eliminate the hydrology element required to sustain wetland conditions. The City of Waukesha has utilized a groundwater model to simulate the groundwater drawdown expected with water supply alternatives that use the shallow aquifer. The groundwater modeling results were used to determine the wetland acreage that would experience of 5 foot or greater drawdown and the wetland acreage that would experience a 1 foot or greater drawdown.

Aquatic Habitat

Aquatic habitat impacts occur when flows change in surface streams. Flows change in surface streams under all alternatives considered. Shallow groundwater pumping alternatives change the surface water and groundwater interaction. Previous studies have identified stream baseflow reductions will occur to surface waters, including baseflow reductions to the Fox River and cold water trout streams, when using more shallow groundwater for water supply. Flow changes also occur with return flow alternatives where flow is no longer discharged to the Fox River and is discharged instead to a Lake Michigan tributary or directly to Lake Michigan. Return flow to a Lake Michigan tributary can increase aquatic habitat quantity and availability. Each of these flow changes has been considered to evaluate reductions or increases to aquatic habitat.

Vegetation and Wildlife

The Vernon Wildlife Area (VWA) is a 4,655-acre property in eastern Waukesha County consisting of wetlands and flowages associated with the Fox River and including a calcareous fen in the southern portion of the property. WDNR documents indicate the VWA provides significant wildlife habitat, especially for migrating and nesting waterfowl. Groundwater drawdown from shallow aquifer pumping could result in habitat type change. The City of Waukesha has utilized a groundwater model to simulate the groundwater drawdown expected with water supply alternatives that use the shallow aquifer. The groundwater modeling results were used to determine acreage of the VWA that would experience of 5 foot or greater drawdown and the VWA acreage that would experience a 1 foot or greater drawdown.

Lake Michigan Return Flow

For the Lake Michigan water supply source alternative, the Great Lakes-St. Lawrence River Basin Water Resources Compact requires return flow be sent back to the Great Lakes basin. Environmental issues related to return flow alternatives include: geomorphic stability changes caused by increases in stream flows, aquatic habitat change, impacts to flooding, and water quality impacts. Each of these areas is reviewed for all alternatives.

Construction Impacts for Conveyance

Each of the water supply and return flow alternatives involves construction of long linear pipelines to convey the water supply or convey the return flow. These long linear projects will cross water bodies, wetlands, public lands, and other features. The impacts that these pipelines may have on environmental resources is reviewed and compared.

Areas Covered by ER with No Significant Impacts or Issues

The ER review compares each of the water supply and return flow alternatives for environmental impacts. Chapter 8 provides a comparison of all alternatives. In reviewing the impacts, it was found that no adverse impacts were common among all alternatives for the following:

- Cultural Resources
- Socioeconomics

Details of these resource alternatives are found in their respective ER chapters.

Comparison of Alternatives

The following table compares the environmental impacts of each of the alternatives. This table and supporting conclusions is found in Chapter 8, Table 8-2.

Selection and Description of Preferred Plan

The Deep and Shallow Aquifers and the Shallow Aquifer and Fox River Alluvium alternatives would have significant adverse environmental impacts to natural resources particularly wetlands and the Vernon Wildlife Area. The Lake Michigan water supply and

return flow alternatives would have only minor adverse environmental impacts to natural resources. Lake Michigan is the preferred water supply alternative as a result.

Of the return flow alternatives, the Underwood Creek and Root River alternatives both would have minor adverse impacts in two categories, whereas the Lake Michigan alternative would have minor adverse impacts in four categories. The costs of the Underwood Creek and Root River alternatives, were compared, and the Underwood Creek alternative is the preferred return flow alternative.

Once a water supplier and return flow location have been reviewed and approved, the City will work with the regulatory agencies during final design to conduct any necessary field surveys, location refinements, mitigation planning, and to obtain required permits.

TABLE ES-1
Water Supply and Return Flow Alternative Environmental Impact Comparison Summary
City of Waukesha Water Supply

Water Supply Alternative	Groundwater Resources	Flow and Geomorphology	Flooding	Aquatic Habitat	Water Quality	Wetlands	Vegetation and Wildlife Resources	Soils	Land Use
Deep and shallow aquifers	Significant adverse impact	No adverse impact	No adverse impact	Significant adverse impact	Minor adverse impact	Significant adverse impact	Significant adverse impact	Minor adverse impact	No adverse impact
Shallow aquifer and Fox River alluvium	Significant adverse impact	No adverse impact	No adverse impact	Significant adverse impact	Minor adverse impact	Significant adverse impact	Significant adverse impact	Minor adverse impact	No adverse impact
Lake Michigan – Milwaukee	No adverse impact	No adverse impact	No adverse impact	No adverse impact	No adverse impact	Minor adverse impact	No adverse impact	No adverse impact	No adverse impact
Lake Michigan – Oak Creek	No adverse impact	No adverse impact	No adverse impact	No adverse impact	No adverse impact	Minor adverse impact	No adverse impact	No adverse impact	No adverse impact
Lake Michigan – Racine	No adverse impact	No adverse impact	No adverse impact	No adverse impact	No adverse impact	Minor adverse impact	No adverse impact	No adverse impact	No adverse impact
Return Flow Alternatives									
Underwood Creek	No adverse impact	No adverse impact	No adverse impact	No adverse impact	Minor adverse impact	Minor adverse impact	No adverse impact	No adverse impact	No adverse impact
Root River	No adverse impact	No adverse impact	No adverse impact	No adverse impact	Minor adverse impact	Minor adverse impact	No adverse impact	No adverse impact	No adverse impact
Direct to Lake Michigan	No adverse impact	Minor adverse impact	No adverse impact	Minor adverse impact	Minor adverse impact	Minor adverse impact	No adverse impact	No adverse impact	No adverse impact

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CHAPTER 1

Introduction

1.1 Introduction

This Environmental Report (ER) has been developed to meet the Wisconsin Environmental Policy Act (WEPA) as required by the Wisconsin Department of Natural Resources (WDNR) and regulated under NR 150 Environmental Analysis and Review Procedures for Department Actions. The WDNR has indicated they will follow the WEPA process for evaluating the City of Waukesha water supply alternatives considered under the City's Great Lakes Diversion Application.

The WEPA process calls for interagency coordination, including federal agencies, and references developing reviews consistent with National Environmental Policy Act (NEPA) where multiple agencies are involved. This document is intended to meet the NEPA process should it be required in the future. The City of Waukesha is evaluating water supply alternatives to secure a sustainable, reliable water supply that is protective of public health and provides regional environmental benefits. Despite significant success with an aggressive water conservation program, the City is faced with a declining groundwater supply and worsening water quality conditions. Consequently, the City has been studying water supply alternatives. This ER evaluates the environmental impacts of the water supply alternatives.

The WDNR issued a formal scoping request for this ER on February 5, 2010. This request has been issued to interested parties and resources agencies and has also been made available to the general public on the WDNR's website.

As part of water supply planning process, the City of Waukesha has conducted meetings to solicit comment from City of Waukesha residents and the general public. Four public meetings have been held in 2010 alone, including one in a neighboring community potentially affected by a Lake Michigan return flow alternative, where the public has been asked to provide verbal or written comment regarding Waukesha's water supply alternatives. Many more public meetings have been conducted in prior years. The information gathered from these public meetings and comments from the public has been used to identify issues of concern which have been addressed in this ER. A compilation of comments received from the 2010 meetings and other public involvement processes will be provided to the WDNR as a separate submittal.

A variety of water supply alternatives have been evaluated, including groundwater, surface water sources in the Mississippi River basin, and Lake Michigan. The Great Lakes-St. Lawrence River Basin Water Resources Compact regulates Lake Michigan as a water supply as a diversion for the City of Waukesha and requires return flow back to the Great Lakes Basin. Consequently, the Lake Michigan water supply alternative also has included an evaluation of return flow alternatives.

This ER evaluates water supply alternatives and the environmental impacts of a City of Waukesha long-term water supply.

ER Chapter 1 introduces the Project in several subsections, which provide an overview of the proposed Project facilities (Chapter 1.2), describe the land requirements for construction and operation (Chapter 1.3), provide information on operation and maintenance procedures for the Project alternatives (Chapter 1.4), and identify agencies contacted and permits required (Chapter 1.5).

1.2 Proposed Facilities

1.2.1 Purpose and Need

The City of Waukesha needs a long-term water source that can meet water supply demands, is protective of human health and the environment, and is sustainable. The water supply source will be used for public water supply and consider year 2035 and ultimate build-out water demand.

1.2.2 Existing Conditions

The City currently obtains more than 87 percent of its water supply from the deep St. Peter Sandstone Aquifer. Near and beyond the City of Waukesha, this aquifer is confined by a geological feature—the Maquoketa shale layer—that limits natural recharge of the aquifer. Continued use of the aquifer by the City and surrounding communities since the 19th century and the presence of the Maquoketa shale have led to the 500- to 600-foot decline in aquifer water levels.[1] These levels continue to drop 5 to 9 feet per year.[2] Reduced groundwater levels in southeastern Wisconsin have in turn affected regional surface waters, which now receive about 18 percent[3] less in groundwater contribution as water migrates toward the deep aquifer. Significant water quality issues occur with declining water levels in the deep aquifer, including increased levels of salts and radium (a naturally occurring element in the deep aquifer that can cause cancer). To provide drinking water with low levels of radium, the City treats some deep aquifer water to remove radium and blends some deep aquifer water with water from the shallow Troy Bedrock aquifer.

The City obtains less than 13 percent of its water supply from the shallow aquifer. Increased pumping of it will stress surface water resources by reducing base flows to local streams and wetlands.[4]

Additional detail on existing water supply conditions and background on the City of Waukesha is found in Application Sections 1 and 2.

1.2.3 Location and Description of Alternatives

The City seeks a water supply of 10.9 million gallons per day (mgd) to meet future average day water supply demand of the City's projected water service area as delineated by the local planning authority, the Southeastern Wisconsin Regional Planning Commission

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[1] *Draft Planning Report on Regional Water Supply Plan for Southeastern Wisconsin,* Southeastern Regional Planning Commission, 2008, pp.102–103.

[2] Waukesha Water Utility 2009 operating data.

[3] U.S. Geological Survey and Wisconsin Geological and Natural History Survey.

[4] *Draft Planning Report on Regional Water Supply Plan for Southeastern Wisconsin,* SEWPRC, 2008, pp. 8–14.

(SEWRPC). The City seeks sufficient water to serve customers within its delineated service area. Section 2 of the Application documents the water supply needed under the planning horizon.

The City evaluated several water supply and return flow alternatives.

1.2.3.1 Water Supply Alternatives

Water supply alternatives included continued use of the deep and shallow aquifer, increased withdrawal from the shallow aquifer, local river supplies, local lake supplies, and wastewater reuse. These alternatives have been developed and analyzed by multiple studies, the findings of which are included in Section 4 of the Application and summarized below. The Application and this Environmental Report (ER) present a comprehensive review of the three most feasible alternatives: continued use of the deep and shallow aquifers, use of shallow aquifer resources alone, and use of Great Lakes water.

In March 2002, the Waukesha Water Utility completed a future water supply study.[5] Stakeholders in this study included representatives from the Utility, City of Waukesha, Wisconsin Department of Natural Resources (WDNR), SEWRPC, U.S. Geological Survey, Wisconsin Geological and Natural History Survey, and the University of Wisconsin–Madison. The study looked at the following 14 water supply sources and combinations of them:

- Deep (confined) aquifer near Waukesha
- Deep (unconfined) aquifer west of Waukesha
- Shallow groundwater south of Waukesha
- Shallow groundwater west of Waukesha
- Dolomite aquifer
- Fox River
- Rock River
- Lake Michigan
- Dam on the Fox or Rock River
- Waukesha quarry
- Waukesha springs
- Pewaukee Lake
- Milwaukee River
- Wastewater reuse

Nine water supply sources were eliminated for the reasons listed in Exhibit 4-1 of the Application. Summary information on these previous studies is included in Section 4 of the Application. Combinations of alternatives have also been evaluated and screened out, as described in Section 4 of the Application. The following water supply alternatives passed the initial screening process:

- Deep confined aquifer
- Deep unconfined aquifer
- Shallow groundwater near Waukesha
- Shallow groundwater and deep confined aquifer
- Lake Michigan

[5] *Future Water Supply Report for the Waukesha Water Utility*, CH2M HILL with Ruekert & Mielke, 2002.

The Application considered four water supply alternatives in detail, chosen on the basis of previous screening[6] and stakeholder feedback. The Application evaluated and compared the following alternatives in detail:

- Deep and shallow aquifers
- Shallow aquifer and Fox River alluvium
- Lake Michigan and shallow aquifer
- Lake Michigan

As discussed in Section 4 of the Application, the *Lake Michigan and shallow aquifer* water supply alternative would utilize the same quantity of shallow groundwater as the *deep and shallow aquifers* water supply alternative. The *Lake Michigan and shallow aquifer* alternative would consequently have the same shallow groundwater impacts as the *deep and shallow aquifers* alternative. The *Lake Michigan and shallow aquifer* alternative would also have similar impacts as the *Lake Michigan* alternative because pipeline construction and the return flow impacts would still occur. Consequently, the impacts of a *Lake Michigan and shallow aquifer* alternative will be greater than the individual impacts of the *deep and shallow aquifers* or the *Lake Michigan* alternatives. The *Lake Michigan and shallow aquifer* alternative will instead have a similar impact as adding the impacts of these two alternatives together. Because the *Lake Michigan and shallow aquifer* alternative has greater impacts, it is not evaluated further in this ER.

The three remaining water supply alternatives have been further divided into five specific sources/corridors including the following:

- Deep and shallow aquifers
- Shallow aquifer and Fox River alluvium
- Lake Michigan supply—Milwaukee
- Lake Michigan supply—Oak Creek
- Lake Michigan supply—Racine

The City of Waukesha currently obtains water from the deep and shallow aquifers. The "No Action" alternative is represented by the Deep and Shallow Aquifers water supply alternative which continues to use both the deep and shallow aquifers for the City of Waukesha's water supply.

1.2.3.2 Return Flow Alternatives

Five alternatives were considered for return flow to the Lake Michigan source watershed. All of the alternatives are able to return the required quantities back to the Lake Michigan basin.

- Underwood Creek, a tributary to the Menomonee River that flows to Lake Michigan.
- Root River, a tributary to Lake Michigan.
- Directly to Lake Michigan.
- The Milwaukee Metropolitan Sewerage District (MMSD) system and water reclamation facility, which would then return flow to Lake Michigan. Two subalternatives were considered for return flow to MMSD.

[6] SEWRPC (2008); CH2M HILL et al. (2002).

Note that the existing discharge location into the Fox River from the Waukesha WWTP will continue to be used at times and continue to meet existing discharge limits. When flow available at the WWTP exceeds the amount to be returned, the excess flow from the WWTP will be conveyed through the existing outfall to the Fox River. Because this Fox River outfall is currently in use, no new impacts are anticipated with its continued use, and thus discharge to the Fox River was not evaluated as part of this ER. Additional information on when discharge to the Fox River will occur is included in Section 5 of the Application. Information on flow changes to the Fox River with a Lake Michigan return flow is included in Chapter 2 of this ER.

Each alternative includes a corridor for the pipeline and associated infrastructure along the pipeline alignment (e.g., pump station, service manholes). The pipeline corridors and the supply and return flow discharge locations were selected to protect public health and safety, to provide long-term sustainability, to minimize environmental impacts, to provide feasible implementation (constructability), to use previously disturbed areas and existing utility corridors, to be consistent with the SEWRPC alignments, to allow the return flow to be used as a resource to the Lake Michigan basin, and to minimize cost.

The supply and return flow pipeline alignments selected follow previously disturbed areas including streets and alleys, bike paths, active and abandoned railroad corridors, utility corridors, and city and county lands. The alignments are discussed below for each return flow alternative. The alignments were developed to a limited level of detail that allows for screening and comparison of alternatives. The concepts do not include the details that will be identified and evaluated in subsequent engineering design phases for the actual project once an alignment is approved.

Similar infrastructure (a pump station and a pipeline of varying length depending on the alternative) was included for each alternative. Additional specific information regarding the various alternatives is included below and in the Application.

1.2.3.3 Location Maps, Detailed Route Maps

The regional location of the supply and return route alternatives is illustrated in the attached figures. Aerial-photo-based maps of the alternative routes are provided as Figures attached to this ER Chapter.

1.2.4 Pipeline Facilities

The various supply and return flow corridors evaluated in this ER are summarized in Table 1-1. Details of each of the alternatives considered and rationales for further evaluation or disqualification are included in Application Sections 4, Water Supply Alternatives, and 5, Return Flow. As a result of the information presented in the Application, only the following alternatives have been included in this ER:

1.2.4.1.1 Supply Alternatives

- Deep and shallow aquifers
- Shallow aquifer and Fox River alluvium
- Lake Michigan—Milwaukee supply
- Lake Michigan—Oak Creek supply
- Lake Michigan—Racine supply

1.2.4.1.2 Return Flow Alternatives

- Underwood Creek to Lake Michigan
- Root River to Lake Michigan
- Directly to Lake Michigan

Proposed pipeline facilities information is summarized in Table 1-1.

TABLE 1-1
Proposed Pipeline Facilities
City of Waukesha Water Supply

Alternative	Diameter (In.)	Length (miles)	Counties
Supply Alternatives			
Deep and Shallow Aquifers	8 to 36	13.9	Waukesha
Shallow Aquifer and Fox River Alluvium	8 to 36	14.7	Waukesha
Lake Michigan—Milwaukee Supply	36	15	Milwaukee and Waukesha
Lake Michigan—Oak Creek Supply	36	27	Milwaukee and Waukesha
Lake Michigan—Racine Supply	36	38	Racine and Waukesha
Return Flow Alternatives			
Underwood Creek to Lake Michigan	36	11.5	Milwaukee and Waukesha
Root River to Lake Michigan	36	15.5	Milwaukee and Waukesha
Direct to Lake Michigan	36	23.5	Milwaukee and Waukesha

1.2.5 Aboveground Facilities

The number and type of aboveground facilities differ for each of the various supply and return flow alternatives. A summary of the proposed aboveground facility is summarized in Table 1-2.

TABLE 1-2
Proposed Aboveground Facilities
City of Waukesha Water Supply

Project Component	Description	Township	County
Supply Alternatives			
Deep and Shallow Aquifers	1 water treatment plant, 11 well houses [a]	Waukesha	Waukesha
Shallow Aquifer and Fox River Alluvium	1 water treatment plant, 15 well houses [b]	Waukesha	Waukesha
Lake Michigan—Milwaukee Supply	— [c]	—	—
Lake Michigan—Oak Creek Supply	— [c]	—	—
Lake Michigan—Racine Supply	— [c]	—	—

TABLE 1-2
Proposed Aboveground Facilities
City of Waukesha Water Supply

Project Component	Description	Township	County
Return Flow Alternatives			
Underwood Creek to Lake Michigan	—[c]	—	—
Root River to Lake Michigan	—[c]	—	—
Direct to Lake Michigan	—[c]	—	—

[a]Includes 1.65 miles of new, 15-foot-wide access roads between well houses discussed in Chapter 7.
[b]Includes 2.78 miles of new, 15-foot-wide access roads between well houses discussed in Chapter 7.
[c]No new aboveground facilities required.

1.3 Land Requirements

Chapter 7 of this ER discusses the potential land acreage totals affected during construction for each of the supply and return flow alternatives being evaluated. These totals are based upon a typical 75-foot-wide construction corridor over the length of the respective alternatives. Land requirements for the pipeline facilities will generally be temporary during construction while land requirements for above ground facilities will generally have long-term operational requirements. A detailed discussion on the current types of land uses along each of the routes, acreage totals of these land uses, and long-term maintenance and aboveground structures impacts are included in ER Chapter 7.

1.3.1 Pipeline Facilities

A summary of land requirements for pipeline facilities is summarized in ER Chapter 7.

1.3.2 Aboveground Facilities

A summary of land requirements for aboveground facilities is summarized in ER Chapter 7.

1.3.3 Access Roads

Existing roads and highways would be used for primary access to the construction workspace for the various supply and return alternatives. Additional temporary access roads would be required during construction in order to facilitate transport of equipment and materials along the construction corridor, but these areas will be restored as agreed upon by the regulatory agencies and consequently resource impacts related to these roads are anticipated to be minor and will not result in any significant long-term impacts.

Construction of new permanent access roads would be required for the Deep and Shallow Aquifers or Shallow Aquifer and Fox River Alluvium alternatives if either were selected as the final supply option. These new permanent access roads would be used to connect the proposed water treatment plant, pump stations, and well houses that would be installed as part of those alternatives and allow for routine maintenance and any repairs that would be necessary. For the purposes of this ER, it was assumed that the access roads would be graveled. A more-detailed discussion on the potential area of impact associated with the development of the access roads is provided in ER Chapter 7, Land Use. The locations of the

potential access roads are indicated on the maps provided as Figures attached to this Chapter.

1.3.4 Schedule

The development of a new water supply and return flow discharge for the City is being driven by a June 30, 2018, deadline to achieve public health protection standards for radium in drinking water. This project will be a multiyear effort consisting of the following major efforts:

- Draft Application made available for public comment—January 28, 2010
- WDNR public scoping process begins for NR 150—February 1, 2010
- Public presentations and meetings—February-April 2008
- Application and Environmental Report submitted to WDNR— May 2010
- WDNR Public Hearing for NR 150—estimated June 2010
- WDNR review completed—estimated August 2010
- Submittal to Great Lakes governors—estimated August 2010
- Approval from Great Lakes governors—estimated fall 2010
- Permitting, fieldwork, design start—estimated January 2011
- Start construction—estimated July 2013
- Completed construction—estimated December 2016

This schedule provides a buffer of approximately 18 months, which may be needed to address longer review times, construction delays, or other unanticipated events.

1.4 Operation and Maintenance

Operation and maintenance will begin upon completion of the construction phase. Regularly scheduled maintenance will ensure that the constructed facilities meet standard service requirements. For aboveground project features and service roads, land use will change with construction and continue for the operation and maintenance phase. For pipelines, land use will change with construction will have primarily temporary impacts; during operation and maintenance, land use impacts, such as those from occasional mowing, will be low.

Where the pipelines are not under pavement, erosion control devices and seeded areas installed during construction will be periodically monitored, and defects will be repaired until a condition similar to approximately adjacent off-right-of-way land is achieved. Monitoring will continue regularly with ground surveys to detect potential mechanical damage caused by natural processes or third-party activities. Wetland and water body crossings will be routinely inspected during a monitoring period to ensure that erosion and sedimentation control practices are effective and to remedy nonconforming situations.

In previously unmaintained areas, a cleared herbaceous condition will be maintained over a 10-foot-wide corridor directly over the supply and return flow pipelines. Ten feet is the minimum right-of-way necessary to allow for periodic pipeline inspection; trees that reach a height of 15 feet and stand within 15 feet of the pipe centerline will be selectively cut. The remaining workspace will revert to its preconstruction land use/land cover once construction is complete. Preconstruction habitat suitable for wildlife will be allowed to reestablish where practicable. Agricultural fields will revert to crop production or pasture.

Mechanical mowing will be performed as required to maintain access and to allow for greater visibility of the line. Brush removal typically will be completed using mechanical equipment.

1.5 Permits and Approvals

Implementing a Lake Michigan water supply alternative would require review and approval under the Great Lakes-St. Lawrence River Basin Water Resources Compact (Compact) and Wisconsin Act 227.

Besides Compact review, construction, operation, and maintenance will be in accordance with applicable federal, state, and local permit requirements. The environmental permits, reviews, and clearances that are anticipated to be applicable are identified in Table 1-3.

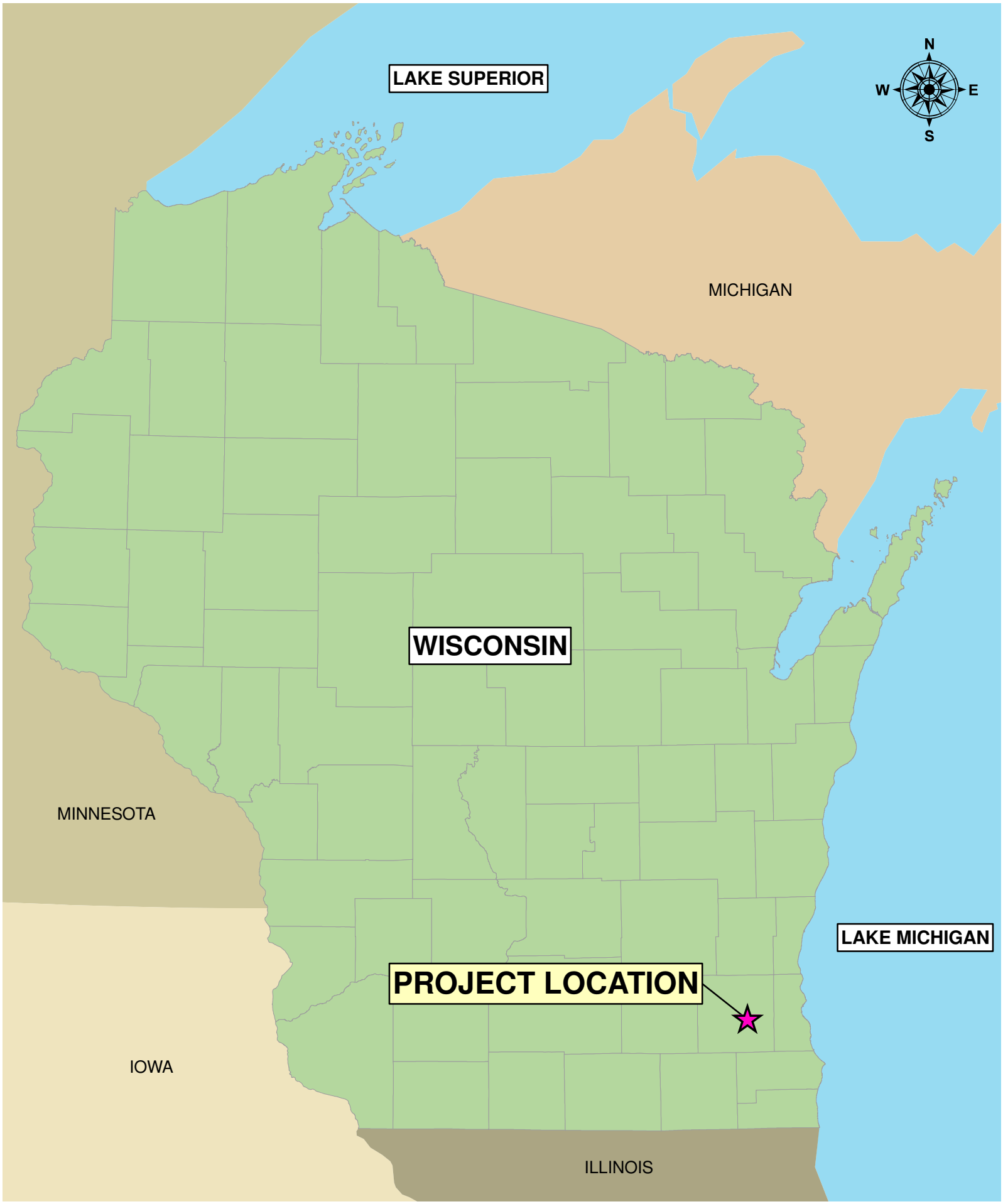
To date, consultations with federal, state, and local regulatory officials and government agencies regarding clearances and data consultations for this Project have been limited to preliminary or screening-level discussions. In-depth coordination regarding project specific permits, approval, and conditions will be completed once approvals for Lake Michigan water have been obtained and the water supplier has been finalized.

TABLE 1-3
Permits, Licenses, Approvals, and Certificates Required for Construction, Operation, and Maintenance
City of Waukesha Water Supply

Permit/Approval (Statute/Reg.)	Administering Agency	Status
Federal		
Endangered Species Section 7 Consultation (Endangered Species Act — 16 U.S.C.1531 et. seq.)	U.S. Fish and Wildlife Service, Green Bay ES Field Office	Initiated January 13, 2010
Section 404 Dredge and Fill Permit (Clean Water Act—33 U.S.C. 1344)	U.S. Army Corps of Engineers, St. Paul District	Pending selection of a preferred supply, return flow alternative, and governors' approval
Section 10 Navigable Waters (Rivers and Harbors Act of 1899- 33 U.S.C. 403)	U.S. Army Corps of Engineers, St. Paul District	Pending selection of a preferred supply, return flow alternative, and governors' approval
State		
Chapter 30 Stream Crossings Navigable Waters (Applications on County Basis; WI NR 199, 102, 103, 155, 117)	WDNR, Bureau of Fisheries Management and Habitat Protection	Pending selection of a preferred supply, return flow alternative, and governors' approval
WPDES Stormwater Discharge Permit (WI NR 216)	WDNR, Bureau of Watershed Management	Pending selection of a preferred supply, return flow alternative, and governors' approval
Hydrostatic Test Discharge General Permit (WI Chapter 283, 216)	WDNR, Bureau of Watershed Management	Pending selection of a preferred supply, return flow alternative, and governors' approval
Pit/Trench Dewatering General Permit (WI Chapter 283, 216)	WDNR, Bureau of Watershed Management	Pending selection of a preferred supply, return flow alternative, and governors' approval
Section 401 Water Quality Certification—Joint Application with COE Outside	Wisconsin Department of Natural Resources, Bureau of	Pending selection of a preferred supply, return flow alternative, and

TABLE 1-3
Permits, Licenses, Approvals, and Certificates Required for Construction, Operation, and Maintenance
City of Waukesha Water Supply

Permit/Approval (Statute/Reg.)	Administering Agency	Status
Navigable Waters (Applications on County Basis; see Stream Crossings in Section 2)	Fisheries Management and Habitat Protection	governors' approval
WDNR—Wastewater Facilities Plan Review (WI NR 110)	WDNR	Submitted with the Application
WDNR—Wisconsin Floodplain Management Program (WI NR 116)	WDNR	Pending selection of a return flow alternative and governors' approval
WDNR–Environmental Report (Statewide; WI NR 150)	WDNR, Bureau of Integrated Science Services	Spring 2010
Natural Heritage Inventory (Wisconsin Endangered Species Law—WI Stats. S. 29.415)	WDNR, Bureau of Endangered Resources	Initiated January 12, 2010
Incidental Take Permit (WI Stats. 29.604)	WDNR, Bureau of Endangered Resources	Pending selection of a preferred supply, return flow alternative, and governors' approval
WDNR—Water Quality Anti-Degradation (WI NR 207)	WDNR	Pending selection of a preferred supply, return flow alternative, and governors' approval
WDNR— WPDES Permit for Effluent Standards and Limitations (WI NR 217 and WI SS 283)	WDNR	October 16, 2008, WDNR letter provided initial information; additional review occurring with governors' approval
WDNR—Water Service Area Plan (WI NR 281)	WDNR	Submitted with the Application
Wastewater systems construction plan review	WDNR	Conducted at design completion and prior to construction
Water systems construction plan review	WDNR	Conducted at design completion and prior to construction
Cultural Resources Review (36 CFR Part 800; WI Chapter 285)	Wisconsin State Historic Preservation Office	Pending selection of a preferred supply, return flow alternative, and governors' approval
Agricultural Impact Statement (WI Statute 32.035)	Wisconsin Department of Agriculture, Trade, and Consumer Protection	Pending selection of a preferred supply, return flow alternative, and governors' approval
County		
Shoreland-Wetland Zoning Permit and Conditional Use Application	Varies by county	Pending selection of a preferred supply, return flow alternative, and governors' approval
Erosion and Sedimentation Control Permit	Varies by county/municipality	Pending selection of a preferred supply, return flow alternative, and governors' approval


LAKE SUPERIOR
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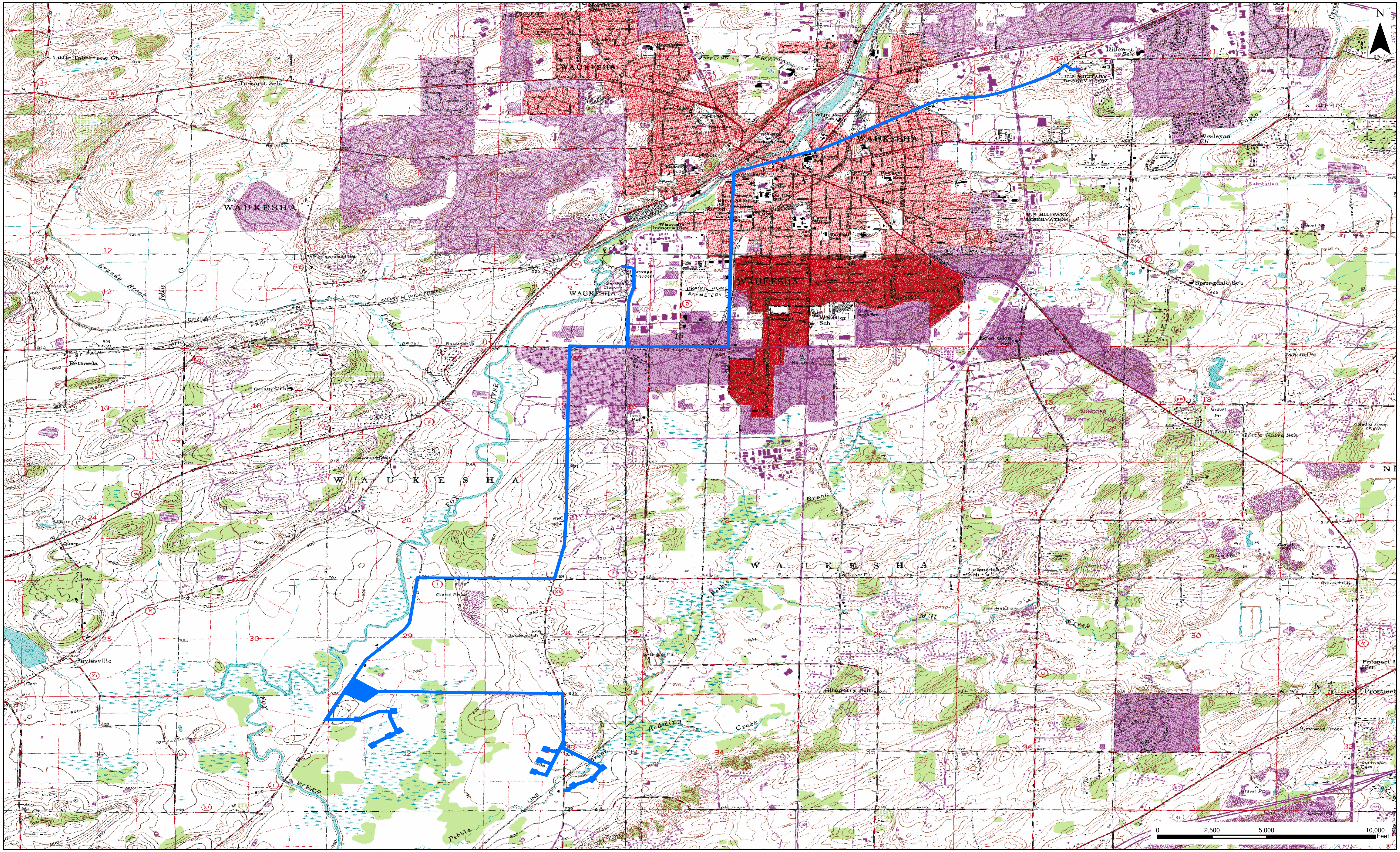
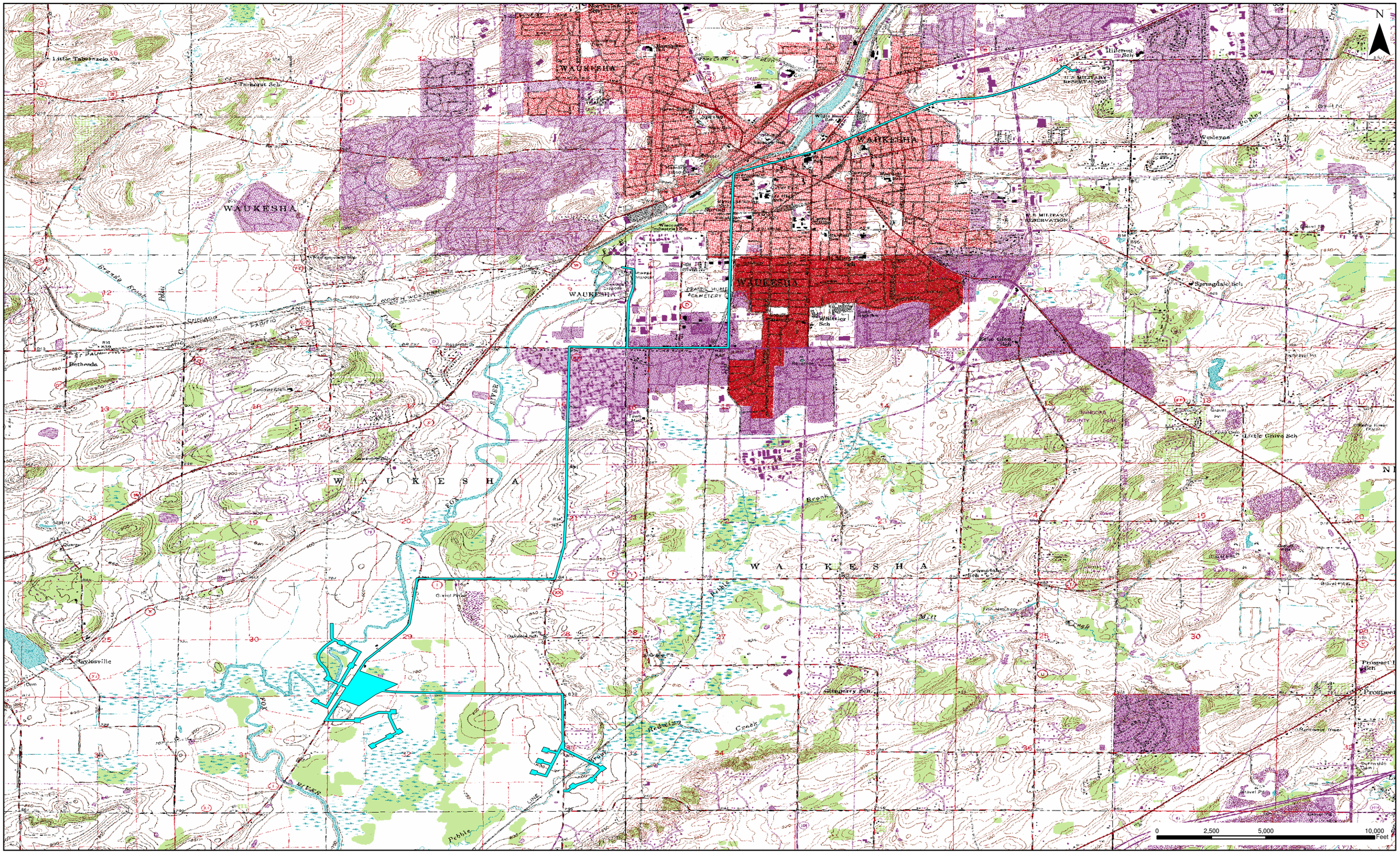
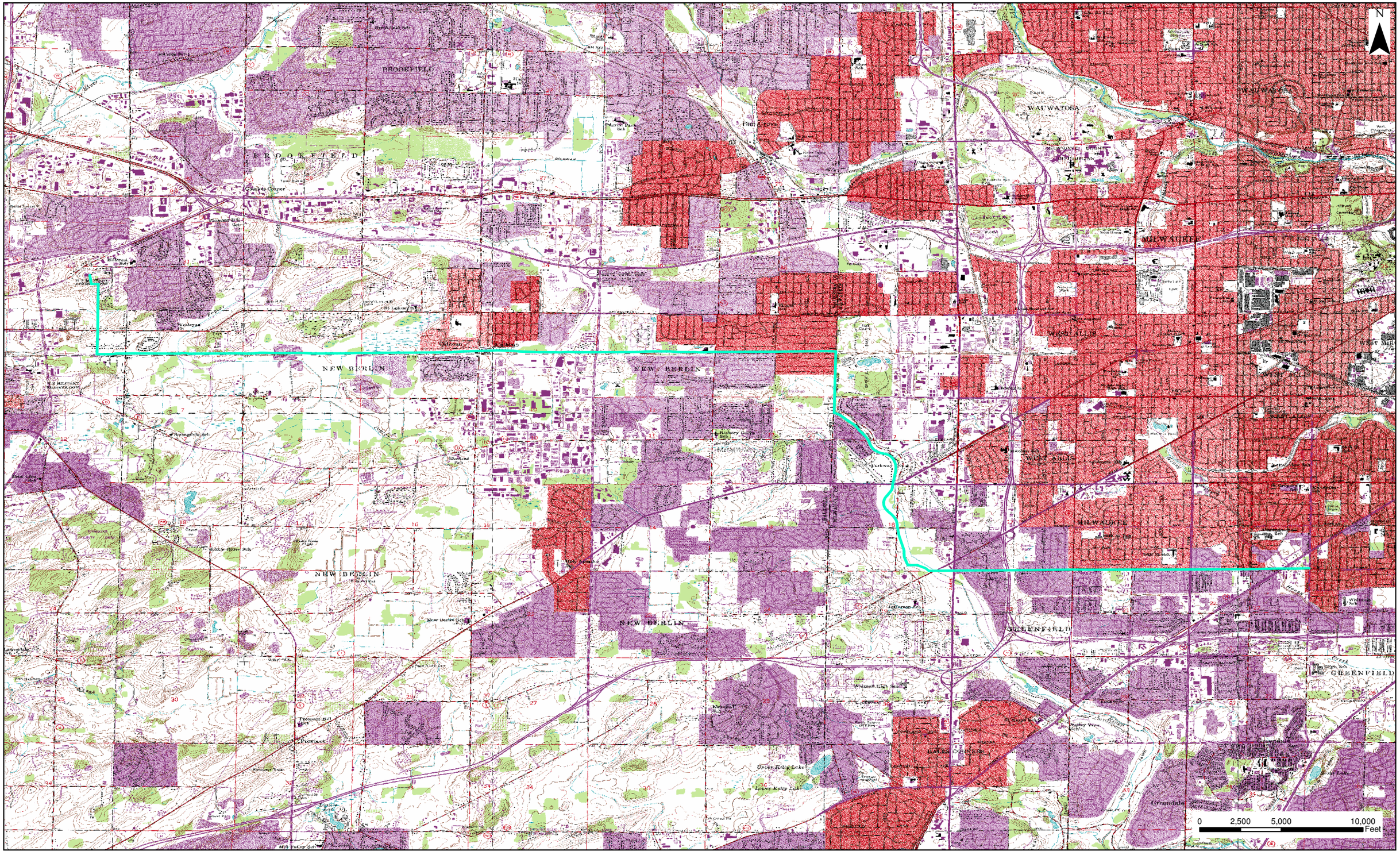
E
S
MICHIGAN
WISCONSIN
MINNESOTA
LAKE MICHIGAN
PROJECT LOCATION
IOWA
ILLINOIS



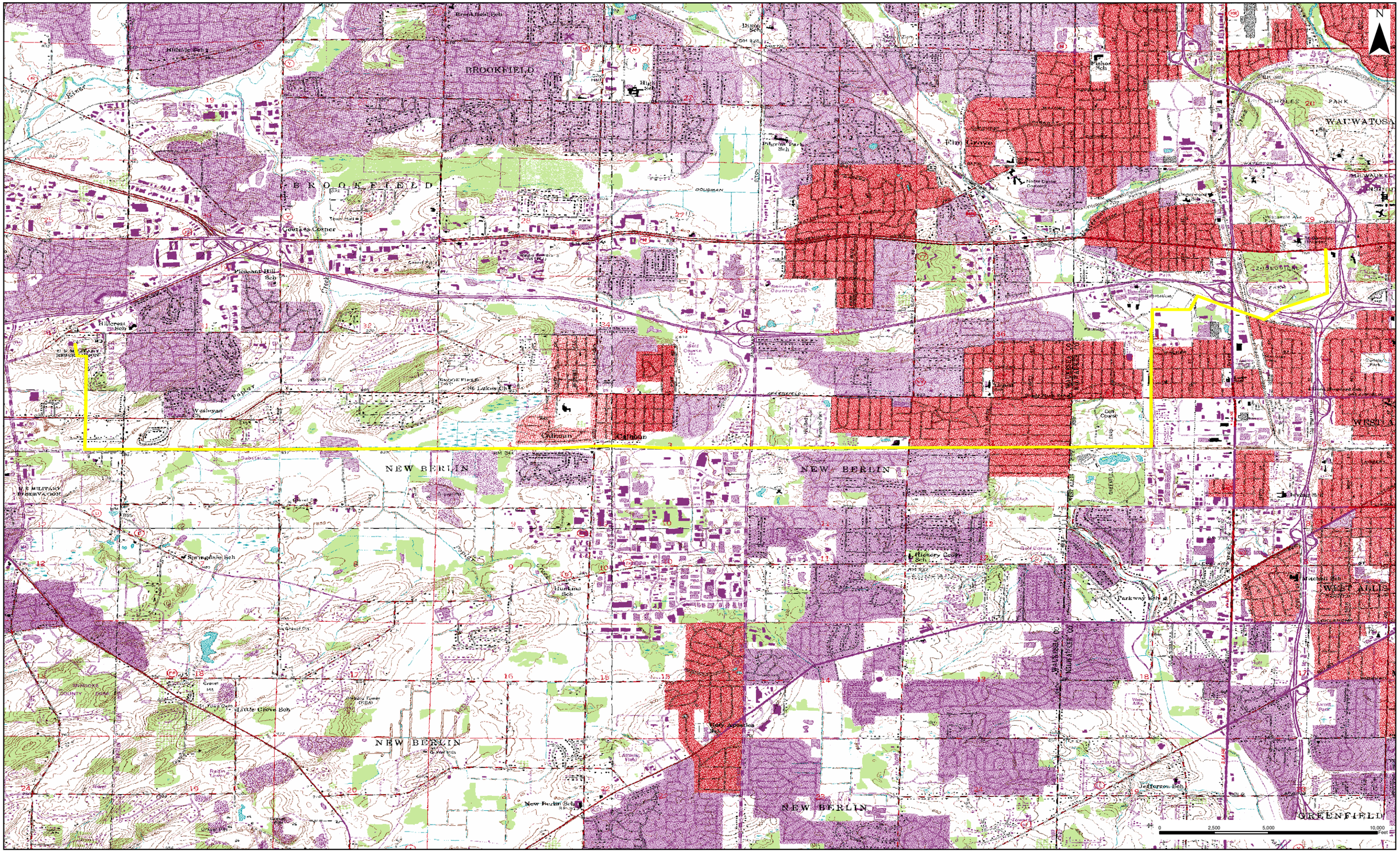
ALTERNATIVE 1 DEEP AND SHALLOW WELLS



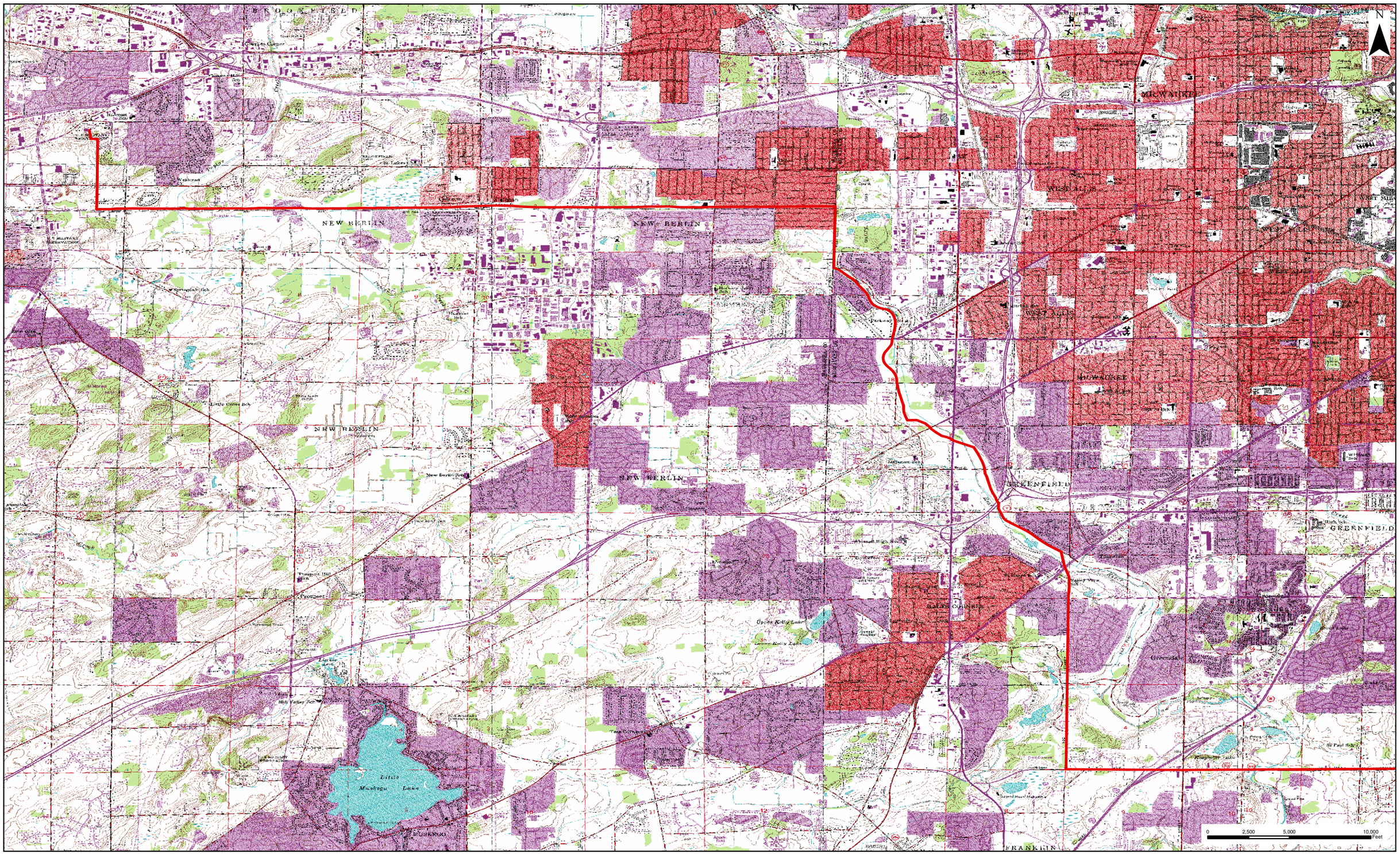
ALTERNATIVE 2 SHALLOW AQUIFER AND FOX RIVER ALLUVIUM



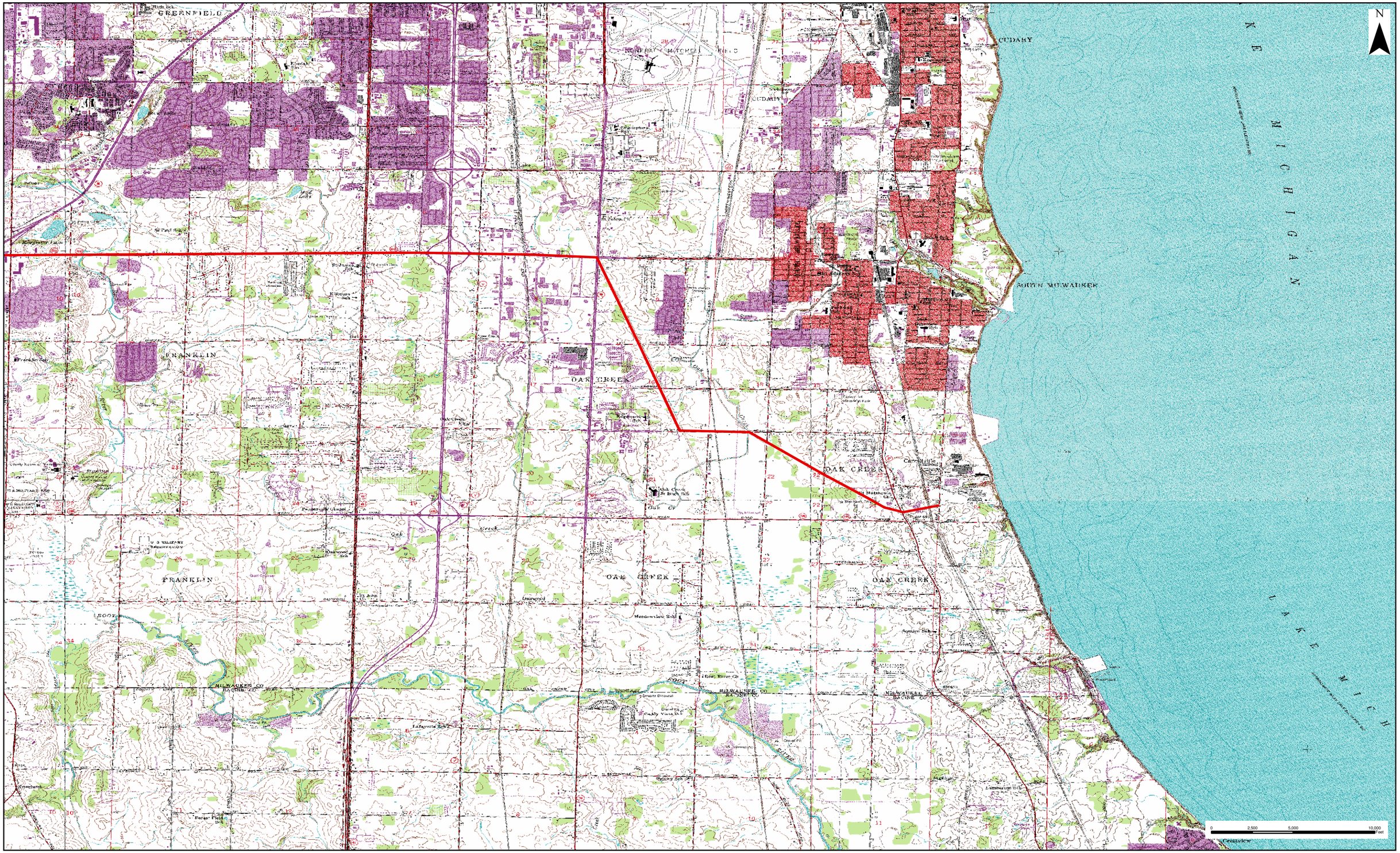
ALTERNATIVE 3-a1 MILWAUKEE SUPPLY



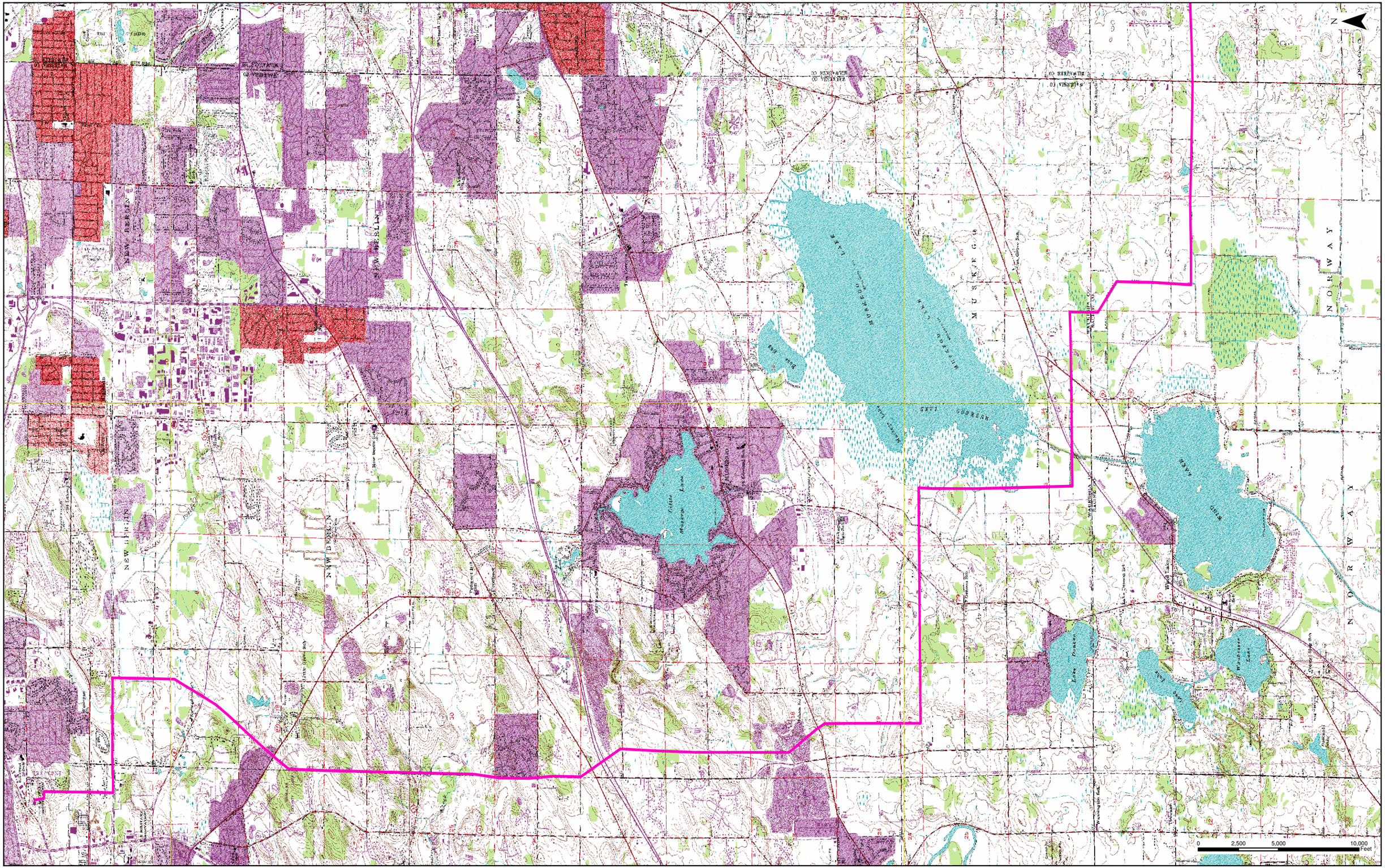
ALTERNATIVE 3-a2 MILWAUKEE SUPPLY 2



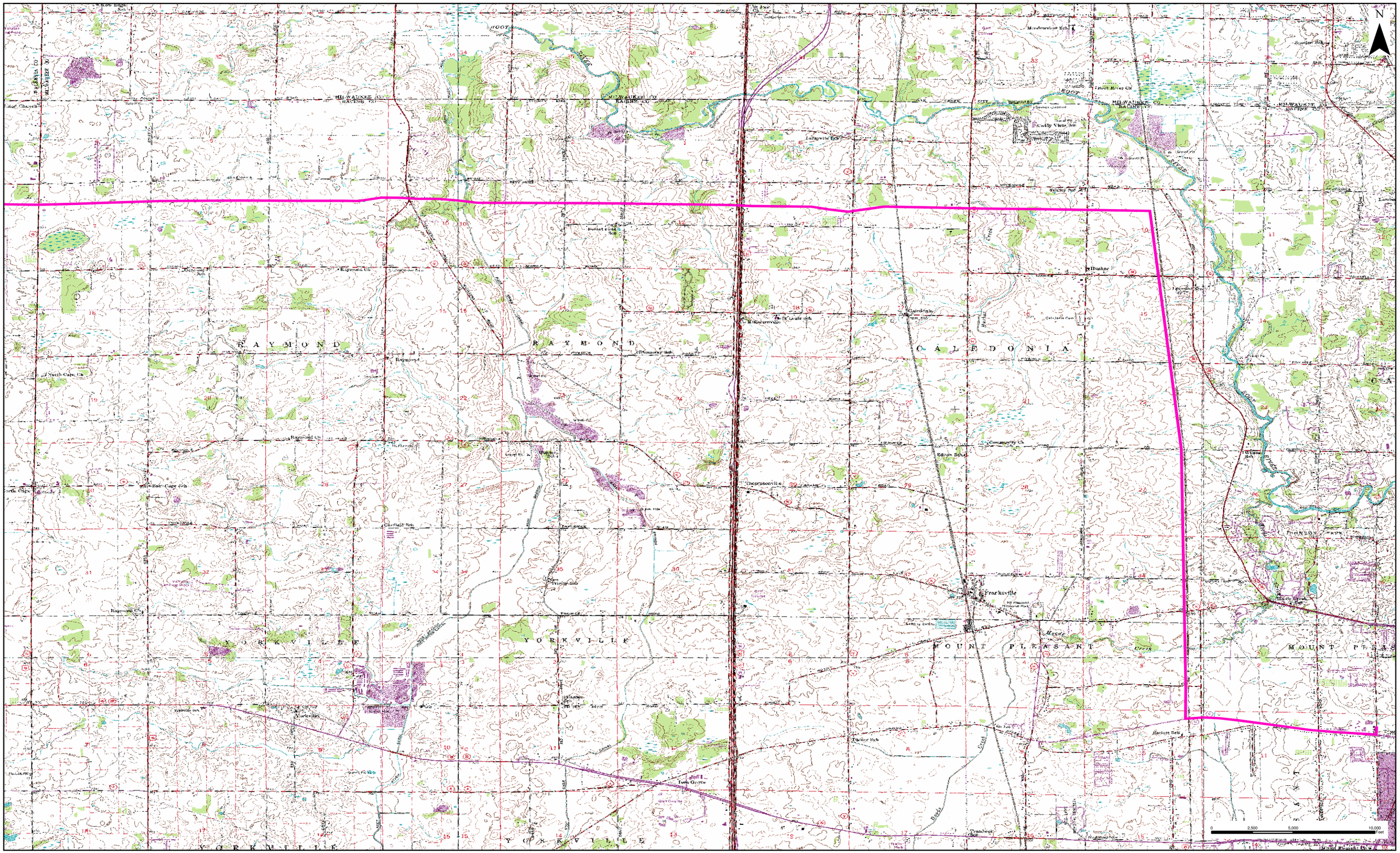
ALTERNATIVE 3-a3 OAK CREEK SUPPLY TILE 1



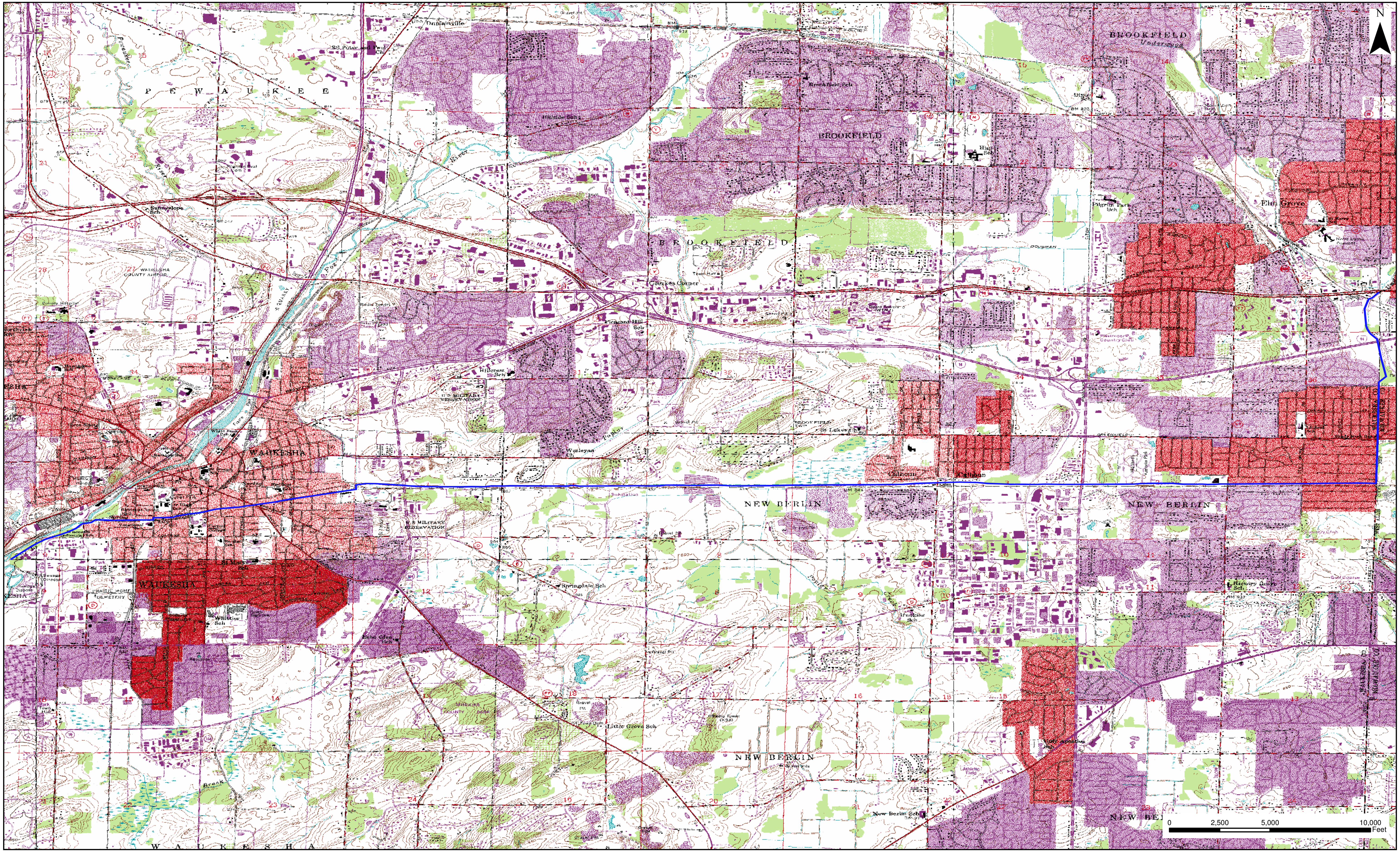
ALTERNATIVE 3-a3 OAK CREEK SUPPLY TILE 2



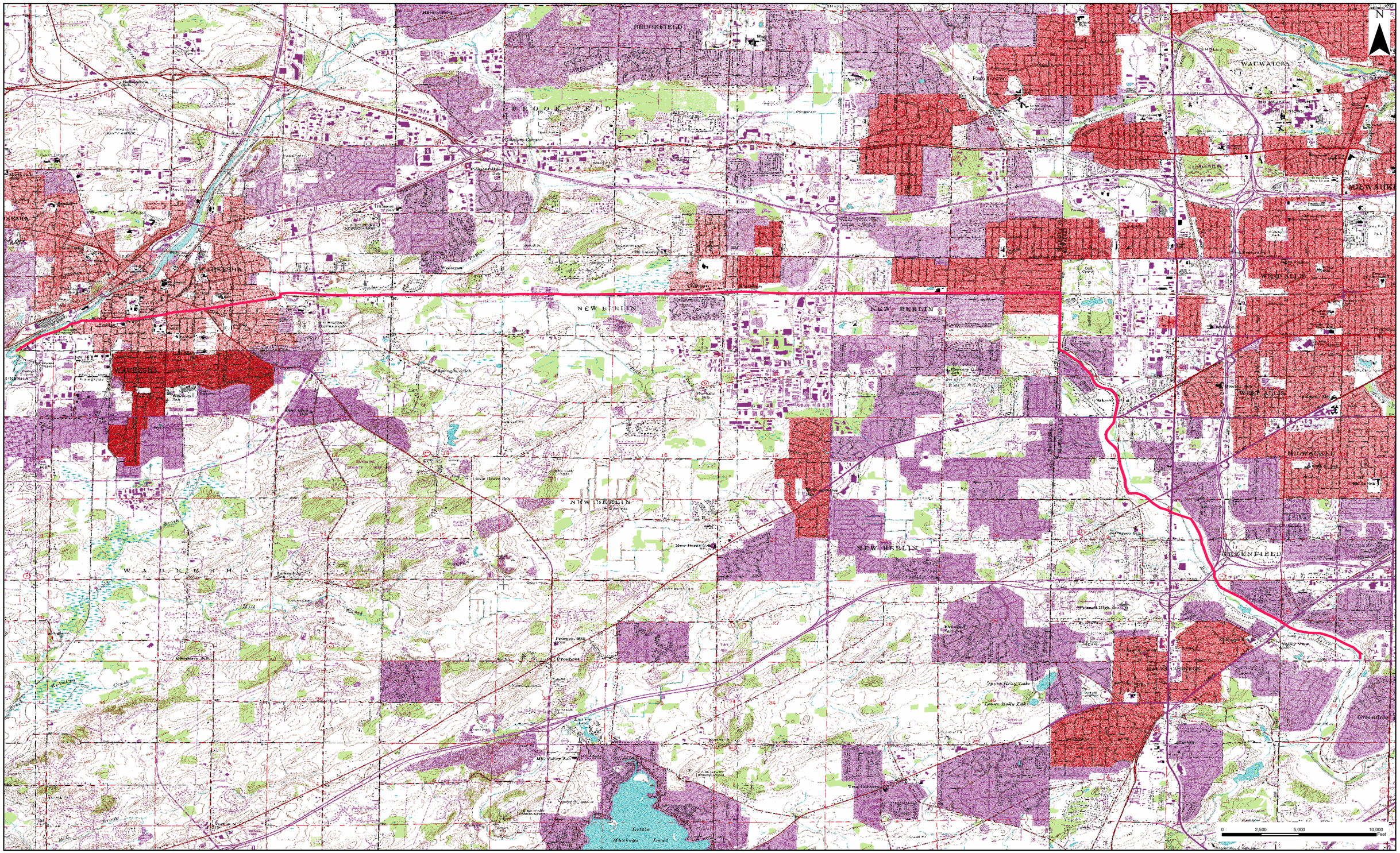
ALTERNATIVE 3-a4 RACINE SUPPLY TILE 1



ALTERNATIVE 3-a4 RACINE SUPPLY TILE 2



ALTERNATIVE 3-b1 UNDERWOOD CREEK



ALTERNATIVE 3-b2 ROOT RIVER

ALTERNATIVE 1 OVERVIEW MAP

N

Legend

- Alt 1 Deep and Shallow Wells Project Area
- Map Tiles
- Municipal Boundaries
- Freeway
- Highway
- Major Roads

0 4,000 8,000 Feet

TILE 4

TILE 3

TILE 2

TILE 1

PEWAUKEE

WAUKESHA

WALES

NEW BERLIN

MUSKEGO

Northview

Davidson

Cleveland

Coffee

Elmhurst

Meadowbrook

Grandview

Merrill Hills

Madison

Moreland

Delafield

Pewaukee

Main

Arcadian

Broadway

Springdale

Saint Paul

Mac Arthur

Prairie

East

Genesee

Sunset

Oakdale

Center

Cth X

National

Beloit

Racine

Martin

Small

College

18

59

164

83

43

TILE 1

Legend

Alt 1 Deep and Shallow Wells Project Area

0 1,000 2,000 Feet

N

Wood Lilly

Gruettner

Cartwr

CR I

Fox Vale

Glendale

Hazelhurst

Oakdale

Lois

Crest

Misty Woods

Deerfield

Townline

TILE 2

Legend

Alt 1 Deep and Shallow Wells Project Area

0 1,000 2,000 Feet

N

School
Haymarket
Alley
Burr Oak
Prairie
Davis
Burr Oak
SR 59
Dixie
Velma
Lawrence
Toxwood
River Place
Rickert
Wes
Ramp
Grand
Travis
Big Bend
Saylesville
Woodview
Wilmont
Parkton
Wren
Rockwood
Center
Fox Ridge
Swallow
Diana
SR 164
River Valley
Kestrel
Fox River
Dale
Maryanna
Red Oak
Oak View
Raintree
Meadow View
Black Oak
Oakdale
CR H
Wood Lilly
CR I

TILE 3

Legend

Alt 1 Deep and Shallow Wells Project Area

0 1,000 2,000 Feet

N

Minot
Cambridge
Saint Paul
Dunbar
Napa
Letko
Hamilton
Pendleton
Minaka
Phillip
West
Walton
Laflin
James
Windemere
Kensington
Newhall
Wilson
Luke
Scott
Arthur
Grandview
Mac Arthur
CR De
Oxford
Wabash
Prarie Home
Estberg
Brighton
Prairie
Grand
East
Badger
Hoover
Hickory
Poplar
Sentry
Progress
Tenny
Sunset
Genesee
Fox River
Garfield
Green Valley
Baird
View
Wisteria
Center
Big Bend
Genesee
Alley
Mulberry
Debbie
Richard
Sycamore
Dixie
School
Alley
Rivera

TILE 4

Legend

Alt 1 Deep and Shallow Wells Project Area

0 1,000 2,000 Feet

N

Moreland
CR J
SR 164
Davidson
Delafield
US 18
SR 164
Madison
Saint Paul
Broadway
Arcadian
SR 59
East
Broadway
Springdale
Prairie

ALTERNATIVE 2 OVERVIEW MAP

N

Legend

- Alt 2 Shallow Aquifer and Fox River Alluvium
- Map Tiles
- Municipal Boundaries
- Freeway
- Highway
- Major Roads

0 4,000 8,000 Feet

TILE 4

TILE 3

TILE 2

TILE 1

PEWAUKEE

WAUKESHA

WALES

NEW BERLIN

MUSKEGO

Northview

Davidson

Madison

Cleveland

Coffee

Sunset

College

Beloit

Elmhurst

Meadowbrook

Grandview

Merrill Hills

Moreland

Delafield

Pewaukee

Springdale

Main

Arcadian

Broadway

Saint Paul

Mad Arthur

Prairie

East

Genesee

Oakdale

Center

Racine

Martin

National

Small

18

59

164

83

43

TILE 1

Legend

Alt 2 Shallow Aquifer and Fox River Alluvium

0 1,000 2,000 Feet

N

Wood Lilly

Gruettner

Cartwr

Fox Vale

Glendale

Wood Lilly

Hazelhurst

Lois

Crest

Oakdale

CR I

Misty Woods

Deerfield

Townline

TILE 2

Legend

Alt 2 Shallow Aquifer and Fox River Alluvium

0 1,000 2,000 Feet

N

Genesee
Valley View
Velma
Donald
Saylesville
Lawrence
Lavine
Campfire
River Valley
Raintree
CR H
School
Davis
Foxwood
Woodview
Swallow
Fox River
Maryanna
Wood Lilly
Oakdale
Alley
Burr Oak
Dixie
SR 59
River Place
Wesley
Parkton
Center
Dale
Red Oak
Oak View
CR I
Prairie
Travis
Wilmont
SR 164
Big Bend

TILE 3

N

Legend

Alt 2 Shallow Aquifer and Fox River Alluvium

0 1,000 2,000 Feet

Minot
Cambridge
Saint Paul
Dunbar
Marshall
Napa
Letko
Pendleton
Minaka
College
Apache
Phillip
West
Laflin
James
Windemere
Kensington
Walton
Newhall
Wilson
Scott
Arthur
Mac Arthur
Grandview
Oxford
CR De
Wabash
Prarie Home
Estberg
Brighton
Prairie
Grand
East
Badger
Hoover
Hickory
Poplar
Sentry
Progress
Tenny
Garfield
Sunset
Genesee
Fox River
Green Valley
Baird
View
Wisteria
Center
Big Bend
Genesee
Alley
Mulberry
Debbie
Richard
Sycamore
Dixie
School
Alley
Rivera

TILE 4

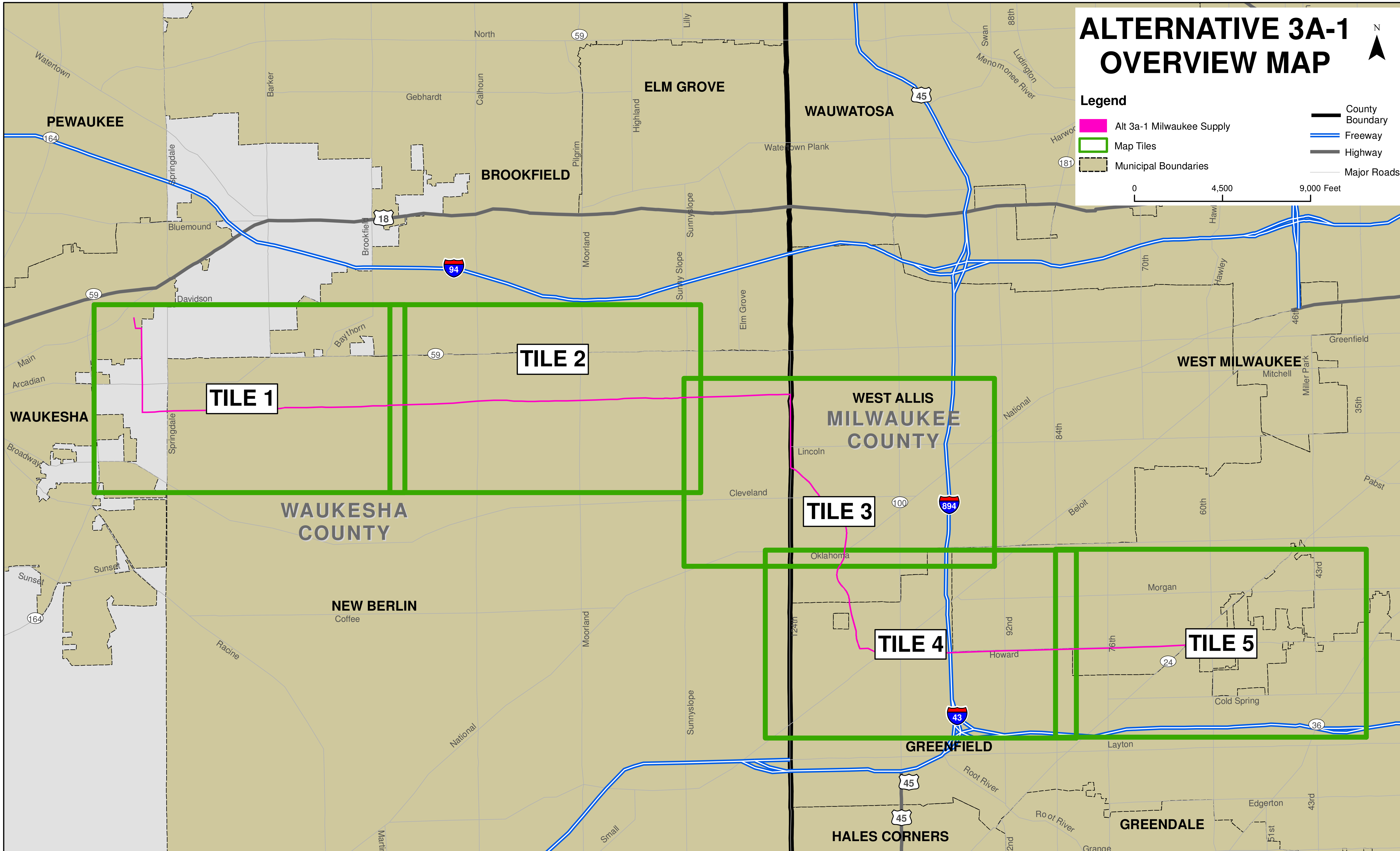
N

Legend

Alt 2 Shallow Aquifer and Fox River Alluvium

0 1,000 2,000 Feet

Moreland
CR J
SR 164
Davidson
Delafield
US 18
SR 164
Madison
Saint Paul
Broadway
Arcadian
SR 59
East
Broadway
Springdale
Prairie



ALTERNATIVE 3A-1
OVERVIEW MAP
N
Legend
Alt 3a-1 Milwaukee Supply
Map Tiles
Municipal Boundaries
County Boundary
Freeway
Highway
Major Roads
0
4,500
9,000 Feet
TILE 1
TILE 2
TILE 3
TILE 4
TILE 5
PEWAUKEE
WAUKESHA
BROOKFIELD
ELM GROVE
WAUWATOSA
WEST ALLIS
MILWAUKEE COUNTY
WAUKESHA COUNTY
WEST MILWAUKEE
NEW BERLIN
GREENFIELD
HALES CORNERS
GREENDALE

TILE 1

Legend

Alt 3a-1 Milwaukee Supply

0 1,000 2,000 Feet

N

Davidson
Main
Belgren
Calico
Summit
Hi Ridge
Linden
Nike
Ridge
Plateau
Barker
Auburn
Dolphin
Marlin
Copenhill
Ashbourne
Cologne
Sunnycrest
Avondale
Coral
Pioneer
Greenhill
Westwoods
Pinecrest
SR 59
Whitehall
Downie
Norwood
Craftsman
Lilly
Lincoln
Anoka
Pearl
Springdale
Danny
Lincoln
SR 59
CR D
Rempe
Broadale
Johnson

TILE 2

Legend

Alt 3a-1 Milwaukee Supply

N

0 1,000 2,000 Feet

Kestrel
Tremont
Ridge
Norwood
Franklin
Michael
Lois
Burnet
Pinehurst
Moorland
Post
Pepper
Dover
Jewel
High Meadow
Davidson
Patti
SR 59
Ridgeway
Fullerton
Sherwood
Meadow
Prospect
Coachlight
164th
167th
Calhoun
Ridge
Ranch
Berlin
Oak
Kostner
Roosevelt
Sunny Slope
Honey
Rogers
West
Rogers
Rogers
Reservoir
Woodview
Westward
Crestview
Woodshire
Woodland
162nd
Lincoln
170th
171st
Commerce
Overland
Krahn
Ronke
Park
Parkside
Brookland
Lilac
Robin
Brittany

TILE 3

Legend

Alt 3a-1 Milwaukee Supply

0 1,000 2,000 Feet

N

Prospect
Forest
Forest
Conrad
Forest
Honey
Honey
Park
Graham
Ferguson
Paddock
Lilac
134th
Robin
Montana
133rd
132nd
130th
Lagoon
Montana
127th
124th
National
Oklahoma
Harrison
Cleveland
Waukesha
Root River
Main
South
116th
115th
Mitchell
106th
Manor Par
Rog
Becher
Grant
114th
107th
102nd
98th
94th
95th
Lincoln
118th
Arthur
117th
SR 100
Hayes
Arthur
100th
Hayes
99th
96th
Harrison
Rosedale
Montana
111th
109th
Montana
111th
Dakota
104th
101st
I 894
97th
94th
Oklahoma
Wollmer
106th
103rd
Euclid

TILE 4

Legend

Alt 3a-1 Milwaukee Supply

0 1,000 2,000 Feet

N

National
Lakefield
122nd
Root River
Toldt
114th
Oklahoma
105th
Euclid
98th
Burdick
Ohio
124th
Holt
113th
Wollmer
I 894
95th
Verona
85th
82nd
Morgan
Eden
White Oak
Russell
Wilbur
120th
116th
SR 100
103rd
96th
93rd
90th
86th
Warnimont
83rd
87th
84th
North
Wilbur
River Ridge
Howard
Tripoli
Howard
Van Beck
Norwich
106th
104th
99th
Waterford
Tesch
Stonewood
119th
117th
Beloit
Plainfield
112th
101st
97th
94th
91st
88th
Leroy
Cold Spring
Todd
Coldspring
SR 100
92nd
90th
Whitaker
Sunset
116th
113th
I 43
I 43

TILE 5

Legend

Alt 3a-1 Milwaukee Supply

N

0 1,000 2,000 Feet

60th

Morgan

43rd

SR 24

76th

Howard

SR 24

60th

84th

Coldspring

Coldspring

Coldspring

SR 36

SR 36

76th

I 43

I 43

ALTERNATIVE 3A-3 OVERVIEW MAP

N

Legend

- Alt 3a-3 Oak Creek Supply
- Map Tiles
- Municipal Boundaries
- County Boundary
- Freeway
- Highway
- Major Roads

0 7,000 14,000 Feet

TILE 1
TILE 2
TILE 3
TILE 4
TILE 5
TILE 6
TILE 7
TILE 8
TILE 9

PEWAUKEE
WAUWATOSA
WAUKESHA
BROOKFIELD
WEST MILWAUKEE
WEST ALLIS
MILWAUKEE
ST. FRANCIS
CUDAHY
SOUTH MILWAUKEE
OAK CREEK
NEW BERLIN
GREENFIELD
GREENDALE
HALES CORNERS
FRANKLIN
MUSKEGO
BIG BEND
WAUKESHA COUNTY
MILWAUKEE COUNTY

Davidson, Main, Arcadian, Springdale, Broadway, Sunset, Baxter, Brookfield, Moorland, Sunny Slope, Elm Grove, Hawley, Bayhorn, Lincoln, National, Cleveland, Oklahoma, Morgan, Beloit, 92nd, 84th, 70th, 60th, 46th, Greenfield, Mitchell, 35th, Cesar E Chavez, Forest Home, Pabst, 20th, 16th, Laph, Holt, Clement, Howard, Whitnall, Packard, Plankinton, Bolivar, Cold Spring, Layton, 43rd, 76th, 24th, 13th, Edgerton, Root River, Northway, Southway, Ramsey, 6th, 5th, Nicholson, College, Grange, Small, Martin, Racine, Coffee, Calhoun, Sunnyslope, Tess Corners, Rawson, North Cape, Saint Martins, Forest Home, Church, Lannon, Woods, Ryan, 116th, 68th, 11st, Drexel, Puetz, Pennsylvania, Milwaukee

18, 59, 45, 181, 57, 894, 100, 24, 43, 38, 41, 36, 32, 164

TILE 1

Legend

Alt 3a-3 Oak Creek Supply

N

0 1,000 2,000 Feet

Davidson

Main

Barker

SR 59

Springdale

CR D

TILE 2

Legend

Alt 3a-3 Oak Creek Supply

N

0 1,000 2,000 Feet

SR 59

Calhoun

Moorland

Sunny Slope

Moorland