
Environmental Report

City of Waukesha Water Supply

Prepared for
City of Waukesha Water Utility

February 2012

CH2MHILL

Executive Summary

Overview of Waukesha Water Supply

Current Supply and Issues

The City of Waukesha currently obtains more than 87 percent of its water supply from the deep St. Peter Sandstone Aquifer. Near and beyond the City, 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 percent³ less groundwater contribution as water migrates toward the deep aquifer. Significant water quality issues developed 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 radium concentrations have prompted the State of Wisconsin to issue a consent order to the City to bring their drinking water quality into radium compliance by June 30, 2018.

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 has 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 study⁵ that examined the impacts of public water supplies on the deep and shallow aquifers as well as the use of Lake Michigan as a water supply source. On the basis of groundwater quantity and quality issues, SEWRPC recommended the long-term water supply for the City be Lake Michigan. A Lake Michigan supply is regulated under the Great Lakes-St. Lawrence River Basin Water Resources Compact (Compact) and Wisconsin State Statute § 281.346 which require return flow be sent back to the Great Lakes basin.

The City has explored water supply alternatives, including use of the deep aquifer, shallow aquifer wells, water conservation, and a Lake Michigan water supply source. Water supply

¹ SEWRPC. 2010. A Regional Water Supply Plan for Southeastern Wisconsin. Planning Report No. 52.

² Waukesha Water Utility 2009 operating data.

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

⁴ SEWRPC. 2010. A Regional Water Supply Plan for Southeastern Wisconsin. Planning Report No. 52.

⁵ Ibid.

and return flow alternatives were developed individually, and return flow alternatives were developed considering the Lake Michigan supply source. These individual water supply and return flow alternatives are combined to create a “system alternative”. A system alternative adds together the environmental impacts from both water supply and treated wastewater discharge to provide the sum of the impacts. An example “system alternative” for a Lake Michigan basin water supply includes connecting to the City of Milwaukee’s Lake Michigan water supply, distribution to Waukesha customers, collection of wastewater in Waukesha’s existing sewer system, wastewater treatment at the City of Waukesha treatment plant, and return flow of treated wastewater to Lake Michigan via Underwood Creek. This Environmental Report (ER) examines the environmental impacts associated with the water supply and return flow alternatives.

As part of the water supply planning process, the City has conducted multiple public meetings to solicit comments from City residents and the general public. Four public meetings have been held, including one meeting in a neighboring community adjacent to one of the Lake Michigan return flow alternatives (Wauwatosa, WI), where the public provided verbal and written comments regarding Waukesha’s water supply alternatives. Many more public meetings have been conducted in prior years and public meetings continue to take place to update the public on long-term water supply planning activities. Public comments and issues raised have been addressed in this document. A compilation of comments received from City meetings and other public involvement processes is included in the Water Supply Service Area Plan, which is Appendix B of the Application for Lake Michigan Water Supply (Application).

Environmental Report

Reason for Preparing

This document 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 it will follow the WEPA process for evaluating the City of Waukesha water supply alternatives considered under the City’s Great Lakes Diversion Application. This document is organized to support the WDNR’s development of an Environmental Impact Statement (EIS).

The WDNR issued a formal EIS scoping request for a City of Waukesha Lake Michigan water supply on February 5, 2010. This request was issued to interested parties and resources agencies and has also been made available to the general public on the WDNR website. The WDNR has obtained input from the public through a series of public meetings held between July 26-28, 2011 in Pewaukee, Wauwatosa, and Sturtevant, Wisconsin.

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 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 and supporting documents.

Purpose and Need

The City needs a long-term water source that can meet water supply demands, is protective of human health and the environment, and is sustainable. The City must also obtain a water supply that meets their consent order for radium compliance by June 30, 2018. 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 for many years. In March 2002, the Waukesha Water Utility completed a future water supply study.⁶ Stakeholders in this study included representatives from the Utility, City of Waukesha, 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

Other water supply sources were eliminated for various technical reasons. Combinations of alternatives have also been evaluated and screened out. The Application and Water Supply

⁶ *Future Water Supply Report for the Waukesha Water Utility*, CH2M HILL with Ruckert & Mielke, 2002.

Service Area Plan considered six water supply alternatives in detail, chosen on the basis of previous screening in the Future Water Supply Study and by SEWRPC, stakeholder feedback, and WDNR request. The benefits of an aggressive water conservation program are included in all water supply alternatives. The Application evaluated and compared the following alternatives in detail:

- Deep and shallow aquifers
- Shallow aquifer and Fox River alluvium
- Unconfined deep aquifer
- Multiple source water supply
- Lake Michigan and shallow aquifer
- Lake Michigan

In this document some of these alternatives were not addressed in detail because they were screened out for implementability, logistics, legal, or for other reasons. As discussed in the Water Supply Service Area Plan (Appendix B 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 document.

The unconfined deep aquifer was eliminated from further evaluation in this document (see Section 2 of this document) because installing high capacity wells in the deep unconfined sandstone aquifer west of the Maquoketa shale has significant logistical, legal, and environmental resource impacts. The multiple source water supply alternatives was also eliminated from further evaluation in this document (see Section 2 of this document) because compared to the five other top ranking alternatives in the Water Supply Service Area Plan, this alternative collectively had the most significant adverse impact ratings.

The remaining water supply alternatives addressed in this document are:

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

Return Flow

The Compact and Wisconsin implementation statute requires return flow for a Lake Michigan water supply. Five alternatives were considered for return flow to Lake Michigan for a Lake Michigan water supply. The alternatives include return flow to:

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

The return flow direct to Lake Michigan near Racine alternative was eliminated in Section 2 of this document because it is significantly more expensive than all other return flow alternatives (Return Flow Alternatives Summary, Appendix F of the Application), it has the greatest impacts because it has the longest pipeline length, and provides no additional benefit than return flow directly to Lake Michigan near Milwaukee and Oak Creek. The MMSD return flow alternatives were eliminated because the SEWRPC regional water supply study did not recommend a MMSD alternative due to the higher cost compared to return flow directly to Lake Michigan and to a Lake Michigan tributary.

Included in all the return flow alternatives is maintaining the existing discharge location into the Fox River from the Waukesha WWTP. Discharge to the Fox River will occur when flow available at the WWTP exceeds the amount to be returned and also return flow could exacerbate flooding conditions in the return flow receiving waters. The discharge to the Fox River and return flow would continue to meet water quality requirements.

A treated wastewater pump station and a pipeline (of varying length depending on the alternative) were included for each return flow alternative. Additional specific information regarding the various alternatives is included in this document and in the Application.

Major Issues in Evaluating Alternatives

Exacerbating Existing Groundwater Problems

All water supply sources were reviewed for their ability to minimize depletion of the deep aquifer currently used by the City. As discussed above, historic use of the deep aquifer has resulted in significant depletion of the aquifer and water quality issues. Continued use of the aquifer would continue the depletion and water quality degradation.

Groundwater Drawdown Impacts

Groundwater drawdown in the shallow aquifer and associated impacts to surface waters and other environmental resources is considered in the water supply alternatives 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 in the shallow aquifers can also affect wetland and other aquatic resources that depend upon groundwater hydrology for maintaining wetland habitat. The City has utilized a groundwater model to simulate the groundwater drawdown expected with long-term water supply alternatives that use the shallow aquifer.

Wetlands

Operational impacts also occur to wetlands from groundwater 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 has utilized a groundwater model to simulate the groundwater drawdown expected with water supply alternatives that use or are hydraulically connected to 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. Depending upon the groundwater supply alternative, groundwater pumping would reduce the groundwater level by 5 feet or more for nearly 1,000 to 2,000 wetland acres. A 1-foot or greater groundwater drawdown would occur over more than 3,000 to 4,000 wetland acres. Use of shallow groundwater sources would have significant adverse effects on these resources.

In addition to significant adverse effects on wetlands from the drawdown of the shallow aquifer, impacts on wetlands occur from temporary construction impacts from pipeline construction and above ground structure construction required for the groundwater and Lake Michigan water supply and return flow alternatives. Construction impacts are temporary during construction and are avoided or mitigated through construction or restoration techniques. However, wetland type changes may occur during operation for some water supply and return flow pipeline alignments that cross forested or shrub/scrub wetlands. Operational impacts from above ground structures occur where access roads, treatment plants, or well house locations occur in wetlands. Before the City obtains a construction permit for the proposed project, the City will coordinate with the WDNR pursuant to the requirement of NR 103 to seek ways to reduce wetland impacts, whether temporary construction or long-term operational impacts. Such analyses will look for ways to further reduce impacts, including adjustments to pipeline routes or construction methods to further minimize impacts.

Aquatic Habitat

Aquatic habitat impacts occur when flows change in surface streams. Flows change in surface streams under all alternatives considered. Groundwater pumping alternatives that affect the shallow aquifer change the surface water and groundwater interaction and decrease the surface water flow volumes. 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 by providing additional flow volume and cross-sectional flow area, especially to Underwood Creek which has very low baseflows and has had no-flow during some periods of the year. Each of these flow changes has been considered for water supply and Lake Michigan return flow alternatives to evaluate reductions or increases in aquatic habitat.

Vegetation and Wildlife

Groundwater drawdown in the shallow aquifer could result in habitat change in the Vernon Wildlife Area (VWA). The 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. The City has utilized a groundwater model to simulate the groundwater drawdown when the shallow aquifer is used for the long-term water supply. The groundwater modeling results were used to determine acreage of wetlands in and around the VWA that would experience of 5 foot or greater drawdown and that would experience a 1 foot or greater drawdown. Depending upon the groundwater supply alternative, groundwater pumping would reduce the groundwater level by 5 feet or more for nearly 1,000 to 2,000 wetland acres. A 1-foot or greater groundwater drawdown would occur over more than 3,000 to 4,000 wetland acres. An analysis of groundwater drawdown effects to wetlands in the VWA area has been prepared and is included as Attachment 6-4, Wetland Habitat Impact Analysis: Vernon Marsh Wildlife Area.

Vegetation and wildlife impacts are also estimated for return flow alternatives. The vegetation impacts occur from temporary construction impacts from pipeline construction required for the return flow alternatives. Construction impacts are temporary during construction and are avoided or mitigated through construction or restoration techniques. However, vegetation and wildlife changes may occur as a result of operational needs (e.g. maintenance easement) of some portions of the return flow pipeline alignments.

Construction Impacts for Conveyance

Each of the water supply and return flow alternatives involves pipeline construction for the water supply and return flow conveyance. The long, linear construction footprint of the pipeline projects will include crossings of water bodies, wetlands, public lands, and other features. The potential environmental impacts of pipeline construction have been reviewed and compared.

Comparison of Alternatives

A comparison of the environmental impacts for each of the alternatives is summarized in Table ES-1. This table does not include cultural resources or socioeconomics because none of the water supply and return flow alternatives has an adverse impact on them. All of the Lake Michigan water supply and return flow alternatives have no significant adverse impacts and have fewer impacts than groundwater alternatives. For the Lake Michigan water supply alternatives, a City of Milwaukee and Oak Creek water supply have the same impact classifications. The two alignments have much overlap but a City of Milwaukee water supply has fewer impacts because it is a shorter pipeline. A City of Racine water supply differs from Milwaukee and Oak Creek only in its impacts to wetlands, which are more because it has the longest pipeline of the three Lake Michigan water supply alternatives.

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

Water Supply Alternative	Groundwater Resources	Geomorphology and Sediments	Flooding	Aquatic Habitat	Water Quality	Wetlands	Vegetation and Wildlife Resources	Soils	Land Use
Water Supply Alternatives									
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 (City of Milwaukee)	No adverse impact	No adverse impact	No adverse impact	Minor adverse impact	No adverse impact	Minor adverse impact	No adverse impact	No adverse impact	No adverse impact
Lake Michigan (City of Oak Creek)	No adverse impact	No adverse impact	No adverse impact	Minor adverse impact	No adverse impact	Minor adverse impact	No adverse impact	No adverse impact	No adverse impact
Lake Michigan (City of Racine)	No adverse impact	No adverse impact	No adverse impact	Minor adverse impact	No adverse impact	Moderate adverse impact	No adverse impact	No adverse impact	No adverse impact
Return Flow Alternatives for Lake Michigan Water Supplies									
Underwood Creek to Lake Michigan	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 to Lake Michigan	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

Similarly, Underwood Creek and Root River return flow alternatives have the same impact classifications but Underwood Creek has fewer impacts primarily because its pipeline is shorter. Both Underwood Creek and Root River return flow alternatives have fewer impacts than a direct to Lake Michigan return primarily because the direct to Lake Michigan return flow is the longest return flow pipeline and it includes an offshore discharge that would disturb the lake bottom. As a result, a Lake Michigan water supply with return flow to Underwood Creek has the least adverse impacts among the alternatives.

A detailed comparison of all of the water supply and return flow alternatives is found in Section 6 of this document.

Selection and Description of the Proposed Project

The proposed project for the City of Waukesha water supply is to obtain a Lake Michigan water supply with return flow to Underwood Creek. This alternative was chosen because it is a long-term water source that can meet water supply demands, it is protective of human health and the environment, and is sustainable. It is also supportive of the City's consent order for radium compliance by June 30, 2018.

A Lake Michigan water supply would be obtained from one of three potential suppliers: the Cities of Milwaukee, Oak Creek, or Racine. The final water supplier will be determined through contract negotiations that are currently in progress and that will determine the project that will be implemented.

Compared to a Lake Michigan water supply, the Deep and Shallow Aquifers and the Shallow Aquifer and Fox River Alluvium alternatives would have significant adverse environmental impacts to natural resources, specifically wetlands and the Vernon Wildlife Area. The Lake Michigan water supply and return flow alternatives would have only minor or moderate 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 return flow discharge will have water quality that will meet all WDNR permit requirements and consequently all return flow alternatives will have a minor adverse impact. The return flow pipeline to Underwood Creek is about four miles shorter than the Root River pipeline. A return flow to Underwood Creek will have less adverse impacts than to the Root River. As a result, return flow to Underwood Creek is the preferred return flow alternative and is included in the proposed project.

Once a water supplier and return flow location have been approved and the proposed project progresses into detailed design, the City of Waukesha will continue to work with the regulatory agencies during final design to conduct any necessary field surveys, location refinements, mitigation planning, and to obtain required construction permits.

Cumulative Impacts

The proposed project will have no significant adverse individual or cumulative impacts on the quantity or quality of the waters and water dependent natural resources of the Great Lakes Basin. To the contrary, the proposed project is anticipated to have a net positive impact on the waters and water dependent natural resources, to the groundwater, and to inland waterways.

As a result of switching to a Lake Michigan source of water, the City of Waukesha would discontinue its use of groundwater from the deep and shallow aquifers. Pumping the deep aquifer pulls down water from the overlaying shallow aquifer to the deep aquifer. If pumping of the deep aquifer is replaced with a Lake Michigan supply, Waukesha will no longer pull water from the shallow aquifer to the deep aquifer. Discontinuing the use of groundwater would stop the cumulative adverse impacts to the groundwater and connected surface water resources (e.g. streams and wetlands). This will improve critical baseflows to surface water resources, including wetlands, streams and lakes.

Switching to a Lake Michigan water supply and discontinuing the withdrawal of groundwater from the deep aquifer would also benefit the waters of the Lake Michigan basin. Historically, water from the deep aquifer flowed towards Lake Michigan. As pumping increased, the flow of groundwater was reversed and water that otherwise would have fed Lake Michigan was drawn to the groundwater wells. Now, waters from Lake Michigan are flowing into the deep aquifer rather than recharging the lake. Switching from the groundwater supply to a Lake Michigan surface water supply would contribute to aquifer recovery and would eliminate the diversion of water from the Lake Michigan groundwater watershed to the Mississippi River watershed.

The City has a goal to exceed the Compact requirements with the return volume equal to the withdrawn volume. By providing 100 percent return volume, there will be no volume change to the Great Lakes basin and therefore no significant cumulative impact to the water dependent industries (e.g. shipping and hydropower generation) in the Great Lakes basin.

The withdrawal of water from Lake Michigan will also not endanger the integrity of the Lake Michigan ecosystem; the return flow water quality will meet all WDNR requirements and the City has a goal to return 100 percent of the withdrawn volume. The return flow will also improve or maintain the physical and biological resources, and improve or have a minor change to the chemical resources of Underwood Creek and Lake Michigan.

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Acronyms and Abbreviations

BLS	Bureau of Labor Statistics
BOD	biological oxygen demand
CED	Center for Economic Development
CLEAN	Contaminated Lands Environmental Action Network
COLD	cold water
CSO	combined sewer overflow
CTH	County Trunk Highway
EIS	Environmental Impact Statement
EO	Executive Order
ER	Environmental Report
ERP	environmental repair
FEMA	Federal Emergency Management Agency
INRA	Isolated Natural Resource Area
LAL	Limited aquatic life
LEF	Limited forage fish
LUST	leaky underground storage tank
MCL	maximum contaminant level
mgd	million gallons per day
MMSD	Milwaukee Metropolitan Sewerage District
MWh	megawatts
NEPA	National Environmental Policy Act
NRCS	Natural Resource Conservation Service
NH ₃ -N	ammonia
NRHP	National Register of Historic Places
PEM	palustrine emergent
PFO	palustrine forested
PSAAP	Public Service Archaeology & Architecture Program
PSS	palustrine scrub-shrub
RR	Remediation and Redevelopment
SEWRPC	Southeastern Wisconsin Regional Planning Commission
SSURGO	Soil Survey Geographic
TDS	total dissolved solids
the City	Great Lakes Basin Compact
the Compact	Waukesha County
the County	Waukesha County
TMDL	total maximum daily load
TP	Total phosphorus
TSS	total suspended solids
USC	U.S. Code
USCB	U.S. Census Bureau
USGS	United State Geological Survey
UV	ultraviolet

UWM	University of Wisconsin–Milwaukee
VWA	Vernon Wildlife Area
WAC	Wisconsin Administrative Code
WDNR	Wisconsin Department of Natural Resources
WEPA	Wisconsin Environmental Policy Act
WGNHS	Wisconsin Geological and Natural History Survey
WPDES	Wisconsin Pollutant Discharge Elimination System
WWFF	Warm water forage fish
WWSF	warm water sport fish
WWTP	Waukesha Wastewater Treatment Plant