



# Wellhead Protection Plan

## Unit Well 23

### City of Madison, Wisconsin



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## EXECUTIVE SUMMARY

This report is a Wellhead Protection Plan (WHPP) for City of Madison Unit Well 23. The primary purposes of this WHPP are to define the wellhead protection area (WHPA) for Unit Well 23 and establish specific criteria for protection of Unit Well 23 and groundwater resources in the WHPA including management activities to maintain a high quality water supply, free of contamination. The primary goal of wellhead protection (WHP) planning is to protect water supply wells from contamination and, thereby, protect people who obtain their water supply from those wells. This WHPP was prepared for Unit Well 23 to conform to the requirements of the Wisconsin Administrative Code, Chapter NR 811, Section 12(6), for WHP planning.

Unit Well 23 is located at 4502 Leo Drive in the eastern part of the City of Madison. Construction of Unit Well 23 was completed in 1958. Unit Well 23 is 500 feet deep. Well 23 is cased with 12-inch diameter casing and grouted to a depth of 102 feet and is open to the lower bedrock (sandstone) aquifer and the upper bedrock aquifer, and has a design capacity of 1,200 gallons per minute (gpm). Unit Well 23 is typically used as a seasonable supply during the peak demand period of May through October.

Land use in the vicinity of Unit Well 23 is residential, manufacturing, conservancy, and commercial. Unit Well 23 and the surrounding properties are located in the City of Madison. The Town of Blooming Grove is located approximately 1.6 miles east of Unit Well 23. Other isolated (island) parcels in the Town of Blooming Grove are located approximately 3,000 to 3,500 feet southwest, and 1.25 miles southeast of Unit Well 23.

As part of the Dane County regional hydrologic study, a regional groundwater flow model was prepared for Dane County (Krohelski et al., 2000) and was used to delineate time-related (5-, 50-, and 100-year time of travel (TOT)) zones of contribution (ZOCs) for municipal wells including Unit Well 23. ZOCs extend northeasterly and southeasterly from Unit Well 23 in the simulated upgradient groundwater flow directions.

The WHPA for Unit Well 23 is illustrated in Figure 3-5. Two zones of protection are within the WHPA. Zone A is defined by the 5-year TOT ZOC. Zone B is defined by a 1,200-foot fixed radius around Unit Well 23. The WHPA will provide a conservative protection zone to account for changes in pumping rates, pumping duration, and interference drawdown from other existing and future wells.

A contaminant source inventory (CSI) was performed for the Unit Well 23 area during November 2010. Known potential and existing contaminant sources and routes within the Unit Well 23 WHPA include sanitary sewer; storm sewer; spill sites; streets, transportation corridors and railroad tracks (potential spills); in-use aboveground storage tank (AST) sites; active and closed underground storage tank (UST) sites; closed and open leaking underground storage tank (LUST) and Environmental Repair Program (ERP) sites; closed landfill; gas stations; a drycleaner; vehicle repair/maintenance businesses; veterinary clinic; road salt use; stormwater retention/infiltration ponds and drainage ways; and probable use of pesticide, herbicide, and nutrients on parks, commercial and residential lawns and gardens.

Programs and activities to be used by the City of Madison and others for WHPA management at Unit Well 23 are grouped into five principal categories as follows:

**1. Existing Programs**

- a. Clean Sweep Collection Program
- b. On-site waste disposal system maintenance
- c. Well construction and abandonment
- d. Land application of sludge and septage
- e. Spill notification and awareness of remedial investigation and cleanup

**2. Land Use Controls**

- a. Existing zoning/WHP overlay zoning and ordinance

**3. Intergovernmental Cooperation**

- a. Land use planning and site plan review

**4. Monitoring**

- a. CSI maintenance
- b. Water quality monitoring

**5. Public Education and Awareness**

- a. Availability of WHPP
- b. Public informational meeting
- c. News releases
- d. Informational materials distributed to residents in WHPA
- e. Land use and contamination source awareness
- f. School programs

Some of these programs and activities are currently being performed, while others are new and will be implemented immediately to help protect Unit Well 23.

The Madison Water Utility has an existing water conservation program and encourages water conservation. The Utility has formulated a contingency plan for providing water in the event that Unit Well 23, or one or more of the City's other water supply wells became contaminated or removed from service. Well 23 is part of Pressure Zone 6. In the event of the loss of Unit Well 23, Unit Wells 11 and 29 (Pressure Zone 6) can serve the area.

The City of Madison has a WHP ordinance and overlay zoning district. The WHP ordinance helps ensure that new contaminant sources are not located in the Unit Well 23 WHPA.

## 1.0 INTRODUCTION AND BACKGROUND

### 1.1 INTRODUCTION

This report is a WHPP for City of Madison Unit Well 23. The primary purposes of this WHPP are to define the WHPA for Unit Well 23 and establish specific criteria for protection of Unit Well 23 and groundwater resources in the WHPA including management activities to maintain a high quality water supply, free of contamination. The primary goal of WHP planning is to protect water supply wells from contamination and, thereby, protect people who obtain their water supply from those wells.

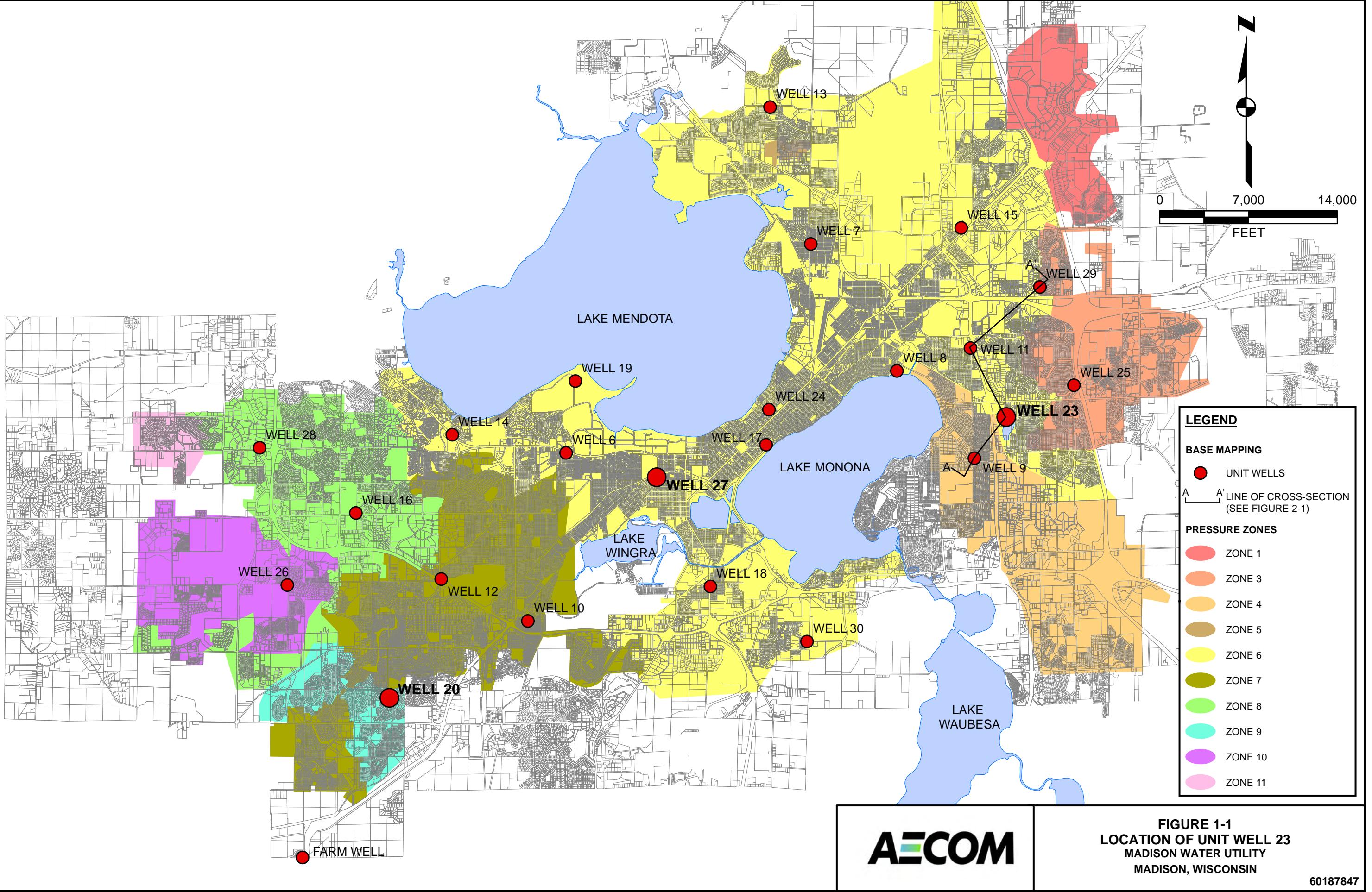
The term "wellhead" refers to the physical structure (well) at the land surface through which groundwater is withdrawn from a subsurface water-bearing formation (aquifer). A WHPA is defined by federal law as "the surface and subsurface area surrounding a water well or wellfield, through which contaminants are reasonably likely to move toward and reach such water well or wellfield" (United States Environmental Protection Agency (USEPA), 2005).

This WHPP was prepared for Unit Well 23 to conform to the requirements of the Wisconsin Administrative Code, Chapter NR 811, Section 12(6), for WHP planning. A copy of this section of the code is in Appendix A. The project scope included the following:

1. Research available information regarding the geology and hydrogeology of the well sites and aquifer parameters.
2. Research well construction and operation of Unit Well 23.
3. Coordinate with the Capital Area Regional Planning Commission (CARPC) to delineate 5-, 50- and 100-year TOT capture zones for Unit Well 23.
4. Perform a CSI to identify and characterize existing and potential contamination sources within a ½-mile radius and within the recharge area equivalent to the 100-year TOT capture zone for Unit Well 23.
5. Assist with the determination of a WHPA for Unit Well 23.
6. Assist with the development of WHP management activities.

### 1.2 LOCATION AND BACKGROUND

Unit Well 23 is located at 4502 Leo Drive in the eastern part of the City of Madison. The site is in the SW¼, NW¼ of the SW¼, of Section 10, Township 7 North, Range 10 East, Dane County, Wisconsin. The location of Unit Well 23 and other water system facilities in the City of Madison are illustrated in Figure 1-1. A portion of the survey plat showing the well site is in Appendix B. Construction of Unit Well 23 was completed in 1958. Unit Well 23 was originally owned by the Town of Blooming Grove and was known as Blooming Grove Well No. 3. The City of Madison "inherited" the well in the 1960s.



The City water system serves approximately 235,000 people and consists of 22 active wells, 29 booster pumping facilities, 25 ground storage reservoirs, 5 elevated water storage tanks, and approximately 840 miles of water transmission and distribution mains. Because of the varying topography in the Madison area, the water system is divided into 10 separate pressure zones. Unit Well 23 is located in Pressure Zone 6. Unit Well 23 is located approximately 1 mile northeast of Unit Well 9, 1 mile southeast of Unit Well 11, and 1 mile southwest of Unit Well 25.

### **1.3 UNIT WELL 23**

Unit Well 23 was drilled to a depth of 500 feet. Well 23 is cased with 12-inch diameter casing and grouted to a depth of 102 feet and is open to the lower bedrock (sandstone) aquifer and the upper bedrock aquifer.

Dolomite is the near surface bedrock and was encountered at a depth of 70 feet. The casing is terminated in sandstone. Shale was encountered 183 below the cased interval over the depths of 285 to 290 feet. Unit Well 23 is terminated in sandstone.

Unit Well 23 was initially test pumped at rates ranging from 612 to 1,007 gpm and had a specific capacity of 12.3 gallons per minute per foot (gpm/ft) of drawdown. Unit Well 23 was then shot with 191 pounds of dynamite. Unit Well 23 was then test pumped for 105 hours at a rate of 1,001 gpm and had a specific capacity of 16.7 gpm/ft of drawdown. Following shooting of Unit Well 23 and at the time of the test pumping, the static (non-pumping) water level in the well was 46 feet below ground. On November 1, 2010, the static water level in Unit Well 23 was 42.7 feet below the measuring point at the wellhead. Unit well 23 is typically used as a seasonal supply during the peak demand period of May through October. A construction report and formation log prepared by the WGNHS is in Appendix C.

## 2.0 HYDROGEOLOGIC CONDITIONS

### 2.1 LAND USE, TOPOGRAPHY, AND DRAINAGE

Well 23 is located at the west end of Leo Drive approximately 1,150 feet south of Cottage Grove Road and 1,100 feet east of Stoughton Road in the City of Madison. Surrounding land uses are residential, manufacturing, conservancy and commercial. Current zoning at the Unit Well 23 site is single family residential (R1). A portion of the City of Madison zoning map for the Unit Well 23 area is in Appendix D.

The natural ground surface at Unit Well 23 is glacial till (Clayton and Attig, 1997). The topography at Unit Well 23 is relatively smooth with low relief hills. Small southwest-northeast trending drumlins cross the Unit Well 23 area. Unit Well 23 is located on the southeast edge of a small, low profile drumlin. A small pond in a closed depression is located approximately 400 feet southeast of Unit Well 23 and has a surface elevation of less than 880 feet above mean sea level (MSL). The ground surface elevation at Unit Well 23 is approximately 905 feet above MSL. Surface elevations within a ½-mile radius of Unit Well 23 range from 970 feet above MSL on the west edge of a hill located ½ mile southeast of Unit Well 23, to about 865 feet above MSL at locations ½ mile northwest of Unit Well 23, where the land slopes west-southwest toward Lake Monona. Locally, drainage is toward the closed depression and lake located southeast of Unit Well 23.

### 2.2 GEOLOGY

The area was glaciated by the Green Bay Lobe during the last part of the Wisconsin Glaciation. The rocks and unlithified deposits in the area range from Precambrian basement rocks to recent soils. The bedrock from oldest to youngest includes Precambrian granite, basalt and rhyolite, and Cambrian age sandstone, dolomite, and shale.

A geological cross-section through Unit Wells 9, 23, 11 and 29 is presented in Figure 2-1. A formation log for strata encountered at Unit Well 23 is in Appendix C. The stratigraphic sequence encountered in the wells is briefly described in the following.

#### 2.2.1 Precambrian Basement Bedrock

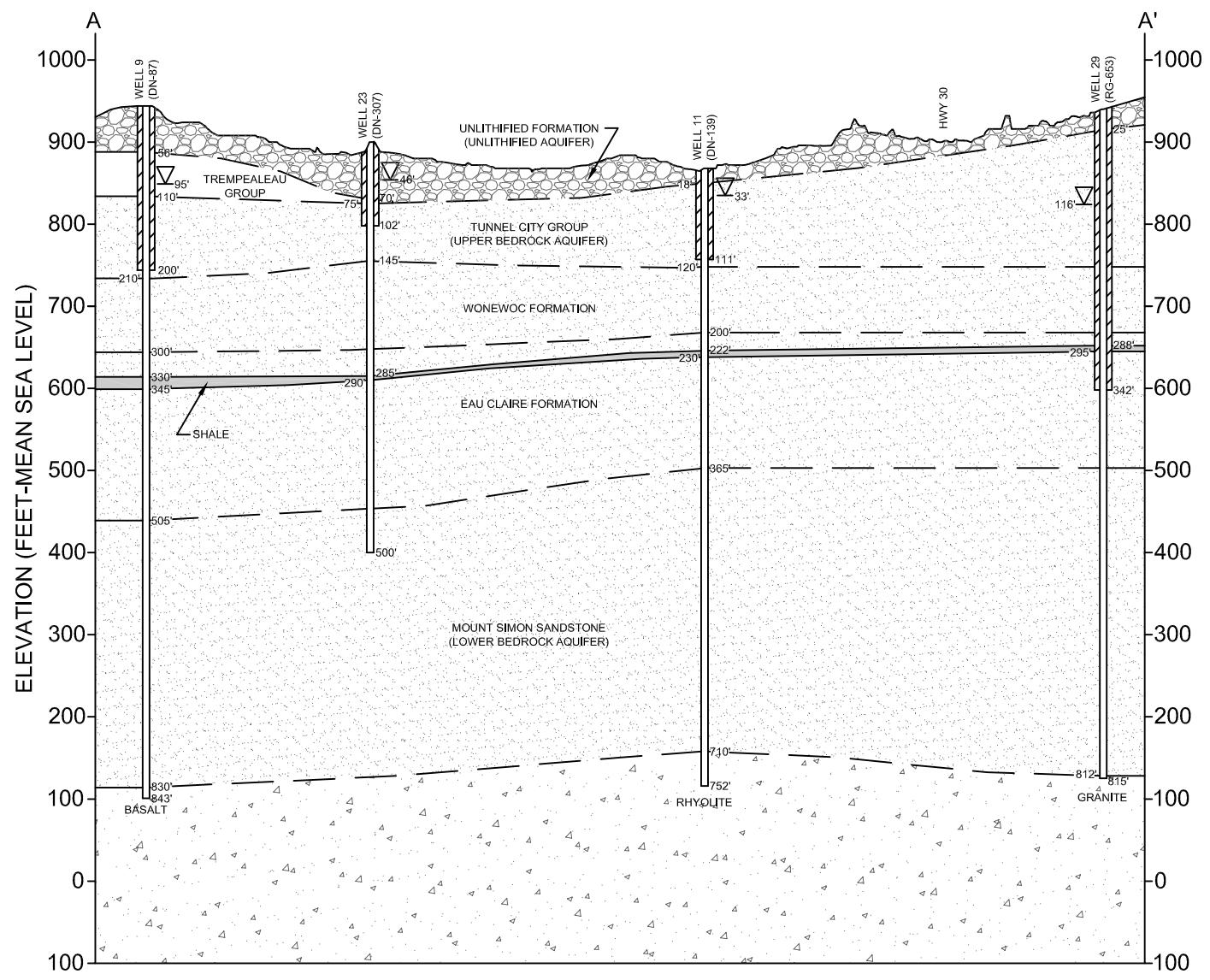
Precambrian bedrock was not encountered in Unit Well 23, but was encountered in Unit Wells 9, 11 and 29. It is estimated that the depth to the Precambrian bedrock at Unit Well 23 is 760 feet below ground surface. The Precambrian bedrock encountered in Unit Wells 9, 11 and 29 is described as dark red granite, pink rhyolite (felsite) and black to red granite, respectively ((Wisconsin Geological and Natural History Survey (WGNHS) Well Log DN-87, and DN-139) and Wisconsin Well Report RG653).

#### 2.2.2 Cambrian Bedrock

Cambrian age rocks encountered in Unit Well 23 include, in ascending order, Mount Simon Formation, Eau Claire Formation, Wonewoc Formation, Tunnel City Group, and the Trempealeau Group.

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SEE FIGURE 1-1 FOR LINE OF CROSS-SECTION A-A'

LEGEND

- WELL
- WELL CASING
- POTENSIOMETRIC SURFACE DEPTH (FEET) (AT TIME OF CONSTRUCTION)
- OPEN BOREHOLE
- 705' WELL DEPTH (FEET)

**AECOM**

FIGURE 2-1  
GEOLOGICAL CROSS-SECTION THROUGH  
MADISON UNIT WELLS 9, 23, 11 & 29  
MADISON, WISCONSIN

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Cambrian age rocks are relatively flat lying in the Madison area in the east-west direction and dip slightly toward the south. The cross-section illustrates a gentle dip toward Unit Well 23. The thicknesses of deep rock units are relatively consistent in the Madison area. A green-gray, sandy, dolomitic shale layer approximately 5-feet thick at Unit Well 23 appears to be laterally extensive through the upper part of the Eau Claire Formation. The shale layer was encountered in Unit Well 23 over the interval of 285 to 290 feet. The boundary between the Wonewoc Formation and Tunnel City Group is not known with certainty. It is assumed that glauconitic sandstones described by the WGNHS in formation Log DN 307 above 145 feet depth, are part of the Tunnel City Group.

### **2.2.3 Unlithified Deposits**

Bedrock is mantled by unlithified glacial till. Clayton and Attig (1997) classify the local near surface unlithified deposits in the immediate vicinity of Unit Well 23 as part of the Horicon Member of the Holy Hill Formation. Clayton and Attig (1997) report that the near surface formation at Unit Well 23 is uniform subglacial till.

The WGNHS described the unlithified formation from a depth of 5 feet to a depth of 70 feet as light brown gray sandy till with some silt and clay and a few small dolomitic stones.

The soil at the Unit Well 23 is classified as the Dodge silt loam (DnC2) (6 to 12 percent slopes). The Dodge silt loam is deep, well drained, and moderately sloping on glaciated uplands. The sandy loam substratum has a permeability of 2 to 6.3 inches per hour (in/hr), and the overlying silt loam has a permeability of 0.63 to 2 in/hr (USDA, 1978). Other nearby soils are the Plano silt loam (PnB) with 2 to 6 percent slopes, and the Plano silt loam (PnA) with 0 to 2 percent slopes. Both Plano silt loam soils formed on benches and in stream valleys and are underlain by gravel outwash at a depth of 6 feet. The sandy loam substratum has a permeability of 2 to 6.3 in/hr, and the overlying silt loam has a permeability of 0.63 to 2 in/hr (USDA, 1978).

Soils east of Unit Well 23 have been disturbed by development and are described as cut and fill materials.

The Dodge silt loam and the Plano silt loam soils have good contaminant attenuation potential (DCRPC, 1999). The DCRPC assigned a risk classification of moderate to high from surface activities in the Unit Well 23 area on the basis of several factors including soil properties (DCRPC, 1999).

## **2.3 HYDROGEOLOGY**

In the study area, groundwater occurs within the lower bedrock aquifer, the upper bedrock aquifer, and the unlithified (sand and gravel) aquifer. The upper bedrock aquifer is used for private domestic supplies in rural areas. The unlithified aquifer is thin, is not laterally extensive and is not used for water supply in the Well 23 area. Municipal and industrial wells are constructed into the lower bedrock aquifer. Following is a brief discussion about the aquifers:

### **2.3.1 Lower Bedrock Aquifer**

The lower bedrock aquifer occurs in the Mount Simon Formation and lower part of the Eau Claire Formation. The Precambrian bedrock is the base of the lower bedrock aquifer and

the shale layer in the Eau Claire Formation is the upper confining unit. Water occurs within horizontal and vertical fractures, along bedding planes, and between sand grains in the aquifer. The saturated thickness of the lower bedrock aquifer is estimated to be 480-feet thick at Unit Well 23. The actual penetrated saturated thickness is 210 feet. The hydraulic conductivity of the lower bedrock aquifer is approximately 10 feet per day (ft/day) (Krohelski et. al., 2000). Unit Well 23 is cased to a depth of 102 feet, which is 183 feet above the Eau Claire shale confining layer; therefore, Unit Well 23 is also open to a large portion of the upper bedrock aquifer.

The grouted casing in Unit Well 23 terminates in the upper bedrock aquifer above the Eau Claire confining layer. Water levels measured in Unit Well 23 should be representative of the composite upper and lower bedrock aquifers. At the time of construction in 1958, the static water level in Unit Well 23 was about 45 feet below ground level (approximately 860 feet above MSL). On November 1, 2010 the static water level in Unit Well 23 was 42.7 feet below the measuring point at the wellhead (approximately 908 feet MSL). Figure E-1 in Appendix E illustrates the simulated potentiometric surface in the lower bedrock (Mount Simon) aquifer and shows the groundwater flow direction toward Unit Well 23 is from the east toward the west (DCRPC, 2004). Figure E-1 illustrates the potentiometric surface elevation in the vicinity of Unit Well 23 at approximately 840 feet above MSL. The storativity of the lower bedrock aquifer is approximately 0.0003, and the porosity is approximately 30 percent (Bradbury, 2001). The porosity of the Eau Claire Formation is approximately 5 percent (Bradbury, 2001).

### **2.3.2 Upper Bedrock Aquifer**

The upper bedrock aquifer occurs in the upper part of the Eau Claire Formation above the shale and within the Wonewoc Formation, Tunnel City Group and Trempealeau Group. Water occurs within fractures, along bedding planes, and between sand grains in the sandstone.

At Unit Well 23, the thickness of the bedrock formation above the shale confining layer is 215 feet and the saturated thickness of the upper bedrock aquifer is also 215 feet. Figure F-1 (DCRPC, 2004) in Appendix F illustrates the simulated potentiometric (water table) surface in the upper bedrock aquifer and unlithified (sand and gravel) aquifer. The elevation of the static water level in Unit Well 23 is assumed to be the elevation of the potentiometric surface (860 feet above MSL) in the combined upper bedrock aquifer and lower bedrock aquifer. Figure F-1 in Appendix F illustrates the elevation of the simulated potentiometric surface in the upper bedrock aquifer (water table) at Unit Well 23 in 2000 was approximately 865 to 870 feet above MSL.

The hydraulic conductivity of the upper bedrock aquifer is approximately 5 ft/day (Krohelski et. al., 2000). The porosity of the upper bedrock formations is approximately 5 percent (Bradbury, 2001).

### **2.3.3 Unlithified Aquifer**

The potentiometric surface occurs at an elevation of about 860 feet, which is within the unlithified formation at Unit Well 23. The driller did not report whether saturated formation was encountered in the unlithified materials at Unit Well 23. The pond located 400 feet southeast of Unit Well 23 has a surface elevation of approximately 975 feet above MSL. The pond elevation is approximately 15 feet higher than the static water elevation in Unit Well 23 and it appears there is a vertically downward hydraulic gradient. On the basis of the elevation differences, the pond and bedrock aquifer are not rapidly hydraulically connected. Where present, the hydraulic

conductivity of the unlithified aquifer varies. For modeling purposes, Krohelski et al., 2000, used a hydraulic conductivity of 7 ft/day and a porosity of 20 percent for the unlithified aquifer.

### **2.3.4 Groundwater Flow System**

Average annual precipitation in the City of Madison area is approximately 30 to 30.5 inches per year (Cline, 1965; Cotter et. al., 1969). Cline (1965) estimated that the amount of recharge to the groundwater reservoir in the Upper Yahara River basin was approximately 6 inches/year (in/yr). Swanson (1996) estimated that the recharge rate in Dane County ranges from 0.3 to 6.7 in/yr and has an average value of 2.6 in/yr. Precipitation infiltrates through the till layer, and recharges the unlithified and shallow bedrock aquifers. In some areas, a small percentage of water moves downward from the upper bedrock aquifer through the Eau Claire confining layer and into the lower bedrock aquifer. Figure E-2 in Appendix E illustrates the location of Unit Well 23, and areas of recharge to and discharge from the lower bedrock (Mount Simon) aquifer (Bradbury et. al, 1999; DCRPC 1999). Unit Well 23 is located near a recharge area. Discharge from the unlithified and shallow bedrock aquifers is to pumping wells and/or to surface waters (lakes, streams, and wetlands). Discharge from the lower bedrock aquifer is primarily to pumping wells.

### 3.0 WHPA DELINEATION

This chapter describes methodologies used to define the Zone of Influence (ZOI) and ZOC for Unit Well 23.

#### 3.1 ZOI

The ZOI for Unit Well 23 was estimated in accordance with Wisconsin Department of Natural Resources (DNR) requirements based on 30 days of continuous pumping at the rated pump capacity, assuming no aquifer recharge. The ZOI was determined using the Theis equation. The estimated ZOI for Unit Well 23 to a radius where there is 1 foot of drawdown, is approximately 7.1 miles. The estimated ZOI to a radius of zero drawdown is approximately 15.2 miles. These estimated ZOI are conservatively large, because the Theis equation does not incorporate aquifer recharge or the effects of potential hydraulic boundaries. For the calculation, it was assumed that the majority of the borehole, open to both the lower and upper bedrock aquifers, supplies water to Unit Well 23. Distance-drawdown calculations are in Appendix G.

#### 3.2 GROUNDWATER MODEL DEVELOPMENT AND ZOC DELINEATION

As part of the Dane County regional hydrologic study, a regional groundwater flow model was prepared for Dane County (Krohelski et. al., 2000) and was used to delineate time-related ZOCs for municipal wells including Unit Well 23. The Dane County regional hydrologic study was conducted cooperatively by the WGNHS, DCRPC, and the United States Geological Survey (USGS). The USGS modular groundwater modeling code (MODFLOW (McDonald & Harbaugh, 1988)) was used to simulate groundwater flow. After the calibrated groundwater flow model was prepared, PATH3D (Zheng, 1991) was used to determine time-related ZOCs.

The model domain covers an area of 50 by 60 miles and is divided into 144,000 nodes. Each node has regular spacing of 1,312.4 feet (400 meters) on a side. The grid has 200 rows and 240 columns (Krohelski et. al., 2000).

In 2002, the original groundwater flow model was converted from a three-layer model to a four-layer model. The sand and gravel aquifer is Layer 1. The upper bedrock aquifer is Layer 2. The Eau Claire Formation is Layer 3, and the lower bedrock aquifer is Layer 4. The model was recalibrated and various boundary conditions were modified (DCRPC, 2001). Other aquifer parameters input into the model were as previously described in Chapter 2 and in Krohelski et al., 2000.

Four groundwater flow simulations were performed for this study, by the CARPC (formerly DCRPC), using the calibrated model and different pumping rates for existing and known future municipal supply wells in Dane County. Simulation No. 1 was performed using the projected pumping rates from municipal wells for the year 2030 (Bradbury, 1998). Total City of Madison 2030 pumping is projected to be 44.328 million gallons per day (MGD). For Simulation No. 1, projected 2030 pumping was distributed evenly among the City's existing and planned wells for an average rate of 1.4413 MGD. Pumping at a rate of 1.4413 MGD is equivalent to pumping continuously at a rate of approximately 1,000 gpm.

Simulation No. 2 was performed using the “maximum sustained pumping rate” or “one-half design capacity” (Bradbury, 1998; DCRPC, 2004). The maximum sustained pumping rate (one-half design capacity) for Unit Well 23 is 0.864 MGD. Pumping at a rate of 0.864 MGD is equivalent to pumping continuously at a rate of 600 gpm.

Simulation No. 3 was performed using full design capacity. Full capacity for Unit Well 23 is 1.728 MGD. Pumping at a rate of 1.728 MGD is equivalent to pumping continuously at a rate of 1,200 gpm.

Simulation No. 4 was performed using the average pumping rate for Unit Well 23 for the maximum year during the past 10 years (2000-2009). The maximum pumpage year for Unit Well 23 was 2008 when Unit Well 23 was pumped at an average rate of approximately 0.888 MGD. Pumping at a rate of 0.888 MGD is equivalent to pumping continuously at a rate of 617 gpm.

PATH3D (Zheng, 1991) was used to determine the time-related ZOCs for Unit Well 23. Particles were input in the model around Unit Well 23 and then tracked backward from the well to points where they enter the groundwater flow system.

### 3.3 ZOC

The area that recharges or contributes water to Unit Well 23 is defined as the ZOC. The areal extent of the ZOC (capture zone) depends on the pumping rate, amount of horizontal and vertical recharge, aquifer characteristics, pumping duration, and other stresses such as other pumping wells. It is beneficial to know the well capture zone, because contaminants introduced within the zone could reach Unit Well 23.

Figure 3-1 illustrates the 5-, 50-, and 100-year TOT ZOCs for Unit Well 23 based on the projected 2030 pumping rate (Simulation No. 1). Figure 3-2 illustrates the 5-, 50-, and 100-year TOT ZOCs for Unit Well 23 based on the one-half design capacity pumping rate (Simulation No. 2). Figure 3-3 illustrates the 5-, 50-, and 100-year TOT ZOCs for Unit Well 23 based on the full design capacity pumping rate (Simulation No. 3). Figure 3-4 illustrates the 5-, 50-, and 100-year TOT ZOCs for Unit Well 23 based on the average pumping rate for Unit Well 23 for the maximum year (Simulation No. 4).

The capture zones extend primarily toward the southeast and northeast in the simulated upgradient groundwater flow direction. Table 3-1 provides a summary the upgradient and downgradient extent of capture zones for the various pumping simulations. The ZOCs delineated using the Simulation No. 3 pumping rates are more conservatively large compared to the ZOCs delineated using the Simulations Nos. 1, 2, and 4 pumping rates.

Figure 2 in Appendix H illustrates ultimate regional ZOCs for Unit Well 23 and for other municipal wells in Dane County. For the ultimate capture zone simulation, groundwater flow pathlines extend upgradient from Unit Well 23 toward the groundwater divide located about 6 miles east-northeast of Unit Well 23.

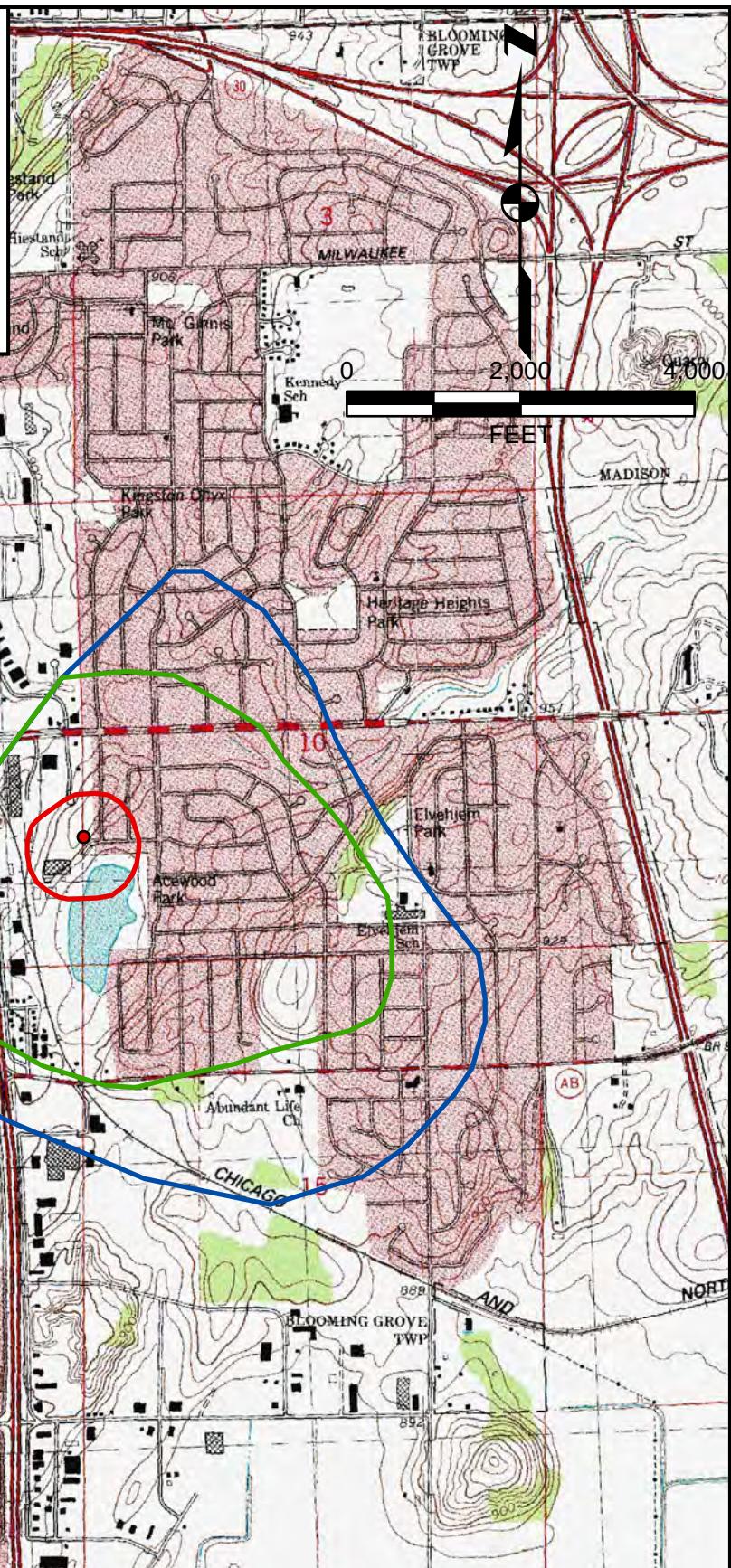
## LEGEND

### BASE MAPPING

- UNIT WELL 23

### CAPTURE AREAS

- 5-YEAR T.O.T. (TIME OF TRAVEL) CAPTURE ZONE
- 50-YEAR T.O.T. (TIME OF TRAVEL) CAPTURE ZONE
- 100-YEAR T.O.T. (TIME OF TRAVEL) CAPTURE ZONE



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**AECOM**

**FIGURE 3-1**  
**5, 50, 100 YEAR T.O.T. Z.O.C.s ASSUMING**  
**PROJECTED 2030 PUMPING RATE**  
**UNIT WELL 23**  
**MADISON, WISCONSIN**

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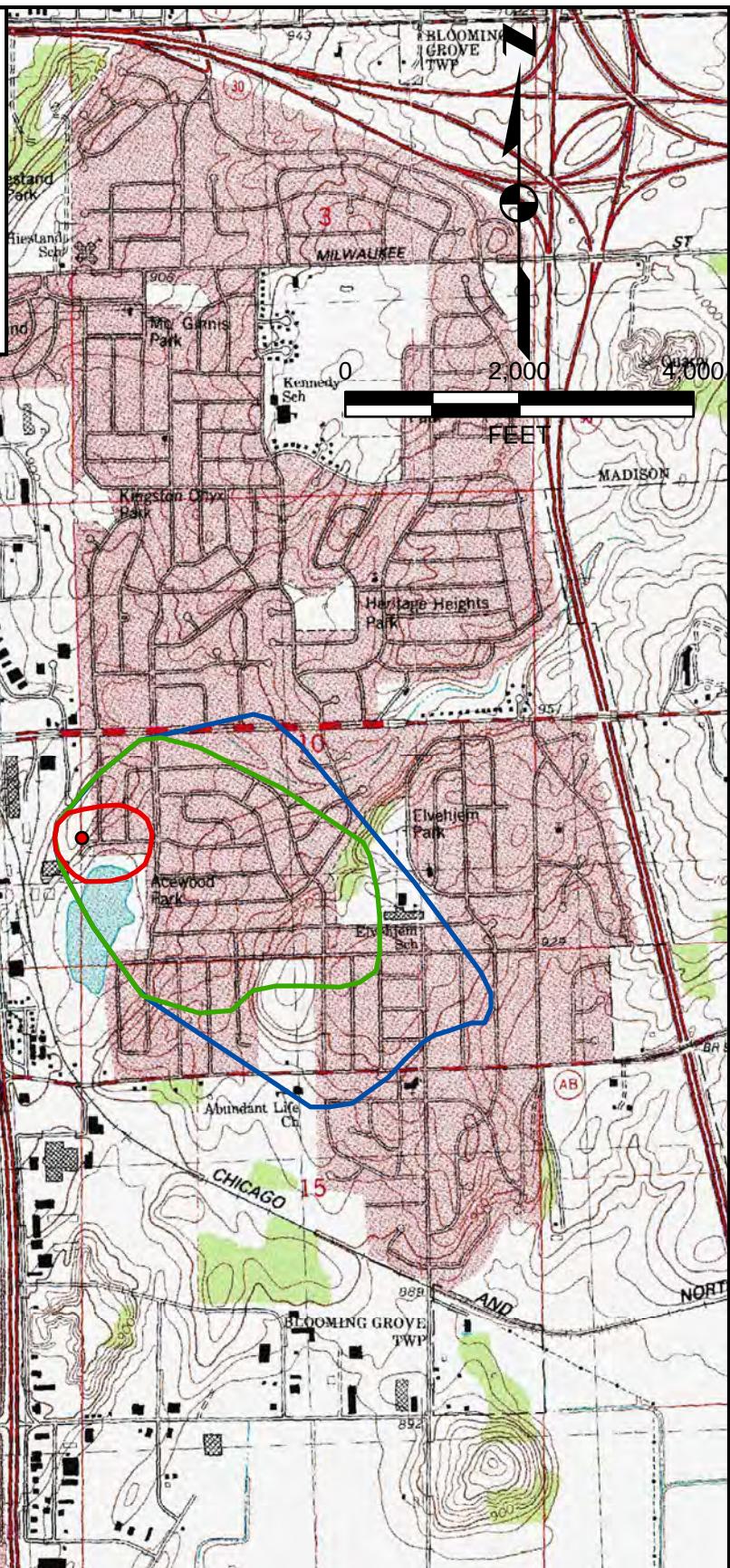
## LEGEND

### BASE MAPPING

- UNIT WELL 23

### CAPTURE AREAS

- 5-YEAR T.O.T. (TIME OF TRAVEL) CAPTURE ZONE
- 50-YEAR T.O.T. (TIME OF TRAVEL) CAPTURE ZONE
- 100-YEAR T.O.T. (TIME OF TRAVEL) CAPTURE ZONE



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**AECOM**

**FIGURE 3-2**  
**5, 50, 100 YEAR T.O.T. Z.O.C.s ASSUMING**  
**50 PERCENT CAPACITY PUMPING RATE**  
**UNIT WELL 23**  
**MADISON, WISCONSIN**

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## LEGEND

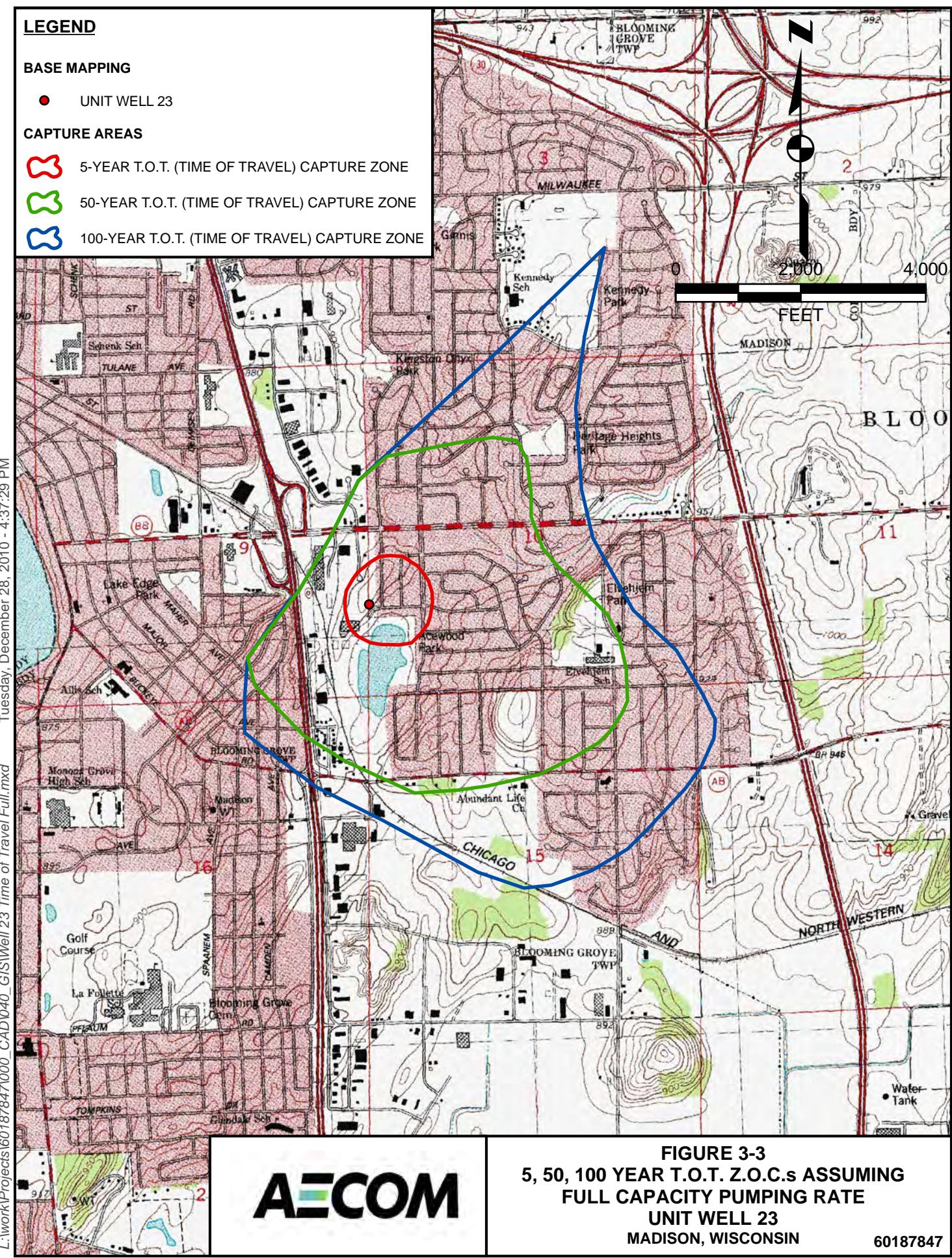
### BASE MAPPING

- UNIT WELL 23

### CAPTURE AREAS

- 5-YEAR T.O.T. (TIME OF TRAVEL) CAPTURE ZONE
- 50-YEAR T.O.T. (TIME OF TRAVEL) CAPTURE ZONE
- 100-YEAR T.O.T. (TIME OF TRAVEL) CAPTURE ZONE

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## LEGEND

### BASE MAPPING

- UNIT WELL 23

### CAPTURE AREAS

- 5-YEAR T.O.T. (TIME OF TRAVEL) CAPTURE ZONE
- 50-YEAR T.O.T. (TIME OF TRAVEL) CAPTURE ZONE
- 100-YEAR T.O.T. (TIME OF TRAVEL) CAPTURE ZONE

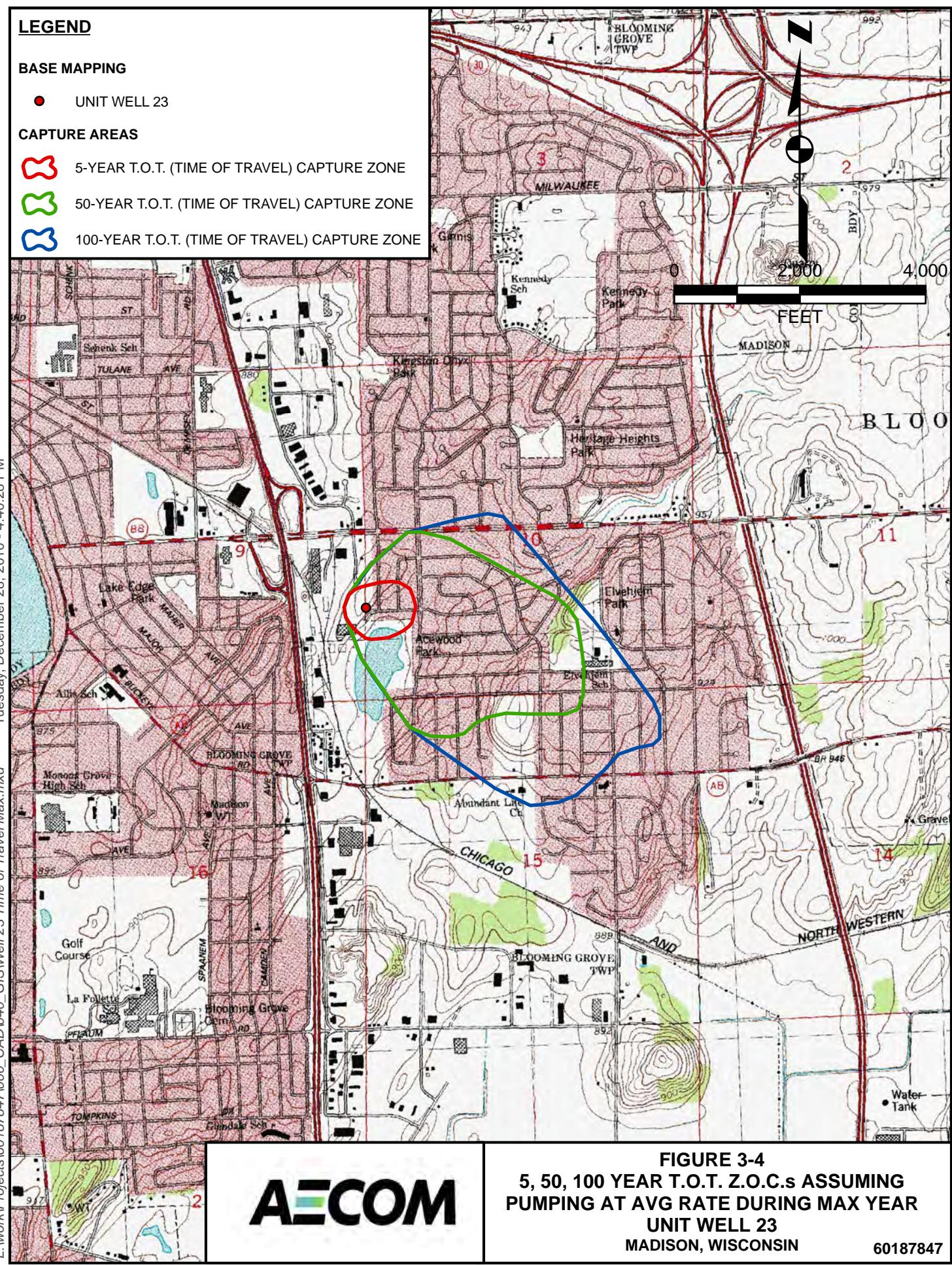


FIGURE 3-4  
5, 50, 100 YEAR T.O.T. Z.O.C.s ASSUMING  
PUMPING AT AVG RATE DURING MAX YEAR  
UNIT WELL 23  
MADISON, WISCONSIN

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**TABLE 3-1**  
**SUMMARY OF EXTENT OF ZOCs (CAPTURE ZONES)**  
**WELLHEAD PROTECTION UNIT WELL 23**  
**MADISON, WISCONSIN**

Item	Simulation No. 1 (projected 2030 pumping rates)	Simulation No. 2 (one-half design capacity pumping rates)	Simulation No. 3 (continuous pumping at full capacity)	Simulation No. 4 Average Pumping Rate During Maximum Pumpage Year
Simulated Pumping Rate	1.4413 MGD (1,000 GPM)	0.864 MGD (600 GPM)	1.728 MGD (1,200 GPM)	0.8884 MGD (617 GPM)
<b>Upgradient (Northeasterly) Extent of ZOC (feet)</b>				
5-year TOT	550	650	950	650
50-year TOT	2,150	1,800	3,500	1,800
100-year TOT	3,350	2,550	6,850	2,600
<b>Upgradient (Southeasterly) Extent of ZOC (feet)</b>				
5-year TOT	700	750	950	700
50-year TOT	3,950	3,700	4,350	3,700
100-year TOT	5,200	5,100	5,850	5,100
<b>Downgradient (Northwesterly) Extent of ZOC (feet)</b>				
5-year TOT	450	300	400	350
50-year TOT	1,300	300	1,050	350
100-year TOT	1,300	300	1,050	350
Notes:				
MGD = Million Gallons per Day				
ZOC = Zone of Contribution				
TOT = Time of Travel				

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### 3.4 WHPA

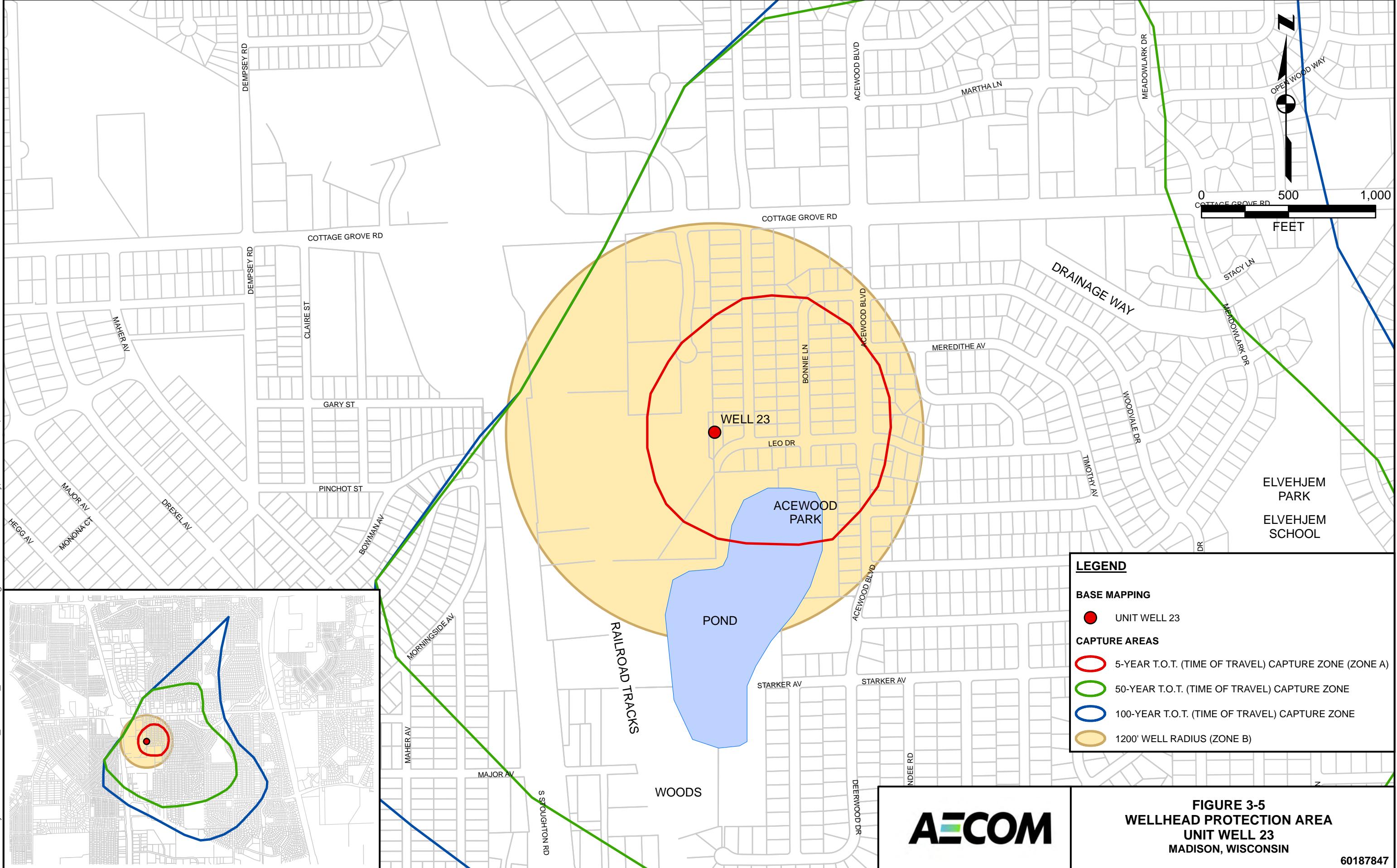
The Wisconsin Administrative Code (Chapter NR 811.12(6)) requires that a WHPA for municipal water supply wells “encompass, at a minimum, that portion of the recharge area equivalent to a 5-year TOT to the well.” Any of the four simulations described above could be used to model the 5-year TOT ZOC for Unit Well 23. It is possible that Unit Well 23 could be pumped at maximum capacity without interruption. Therefore, Simulation No. 3 provides a realistic, but very conservative model of well capture zones for Unit Well 23. Simulation No. 3 was used to generate the long-term capture zones and WHPA for Unit Well 23.

The 5-year TOT ZOC for Unit Well 23 extends 950 feet northeasterly and southeasterly upgradient from the well, and approximately 400 feet downgradient from the well. The 100-year TOT ZOC extends approximately 5,850 feet southeasterly and 6,850 feet northeasterly from Unit Well 23 and approximately 1,050 feet downgradient (northwesterly) from the well.

Protecting the entire 100-year TOT ZOC from Unit Well 23 to the upgradient boundary at the same level of protection, as the area within the 5-year TOT ZOC is likely too severe.

The WHPA for Unit Well 23 is illustrated in Figure 3-5. Two zones of protection are within the WHPA. Zone A is the area around Unit Well 23 that is defined by the 5-year TOT ZOC delineated for Simulation No. 3 (full design capacity pumping rate). Zone B is the area around Unit Well 23, beyond Zone A, that is defined by a 1,200-foot fixed radius around Unit Well 23. This radius is selected because the Wisconsin Administrative Code Chapter NR 811.12(5)(d) requires a 1,200-foot separation distance between a municipal water supply well and certain contamination sources.

As illustrated in Figure 3-5, Zone A is surrounded by Zone B, and Zone B extends beyond the downgradient extent of the 50-year and 100-year TOT ZOCs. The WHPA will provide a conservative protection zone to account for changes in pumping rates, pumping duration, and interference drawdown from other existing and future wells. The WHPA is located entirely within the City of Madison.



## 4.0 POTENTIAL CONTAMINANT SOURCES

### 4.1 CSI

A CSI was performed for the Unit Well 23 area during November 2010. The CSI consisted of a search of government records, interviews, and a reconnaissance survey of the area within a ½-mile radius and the recharge area equivalent to the delineated 100-year TOT ZOC for Unit Well 23. General land use observations and reconnaissance were made on November 2 and 18, 2010.

The location of potential, existing, and former contaminant sources in the WHPA, within a ½-mile radius and the recharge area equivalent to the delineated 100-year TOT ZOC for Unit Well 23 are illustrated in Figure 4-1. Table 4-1 provides a summary of potential contaminant sources that were observed and/or reported to be within the WHPA and review area.

Potential, existing, and former contaminant sources and routes within the WHPA, ZOCs and in close proximity to the ZOCs for Unit Well 23 include 14 former spill sites, potential spills along roads and railroad tracks; sanitary and storm sewers; several storm sewer drainage ways, infiltration basins and ponds, 12 sites with in-use ASTs; 5 sites with closed ASTs; 5 sites with in-use USTs, 26 closed UST sites; 3 open LUST sites; 16 closed LUST or ERP sites; 7 gas stations; 1 drycleaner; 4 vehicle repair/maintenance businesses; a former landfill site; road salt use; and probable use of pesticide, herbicide, and nutrients on parks, commercial and residential lawns and gardens.

Based on the available information, the following are descriptions of known potential, existing, and former contaminant sources in the WHPA, within a ½-mile radius of Unit Well 23 and within the recharge area equivalent to the delineated 100-year TOT of Unit Well 23:

The nearest storm sewer is located beneath Leo Drive, 450 feet east of Unit Well 23. The storm sewer and sewer drainage ways discharge to a pond located 400 feet south-southeast of Unit Well 23. The nearest sanitary sewer main is located in Vernon Avenue, 170 feet east of Unit Well 23.

Water wells are conduits (routes) to groundwater. A poorly constructed or damaged well may allow contaminants to enter groundwater or to move from one aquifer into another. No private wells were observed in the Unit Well 23 area during the site reconnaissance survey. The WGNHS 2010 private well database, Dane County private well list, and Madison Water Utility private well list were reviewed to identify private wells located in the vicinity of Unit Well 23. Twenty-two records were found for private wells located within, or relatively nearby the area encompassed by the 100-year TOT ZOC for Unit Well 23. A summary of the private wells is included in Appendix I. All but two of the wells have been abandoned. One active well is located 3,200 feet southeast of Unit Well 23 on Buckeye Road. The other active well is located one mile north-northwest of Unit Well 23 and is not in the Unit Well 23 capture zone. Several records were found for private wells in Section 11, 14 and 15 T7N, R10E at locations 1.25 to 2 miles east and southeast of Unit Well 23. The private wells identified are well beyond the Unit Well 23 capture zones and will not impact Unit Well 23. All properties located within the area encompassed by the 100-year TOT ZOC for Unit Well 23 are within the City of Madison. The nearest non-City parcel relative to Well 23 is the Town of Blooming Grove Town Hall site, which

**TABLE 4-1**  
**CONTAMINANT SOURCE INVENTORY SUMMARY**  
**WELLHEAD PROTECTION UNIT WELL 23**  
**MADISON, WISCONSIN**

Map Site No. (EDR Reference No.)	Owner/Location	Database or Reference Source	Existing, Potential, or Former Contaminant Sources	Reported Status	Approximate Distance to Unit Well 23	Location within Capture Zone	Estimated Threat to Supply Wells
1 (D15)	United Building Centers 1102 Lumbermans Trail Madison, WI	EDR Report- Registered UST ( Facility ID No. 78077) Registered AST  Site Reconnaissance	Closed/Removed USTs: 12,016 gal. unknown contents, 3@12,000 gal. unleaded gas, 12,000 gal. leaded gas, 1,000 gal. diesel, 100 gal. unleaded gas, 100 gal. leaded gas, 1,200 gal fuel oil (Tank ID Nos. 272026, 272783, 272784, 272785, 272874, 272875, 272883, 272884, 272891). 8/1986 and 11/1986.  Closed/Removed ASTs: 300 gal unleaded gas, 500 gal diesel (Tank ID Nos. 202104, 1210582) 8/1992 and 1/2001  Pro Build Millwork – Two Landmark portable ASTs on wheels. Stains on ground beneath tanks may indicate leaks. One AST was parked over the storm sewer manhole grate and there were stains on the concrete and grate. Shed with caution and diesel fuel label on it. Several pieces of heavy equipment parked on sloping concrete surface. Slopes toward storm sewer grate. Potential for leaks and spills.	Closed/Removed USTs 11/1986  Closed/Removed ASTs 1/2001  In Use Portable ASTS 2010  Shed with Diesel Fuel Label 2010  Possible Fuel Leak over Storm Sewer Manhole	250 ft SW	Zone A – 5 yr TOT	High
2 (D16, D17)	TC Products Company 1040 Lumbermans Trail Madison, WI	EDR Report- Registered UST (Facility ID No. 729385) BRRTS Brownfields  Site Reconnaissance	Closed/Removed UST: 10,000 gal. chemical (Tank ID No. 1163370). 9/2007  In use UST: 10,000 gal. chemical (Tank ID No. 1163372)  BRRTS – no detection or insignificant contamination Elevator (grain feed?), loading dock, potential spills	Closed/Removed UST 9/2007  In Use UST	450 ft NW	Zone A – 5 yr TOT	High
3 Site Obs.	Storm Drainage Channels and Pond Madison, WI	Site Reconnaissance	Storm water drainage from parking lots and streets flows into unlined drainage channels which discharge to a large pond located 500 feet south of Well 23	Storm Sewer Discharge Areas 2010	450 ft SE	Zone A – 5 yr TOT	Low
4 Site Obs.	Railroad Tracks Madison, WI	Site Reconnaissance	Potential for leaks and spills along railroad tracks	Active Railroad Tracks	700 ft West	Zone B – 50 yr TOT	Moderate
5 (I36, I37, I38, I39, I40, I41, I42)	Central Storage Warehouse Company 4309 Cottage Grove Road Madison, WI	EDR Report- Registered UST (Facility ID 61023) LUST WI ERP Spills ERNS Tier 2 FINDS	Closed Removed USTs: 10,000 gal. diesel, 10,000 gal fuel oil (Tank ID Nos. 272815 and 272816). 4/1992 and 8/1998  Closed LUST 10/1998, petroleum contaminated soil, central storage warehouse site #2, closed under NR 708  Closed ERP 8/1991, details not reported.  Spill 5/1991, equipment fire caused anhydrous ammonia spill and soil contamination, cleaned up with absorbent material, closed Spill 3/2001, ammonia spill and air contamination, closed Spill 10/2005, valve malfunctioned releasing ammonia and contaminating the storm and sanitary sewers  ERNS – anhydrous ammonia leaks and spills  Tier 2 listing – sulfuric acid in batteries in battery room, anhydrous ammonia	Closed/Removed USTs 4/1992, 8/1998  Closed LUST 10/1998  Closed ERP 8/1991  Closed Spills 5/1991, 3/2001, 10/2005	900 ft NW	Zone B – 50 yr TOT	High

TABLE 4-1 (cont.)

Map Site No. (EDR Reference No.)	Owner/Location	Database or Reference Source	Existing, Potential, or Former Contaminant Sources	Reported Status	Approximate Distance to Unit Well 23	Location within Capture Zone	Estimated Threat to Supply Wells
6 (E21, E22)	Radford Property 4401 Cottage Grove Road Madison, WI	EDR Report- WI - Registered UST (Facility ID 136149) BRRTS Brownfields	Closed/Removed UST: 5,000-gallon diesel (Tank ID No. 273096) 6/1990 BRRTS – General liability clarification letter issued 3/2001	Closed/Removed UST 6/1990	900 ft NNW	Zone B – 50 yr TOT	Low
7 (C10, C11)	Ron's Service Center 4515 Cottage Grove Road Madison, WI	EDR Report- Registered UST (Facility ID No. 128375) Registered AST RCRA-NonGen FINDS LUST CRS AUL SHWIMS  Site Reconnaissance	Closed/Removed USTs: 300 gal. waste/used motor oil, 8,000 gal. unleaded gas, 2@6,000 gal. unleaded gas, 500 gal. fuel oil (Tank ID No. 272762, 272763, 272764, 272765, 272766) 12/1997  In use AST: 275 gal. fuel oil (Tank ID No. 15991)  Closed LUST 6/2001, soil and groundwater contamination in fractured bedrock, conditional closure with GIS registry  RCRA – historical generator of ignitable hazardous waste. No violations  Vehicles service center, battery sales, vehicle parking	Closed/Removed USTs 12/1997  In Use AST  Closed LUST GIS Registry 6/2001  Vehicles Service 2010	1,150 ft NNE	Zone A – 5 yr TOT	High
8 (E19, E20)	Madison City Fire Station #5 4418 Cottage Grove Road Madison, WI	EDR Report- Registered UST (Facility ID No. 681285) WI ERP	Closed/Removed UST: 1,500 gal. diesel (Tank ID No. 271801) Closed ERP, petroleum contaminated soil, closed out under NR 708	Closed/Removed UST  Closed ERP 7/1997	1,350 ft North	50 yr TOT	Low
9 (55)	4203 Cottage Grove Road Madison, WI	EDR Report- Spill	Spill 10/1988, broken pipe caused ammonia spill which caused surface water contamination. Closed 10/1988	Closed Spill 10/1998	1,400 ft NW	> 100 yr TOT	Low
10 (G29, G30, G31)	Bachman Construction Co. Inc. 1201 S Stoughton Road Madison, WI	EDR Report- Registered UST (Facility ID 89761) Registered AST SHWIMS  Site Reconnaissance	Closed/Removed UST: 5,000-gal leaded gas, 1,000 gal. leaded gas (Tank ID Nos. 271547, 271556). 4/1988  Closed/Removed AST: 2@1,000 gal. diesel (Tank ID Nos. 202261, 202262) 9/2003  Storage yard – vehicles, equipment, trailers, supplies	Closed/Removed USTs 4/1988  Closed/Removed ASTs 5/1997	1,400 ft SW	50 yr TOT	Low
11 (E23)	DB's Service Center Phillips 66 Richard Blatter 902 Atlas Avenue Madison, WI	EDR Report- Registered UST (Facility ID 65525) Registered AST BRRTS LUST Spills CRS AUL  Site Reconnaissance	Active gas station.  Closed Removed USTs: 550-gal. waste/used oil, 1,000 gal. fuel oil, 4,000 gal. diesel, 6,000 gal. leaded gas, 8,000 gal. unleaded gas (Tank ID Nos. 272018, 272019, 272020, 272021, 272022) 11/1990  In use USTs: 10,000 gal diesel, 10,000 gal unleaded gas, 6,000 gal. unleaded gas (Tank ID Nos. 273442, 273443, 273444)  In use AST: 250 gal. used/waste motor oil  Closed LUST 10/1999, petroleum soil contamination, conditional closure with GIS registry  Closed Spill 2/1995, driver drove away with dispenser hose in the tank spilling gasoline	Active Gas Station  Closed/Removed USTs 11/1990  In Use AST  Closed LUST 10/1999 Conditional Closure w/ GIS Registry	1,400 ft North	50 yr TOT	Moderate

TABLE 4-1 (cont.)

Map Site No. (EDR Reference No.)	Owner/Location	Database or Reference Source	Existing, Potential, or Former Contaminant Sources	Reported Status	Approximate Distance to Unit Well 23	Location within Capture Zone	Estimated Threat to Supply Wells
12 (B4, B5)	CITGO Quick Mart Francois Oil Company 4601 Cottage Grove Road Madison, WI	EDR Report- Registered UST (Facility ID No. 64833) RCRA-SQG, FINDS LUST SPILLS SHWIMS  Site Reconnaissance	Closed/Removed USTs: 5@4,000 gal. unleaded gas, 2@550 gal. fuel oil (Tank ID Nos. 271594, 271595, 271880, 271881, 271882, 271883, 273493) 10/1996  In Use USTs: 12,000 gal. unleaded gas, 20,000 gal. unleaded gas (Tank ID Nos. 274180, 274181)  Open LUST started 2/2000, petroleum contaminated soil  Spill 8/1993, overfill of UST gasoline, impacted storm sewer, cleaned with absorbent material Spill 11/1985, breached fuel tank causing surface water contamination  RCRA – ignitable hazardous wastes. No violations  Gas station	Closed/Removed USTs 10/1996  In Use USTs  Open LUST site  Historic Spills  Active Gas Station 2010	1,450 ft NE	50 yr TOT	High
13 (H34)	Ferrell Gas 1301 South Stoughton Road Madison, WI	EDR Report- Tier 2	Liquid petroleum propane in above ground tank	Tier 2 listing (propane)	1,500 ft SW	50 yr TOT	Low
14 (C12)	Walgreens 4518 Cottage Grove Road Madison, WI	EDR Report- RCRA-CESQG FINDS SHWIMS	RCRA – No violations	Active Store	1,700 ft NNE	50 yr TOT	Low
15 Site Obs.	Wash Basket Laundry 915 Atlas Avenue Madison, WI	Site Reconnaissance	Self Serve Laundry. Detergents use (No apparent drycleaning)	Laundromat 2010	1,550 ft North	50 yr TOT	Low
16 (F32)	Group Health Coop East Grove Health Center 814 Atlas Avenue Madison, WI	EDR Report- SHWIMS	Closed SHWIMS entry	Closed SHWIMS Entry	1,600 ft NNW	> 100 yr TOT	Low
17 (H33, H35, H43)	Supersweet Feeds 1401 Stoughton Road Madison, WI	EDR Report- Registered UST (Facility ID 135074) Registered AST LUST BRRTS  Site Reconnaissance	Closed Removed UST: 2@8,000 gal. diesel, 2@10,000 gal. diesel, 3@7,500 gal fuel oil (Tank ID Nos. 265769, 271566, 271567, 272091, 272092, 272093, 273126). 3/1990  In Use AST: 300 gal. waste/used motor oil (Tank ID No. 1183893)  Closed LUST 4/1991, petroleum contaminated soil  BRRTS – UST Closure listing  Vertical feed elevators and tanks	Closed/Removed USTs 3/1990  In Use AST  Closed LUST 4/1991	1,650 ft SW	50 yr TOT	Moderate
18 (B6)	Gerhardt Snyder Drug 4620 Cottage Grove Road Madison, WI	EDR Report- SHWIMS	SHWIMS listing. No specific detail	Active Site	1,800 ft NE	50 yr TOT	Low
19 (J44, J45)	Universal Presentation Concepts (UPC Design & Manufacturing) 1501 S. Stoughton Road Madison, WI	EDR Report- RCRA-NonGen FINDS Manifest SHWIMS AIRS  Site Reconnaissance	RCRA – handler of ignitable hazardous materials, lead, benzene, methyl-ethyl ketone, tetrachloroethylene, trichloroethylene and non-halogenated solvents  VOC emissions from painting and screen printing No violations reported  Manufacturer of store fixtures, loading dock on east side	Active Site with Chemicals Use	1,850 ft SW	50 yr TOT	Low

TABLE 4-1 (cont.)

Map Site No. (EDR Reference No.)	Owner/Location	Database or Reference Source	Existing, Potential, or Former Contaminant Sources	Reported Status	Approximate Distance to Unit Well 23	Location within Capture Zone	Estimated Threat to Supply Wells
20 (K48, K49)	Dubois Auto Clinic Inc. 801 Atlas Avenue Madison, WI	EDR Report- Registered UST (Facility ID 72238) LUST  Site Reconnaissance	Closed/Filled with inert material USTs: 1,000 gal. unknown contents, 2@500 gal. unknown contents (Tank ID Nos. 272855, 272856, 272857) 3/1985  Closed/Removed UST: 300 gal. waste/used motor oil (Tank ID No. 273361) 12/1991  Closed LUST 4/1992, petroleum contaminated soil  Auto sales, vehicle parking and staging	Closed Filled with Inert Material USTs 3/1985  Closed/Removed UST 12/1991  Closed LUST 4/1992	1,850 ft NNW	> 100 yr TOT	Low
21 (F27, F28)	U Haul #75051 22 Atlas Court Madison, WI	EDR Report- Registered UST (Facility ID 678055) RCRA-CESQG FINDS WI ERP LUST Spills CRS AUL  Site Reconnaissance	Closed Removed UST: 10,000-gallon unleaded gas (Tank ID No. 678055) 5/1997  Closed ERP 6/1995, contaminated soil  Closed LUST 11/2005, residual soil and groundwater contamination above applicable standards RCL/SSRCL and NR 140. Conditional NR 726 closure with GIS registry  Spill 3/1993, unknown substance contaminated surface water. Last action 6/1995  RCRA - Small quantity generator of ignitable hazardous wastes, no violations found  Vehicles parking and potential for leaks and spills	Closed/Removed UST 5/1997  Closed LUST 11/2005 Conditional NR 726 Closure  Closed Spill 6/1995	1,850 ft North	> 100 yr TOT	Low
22 (K 46, K47)	Environmental Management Consulting 801 Atlas Avenue Madison, WI	EDR Report- FTTS Hist. FTTS FINDS	Violation 5/1994 regarding air clearance of a functional space, related to asbestos abatement	Active Business	1,900 ft NNW	> 100 yr TOT	Low
23 (62)	513 Bowman Ave. Madison, WI	EDR Report- ERNs	Caller reported 12/30/1998 that their No. 2 fuel oil tank in their basement had been overfilled and oil had spilled onto their floor	Fuel Oil Spill in Basement	1,950 ft West	> 100 yr TOT	Low
24 (3)	Shine Cleaners 4684 Cottage Grove Road Madison, WI	EDR Report- RCRA-CESQG, FINDS BRRTS MANIFEST SHWIMS	Conditionally Exempt Small quantity generator of hazardous waste – spent halogenated solvents. No violations	Active Drycleaner	2,150 ft NE	50 yr TOT	High
25 Site Obs.	TCO Parts & Power 709 Atlas Avenue Madison, WI	Site Reconnaissance	Truck parking, equipment storage, lawn mowers, organized Potential for leaks and spills	Active Parts & Equipment Store	2,150 ft NNW	> 100 yr TOT	Low
26 Site Obs.	Autech of Wisconsin 1601 S. Stoughton Road Madison, WI	Site Reconnaissance	Vehicle sales, parking, potential for leaks and spills	Vehicle Sales	2,200 ft SSW	50 yr TOT	Low
27 (O72)	American Family Insurance 708 Cottage Court Madison, WI	EDR Report- RCRA-CESQG	RCRA – no violations reported Gated yard surrounding large warehouse	RCRA No Violations	2,200 ft NW	> 100 yr TOT	Low

TABLE 4-1 (cont.)

Map Site No. (EDR Reference No.)	Owner/Location	Database or Reference Source	Existing, Potential, or Former Contaminant Sources	Reported Status	Approximate Distance to Unit Well 23	Location within Capture Zone	Estimated Threat to Supply Wells
28 (A1, A2)	Valley Bank Rolling Meadows Branch (Currently Pizza Hut) David Geier 4762 Cottage Grove Road Madison, WI	EDR Report- Registered UST (Facility ID 140089) LUST CRS AUL	Closed/Removed USTs: 2@8,000 gal leaded gas, 6,000 gal. unleaded gas (Tank ID Nos. 273171, 273172, 273173) 11/1981 Closed LUST site 10/2003, petroleum contaminated soil and groundwater, closure with GIS registry. Groundwater contamination remaining above NR 140 standards	Closed/Removed USTs 11/1981 Closed LUST with GIS Registry 10/2003	2,200 ft NE	50 yr TOT	Moderate
29 Site Obs.	Wadada Auto works 1619 S. Stoughton Road Madison, WI	Site Reconnaissance	Vehicle sales, parking, potential for leaks and spills	Vehicle Sales	2,300 ft SSW	50 yr TOT	Low
30 (R78, R79)	Continental Baking 621 Atlas Avenue Madison, WI	EDR Report- Registered UST (Facility ID 64638) Registered AST LUST Spills	Closed/Removed UST: 10,000 gal. diesel (Tank ID No. 272027). 9/1996  In Use AST: 225 gal. waste/used motor oil  Closed LUST 2/1997, soil contamination  Spill 12/2008, vehicle hit power pole and ruptured transformer which spilled mineral oil causing soil contamination. Excavated contaminated soil	Closed Removed UST 9/1996  In Use AST  Closed LUST 2/1997  Spill 12/2008	2,450 ft NNW	> 100 yr TOT	Low
31 (S90)	Walter Bilsky 704 Cottage Grove Road Madison, WI	EDR Report- Registered UST (Facility ID 142323 )	In Use UST: 500 gal. leaded gas (Tank ID No. 276338)	In Use UST	2,500 ft NW	> 100 yr TOT	Low
32 Site Obs.	Jacket Racket Screen Printing 710 Cottage Grove Road #D Madison, WI	Site Reconnaissance	Use of inks and dyes. No apparent spills or poor housekeeping	Active Screen Printing 2010	2,550 ft NW	> 100 yr TOT	Low
33 (O69, O70, O71)	American Family Mutual Insurance Company 718 Cottage Court Madison, WI	EDR Report- Registered UST (Facility ID 678578) Registered AST SHWIMS Tier 2  Site Reconnaissance	Closed/Removed UST: 3,000 gal. diesel (Tank ID No. 273091) 3/2010  Closed/Removed AST: 200 gal. diesel (Tank ID No.1262705) 3/2010  In Use ASTs: 2@3,000 gal. diesel (Tank ID Nos. 1262712, 1262706)  Tier 2 – sulfuric acid in batteries in UPS storage room, fuel oil in belly tank underneath generators  Gated property - warehouse	Closed Removed UST and AST 3/2010  In Use AST	2,600 ft NW	> 100 yr TOT	Low
34 (60)	Barr's Kawasaki 1701 S. Stoughton Road Madison, WI	EDR Report- RCRA-NonGen	Small quantities of ignitable hazardous wastes, benzene, and tetrachloroethylene, no violations reported	Active Site	2,600 ft SSW	100 yr TOT	Low
35 Site Obs.	Fuel Systems of Madison 4229 Argosy Court Madison, WI	Site Reconnaissance	Oils- Fuel (wholesale). No readily apparent environmental concern	Active Business	2,600 ft NNW	> 100 yr TOT	Low

TABLE 4-1 (cont.)

Map Site No. (EDR Reference No.)	Owner/Location	Database or Reference Source	Existing, Potential, or Former Contaminant Sources	Reported Status	Approximate Distance to Unit Well 23	Location within Capture Zone	Estimated Threat to Supply Wells
36 (AA130, AA131, AA132, AA144)	Mobil Gas Station (current) Darshans Wisconsin Properties Four Marathon Bulk #234 605 Cottage Grove Road Madison, WI	EDR Report- WI - Registered UST (Facility ID 100314) FINDS LUST CRS AUL RCRA-Non Gen SHWIMS Tier 2	Closed/Removed USTs: 3@10,000 gal. unleaded, 2@10,000 gal. leaded gas, 8,000 gal unleaded gas, 4,000 gal. diesel, 4,000 gal. unleaded gas, 1,111 gal. leaded gas , 8,000 gal diesel, 8,000 gal. leaded gas,, 12,000 gal. unleaded gas (Tank ID Nos. 271875, 271876, 271877, 271878, 271879, 272742, 272743, 272744, 272745, 272746, 274937) 12/1990  In Use UST: 6,000 gal unleaded gas (Tank ID No. 9393) Closed LUST 3/2006, gasoline contaminated soil and groundwater. Conditional closure with GIS Registry. Groundwater contamination above NR 140 standards  RCRA- small quantities of ignitable hazardous wastes  Gas station	Closed/Removed USTs 12/1990  In Use UST  Closed LUST 3/2006 Conditional with GIS Registry  Active Gas Station 2010	2,650 ft NW	> 100 yr TOT	Low
37 (S96)	Thermogas Co. Madison (currently Badger Cab Co.) 700 Cottage Grove Road Madison, WI	EDR Report- RCRA-CESSQG FINDS WI ERP AGSPILLS CRS AUL SHWIMS	Closed ERP 7/2005, groundwater at or above NR 140 standard, conditional closure with GIS Registry. Dept. of AG spill site  RCRA – ignitable, halogenated and non-halogenated hazardous wastes. No violations reported  Listed bulk fertilizer and pesticide storage facility	Closed ERP with GIS Registry	2,650 ft NW	> 100 yr TOT	Low
38 (M56, M57, M58, M59)	Jiffy Stop Service Station (Former) 4402 Buckeye Road (Site B) Madison, WI	EDR Report- Registered UST (Facility ID 117501) RCRA-CESQG FINDS LUST SHWIMS	Admin Closure UST: 1,000 gal. fuel oil (Tank ID No. 271843) 1/1986  Closed/Removed USTs: 4,000 gal. unleaded gas , 8,000 gal. unleaded gas, 6,000 gal. diesel (Tank ID No. 272664, 272665, 272666) 3/1994  In Use USTs: 12,000 gal. unleaded gas, 3@8,000 gal. unleaded gas (273910, 273911, 273912, 273913)  RCRA – ignitable hazardous wastes, no violations  Closed LUST 2/1995, petroleum contaminated soil Closed LUST 5/1995, gasoline contaminated soil  Spill 8/1995, gasoline, details not reported. Closed 8/1995	Closed USTs 9/1994  Closed Spill 5/1987  Closed LUST Sites 2/1995, 5/1995  Closed Spill 8/1995	2,650 ft SSW	100 yr TOT	Moderate
39 (L50, L51, M56)	PDQ Food Store #115 4426 Buckeye Road Madison, WI	EDR Report- Spills Registered UST (Facility ID 117502)	Closed/Removed USTs: 6,000 gal. diesel, 3@12,000 gal. unleaded gas (Tank ID Nos. 272551, 272552, 272554) 9/1994  Spill 5/1987, soil contamination resulted from failure to keep nozzle in tank. Closed 5/1987  Gas station	Closed USTs 9/1994  Closed Spill 5/1987  Active Gas Station 2010	2,650 ft SSW	100 yr TOT	Moderate
40 (N63, N64)	SM&P Conduit Co. Inc. 4229 Argosy Court A Madison, WI	EDR Report- RCRA-NonGen FINDS SHWIMS	RCRA- very small quantities of hazardous wastes, no violations reported	Active Site No RCRA Violations	2,750 ft NNW	> 100 yr TOT	Low

TABLE 4-1 (cont.)

Map Site No. (EDR Reference No.)	Owner/Location	Database or Reference Source	Existing, Potential, or Former Contaminant Sources	Reported Status	Approximate Distance to Unit Well 23	Location within Capture Zone	Estimated Threat to Supply Wells
41 Site Obs.	Chem Dry 4231 Argosy Court Madison, WI	Site Reconnaissance	Carpet and upholstery cleaning service	Active Business Potential Spills	2,700 ft NNW	> 100 yr TOT	Low
42 (S97)	Ferrellgas 700 Cottage Grove Road Madison, WI	EDR Report-Tier 2 Site Reconnaissance	In Use large propane cylinder  Tier 2 - Propane	In Use AST Propane Storage	2,650 ft NW	> 100 yr TOT	Low
43 (R87)	Diesel Specialists of Madison 4209 Argosy Court Madison, WI	EDR Report-RCRA FINDS SHWIMS	RCRA – ignitable, halogenated and non-halogenated hazardous wastes. No violations reported	RCRA No Violations	2,750 ft NNW	> 100 yr TOT	Low
44 (106)	Marilyn & Byron Chase 307 East Lakeview Avenue Madison, WI	EDR Report-Registered UST (Facility ID No. 107477)	Closed/Removed UST: 275 gal. fuel oil (Tank ID No. 273093) 6/1989	Closed/Removed UST 6/1989	2,800 ft SW	> 100 yr TOT	Low
45 (AA134)	Kentucky Fried Chicken 604 Cottage Grove Road Madison, WI	EDR Report-LUST LAST CRS AUL	Closed LUST 5/2003, soil contamination. Conditional closure with soil contamination above residual contamination level and groundwater above NR 140. GIS Registry  Closed LAST 5/2003, NR 726 closure with GIS Registry	Closed LUST 5/2003  Closed LAST 5/2003 GIS Registry	2,800 ft NW	> 100 yr TOT	Low
46 (AA133)	Danco Prairie FS Coop 604 Cottage Grove Road Madison, WI	EDR Report-Registered AST (Facility ID 151520)	Closed/Removed ASTs: 17,000 gal. diesel, 17,000 gal leaded gas, 19,000 gal. leaded gas (Tank ID Nos. 202403, 202404, 202402) 1/1975	Closed/Removed ASTs 1/1975	2,850 ft NW	> 100 yr TOT	Low
47 (AA145)	Dempsey & Cottage Grove Road Madison, WI	EDR Report-Spill	Historic spill 1/1991, breakage of pipeline caused ammonia spill and air contamination	Closed Ammonia Spill 1/1991	2,900 ft NW	> 100 yr TOT	Low
48 (N65, N66, N67)	Four Lakes Color Graphics Inc. 4230 Argosy Court Madison, WI	EDR Report-RCRA-Non-Gen FINDS Registered AST (Facility ID No. 182306) SHWIMS Tier 2	In Use ASTs: 1,500 gal. diesel, 200 gal. diesel, (Tank ID Nos. 495577, 495568)  RCRA- small quantities of ignitable hazardous wastes,, no violations reported.  Tier 2 listing – diesel fuel	In Use ASTs Active Site	2,950 ft NNW	> 100 yr TOT	Low
49 (AA146, AA147)	Lake City Motors (current) Fiore Coal & Gas Co. CV Pros 3901 Dempsey Road Madison, WI	EDR Report-Registered UST (Facility ID 65395) LUST RCRA-NonGen FINDS SHWIMS  Field Observation	Closed/Removed UST: 550 gal. waste/used motor oil, 3@3,000 gal. leaded gas, 2@550 gal. fuel oil (Tank ID Nos. 271626, 273177, 273189, 273190, 273391, 453910) 2/1982  LUST 4/1997, soil and groundwater contamination. Conditional closure under NR 726. Closed 8/2001  Lake City Motors – vehicle service and oil change  RCRA waste – tetrachloroethylene, no violations reported	Closed/Removed USTs 2/1982  LUST Conditional Closure NR 726  Active Vehicle Service 2010	2,950 ft WNW	> 100 yr TOT	Low
50 (M61)	Bark River Culvert & Equip. Co. (not observed at this location) 4301 E Buckeye Road Madison, WI	EDR Report-Registered UST (Facility ID No. 674636)	Closed/Removed USTs: 3,000 gal. unleaded gas, 1,000 gal. diesel, 500 gal. waste/used motor oil (Tank ID Nos. 272411, 272412, 272413) 12/1989	Closed/Removed USTs 12/1989	3,050 ft SSW	100 yr TOT	Low
51 (P73)	Meinke Car Care Center Roy Sternberg 1826 S. Stoughton Road Madison, WI	EDR Report-Registered AST (Facility ID 190939) Site Reconnaissance	In Use AST: 550 gal waste/used motor oil (Tank ID No. 660294) Vehicle maintenance, exhaust, brakes, lube	In Use AST Car Care Business 2010	3,100 ft SSW	> 100 yr TOT	Low

TABLE 4-1 (cont.)

Map Site No. (EDR Reference No.)	Owner/Location	Database or Reference Source	Existing, Potential, or Former Contaminant Sources	Reported Status	Approximate Distance to Unit Well 23	Location within Capture Zone	Estimated Threat to Supply Wells
52 (Q77, U100)	Sani Matic Systems 1915 S Stoughton Road Madison, WI	EDR Report- RCRA-CESQG FINDS ERP NPDES SHWIMS FTTS Site Reconnaissance	Closed ERP 4/2003, soil contamination, conditional closure  RCRA – small quantities of ignitable hazardous wastes, halogenated solvents, non-halogenated solvents. No violations reported  FTTS – Asbestos abatement	Closed ERP 4/2003 Soil Contamination	3,150 ft South	100 yr TOT	Low
53 (L53, L54)	Dean Medical Office 1821 S Stoughton Road Madison, WI	EDR Report- Registered AST (Facility ID 672170) SHWIMS	In Use AST: 2,500 gal. diesel (Tank ID No. 948481)	In Use AST	3,150 ft SSW	100 yr TOT	Low
54 (8)	1510 Woodvale Drive Madison, WI	EDR Report- SPILLS	Spill 11/1982, closed 12/1982, fuel oil pumped into basement impacting sanitary sewer	Spill 11/1982 Closed 12/1982	3,150 ft SE	50 yr TOT	Moderate
55 (P74, P75, P76)	Checker Auto Parts (currently O'Reilly Auto parts) Safety Clean Systems Inc. 1830 S Stoughton Road Madison, WI	EDR Report- RCRA-SQG FINDS SHWIMS Registered AST (Facility ID No. 746876) Tier 2	In Use AST: 120 gal. waste/used motor oil (Tank ID No. 1222004)  RCRA – storage of small quantities of hazardous materials, no violations  Tier 2 – sulfuric acid	In Use AST	3,200 ft SSW	> 100 yr TOT	Low
56 Site Obs.	Royster Clark 800 Block of Dempsey Road Madison, WI	EDR Report- Site reconnaissance DCRPC, 1999	Remediation shed located immediately west of Dempsey Road (Chem Trec 800-424-9300)  Listing for bulk fertilizer and pesticide storage facility	Remediation Shed (in-place)	3,100 ft NW	> 100 yr TOT	Low
57 Site Obs.	Four Lakes Wholesale 4277 Argosy Court Madison, WI	Site Reconnaissance	Paint storage and sales, potential for leaks and spills	Paint Storage and Sales 2010	3,250 ft North	> 100 yr TOT	Low
58 (P88, P89)	Car Corp. of Madison (former) (current Dent Doctor) 1850 S. Stoughton Road Madison, WI	EDR Report- SHWIMS RCRA-NonGen FINDS Site Reconnaissance	RCRA – ignitable, halogenated and non-halogenated hazardous wastes. No violations reported  Dent Doctor sign reads "paint free"	RCRA No Violations	3,250 ft SSW	> 100 yr TOT	Low
59 (13)	Marvin Johnson 1609 Woodvale Drive Madison, WI	EDR Report- Registered UST (Facility ID No. 108539)	Closed/Removed UST: 300 gal. leaded gas (Tank ID No. 274219) 4/1997	Closed/Removed UST 4/1997	3,400 ft SE	50 yr TOT	Low
60 Site Obs.	Farenbach Automotive Repair 4309 Neptune Court Madison, WI	Site Reconnaissance	Full automobile service and repair. Potential for leaks and spills, vehicle parking/staging area	Auto Repair 2010	3,400 ft NNW	> 100 yr TOT	Low
61 (99)	Steven Doll 4902 Buckeye Road Madison, WI	EDR Report- Registered UST (Facility ID No. 87270)	Closed/Removed UST: 265 gal. fuel oil (Tank ID No. 273363) 3/2006	Closed/Removed UST 3/2006	3,450 ft SE	50 yr TOT	Low
62 Site Obs.	Lazybones Laundry & Cleaning Services, Inc. 4309 Neptune Court #B Madison, WI	Site Reconnaissance	Laundry services. Lazybones stated Dec. 14, 2010 that no drycleaning is performed at the Neptune Court facility	Laundry Facility 2010	3,400 ft NNW	> 100 yr TOT	Low
63 Site Obs.	Town of Blooming Grove Town Hall 1880 S. Stoughton Road Madison, WI	Site Reconnaissance	Trucks and equipment parking, mechanic bays, storage yard Potential fluid leaks and spills	Blooming Grove Town Hall Trucks & Equipment	3,500 ft SSW	> 100 yr TOT	Low
64 (92)	Ken Strand 4716 Camden Road Madison, WI	EDR Report- Registered UST (Facility ID 98976)	In Use UST: 300 gal. fuel oil (Tank ID NO. 273111)	In Use UST	3,500 ft SW	> 100 yr TOT	Low

TABLE 4-1 (cont.)

Map Site No. (EDR Reference No.)	Owner/Location	Database or Reference Source	Existing, Potential, or Former Contaminant Sources	Reported Status	Approximate Distance to Unit Well 23	Location within Capture Zone	Estimated Threat to Supply Wells
65 (Q80, Q81, Q82, Q83, Q84, Q85, Q86)	Bou-Matic Pure Labs LLC 1919 S. Stoughton Road Madison, WI	EDR Report- Registered UST (Facility ID No. 672719) Registered AST LUST Manifest Spills CRS AUL AIRS SHWIMS TRIS FINDS SSTS Tier 2  Site Reconnaissance	Closed/Removed USTs: 2@10,000 gal. fuel oil, 2,000 gal industrial, (Tank ID Nos. 271546, 271557) 7/1993  In Use ASTs: 6@6,200 gal. chemical Tank ID Nos. 1242164, 1242166, 1242163, 1242162, 1242155, 1242165)  Open LUST, start 7/1993, soil and groundwater contamination, chlorinated solvents. GIS registry. 4/2001, petroleum contaminated soil with conditional closure  Spill 6/2008, bright sapphire blue substance was observed in the Madison detention pond located adjacent to Bou Matic Co. (paints, inks, dyes). Source not determined. Closed 6/2008  RCRA – ignitable hazardous wastes, chromium, mercury, benzene, tetrachloroethylene. Violations – general  Tier 2 listing – sodium hydroxide, sodium polyacrylate, nitrogen, sulfuric acid, iodine, nitric acid, caustic soda, potassium hydroxide, phosphoric acid, sodium hypochlorite, caustic potash, glycerin, fuel oil  Liquid nitrogen tanks, BOC gas	Closed Removed USTs 7/1993  Open LUST GIS Registry  Closed Spill 6/2008	3,550 ft SSW	> 100 yr TOT	Low
66 (U98)	1919 S. Stoughton Road Madison, WI	EDR Report- Spill	Spill 2/1981, accident at City Disposal Co. caused soil contamination	Old spill 2/1981	3,600 ft SSW	> 100 yr TOT	Low
67 (26)	Peter Lee Orlopp 1605 Homberg Lane Madison, WI	EDR Report- Registered UST (Facility ID 694652)	Closed/Removed UST: 1,000 gal. fuel oil (Tank ID No. 1003589) 1/2005	Closed/Removed UST	4,000 ft SE	50 yr TOT	Low
68 (95)	Acewood Blvd & Onyx Lane Madison, WI	EDR Report- Spills	Spill 7/2000, city trash truck blew a hydraulic hose releasing mineral oil and causing storm sewer contamination. Closed 7/2000	Closed Spill 7/2000	4,200 ft NNE	> 100 yr TOT	Low
69 (W104, W105)	Midwest Steel Division 2002 Vondron Road Madison, WI	EDR Report- WDS WI ERP SWF/LF SHWIMS	Open ERP site, start 7/1988, landfill (closed status)  BRRTS reports 4 acre site	Closed Landfill  Open ERP	5,500 ft SE	100 yr TOT	High
70 (T93)	Madison Water Utility (Unit Well 25) 5415 Queensbridge Road Madison, WI	EDR Report- Registered AST (Facility ID 664709) Tier 2	In Use AST: 490 gal. diesel (Tank ID No. 919908), generator fuel supply Tier 2 listing - chlorine	In Use AST	5,850 ft ENE	> 100 yr TOT	Low
71 (186)	Mile Post 139 I90/94 (I39) Madison, WI	EDR Report- Spill	Spill 3/1995, accident spilled diesel fuel on highway and causing soil contamination, cleaned up using absorbent material	Closed Spill 7/1995	6,300 ft ENE	> 100 yr TOT	Low
72 (157)	1606 S. Thompson Drive Madison, WI	EDR Report- Spill	Historic spill 9/1992, lightning hit a transformer rupturing the unit and spilling mineral oil. Soil contamination cleaned up using absorbent material. End 1992	Spill 9/1992	6,300 ft ESE	> 100 yr TOT	Low
73 Site Obs.	Pond NE of intersection of I39 and Buckeye Road Madison, WI	Site Reconnaissance	Borrow pit pond	Pond	7,400 ft ESE	> 100 yr TOT	Low

TABLE 4-1 (cont.)

Map Site No. (EDR Reference No.)	Owner/Location	Database or Reference Source	Existing, Potential, or Former Contaminant Sources	Reported Status	Approximate Distance to Unit Well 23	Location within Capture Zone	Estimated Threat to Supply Wells
74 (AG196, AG197, AG198)	Agrinetics Corp. 5649 East Buckeye Road Madison, WI	EDR Report- Registered AST (Facility 50800) Registered UST RCRA-Non Gen MLTS FINDS BRRTS Manifest SHWIMS	Closed/Removed ASTs: 2@265 gal. diesel (Tank ID Nos. 202176, 202177) 7/1993 and 6/2004  Closed/Removed USTs: 2,500 gal. fuel oil, 500 gal. diesel, 2,000 gal. unleaded gas, 2@15,000 gal. fuel oil (Tank ID Nos. 272951, 272952, 272953, 272954, 272955) 12/1993, 10/1997 and 12/1997.  RCRA – small quantities of halogenated solvents and corrosive wastes. No violations reported	Closed/Removed ASTs 7/1993 and 6/2004  Closed/Removed USTs 12/1993, 10/1997, 12/1997	6,650 ft ESE	> 100 yr TOT	Low
75 (229)	Wolf Trucking I90 at Milepost 140 Madison, WI	EDR Report- WI – ERP Spills	Spill 5/1981, drum split in transit causing soil contamination (material spilled not reported – industrial chemicals)  Spill 10/1998, fuel tank was punctured by debris coming off a vehicle ahead of Wolf Trucking semi. Caused soil contamination. Excavated 60 tons of soil. Closed	Closed Spills 5/1981 10/1998	6,950 ft ESE	> 100 yr TOT	Low
76 Site Obs.	Yahara Buckeye Quarry East Buckeye Road (east of I39) Madison, WI	Site Reconnaissance	Non-metallic mining operations - quarry Heavy equipment use. Potential for leaks and spills Industrial storm water runoff Explosives used for blasting	Active Quarry	8,300 ft ESE	> 100 yr TOT	Low
	Highways, roads, streets throughout the area	Site Reconnaissance	Salt application Potential spills	Active		Zone A – 5 yr TOT	Low

## Notes:

1. Zone A = Within 5 year TOT ZOC
2. Zone B = Beyond Zone A, but within 1200-ft. radius.

AST - Aboveground Storage Tank

AUL - Deed Restriction Data

BRRTS - Wisconsin Bureau of Remediation &amp; Redevelopment Tracking System

CERCLIS - Comprehensive Environmental Response, Compensation, and Liability Information System

COORACTS - Corrective Action Activity

CRS - Closed Remediation Sites

DNR - Wisconsin Department of Natural Resources

EPA - Environmental Protection Agency

ERNS - Emergency Response Notification System

ERP - Wisconsin Environmental Repair Program Database

FINDS - Facility Index System/Facility Registry System

LAST - Leaking Aboveground Storage Tank

LUST - Leaking Underground Storage Tank

MANIFEST - Hazardous Waste Manifest Information

NPL National Priorities List (NPL)

SHWIMS - Solid &amp; Hazardous Waste Information Management System

RCRA-CESQG - Resource Conservation and Recovery Act- Conditionally Exempt Small Quantity Generator

RCRA-LQG - Resource Conservation and Recovery Act (RCRA) - Large Quantity Generator

RCRA-SQG - Resource Conservation and Recovery Act- Small Quantity Generator

SPILLS - Wisconsin DNR Spills Database

TOT - Time of Travel

UST - Underground Storage Tank

WI - Wisconsin

is located at 1880 S. Stoughton Road and is approximately 3,400 feet south-southwest of Unit Well 23. The Town of Blooming Grove Town Hall site is located about 350 feet southwest of the 100-year TOT ZOC boundary. The Town of Blooming Grove was asked about water supply for their property and they responded that they are provided water by the City of Madison (Town of Blooming Grove, 2010). There is no private well at their property.

There are no private sewage disposals systems in the vicinity of Unit Well 23. All businesses and residents located in the area are served by the City of Madison municipal sewer system.

Based on the site reconnaissance and a review of the Wisconsin registered storage tank list, there is one active UST site located within 1,200 feet of Unit Well 23. The UST is located at 1040 Lumberman's Trail, which is approximately 400 feet northwest of Unit Well 23. The 10,000 gallon UST contains an unspecified chemical. Four closed, removed, or abandoned UST sites are located within 1,200 feet of Unit Well 23.

There are three open LUST or ERP sites located within the 100-year ZOC for Unit Well 23.

There are two closed LUST sites within 1,200 feet of Unit Well 23. One LUST site is located at 4515 Cottage Grove Road and is 1,100 feet north-northeast of Unit Well 23. The other LUST site is located at 4309 Cottage Grove Road and is 850 feet northwest of Unit Well 23. Both LUST sites received conditional closure with residual contamination remaining at the sites. Ten of the 16 closed LUST and/or ERP sites located in the search area near Unit Well 23 received closure with residual soil/and/or groundwater contamination remaining at the sites.

Based on the site reconnaissance and a review of the Wisconsin registered storage tank list, the nearest AST is located at 1102 Lumberman's Trail, and is approximately 200 feet southwest of Unit Well 23. Two portable ASTs on wheels were observed at the site. Stains on the ground beneath the ASTs may indicate leaks from the ASTs.

Based on the review of the Wisconsin Spills List there are three historic spills that occurred within 1,200 feet of Unit Well 23. All three spills occurred at 4309 Cottage Grove Road and involved the release of ammonia. The spills caused contamination of soil, air and the storm sewers. All of the spill sites have closed status.

A drycleaner is located approximately 2,100 feet northeast of Unit Well 23.

DNR records show that a historical solid waste disposal site (Midwest Steel auto shredder) is located approximately 5,500 feet southeast of Unit Well 23 (Wisconsin DNR, 2010 (BRRTS)). Records show the site was used for vehicle shredding and was operated during the period of 1976 through 1980 (DCRPC, 1999). The area is currently residential land use.

No cemeteries were observed in the Unit Well 23 ZOCs.

There are no sludge or septage spreading areas in the Unit Well 23 WHPA or within the 100-year ZOC.

No bulk salt storage sheds or bulk pesticide, fertilizer storage, and/or mix-load sites were identified within the ½-mile radius or the recharge area equivalent to the delineated 100-year

TOT of Unit Well 23, or within the upgradient recharge area. Salt is applied to roadways in the Unit Well 23 ZOCs during the winter, as a deicer.

The separation distances between Unit Well 23 and potential contaminant sources identified in Wisconsin Administrative Code NR 811.12(5) are summarized in Table 4-2. The required separation distance from Unit Well 23 is not met for the sanitary sewer, for the closed LUST site located at 4515 Cottage Grove Road where there is residual groundwater contamination above Chapter NR140 standards, or for the ASTs located at 1102 Lumberman's Trail (250 feet southwest of Unit Well 23). The Wisconsin UST database reports that the fuel oil AST located at 4515 Cottage Grove Road is a single wall tank. Single walled ASTs and USTs do not meet Wisconsin Department of Commerce standards for placement closer than 1,200 feet to a municipal water supply well.

#### **4.2 UNIT WELL 23 WATER QUALITY AND LAND USES**

Based on the latest water quality samples, water pumped from Unit Well 23 is hard (454 milligrams per liter (mg/L)), and contains low levels of iron (0.069 mg/L), manganese (0.0029 mg/L), nitrate (3.27 mg/L), chloride (62.61mg/L), sulfate (27.3 mg/L), and radon (0 pico curies per liter (pCi/L)) (DNR, 2010). No volatile organic compounds (VOCs) or synthetic organic compounds (SOCs) were detected in water pumped from Unit Well 23 during the last sampling cycles of 2010 for VOCs and 2005 for SOCs (DNR, 2010). Table 4-3 contains a summary of the Unit Well 23 inorganic water quality data. Appendix J contains the historical water quality information for Unit Well 23.

Select water quality parameters were graphed and reviewed to determine if there are trends in the water quality. Appendix J includes the historical water quality graphs. On the basis of the water quality data, it does not appear that road salt application (chlorides), or nutrient loading (nitrates) on grass areas in the well capture zone areas has significantly affected the quality of groundwater pumped from Unit Well 23. The concentrations are well below the nitrate maximum contaminant level (MCL) of 10 mg/L, and the secondary standard of 250 mg/L for chloride. There does appear to be an inclining trend in the chloride and sodium concentrations at the site which would indicate a trend of road salt infiltration. This is most likely due to road surface runoff that enters the pond near the Unit Well 23 site. Also, nitrate levels at Unit Well 23 are higher than other wells which is also attributed to the location of the well near the pond.

Unit Well 23 is not cased through the Eau Claire shale confining layer; therefore, Unit Well 23 is open to approximately 183 feet of the upper bedrock aquifer, which is more vulnerable to contamination from near-surface contaminant sources compared to the lower bedrock aquifer.

#### **4.3 LAND USES AND WHP PLANNING**

Some of the land uses in the vicinity of Unit Well 23 are not compatible with WHP planning, including major highways and railroad tracks (high potential for spills), vehicle repair and maintenance, gas stations, drycleaning, and manufacturing properties with active USTs. Land uses summarized in Table 4-2 should be prohibited in the vicinity of Unit Well 23, within the respective minimum separation distances shown. Also, it is not desirable to have commercial and manufacturing districts located in WHPAs as occurs in the Unit Well 23 WHPA. The pond located 400 feet southeast of Unit Well 23 is a concern because it receives discharge from the storm sewers. Land uses summarized in Table K-1 in Appendix K should be prohibited from

**TABLE 4-2**  
**MINIMUM SEPARATION REQUIREMENTS**  
**BETWEEN PUBLIC WELLS AND**  
**POTENTIAL CONTAMINANT SOURCES**  
**WELLHEAD PROTECTION PLAN, UNIT WELL 23**  
**MADISON, WISCONSIN**

Potential Contamination Source	Minimum Separation Distance
Emergency or Standby Power System for Well	10 feet
Storm Sewer	50 feet
Sanitary Sewer	200 feet <sup>1</sup>
Sanitary Lift Station	200 feet
Single Family Residential Fuel Oil Tank	200 feet
Private on Site Water Treatment System (POWTS) Treatment Tank or Holding Tank Component and Associated Piping.	200 feet
Double Walled Below or Above Ground Gasoline or Fuel Oil Tank Following Most Restrictive Com 10.260 Standards and Approved by Comm 10.110	300 feet
Cemetery	400 feet
Stormwater Retention or Detention Pond	400 feet
POWTS Dispersal Component With a Capacity of Less Than 12,000 gpd.	400 feet
Double Walled Below or Above Ground Gasoline or Fuel Oil Tank Following Com 10.260 Double Walled Tank Standards and Approved by Comm 10.110	600 feet
Land Application of Municipal, Commercial, or Industrial Waste	1,000 feet
Boundaries of Land Spreading Facility Regulated Under Chapter NR 718	1,000 feet
Agricultural, Industrial, Commercial, or Municipal Wastewater Treatment Plant Treatment Units, Lagoons, or Storage Structures	1,000 feet
Manure Stacks or Storage Structures	1,000 feet
POWTS Dispersal Component With a Capacity of 12,000 gpd or More.	1,000 feet
Solid Waste Storage, Transportation, Transfer, Incineration, Air Curtain Destructor, Processing, Wood Burning, or One-Time Disposal or Small Demolition Facility	1,200 feet
Sanitary Landfill	1,200 feet
Property with Residual Groundwater Contamination Exceeding Chapter NR 140 Enforcement Standards	1,200 feet
Coal Storage Area	1,200 feet
Salt or Deicing Material Storage	1,200 feet
Gasoline or Fuel Oil Storage Tanks Not Constructed Per Comm 10.260 / Not Approved by Comm 10.110	1,200 feet
Pesticide or Fertilizer Handling or Storage Facilities	1,200 feet

Reference: Wisconsin Administrative Code, NR 811, November 2010.

Footnote:

<sup>1</sup> Lesser separation for sanitary sewer may be allowed if the sewer is constructed of water main materials and pressure tested. Less than 50 feet separation is not allowed.

**TABLE 4-3**  
**SUMMARY OF WATER QUALITY DATA**  
**WELLHEAD PROTECTION PLAN, UNIT WELL 23**  
**MADISON, WISCONSIN**

Parameter	Value	Maximum Contaminant Limit (MCL) Or Secondary Standard
Alkalinity (mg/L)	269 - 350	None
Hardness (mg/L)	390 -454	None
pH	7.37 – 8.11	6.5 – 8.5
Iron (mg/L)	0.05 – 0.11	0.3
Manganese (mg/L)	0.026 – 0.057	0.05
Chloride (mg/L)	39.8 – 62.6	250
Nitrate – Nitrogen (mg/L)	Non Detect – 4.17	10.0
Sulfate (mg/L)	23.9 - 34	250
Barium (mg/L)	0.042 – 0.065	2.0
VOCs (Concentration greater than MCL)	None	Varies
SOCs (Concentration greater than MCL)	None	Varies

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WHPA Zones A and B. Where any of the uses listed in Table J-1 currently exist within Zones A and B, owners should be allowed to upgrade the facilities to facilitate or enhance groundwater protection.

Tables 4-4 and 4-5 in Appendix K summarize several potential sources of groundwater contamination and land uses, and their relative risk to groundwater, respectively.

## 5.0 MANAGEMENT ACTVITIES

### 5.1 ALTERNATIVE MANAGEMENT ACTIVITIES

Table 5-1 summarizes key elements of a management plan developed for the City of Madison. Activities were identified for resource management within the delineated WHPA and within far upgradient ZOCs.

The various activities can be grouped into five principal categories as follows:

1. Existing programs
2. Land use controls
3. Intergovernmental cooperation
4. Monitoring
5. Public education and awareness

All landowners in the Unit Well 23 area, whether residing in the City of Madison or in surrounding areas, rely on groundwater resources for water supply. Emphasis should be placed on management activities that provide a mutual benefit to the City of Madison residents and other property owners who rely on the groundwater resources.

#### 5.1.1 Category 1 - Existing Programs

##### 5.1.1.1 Hazardous Waste Collection/Disposal Program (Clean Sweep)

Public Health Madison and Dane County operates the Clean Sweep Collection Program. The Clean Sweep Program involves collection and disposal of residential, agricultural, and small business hazardous chemicals and wastes and product exchange of unwanted hazardous products when applicable. Disposal of household residential hazardous wastes is free; however, some household hazardous wastes cannot be accepted by the Clean Sweep Program. The Clean Sweep website should be consulted about specific items being disposed. Small quantities of hazardous materials and wastes from small businesses are accepted on Thursday mornings, by appointment only, and there is a per pound charge for materials. Costs are summarized on the Clean Sweep website. There are similar charges for disposal of hazardous materials disposed of by producers of agricultural crops and commodities; however, Dane County farmers receive a subsidy. Collections are held between 7:30 a.m. and 2:00 p.m. on Tuesdays, Wednesdays, Fridays, and Saturdays; May 1 through October 30. The Clean Sweep site is located at the north end of the Dane County Highway Garage property, 2302 Fish Hatchery Road, Madison, Wisconsin.

Information about the Clean Sweep Collection Program can be obtained by calling (608) 243-0368. Clean Sweep Collection Program website is [www.danecountycleansweep.com](http://www.danecountycleansweep.com)

The Clean Sweep Collection Program is advertised using public service announcements and materials distributed by municipalities including direct mail to select customer groups, press releases, publications and newsletters, television coverage, and brochures. The program also maintains a website as noted above and an informational hotline. Funding for the program is

**TABLE 5-1**  
**SUMMARY OF MANAGEMENT ACTIVITIES**  
**WELLHEAD PROTECTION PLAN - UNIT WELL 23**  
**MADISON, WISCONSIN**

Program Category	Activity	Description	Responsible Unit(s) of Government	Implementation Schedule	
				Date	Action Item
1. Existing Programs	a. Hazardous Waste Collection (CLEAN SWEEP)	<ul style="list-style-type: none"> <li>Hazardous waste collection and disposal. Residential, agricultural, and small business hazardous waste. Commercial with small fee. May through October collections in Madison.</li> <li>Target local property owners and residents to participate.</li> </ul>	<ul style="list-style-type: none"> <li>Public Health Madison and Dane County</li> </ul>	1. 2011  2. As needed	1. <b>Madison Water Utility</b> send information about the Clean Sweep Collection Program to property owners in the WHPA, to encourage participation in the program.  2. <b>Dane County</b> sponsors advertising and feature articles.
	b. On Site Waste Disposal System (Septic) Maintenance	<ul style="list-style-type: none"> <li>Maintenance/servicing contract currently required for system owners on record.</li> <li>Orders issued to confirm failing system owners.</li> <li>Include all property/septic system owners in WHPA in notification database.</li> <li>Conduct Public Education.</li> </ul>		1. 2011, then annually  2. 2011  3. Every 3 years	1. <b>Madison Water Utility</b> request that Public Health Madison and Dane County Health Services provide information to owners of private sewage disposal systems about sewage system maintenance, and the types of waste that should not be disposed of in a septic system.  2. <b>Madison Water Utility</b> prepare an article for newspaper release about septic system dos and don'ts.  3. <b>Public Health Madison and Dane County Environmental Health Services</b> ensure that system maintenance and pumping are performed.

TABLE 5-1 (cont.)

Program Category	Activity	Description	Responsible Unit(s) of Government	Implementation Schedule	
				Date	Action Item
1. Existing Programs (cont.)	c. Well Construction and Abandonment	<ul style="list-style-type: none"> <li>• Dane County review applications and require construction permits for new private water supply wells.</li> <li>• Enforce well abandonment ordinance(s) (Dane County Chapter 45, and City of Madison General Ordinance Sec. 13.21) and review new well construction.</li> <li>• Madison Water Utility review applications for private well operation permits.</li> <li>• City of Madison require proper abandonment of unused and unsafe wells.</li> <li>• Update well inventory in WHPA.</li> <li>• Familiarize with WI Admin. Codes, Chapters NR 141, 811, and 812.</li> </ul>	<ul style="list-style-type: none"> <li>• Wisconsin DNR</li> <li>• Public Health Madison &amp; Dane County Environmental Health Services</li> <li>• City of Madison</li> <li>• Madison Water Utility</li> </ul>	1. Ongoing  2. Ongoing  3. 2011, then annually  4. Ongoing  5. Every 5 years in conjunction with well permits  6. Ongoing  7. Ongoing  8. 2011  9. Ongoing  10. 2011	1. <b>Dane County Environmental Health Division</b> continue to review well applications and require construction permits for new private water supply wells.  2. <b>Madison Water Utility</b> continue to review applications for private wells operation permits.  3. <b>Madison Water Utility</b> request that Public Health Madison & Dane County Environmental Health Services provide the names and addresses of owners of private wells located in the Unit Well 23 WHPA.  4. <b>Madison Water Utility</b> determine the location of other private water supply wells that may be located within the WHPA and which are not recorded in the County database.  5. <b>Madison Water Utility</b> send private well owners within the WHPA, DNR pamphlets about well upkeep and proper abandonment procedures in the event the owners abandon their existing wells.  6. <b>Madison Water Utility</b> update the private well inventory for wells located in the WHPA.  7. <b>City of Madison and Dane County</b> enforce existing well abandonment ordinances, to ensure that all private wells are permitted, or properly abandoned if unused.  8. <b>Madison Water Utility</b> request that Dane County consider proximity and depth of proposed private wells relative to Unit Well 23 prior to issuing permits for construction of new private water supply wells.  9. <b>Madison Water Utility</b> direct residents to the DNR private well code (Chapter NR 812) or to the Wisconsin DNR private well section (608) 266-0821 when questions arise about private water supply wells.  10. <b>Madison Water Utility</b> provide information in the annual Consumer Confidence Report (CCR) about proper abandonment of unused wells.

TABLE 5-1 (cont.)

Program Category	Activity	Description	Responsible Unit(s) of Government	Implementation Schedule	
				Date	Action Item
1. Existing Programs (cont.)	d. Land Application of Sludge and Septage	<ul style="list-style-type: none"> <li>Enforce existing rules.</li> </ul>	<ul style="list-style-type: none"> <li>Wisconsin DNR</li> <li>Dane County</li> <li>Madison Metropolitan Sewerage District (MMSD)</li> </ul>	1. 2011	1. <b>Madison Water Utility</b> provide a copy of the WHPA and ultimate recharge area maps to the MMSD and request that sludge not be spread in the Unit Well 23 ultimate recharge area.
				2. 2011	2. <b>Madison Water Utility</b> provide a copy of the WHPA and ultimate recharge area maps to the DNR Watershed Management Office (608-267-7694 (central office) 608-275-3325 (Fitchburg office)) and request that new permits for sludge and septage spreading not be issued for properties located in the Unit Well 23 recharge area equivalent to the 100-year TOT capture zone.
				3. Ongoing	3. <b>Madison Water Utility</b> encourage development of additional authorized septage discharge points in the City of Madison wastewater treatment system.
				4. Ongoing	4. DNR enforce rules, particularly in WHPAs.
				5. 2011	5. <b>Dane County</b> develop regulatory program including ordinance.
	e. Spill Notification and Awareness of Remedial Investigation and Cleanup	<ul style="list-style-type: none"> <li>Monitor and keep informed of potential contamination sources in the WHPA and recharge areas.</li> <li>Work with DNR to achieve investigation and cleanup of known contamination sources.</li> </ul>	<ul style="list-style-type: none"> <li>Wisconsin DNR</li> <li>Dane County Emergency Management</li> <li>Wisconsin DATCP and COMM</li> <li>City of Madison Fire Department</li> </ul>	1. 2011	1. <b>Madison Water Utility</b> request that DNR, City Police, and the Dane County Emergency Management Office inform the City about future events (spills, leaks, investigations, etc.) that occur in the Unit Well 23 WHPA or in upgradient recharge areas.
				2. 2011, then ongoing	2. <b>Madison Water Utility</b> monitor the status of existing and potential contamination sources in the WHPA, investigations regarding nature and extent of releases, and the status of cleanup activities, then determine if Utility action is needed.
				3. 2011	3. <b>Madison Water Utility</b> provide WHPA map to DNR and request that contaminated sites located in the Unit Well 23 WHPA be carefully reviewed before being granted closure.
	a. Existing Zoning/Wellhead Protection Overlay Zoning and Ordinance	<ul style="list-style-type: none"> <li>Enforce existing zoning.</li> <li>Discourage conditional uses or zoning changes that increase risk to groundwater.</li> </ul>	<ul style="list-style-type: none"> <li>City of Madison</li> <li>Dane County Planning and Development</li> </ul>	1. April 2011 2. 2011 3. 2011	1. <b>City of Madison</b> amend WHP ordinance and add WP-23 Wellhead Protection District No. 23. 2. <b>City of Madison</b> provide Dane County with a copy of the WHP ordinance and WHPA map. 3. <b>Dane County</b> consider developing WHP Overlay District ordinance.

TABLE 5-1 (cont.)

Program Category	Activity	Description	Responsible Unit(s) of Government	Implementation Schedule	
				Date	Action Item
3. Intergovernmental Cooperation	a. Land Use Planning and Site Plan Review	<ul style="list-style-type: none"> <li>• Cooperate in land use planning to protect groundwater resources and WHPAs.</li> <li>• Keep appraised of development in WHPA.</li> <li>• Ensure development complies with separation distances between the well and potential contamination sources as required by WI Admin. Code, Chapter NR 811.12.</li> </ul>	<ul style="list-style-type: none"> <li>• City of Madison Planning and Development Department</li> <li>• Dane County Planning and Development Department</li> <li>• Town of Blooming Grove</li> </ul>	1. 2011	<p>1. <b>City of Madison</b> provide Dane County, and the Town of Blooming Grove with a copy of:</p> <ol style="list-style-type: none"> <li>The WHPP and maps showing the Unit Well 23 WHPA and ZOCs.</li> <li>A summary of separation distances required between municipal water supply wells and potential contamination sources (Wisconsin Administrative Code, Chapter NR 811.12(5)(d)).</li> <li>A list of potential contamination sources that can threaten groundwater.</li> <li>A list of high risk land uses that should be prohibited from WHPAs.</li> </ol>
				2. 2011 – Ongoing	2. <b>City of Madison Planning and Development Department</b> ensure that development complies with separation distances required between municipal water supply wells and potential contamination sources.
				3. 2011 – Ongoing	3. <b>City of Madison</b> encourage the Town of Blooming Grove, and Dane County Boards to help protect the Unit Well 23 recharge area when evaluating proposed development.
				4. 2011	4. <b>City of Madison Planning and Development Department</b> will use an Environmental Permits Checklist for site plan review. The checklist will help ensure compliance with local, County, and State permits and will raise awareness about groundwater protection.
				5. 2011 – Ongoing	5. <b>City of Madison Planning and Development Department</b> provide a copy of the WHPA map and Site Plan Review Environmental Permits Checklist to developers and property owners and require that the developer indicate on the environmental permits checklist and hazardous substances reporting form whether the proposed development is in a WHPA.
4. Monitoring	a. Contaminant Source Inventory (CSI) Maintenance	<ul style="list-style-type: none"> <li>• Update CSI and conduct windshield survey</li> </ul>	<ul style="list-style-type: none"> <li>• Madison Water Utility</li> </ul>	1. November 2010, then every 5 years (November 2015)	<p>1. <b>Madison Water Utility</b> update the CSI by conducting a windshield survey of properties located in the WHPA and by performing State and Federal database checks.</p>
	b. Water Quality Monitoring	<ul style="list-style-type: none"> <li>• Conduct sampling of supply wells.</li> </ul>	<ul style="list-style-type: none"> <li>• Madison Water Utility</li> </ul>	<p>1. As required – Ongoing</p> <p>2. Ongoing</p>	<p>1. <b>Madison Water Utility</b> perform water quality monitoring as required by DNR and as otherwise needed.</p> <p>2. <b>Madison Water Utility</b> continue to post water quality data online at (<a href="http://www.madisonwater.org">http://www.madisonwater.org</a> or <a href="http://www.cityofmadison.com/water/">http://www.cityofmadison.com/water/</a>) for public review</p>

TABLE 5-1 (cont.)

Program Category	Activity	Description	Responsible Unit(s) of Government	Implementation Schedule	
				Date	Action Item
5. Public Education and Awareness	a. Availability of WHPP	<ul style="list-style-type: none"> <li>Provide copies to Water Utility Office, Public Library, City Hall, Town of Blooming Grove, and Dane County.</li> </ul>	<ul style="list-style-type: none"> <li>City of Madison</li> </ul>	1. 2011  2. 2011  3. 2011	1. <b>City of Madison</b> provide copies of the WHPP for review by the public at the Water Utility Office, Madison Public Library, and City Hall.  2. <b>City of Madison</b> provide a copy of the WHPP to the Town of Blooming Grove, and Dane County.  3. <b>Madison Water Utility</b> communicate the availability of the plan through a newspaper article.
	b. Public Informational Meeting	<ul style="list-style-type: none"> <li>Perform as part of a City Committee meeting or Common Council Meeting.</li> </ul>	<ul style="list-style-type: none"> <li>City of Madison</li> </ul>	1. 2011  2. 2011	1. <b>City of Madison</b> conduct a public informational meeting as part of a City committee meeting or the Common Council meeting during the review phase of the WHPP.  2. <b>City of Madison</b> provide WHPA maps for public review and an information sheet or brochure available for public use.
	c. News Releases	<ul style="list-style-type: none"> <li>Issue early in program implementation, and reinforce annually, as necessary.</li> </ul>	<ul style="list-style-type: none"> <li>City of Madison</li> </ul>	1. 2011, then annually	1. <b>Madison Water Utility</b> will provide a news release to the local newspaper about the WHPP for Unit Well 23.
	d. Informational Materials Distributed To Residents in WHPA	<ul style="list-style-type: none"> <li>Hazardous Waste Collection (Clean Sweep) Program</li> <li>Materials describing proper use and application of fertilizers and pesticides.</li> </ul>	<ul style="list-style-type: none"> <li>City of Madison</li> <li>Wisconsin DNR</li> <li>University Extension Office</li> </ul>	1. 2011, then ongoing  2. 2011	1. <b>Madison Water Utility</b> prepare informational materials and/or obtain from the Wisconsin DNR Bureau of Drinking Water and Groundwater, Dane County or UW Extension fliers, brochures and pamphlets, including: <ul style="list-style-type: none"> <li>a. Information about hazardous waste collection/disposal program (Clean Sweep) activities.</li> <li>b. Materials describing the proper use and application of lawn fertilizers and pesticides.</li> <li>c. Wellhead protection planning</li> <li>d. Annual Consumer Confidence Report (CCR) containing information about WHP planning.</li> </ul> 2. <b>Madison Water Utility</b> update information in website ( <a href="http://www.madisonwater.org">http://www.madisonwater.org</a> or <a href="http://www.cityofmadison.com/water/">http://www.cityofmadison.com/water/</a> ) about WHP planning.

TABLE 5-1 (cont.)

Program Category	Activity	Description	Responsible Unit(s) of Government	Implementation Schedule	
				Date	Action Item
5. Public Education and Awareness (cont.)	e. Land Use and Contaminant Source Awareness	<ul style="list-style-type: none"> <li>• Notify and offer guidance to owners of potential high risk land uses in WHPA.</li> </ul>	<ul style="list-style-type: none"> <li>• City of Madison</li> </ul>	1. 2011	<p>1. <b>Madison Water Utility</b> provide information to owners of property with existing or potential contamination sources located within the WHPA to emphasize the importance of awareness of the WHPA, the owner's location with respect to the WHPA, and potential contamination source(s) of concern. Specific information to be provided includes:</p> <ul style="list-style-type: none"> <li>a. Leaking USTs and ASTs.</li> <li>b. Upgrading existing ASTs and USTs systems.</li> <li>c. Materials describing the proper use and application of lawn fertilizers and pesticides.</li> </ul>
	f. School Programs	<ul style="list-style-type: none"> <li>• Participate in school programs.</li> </ul>	<ul style="list-style-type: none"> <li>• City of Madison</li> <li>• University Extension Office</li> <li>• Madison Public Schools</li> </ul>	1. 2011 2. 2011	<p>1. <b>Madison Water Utility</b> inform schools about the availability of tours at water supply facilities.</p> <p>2. <b>Madison Water Utility</b> prepare a water/groundwater fact sheet for school education.</p>

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primarily provided by a percentage of tipping fees collected at local landfills. Additional information about the Clean Sweep Collection Program is in Appendix L.

The Clean Sweep Collection Program will be coupled with the City of Madison's WHP planning efforts. The following will be completed for this management activity:

1. Madison Water Utility will send information about the Clean Sweep Collection Program to property owners in the WHPA, to encourage participation in the program.

#### **5.1.1.2 On-Site Waste Disposal System Maintenance**

The nearest private sewage disposal systems in the Unit Well 23 recharge area are located approximately 1.5 to 2 miles east of Unit Well 23 and are located well beyond the 100-year TOT ZOC for Unit Well 23. The sewage disposal systems are low risk to Unit Well 23. However, nutrient loading to groundwater is a regional concern, and it is prudent to be proactive regarding management of private sewage disposal systems.

The Public Health Madison and Dane County has an existing program for the inventorying and servicing of private on-site waste disposal (septic) systems located in Dane County. Data for private waste disposal systems are recorded in a central database. All owners of septic systems are required every three years to have their septic tanks pumped and inspected and any required maintenance performed. The Public Health Madison and Dane County charges the owners of septic systems an annual fee of \$8.67 per system, to support the Public Health inventory program. The purpose of the inventory is to ensure that private systems are maintained and operating correctly, so that they do not endanger the groundwater resources (Public Health Madison, 2010).

The Public Health Madison and Dane County Environmental Health Services investigates complaints about non-complying sewage disposal systems and issues replacement orders to owners of failing systems.

For this management activity, the City will perform the following:

1. Request that Public Health Madison and Dane County provide information to owners of private sewage disposal systems located in Dane County, about sewage system maintenance, and the types of waste that should not be disposed of in a septic system.
2. Prepare an article for the newspaper about private sewage disposal systems do's and don'ts.

#### **5.1.1.3 Well Construction and Abandonment**

The proposed activities under this category for WHP include public education and private well inventory maintenance. Education will improve awareness on the part of private well owners of the importance of proper well construction and abandonment (filling and sealing) of unused wells.

The City of Madison (General Ordinance Section 13.21) and Dane County (Chapter 45) have well abandonment ordinances for non-complying, unsafe, and unused wells. A copy of the

City of Madison Well Abandonment Ordinance and the Dane County ordinance "Relating to Private Water Systems" are in Appendix M. Other information about private wells and well abandonment is in Appendix N. As of June 1, 2008, only licensed well drillers and pump installers can fill and seal wells in Wisconsin (Wisconsin DNR, 2010).

Dane County and the Wisconsin DNR have regulatory authority for proper construction and abandonment of unused wells (Wisconsin Administrative Code, Chapters NR 811 and 812). A DNR notification number is required prior to well construction. Dane County also requires a permit prior to construction. After a well is constructed, Public Health Madison and Dane County sanitarians inspect the well.

Madison General Ordinance Section 13.21 requires an owner of a private well located in the City of Madison, or on premises served by the Madison Water Utility to abandon the private well, or obtain a well operation permit from the Madison Water Utility. Madison Water Utility oversees (witnesses) the abandonment of unsafe, unused, or non-complying wells that are located in the City. Dane County oversees the abandonment of unsafe, unused, or non-complying wells that are located in the County. The Public Health Madison and Dane County Environmental Health Division administers a county reimbursement program for abandoning these categories of wells. The City of Madison offers partial reimbursement of the cost (up to fifty percent of the cost, up to \$1,000) to abandon a private domestic well.

The following will be completed for this management activity:

1. Dane County Environmental Health Division will continue to review well applications and require construction permits for new private water supply wells.
2. Madison Water Utility will continue to review applications for private wells operation permits.
3. Madison Water Utility will request that the Dane County Environmental Health Division provide the names and addresses of owners of private wells located in the Unit Well 20 WHPA.
4. Madison Water Utility will determine the location of other private water supply wells that may be located within the WHPA and which are not recorded in the County database.
5. Madison Water Utility will send information to property owners located within the Unit Well 20 WHPA, about proper abandonment procedures in the event the property owners have an unused well on their property.
6. Madison Water Utility will update the private well inventory for wells located in the WHPA.
7. The City of Madison and Dane County will enforce the existing City and Dane County well abandonment ordinances, to ensure that all private wells are permitted or properly abandoned if unused.

8. Madison Water Utility will request that Dane County consider proximity and depth of proposed private wells relative to Unit Well 20 prior to issuing permits for construction of new private water supply wells.
9. Madison Water Utility will direct residents to the DNR private well code (Chapter NR 812) or to the Wisconsin DNR private well section (Bureau of Drinking Water and Groundwater) (608) 266-0821 when questions arise about private water supply wells.
10. Madison Water Utility will provide information in the annual Consumer Confidence Report (CCR) about proper abandonment of unused wells.

#### **5.1.1.4 Land Application of Sludge and Septage**

There are no permitted septage application sites located within the Unit Well 23 ZOCs. The Wisconsin DNR issues permits for septage and sludge disposal sites in Wisconsin. Current sludge and septage application sites are low risk to Unit Well 23. The Unit Well 23 100-year TOT ZOC is located entirely within the City of Madison, and land uses within the 100-year TOT ZOC are not compatible with sludge or septage spreading. However, nutrient loading to groundwater is a regional concern, and it is prudent to be proactive regarding management of sludge and septage disposal.

The following will be completed for this management activity:

1. Madison Water Utility will provide a copy of the WHPA and ultimate recharge area maps to the MMSD and request that sludge and septage not be spread in the Unit Well 23 ultimate recharge area.
2. Madison Water Utility will provide a copy of the WHPA and recharge area maps to the DNR Watershed Management office ((608) 267-7694 (central office) (608) 275-3325 (Fitchburg office)) and request that new permits for sludge and septage spreading not be issued for properties located in the Unit Well 23 ultimate recharge area.
3. Madison Water Utility will encourage development of additional authorized septage discharge points in the City of Madison wastewater treatment system.

#### **5.1.1.5 Spill Notification and Awareness of Remedial Investigation and Cleanup**

There are two closed LUST sites, one associated closed ERP site, two spill and leak sites, two sites with in-use ASTs, and one site with an in-use UST within the Unit Well 23 WHPA. Both LUST sites were conditionally closed with residual contamination remaining at the sites. The following will be completed for this management activity:

1. Madison Water Utility will request that the City Police, DNR, and the Dane County Emergency Management Office inform the Utility about future events (spills, leaks, investigations, etc.) that occur in the Unit Well 23 WHPA or in upgradient recharge areas.

2. Madison Water Utility will monitor the status of existing and potential contamination sources in the WHPA and upgradient recharge areas, investigations regarding nature and extent of releases, and the status of cleanup activities.
3. Madison Water Utility will provide the DNR a map showing the location of Unit Well 23 WHPA and request that contaminated site(s) located in the Unit Well 23 WHPA be carefully reviewed before being granted closure.

### **5.1.2 Category 2 - Land Use Controls**

#### **5.1.2.1 Existing Zoning/Wellhead Protection Overlay Zoning and Ordinance**

The City of Madison and Dane County have land subdivision and zoning ordinances to control and direct development. Land subdivision and zoning ordinances are used to safeguard flood plains, wetlands, shore lands, highway access, air quality, surface water, and other concerns. Existing zoning regulations will be enforced to help protect municipal well recharge areas and groundwater.

The City of Madison has a WHP ordinance. The ordinance prohibits incompatible development with the establishment of an overlay district for the 5-year TOT ZOC (Zone A) and the 1,200-foot radius ZOC (Zone B). The WHP ordinance helps ensure that future potential contamination sources are not located in the Unit Well 23 WHPA. A copy of the WHP ordinance is in Appendix O.

The following will be completed for this management activity:

1. The City of Madison will amend Section 28.06 of the Madison General Ordinances and add Wellhead Protection District No. 23.
2. The City of Madison will provide Dane County with a copy of the WHP ordinance and Unit Well 23 WHPA map.

### **5.1.3 Category 3 - Intergovernmental Cooperation**

#### **5.1.3.1 Land Use Planning and Site Plan Review**

Land use planning is performed to control and direct development. Land use planning and site plan review should also be used to help protect WHPAs. The following will be completed for this management activity:

1. The City of Madison will provide Dane County and the Town of Blooming Grove with a copy of:
  - a. The WHPP and maps showing the Unit Well 23 WHPA and ZOCs.
  - b. A summary of separation distances required between municipal water supply wells and potential contamination sources (Wisconsin Administrative Code, Chapter NR 811.16(4)(d)).

- c. A list of potential contamination sources that can threaten groundwater.
  - d. A list of high-risk land uses that should be prohibited from WHPAs.
2. The City of Madison Planning and Development Department will ensure that development complies with separation distances required between municipal water supply wells and potential contamination sources (Wisconsin Administrative Code, Chapter NR 811.12(5)(d)).
  3. The City of Madison Planning and Development Department will use an Environmental Permits Checklist for site plan review for proposed development in the Unit Well 23 recharge area. The checklist will help ensure compliance with local, county, and state permits; and will raise awareness about groundwater protection.
  4. The City of Madison Planning and Development Department will provide a copy of the WHPA map and Site Plan Review Environmental Permits Checklist to developers and property owners and require that the developer indicate on the environmental permits checklist and hazardous substances reporting form whether the proposed development is in a WHPA.

#### **5.1.4 Category 4 - Monitoring**

##### **5.1.4.1 CSI Maintenance**

As part of this study, a CSI was conducted within the delineated WHPA and ZOCs. It will be important to maintain current knowledge of land use, potential contamination sources, and development within the WHPA. The following will be completed for this management activity:

1. Madison Water Utility will update the CSI by conducting a windshield survey of properties located in the WHPA and by performing state and federal database checks on an interval of once every five years.

##### **5.1.4.2 Water Quality Monitoring**

Currently, each of the City of Madison's supply wells are tested annually, some are tested more often depending on the analytes and the detected level. VOCs are tested annually and quarterly for several wells. SOCs are tested every three years. Inorganic testing is done at a minimum of every three years. Microbiological testing, total coliform bacteria, are tested for weekly. Results are summarized and reviewed for conformance with regulatory drinking water standards, for comparison with current water quality results, and to identify any potential trends in contaminant concentrations.

City of Madison property owners and residents can go to the Madison Water Utility's website at [www.madisonwater.org](http://www.madisonwater.org) or <http://www.cityofmadison.com/water/> and look up the wells that serve their address, and can review the water quality data for the previous year for the well(s) of interest.

The following will be completed for this management activity:

1. Madison Water Utility will perform water quality monitoring as required by DNR and as otherwise needed.
2. Madison Water Utility will continue to post water quality data online for public review.

### **5.1.5 Category 5 - Public Education and Awareness**

The City of Madison will implement an education program to inform area residents of the need to protect the public water supply. Education is the best way to help people understand that human activities on the land and in the atmosphere influence the water cycle and affect the quality of our groundwater and surface water resources. The public education program will consist of the following:

1. Make available copies of the WHPP
2. Public Informational Meeting
3. News releases
4. Make available and distribute information materials
5. Land Use and Contaminant Source Awareness
6. School programs

#### **5.1.5.1 Availability of WHPP**

The following will be completed for this management activity:

1. The City of Madison will provide copies of the WHPP for review by the public at the Water Utility Office, Madison Public Library, and City Hall.
2. The City of Madison will provide a copy of the WHPP to the Town of Blooming Grove and to Dane County.
3. Madison Water Utility will communicate the availability of the plan through a newspaper article.

#### **5.1.5.2 Public Informational Meeting**

The purpose of a public informational meeting will be to inform residents of the WHPP, and provide an opportunity for public education and awareness.

The following will be completed for this management activity:

1. The City of Madison will conduct a public informational meeting as part of a City committee meeting or the Common Council meeting during the review phase of the WHPP.
2. The City of Madison will provide WHPA maps available for public review and an information sheet or brochure available for public use.

### **5.1.5.3 News Releases**

The purposes of news releases are to elevate public awareness, educate the public on the need for WHP, and provide examples of prudent WHP measures. Initially, a news release will inform the public that a WHPP has been developed for Unit Well 23 and will indicate the locations where the WHPP will be available for review.

The following will be completed for this management activity:

1. Madison Water Utility will provide a news release to the local newspaper, at the beginning of the WHP project for Unit Well 23, then annually.

### **5.1.5.4 Informational Materials Distributed to Residents in WHPA**

Informational materials will be prepared and distributed to residents living within the WHPA to educate and inform property owners about various topics such as WHP planning activities, and best waste management procedures.

The following will be completed for this management activity:

1. Madison Water Utility will prepare informational materials and/or obtain from the Wisconsin DNR Bureau of Drinking Water and Groundwater, Dane County or University of Wisconsin Extension fliers, brochures, and pamphlets, including:
  - a. Information about hazardous waste collection/disposal program (Clean Sweep) activities
  - b. Materials describing the proper use and application of lawn fertilizers and pesticides
  - c. WHP planning
  - d. Annual Consumer Confidence Report (CCR) containing information about WHP planning
2. Madison Water Utility will add WHP planning information to their website homepage (<http://www.madisonwater.org> or <http://www.cityofmadison.com/water/>).

### **5.1.5.5 Land Use and Contaminant Source Awareness**

During the CSI, properties were identified with land uses and existing or potential contaminant sources that pose, or may pose, a threat to groundwater. To increase awareness and minimize risk to groundwater and Unit Well 23, it is important to inform property owners about existing and potential contaminant sources on their properties. An initial mailing will be made at the beginning of the WHP program. In this mailing, property owners will be advised to contact the City if they have questions, or require additional information.

The following will be completed for this management activity:

1. Madison Water Utility will provide information to owners of property with existing or potential contaminant sources located within the WHPA to emphasize the importance of awareness of the WHPA, the owner's location with respect to the WHPA, and potential contaminant source(s) of concern. Specific information to be provided includes:
  - a. Leaking underground and aboveground storage tanks
  - b. Upgrading existing ASTs and USTs systems
  - c. Materials describing the proper use and application of lawn fertilizers and pesticides

#### **5.1.5.6 School Programs**

The City of Madison will participate in school education programs. The following will be completed for this management activity:

1. Madison Water Utility will inform schools about the availability of tours at water supply facilities. During tours, students will be exposed to important concepts related to groundwater and WHP.
2. Madison Water Utility will prepare a water/groundwater fact sheet for school education programs.

### **5.2 WATER CONSERVATION PROGRAM**

The Madison Water Utility has an existing water conservation program that includes addressing the needs for both water accountability in the distribution system, and water conservation by the public. The 2008 Water Conservation Plan (Appendix P) provides further details on the conservation plans developed.

During 2009, the Utility maintained water accountability in the distribution system of 89 percent. The Utility maintains this high level of water accountability by regularly servicing water meters, reviewing water accountability records, and conducting water leak detection surveys when needed.

The Utility currently has brochures available free to the public describing useful water conservation measures. The brochures are also distributed to the public and discussed in speaking engagements with local organizations and schools by Water Utility staff.

The Madison Water Utility also has information about water conservation at its website (<http://www.madisonwater.org> or <http://www.cityofmadison.com/water/>). Water conservation information is in Appendix Q.

The Utility has the authority to impose water use restrictions when necessary.

### 5.3 CONTINGENCY PLAN

The Utility has formulated a contingency plan for providing water in the event that Unit Well 23 or one or more of the City's other water supply wells became contaminated or removed from service. The plan primarily relies on the capacity of the system without the capacity of any given well or wells to meet the supply needs of the City of Madison.

The City's water system was designed to supply the maximum water demand for an indefinite period with the largest well out of service. As a result, if Unit Well 23, or any other supply well of the water system, is out of service for a short period of time, the reliable water supply capacity is sufficient to meet demands. Unit Well 23 provides reliable supply to the water system and fire protection for the eastern part of the City, specifically the Pressure Zone 6 neighborhoods. In the event of the loss of Unit Well 23, Unit Wells 11, and 29 in Pressure Zone 6 or Unit Well 9 in Pressure Zone 4 can serve the area.

Additionally, the City's wells and wellfields are widely spaced and generally have different recharge areas, thereby making them less vulnerable to potential localized contamination. In the event of a power failure, several of Madison's supply well pumping stations are equipped with standby generators or power plugs for connecting portable generators.

The contingency plan also relies on communication with first responders and a plan of action in the event of a water system emergency. Dane County Emergency Management Office will be requested to notify the Water Utility if there is an occurrence in the vicinity of the Unit Well 23 WHPA. As well, the Wisconsin Contingency Plan for Hazardous Substance Discharges specifically includes protection of potable water system within the plan immediately following prevention of human injury (DNR 1998).

A list of emergency contact numbers was compiled to provide Utility staff immediate access to the appropriate agencies in the event of an emergency. This list is provided in Table 5-2.

### 5.4 MANAGEMENT PLAN

A management plan was formulated to help protect the Unit Well 23 WHPA from existing and potential future sources of contamination. Table 5-1 summarizes major elements of the management plan.

Public education is an important element in the management plan. Educational activities will provide a mutual benefit to the City of Madison and other property owners located in far upgradient parts of the Unit Well 23 recharge area.

The hazardous waste collection/disposal program (Clean Sweep) is also an important part of the management plan. The program provides a means for residents and businesses in the WHPA and throughout the area to properly dispose of hazardous chemicals. Residents and producers of agricultural crops and commodities can dispose of hazardous materials and wastes free of charge. Small quantities of commercial wastes from small businesses can be disposed of for a nominal fee. The City will promote the Clean Sweep Programs using the public education activities summarized in this plan.

**TABLE 5-2**  
**EMERGENCY CONTACT NUMBERS**  
**WELLHEAD PROTECTION PLAN, UNIT WELL 23**  
**MADISON, WISCONSIN**

Emergency Contact	Name	Phone No.
Water Utility Emergency Service	On-call	Office: 608-266-4665
Water Utility Manager	Tom Heikkinen	Office: 608-266-4651
Principal Engineer	Alan Larson	Office: 608-266-4653
Civil Engineer	Dennis Cawley	Office: 608-261-9243
Police Department	Emergency Dispatch Non-Emergency Dispatch	911 608-255-2345
Fire Department	Emergency Dispatch Administration	911 608-266-4420
Dane County Emergency Response	On-Call	911
Dane County Emergency Management Office	Hazardous Materials Planning Office (General)	608-266-4330
Dane County Environmental Health	Office	608-242-6515
Local – DNR Water Supply Contact Person	Tom Stunkard Fitchburg	608-275-3300
Central Office – DNR Water Supply	Norman Hahn Madison	608-267-7661
Well Driller	Municipal Well & Pump Tracy Greenfield	Office: 920-324-3400 Cellular: 262-424-2328
Well Driller	Layne Northwest Jeff Gibson	Office: 262-246-4646 After Hours: 262-246-4646
Pump Installer	Municipal Well & Pump Tracy Greenfield	Office: 920-324-3400 Cellular: 262-424-2328
Pump Installer	Layne Northwest Jeff Gibson	Office: 262-246-4646 After Hours: 262-246-4646
Town of Blooming Grove Clerk/Treasurer/Administrator	Mike Wolf	608-223-1104
State Patrol	Emergency Administration	911 608-266-3212
Hazardous Material Response Team Wisconsin Division of Emergency Mgt.	DNR - Leroy Conner	1-800-943-0003 (Menu)
Electric Utility	Madison Gas & Electric Emergency Service	608-252-1111

Local governmental agencies (city, township, and county) recognize the need for planning to protect WHPAs. Intergovernmental cooperation is an important part of the plan as agencies work together to consider the needs for WHP during planning and permitting processes. The Madison Water Utility will provide the City of Madison Planning and Development Department a copy of the Unit Well 23 WHPA map and a list of potential contamination sources that can threaten groundwater. The Madison Planning and Development Department will ensure that future development complies with the separation distances required between municipal water supply wells and potential contamination sources (Wisconsin Administrative Code, Chapter NR 811.12(5)(d)). The City will encourage Dane County, and the Town of Blooming Grove boards to help protect the municipal water supply well's WHPAs and ultimate upgradient recharge areas when evaluating proposed development.

The City of Madison has a WHP ordinance and overlay zoning district. The WHP ordinance helps ensure that new potential contamination sources located within the City of Madison are not located in the Unit Well 23 WHPA.