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Wellhead Protection Plan
Unit Well 6
City of Madison, Wisconsin

City of Madison
Wisconsin

Prepared for:
Madison Water Utility
119 East Olin Avenue
Madison, WI 53713

Prepared by:
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November 20, 2007

Earth Tech Project No. 82359

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REFERENCES

Bradbury, K.R., 1998, Zones of Contribution for Municipal Wells in Dane County, Wisconsin, WGNHS-University of Wisconsin Extension, Madison, Wisconsin.

Bradbury, K.R., S.K. Swanson, J.T. Krohelski, and A.K. Fritz, 1999, Hydrogeology of Dane County, Wisconsin, WGNHS and USGS Open File Report 1999-04, Madison, Wisconsin.

Bradbury, K.R., November 2001, Personal Communication with Earth Tech regarding estimated aquifer parameters.

Clayton, L. and J.W. Attig, 1997, Pleistocene Geology of Dane County, Wisconsin, WGNHS Bulletin 95, Madison, Wisconsin.

Cline, D.R., 1965, Geology and Ground-Water Resources of Dane County, Wisconsin, USGS Water-Supply Paper 1779-U, Washington, D.C.

Cotter, R.D., R.D. Hutchinson, E.L. Skinner and D.A. Wentz, 1969, Water Resources of Wisconsin, Rock-Fox River Basin, Hydrologic Investigations Atlas HA-360, U.S. Geological Survey, Washington D.C.

DCRPC (Dane County Regional Planning Commission), 1999, Dane County Groundwater Protection Plan, (Appendix G of the Dane County Water Quality Plan), Madison, Wisconsin.

DCRPC (Dane County Regional Planning Commission), 1999, 2000, 2001, 2003 and 2004, Modeling and Management Program Reports. Published in association with the Dane County Regional Hydrologic Study, the Wisconsin Geological and Natural History Survey, and the United States Geological Survey, Madison, Wisconsin.

Earth Tech, Inc., December 1999, Water System Master Planning Study, Madison, Wisconsin.

Environmental Data Resources (EDR), Inc., March 2007, The EDR Radius Map Report, Unit Well 6, Inquiry No. 1868780.1s, Madison, Wisconsin.

Hole, F.D., 1968, Soils of Wisconsin Map. University Extension/WGNHS, 1:710,000, Madison, Wisconsin.

Krohelski, J.T., K.R. Bradbury, R.J. Hunt, and S.K. Swanson, 2000, Numerical Simulation of Groundwater Flow in Dane County, Wisconsin, WGNHS Bulletin 98, Madison, Wisconsin.

Madison Water Utility, 2007, Water Quality For Wells Serving Your Address, City of Madison Online [online], [Accessed 16 May 2007], Available from World Wide Web: <http://www.cityofmadison.com/water/>.

Madison Zoning Department, 2007, City of Madison Zoning Districts Map, 2006, Madison, Wisconsin.

McDonald, M.G. and A.W. Harbaugh, 1988, A Modular Three-Dimensional Finite Difference Ground-Water Flow Model: U.S. Geological Survey Techniques of Water-Resources Investigations 06-A1, 576 p.

Mickelson, D.M, L. Clayton, R.W. Baker, W.M. Mode, and A.F. Schneider, 1984, Pleistocene Stratigraphic Units of Wisconsin, WGNHS Miscellaneous Paper 84-1, Madison, Wisconsin.

Swanson, S.K., 1996, A Comparison of Two Methods Used to Estimate Groundwater Recharge in Dane County, Wisconsin, M.S. Thesis, University of Wisconsin-Madison.

USDA, 1978, Soil Survey of Dane County, Wisconsin, Madison, Wisconsin.

USEPA, 1993, Wellhead Protection: A Guide for Small Communities, EPA/625/R-93/002, Washington, D.C.

USEPA 2005, Office of Environmental Information: 42 USC 300h-7: Part C - Protection of Underground Sources of Drinking Water, State Programs to Establish Wellhead Protection Areas (Federal Law Subsection)[online], [accessed 25 February 2005], Available from World Wide Web: <http://oaspub.epa.gov/>.

USGS, 1959 (Photorevised 1969 and 1974), Madison East, Wisconsin, 7.5 Minute Quadrangle Topographic Map.

USGS, 1959 (Photorevised 1969 and 1974), Madison West, Wisconsin, 7.5 Minute Quadrangle Topographic Map.

Wisconsin Administrative Code, June, 2003, Chapter NR 811 - Requirements For the Operation and Design of Community Water Systems, Madison, Wisconsin.

Wisconsin Administrative Code, July, 2002, Chapter NR 812 - Well Construction and Pump Installation, Madison, Wisconsin.

Wisconsin Department of Natural Resources, Well Construction Reports, Madison, Wisconsin.

Zheng, C., 1991, PATH3D 3.0 A Ground-water Path and Travel-Time Simulator, S.S. Papadopulos and Associates.

EXECUTIVE SUMMARY

This report is a Wellhead Protection Plan (WHPP) for City of Madison Unit Well 6. The primary purposes of this WHPP are to define the wellhead protection area (WHPA) for Unit Well 6 and establish specific criteria for protection of Unit Well 6 and groundwater resources in the WHPA including management strategies 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 6 to conform to the requirements of the Wisconsin Administrative Code, Chapter NR 811, Section 16(5), for WHP planning.

Unit Well 6 is located at 2757 University Avenue in the west-central part of the City of Madison. Construction of Unit Well 6 was completed in 1938. Unit Well 6 is 750 feet deep, is open primarily to the lower bedrock (sandstone) aquifer, and has a design capacity of 2,400 gallons per minute (gpm).

Land use in the vicinity of Unit Well 6 is primarily residential and commercial.

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 6. ZOCs extend southwest of Unit Well 6 in the simulated upgradient groundwater flow direction.

Figure 3-5 shows the WHPA for Unit Well 6. 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 6. 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 6 area during April 2007. Known potential and existing contaminant sources and routes within the Unit Well 6 WHPA include sanitary and storm sewers; spill sites; active aboveground storage tank (AST) sites; active and closed underground storage tank (UST) sites; closed leaking underground storage tank (LUST) sites; gas stations; drycleaners; auto repair businesses; veterinary clinics; road salt use; 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 6 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 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 6.

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 6, or one or more of the City's other water supply wells, become contaminated or removed from service. In the event of the loss of Well 6, other wells in Zone 6, such as Wells 14, 19, and 27, or Wells in Zone 7 could be used to 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 6 WHPA.

DANE COUNTY

INDEX MAP

N

0' 7000' 14000'

SCALE

LAKEVIEW PRESSURE ZONE (5)

EAST PRESSURE ZONE (1)

MAIN PRESSURE ZONE (6)

GLACIER HEIGHTS PRESSURE ZONE (2)

RICHMOND HILLS PRESSURE ZONE (3)

ALLIS HEIGHTS RESERVOIR

SOUTHEAST PRESSURE ZONE (4)

UNIT WELL 6

PRESSURE ZONE (11)

NORTHWEST PRESSURE ZONE (8)

WEST PRESSURE ZONE (10)

SOUTHWEST PRESSURE ZONE (7)

SMITH PRESSURE ZONE (9)

LAKE MENDOTA

LAKE MONONA

LAKE WINGRA

LAKE WAUBESA

UNIVERSITY BAY

MONONA BAY

SQUAW BAY

UPPER MUD LAKE

YAHARA RIVER

SPRING CREEK

LEGEND

- 20 UNIT WELL NUMBER
- ● WELL
- ■ RESERVOIR
- ▲ ELEVATED STORAGE
- ⊙ BOOSTER PUMP STATION

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FIGURE 1-1

LOCATION OF UNIT WELL 6 & OTHER WATER SYSTEM FACILITIES

MADISON WATER UTILITY

MADISON, WISCONSIN

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1.0 INTRODUCTION AND BACKGROUND

1.1 INTRODUCTION

This report is a WHPP for City of Madison Unit Well 6. The primary purposes of this WHPP are to define the WHPA for Unit Well 6 and establish specific criteria for protection of Unit Well 6 and groundwater resources in the WHPA including management strategies 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 6 to conform to the requirements of the Wisconsin Administrative Code, Chapter NR 811, Section 16(5), 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 6.

3. Coordinate with the Dane County Community Analysis and Planning Division (CAPD) of the Department of Planning & Development to delineate 5-, 50- and 100-year TOT capture zones for Unit Well 6.

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 6.

5. Assist with the determination of a WHPA for Unit Well 6.

6. Assist with the development of WHP management strategies.

1.2 LOCATION AND BACKGROUND

Unit Well 6 is located at 2757 University Avenue in the west-central part of the City of Madison. The site is in the NE¼, NE¼ of the NW¼, of Section 21, Township 7 North, Range 9 East, Dane County, Wisconsin. Figure 1-1 shows the location of Unit Well 6 and other water system facilities in the City of Madison. A portion of the survey plat showing the well site property is in Appendix B. Construction of Unit Well 6 was completed in 1938.

The City water system serves approximately 218,000 people and consists of 24 active wells, 28 booster pumping facilities, 24 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 11 separate pressure zones. Unit Well 6 is located in the western part of Pressure Zone 6. Unit Well 6 is located approximately 1.7 miles east of Unit Well 14 and 0.85 mile south of Unit Well 19.

1.3 UNIT WELL 6

Unit Well 6 was constructed to a depth of 750 feet. The well is cased with 24-inch outside diameter (OD) steel casing grouted to a depth of 220.5 feet below ground. A 22-inch diameter open borehole extends from 220.5 feet to the bottom of the well. Sandstone bedrock was encountered at a depth of 45 feet. Shale was encountered over the interval of 225 to 260 feet. Rhyolite was encountered at a depth of 740 feet. Unit Well 6 was test pumped at a rate of 2,000 gpm and had a specific capacity of 17.25 gpm per foot of drawdown (gpm/ft). Well 6 was blasted (shot) to increase the specific capacity. The drilling log shows that after four shots, the specific capacity of Unit Well 6 increased to 22.3 gpm/ft. At the time of the original test pumping, the static (non-pumping) water level in Unit Well 6 was 27 feet below ground. In April 2007 the static water level was approximately 40 feet below ground. A construction report and formation log prepared by the Wisconsin Geological and Natural History Survey (WGNHS) is in Appendix C.

2.0 HYDROGEOLOGIC CONDITIONS

2.1 LAND USE, TOPOGRAPHY, AND DRAINAGE

Well 6 is located in a community mixed use district. Surrounding land use is City of Madison low and medium density residential, and Village of Shorewood Hills commercial and residential. Current zoning immediately around Unit Well 6 is Commercial (C2) and Residential (R1). A portion of the City of Madison zoning map for the Unit Well 6 area is in Appendix D. The southern boundary of the Village of Shorewood is located 250 feet north of Unit Well 6.

Unit Well 6 is located in a till covered area, between small drumlins, and is approximately 3,700 feet southwest of University Bay in Lake Mendota. The ground surface elevation at Unit Well 6 is approximately 880 feet above mean sea level (MSL). The relief within a ½-mile radius of Well 6 ranges from approximately 1,040 feet above MSL, on a hill located southwest of Well 6, to 849 feet above MSL at Lake Mendota. Locally, drainage from Unit Well 6 is eastward along University Avenue, then toward Lake Mendota.

2.2 GEOLOGY

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

Figure 2-1 is a geologic cross-section which extends west to east through Unit Wells 14, 6, and 27. A formation log for strata encountered at Unit Well 6 is in Appendix C. The stratigraphic sequence encountered in the wells is briefly described in the following sections.

2.2.1 Precambrian Basement Bedrock

Precambrian bedrock was encountered in water supply Unit Well 6 at a depth of 740 feet below ground surface. The Precambrian bedrock encountered in Unit Well 6 is rhyolite (WGNHS Well Logs DN-52 and BF506).

2.2.2 Cambrian Bedrock

Cambrian age rocks encountered in Unit Well 6 include, in ascending order, Mount Simon Formation, Eau Claire Formation, Wonewoc Formation, and the Tunnel City Group.

Cambrian age rocks are relatively flat, lying in the Madison area in the east-west direction and dip slightly to the south. The cross-section shows a gentle eastward slope of the Precambrian bedrock surface. The thickness of deep rock units appears to be relatively consistent in the Madison area, although there are textural and compositional changes, laterally. The occurrence and thickness of the upper Tunnel City Group bedrock varies, because it is the upper erosional surface. The Tunnel City Group strata were not encountered at Unit Well 27. Figure 2-1 shows the strata above the Tunnel City Group at Unit Well 6 consists of unlithified deposits. A gray to green-gray, dolomitic shale layer ranging from 5 to 25 feet thick is encountered in the upper part of the Eau Claire Formation and appears to be laterally extensive.

2.2.3 Unlithified Deposits

Bedrock is mantled by unlithified glacial till and alluvial deposits. Clayton and Attig (1997) classify the local near surface unlithified deposits in the immediate vicinity of Unit Well 6 as part of the Horicon Member of the Holy Hill Formation. Clayton and Attig (1997) report that the near surface formation at Unit Well 6 is uniform, subglacial till.

At Unit Well 6, the formation from the top of the sandstone bedrock (encountered at a depth of 45 feet) to 15 feet depth below the ground surface is described as yellow-gray sandy till (35 to 45 feet in depth), sandy gravel (30 to 35 feet), and yellow-brown to yellow-gray, sandy till, (15 to 30 feet in depth). Formation samples from 0 to 15 feet in depth were not described.

Soils in the immediate vicinity of Unit Well 6 are classified as the Virgil silt loam and the Batavia silt loam (Hole, 1968; United States Department of Agriculture (USDA), 1978). The Virgil silt loam has fair contaminant attenuation potential. The Batavia silt loam has good contaminant attenuation potential. The Dane County Regional Planning Commission (DCRPC) assigned a risk classification of moderate to extreme from surface activities within a 1-mile radius of Unit Well 6 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 and sand and gravel aquifer are often used for private domestic supplies, particularly in rural areas. Municipal and most 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. 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 480 feet thick in Unit Well 6. The hydraulic conductivity of the lower bedrock aquifer is approximately 10 feet per day (ft/day) (Krohelski et. al., 2000). Unit Well 6 is cased to a depth of 220.5 feet, which is 14.5 feet above the Eau Claire shale confining layer; therefore, Unit Well 6 is open to a small amount of the upper bedrock aquifer and all of the lower bedrock aquifer.

The grouted casing in Unit Well 6 terminates in the upper bedrock aquifer above the Eau Claire confining layer. Water levels measured in Unit Well 6 should be representative of the composite upper and lower bedrock aquifers. In April 2007, the static water level in Unit Well 6 was approximately 40 feet below ground level (approximately 840 feet MSL). Figure 4 in Appendix E shows the simulated potentiometric surface in the lower bedrock (Mount Simon) aquifer and shows the groundwater flow direction toward Unit Well 6 is from northwest, west, and southwest (DCRPC, 2004). Figure 4 shows the potentiometric surface elevation in the vicinity of Unit Well 6 at approximately 850 feet MSL. The storativity of the lower bedrock aquifer is

PSLtscale: Ltscale: 0.5 LayoutName: FIGURE2-1.WELLS-14-6-27.
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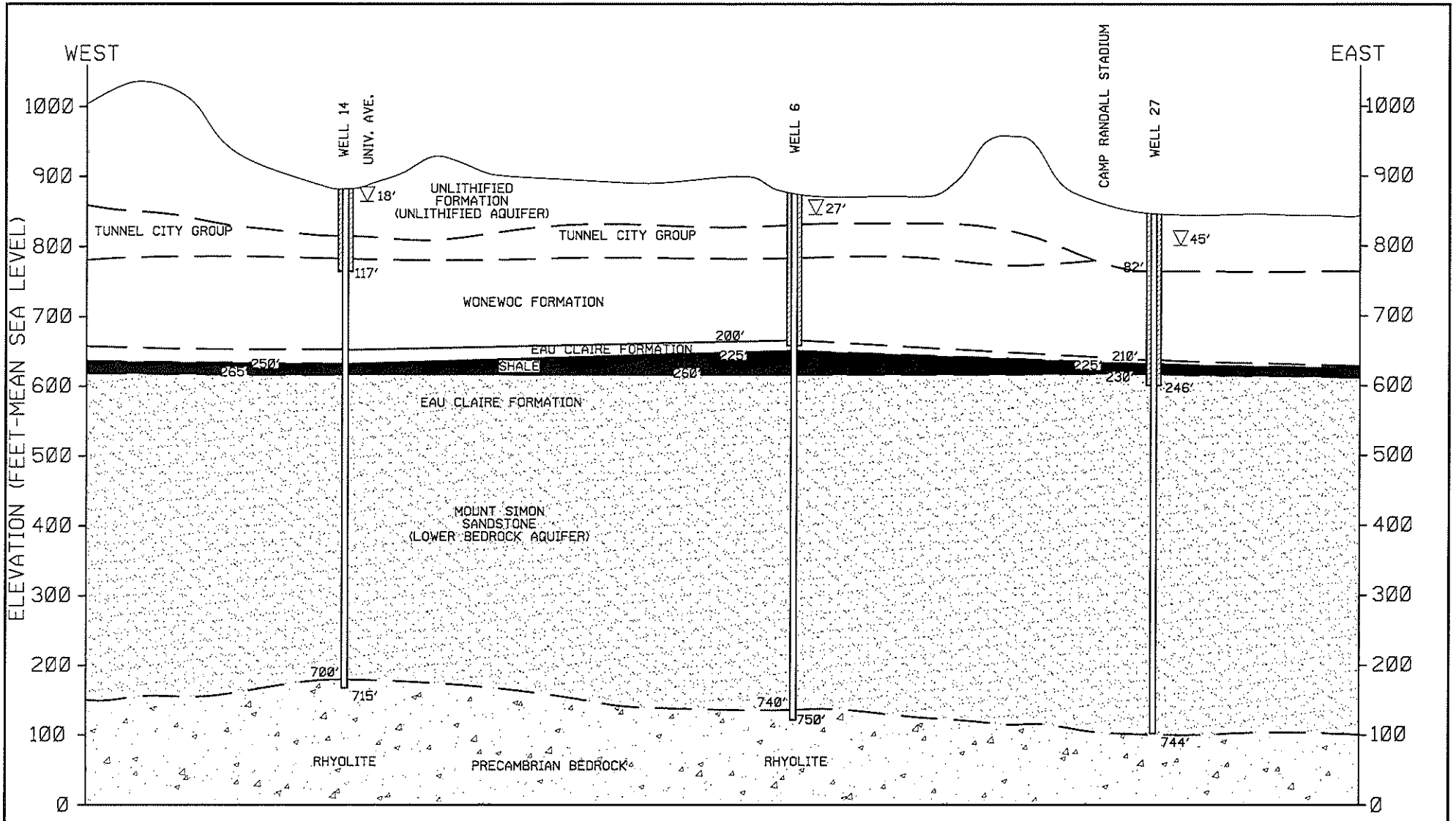

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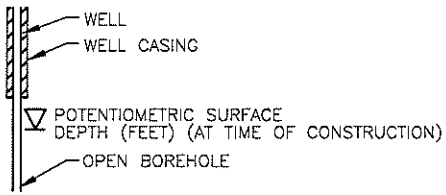

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FIGURE 2-1
GEOLOGIC CROSS-SECTION THROUGH MADISON UNIT WELLS 14, 6 & 27
MADISON, WISCONSIN

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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 and Tunnel City Group. Water occurs within fractures, along bedding planes, and between sand grains in the sandstone.

At Unit Well 6, the thickness of the bedrock formation above the shale confining layer is 190 feet, and the saturated thickness of the upper bedrock aquifer is also 190 feet. Figure 3 (DCRPC, 2004) in Appendix F shows the simulated potentiometric (water table) surface in the upper bedrock aquifer and unlithified (sand and gravel) aquifer. Figure 3 in Appendix F shows the elevation of the simulated water table surface in 2000 in the vicinity of Unit Well 6 was approximately 865 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 Sand and Gravel Aquifer

The sand and gravel aquifer occurs in the near surface sand and gravel deposits. The unlithified materials are 45 feet thick at Unit Well 6. At the time of construction, depth to the static water level in Well 6 was 27 feet. Where present, the hydraulic conductivity of the sand and gravel 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 sand and gravel 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 per 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. Map 7 in Appendix E shows the location of Well 6, and areas of recharge to and discharge from the lower bedrock (Mount Simon) aquifer (Bradbury et. al, 1999; DCRPC 1999). 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 6.

3.1 ZOI

The ZOI for Unit Well 6 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 6 to a radius where there is 1 foot of drawdown is approximately 9.6 miles. The estimated ZOI to a radius of zero drawdown is approximately 19.7 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 open borehole (minus the shale portion of the Eau Claire Formation), open to both the lower and upper bedrock aquifers, supplies water to Unit Well 6. 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
ne Dane County regional hydrologic study was
CRPC, and the United States Geological Survey
modeling code (MODFLOW (McDonald & Harbaugh,
ow. After the calibrated groundwater flow model
used to determine time-related ZOCs.

Date ?

60 miles and is divided into 144,000 nodes. Each
00 meters) on a side. The grid has 200 rows and

l was converted from a three-layer model to a
fer is Layer 1. The upper bedrock aquifer is
3, and the lower bedrock aquifer is Layer 4. The
ary conditions were modified (DCRPC, 2001). Other
e as previously described in Chapter 2 and in

Four groundwater flow simulations were performed for this study, by the Dane County CAPD, 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 6 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. 3 was performed using full design capacity. Full capacity for Unit Well 6 is 3.456 MGD. Pumping at a rate of 3.456 MGD is equivalent to pumping continuously at a rate of 2,400 gpm.

Simulation No. 4 was performed using the average pumping rate for Unit Well 6 for the maximum year during the past eight years (1999-2006). The maximum pumpage year for Unit Well 6 was 1999, when Unit Well 6 was pumped at an average rate of approximately 0.720 MGD. Pumping at a rate of 0.720 MGD is equivalent to pumping continuously at a rate of 500 gpm.

PATH3D (Zheng, 1991) was used to determine the time-related ZOCs for Unit Well 6. Particles were input in the model around Unit Well 6 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 6 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 6.

Figure 3-1 shows the 5-, 50-, and 100-year TOT ZOCs for Unit Well 6 based on the projected 2030 pumping rate (Simulation No. 1). Figure 3-2 shows the 5-, 50-, and 100-year TOT ZOCs for Unit Well 6 based on the one-half design capacity pumping rate (Simulation No. 2). Figure 3-3 shows the 5-, 50-, and 100-year TOT ZOCs for Unit Well 6 based on the full design capacity pumping rate (Simulation No. 3). Figure 3-4 shows the 5-, 50-, and 100-year TOT ZOCs for Unit Well 6 based on the average pumping rate for Unit Well 6 for the maximum year (Simulation No. 4).

The capture zones extend toward the southwest in the simulated upgradient groundwater flow direction and as skewed by the influence of other pumping wells. Table 3-1 summarizes 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 Simulation Nos. 1, 2, and 4 pumping rates.

Figure 2 in Appendix H shows ultimate regional ZOCs for Unit Well 6 and for other wells in Dane County. Groundwater flow pathlines extend upgradient (south-southwestward) from Unit Well 6 to the groundwater divide located approximately 8 to 9 miles south-southwest of Unit Well 6 and are located entirely within Dane County.

SOURCE: USGS 15 MINUTE QUADRANGLE,
MADISON WEST & MADISON EAST, WISCONSIN, 1983

DANE COUNTY

INDEX MAP

SCALE 1: 24000

1 1/2 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

CONTOUR INTERVAL 10 FEET
DATUM IS MEAN SEA LEVEL

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FIGURE 3–1
5, 50, 100 YEAR T.O.T. Z.O.C.s ASSUMING PROJECTED 2030 PUMPING RATE

MADISON, WISCONSIN

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DANE COUNTY

INDEX MAP

SOURCE: USGS 15 MINUTE QUADRANGLE,
MADISON WEST & MADISON EAST, WISCONSIN, 1983

SCALE 1: 24000

1 1/2 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

CONTOUR INTERVAL 10 FEET
DATUM IS MEAN SEA LEVEL

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FIGURE 3–2
5, 50, 100 YEAR T.O.T. Z.O.C.s ASSUMING 50 PERCENT CAPACITY PUMPING RATE

MADISON, WISCONSIN

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DANE COUNTY

INDEX MAP

SOURCE: USGS 15 MINUTE QUADRANGLE,
MADISON WEST & MADISON EAST, WISCONSIN, 1983

SCALE 1: 24000

1 1/2 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

CONTOUR INTERVAL 10 FEET
DATUM IS MEAN SEA LEVEL

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FIGURE 3-3
5, 50, 100 YEAR T.O.T. Z.O.C.s ASSUMING FULL CAPACITY PUMPING RATE

MADISON, WISCONSIN

82359

PSLtscale: 1 Ltscale: 1 LayoutName: WELL6.FIG3-3.
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SOURCE: USGS 15 MINUTE QUADRANGLE,
MADISON WEST & MADISON EAST, WISCONSIN, 1983

DANE COUNTY

INDEX MAP

SCALE 1: 24000

1 1/2 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

CONTOUR INTERVAL 10 FEET
DATUM IS MEAN SEA LEVEL

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FIGURE 3-4
5, 50, 100 YEAR T.O.T. Z.O.C.s ASSUMING PUMPING AT AVERAGE RATE DURING THE MAXIMUM YEAR
MADISON, WISCONSIN

82359

PSLtscale: 1 Ltscale: 1 LayoutName: WELL6.FIG3-4.
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TABLE 3-1
SUMMARY OF EXTENT OF ZOCs (CAPTURE ZONE)
WELLHEAD PROTECTION UNIT WELL 6
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 (MGD)	1.4413 (1,000 GPM)	1.728 (1,200 GPM)	3.456 (2,400 GPM)	0.72 (500 GPM)
Upgradient Extent of ZOC (feet)				
5-year TOT	350	400	600-650	250
50-year TOT	2,300-3,100	2,600-3,100	3,500	1,900-3,000
100-year TOT	3,900-5,100	4,250-5,100	5,600	3,700-5,100
Downgradient Extent of ZOC (feet)				
5-year TOT	600	500	550	500

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 811.16(5)(e)) 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 6. It is possible that Unit Well 6 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 6. Simulation No. 3 was used to generate the long-term capture zones and WHPA for Unit Well 6.

The 5-year TOT ZOC for Unit Well 6 extends approximately 650 feet upgradient of the well in the west-southwesterly direction, and approximately 550 feet downgradient from the well. The 100-year TOT ZOC extends approximately 5,600 feet upgradient from Unit Well 6 in the southwesterly direction. Protecting the entire 100-year TOT ZOC from Unit Well 6 to the upgradient boundary at the same level of protection, as the area within the 5-year TOT ZOC, is likely too severe.

Figure 3-5 shows the WHPA for Unit Well 6. Two zones of protection are within the WHPA. Zone A is the area around Unit Well 6 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 6, beyond Zone A, that is defined by a 1,200-foot fixed radius around Unit Well 6. This radius is selected because Wisconsin Administrative Code, Chapter NR 811.16(4), requires a 1,200-foot separation distance between a municipal water supply well and certain contamination sources.

Figure 3-5 shows that Zone A is contained within Zone B. 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 northern part of the WHPA is located within the Village of Shorewood Hills. The southern part of the WHPA is located within the City of Madison.

1200' RADIUS

UNIT WELL 6

ZONE B

ZONE A

ZONE B

1200' RADIUS
ZONE B
ZONE A

0' 300' 600' 1200'
SCALE

5 YEAR TIME OF TRAVEL CAPTURE ZONE (ZONE A).

50 YEAR TIME OF TRAVEL CAPTURE ZONE

100 YEAR TIME OF TRAVEL CAPTURE ZONE

PSLtscale: 1 Ltscale: 1 LayoutName: WELL6.FIG3-5.
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FIGURE 3-5
WELLHEAD PROTECTION AREA
UNIT WELL 6

MADISON, WISCONSIN

82359

4.0 POTENTIAL CONTAMINANT SOURCES

4.1 CSI

A CSI was performed for the Unit Well 6 area during April 2007. 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 of Unit Well 6. General land use observations and reconnaissance were made on April 4 and 18, 2007.

Figure 4-1 shows 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 of Unit Well 6. Table 4-1 summarizes 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 and ZOCs for Unit Well 6 include former spills and potential spills along roads and main transportation corridors; sanitary and storm sewers; active AST sites; active and closed UST sites; closed LUST sites; gas stations; drycleaners; auto repair businesses; veterinary clinics; 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 6 and within the recharge area equivalent to the delineated 100-year TOT of Unit Well 6:

The nearest storm sewer is located in North Franklin Avenue, approximately 100 feet west of Unit Well 6.

The nearest sanitary sewer main is located in North Franklin Avenue, approximately 90 feet west of Unit Well 6.

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 6 area during the site reconnaissance survey. City residents and the Village of Shorewood Hills residents are provided water by the City of Madison. A construction record was located for a private well at the Veteran's Hospital, which is approximately 1,000 to 1,500 feet northeast of Unit Well 6. The Veteran's Hospital well is 718 feet deep and has grouted casing to a depth of 270 feet.

There are no private sewage disposal systems in the vicinity of Unit Well 6. All businesses and residents located in the City of Madison and Village of Shorewood Hills are served by municipal sewer systems.

Based on the site reconnaissance and a review of the Wisconsin registered storage tank list, two active UST sites are located within 1,200 feet of Unit Well 6. The nearest site is located at 2801 University Avenue, which is approximately 230 feet northwest of Unit Well 6. Twelve closed, removed, or abandoned UST sites are located within 1,200 feet of Unit Well 6.

TABLE 4-1
CONTAMINANT SOURCE INVENTORY SUMMARY
WELLHEAD PROTECTION UNIT WELL 6
MADISON, WISCONSIN
APRIL 2007

Map Site No.	Owner/Location	Database or Reference Source	Existing, Potential, or Former Contaminant Sources	Reported Status	Approximate Distance to Unit Well 6	Location within Capture Zone	Estimated Threat to Supply Wells
1 (A1)	Madison Water Utility Well 6 2757 University Avenue Madison, WI	EDR Report- Tier 2 Database	Hydrofluosilicic acid storage and use	Active	At Well 6	At Well, Zone A	Moderate
1B	City of Madison Streets throughout Area	Site Reconnaissance City Maps	Sanitary sewer	Active Sanitary Sewer	90 feet West	Zone A	High
1C	City of Madison Streets throughout Area	Site Reconnaissance City Maps	Storm sewer	Active Storm Sewer	100 feet West	Zone A	Moderate
2 (A2/A3/A4)	Car Care Clinic 2733 University Avenue Madison, WI	EDR Report- HWIMS - RCRA-Small Quantity Generator, FINDS WI - Registered UST (Facility ID 59898)	Automotive fluids Closed/removed waste/used motor oil tank, 950 gallon	Active Site Closed UST	155 feet ESE	Zone A	Moderate
3 (B5)	Gas U Save (current) Gas N Food Pantry (former) (Former Vista U Pump #8) 2801 University Avenue Madison, WI	EDR Report- WI - Registered UST (Facility ID 139362) LUST Site Reconnaissance	UST – unleaded gasoline, 15,000 gallon in use UST- gasoline, 8,000 gallon in use UST – unleaded gasoline, 7,000 gallon in use 3 closed USTs, unleaded gasoline 10,000, 10,000 and 8,000 gallon LUST site (former Vista U Pump) contaminated soil and free product. Site closed with deed restriction.	Active	230 feet NW	Zone A	High
4 (C8)	Lake Point Commons Twentieth Century Markets, Inc. 2701 University Avenue Madison, WI	EDR Report- WI - Registered UST (Facility ID 74686)	UST: Fuel oil, 1,111-gallon (Tank ID No. 272568)	Closed/Removed	500 feet ESE	Zone B	Low
5 (D9)	Radiation Center 2716 Marshall Court Madison, WI	EDR Report- MLTS	Storage and use of radioactive materials	Active	525 feet North	Zone B	Low
6 (D10)	Dr. Jean Piper Office 2701 Marshall Court Madison, WI	EDR Report- WI - Registered UST (Facility ID 196345)	UST: 550-gallon fuel oil	Closed/Removed	500 feet NE	Zone A	Low
7 (11)	Carrie Apartments 513 Farley Avenue Madison, WI	EDR Report- WI - Registered UST (Facility ID 174276)	Closed/removed USTs: 4-500-gallon fuel oil	Closed/Removed	750 feet SE	Zone B	Low
8 (12)	WI Brick and Block (former) 2840 University Avenue Madison, WI	EDR Report- WI - Registered UST (Facility ID 144338)	Closed/removed USTs: 5,000 gallon leaded gasoline; 10,000 gallon diesel; 1,000 gallon unknown; 2,000 gallon unleaded gasoline	Closed/Removed	700 feet NW	Zone B	Low
9 (C13)	Picketts 76 Service 2635 University Avenue Madison, WI	EDR Report- WI - LUST (DNR Activity No. 03-13-002421), Registered UST (Facility ID 118558) SHWIMS - RCRA-Small Quantity Generator, FINDS	LUST case with soil and groundwater contamination – site closed with deed restriction. Closed/removed USTs: 3,000-gallon unleaded gasoline; 8,000 gallon unleaded gasoline; 3,000 gallon unleaded gasoline; 4,000 gallon unleaded gasoline; 400 gallon waste/used motor oil; 1,000 gallon fuel oil. Small quantity generator, automotive fluids.	Closed/Removed USTs Empty Building	650 feet SE	Zone B	Low

TABLE 4-1 (cont.)

Map Site No.	Owner/Location	Database or Reference Source	Existing, Potential, or Former Contaminant Sources	Reported Status	Approximate Distance to Unit Well 6	Location within Capture Zone	Estimated Threat to Supply Wells
10 (E14/E15)	Amoco Car Care (Currently not at this Address) 2875 University Avenue Madison, WI	EDR Report- Registered UST (Facility ID 52677) WI WRRSER	Closed/removed USTs: 550 gallon used motor oil, 8,000 gallon unleaded gasoline; 6,000 gallon unleaded gasoline; 550 gallon fuel oil; 6,000 gallon leaded gasoline.	Closed/Removed	830 feet NW	Zone B	Low
11 (E16)	Klinke Cleaners 2875 University Avenue Madison, WI	EDR Report- WI - LUST (DNR Activity No. 03-13-001178), SHWIMS - RCRA-Small Quantity Generator, FINDS	Closed LUST – Unleaded and leaded gasoline soil and groundwater contamination. Conditional closure February 1996.	Closed	800 feet NW	Zone B	Moderate/High
12	Animal Hospital 2837 University Avenue Madison, WI	Site Reconnaissance	Storage and use of potentially hazardous fluids Animal waste	Active Veterinary	550 feet NW	Zone A	Low
12B	Pet Clinic 2865 University Avenue Madison, WI	Site Reconnaissance	Storage and use of potentially hazardous fluids Animal waste	Active Veterinary	700 feet NW	Zone B	Low
13 (F19/F20/F21/ F22/F23)	William S. Middleton Memorial VA Hospital 2500 Overlook Terrace Madison, WI	EDR Report- WI Spills, BRRTS, Registered UST (Facility ID 118558), SHWIMS - RCRA-Small Quantity Generator, FINDS, WI Manifest, WI AST	Diesel fuel spill – pump generator float valve failed. Used absorbent and excavation of contaminated soil. Closed 1997. USTs – fuel oil, 2- 4,000 gallon in use UST- unleaded gasoline, 600 gallon in use UST – fuel oil, 1,000 gallon in use UST – diesel, 600 gallon in use 4 closed USTs, diesel 3,000 gallon; leaded gasoline 2-1,000 gallon; diesel 4,000 gallon AST diesel 100 gallon in use	Active USTs and AST Closed/Removed USTs	1,000 – 1,500 feet NE	Zone B	Low
14 (24)	Sarko Rohrbach 615 Ridge Street Madison, WI	EDR Report- WI Registered UST (Facility ID 129971)	Closed/removed UST: 300-gallon fuel oil, residential use.	Closed/Removed	750 feet West	Zone B	Low
15 (E25)	Robert Ranguette 2901 University Avenue Madison, WI	EDR Report- WI Registered UST (Facility ID 116610)	Closed/removed USTs: 3 - 1,500-gallon leaded gasoline, 500 gallon fuel oil	Closed/Removed	975 feet NW	Zone B	Low
16 (G26)	Dick Pierce 2741 Chamberlain Avenue Madison, WI	EDR Report- WI - Registered UST (Facility ID 69646)	Closed/removed UST: 300-gallon fuel oil	Closed/Removed	1,200 feet South	Zone B	Low
17 (G27/G28)	Suzanne Voss / Voss Estate 2739 Chamberlain Avenue Madison, WI	EDR Report- WI - Registered UST (Facility ID 194521) WI - LUST (DNR Activity No. 03-13-257177)	Closed/removed UST: 300-gallon fuel oil Closed LUST – Petroleum soil and groundwater contamination. Conditional closure August 2000	Closed/Removed UST Closed LUST	1,200 feet South	Zone B	Low
18	Railroad Tracks Immediately North and NW Madison, WI	Site Reconnaissance	Transport of Hazardous Materials Potential Spills	Active Railroad	175 feet North	Zone A	Low
19 (29)	Jim Stopple 2906 Stevens Street Madison, WI	EDR Report- WI - Spills	June 1996 spill of unknown petroleum. Contaminated soil excavated.	Historic Spill	975 feet SW	Zone B	Low
20 (H30)	2583 University Avenue Madison, WI	EDR Report- WI - LUST (DNR Activity No. 03-13-170394) WI Spills WI Registered UST (Facility ID 89648)	Closed LUST – Petroleum soil contamination. Conditional closure January 2003. Deed Restriction November 1990 spill of unknown paints, inks and dyes (contained/recovered) Closed/removed USTs: 1,000-gallon waste/used motor oil; 2 - 6,000 gallon leaded gasoline; 6,000 gallon unleaded gasoline	Conditionally Closed LUST Historic Spill Closed Removed USTs	1,450 feet SE	Downgradient within ½ Mile Radius	Low

TABLE 4-1 (cont.)

Map Site No.	Owner/Location	Database or Reference Source	Existing, Potential, or Former Contaminant Sources	Reported Status	Approximate Distance to Unit Well 6	Location within Capture Zone	Estimated Threat to Supply Wells
21 (H31)	Rod Bruner 2569 University Avenue Madison, WI	EDR Report- WI - Registered UST (Facility ID 100217)	Closed/removed UST: 1,000 gallon fuel oil.	Closed/Removed	1,575 feet SE	Downgradient within ½ Mile Radius	Low
22 (I32/I33)	University of WI – Waisman Center 1500 Highland Avenue Madison, WI	EDR Report- FINDS FTTS SHWIMS	Facility complaint -	Not Reported	1,400 feet NE	Downgradient within ½ Mile Radius	Low
23 (35)	Tom Schaefer 2606 Chamberlain Avenue Madison, WI	EDR Report- WI - Registered UST (Facility ID 137760)	Closed/removed UST: 500 gallon fuel oil.	Closed/Removed	1,500 feet SE	Sidegradient within ½ Mile Radius	Low
24 (36) (51)	Shorewood Shopping Center 3030 University Avenue Madison, WI	EDR Report- BRRTS (DNR Activity No. 09-13-546967) WI - Registered UST (Facility ID 131581)	1989 closed tank, no site investigation required. Closed filled with inert materials USTs: 1,000 gallon gas; 2 - 500 gallon gas; 2,000 gallon gas	Closed USTs	1,800 feet NW	Sidegradient within ½ Mile Radius	Low
25 (37)	Michael Sack 218 Shepard Terrace Madison, WI	EDR Report- WI Registered UST (Facility ID 110841)	1,111 gallon empty UST removed - residential	Closed/Removed	1,400 feet SW	Sidegradient within ½ Mile Radius	Low
26 (38)	Robert Cohn 2554 Kendall Avenue Madison, WI	EDR Report- WI - Registered UST (Facility ID 124613)	Closed/removed UST: 500 gallon fuel oil.	Closed/Removed	1,550 feet SE	Sidegradient within ½ Mile Radius	Low
27 (39)	Ted Amman 2525 University Avenue Madison, WI	EDR Report- WI Spills	May 1990 historic spill when car hit transformer. Soil contamination removed.	Closed	1,700 feet SE	Sidegradient within ½ Mile Radius	Low
28 (J40-J45)	University of WI Hospital and Clinics 600 Highland Avenue Madison, WI	EDR Report- WI - Registered UST (Facility ID 674642) FTTS FINDS AST LUST WI SPILLS WI ERP BRRTWS SHWIMS	Closed/removed USTs: 2 - 7,500-gallon diesel; 8,000 gallon fuel oil. 10,000 gallon aviation fuel (in use) AST: 1,500 gallon diesel (in use) Closed LUST – Closed December 1998 under NR 708.09 – Soil Contamination Historic Spill August 1994 – Transmission equipment caused unknown petroleum soil contamination – Closed Closed ERP site- contaminated soil	Closed/Removed USTs Active UST and AST	1,700 feet East	Downgradient within ½ Mile Radius	Low
29 (46)	Robert Burris 1015 University Bay Drive Madison, WI	EDR Report- WI - Registered UST (Facility ID 158179)	Closed/removed UST: 1,000-gallon fuel oil - residential	Closed/Removed	1,875 feet North	Downgradient within ½ Mile Radius	Low
30 (J47-J48)	University of WI Health Sciences Learning center 750 Highland Avenue Madison, WI	EDR Report- SHWIMS AST	AST: 600-gallon diesel (in use).	In Use AST	1,850 feet NE	Downgradient within ½ Mile Radius	Low
31	Shorewood Hills Community Building Shorewood Hills, WI	Site Reconnaissance	Nutrient loading on garden plots. Potential use of pesticides and herbicides	Active (Summer)	1,350 feet NW	Sidegradient within ½ Mile Radius	Low
32 (51)	MPI Wisconsin Fine Blanking & Machining 101 Grand Avenue Madison, WI	EDR Report- WI – AST	In use ASTs: 1,500 gallon chemical; 2,000 gallon chemical; 500 gallon chemical (chemical type not reported).	Active	2,100 feet SE	Sidegradient within ½ Mile Radius	Low
33 (K53)	Esther Morgensen 3124 Harvey Street Madison, WI	EDR Report- WI - Registered UST (Facility ID 76435)	Closed/removed UST: 550-gallon fuel oil - residential	Closed/Removed	1,750 feet West	Sidegradient within ½ Mile Radius	Low

TABLE 4-1 (cont.)

Map Site No.	Owner/Location	Database or Reference Source	Existing, Potential, or Former Contaminant Sources	Reported Status	Approximate Distance to Unit Well 6	Location within Capture Zone	Estimated Threat to Supply Wells
34 (54/55)	Resurrection Catholic Cemetery 2705 Regent Street Madison, WI	EDR Report- WI - Registered UST (Facility ID 176479) LUST	Closed/removed UST: 500-gallon fuel oil Closed LUST August 1999 – Soil Contamination	Closed/Removed UST Closed LUST	2,250 – 2,450 feet South	Sidegradient within ½ Mile Radius	Low
35 (56)	Mac Passano 2838 Regent Street Madison, WI	EDR Report- WI - Registered UST (Facility ID 106700)	Closed/removed UST: 500-gallon fuel oil - residential	Closed/Removed	2,075 feet SW	Sidegradient within ½ Mile Radius	Low
36 (K57)	Century House 725 Hill Street Madison, WI	EDR Report- WI Spills	Spill at loading dock December 2000, Diesel fuel – March 2001 closed	Closed	1,950 feet West	Sidegradient within ½ Mile Radius	Low
37 (58)	Millers Liquor LLC 2401 University Avenue Madison, WI	EDR Report- WI – ERP LAST	Non-chlorinated solvents – Began February 2003	Open Investigation	2,375 feet SE	Downgradient within ½ Mile Radius	Low
38 (L59/L60)	Hoyt Elementary School 3802 Regent Street Madison, WI	EDR Report- WI - Registered UST (Facility ID 89223) LUST	Closed/removed UST: 15,000-gallon fuel oil LUST site open June 1992, closed May 1994 Soil Contamination	Closed/Removed UST Closed LUST	2,150 feet SW	Sidegradient within ½ Mile Radius	Low
39 (M61/M62)	Shorewood Service Center 3300 University Avenue Madison, WI	EDR Report- WI - Registered UST (Facility ID 131583) WI - LUST (DNR Activity No. 03-13-104773)	Closed/removed USTs: 2 - 8,000-gallon unleaded gasoline; 4,000-gallon unleaded gasoline; 1,000 gallon waste/used motor oil. Conditionally closed LUST – GIS Registry and deed restriction. Closed February 2004. Petroleum soil and groundwater contamination.	Closed/Removed USTs Closed LUST Removed Facility	2,150 feet NW	Sidegradient within ½ Mile Radius	Low
40 (M63)	Whole Earth Market 3313 University Avenue Madison, WI	EDR Report- WI - Spills	Diesel fuel spill caused storm sewer contamination. Closed February 2000	Closed Spill	2,325 feet WNW	Sidegradient within ½ Mile Radius	Low
41 (M64)	3300 University Avenue and Shorewood Boulevard Madison, WI	EDR Report- WI - Spills	Petroleum spill into storm sewer	Closed Spill	2,050 feet NW	Sidegradient within ½ Mile Radius	Low
42 (65)	Mossman Estate 2902 Columbia Road Madison, WI	EDR Report- WI - Registered UST (Facility ID 112604)	Closed/removed UST: 900-gallon fuel oil - residential	Closed/Removed	2,400 feet NNW	Downgradient within ½ Mile Radius	Low
43 (66)	Eric Smith 1107 Amherst Drive Madison, WI	EDR Report- WI - Registered UST (Facility ID 75927)	Closed/removed UST: 1,000-gallon fuel oil - residential	Closed/Removed	2,500 feet NNW	Downgradient within ½ Mile Radius	Low
44 (N67/N68)	Wisconsin Bell (DBA SBC Services Wisconsin) 2802 Sylvan Avenue Madison, WI	EDR Report- Tier 2 AST WI - Registered UST (Facility ID 106820)	Storage or manufacture of sulfuric acid. Closed/removed ASTs: 2 - 275 gallon diesel (In Use) AST: 1,000 gallon diesel Closed filled with inert materials USTs: 140-gallon unknown contents; 2,000 gallon fuel oil	Closed/Removed ASTs Closed Filled USTs In Use AST	2,350 feet South	Sidegradient within ½ Mile Radius	Low
46 (M70/M71)	TDS Metrocom 3300 University Avenue Suite 100 Madison, WI	EDR Report- WI – AST Tier 2	Closed/removed ASTs: 800-gallon diesel; 1,400 gallon diesel. Storage or manufacture of sulfuric acid.	Closed/Removed AST	2,150 feet NW	Sidegradient within ½ Mile Radius	Low
47 (72)	Hoyt Park 3902 Regent Street Madison, WI	EDR Report- WI - Spills	Leaking auto tank caused petroleum contamination – contained/recovered.	Historic Spill	2,300 feet SW	50 year TOT/ Sidegradient within ½ Mile Radius	Low
48 (73)	Georgia Robinson Beale Trust 2816 Columbia Madison, WI	EDR Report- WI - Registered UST (Facility ID 180271)	Closed/removed UST: 1,000-gallon fuel oil	Closed/Removed	2,525 feet NNW	Downgradient within ½ Mile Radius	Low

TABLE 4-1 (cont.)

Map Site No.	Owner/Location	Database or Reference Source	Existing, Potential, or Former Contaminant Sources	Reported Status	Approximate Distance to Unit Well 6	Location within Capture Zone	Estimated Threat to Supply Wells
49	Solid Waste Disposal Site Doctor's Park Area General Location SE1/4, of SW1/4 of Section 16 Madison, WI	1999 Dane County Groundwater Protection Plan (Original Source DNR Files)	Disposal of wood and brush	Closed (Period of Use not Reported)	1,000 feet North	Zone B	Low
50 (O75)	Highland Transitional Care 2308 University Avenue Madison, WI	EDR Report- WI - Registered UST (Facility ID 678477)	Closed/removed UST: 1,000-gallon fuel oil	Closed/Removed	2,500 feet ESE	Downgradient within ½ Mile Radius	Low
51 (O76)	Casablanca Apartments 2302 University Avenue Madison, WI	EDR Report- WI - Registered UST (Facility ID 60594)	Closed/removed UST: 1,500-gallon fuel oil	Closed/Removed	2,625 feet ESE	Downgradient within ½ Mile Radius	Low
52 (P77)	Todd McGrath Kendall Associates 2324 Kendall Avenue Madison, WI	EDR Report- WI - Registered UST (Facility ID 137397)	Closed/removed UST: 1,000-gallon fuel oil - residential	Closed/Removed	2,500 feet ESE	Downgradient within ½ Mile Radius	Low
53 (78)	Catherine Marin 2326 Chamberlain Avenue Madison, WI	EDR Report- WI - Registered UST (Facility ID 60708)	Closed/removed UST: 1,000-gallon fuel oil	Closed/Removed	2,600 feet ESE	Sidegradient within ½ Mile Radius	Low
54 (Q79)	Village of Shorewood Hills 1008 Shorewood Boulevard Madison, WI	EDR Report- WI - Registered UST (Facility ID 140978) SHWIMS Site Reconnaissance	Closed/removed USTs: 2 - 1,000-gallon unleaded gasoline Village garage and fire station – truck parking Storage and use of fluids and solvents	Closed/Removed	2,600 feet NW	Sidegradient within ½ Mile Radius	Low
65 (105)	Davis Property 718 Eugenia Avenue Madison, WI	EDR Report- Brownfields BRRTS	"Environmental pollution and remediation." Specific concern not reported.	Active 2/13/02	2,650 feet West	Sidegradient within ½ Mile Radius	Low
66 (U106)	Hilldale Shell 3401 University Avenue Madison, WI	EDR Report- WI - Registered UST (Facility ID 677649) LUST FINDS RCRA-SQG WI WRRSER BRRTS SHWIMS	Closed/removed USTs: 2 - 10,000-gallon unleaded gas; 500 gallon waste/used motor oil; 8,000 gallon unleaded gasoline. In use USTs: 15,000 gallon unleaded gasoline; 8,000 gallon unleaded gasoline. Closed LUST December 2003 – Free product petroleum soil and groundwater contamination. GIS Registry Deed Restriction. Small Quantity Haz Waste Generator	Closed/Removed USTs In Use USTs Closed LUST 12/03	2,800 feet West	Sidegradient beyond ½ Mile Radius	Low
67	Mobil Station 3505 University Avenue Madison, WI	Site Reconnaissance	Gas station – storage and sales of gasoline and diesel fuels.	Active	3,000 feet West	Sidegradient beyond ½ Mile Radius	Low
68 (112/125)	Vukelich Property 3934 Plymouth Circle Madison, WI	EDR Report- WI - Registered UST (Facility ID 89445) WI - LUST (DNR Activity No. 03-13-002810)	Closed/removed UST: 500 gallon fuel oil Closed LUST: Petroleum contaminated soil	LUST Closed August 1996	2,750 feet SW	Sidegradient beyond ½ Mile Radius	Low
69 (113)	Kenneth Wilkening 3309 Bluff Street Madison, WI	EDR Report- WI - Registered UST (Facility ID 657359)	Closed/filled with inert material UST: 1,111-gallon fuel oil.	Closed/Filled UST	2,850 feet SW	50 Year TOT	Low
70 (Y119)	Raymond Seyborg 510 North Blackhawk Avenue Madison, WI	EDR Report- WI - Registered UST (Facility ID 121381)	Closed/removed UST: 500-gallon fuel oil	Closed/Removed USTs	3,000 feet SW	50 Year TOT	Low
71 (Y126)	Northwood Investments 432 N Blackhawk Avenue Madison, WI	EDR Report- WI - Registered UST (Facility ID 114904) WI - LUST (DNR Activity No. 03-13-002713)	Closed/removed UST: 300-gallon fuel oil. Closed LUST: May 1996 soil contamination	Closed/Removed UST Closed LUST May 1996	3,075 feet SW	50 Year TOT	Low

TABLE 4-1 (cont.)

Map Site No.	Owner/Location	Database or Reference Source	Existing, Potential, or Former Contaminant Sources	Reported Status	Approximate Distance to Unit Well 6	Location within Capture Zone	Estimated Threat to Supply Wells
72 (AF 155)	Lorainne Devit 3521 Heather Crest Madison, WI	EDR Report- WI - Registered UST (Facility ID 706520)	Closed/filled with inert material UST: 1,111-gallon contents not reported.	Closed/Filled in place UST	3,350 feet SW	50 Year TOT	Low
73 (160)	Shamarie Sais 14 South Blackhawk Avenue Madison, WI	EDR Report- WI - Registered UST (Facility ID 174299)	Closed/removed UST: 1,500-gallon fuel oil	Closed/Removed	3,650 feet SW	100 Year TOT	Low
74 (AF 163)	Craig Weiss 3553 Heather Crest Madison, WI	EDR Report- WI - Registered UST (Facility ID 65029)	Closed/filled with inert material UST: 275-gallon fuel oil	Closed/Filled in Place UST	3,500 feet WSW	100 Year TOT	Low
75 (AI167)	Karen Larsen 326 N Hillside Terrace Madison, WI	EDR Report- WI - Registered UST (Facility ID 98246)	Closed/removed UST: 500-gallon fuel oil	Closed/Removed	3,600 feet WSW	100 Year TOT	Low
76 (AI177)	Mary Clingman 314 N Hillside Terrace Madison, WI	EDR Report- WI - Registered UST (Facility ID 108758)	Closed/removed UST: 300-gallon fuel oil	Closed/Removed	3,750 feet WSW	100 Year TOT	Low
77 (AO193/194)	Del Marshall 10 S Hillside Terrace Madison, WI	EDR Report- WI - Registered UST (Facility ID 720551) WI - LUST (DNR Activity No. 03-13-548370)	Closed/removed UST: 550-gallon fuel oil Closed LUST: January 2007 soil contamination closed with GIS Registry Deed Restriction	Closed/Removed UST Closed LUST Jan 2007	4,200 feet SW	100 Year TOT	Low
78 (AX230)	W. C. Goebel 202 N Midvale Boulevard Madison, WI	EDR Report- WI - Registered UST (Facility ID 4512)	Closed/removed UST: 1,000-gallon fuel oil	Closed/Removed	4,600 feet SW	100 Year TOT	Low
79 (246)	Hilldale Firestone Robert Schmied 319 Price Place Madison, WI	EDR Report- WI – AST	Closed/removed AST: 550-gallon waste/used motor oil	Closed/Removed	4,500 feet SW	100 Year TOT	Low
80 (251)	Patrick Kelecy 4337 Bagley Parkway Madison, WI	EDR Report- WI - Registered UST (Facility ID 116840)	Closed/removed UST: 550-gallon fuel oil	Closed/Removed UST	4,900 feet SW	100 Year TOT	Low
81 (273)	Marlene Rundhaug 22 Merlham Drive Madison, WI	EDR Report- WI - Registered UST (Facility ID 713980)	Closed/removed UST: 300-gallon fuel oil	Closed/Removed UST	5,000 feet SW	100 Year TOT	Low
82 (BG275/276)	Edgecomb Property 4338 Upland Drive Madison, WI	EDR Report- WI - Registered UST (Facility ID 98246) WI - LUST (DNR Activity No. 03-13-001659)	Closed/removed UST: 250-gallon fuel oil Closed LUST: August 1993 soil contamination	Closed/Removed UST Closed LUST Aug 1993	5,300 feet SW	100 Year TOT	Low
83 (295)	Roy Burgo 214 S Midvale Boulevard Madison, WI	EDR Report- WI - Registered UST (Facility ID 128646)	Closed/removed UST: 1,000-gallon fuel oil	Closed/Removed	5,650 feet SW	Upgradient Beyond 100 Year TOT	Low
84	Numerous Properties Throughout Area	Site Reconnaissance	Parking surfaces, potential leaks and spills and runoff to storm sewer	Active Parking Lots	Variable	All Zones	Low – Moderate
85	Numerous Properties Throughout Area	Site Reconnaissance	Grass Areas: Parks and residences. Potential nutrient loading and use of pesticides and herbicides.	Active Green Space Areas	Variable	All Zones	Low – Moderate
86	All Roads and Properties City of Madison	Site Reconnaissance	Potential for leaks and spills of hazardous materials	Spills Can Occur at Any Time and at Any Location	Variable	All Zones	Low – High
87	Major Roadways City of Madison	City Records	Salt application	Application During Winter	Variable	All Zones	Low – Moderate

TABLE 4-1 (cont.)

Map Site No.	Owner/Location	Database or Reference Source	Existing, Potential, or Former Contaminant Sources	Reported Status	Approximate Distance to Unit Well 6	Location within Capture Zone	Estimated Threat to Supply Wells

Notes:

Map Numbers correspond to numbers shown on Figure 4-1
EDR Search Report Number(s) are shown in parenthesis (A1/A2, etc.) and pertain to EDR's search map and report. They are listed for cross-reference purposes.

1. Zone A = Within 5 year TOT ZOC
2. Zone B = Beyond Zone A, but within 1200-ft. radius.
3. TOT = Time of Travel
4. Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS)
5. National Priorities List (NPL)
6. Resource Conservation and Recovery Act- Large Quantity Generator (RCRA-LQG)
7. Resource Conservation and Recovery Act- Small Quantity Generator (RCRA - SQG)
8. The Facility Index System (FINDS)
9. Underground Storage Tank (UST)
10. Aboveground Storage Tank (AST)
11. Environmental Protection Agency (EPA)
12. Solid & Hazardous Waste Information Management System (SHWIMS)
13. Material Licensing Tracking System (MLTS)
14. FIFRA/TSCA Tracking System (FTTS) (FIFRA = Federal Insecticide, Fungicide & Rodenticide Act; TSCA = Toxic Substances Control Act)
15. Wisconsin (WI)
16. Wisconsin DNR Spills Database (SPILLS)
17. Wisconsin Leaking Underground Storage Tank List (LUST)
18. Wisconsin Environmental Repair Program Sites (ERP)
19. Bureau (of Commerce) Remediation and Redevelopment Tracking System (BRRTS)
20. Wisconsin Remedial Response Site Evaluation Report (WRRSER)
21. Wisconsin Department of Natural Resources (DNR)
22. List of Licensed Landfills (WF/LF)

There are four reported LUST sites within 1,200 feet of Unit Well 6, all of which are closed. The nearest site is located approximately 230 feet northwest of Unit Well 6 at 2801 University Avenue. The second site is located approximately 650 feet southeast of Unit Well 6 at 2635 University Avenue. The third site is located approximately 800 feet northwest of Unit Well 6 at 2875 University Avenue. The fourth site is located 1,200 feet south of Unit Well 6, at 2739 Chamberlain Avenue.

Based on the site reconnaissance and a review of the Wisconsin registered storage tank list, the nearest AST is located within 1,000 to 1,500 feet northeast of Unit Well 6 at the Veteran's Hospital. The AST contains 100 gallons of diesel fuel.

Based on a review of the Wisconsin Spills List, two reported historic spills have occurred within 1,200 feet of Unit Well 6. In 1996, a spill of unknown petroleum occurred at 2906 Stevens Street, which is approximately 975 feet southwest of Unit Well 6. In 1997, a spill of diesel fuel occurred at the Veteran's Hospital located approximately 1,000 to 1,500 feet northeast of Unit Well 6. Contaminated soil was excavated from both sites. No other closed or active spill sites are reported within 1,200 feet of Unit Well 6.

A dry cleaning business is located approximately 800 feet northwest of Unit Well 6.

There are no golf courses in the vicinity of Unit Well 6.

DNR records show that a historical solid waste disposal site is located approximately 1,000 feet north of Unit Well 6. Records show the site was for disposal of wood and brush (DCRPC, 1999). The area was observed during the site reconnaissance survey, but a disposal area was not apparent.

The nearest cemetery is located approximately 2,100 feet south of Unit Well 6 and is beyond the WHPA and ZOCs.

There are no sludge or septage spreading areas in the Unit Well 6 WHPA or in upgradient ZOCs.

According to the DNR Bureau of Remediation and Redevelopment Tracking System (BRRTS) website, there are two properties located within 1,200 feet of Unit Well 6, which have contaminated soil and/or groundwater and received closure with residual contamination remaining at the sites. The nearest site is located 230 feet northwest of Unit Well 6 at 2801 University Avenue. The other site is located 650 feet southeast of Unit Well 6 at 2635 University Avenue.

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 6, or within the upgradient recharge area. Salt is applied to roadways in the Unit Well 6 ZOCs during the winter as a deicer.

The separation distances between Unit Well 6 and potential contaminant sources identified in Wisconsin Administrative Code NR 811.16 are summarized in Table 4-2. Required separation distances from Unit Well 6 are not met for the sanitary sewer, the USTs located at 2801 University Avenue, or sites with residual groundwater contamination.

TABLE 4-2
MINIMUM SEPARATION REQUIREMENTS
BETWEEN PUBLIC WELLS AND
POTENTIAL CONTAMINANT SOURCES
WELLHEAD PROTECTION PLAN, UNIT WELL 6
MADISON, WISCONSIN

Potential Contamination Source	Minimum Separation Distance
Storm Sewer	50 feet
Sanitary Sewer	200 feet[1]
Sanitary Lift Station	200 feet
Single Family Residential Fuel Oil Tank	200 feet
Septic Tank Receiving Less than 8,000 gpd	400 feet
Cemetery	400 feet
Stormwater Drainage Pond	400 feet
Gasoline or Fuel Oil Tank Approved by Comm 10.10	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
Industrial, Commercial, or Municipal Wastewater Lagoons or Storage Structures	1,000 feet
Manure Stacks or Storage Structures	1,000 feet
Septic Tanks or Soil Absorptive Units Receiving Greater than 8,000 gpd	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 as Recorded on the DNR GIS Registry	1,200 feet
Coal Storage Area	1,200 feet
Salt or Deicing Material Storage	1,200 feet
Gasoline or Fuel Oil Storage Tanks not Approved by Comm 10.10	1,200 feet
Bulk Fuel Storage Facilities	1,200 feet
Pesticide or Fertilizer Handling or Storage Facilities	1,200 feet

Reference: Wisconsin Administrative Code, NR 811, June 2003.

Footnote:

[1] 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.

4.2 UNIT WELL 6 WATER QUALITY AND LAND USES

Water pumped from Unit Well 6 is hard (375 milligrams per liter (mg/L)) and contains low levels of iron (0.011 mg/L), manganese (0.012 mg/L), nitrate (3.2 mg/L), chloride (29 mg/L), and sulfate (23.5 mg/L) (Madison Water Utility, 2007). Low levels of two disinfection byproducts, which form during the chlorination of water when chlorine interacts with impurities in the groundwater, were also detected in water pumped from Unit Well 6. No other volatile organic compounds (VOCs) or synthetic organic compounds (SOCs) were detected.

On the basis of these water quality data, it appears that road salt application on streets, and nutrient loading on grass areas in the well capture zone areas, could be impacting the quality of groundwater pumped from Unit Well 6. Chloride and nitrate concentrations in water pumped from Unit Well 6 are slightly elevated compared to the concentrations of chloride and nitrate in some of the City of Madison wells. 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.

Unit Well 6 is not cased through the Eau Claire shale confining layer; therefore, Unit Well 6 is open to a portion 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 6 are not compatible with WHP planning, including gas stations, vehicle maintenance and repair, and dry cleaning. Land uses summarized in Table 4-2 should be prohibited in the vicinity of Unit Well 6, within the respective minimum separation distances shown. Also, it is not desirable to have commercial, manufacturing, or industrial districts located in WHPAs. Land uses summarized in Table I-1 in Appendix I should be prohibited from WHPA Zones A and B. Where any of the uses listed in Table I-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 I summarize several potential sources of groundwater contamination and land uses and their relative risk to groundwater, respectively.

5.0 MANAGEMENT STRATEGIES

5.1 ALTERNATIVE MANAGEMENT STRATEGIES

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 within the WHPA rely on groundwater resources for water supply. Emphasis should be placed on management activities that will provide a mutual benefit to the City of Madison residents and other property owners located within the WHPA and other ZOCs.

5.1.1 Category 1 - Existing Programs

5.1.1.1 Hazardous Waste Collection/Disposal Program (Clean Sweep)

The Dane County Department of Public Works and the City of Madison Department of Public Health co-sponsor the Clean Sweep Collection Program. The Clean Sweep program involves collection and disposal of residential, agricultural, and small business hazardous chemicals and wastes. 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 Wednesdays, by appointment only, and there is a per-pound charge for materials. Costs are summarized on the Clean Sweep website. There is no charge for disposal of hazardous materials disposed of by producers of agricultural crops and commodities. Agri-businesses such as golf courses and farm cooperatives are charged one-half of the small business disposal charge. Collections are held between 7:30 a.m. and 2:00 p.m. on Tuesdays, Wednesdays, Fridays, and Saturdays, May 1 through October 31. 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) 294-5366 or (608) 294-5358. Clean Sweep Collection Program websites are at:

www.danecountycleansweep.com

and

www.cityofmadison.com/health/envhealth/clnswp.html

TABLE 5-1
SUMMARY OF MANAGEMENT STRATEGIES
WELLHEAD PROTECTION PLAN - UNIT WELL 6
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)	• Hazardous waste collection and disposal. Residential, agricultural, and small business hazardous waste. Commercial with small fee. May through October collections in Madison. • Target local property owners and residents to participate.	• Dane County Department of Public Works • City of Madison Department of Public Health	1. 2008 2. As needed	1. **Madison Water Utility** send information about the Clean Sweep Collection Program to property owners in the WHPA, to encourage participation in the program. 2. **Dane County** sponsors advertising and feature articles.
	b. On Site Waste Disposal System (Septic) Maintenance	• Maintenance/servicing contract currently required for system owners on record. • Orders issued to confirmed failing system owners. • Include all property/septic system owners in WHPA in notification database. • Conduct Public Education.	• Dane County Environmental Health Department	1. 2008, then annually 2. 2008 3. Every 3 years	1. **Madison Water Utility** request that the Dane County Environmental Health Department 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. **Madison Water Utility** prepare an article for newspaper release about septic system dos and don'ts. 3. **Dane County Environmental Health Department** 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 Abandonment	• Enforce well abandonment ordinance(s) (Dane County Chapter 45, and City of Madison General Ordinance Sec. 13.21) and review new well construction. • Require proper abandonment of unused and unsafe wells. • Update well inventory in WHPA once every 5 years. • Familiarize with WI Admin. Codes, Chapters NR 141, 811, and 812.	• Wisconsin DNR • Dane County Environmental Health Department • City of Madison	1. **2008, then annually** 2. **2008, then every five years (2013)** 3. **2008** 4. **2008, then every five years** 5. **Ongoing** 6. **2008** 7. **As needed** 8. **2008**	1. **Madison Water Utility** request that the Dane County Environmental Health Department provide them the names and addresses of owners of private wells located in the Unit Well 6 WHPA. 2. **Madison Water Utility** 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. 3. **Madison Water Utility** 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. 4. **Madison Water Utility** update the private well inventory for wells located in the WHPA. 5. **City of Madison and Dane County** enforce existing well abandonment ordinances, to ensure that all private wells are permitted, or properly abandoned if unused. 6. **Madison Water Utility** request that Dane County consider proximity and depth of proposed private wells relative to Unit Well 6 prior to issuing permits for construction of new private water supply wells. 7. **Madison Water Utility** 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. 8. **Madison Water Utility** prepare newspaper article 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	• Enforce existing rules.	• Wisconsin DNR • Dane County • Madison Metropolitan Sewerage District (MMSD)	1. **2008**	1. **Madison Water Utility** provide a copy of the WHPA and recharge area maps to the MMSD and request that sludge not be spread in the Unit Well 6 recharge area equivalent to the 100-year TOT capture zone.
				2. **2008**	2. **Madison Water Utility** 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 6 recharge area equivalent to the 100-year TOT capture zone.
				3. **Ongoing**	3. **Madison Water Utility** 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. **2008**	5. **Dane County** develop regulatory program including ordinance.
	e. Spill Notification and Awareness of Remedial Investigation and Cleanup	• Monitor and keep informed of potential contamination sources in the WHPA and recharge areas. • Work with DNR to achieve investigation and cleanup of known contamination sources.	• Wisconsin DNR • Dane County Emergency Management • Wisconsin DATCP and COMM • City of Madison Fire Department	1. **2008**	1. **Madison Water Utility** 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 6 WHPA or in upgradient recharge areas.
				2. **2008, then ongoing**	2. **Madison Water Utility** 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. **2008**	3. **Madison Water Utility** provide WHPA map to DNR and request that contaminated sites located in the Unit Well 6 WHPA be carefully reviewed before being granted closure.

TABLE 5-1 (cont.)

Program Category	Activity	Description	Responsible Unit(s) of Government	Implementation Schedule	
				Date	Action Item
2. Land Use Controls	a. Existing Zoning/Wellhead Protection Overlay Zoning and Ordinance	• Enforce existing zoning. • Discourage conditional uses or zoning changes that increase risk to groundwater.	• City of Madison • Dane County Planning and Development	1. **November 2007** 2. **2008** 3. **2008**	1. **City of Madison** amend WHP ordinance and add WP-6 Wellhead Protection District No. 6. 2. **City of Madison** provide Dane County with a copy of the WHP ordinance and WHPA map. 3. **Dane County** consider developing WHP Overlay District ordinance.
3. Intergovernmental Cooperation	a. Land Use Planning and Site Plan Review	• Cooperate in land use planning to protect groundwater resources and WHPAs. • Keep appraised of development in WHPA. • Ensure development complies with separation distances between the well and potential contamination sources as required by WI Admin. Code, Chapter NR 811.16.	• City of Madison Planning and Development Department • Dane County Planning and Development Department • Village of Shorewood Hills	1. **2008** 2. **2008 – Ongoing** 3. **2008 – Ongoing** 4. **2008** 5. **2008 – Ongoing**	1. **City of Madison** provide Dane County, and the Village of Shorewood Hills with a copy of: a. The WHPP and maps showing the Unit Well 6 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. **City of Madison Planning and Development Department** ensure that development complies with separation distances required between municipal water supply wells and potential contamination sources. 3. **City of Madison** encourage the Village of Shorewood Hills, and Dane County Boards to review proposed development in the ZOCs and WHPA in their jurisdiction, with regard to Unit Well 6 recharge area. 4. **City of Madison Planning and Development Department** develop 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. **City of Madison Planning and Development Department** 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.

TABLE 5-1 (cont.)

Program Category	Activity	Description	Responsible Unit(s) of Government	Implementation Schedule	
				Date	Action Item
4. Monitoring	a. Contaminant Source Inventory (CSI) Maintenance	• Update CSI and conduct windshield survey	• Madison Water Utility	1. **April 2007, then every 5 years (April 2012)**	1. **Madison Water Utility** update the CSI by conducting a windshield survey of properties located in the WHPA and by performing State and Federal database checks.
	b. Water Quality Monitoring	• Conduct sampling of supply wells.	• Madison Water Utility	1. **As required – Ongoing** 2. **Ongoing**	1. **Madison Water Utility** perform water quality monitoring as required by DNR and as otherwise needed. 2. **Madison Water Utility** continue to post water quality data online at (http://www.madisonwater.org or http://www.cityofmadison.com/water/) for public review
5. Public Education and Awareness	a. Availability of WHPP	• Provide copies to Water Utility Office, Public Library, City Hall, Village of Shorewood Hills, and Dane County.	• City of Madison	1. **2008** 2. **2008** 3. **2008**	1. **City of Madison** provide copies of the WHPP for review by the public at the Water Utility Office, Madison Public Library, and City Hall. 2. **City of Madison** provide copies of the WHPP to the Village of Shorewood Hills, and Dane County. 3. **Madison Water Utility** communicate the availability of the plan through a newspaper article.
	b. Public Informational Meeting	• Perform as part of a City Committee meeting or Common Council Meeting.	• City of Madison	1. **2008** 2. **2008**	1. **City of Madison** 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. **City of Madison** provide WHPA maps for public review and an information sheet or brochure available for public use.
	c. News Releases	• Issue early in program implementation, and reinforce annually, as necessary.	• City of Madison	1. **2008, then annually**	1. **Madison Water Utility** will provide a news release to the local newspaper about the WHPP for Unit Well 6.

TABLE 5-1 (cont.)

Program Category	Activity	Description	Responsible Unit(s) of Government	Implementation Schedule	
				Date	Action Item
5. Public Education and Awareness (cont.)	d. Informational Materials Distributed To Residents in WHPA	• Hazardous Waste Collection (Clean Sweep) Program • Materials describing proper use and application of fertilizers and pesticides.	• City of Madison • Wisconsin DNR • University Extension Office	1. **2008, then ongoing**	1. **Madison Water Utility** 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: 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. Wellhead protection planning d. Annual Consumer Confidence Report (CCR) containing information about WHP planning.
				2. **2008**	2. **Madison Water Utility** update information in website (http://www.madisonwater.org or http://www.cityofmadison.com/water/) about WHP planning.
	e. Land Use and Contaminant Source Awareness	• Notify and offer guidance to owners of potential high risk land uses in WHPA.	• City of Madison	1. **2008**	1. **Madison Water Utility** 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: a. Leaking underground and above ground storage tanks. b. Materials describing the proper use and application of lawn fertilizers and pesticides.
	f. School Programs	• Participate in school programs.	• City of Madison • University Extension Office • Madison Public Schools	1. **2008** 2. **2008**	1. **Madison Water Utility** inform schools about the availability of tours at water supply facilities. 2. **Madison Water Utility** prepare a water/groundwater fact sheet for school education.

The Clean Sweep Collection Program is advertised using public service announcements and materials distributed by municipalities. Funding for the program is provided by a percentage of tipping fees collected at local landfills and support from the Wisconsin Department of Agriculture, Trade and Consumer Protection (DATCP). Additional information about the Clean Sweep Collection Program is in Appendix J.

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 6 recharge area are located approximately 4.5 to 5 miles south-southwest of Unit Well 6 and are located well beyond the 100-year TOT ZOC for Well 6. The sewage disposal systems are likely low risk to Unit Well 6 at the present time. Nutrient loading to groundwater is a regional concern, and it is prudent to be proactive regarding management of private sewage disposal systems.

The Dane County Human Services Department, Environmental Health Services, has an existing program for maintenance/servicing of private on-site waste disposal (septic) systems. Data for private waste disposal systems are recorded in a central database. Every three years, all owners of septic systems are required to have their septic tanks pumped and inspected and any required maintenance performed. The County charges the owners of septic systems a $26 filing fee at the time the maintenance/servicing is performed.

The 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 Dane County provide information to owners of private sewage disposal systems located within the ultimate well capture zones, 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 system dos and don'ts.

5.1.1.3 Well Abandonment

The proposed strategies 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 abandonment. One well record was found for a private well in the vicinity of Unit Well 6. The record is for a private well at the Veteran's Hospital, which is located approximately 1,000 to 1,500 feet northeast of Unit Well 6. The well is within WHPA Zone B, but is not within a Unit Well 6 ZOC.

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. Copies of the City of Madison Well Abandonment Ordinance and the Dane County ordinance "Relating to Private Water Systems" are in Appendix K. Other information about wells and well abandonment is in Appendix L.

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). Dane County sanitarians review well siting permit applications, issue permits, inspect wells after construction, and oversee the abandonment of unsafe, unused, or non-complying wells. The Dane County Health Services Division administers a County reimbursement program for abandoning these categories of wells.

The following will be completed for this management activity:

1. Madison Water Utility will request that the Dane County Environmental Health Services provide them the names and addresses of owners of private wells located in the Unit Well 6 WHPA.

2. 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.

3. Madison Water Utility will send information to property owners located within the Unit Well 6 WHPA about proper abandonment procedures in the event the property owners have unused wells on their property.

4. Every five years, Madison Water Utility will update the private well inventory for wells located in the WHPA.

5. 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.

6. Madison Water Utility will request that Dane County consider proximity and depth of proposed private wells relative to Unit Well 6 prior to issuing permits for construction of new private water supply wells.

7. Madison Water Utility will 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.

8. The Madison Water Utility will prepare a newspaper article 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 6 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 6. 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 recharge area maps to the MMSD and request that sludge and septage not be spread in the Unit Well 6 recharge area equivalent to the 100-year TOT capture zone.

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 6 recharge area equivalent to the 100-year TOT capture zone.

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 four closed LUST sites and two known historical spill sites within the Unit Well 6 WHPA. There are also two properties located within the Unit Well 6 WHPA that have contaminated soil and/or groundwater and received closure from the DNR, 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 6 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 the Unit Well 6 WHPA and request that any contaminated site(s) located in the Unit Well 6 WHPA be carefully reviewed before being granted closure.

5.1.2 Category 2 - Land Use Controls

5.1.2.1 Existing Zoning/WHP 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 6 WHPA. A copy of the WHP ordinance is in Appendix M.

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. 6.

2. The City of Madison will provide Dane County with a copy of the WHP ordinance and Unit Well 6 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 Village of Shorewood Hills with a copy of:

    a. The WHPP and maps showing the Unit Well 6 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.

3. The City of Madison will encourage the Village of Shorewood Hills to review proposed development in the ZOCs and WHPA in their jurisdiction with regard to the Unit Well 6 recharge area.

4. The City of Madison Planning and Development Department will develop 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. 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 is 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 and 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 or http://www.cityofmadison.com/water/ to look up the wells which 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 what they apply on or dispose in their land or in drains and pipes today may be what they or their neighbors drink tomorrow. 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 copies of the WHPP to Dane County and the Village of Shorewood Hills.

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 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 6 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 6, 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 UW 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 6, 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. LUSTs and ASTs

    b. 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.

During 2006, the Utility maintained water accountability in the distribution system of 94 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 N.

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 6 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 6, 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 6 provides reliable supply to the water system and fire protection for the northwest part of the City, specifically the UW Campus area and near-west neighborhoods between Randall Avenue and Glenway Street extending from Lake Mendota to Monroe Street (Madison Water Utility, 2007). In the event of the loss of Unit Well 6, other wells in Zone 6, such as Wells 14, 19, and 27, or Wells in Zone 7 could be used to 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 6 WHPA.

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 6 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, particularly because the Unit Well 6 ZOCs include property in the City of Madison and the Village of Shorewood Hills. Educational activities will provide a mutual benefit to the City of Madison and other property owners located within the WHPA and ZOCs.

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.

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 City will provide Dane County and the Village of Shorewood Hills with copies of the WHPP and maps showing the Unit Well 6 WHPA, the separation distances required between municipal water supply wells and potential contamination sources (Wisconsin Administrative Code, Chapter NR 811.16(4)(d)), and a list of potential contamination sources that can threaten groundwater. The City will encourage county and village boards to help protect the WHPA, ZOCs, and 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 6 WHPA.

TABLE 5-2
EMERGENCY CONTACT NUMBERS
WELLHEAD PROTECTION PLAN, UNIT WELL 6
MADISON, WISCONSIN

Emergency Contact	Name	Phone No.
Water Utility Emergency Service	On-call	Office: 608-266-4665
Interim Water Utility Manager	Larry Nelson	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
Village of Shorewood Hills	Village Hall	608-267-2680
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