

Wellhead and Source Water Protection Part II: Wellhead Protection Plan City of Rochester, Minnesota



February 2007

by

Todd Osweiler, RPU

&

Tony Hill, Olmsted County



Table of Contents

Public Water Supply Profile	5
Documentation List	6
Abbreviations	7
Wellhead Protection Team	8
Executive Summary.....	9
1.0 Data Elements and Assessment	11
1.1 Physical Environment Data Elements	11
1.1.1 Precipitation... ..	11
1.1.2 Geology.....	12
1.1.3 Soils.....	13
1.2.4 Water Resources.....	14
1.2 Land Use Data Elements	17
1.3. Water Quantity Data Elements	18
1.3.1 Surface Water Quantity	18
1.3.2 Groundwater Quantity	20
1.4 Water Quality Data Elements	22
1.4.1 Surface Water Quality	22
1.4.2 Groundwater Quality	23
1.5 Assessment of Data Elements.....	24
1.5.1 Use of Municipal Wells.....	24
1.5.2 Wellhead Protection Area Criteria.....	24
1.5.3 Quality and Quantity of Water Supplying the Public Water Supply Wells.....	24
1.5.4 Land and Groundwater Uses in the DWSMA.....	25
2.0 Impact of Changes on the Public Water Supply Wells	26
2.1 Potential Changes Identified.....	26
2.1.1 Physical Environment.....	26
2.1.2 Land Use	27
2.1.3 Surface Water	27
2.1.4 Groundwater.....	28
2.1.5 Administrative, Technical, and Financial Considerations	28
3.0 Issues, Problems, and Opportunities.....	30
3.1 Physical Environmental Data Elements.....	30
3.1.1 Source Water Aquifers	30
3.1.2 Groundwater Quality	30
3.1.3 Drinking Water Supply Management Areas.....	31
3.2 Public Meeting/Written Comments	32
3.3 Data Elements.....	32
3.4 Local, State, and Federal Programs/Regulations	32
4.0 Wellhead Protection Goals	34
5.0 Objectives and Plans of Action.....	35
5.1 Public Education and Community Awareness.....	36
5.2 Land Use BMPs.....	37
5.2.1 Agricultural	37
5.2.2 Urban Turf and Landscape Management	39
5.2.3 Hazardous Materials Management	40
5.2.4 Storm Water	40
5.2.5 Individual Sewage Treatment Systems (ISTS).....	42
5.2.6 Storage Tanks (AST/UST).....	43
5.2.7 Class V Wells (shallow disposal systems).....	44
5.2.8 Private Wells	44
5.2.9 Substantial Land Alterations	45
5.2.10 Spill Prevention and Response	45
5.3 Interagency Cooperation.....	46
5.4 Existing Program Assessment	48
5.5 Water Conservation	49
5.6 PCSI Evaluation	50
5.7 Future Program Needs.....	50
5.8 Inner Wellhead Management Zones.....	52
5.9 Old Municipal Wells	52
6.0 Evaluation of the WHP Program	53
7.0 Alternative Water Supply Contingency Strategy.....	54

Tables

Table 1: Rochester Annual Precipitation

Table 2: USGS Computer Model Recharge Rates & Percent Contribution of the St. Peter and Prairie du Chien Aquifers

Table 3: Wells with a Surface Water Component

Table 4: Major Impoundments in the Rochester Area

Table 5: Non-Community Water Supply Wells in the RPU Service Area

Table 6: Impaired Water in the Rochester Area

Table 7: Wells with a DWSMA Intersecting an Impaired Stream Reach

Table 8: Warmest Mean Temperature for a Year – Rochester, Minnesota

Table 9: RPU's High Vulnerable Wells

Table 10: RPU's Moderately Vulnerable Wells

Table 11: RPU's Low Vulnerable Wells

Figures

Figure 1: DWSMA Locations

Figure 2: Annual Precipitation and Gauging Station

Figure 3: Eroding Soils

Figure 4: Rochester Area Watersheds

Figure 5: Rochester Area Flood Plains

Figure 6A: Wetlands, Lakes, Rivers and Streams – Northern Rochester

Figure 6B: Wetlands, Lakes, Rivers and Streams – Southern Rochester

Figure 7: Land Use Map

Figure 8A: Rochester Zoning North

Figure 8B: Rochester Zoning South

Figure 9: Number of Private Wells in the County and their Source Water Aquifer (located in text)

Figure 10: Rochester Area Impaired Waters

Figure 11: Individual Well Priorities and Objectives

Figure 12: Summary of PCSI

Figure 13A: PCSI North Rochester Area

Figure 13B: PCSI Central Rochester Area

Figure 13C: PCSI South Rochester Area

Figure 14-41: PCSI for Individual Wells

Appendices

Appendix A: 2005 Drinking Water Consumer Confidence Report

Appendix B: Issues, Problems, and Opportunities Worksheet

Appendix C: RPU Water Emergency and Conservation Plan

Appendix D: WHP Plan Part I

Appendix E: Decorah Edge Ordinance

Appendix F: Inner Wellhead Management Zone 2006

Appendix G: Old Municipal Wells

Public Water Supply Profile

Public Water Supply

NAME: Rochester Public Utilities

ADDRESS: 4000 East River Rd. NE, Rochester, MN 55906

TELEPHONE NUMBER: (507) 280-1500

E-MAIL: webrequests@rpu.org

FAX #: (507) 280-1542

Wellhead Protection Manager

NAME: Joseph Hensel

ADDRESS: 4000 East River Road NE
Rochester, MN 55906

TELEPHONE NUMBER: (507) 280-1556

E-MAIL: jhensel@rpu.org

FAX #: (507) 280-1542

Minnesota Department of Health Planner

NAME: Art Persons, Planning Supervisor

ADDRESS: 18 Wood Lake Drive Southeast

TELEPHONE NUMBER: (507) 292-5138

E-MAIL: art.persons@health.state.mn.us

FAX #:(507) 285-7445

General Information

UNIQUE WELL NUMBER(S): 220666 (Well 11), 220833 (Well 12), 222525(Well 13), 222528(Well 15), 220822(Well 17), 220681(Well 19), 220662(Well 20), 220625v(Well 21), 220818(Well 22), 220660(Well 23), 220819(Well 24), 220675(Well 25), 147451(Well 26), 224212(Well 27), 180567(Well 28), 161425(Well 29), 239761(Well 30), 434041(Well 31), 506819(Well 32), 220627(Well 33), 463536(Well 34), 601335(Well 35), 676687(Well 37), 409455(Well 70), 219560(Well 71), 220628(Well 72), 228168(Well 73), 227649 (Well 74)

SIZE OF POPULATION SERVED: 97,000

Documentation List

Step	Date Performed
Scoping Meeting II Held: (Minn. Rules Chapter 4720.5349, subp. 1)	1/6/05
Scoping Decision Notice Received: (Minn. Rules Chapter 4720.5340, subp. 2)	2/9/05
Remaining Portion of Plan Submitted to Local Units of Government (LUG's): (Minn. Rules Chapter 4720.5350, subp. 1 & 2)	
Review Received From Local Units of Government: Minn. Rules Chapter (4720.5350, subp. 2)	
Review Considered: (Minn. Rules Chapter 4720.5350, subp. 3)	
Public Hearing Conducted: (Minn. Rules Chapter 4720.5350, subp.4)	
Remaining Portion WHP Plan Submitted: (Minn. Rules Chapter 4720.5360, subp. 1)	
Approved Review Notice Received:	

Abbreviations

AST	Above Ground Storage Tank
BMP	Best Management Practice
BWSR	Minnesota Board of Water and Soil Resources
CCR	Consumer Confidence Report
CIP	Capital Improvement Plan
CREP	Conservation Reserve Enhancement Program
CRP	Conservation Reserve Program
DNR	Minnesota Department of Natural Resources
DWSMA	Drinking Water Supply Management Area
EQIP	Environmental Quality Incentives Program
EMR	Emergency Response Plan
ERZ	Emergency Response Zone
FSA	United States Dept. of Agriculture - Farm Service Agency
HWF	Olmsted County Hazardous Waste Facility
IDDE	Illicit Discharge Detection and Elimination
ISTS	Individual Sewage Treatment System
IWMZ	Inner Well Management Zone
MDA	Minnesota Department of Agriculture
MDH	Minnesota Department of Health
MGS	Minnesota Geologic Survey
MnDOT	Minnesota Department of Transportation
MnTAP	Minnesota Technical Assistance Program
MPCA	Minnesota Pollution Control Agency
MRWA	Minnesota Rural Water Association
MS4	Municipal Separate Storm Sewer System
NPDES	Nation Pollutant Discharge Elimination System
NRCS	United States Dept. of Agriculture – Natural Resource Conservation Service
OCES	Olmsted County Environmental Services
OCPW	Olmsted County Public Works Department
PCSI	Potential Contaminant Source Inventory
RAB	Rochester Area Builders
RCTC	Rochester Community and Technical College
RFD	Rochester Fire Department
ROCPD	Rochester-Olmsted Consolidated Planning Department
RPRD	Rochester Park and Recreation Department
RPU	Rochester Public Utilities
RSD	Rochester School District 535
RWP	Rochester Public Works Department
RWRP	Rochester Water Reclamation Plant
SDWA	Safe Drinking Water Act
SEMNRB	Southeast Minnesota Water Resources Board
SWCD	Olmsted Soil and Water Conservation District
SWPPP	Storm Water Pollution Prevention Plan
TCPA	Township Cooperative Planning Association
UMES	University of Minnesota Extension Service
USGS	United States Geologic Survey
UST	Underground Storage Tank
VOC	Volatile Organic Compounds
WHP	Wellhead Protection
WHPA	Wellhead Protection Area
WHPP	Wellhead Protection Program
WHPT	Wellhead Protection Team

Wellhead Protection Team Members

Joe Hensel	Rochester Public Utilities
Todd Osweiler	Rochester Public Utilities
Greg Rowley	Rochester Public Utilities
Bill Cook	Rochester Public Utilities
Tony Hill	Olmsted County Public Works
Art Persons	Minnesota Department of Health
Justin Blum	Minnesota Department of Health
Jeff Green	Minnesota Department of Natural Resources
Terry Lee	Olmsted County Environmental Resource Services
Barb Huberty	Rochester Public Works
Denny Manning	Rochester-Olmsted Planning Department
John Harford	Rochester-Olmsted Planning Department
Justin Watkins	Minnesota Pollution Control Agency
Jim Stannard	Olmsted Soil & Water Conservation District
Jim Baier	Chairman of the Marion Township
Sandi Goslee	Rochester-Olmsted Planning Department
Robyn Hoerr	Minnesota Rural Water Association
Adam Birr	Minnesota Dept. of Agriculture

Executive Summary

Wellhead protection is a community-based approach designed to protect public drinking water supplies by managing the land surface to prevent contaminants from entering the area that contributes water to a well. The federal Safe Drinking Water Act (SDWA), as amended in 1986, established a program for States to delineate and manage wellhead protection areas (WHPAs) for the purpose of protecting groundwater from contamination. The U.S. Environmental Protection Agency (EPA) approved Minnesota's Wellhead Protection Program (WHPP) in March 1996. Minnesota's WHPP is coordinated by the Minnesota Department of Health (MDH) and regulated through Minnesota Rules Chapter 4720.5100. These regulations require the public water suppliers to: 1) determine the capture zone (wellhead protection area) of each well based on ground water flow data and other hydrogeologic information; 2) assess the vulnerability of each well to contamination; 3) inventory potential sources of contamination within each drinking water supply management area (DWSMA); and 4) develop a plan to manage and control potential sources of contamination on the landscape that are identified within the DWSMAs. The MDH separated the wellhead protection planning process into two separate phases.

Part I

Part I of the planning process involves the delineation of WHPAs and DWSMAs for each well in the public water supply system as well as an assessment of their vulnerability to potential contamination. Part II requires the creation of the wellhead protection plan itself, including goals, objectives and action items needed to protect the DWSMAs from sources of pollution spread across the landscape. Part II must also include an evaluation of the program and a contingency plan for establishing an alternative water supply in case of a major emergency to the system.

RPU completed Part I of the Wellhead and Source Water Protection Plan (the Plan) in June 2004 and received approval by the MDH in September 2004. Part I of the Plan: delineated the WHPA and DWSMA (Fig. 1) for each well in the RPU system, evaluated the vulnerability status of each source water aquifer in the area, and determined the vulnerability of each well in the municipal system. As noted in the Part I, much of the RPU public water supply system utilizes the St. Peter-Prairie du Chien-Jordan aquifer, which is considered vulnerable to contamination. The deeper aquifers in the local geologic setting, the Franconia - Ironton Galesville and Mt. Simon, are considered to have lower vulnerability ratings due to the presence of confining layers associated with these formations. For wells constructed in these low vulnerability aquifer settings and in areas with a large cumulative thickness of clay-rich deposits present in the ground surface, the MDH determined that wells located around these subsurface features have a lower chance of being contaminated than the wells drawing directly from St. Peter-Prairie du Chien-Jordan aquifer. However, because of the unique groundwater flow system in the Rochester Basin, the depth of the aquifer is not a very reliable indicator of vulnerability as is the case in other hydrogeological settings across the state. Therefore, in accordance with Minnesota Rules Chapter 4720.5550, the MDH required additional water chemistry and groundwater age dating analysis in order to further assess the vulnerability of each well in the municipal water supply system. Part I of this plan identified several wells in the system that are vulnerable to land surface contamination based on water chemistry and groundwater age dating information that was previously collected by the MDH. The MDH determined that the opposite was also true, that some wells in the RPU system presumed to be vulnerable due to their geological setting proved to contain older water and thus regarded these wells as being protected from most sources of contamination.

Part II

In accordance with Minnesota Rules Chapter 4720.5200, Part II of this plan includes the following information:

- A review and assessment of the physical data elements of the Rochester area.
- Results of the potential contaminant source inventory (PCSI) for each DWSMA.
- Identification of changes, issues, problems and opportunities related to the DWSMAs and potential contaminant sources.
- A discussion of management strategies for potential sources of pollution – including goals, objectives and action plans associated with each strategy.
- An evaluation of the wellhead and source water protection program.
- A discussion of alternative water supply contingency strategies.

Chapter 1 – Data Elements and Assessments

Provides a re-assessment of the data elements that were examined in Part I of this Plan in order to ensure appropriate management strategies were developed for each DWSMA within the RPU public water supply system.

Chapter 2 – Impact of Changes on the Public Water Supply Wells

Examines the potential changes to the physical environment, land use, water distribution, water availability, water quality, water quantity, and the overall use of water resources within the community.

Chapter 3 – Issues, Problems, and Opportunities

This chapter identifies the issues, problems, and opportunities of the Aquifer, the Well Water, and the DWSMA based upon the resource assessments outlined in Chapters 1 and 2. This information and data provides support, and a basis, for the approaches taken to protect the community's source water aquifers from contamination.

Chapter 4 – Wellhead Protection Goals

Provides a framework for determining the overall objectives of the Plan as well as defining the action items required to accomplish the program's mission.

Chapter 5 – Objectives and Plans of Actions

Identifies specific management strategies that are required to accomplish the goals of this Plan and what actions will be necessary to achieve each objective. There will be a detailed description along with a time frame and frequency of each action item.

Chapter 6 – Evaluation of the WHP Program

Provides a strategy to evaluate the progress of the Plan's implementation mechanisms, and establishes a process to evaluate the effectiveness of each WHP measure.

Chapter 7 – Alternative Water Supply Contingency Strategy

This chapter identifies the contingency strategy for addressing both short-term and long-term disruptions to the RPU public water supply system that could be caused by contamination or mechanical failures. RPU's DNR Water Emergency and Conservation Plan fulfills the requirements of Minnesota Rules Chapter 4750.5280 for this Plan.

1.0 Data Elements and Assessment

1.1 Physical Environment Data Elements

In accordance with Minnesota Rules Chapter 4720.5200, the following subsections provide an assessment of the physical data elements that relate to RPU's wellhead protection program. The purpose of this assessment is to gain a better understanding of the existing natural features that serve as the basis for developing a comprehensive wellhead protection plan for the community. These physical data elements and their properties are useful for identifying existing and potential land and water problems/conflicts to the public water supply system, and assist in providing a framework for developing management strategies for protecting the community's DWSMAs (Fig. 1).

1.1.1 Precipitation

Local precipitation data was analyzed for this Plan since determining the distribution, frequency, duration, and intensity of storm events assists to guide the management strategies that are important for protecting the community's source water aquifers (Fig. 2, table 1). A water budget model developed by the USGS for the Rochester area (Almendinger, J.E. & Delin, G.N; 1991; *Delineation of Recharge Areas for Selected Wells in the St. Peter-Prairie du Chien-Jordan Aquifer, Rochester, Minnesota*) noted that some localized precipitation infiltrates into the subsurface, and ultimately enters the source water aquifers serving RPU's public water supply system. The rate of infiltration increases in areas where the highly permeable soils/glacial deposits are present near the land surface. Due to the natural topographic conditions in the Rochester area and the potential of storm water to influence/impact the water supply aquifers, precipitation data was assessed to help guide management strategies for protecting the City of Rochester's source water aquifers from possible contamination spread across the landscape.

Table 1: Rochester Annual Precipitation

Year	Precipitation (inches)
2000	40.88
2001	40.33
2002	32.48
2003	23.34
2004	39.38
2005	33.39
2006	31.20

NOAA National Climatic Data Center – Rochester International Airport

The Rochester area is characterized as having a humid continental climate regime with mild summers to cold winters. The humid continental climate is known for its variable weather conditions due to its location within the interior of the North America continent and its position along the midlatitudes. The City of Rochester lies near the northern edge of influence of the Gulf of Mexico tropical maritime air mass, which moves warm moist air from the Gulf region into the upper Midwest. Precipitation in this humid continental climatic zone is primarily due to

the inflow of maritime tropical air from the Gulf of Mexico colliding with the yearly influential polar-type air masses from Canada. Information from the High Plains Regional Climate Center indicates that the normal annual precipitation for the Rochester area from 1948 to 2005 was 30.14 inches. Nearly 70% of this annual precipitation in the area falls during the spring and summer meteorological seasons from April to August. The winter season tends to be the driest with the month of February usually having the least amount of precipitation, averaging less than one inch of water equivalent. The average winter snowfall (measured July through June) in Rochester is 48.1 inches with a fairly even distribution from December through March. The U.S. Weather Service Data Center, located near the Rochester International Airport, has observed measurable snow amounts from early-October to as late as mid-May. In addition, data from the U.S. Weather Service Data Center indicates that annual precipitation for the Rochester area has ranged from a maximum of 43.9 inches in 1990 to a low of 11.6 inches in 1910.

1.1.2 Geology

As discussed in Part I of the Plan (Appendix D), Rochester's unique geological conditions influence the quantity and quality of the community's source water. The sedimentary bedrock formations that underlie the City contain some of the state's largest reserves of groundwater; however, due to some unique features and their location within the landscape - these formations can become easily contaminated. "The large number of wells used for public water supply and the varied geological setting over the Rochester Basin cause there to be significant differences between the vulnerability of wells in the system. The Prairie du Chien and Jordan Aquifers are generally considered to be vulnerable to contamination. Deeper aquifers, the Franconia - Ironton Galesville and Mt. Simon are considered to be not vulnerable by virtue of protective low permeability layers" (Blum, J. & Osweiler, T; June 2004; *Part I of the Wellhead Protection Plan for the City of Rochester Minnesota*). Based on the information presented in Part I, the geologic conditions within each DWSMA were considered in developing the management strategies for protecting the local source water aquifers.

Rochester, like most of central and southern Minnesota, is underlain by Paleozoic sandstones, shales and limestones that formed from sediments deposited millions of years ago when the North American continent was covered by a shallow sea. Another important geologic factor that makes the Rochester area unique is that it escaped the last glaciers of the Late Wisconsin Ice Age (over 500,000 years ago). The "driftless" region of southeast Minnesota is relatively free of glacial sediment (unlike most of Minnesota) leaving the bedrock subject to erosion. Much of the bedrock strata exposed near or at the land surface around the City is carbonate rock, which is limestone made primarily of calcite. As groundwater moves through the cracks in these carbonate rocks, it has the ability to dissolve the minerals creating fractures, fissures, conduits and sometimes even sinkholes and caves across the region. This type of landscape created on soluble rock with efficient underground drainage systems is referred to as Karst (a geological setting that has the potential to allow surface water to enter the groundwater system within a very short period of time).

The geology of the region provides for the unique topographic setting in and around the City. The Rochester area consists of scenic bluffs, steep slopes, intricate stream drainage systems, and unique environments along the hillsides that surround the City. Rochester is situated in a river valley (Rochester Basin) that was created by the South Fork Zumbro River and its associated tributaries. The Rochester Basin is surrounded by the Rochester Till Plain physiographic region of Minnesota, which is characterized by rolling till uplands and bedrock bluffs. On the edges of the Rochester Basin, the subsurface deposits generally consist of clay-rich glacial

sediments overlying older bedrock layers. Towards the center of the basin, the clay-rich glacial sediments have been removed by erosive forces over the years, and the bedrock layers tend to be mantled with thin alluvial deposits. Underlying these alluvium and glacial sediments are relatively flat-lying sedimentary bedrock layers.

The uppermost bedrock layers exposed in the Rochester area are the Galena, Decorah, Platteville and Glenwood Formations consisting of dolomitic limestone and shale. The bedrock layers found at the edges of the Rochester Basin tend to be younger than those found at the center of the basin. Underlying the Glenwood Formation is the St. Peter Sandstone. This sandstone formation is a well-sorted white to yellow quartz arenite that is not cemented and is easily eroded. The St. Peter sandstone forms the bluffs along the edges of the Rochester Basin. Beneath the St. Peter Sandstone, at the center of the basin, are light brown limestone, dolomite, and sandy dolomite sequence with karstic features that is referred to as the Prairie du Chien Group (formations beneath the Prairie du Chien Group are not exposed to the land surface in the Rochester area). Underlying the Prairie du Chien Group is the Jordan Formation, which consists of a white to yellowish quartzose sandstone. Beneath the Jordan Formation are the St. Lawrence and Franconia Formations that consist of dolomitic siltstone and shale layers underlain by very fine grained sandstone intermixed with shale. Below the St. Lawrence and Franconia Formations are the Ironton and Galesville Sandstones, the Eau Claire Formation (consisting of siltstone, shale and very fine grain sandstone) and the Mt. Simon Sandstone.

1.1.3 Soils

Soil properties and their associated characteristics were analyzed in the development of this Plan since the type as well as the pattern and location of the soil assists to guide the strategies that are important for protecting the area's water supply aquifers. The South Fork Zumbro River and its associated streams along with the "driftless" nature of glacial sediment have been the primary influences on the geomorphology and soils of the Rochester area. A soils map for Olmsted County is in our GIS and is too detailed to provide a usable figure in this plan, but is accessible by RPU staff.

Based upon the information provided in the Olmsted County Soil Survey (United States Department of Agriculture – Soil Conservation Service; March 1980; *Soil Survey of Olmsted County Minnesota*), a wide range of soil types are present in the Rochester area. These soils range from highly erodible soils situated along the hillside slopes and in the floodplains to rich-clay glacial sediments that act as confining layers overlaying the buried bedrock valleys in the western part of the County (Fig. 3). An evaluation of the Olmsted County Soil Survey found that five common soil associations exist within the City. Each of these soil associations has distinct profiles, relief characteristics, and drainage properties. Typically, a soil association consists of one or more major soils along with some minor soil types. The following major soil associations have been identified within the City of Rochester.

- The Dickinson-Plainfield-Kalmarville association consists of loamy to silty type soils that are well-to-poorly drained. This association is usually found along the outwashed terraces, foot slopes and floodplains in the Bear Creek and South Fork Zumbro River subwatersheds. Typical slopes for this association range between 0 to 30%. The Waukee-Radford-Splitville association is similar to the Dickinson-Plainfield-Kalmarville association except that it tends to be less steep (0 to 3%). The Waukee-Radford-Splitville association is typically found in the stream valleys of Willow Creek and the South Fork Zumbro River.
- The Rockton-Chanahorn-Atkinson association consists of loamy soils that are well-drained, and located on nearly level to gently sloping upland areas and the deeply, dissected

drainageways around the City. This soil association tends to be present in a loamy mantle and underlying clayey residuum located above the bedrock units. Typical slopes for this association range from 0 to 12%. This association covers the southern upland portions of Willow Creek and South Fork Zumbro River subwatersheds, and a majority of the upland areas along Bear Creek.

- The Mt. Carroll-Marlean-Arenzville association is located in areas that were formed in loess. This association includes silty, well-drained soils that are nearly level to very steep. This association is typically found in the upland areas of the City. The Mt. Carroll-Marlean-Arenzville association is deeply dissected in the narrow ravines and in the upstream areas along Cascade Creek and Silver Creek. The Timula-Port Byron association is similar to the Mt. Carroll-Marlean-Arenzville association with soils that are well drained on upland summits and drainageways. Slopes for this association typically range from 0 to 30%. The Timula-Port Byron association covers a major portion of the Kings Run subwatershed.
- The Racine-Floyd-Maxfield association consists of silty soils located in the uplands as well as along the drainageways located in the northern portions of the Bear Creek subwatershed and southern portions of the Willow Creek subwatershed. Local relief between the drainageways and upland area for this soil association is usually about 20 to 50 feet, with slopes ranging from 0 to 18%.

Evaluating the taxonomic class and location of these major soil associations assisted in further defining the soil suitability of the area, and identify possible limitations of various land uses within the City of Rochester in order to prevent contamination from entering the community's source water aquifers.

1.1.4 Water Resources

Since the hydrogeologic and surface waters (water resource) conditions of the area have the potential to influence/impact the quality and quantity of the source water aquifer, these data elements were considered in the management strategies identified in this Plan (Fig. 4). The City of Rochester is located within the South Zumbro River Watershed, which is situated in the Lower Mississippi River Basin. The South Fork Zumbro River drains a 243,000-acre watershed in Olmsted and Dodge Counties. The river flows eastward from its headwaters in Dodge County through the broadleaf forest and farmland across the Rochester Plateau into the Rochester Basin. In general, the land surface around the City of Rochester slopes towards the center of the basin and north along the South Fork Zumbro River. As the river reaches the basin, it begins to flow north to its confluences with the Middle and North Fork Zumbro Rivers near the Olmsted-Wabasha county line. As the river makes its way through the Rochester Basin, it collects surface flows from several area creeks. Seven major tributaries of the South Fork Zumbro River flow within the City of Rochester: Badger Run, Bear Creek, Cascade Creek, Hadley Creek, Kings Run, Silver Creek, and Willow Creek. Stream-discharge measurements conducted by the USGS in 1991 (Almendinger, J.E. & Delin, G.N, 1991) showed that most stream reaches in the Rochester area gain water from the groundwater system.

The hydrogeologic framework for southeastern Minnesota consists of a complex network of Paleozoic aquifers intermixed with confining beds. The near land surface aquifer in Olmsted County is referred to as the Upper Carbonate aquifer and consists of the Maquoketa-Dubuque Formations, and Galena Group limestone and dolomite bedrock layers. This Upper aquifer is somewhat defined by the local topography and land surface drainage patterns of the area. Groundwater recharge for these aquifers primarily occurs directly through infiltration, drainage into fractured bedrock, and from stream leakage. Underlying the upper aquifer is the Decorah

shale confining layer, which acts as an aquiclude (a subsurface rock, soil or sediment unit that does not yield useful quantities of water) that drastically slows the downward movement of water from the Upper aquifer to the lower aquifers. In general, the Upper aquifer recharges the lower aquifers primarily along the terminal edge of the Decorah shale. In locations where the Decorah shale confining unit has been eroded away by streams and drainages, water from the Upper Carbonate aquifer recharges directly to the lower aquifers. Underlying the Decorah shale is another series of bedrock formations that collectively form the St. Peter-Prairie du Chien-Jordan aquifer. The St. Lawrence and Franconia Formations are located beneath the St. Peter-Prairie du Chien-Jordan aquifer. These formations are characterized by low permeability and typically act as confining layers for the deeper aquifers. Underlying the St. Lawrence and Franconia confining units are the Iron-Galesville aquifer and the Eau Claire Formation which acts a confining unit for the deeper Mt. Simon aquifer. Historically, the aquifers and confining beds in the region were regarded as being fairly homogenous but recent studies by the Minnesota Geological Survey (MGS) shows an even more complex setting with many more hydraulic differences within the individual aquifer units. These recent studies by the MGS stress the need to understand the local hydrostratigraphic and hydraulic settings of the Paleozoic strata in order to increase the accuracy and usefulness of the community's wellhead protection plan.

All the water used for the Rochester municipal water supply is obtained from groundwater wells spread throughout the City. The majority of wells in the municipal water supply system draw their water primarily from the Jordan Sandstone, which is located below the Prairie du Chien Group. The hydraulic interconnection between the Prairie du Chien and Jordan Formations is such that they are considered to be one aquifer regionally, the Prairie du Chien - Jordan aquifer. In the Rochester area, the St. Peter Sandstone aquifer is also considered to be well connected to the underlying Prairie du Chien-Jordan aquifer so it was included in the groundwater flow model in Part I of this Plan as being part of the primary source water aquifer for the community. Local hydrogeologic studies performed by the USGS indicated that the shales in the overlying younger bedrock units appear to be effective confining units for the St. Peter-Prairie du Chien-Jordan aquifer. The 1991 USGS study (Almendinger, J.E. & Delin, G.N, 1991) concluded that a major area of recharge for the community's water supply aquifers occurs at the edge of these confining units, where the Decorah and Glenwood shales are exposed near the land surface. In areas around the City where these upper shale confining units are absent, the St. Peter-Prairie du Chien-Jordan aquifer is hydrologically connected to the overlying soils and thin glacial sediments. This hydrologic connection is evident in the alluvial sands and gravels located in the valleys located along the South Fork Zumbro River and the smaller tributary systems in the Rochester area. Some locations in the northwest part of the City are covered by lower permeability glacial till units, which overlay the bedrock aquifers described earlier. These glacial till units provide some hydraulic confinement and protection to the water supply aquifers at those specific locations within Rochester.

Two of the most important features that influence the area's hydrogeologic system and require specific management strategies for this Plan are the karstic terrain of the region and Decorah shale "edge effect". As describe earlier, Karst topography of the Rochester area is characterized by Paleozoic limestone and dolostone exposed at the land surface without much overlying sediment. The absence of a sediment blanket allows surface water to enter the underground drainage system more easily, making the community's water supply system more vulnerable to contamination. The other important local feature is the terminal edge of the Decorah shale confining unit (also referred to as the Decorah Edge). The Decorah Edge is defined as the area in which the Decorah, Platteville, or Glenwood formation is the first encountered bedrock. The 1991 USGS study revealed the presence of an "edge effect" or focused groundwater recharge zone for the lower aquifer system along the Decorah shale. The Decorah Edge is known for its wet slopes and a complex of woodland and wetland areas along the hillsides surrounding the

City. The USGS estimated that about half of the City’s recharge to St. Peter- Prairie du Chien-Jordan aquifer is from the Decorah Edge. In fact, the USGS water budget model for the City of Rochester identified five hydrogeologic zones with differing rates of groundwater recharge for the St. Peter-Prairie du Chien-Jordan aquifer (the primary source water aquifer for the community). The USGS model estimated that approximately 13 inches per year (in/yr) recharges the source aquifer from the zone along the Decorah shale confining unit. In addition, the computer model estimated that where the Decorah-Platteville-Glenwood confining unit is absent, recharge occurs as infiltration from precipitation at a rate of about 5 in/yr; 4.5 in/yr of recharge from the sewered area of the City; 1 in/yr enters the aquifers through the thick glacial drift that overlies the Prairie du Chien group in the bedrock valley west of Rochester; and about 0.4 in/yr from the Decorah confining unit (Table 2).

Table 2 -USGS Computer Model Recharge Rates & Percent Contribution to the St. Peter and Prairie du Chien-Jordan Aquifers.

Recharge Zone	Recharge Rate (inches/year)	Modeled Rate (inches/year)	Recharge (percent)
Edge of the Decorah Confining Unit	5-17	13	54
Prairie du Chien Group Uppermost Unit	2-6	5	26
Sewered Area of Rochester	2-6	4.5	10
Decorah Confining Unit	0-2	0.4	8
Glacial Drift	0-2.5	1	2

The South Zumbro River Watershed and the St. Peter-Prairie du Chien-Jordan aquifer are important water resource features that require the development and implementation of management strategies for protecting RPU’s drinking water system. These two natural features become intertwined due to the direct interconnection between the land surface and groundwater resources because of the area’s unique topographic terrain. Hydrogeological mapping shows that most of the water entering the City’s water supply system originates as surface water in Olmsted County. The potentiometric surface of the St. Peter-Prairie du Chien-Jordan aquifer indicates that the water entering the aquifer in the central part of the County flows toward the Rochester Basin and the South Fork Zumbro River. The area of the St. Peter-Prairie du Chien-Jordan aquifer, which underlies and serves the City, is known as the Rochester-Zumbro AQUI-shed (a hydrogeologic feature defined by the local topography as well as the regional geological setting). This aqui-shed is about 140 square miles with an approximate regional hydraulic gradient of 10 to 20 feet/mile. The boundaries of the Rochester-Zumbro AQUI-shed fall almost entirely inside the South Zumbro River Watershed with a small contributing area located northeast of the City in Whitewater River Watershed. Regional groundwater flow for the aqui-shed is towards the South Fork Zumbro River in the upland and bluff areas, and changes to a more parallel direction as flows reach the alluvial sediments near the river in the central portion of the Rochester Basin. Since there are few alternatives for obtaining drinking water in the area besides the Rochester-Zumbro AQUI-shed, extensive efforts have been made to characterize the susceptibility of this important hydrogeologic feature.

There are no natural occurring lakes in the South Zumbro River Watershed; however, several artificial lakes and reservoirs have been constructed within the river system over time. Silver Lake, located near Rochester’s downtown area, was originally developed on the South Fork Zumbro River as a reservoir for hydroelectrical power production. Three other lakes have been developed in the City as a result of aggregate mining activities: Foster Arend Lake, Bamber Lake, and Lake George. A fourth lake (Cascade Lake) is planned from a water-filled aggregate mining pit located near Cascade Creek. In addition, several large scale reservoirs were constructed in the watershed in response to a series of record floods along the South Zumbro

River from 1951 to 1978. The City of Rochester and Olmsted County initiated the South Zumbro Flood Control Project to reduce flooding in the Rochester area. The project included constructing seven flood control reservoirs along the outlying creeks in the upper reaches of the watershed (Fig. 5). These reservoirs are located along Bear Creek, Willow Creek and Silver Creek.

Wetlands were also evaluated as part of the plan since they provide a multitude of values and functions that are crucial to the local ecology and the community's water resources. The City of Rochester's Storm Water Management Plan (1999) classifies the community's wetlands into four categories, based on floral diversity/integrity and wildlife habitat criteria:

- Ecosystem support – wetlands altered by human activities but with values important to adjacent upland ecosystems or drainage to other systems;
- Natural – wetlands with generally intact remnant plant communities;
- Unique – intact wetlands with special and unusual qualities; and
- Urban – isolated wetlands that had already been significantly altered or degraded.

Most of the wetlands within the South Zumbro River Watershed are surface water-fed wetlands that are located along floodplains associated with the various creeks and rivers (Fig. 6A & 6B). Smaller groundwater-fed wetlands appear as side hill seeps adjacent to outcroppings along the Decorah Shale bedrock unit, as perched water discharge points on the glacial till plain or along outcrop edges of the till plain. The Minnesota Department of Natural Resources (DNR) has identified ten groundwater-fed wetlands as calcareous fens within Olmsted County. These fens have been classified as Outstanding Resource Value Waters (ORVW) by the State of Minnesota. Under Minnesota Rules Chapter 7050, ORVWs require a higher level of protection and are more stringently regulated than the other waters of the state due to their high quality and/or unique value as a water resource. Four of the ten calcareous fens situated in Olmsted County are located within the City of Rochester: the Airport Fen (formerly the High Forest Fen), the Mutchler Fen, the Stonehedge Fen, and the Joyce Park Fen. The Marion 8 Fen is located outside of the municipal limits but located within the City's future growth area. A 1999 assessment indicated that the City had approximately 980 acres of wetlands or about 2% of the total land area in the community's 2020 Urban Service Area.

1.2 Land Use Data Elements

Certain types of land uses (Fig. 7A & 7B) in the Rochester area could potentially influence/impact the source water aquifers. Due to this possible influence from specific land uses, a potential contaminant source inventory (PCSI) was performed within each DWSMA. Information on potential contaminant sources was obtained from the City of Rochester, Olmsted County, Olmsted Soil & Water Conservation District (SWCD), Minnesota Pollution Control Agency (MPCA), and Minnesota Department of Health (MDH). Results of this inventory indicated the presence of several potential sources of contamination within the DWSMAs. Potential contaminant sources identified as posing a high to moderate contamination risk to the source water aquifers include: feedlots, agricultural chemical (fertilizers, pesticides, herbicides) and feed/silage storage/use/retail facilities, nutrient/pesticide applications, individual sewage treatment systems, household hazardous waste, chemical mixing facilities, petroleum/chemical product distribution, above/underground storage tanks, shallow disposal systems, unused wells, salvage yards, abandoned solid waste dumps, vehicle repair facilities, pipelines, MPCA clean-up sites, stormwater, and major land alterations. All these high to moderate risk potential contaminant sources were considered in the developing the management strategies for this Plan.

Rochester is the third largest city in the state with an estimated population of 94,820 and a land

area of about 40 square miles. It is part of the state's "Population Growth Corridor" that extends from Rochester through the Minneapolis-St. Paul metropolitan area to the Central Lakes region (Cass and Crow Wing Counties) of the state. According to the Minnesota State Demographic Center, the communities in this growth corridor are expected to add over 400,000 people by 2030, a 43% population increase from 2000. Over this same thirty-year time period (2000 to 2030), it is estimated that the total population in the Rochester metropolitan area will grow by over 46,000 persons, which equates to about a 37% population increase.

This population growth in the Rochester area will produce substantial changes to the current land cover and land use patterns of the City. Minnesota Statue 462.351 enables municipalities to administer land use controls, and develop comprehensive plans that assist to guide policy decisions for a community's future land use, population growth, and infrastructure investments. The Rochester-Olmsted Consolidated Planning Department administers land use controls within the municipal limits of the community. In 2006, existing land use within the municipal limits of the City consisted of about 59% residential, 12% parks/open space, 9% commercial/industrial, 7% non-residential (i.e., medical, airport, governmental facilities, utilities, cemeteries, and places of worship), 1% farm dwellings, and 12% public right-of-way/vacant floodway lands/rivers, lakes and creeks.

Much of the land use surrounding the City is agricultural and low density suburban development (Fig. 8A & 8B). Most of the new development in the Rochester area is occurring in the former agricultural areas located adjacent to the City. Three of the inner ring townships (Cascade, Haverhill, and Rochester) surrounding the City are part of the Township Cooperative Planning Association (TCPA), which is a consortium of 13 townships in Olmsted County providing land use planning and zoning services to the suburban and exurban townships.

1.3 Water Quantity Data Elements

1.3.1 Surface Water Quantity

As discussed in Section 1.1.4 of this Plan, there appears to be areas across the local landscape where a hydraulic connection exists between surface water and the source water aquifers. Since surface waters have the potential to influence/impact the source water aquifers, this data element was considered when developing management strategies for this Plan. In fact, several wells in the RPU water supply system have been identified as having surface water components (Table 3). The hydraulic connection between the surface waters and source water aquifers is part of the reason RPU modeled and incorporated the 50-year time-of-travel (TOT) zones into this Plan. The surface water quantity data elements were incorporated into the WHP planning process for the purpose of capturing the surface water components that drain into a vulnerable DWSMA.

Table 3 - Wells with a Surface Water Component

Well Unique Number	RPU Well Number	Aquifer	Subwatershed
220666	11	Prairie du Chien – Jordan	South Zumbro River
220833	12	Jordan - Ironton Galesville	South Zumbro River
222525	13	Prairie du Chien – Jordan	South Zumbro River
222527	18	Jordan - Ironton Galesville	Cascade Creek
220681	19	Jordan - Ironton Galesville	South Zumbro River
220662	20	Prairie du Chien - Mt. Simon	South Zumbro River
220818	22	Prairie du Chien - Ironton Galesville	South Zumbro River
147451	26	Prairie du Chien – Jordan	Cascade Creek
224212	27	Prairie du Chien – Jordan	Silver Creek
180567	28	Jordan	South Zumbro River
239761	30	Jordan	Silver Creek
434041	31	Jordan	Willow Creek
506819	32	Jordan	Silver Creek

The City of Rochester has approximately 65 miles of creeks/streams and over 950 acres of surface water in the form of lakes/reservoirs, wetlands and storm water management ponds. The Rochester area has a mature, riverine dominated landscape that is characterized by a stream-dissected terrain with intricate drainage patterns. The central feature of the regional drainage system is the South Fork Zumbro River. Due to the rolling terrain, intricate drainage system and frequency of extreme precipitation events, the City of Rochester has a long history of seasonal flooding. As describe earlier, the South Zumbro Flood Control Project was initiated after a series of record floods that occurred in the area over the last several decades. In the 1980's and early 1990's, the U.S. Army Corps of Engineers, U.S. Department of Agriculture – Natural Resource Conservation Service (NRCS), Olmsted County and the City of Rochester spent over \$100 million channelizing the riverbanks within the City and constructing several flood control reservoirs in the upper reaches of the watershed.

The number of surface water impoundments around the City has increased over time. Currently, the size of the impoundments within the City of Rochester ranges from about 62 acres impounded on Silver Lake to approximately 18 acres impounded at Foster Arend Lake and Lake George. Additionally, there are over 250 stormwater management ponds located within the City limits.

Table 4 – Major Impoundments in the Rochester Area

<i>Impoundment</i>	<i>River or Stream</i>	<i>Acres of Impoundment</i>
Bamber Lake	South Zumbro	62
Cascade Lake (future lake)	Cascade Creek	~100
Foster Arend Lake	South Zumbro	18
Lake George	South Zumbro	18
Silver Lake	South Zumbro	62
KR6 – Flood Control Reservoir	Cascade Creek	29
WR6A – Flood Control Reservoir	Willow Creek	72
Mayowood Lake*	South Zumbro	44
BR1 – Chester Woods Lake*	Bear Creek	118
KR3 – Flood Control Reservoir*	Cascade Creek	25
KR7 – Flood Control Reservoir*	Cascade Creek	48
SR2 – Flood Control Reservoir*	Silver Creek	98
WR4 – Flood Control Reservoir*	Willow Creek	40

* = Located outside of the City of Rochester.

An evaluation of annual discharge measurements from the USGS gauging station located on the South Fork Zumbro River near the 37th Street Bridge indicated fairly consistent surface water flows from 1982 to 2004. Discharge data from this gauging station suggests that about 60% of the flow in the river originates as base flow while the other 40% can be attributed to runoff during storm and/or melting events.

1.3.2 Groundwater Quantity

Each day, nearly 12 million gallons of water is needed to meet the City of Rochester’s residential, commercial and industrial needs. All the water used for the Rochester municipal water supply is obtained from groundwater wells spread throughout the City. The sedimentary bedrock aquifers that underlie and serve the City’s community water supply wells have generally produced sufficient volumes of water with very few limitations. These bedrock aquifers for many thousands of years received glacial melt waters and precipitation, filling the crevices/cracks of the limestone and pore spaces of the sandstone, creating some of the largest groundwater reservoirs in the state. This large volume of groundwater contained beneath southeastern Minnesota should provide for a more than adequate quantity of water to meet the existing and near future demands of the City.

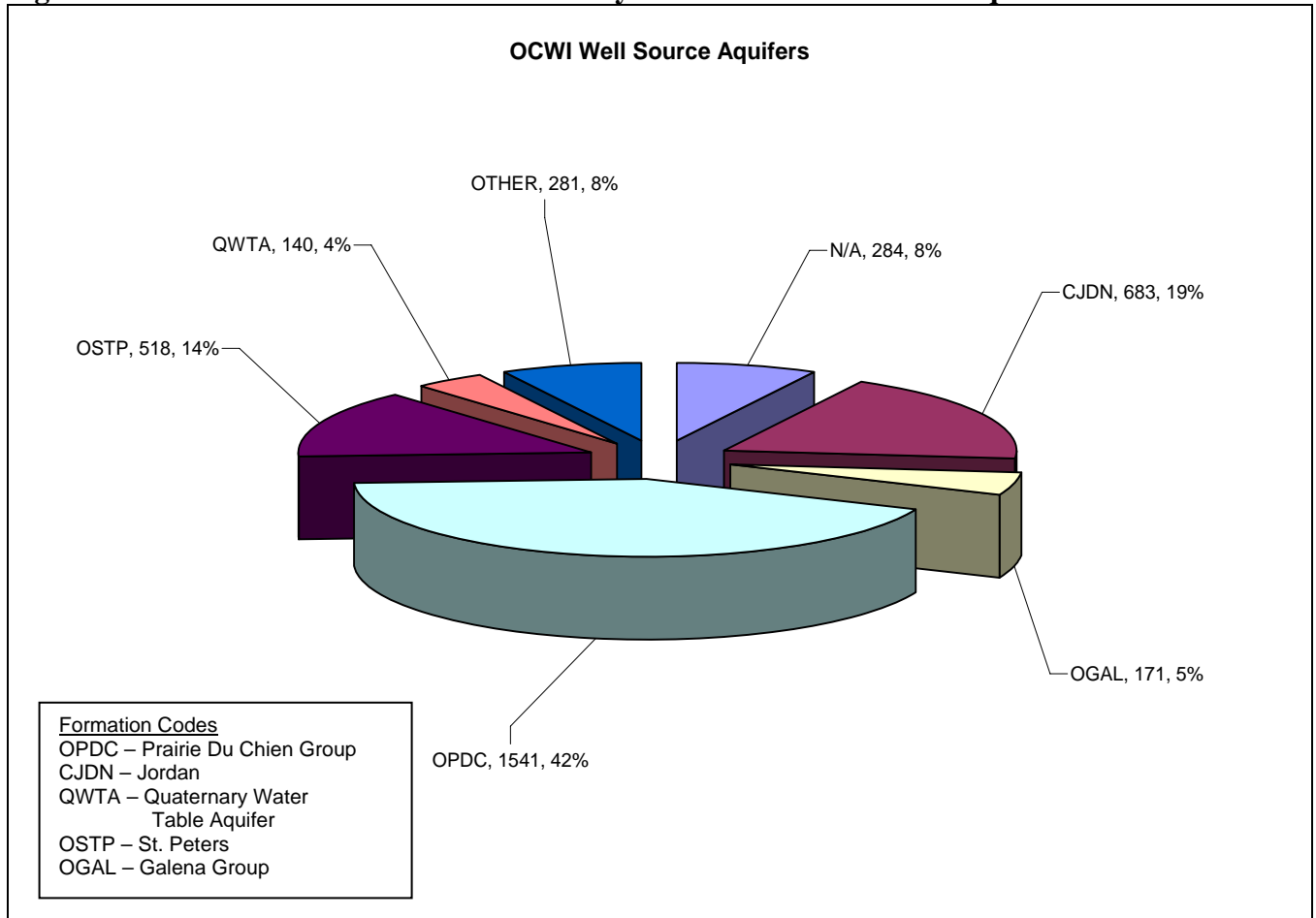
RPU currently owns and operates 28 active high capacity wells. The majority of these municipal wells are open to the Jordan aquifer; however, several are multi-aquifer wells open from the Prairie du Chien to the deeper Iron-ton Galesville and Mt. Simon aquifers. Part I of this Plan identified 24 non-community wells located within or near the RPU service area (two of the non-community wells identified in Part I have since been sealed). The majority of these non-community wells are open to the St. Peter-Prairie du Chien-Jordan aquifer (Table 5). In addition, there are about 3,500 private wells located in Olmsted County. The majority of wells listed in the Olmsted County Well Index are open to the Prairie du Chien Group (Fig. 9).

Table 5 - Non-Community Water Supply Wells in the RPU Service Area

Number	Well Owners Name	Well Unique Number	Discharge (gallons/minute)	Aquifer
1	AMPI – Well #1	228636	938	Jordan
2	AMPI – Well #2	228365	621	Jordan
3	AMPI – Well #3	233030	9	Prairie du Chien-Jordan
4	Mayo - Franklin Heating Station Well #1	220664	527	Prairie du Chien - Franconia
5	Mayo - Franklin Heating Station Well #2	220665	987	Prairie du Chien-Jordan
6	IBM	220817	177	Prairie du Chien - Eau Claire
7	Lenwood Heights	220687	21	Jordan
8	OSJOR Well Corp.	220776	17	Jordan
9	Olmsted County Well #1	220784	149	Prairie du Chien - Jordan
10	Olmsted County Well #2	220785	173	Jordan-Ironton Galesville
11	Peoples Cooperative Power Association	220629	5	Jordan
12	Rochester Welding	248438	2	Prairie du Chien
13	Seneca Food Corp.	242118	272	Prairie du Chien - Jordan
14	Rochester Golf & CC	227828	41	Prairie du Chien
15	Mayo – St. Mary’s Hospital Well	231890	530	Jordan
16	Sargent’s Landscaping Nursery, Inc.	119813	25	Jordan
17	Veolia Environmental Services (formerly Onyx)	449365	1	Jordan
18	Domaille Engineering	150217	1	Jordan
19	Quest International	228150	187	Prairie du Chien
20	Willow Creek Golf Course	120022	76	St. Peter - Prairie du Chien
21	Mathy Construction Well # 1	NA	444	Prairie du Chien
22	Mathy Construction Well # 2	NA	230	Prairie du Chien

NA = Not applicable.

Fig. 9 – Number of Private Wells in the County and their Source Water Aquifers



RPU does not anticipate that these wells or their use should significantly impact the municipal wells or the source water aquifers. Currently, there are no groundwater conflicts or interference problems between RPU and these non-community water supply wells and private wells in the Rochester area.

The placement of additional high capacity wells in the Rochester area and/or prolonged and substantial groundwater withdrawals from the source water aquifers could impact RPU’s municipal water supply system. Prolonged and substantial pumping could potentially lead to temporary or permanent decreases in groundwater levels. Because of these potential conflicts/problems, management strategies presented in this Plan includes objectives and actions that address the overall management of the community’s source water aquifers.

1.4 Water Quality Data Elements

1.4.1 Surface Water Quality

Minnesota Rules Chapter 4720.5400, subp.5, requires the inclusion of a surface water component to the wellhead protection area if the well is considered vulnerable to contamination by overland flow that is upgradient or uphill of the delineated well capture zone. As discussed earlier, several wells in the RPU public water supply system have been identified as having a surface water component. Since the quality of the local surface waters have the potential to influence/impact the source water aquifers, these data elements have been considered in the management strategies for this Plan (Fig. 10).

Several stream reaches in the Rochester area do not meet surface water quality standards that

have been established by the U.S. Environmental Protection Agency (EPA). The Minnesota Pollution Control Agency (MPCA) has listed these segments in their draft 2006 303(d) list of impaired waters (Table 6). These reaches in the City include sections of: Cascade Creek, Silver Creek, South Zumbro River, and Willow Creek. The MPCA identified these segments as being impaired due to excess fecal coliform bacteria and/or turbidity levels. The Agency is also proposing to include a fish consumption advisory for mercury on Silver Lake and Reservoir WR6A along Willow Creek. Table 7 defines the wells that are listed in Part 1 of the plan with a surface water component that intersect stream reaches which are included on the MPCA's Impaired Water and TMDL listings.

Table 6 – Impaired Waters in the Rochester Area

Stream Reach	Impaired Use	Pollutant or Stressor
Cascade Creek (Dodge County to South Zumbro River)	Aquatic Life	Turbidity
Silver Creek (80 th Avenue NE to Silver Lake)	Aquatic Life	Turbidity
South Fork Zumbro River (Hwy 63 to Cascade Creek)	Aquatic Recreation	Fecal Coliform Bacteria
South Fork Zumbro River (County Road 15 to Hwy 63)	Aquatic Life and Recreation	Turbidity and Fecal Coliform Bacteria
South Fork Zumbro River (Cascade Creek to Lake Zumbro)	Aquatic Life	Turbidity
Willow Creek (County Road 8 to Bear Creek)	Aquatic Life	Turbidity
Reservoir WR6A (Willow Creek)	Aquatic Consumption	Mercury
Silver Lake	Aquatic Consumption	Mercury

Table 7 – Wells with DWSMA Intersecting an Impaired Stream Reach

Well Unique Number	RPU Well Number	Impaired Stream Reach	Pollutant or Stressor
220666	11	South Zumbro River	Fecal Coliform
220833	12	South Zumbro River	Fecal Coliform
222525	13	South Zumbro River	Fecal Coliform
222527	18	Cascade Creek	Turbidity
220681	19	Willow Creek	Turbidity
220662	20	South Zumbro River	Fecal Coliform
147451	26	Cascade Creek	Turbidity
224212	27	Silver Creek	Turbidity
180567	28	South Zumbro River	Fecal Coliform
239761	30	Silver Creek	Turbidity
434041	31	Willow Creek	Turbidity

1.4.2 Groundwater Quality

Since several of RPU's municipal wells and the source water aquifers within the DWSMAs are classified as vulnerable to contamination, groundwater quality data elements have been considered in the management strategies for this Plan. Samples from the RPU's municipal wells and public water supply system are routinely collected and analyzed for the requirements defined

under the MDH's Public Water Supply Program and the federal SWDA. Historical water quality data has shown detections of halogenated organic compounds (primarily industrial/commercial solvents and their transformation products) in five of the municipal wells; however, the concentrations of these organic compounds were less than 10% of the EPA maximum contaminant level (MCL). At times the water supply system does contain moderately high levels of iron, calcium and magnesium. The EPA considers these contaminants to have only cosmetic or aesthetic effects in drinking water and no human health limits apply to these parameters. Recent testing of the public water supply system has shown the water from all the municipal wells to be excellent quality and the system is in compliance with all applicable state and federal rules, regulations, standards and limits. In fact, routine testing has shown that the water withdrawn from the municipal distribution system surpasses most of the standards established under the SDWA. RPU adds chlorine, fluoride, and polyphosphate to the public water supply for disinfection, public health and engineering purposes. A copy of the 2005 Drinking Water Consumer Confidence Report is provided in Appendix A.

1.5 Assessment of Data Elements

1.5.1 Use of Municipal Wells

In 2005, the City of Rochester used 4.7 billion gallons of water. The city anticipates continued residential, commercial, and industrial growth and development over the next ten years or the life of this Plan. Currently, RPU can meet the water demand for the community; however, water usage continues to increase as the City's population grows. In order to continue to meet the water demands of the growing community, RPU has been adding approximately one well ever other year. Issues related to the growth of the City of Rochester, water usage of adjacent high capacity wells, and/or a severe seasonal drought were evaluated and addressed in this Plan. General information describing the public water supply system is presented in the Source Water Assessment (SWA) found in Part I of this Plan. Additional information regarding the municipal wells is provided in Appendix C (RPU Emergency and Conservation Plan).

1.5.2 Wellhead Protection Area Criteria

Detailed information regarding the modeling and delineation of the local and regional groundwater flow in the bedrock aquifers was provided in Part I of the Wellhead Protection Plan. The WHPA delineation method and criteria for the source water aquifers were addressed and discussed in Part I. An electronic copy of Part I of the Plan is included in Appendix D.

1.5.3 Quality and Quantity of Water Supplying the Public Water Supply Well

Based on the available information, there is no know groundwater quality or quantity issues that significantly influence/impact the management of the DWSMA associated with the RPU municipal wells. The quality of water produced by RPU currently meets or exceeds standards of the Federal SDWA. VOCs have been detected at or slightly above the MDH's detection level limit the wells haven't been impacted and are sampled on a more frequent cycle. There have been no groundwater quality concerns or issues identified at this time.

The quantity of water produced by the City has increased during the last 5 years and is anticipated to continue in the future. Currently, there are no known groundwater conflicts or interference issues that have been identified within the DWSMAs regarding the use of the municipal wells or other high-capacity wells within or adjacent to the public water supply system. Although it may be a concern with the continued growth of undeveloped land inside the city limits could some day effect the rate at which the ground water recharges. These potential

issues/conflicts were evaluated and addressed in this Plan.

1.5.4 The Land and Groundwater Uses in the Drinking Water Supply Management Area

Land uses within the DWSMA's have the potential to affect source water protection efforts and management strategies for the DWSMA's. Through the PCSI process, as outlined in Section 1.2 of this Plan, it was determined that some land uses should be considered a high priority in developing the management strategies for this wellhead and source water protection plan.

Potential contaminant sources identified as posing a high to moderate contamination risk to the source water aquifers include: feedlots, agricultural chemical and feed/silage storage/use/retail (fertilizers, pesticides, herbicides), nutrient/pesticide applications, individual sewage treatment systems, household hazardous waste, chemical mixing facilities, petroleum/chemical product distribution, above/underground storage tanks, shallow disposal systems, unused wells, salvage yards, abandoned solid waste dumps, vehicle repair, pipelines, MPCA clean-up sites, stormwater, and major land alterations. Lower risk land uses which pose a lesser risk of impacting the source water aquifer and municipal wells were also identified in the PCSI process. These lower risk land uses included: salt storage facilities, hazardous waste generators, cemeteries, cement production facilities, and lumber yards. Potential contaminant sources identified as posing a high to moderate risk to the source water aquifers were addressed with specific management strategies for each DWSMA.

In Part I of the Plan, all the high-capacity wells in the area were identified. The potential hydrogeologic effects from these wells were incorporated into the delineation of the WHPAs and the delineation of the DWSMAs. Changes in the use of high capacity wells could potentially alter groundwater flow and affect the boundaries and geometry of the WHPAs and DWSMAs for the municipal wells; temporarily and or permanently lower the groundwater levels of the source water aquifers; and or cause changes in the movement and extent of the existing or future contaminant plumes in the groundwater. For these reasons, high-capacity wells have been incorporated into the management strategies of the Plan.

Wells that aren't properly maintained, damaged, poorly-constructed or unused/abandoned wells could provide a direct route for contaminants to enter the source water aquifer. Inventory of privately owned wells using the County Well Index especially those that penetrate the source water aquifer, have also been considered in the developing the management strategies for the DWSMA.

2.0 Impact of Changes on the Public Water Supply Wells

2.1 Potential Changes Identified

2.1.1 Physical Environment

Climatic conditions in the Rochester area have changed dramatically over the past century. During the last several decades, precipitation over much of the Rochester area has followed a very moist pattern. This is in stark contrast to the drier conditions of the early 20th century. In fact, precipitation in the Rochester area for the 1990's exceeded the climatological benchmark (1961-1990 normal) by a significant amount. From 1991 to 1999, southeastern Minnesota received a cumulative precipitation departure from normal in excess of 40 inches, ranking it as the wettest decade of the 20th century. This is coupled with a very wet period that existed from 1977 to 1989, which made the last 25 years of the 20th century extremely wet compared to the first three quarters of the century. Based on recent data from the National Climatic Data Center (2000 to 2004), for the Rochester area, this wetter moisture pattern seems to be continuing. Additionally, there also appears to be a greater frequency of the more intense, seasonal rain events occurring over shorter time periods as well as more multiple days with measurable precipitation. Due to the nature of region's varied climate and recent patterns of extreme drought to heavy precipitation variations, this Plan identifies specific management strategies to deal with the dynamic climate conditions of the Rochester area. In addition to experiencing a more storm intense and wetter climate, Rochester is also experiencing a warming trend (Table 8). 2006 was the second warmest year on record for the Rochester area (modern records for Rochester date back to 1886). This comes on the heels of 2005, which was the 6th warmest year on record. Climate is one of the principal factors in determining the water resources of the region. Climate strongly influences both the supply of and demand for water. Climatic factors, such as temperature, humidity, and wind, govern water loss through evaporation and transpiration. Because evaporation is likely to increase with a warmer climate, it could result in lower stream/river flow and lake levels, particularly during the summer metrological season. If stream flow and lake levels recede, groundwater (the primary source of drinking water in Rochester) also could be reduced. Higher temperatures can cause a cascading effect on the local water resources – reducing the overall supply due to evaporation/transpiration but an increase in demand for irrigation and electrical power production for cooling purposes. Furthermore, a change in the local climate/hydrologic regime could also impact the soils and geologic formations of the region by reducing moisture levels impacting the current and future land uses. Since the future of the regional climate is uncertain, management strategies were developed in this Plan to address these potential changes to the physical environment.

Table 8 – Warmest Mean Temperature for a Year – Rochester, Minnesota

Rank	Year	Average Temperature (F°)
1	1931	49.8
2	2006	47.6
3	1987	47.5
3	1998	47.5
5	1941	46.6
6	2005	46.3
7	1934	46.1
8	1949	46.0
9	1946	45.9
9	1990	45.9

2.1.2 Land Use

As describe earlier, Rochester is among the fastest growing cities in the state. Land use planning efforts by the City has focused on developing the remaining vacant lands within the community (currently about 24,000 acres); however, much of the development is occurring on the periphery - limiting the demand infill and redevelopment opportunities. As development pressure around Rochester grows, the City is expanding from its original central river basin location into the upper plateau landscape that surrounds the community. As urbanization moves up the hillsides that surround the City, it is encroaching on a unique biological and topographical area along the terminal edge of the Decorah shale. The wet slopes of the Decorah Edge provide a rich biological setting of soils, woodlands, and wetlands (Edge Wetlands) that until recently have gone mostly undisturbed. It is thought that as the water from the seeps and springs flows along the Decorah Edge that the soils and vegetation on the hillsides allows from some natural filtration of pollutants to take place before the water reaches the St. Peter-Prairie du Chien-Jordan aquifer. It should be noted that the groundwater above the Decorah, in the Galena aquifer, is often polluted and new wells in Olmsted County can no longer be developed into it due to the excessive nutrient levels in the aquifer. Disturbance of the groundwater flows and removal of the soils and vegetation along the Decorah Edge could impact the quality and quantity of the water recharging the St. Peter-Prairie du Chien-Jordan aquifer. As discussed earlier, the 1991 recharge study by the USGS (Almendinger, J.E. & Delin, G.N, 1991) for the community's source water aquifer found that about half of the City's drinking water comes from flows over the Decorah Edge. To address these development concerns, Olmsted County amended the County Wetland Conservation Ordinance (WCO) by including a Decorah Edge Overlay Zone (DEOZ) and additional Edge Wetland restrictions (Appendix E). The City of Rochester is currently in the process of adopting a similar ordinance. RPU fully supports the efforts of the County and the City to protect this important recharge area.

In addition, land cover and land use in the DWSMAs will consistently be changing and moving to higher order land use categories as the City expands. RPU will continue to review all land development plans within the City to ensure adequate measures are in place to protect the municipal drinking water supply. All anticipated major land use changes have been considered in the management strategies presented in this Plan.

2.1.3 Surface Water

The quantity of the surface water in the Rochester area will likely fluctuate based on the metrological season. The Rochester area will likely experience increases of surface water flows during the spring and summer seasons due to several factors: the current wetter climatic conditions of the area; the added impervious surface due to urbanization; and the goal of the City's Surface Water Management Plan (SWMP) to catch, store and treat more of this stormwater on the landscape. For example, in 2005, there were over 250 stormwater management ponds located throughout the community and this number will continue to increase as the community grows. The City of Rochester currently requires new developments to limit the rate of runoff from a site to pre-development conditions. The result is the construction of on-site stormwater pond(s) or the development of regional detention basins as outlined in the City's SWMP. Since much of this added surface water quantity will likely be a result of these more intense precipitation events described earlier, it is likely that a majority of this increased surface water will be captured as overland flow in the stormwater management system thus having a very limited influence/impact on the community's source water aquifers.

The quality of the surface water is anticipated to improve as more landscape management practices and

educational programs are implemented in the South Zumbro Watershed. The quality of the urban runoff should improve as the City, Olmsted County, four suburban townships (Cascade, Haverhill, Marion and Rochester), Minnesota Department of Transportation (MnDOT) District 6, and Rochester Community and Technical College (RCTC) implement their Storm Water Pollution Prevention Programs (SWPPPs). Additionally, the quality should improve as more runoff pollution prevention and stormwater treatment BMPs are installed in the urban service area and as programs/activities are instituted to delist the urban stream reaches identified in the state's Impaired Waters and TMDL program. The water quality in the suburban and rural areas of the watershed is also anticipated to improve due to the increased number of local, state and federal programs available to assist landowners with improving their land management practices. Current programs offered to landowners in the watershed include financial and technical assistance for repairs/replacements with failing septic systems, sealing unused wells, improving conservation tillage and manure management practices, installation of grassed waterways and stream fencing, streambank and wildlife restoration projects, tree/native grass planting, wetland restoration, and set aside cropland rental incentives. The quality of the water from the wells with a surface water component (RPU municipal wells: 11, 12, 13, 18, 19, 20, 22, 26, 27, 28, 30, 31, and 32) should remain high and continue to meet all federal and state standards.

2.1.4 Groundwater

RPU is anticipating the quantity and quality of the groundwater in the Rochester-Zumbro Aquifer to remain high and meet all federal and state standards. The region's demand for water is expected to increase over the next 10 years. RPU estimates that an additional 1.06 million gallons of water per day (mgd) will be needed by 2014 to meet demands of the community. In the last couple of years, two new wells have been added to the system in order to meet the growth of the City. Well #38 is located in northwest section of Rochester, and Well #39 was installed in the southwest section of the City. It is anticipated that several new wells will be installed in the next 5 years (requiring updates to this Plan). In addition, new or expanding business and industries within the City may construct additional high-capacity wells and/or increase the use of their existing wells. RPU will continue to work with these non-community public water suppliers to ensure that no water use conflicts arise. RPU will also focus efforts on insuring aquifer sustainability and implementing water conservation strategies as major components of this Plan. RPU has considered and addressed all existing and future contaminant and pollutant sources within each DWSMA.

2.1.5 Administrative, Technical, and Financial Considerations

Due to the administrative, technical, and financial management strategies developed for this Plan, the quality of the source water aquifers should remain high. This Plan will be administered by the RPU WHP Manager with cooperation from local, state, and federal regulatory agencies and cooperators listed in Chapter 5. RPU cooperative relationships with the local and state regulatory authorities since these agencies/departments are responsible for enforcing land use ordinances, zoning laws, sewer ordinances, solid waste rules, well permits, storage tank rules, groundwater appropriation permits, and NPDES permits. RPU will also work with the identified state agencies and local cooperators to incorporate the goals of this Plan into existing land and water resource programs. At a minimum, this Plan will be revised/updated every ten years, and amended as new wells are added to the municipal water supply system in accordance with Minnesota Rules Chapter 4720.5570.

A Wellhead Protection Team (WHPT) was developed for this planning process. The WHPT includes members of local and state water and land resource management agencies and departments. These entities represented on the WHPT includes: RPU, City of Rochester, Olmsted County, Township Cooperative Planning Association (TCPA), Olmsted Soil & Water Conservation District (SWCD),

Minnesota Department of Health (MDH), Minnesota Department of Agriculture (MDA), Minnesota Department of Natural Resources (DNR), Minnesota Pollution Control Agency (MPCA) and Minnesota Rural Water Association (MRWA). The mission of the WHPT is to: 1) provide guidance and technical support through all phases of Plan development process; 2) review and provide recommendations for work plan parameters; and 3) help to guide policy within their own organizations/programs in order to assist RPU with accomplishing the goals, objectives and action measures set forth in this Plan. The WHPT will meet annually in March to review whether the strategies noted for the past year were implemented and, if they were not, identify the actions needed to improve the strategies of the Plan.

In order to meet the goals of this Plan, RPU may need to place an added surcharge on each customer's water utility bill or place a special assessment per service connection. Rochester is perceived as a wealthy community but local governments continue to struggle with meeting the growing service demands of their populations. This struggle continues to escalate due to increasing infrastructure costs and demand for municipal services. Due to this sustained growth of the City, RPU anticipates on installing a new municipal well every two years for the next couple of years. Additionally, many RPU customers are concerned with the rapidly rising property taxes and increased fees due to reduced federal and state aid to the City. State funding for implementing local WHPPs is very limited, and the state has downsized many of its land and water based educational activities with the elimination of UofM Extension Service and DNR programs in the southeast Minnesota region. These rapidly increasing infrastructure costs, service demands and policy decisions at the state level add difficulty to funding and implementing new local programs.

3.0 Issues, Problems, and Opportunities

In accordance with Minnesota Rules Chapter 4720.5230, this section of the Plan discusses the water use and land use issues, problems and opportunities related to the source water aquifers, groundwater quality, the DWSMAs. Appendix B provides a listing of the issues, problems and opportunities identified by the WHPT.

3.1. Physical Environment Data Elements

3.1.1 Source Water Aquifers

Part I of this Plan classified several of the City of Rochester's source water aquifers as being vulnerable to contamination. In addition, several high-capacity wells are currently located within the RPU service area, and utilize the same source water aquifers for domestic, manufacturing and production uses. Significant increase in the use of these wells or the addition of new high-capacity wells near or within the designated DWSMAs could impact the quality of the source water and the RPU municipal water supply system. These impacts could include the alteration of the groundwater flow field, temporary or permanent reduction in groundwater elevations, adverse movement of groundwater contamination to a specific well, reduction in aquifer storage and capacity, and the alterations in the geometry, shape, and the extent of the WHPAs and the DWSMAs that were identified in Part I of this Plan. RPU will work with the DNR, MDH, MPCA, Olmsted County and other high-capacity well owners in the area to monitor groundwater elevations and evaluate annual withdraw rates in order to minimize potential water use conflicts.

Land use issues could potentially affect the management of the municipal wells and their corresponding DWSMAs. Rochester is one of the fastest growing cities in Minnesota. The annual population growth rate for the City is expected to be about 1.2% over the next five years, which equates to an increase of about 1,500 people per year. This rapid population growth will also place a higher demand for municipal water, and continue the expansion of the City into the agricultural areas adjacent to Rochester. This growth in urban development will increase the amount impervious surface in the area thus hardening the landscape reducing infiltration and groundwater levels. Reduced groundwater levels can decrease the availability of the source water aquifers to meet future water needs. RPU will work with the Rochester-Olmsted Consolidated Planning Department (ROCPD) and Township Cooperative Planning Association (TCPA) to improve the land development referral notice process within the DWSMAs; standardized the process for providing comments, guidance and recommendations for long range land use planning efforts; and develop mechanisms for creating new policies/ordinances that further regulate land uses within the DWSMAs.

3.1.2 Groundwater Quality

As previously discussed, groundwater is the main source of supplying water for residential, industrial and commercial uses in Rochester. The Karst geology of the area provides the community with abundant groundwater but it also increases the resources vulnerability to contamination. This hydrogeologic environment promotes rapid infiltration of surface water into the subsurface and conversely allows groundwater to discharge to the land surface. The Decorah Edge was also identified as a groundwater quality issue since it has been identified as a primary recharge area for the City's water supply system. It is thought that the soils and vegetation along the Decorah Edge allows for some natural filtration of pollutants to take place before the water reaches the St. Peter-Prairie du Chien-Jordan aquifer. Many of these focused groundwater recharge areas have been lost due to

development. To address these development concerns, Olmsted County amended the County Wetland Conservation Ordinance (WCO) by including a Decorah Edge Overlay Zone (DEOZ) and additional Edge Wetland restrictions (Appendix E). The City of Rochester is currently in the process of adopting a similar ordinance.

Other issues/problems that were identified related to groundwater quality included: better coordination between RPU and the local agricultural resource agencies, lack of state oversight on local ISTS inspection programs, improve coordination with state regulatory agencies, and a need to review existing local/state programs that might affect WHP planning efforts.

3.1.3 Drinking Water Supply Management Areas

Part I of this Plan identified 15 wells as being highly vulnerable to contamination (Table 9), 5 wells were classified as having a moderate level of vulnerability (Table 10), and 8 wells had a low vulnerability rating (Table 11). Part I of this Plan also defined the surface and subsurface drinking water management areas that surrounded each public water supply well in the RPU municipal system. RPU performed a PCSI to identify possible groundwater contaminant sources by

Table 9 – RPU’s Wells Classified as Highly Vulnerable Rating

Well Unique Number	RPU Well Number	Source Aquifer	First Encountered Bedrock	Aquifer Vulnerability
220666	11	Prairie du Chien-Jordan	Prairie du Chien Group	high
220833	12	Jordan-Ironton Galesville	Prairie du Chien Group	high
222525	13	Prairie du Chien-Jordan	Prairie du Chien Group	high
222528	15	Prairie du Chien-Jordan	Prairie du Chien Group	high
222527	18	Jordan-Ironton Galesville	St. Peter Sandstone	high
220681	19	Jordan-Ironton Galesville	St. Peter Sandstone	high
220662	20	Prairie du Chien-Mt. Simon	Prairie du Chien Group	high
220818	22	Prairie du Chien-Ironton Galesville	Prairie du Chien Group	high
147451	26	Prairie du Chien-Jordan	Platteville Limestone	high
224212	27	Prairie du Chien-Jordan	Prairie du Chien Group	high
180567	28	Jordan	Prairie du Chien Group	high
239761	30	Jordan	Prairie du Chien Group	high
434041	31	Jordan	St. Peter Sandstone	high
506819	32	Jordan	Decorah Shale	high
601335	35	Jordan	Prairie du Chien Group	high

Table 10 - RPU’s Wells Classified as Moderately Vulnerable Rating

Well Unique Number	RPU Well Number	Source Aquifer	First Encountered Bedrock	Aquifer Vulnerability
220822	17	Prairie du Chien-Ironton Galesville	St. Peter Sandstone	moderate
161425	29	Jordan	St. Peter Sandstone	moderate
220627	33	Jordan	Decorah Shale	moderate
463536	34	Jordan	St. Peter Sandstone	moderate
601336	36	Jordan	Prairie du Chien Group	moderate

Table 11 - RPU's Wells Classified as Low Vulnerable Rating

Well Unique Number	RPU Well Number	Source Aquifer	First Encountered Bedrock	Aquifer Vulnerability
220625	21	Jordan-Ironton Galesville	Eau Claire Formation	low
220660	23	Prairie du Chien - Ironton Galesville	Prairie du Chien Group	low
220819	24	Jordan-Ironton Galesville	Prairie du Chien Group	low
220675	25	Prairie du Chien - Ironton Galesville	Prairie du Chien Group	low
409455	70	Jordan	Decorah Shale	low
219560	71	Prairie du Chien -Jordan	Galena Group	low
220628	72	Jordan	St. Peter Sandstone	low
228168	73	Jordan	Galena Group	low

examining land use within each DWSMA as Part II of this Plan. Current land uses within the DWSMAs include: agricultural, single and multi-family residential, parks and open space, commercial and industrial, institutional, and undeveloped lands. All of these land uses have the potential to pose a risk to groundwater. The information gathered during the PCSI process allowed RPU to identify each potential source within the DWSMAs and to set in-place mechanisms to begin tracking these sources. The PCSI also provided RPU with an opportunity to catalog each potential contaminant source and to begin coordinating efforts with local planning entities to review land use changes and planning efforts within the DWSMAs. As part of development of this Plan, RPU will continue to catalog and manage the potential contaminant sources within each DWSMA, and work with the land use planning entities to stay informed on land use changes or potential threats to the source water aquifers.

3.2 Public Meetings/Written Comments

At the beginning of the wellhead protection process, RPU sent notifications to local units of government informing them of the commencement of the program. At the completion of Part I of the Plan, RPU held public meetings with the RPU Board, Olmsted County Environmental Commission and the Rochester Planning and Zoning Commission. On November 22, 2004, RPU held a public meeting to receive comments from the general public regarding Part I of this Plan. To date, RPU has not received any correspondence/communications regarding issues, problems or opportunities related to this Plan from the general public.

3.3 Data Elements

All issues, problems and opportunities related to the data elements identified by the MDH and WHPT were addressed and identified in this Plan. Furthermore, all available information was used in compiling and assessing the data elements. Data for this Plan was compiled from multiple sources including: MDH, MPCA, ROCPD, RPW, and OCES. RPU intends to continue collecting and updating data elements on a routine basis as it becomes available from state agencies and local departments. RPU will continue to collect local data as it relates to the municipal water supply system, and update the Plan if new pertinent data becomes available. RPU does not have the resources to independently collect the necessary potential contaminant source data for this Plan. RPU will continue to rely on other local and state entities to obtain the data related to the PCSI.

3.4 Local, State and Federal Programs and Regulations

One of main focuses of this Plan is public education and outreach through the use of existing local and state programs. The demographic characteristics of Rochester present several challenges to increasing

the public awareness and understanding of wellhead protection. The population of the community is very mobile. For example, according to the 2000 Census, 51% of the population moved from a different residence over the ten year reporting period, and 26% of the population moved to Rochester from outside the City. A higher proportion of these new residents include a higher portion of foreign-born immigrants with limited proficiency in English. According to the U.S. Census, 71% of the net migration to the City that has occurred since 2000 is of foreign origin. The Rochester School District estimates that it serves a student body population that speaks 52 different languages, and about 20% of the public school students speak a language other than English in their home. The 2000 Census also indicated that 31,347 (43%) of the 72,141 workers in Rochester commute from outside the City. Furthermore, Rochester also hosts over 2.5 million visitors each year. Educational activities related to this Plan will be difficult to implement and measure due to the community's diverse demographics. However, in general, RPU' education efforts should benefit from the community's highly educated work force. Since several land and water resource educational programs currently exist, RPU will focus on collaborating with local and state entities already providing these services such as: Rochester Public Works, UofM Extension Service, Olmsted County, MPCA, DNR, and MDH.

Before the start of the wellhead protection planning process, there was a lack of coordination between RPU and the local, state and federal land and water resource agencies in the region. RPU developed the WHPT to bridge this coordination gap. RPU will seek formal pledges from the cooperative entities highlighted in Chapter 5 of this Plan. WHPT did not recommend that additional regulations or ordinances be developed for the program at this time. The WHPT was confident that the majority of the local issues and problems could be addressed through existing local, state or federal programs.

Existing local, state, and federal land and water resource programs appear adequate for achieving the goals, objectives, and action items identified in this Plan. No additional issues, problems, or opportunities related to local, state, and federal programs and regulations have been identified other than those already addressed in the Plan.

4.0 Wellhead Protection Goals

RPU's Wellhead Protection Mission Statement: The overall goal is to institute a program that will provide for the protection of the municipal water supply system by preventing new risks and reducing existing threats to the city wells. Furthermore, the Wellhead Protection Program should promote the public health, safety, and general welfare, and minimize public and private losses due to contamination of the public water supply system.

Purpose of the WHP Plan: Rochester Public Utilities overall intent is to maintain two important aspects of the public water supply.

- Quality – To preserve and protect the quality and affordability of groundwater by assuring the water supply system meets state and federal drinking water standards.
- Quantity – To promote public health, economic development and community infrastructure by maintaining an adequate and efficient water supply system for all residents and businesses within the community.

RPU has identified the following program activities to achieve the goals of the WHP program:

- ◆ Public outreach and community awareness;
- ◆ Adoption and implementation of Best Management Practices (BMP's);
- ◆ Coordination and cooperation with state agencies and other local departments;
- ◆ Utilization of existing programs, processes, and regulatory controls;
- ◆ Implementation of a proactive community-wide water conservation program;
- ◆ Routine updates, data collection and evaluation of the Potential Contaminant Source Inventory (PCSI); and
- ◆ Establishing future program needs.

5.0 Objectives and Plans of Action

As discussed in Part 1 several wells were identified as being vulnerable to contamination. Fig 11 identifies the wells that are vulnerable based on Aquifer Vulnerability and also which objectives will apply to each individual well.

5.1 Public Education & Community Awareness

5.2 Land Use BMP's

5.2.1 Agricultural

5.2.2 Turf & Landscape Management

5.2.3 Hazardous Materials Management

5.2.4 Stormwater

5.2.5 Individual Sewage Treatment Systems (ISTS)

5.2.6 Storage Tanks (AST/UST)

5.2.7 Class V Wells (shallow disposal systems)

5.2.8 Private Wells

5.2.9 Major Land Alterations

5.2.10 Spill Prevention and Response

5.3 Interagency Cooperation

5.4 Existing Program Assessment

5.5 Water Conservation

5.6 PCSI Evaluation

5.7 Future Program Needs

5.8 Inner Wellhead Management Zones

5.9 Old Municipal Wells

5.1 Public Education & Community Awareness

Objective: Increase public and internal City staff awareness and general knowledge about the importance of WHP, and identify steps that individuals and businesses can take to maintain the quality and quantity of the community's drinking water.

Action 1: Continue to develop and distribute verbal, written, and visual information describing RPU's WHP Program to the general public; highlighting the various management strategies outlined in this Plan to area residents and businesses using various methods such as: bill stuffers, newsletters, fact sheets, press releases, news print articles, direct mailings, television and radio reports, posters, presentations and the RPU web site.

Source of action: RPU staff

Responsible Agency/Cooperator(s): RPW, OCES, OCPW, TCPA, MDH, DNR, and MPCA

Projected Time Frame: 2007/On-going activity

Resource Requirements: Staff time, Printing & Mailing expenses

Action Measurement: For each distribution method, record the type of audience and the number of recipients.

Action 2: Continue to promote the WHP program through community events such as the Children's Water Festival, Earth Day/Spring Thing event, the Rochester Home and Garden Show, the City's Arbor Day event, and the RNeighbors NeighborWoods and Citizen Forester programs.

Source of action: RPU staff

Responsible Agency(s): RPW, RPRD, RSD, RAB, Quarry Hill Nature Center, RNeighbors, and Maier Forest & Tree

Projected Time Frame: 2006/On-going activity

Resource Requirements: Staff time, Children's Water Festival, and Arbor Day

Action Measurement: Record each promotional event, the type of audience, number of attendees, and the number of informational documents distributed.

Action 3: Work with City, County and Township staff to develop and implement a program to train City, County and Township employees that work with materials that are potential contaminant sources to utilize appropriate practices in order to prevent or reduce water quality impacts.

Source of action: RPU staff

Responsible Agency(s): RPW, OCPW, and TCPA

Projected Time Frame: 2007/On-going activity

Resource Requirements: Staff time

Action Measurement: Record the number of employees receiving educational materials.

Action 4: Work with City and County staff to develop and implement a general informational program for the purpose of increasing employee awareness and knowledge of the WHP program.

Source of action: Coordinate w/City, County and Townships to cover WHP during

appropriate employee training.

Responsible Agency(s)/Cooperator(s): RPW and OCPW

Projected Time Frame: 2007/On-going activity

Resource Requirements: Staff time

Action Measurement: Record the number of participants

Action 5: Develop an educational program for local land developers and their engineers/consultants to inform them about the WHP program, and encourage them to incorporate land design practices that help protect groundwater resources.

Source of action: RPU staff - Work w/Rochester Area Builders to present information at local workshops and the development of articles for their newsletters.

Responsible Agency(s): RAB

Projected Time Frame: Start in 2007 and present to Rib's Developers & Commercial Builders Council meetings every other year. Annually publish WHP articles in Rib's monthly newsletters.

Resource Requirements: Staff time, costs for articles in newsletter

Action Measurement: Record the number of presentation and articles published.

5.2 Land Use BMPs

5.2.1 Agricultural

Objective: Support local agricultural resource staff in assisting landowners with implementing agricultural BMP's, and encourage the promotion of existing conservation programs to area landowners for protecting and improving the groundwater resources.

Action 1: Improve interagency coordination between RPU and the SWCD, NRCS and FSA in setting local priorities regarding conservation practices within the DWSMA's, and assist local agricultural resource staff with developing future funding requests.

Source of action: RPU staff - Assist local agricultural resource staff implementing BMP's.

Responsible Agency(s): SWCD, NRCS, and FSA

Projected Time Frame: 2009/On-going activity

Resource Requirements: Staff time

Action Measurement: Record the number of meetings and discussions with the agricultural services agencies.

Action 2: Work with Olmsted SWCD staff in developing and distributing direct mailings promoting the use of the Environmental Quality Incentives Program (EQIP), Conservation Reserve Enhancement Program (CREP), Conservation Reserve Program (CRP) and other agricultural conservation programs to landowners in the DWSMA's that are not currently enrolled in these programs. In addition, develop a process to follow up the mailings with direct personal contact from SWCD staff.

Source of action: RPU staff

Responsible Agency(s): SWCD, NRCS, MDA, and UMES

Projected Time Frame: 2009/On-going activity

Resource Requirements: Staff time, Financial assistance by RPU

Action Measurement: Record the number of recipients, number of direct contacts and

participation rates.

Action 3: Work with Olmsted SWCD staff in developing educational materials that can be used for direct mailings/newsletters or distributed at agricultural workshops and/or field demonstrations describing the challenges to protecting the local groundwater resources and the benefits of using appropriate agricultural BMP's. Topics will include: nutrient and manure management; the proper handling, storage and disposal of chemicals and fertilizers; conservation tillage practices; silage storage; crop management activities; and backflow/back siphon prevention.

Source of action: RPU staff

Responsible Agency(s): SWCD, RWRP, NRCS, MDA, UMES, and FSA

Projected Time Frame: 2009/On-going activity

Resource Requirements: Staff time, Financial assistance by RPU

Action Measurement: Record the event and number of documents distributed.

Action 4: Work with Olmsted SWCD to ensure that feedlot operators within the DWSMA's receive assistance with improving their animal waste treatment systems and incorporating appropriate BMP's.

Source of action: RPU staff

Responsible Agency(s): SWCD

Projected Time Frame: 2009/On-going activity

Resource Requirements: Staff time, Printing & mailing costs

Action Measurement: Record the number of producers in the DWSMA that the Feedlot Technician assisted.

Action 5: Mail information to local agricultural businesses, crop consultants and chemical suppliers explaining the WHP program, the importance of nutrient management planning, and appropriate measures for storing, handling and disposing of agricultural chemicals.

Source of action: RPU staff

Responsible Agency(s): Ag Cooperatives and area crop consultants

Projected Time Frame: 2009/On-going activity

Resource Requirements: Staff time, Printing & mailing costs

Action Measurement: Record the number of businesses/consultants receiving informational materials.

Action 6: Support efforts by the MDH encouraging changes to the federal Farm Bill that would allow the conservation programs to focus income support to landowners having agricultural lands in areas that have the potential to impact the local water supply, and allow alternative crop (i.e., alfalfa) payments to exceed those of traditional crop payments (i.e., corn and soybeans) within these sensitive areas.

Source of action: RPU staff

Responsible Agency(s): MDH, SWCD, NRCS, and FSA

Projected Time Frame: 2007/On-going as needed

Resource Requirements: Staff time

Action Measurement: Changes in the future Farm Bills that help reduce nutrient loading to the source water aquifers.

5.2.2 Urban Turf & Landscape Management

Objective: Encourage the safe and efficient use of fertilizer and pesticides on urban lawns and open spaces, and support landscaping practices that minimizes water, fertilizer and pesticide use.

Action 1: Work with RPW staff to develop and implement a program to increase public understanding of landscaping, gardening and turf maintenance practices that minimize water, fertilizer and pesticide use.

Source of action: RPU staff

Responsible Agency(s): RPW, MDA, and UMES

Projected Time Frame: 2008/On-going as needed

Resource Requirements: Staff time, Printing & mailing costs

Action Measurement: For each distribution method, record the type of audience and the number of recipients.

Action 2: Work with the RPU Maintenance and Grounds staff, RPRD, RPW, RSD, Recto's Horticulture Technology Program, MDA, and UMES to develop low-maintenance landscaping and turf management practices that reduce water, fertilizer and pesticide use in public open spaces within the DWSMA's.

Source of action: RPU staff

Responsible Agency(s): RPRD, RPW, RSD, RCTC, UMES, and MDA

Projected Time Frame: 2008/On-going as needed

Resource Requirements: Staff time

Action Measurement: Development of a low-maintenance and turf management program for public open spaces within the DWSMA's.

Action 3: Work with the RPU Maintenance and Grounds staff to design and install low-maintenance landscape demonstration projects at neighborhood well houses and at other RPU owned and operated facilities.

Source of action: RPU staff

Responsible Agency(s): RPU Maintenance & Grounds staff

Projected Time Frame: 2007/On-going as needed

Resource Requirements: Staff time, cost of materials

Action Measurement: Record the number of demonstration projects and success of planting over time.

Action 4: Work with the Midi's Urban Fertilizer/Pesticide BMP Specialist to develop a low impact BMP/vegetation management training program for City and County personnel that are assigned turf and landscape maintenance responsibilities.

Source of action: RPU staff

Responsible Agency(s): MDA, RPW, OCPW, and RPRD

Projected Time Frame: 2008/On-going as needed

Resource Requirements: Staff time

Action Measurement: Record the number of training sessions, topics and attendees.

5.2.3 Hazardous Materials Management

Objective: Promote the safe use and proper disposal of hazardous materials.

Action 1: Through an RPU bill insert, provide information to local households and businesses about Olmsted County's Hazardous Waste Facility (HWF).

Source of action: RPU staff
Responsible Agency(s): OCPW and RPW
Projected Time Frame: 2008/Biannual
Resource Requirements: Staff time, Printing & mailing costs
Action Measurement: Provide the number of bill inserts delivered.

Action 2: Identify hazardous waste generators located within the DWSMA's, and through direct mailings provide generators with information about the WHP program and available technical support services.

Source of action: RPU staff
Responsible Agency(s): MPCA, OCPW, and MnTAP
Projected Time Frame: 2008/Biannual
Resource Requirements: Staff time, Mailing & printing costs
Action Measurement: Record the number of hazardous waste generators contacted.

Action 3: Encourage the MPCA to strengthen their inspection/auditing process of hazardous materials located within the DWSMA's, and support efforts by the MPCA to increase the awareness of the WHP program with local hazardous waste generators.

Source of action: RPU staff
Responsible Agency(s): MPCA
Projected Time Frame: 2008/Biannual
Resource Requirements: Staff time, Mailing & printing costs
Action Measurement: Record the number of hazardous waste generators contacted.

Action 4: Work with ROCPD to study appropriate changes to City and County zoning ordinances related to WHP measures such as land use controls and new standards.

Source of action: RPU staff
Responsible Agency(s): ROCPD
Projected Time Frame: 2008/Biannual
Resource Requirements: Staff time
Action Measurement: Record the number of meetings with land use planners regarding future ordinances and policies.

5.2.4 Stormwater

Objective: Collaborate with the City of Rochester, Olmsted County, MnDOT Region 6, RCTC, Cascade Township, Haverhill Township, Marion Township, and Rochester Townships with implementing the requirements of their NPDES MS4 Phase II permits and Stormwater Pollution Prevention Programs (SWPPP) that related to groundwater resource protection.

Action 1: Develop collaborative educational programs with the Rochester Urbanizing Area (RUA) MS4 Work Group.

Source of action: RPU staff

Responsible Agency(s): RPW, OCPW, MnDOT, RCTC, Cascade Township, Haverhill Township, Marion Township, and Rochester Township

Projected Time Frame: 2007/Monthly Basis

Resource Requirements: Staff time

Action Measurement: Record the distribution method of the educational material as well as the type of audience and the number of recipients.

Action 2: Coordinate with the RPW to further develop the City's Illicit Discharge Detection and Elimination (IDDE) program within the DWSMAs.

Source of action: RPU

Responsible Agency(s): RPW

Projected Time Frame: 2008/2 year cycle

Resource Requirements: Staff time

Action Measurement: Record the number of meetings related to IDDE.

Action 3: Work with RPW to identify and evaluate existing stormwater control systems that have the potential to impact the drinking water supply system.

Source of action: RPU staff

Responsible Agency(s): RPW

Projected Time Frame: 2007/On-going activity

Resource Requirements: Staff time

Action Measurement: Record the number of meetings with RPW staff and create an electronic map identifying stormwater control systems that may impact the drinking water supply.

Action 4: Assist RPW with developing and applying policies for stormwater measures located in the DWSMAs.

Source of action: RPU staff

Responsible Agency(s): RPW

Projected Time Frame: 2007/On-going activity

Resource Requirements: Staff time

Action Measurement: Record the number of meetings with RPW staff regarding future guidelines and policies.

Action 5: Assist RPW with determining areas in the City that have the best potential for installing storm water infiltration practices.

Source of action: RPU staff

Responsible Agency(s): RPW

Projected Time Frame: 2007/On-going activity

Resource Requirements: Staff time

Action Measurement: Creation of an electronic map by RPW identifying areas with the best potential for developing stormwater infiltration BMP's.

Action 6: Assist RPW with implementing the good housekeeping measures identified in the City's SWPPP.

Source of action: RPU staff

Responsible Agency(s): RPW

Projected Time Frame: 2007/On-going activity

Resource Requirements: Staff time

Action Measurement: Record the number of meetings and development of a work plan with RPW related to the implementation of good housekeeping measures.

5.2.5 Individual Sewage Treatment Systems (ISTS)

Objective: Support state and local ISTS management efforts for improving the tracking, construction, operation, and maintenance of these systems located within the DWSMA's.

Action 1: Support efforts by the County and Townships to maintain updated information on existing systems within the DWSMA's, and encourage the enforcement of the County's ISTS Ordinance and State ISTS Rules.

Source of action: RPU staff

Responsible Agency(s): ROCPD, TCPA, and MPCA

Projected Time Frame: 2008/Biannual

Resource Requirements: Staff time

Action Measurement: Current inventory of individual sewage treatment systems and tracking enforcement actions in the DWSMA's.

Action 2: Work with the County, TCPA, and UMES to provide operation and maintenance educational materials to new and existing ISTS owners within the DWSMA's.

Source of action: RPU

Responsible Agency(s): ROCPD, TCPA, OCES, and UMES

Projected Time Frame: 2008/Biannual

Resource Requirements: Staff time

Action Measurement: For each distribution method, record the type of audience and the number of recipients.

Action 3: Support efforts to connect unsewered areas within the DWSMA's to publicly owned water reclamation facilities and encourage participation in the City of Rochester's Water Quality Protection Program.

Source of action: RPU staff

Responsible Agency(s): ROCPD, TCPA, OCES, and RPW

Projected Time Frame: 2008/Biannual

Resource Requirements: Staff time

Action Measurement: Record the number of connections of unsewered areas within the DWSMA's to community sewer systems.

Action 4: Encourage the MPCA to strengthen their oversight responsibilities of the local ISTS inspection programs within the DWSMA's.

Source of action: RPU staff
Responsible Agency(s): ROCD, MPCA, TCPA, and MDH
Projected Time Frame: 2008/Biannual
Resource Requirements: Staff time
Action Measurement: Record the number of audits performed by the MPCA.

Action 5: Support efforts to update the County's ISTS Ordinance requiring owners of individual and cluster sewage treatment systems to perform routine maintenance activities on their systems within the DWSMA's.

Source of action: RPU staff
Responsible Agency(s): ROCD, MPCA, TCPA, and MDH
Projected Time Frame: 2008/Biannual
Resource Requirements: Staff time
Action Measurement: Record the number of audits performed by the MPCA.

5.2.6 Storage Tanks (AST/UST)

Objective: Insure that owners of storage tanks within the DWSMA's adequately inspect, monitor and maintain their AST/UST's in order to prevent leaks and spills. In addition, educate tank owners on the importance of developing/maintaining adequate leak and spill response plans.

Action 1: Through direct mailings, educate all owners of regulated storage tanks within the DWSMA's about the WHP program; the need to thoroughly inspect and maintain their tanks; and the importance of having adequate leak and spill prevention plans.

Source of action: RPU
Responsible Agency(s): MPCA
Projected Time Frame: 2007/Biannual
Resource Requirements: Staff time
Action Measurement: Record the number of recipients.

Action 2: Encourage the MPCA to strengthen their inspection/auditing process for all regulated storage tanks within the DWSMA's.

Source of action: RPU staff
Responsible Agency(s): MPCA
Projected Time Frame: 2007/Biannual
Resource Requirements: Staff time
Action Measurement: Record the number of MPCA contacts within DWSMA.

Action 3: Perform an inventory of the DWSMA's that formerly contained residential fuel oil tanks and determine if adequate closure methods were utilized at the time the tanks were abandoned.

Source of action: RPU staff
Responsible Agency(s): MPCA
Projected Time Frame: 2007/Biannual
Resource Requirements: Staff time
Action Measurement: An evaluation of the DWSMA's that formerly contained residential

fuel oil tanks.

5.2.7 Class V Wells (shallow disposal systems)

Objective: Insure that all Class V Wells are identified within the DWSMA's and that the owners of these shallow disposal systems are aware of the EPA requirements.

Action 1: Perform an inventory of possible shallow disposal systems in the areas of the DWSMA's that were not covered as part of the 2005 Southeast Minnesota Water Resources Board Study for Olmsted County.

Source of action: RPU staff

Responsible Agency(s): SEMNWRB, OCES, RPW, and MDH

Projected Time Frame: 2008/Biannual

Resource Requirements: Staff time

Action Measurement: A completed inventory of possible shallow disposal systems in the areas of the DWSMA's.

Action 2: If a business is identified as having a Class V Well, educational material will be distributed to the landowner and/or business operator describing the impacts that these systems can have on the local groundwater resources, and explain the new EPA disclosure and closure requirements. The MDH Regional Planner will be notified to assist with determining the status of the shallow disposal system and help the landowner and/or business operator with the federal requirements.

Source of action: RPU staff

Responsible Agency(s): MDH

Projected Time Frame: 2008/Biannual

Resource Requirements: Staff time, Mailing & printing costs

Action Measurement: Record the number of informational documents distributed and status of the system.

5.2.8 Private Wells

Objective: Identify private wells within the DWSMA's, educate owners on proper well maintenance practices, and provide financial assistance for sealing unused wells.

Action 1: With assistance from ROCPD, ensure that the information in the PCSI on the location and ownership of all private wells within the DWSMA's is accurate.

Source of action: RPU

Responsible Agency(s): ROCPD

Projected Time Frame: 2009/Biannual

Resource Requirements: Staff Time

Action Measurement: Record the location and number of private wells in the DWSMA's.

Action 2: Through direct mailings, educate private well owners on proper well maintenance practices and promote RPU's well sealing incentive program, which provides cost sharing of 50% (up to \$1,000)

to seal unused wells within the DWSMA's.

Source of action: RPU

Responsible Agency(s): ROCPD

Projected Time Frame: 2009/Biannual

Resource Requirements: Staff Time and Cost Sharing

Action Measurement: Record the number of program participants.

5.2.9 Substantial Land Alterations

Objective: Evaluate the City's Zoning Ordinance and Land Development Manual regarding intensive/substantial land alteration activities that have the potential to impact the DWSMA's.

Action 1: Development of a technical committee to review/evaluate the City's Zoning Ordinance and Land Development Manual (Section 62.1100: Excavation Activities & Substantial Land Alterations) to determine if adequate measures are in place to protect the DWSMA's from substantial land alteration projects, mining operations and quarries..

Source of action: RPU staff

Responsible Agency(s): DNR, MDH, MPCA, MGS, USGS, RWP, OCES, OCPW, ROCPD, and TCPA

Projected Time Frame: 2009/Biannual

Resource Requirements: Staff time

Action Measurement: Prepare a technical report summarizing the impacts of substantial land alteration projects on the DWSMA's and make recommendations to the City Council and County Board based on the findings of the work group.

5.2.10 Spill Prevention and Response

Objective: Create awareness about the WHP program along major transportation and utility corridors within the DWSMA's. Protect the groundwater and public water supply wells from possible contamination from accidental spills along roads, pipelines, and railroads. Inform state and local emergency responders about the location of the DWSMA's and, if deemed necessary, request modifications to their spill response plans in order to protect the local groundwater resources.

Action 1: Post WHP signs along selected highways and roads that intersect the ERZ within vulnerable DWSMA's.

Source of action: WHP manager

Responsible Agency(s): RPW, MNDOT, and OCPW

Projected Time Frame: 2009/Biannual

Resource Requirements: Staff time, Expenses

Action Measurement: Record the location and the number of signs posted along public right-of-ways.

Action 2: Meet with highway, pipeline, and railroad spill responders as well as local traffic planners to create awareness of the DWSMA's, and work with local spill responders to ensure that adequate measures are in place for responding to spills within the DWSMA's.

Source of action: WHP manager

Responsible Agency(s): RFD, MPCA, MnDOT, OCPW, RPW, State Duty Officer, and ROCPD

Projected Time Frame: 2009/Biannual

Resource Requirements: Staff time

Action Measurement: Record the number of meetings and contacts with the state and local emergency responders.

Action 3: Identify and contact the federal and state agencies responsible for regulating the transporting of large quantities of potential contaminants, to ensure that owners/operators of railways, pipelines, and truck fleets are aware of the WHP program.

Source of action: WHP manager

Responsible Agency(s): MnDOT and MPCA

Projected Time Frame: 2009/Biannual

Resource Requirements: Staff time

Action Measurement: Record the number of meetings and contacts with MPCA and transporters.

5.3 Interagency Cooperation

Objective: Improve cooperation and coordination between RPU and local, state and federal agencies/departments that oversee and regulate programs that affect the WHP program.

Action 1: Set-up individual meetings and discussions between RPU and the directors/staff of the ROCPD and TCPA to evaluate the current land development review process within the DWSMA's.

Source of action: RPU staff

Responsible Agency(s): ROCPD and TCPA

Projected Time Frame: 2007

Resource Requirements: Staff time

Action Measurement: Evaluation of the land development review process within the DWSMA's.

Action 2: In conjunction with Action 1, improve the land development referral notice process within the DWSMA's.

Source of action: Wellhead Protection Manager

Responsible Agency(s): ROCPD and TCPA

Projected Time Frame: 2007

Resource Requirements: Staff time

Action Measurement: Establishment of an updated/formal development review process for the DWSMA's.

Action 3: Provide comments, guidance, policy recommendations to appropriate agencies for the development of long range land use and infrastructure plans, development proposals, and site plans/improvements.

Source of action: Wellhead Protection Manager

Responsible Agency(s): ROCPD and TCPA

Projected Time Frame: 2007

Resource Requirements: Staff time

Action Measurement: Establishment a standardized process to provide comments, guidance and recommendations for long range land use planning.

Action 4: Improve coordination between RPU and the ROCPD and TCPA when local jurisdictions are in the process of developing new land use policies/ordinances that could impact the WHP program.

Source of action: Wellhead Protection Manager

Responsible Agency(s): ROCPD and TCPA

Projected Time Frame: 2007

Resource Requirements: Staff time

Action Measurement: Record the number of meetings with land use plan preparers regarding future ordinances and policies.

Action 5: Work with the MPCA Wellhead Technical Advisory Team representative to set meetings/discussions with local Agency staff in programs with regulatory authority to inspect potential contaminant sources and oversee cleanup programs within the DWSMA's.

Source of action: RPU staff

Responsible Agency(s): MPCA and MDH

Projected Time Frame: 2007/On-going activity

Resource Requirements: Staff time

Action Measurement: Record the number of meetings with MPCA program staff.

Action 6: Support RPW in developing engineering standards and specifications for future utilities, grading, roads, and storm water management systems located within the Decorah Edge setting.

Source of action: RPU staff

Responsible Agency(s): RPW and ROCPD

Projected Time Frame: 2007/On-going activity

Resource Requirements: Staff time

Action Measurement: Development of engineering standards and specifications for the Decorah Edge setting.

Action 7: Support efforts by the County and TCPA to require nutrient management plans for producers and water reclamation facilities that spread fertilizers, manure, and biosolids within the DWSMAs.

Source of action: RPU staff

Responsible Agency(s): MDA, MPCA, SWCD, RWRP, ROCPD, and TCPA

Projected Time Frame: 2006

Resource Requirements: Staff time

Action Measurement: Incorporation of nutrient management plans as part of the conditional use permit for the spreading of fertilizers, manure, and biosolids in the DWSMA's by producers and water reclamation facilities.

5.4 Existing Program Assessment

Objective: Support efforts to review and evaluate local and state programs/regulations that affect the WHP program and update as needed.

Action 1: Review and evaluate the City, County and Township programs to identify existing efforts that effectively manage/limit potential contaminant sources within the DWSMA's, and, if deemed necessary, provide recommended changes to City staff and/or committees that oversee local policies/ordinances.

Source of action: WHP Manager

Responsible Agency(s): ROCPD and RPW

Projected Time Frame: 2008

Resource Requirements: Staff time

Action Measurement: Summary of existing local ordinances and programs affecting WHP.

Action 2: Encourage the MDH to coordinate with other state agencies to review and evaluate existing State rules and programs that can be used to assist state and local authorities in reducing water quality impacts to DWSMA's. Encourage MDH to publish and distribute findings.

Source of action: WHP Manager

Responsible Agency(s): MDH, DNR, MPCA, MDA, BWSR, and MnDOT

Projected Time Frame: 2009

Resource Requirements: Staff time

Action Measurement: A summary of state rules and programs affecting WHP.

Action 3: Support efforts by the DNR to gather more accurate and reliable pumping data on high capacity wells in the Rochester area, and encourage the development of an assessment to determine the impacts that these wells might have on the established DWSMA's.

Source of action: WHP Manager

Responsible Agency(s): DNR and MDH

Projected Time Frame: 2008/on going activity

Resource Requirements: Staff time

Action Measurement: An assessment of the high capacity wells in the area and their influence on the DWSMA's.

Action 4: Continue to update and evaluate water quality data by using RPU's water quality database to assist in identifying detectable contaminants that may pose risk to the municipal wells.

Source of action: WHP Manager

Responsible Agency(s): MDH

Projected Time Frame: 2008/on going activity

Resource Requirements: Staff time

Action Measurement: Report all detectable contaminants annually in RPU's Consumer Confidence Report (CCR).

5.5 Water Conservation

Objective: Continue to fund and support RPU's water conservation awareness programs, and reduce current overall water usage of 140 gallons per capita per day by 10 percent to achieve 126 gallons per capita per day 2010.

Action 1: Through bill stuffers and the RPU web site, continue to provide customers with tips for saving water in their home/business and actively encourage customers to replace high volume fixtures with low-flow devices. In addition, continue to inform customers about the use of new water-saving technologies and continue to promote RPU's low-volume washer rebate program.

Source of action: WHP Manager

Responsible Agency(s): RPU Marketing Dept.

Projected Time Frame: 2008

Resource Requirements: Staff time

Action Measurement: Record the number of bill stuffers distributed, public contacts regarding water saving technologies, and participation rates in the low-volume washer rebate program.

Action 2: Establish a working committee to review and evaluate RPU's Emergency Water Conservation Plan to determine the effectiveness of the current water conservation marketing and rebate programs. If deemed necessary, update and expand the existing programs in order to achieve the water conservation objective of this Plan.

Source of action: WHP Manager

Responsible Agency(s): RPU Marketing Dept.

Projected Time Frame: 2008/Annual review

Resource Requirements: Staff time

Action Measurement: Establishment of the working committee and review of the current conservation marketing and rebate programs.

Action 3: Work with RPU's Finance Department to develop a method to insert customer's water usage in their monthly billing statements. The illustration will compare the customer's water usage to the overall residential goal of consuming no more than 58 gallons per capita per day.

Source of action: WHP Manager

Responsible Agency(s): RPU Finance Dept. and RPU Marketing Dept.

Projected Time Frame: 2008/Annual review

Resource Requirements: Staff time

Action Measurement: Establishment of an illustration in the monthly bill statements providing customers with direct feedback of their monthly water usage.

Action 4: Review and evaluate water use information from large volume customers. Work with these customers to determine appropriate water saving retrofits and technologies in order to reduce their overall water usage.

Source of action: WHP Manager

Responsible Agency(s): DNR, MnTAP, and OCES

Projected Time Frame: 2008/Annual review

Resource Requirements: Staff time

Action Measurement: Track the number of contacts with large water use customers.

Action 5: Work with OCPW and Olmsted SWCD to enhance the existing water/environment presentation of the Ag-in-the-Classroom K-5 program by incorporating a water conservation component into the existing environmental presentation.

Source of action: WHP Manager

Responsible Agency(s): OCPW, SWCD, RSD, and UMES

Projected Time Frame: Annual

Resource Requirements: Staff time

Action Measurement: Track the number of Ag-in-the-Classroom presentations related to water conservation.

5.6 PCSI Evaluation

Objective: On a routine basis, update and validate the PCSI database.

Action 1: Review and update the PCSI on a bi-annual basis.

Source of action: WHP Manager

Responsible Agency(s): RPU GIS Specialist

Projected Time Frame: 2008

Resource Requirements: Staff Time

Action Measurement: Track and record updates.

Figure 12 shows a complete list of all PCSI within the DWSMA's. Figure 13A, 13B & 13C show the potential contaminants in the north, central & south sections of Rochester. Figure 14 thru 41 shows the potential contaminant sources for each individual wells.

5.7 Future Program Needs

Objective: Implement the actions outlined in this Plan and identify essential program needs to achieve the overall goals of the WHP program.

Action 1: Based on the action items and schedules presented in this Plan, establish an annual budget to implement the yearly activities.

Source of action: WHP Manager

Responsible Agency(s):

Projected Time Frame: 2008

Resource Requirements:

Action Measurement: Development of an annual wellhead protection budget.

Action 2: Continue to provide financial support for local groundwater studies and develop a technical committee to help establish priorities for this funding.

Source of action: WHP Manager

Responsible Agency(s): MGS, USGS, DNR, MPCA, OCES, RPW, and MDH

Projected Time Frame: 2008

Resource Requirements: \$50,000

Action Measurement: Document the funding and studies provided by RPU.

Action 3: Support and encourage the DNR and MDH in their efforts to further evaluate baseflow conditions of the local streams in order to help further define the interaction between groundwater and surface water flows in the Rochester Basin.

Source of action: WHP Manager

Responsible Agency(s): DNR and MDH

Projected Time Frame: 2008

Resource Requirements: Staff time

Action Measurement: Development of a DNR report on the baseflow conditions of the local streams and assessment of the surface water interaction with local aquifers.

Action 4: Support the development of a groundwater monitoring network in and around the City of Rochester using domestic, commercial, industrial, and observation wells for the purpose of: 1) assisting to document changes in groundwater storage over time; 2) help predict potential water quality changes; 3) evaluate responses of the hydrologic system to natural climatic variations and human-induced stresses; and 4) provide the information necessary to effectively manage the resource.

Source of action: WHP Manager

Responsible Agency(s): USGS, MGS, DNR, MDH, MPCA, and OCES

Projected Time Frame: 2008

Resource Requirements: Staff time

Action Measurement: Development of a groundwater monitoring network using a domestic, commercial, industrial, and observation wells in and around the City of Rochester.

Action 5: Set up meetings between RPU and other large appropriators in the area to discuss and address water quantity needs and issues.

Source of action: WHP Manager

Responsible Agency(s): Mayo, AMPI, Mathy Construction, Seneca, IBM, Kerry

Projected Time Frame: 2009

Resource Requirements: Staff time

Action Measurement: Record the number of meetings and topics discussed.

Action 6: Support measures to grant the DNR authority to deny water appropriation requests due to interference problems with established DWSMA's.

Source of action: WHP Manager

Responsible Agency(s): DNR and Local Legislators

Projected Time Frame: 2009

Resource Requirements: Staff time

Action Measurement: Legislation/Policy authorizing the DNR to deny a water appropriation request due to interference problems with established DWSMA's.

5.8 Inner Wellhead Management Zones

Objective: Update the IWMZs every 5 years for all public water supply wells.

Action 1: Review the current IWMZ inspection process with the RPU Water Operators to identify if any gaps exist in the current procedures, and establish a reporting system to monitor isolation distances and tracking land alteration projects within the IWMZs.

Source of action: WHP Manager

Responsible Agency(s): RPU Water Operators

Projected Time Frame: 2011/5-year cycle

Resource Requirements: Staff time

Action Measurement: An updated IWMZ inspection process with electronic mapping and reporting process.

Objective: Implement recommended WHP measures in the IWMZ's.

Action 1: Review the current IWMZ – PCSI forms located in Appendix F and implements the recommended WHP measures in the IWMZ's.

Source of action: Environmental Analyst

Responsible Agency(s): RPU Water Operators

Projected Time Frame: 2007/continue until all wells have been addressed

Resource Requirements: Staff time

Action Measurement: Update IWMZ forms when WHP measures have been addressed.

5.9 Old Municipal Wells

Objective: With the assistance of the MDH Well Management Unit Staff: 1) field verify the locations of the former city wells 2) determine what needs to be done in regards to the wells identified in the City of Rochester.

Action 1: Contact and request the assistance of the MDH Well Management Unit to assist City Staff in field verifying the locations of the former city wells in the City of Rochester. Request that the MDH Well Management Unit determine what needs to be done in relationship to the condition and status of these wells.

Source of action: WHP Manager and MDH Well Management Unit Staff

Responsible Agency(s): RPU, MDH

Projected Time Frame: 2009

Resource Requirements: Staff Time

Action Measurement: Locate and confirm the status of former public water supply wells and a determination is made regarding what may need to be done with the wells identified.

6.0 Evaluation of the WHP Program

The success of the wellhead protection plan must be routinely evaluated to determine whether the Plan is effectively accomplishing its goals and objectives.

The wellhead protection plan includes monitoring and evaluation measures to ensure implementation and determine the effectiveness of management strategies outlined in Chapter 5.

This evaluation will:

- Track the implementation of the objectives and action items identified in Chapter 5 of this Plan;
- Determine the effectiveness of specific management strategies regarding the protection of the City's water supply;
- Identify possible changes to these strategies which may improve their effectiveness; and
- Determine the adequacy of financial resources and staff availability to carry out the management strategies planned for the coming year.

The City will continue to cooperate with the Minnesota Department of Health in the annual monitoring of the City water supply to determine whether the management strategies are having a positive effect and to identify water quality problems that may arise which must be addressed.

The Wellhead Protection Team will meet annually in March to review whether the strategies noted for the past year were implemented and, if they were not, identify the actions needed to improve WHP strategies.

The Wellhead Protection Manager will present an annual report to the RPU Board to update the progress of the wellhead protection management objectives and strategies. A copy of the report will be sent to the Minnesota Department of Health Source Water Protection Unit in St. Paul, and another copy will be placed on-file in the City's Wellhead Protection file. The intent of the annual report is to compile a comprehensive evaluation of the implementation of source management strategies for use when the city's wellhead protection plan is updated.

7.0 Alternative Water Supply Contingency Strategy

Management solutions to water supply planning consist of various methods of managing and operating water systems in order to minimize costs and maximize efficiency, predictability, conservation, and emergency preparedness. An important facet of water planning is ensuring that adequate alternative sources of water will be available should there be a partial or total loss of the public water supply system as a result of a natural disaster, chemical contamination, civil disorder, or human caused disruption. In 2004, RPU completed an Emergency Management Plan (EMR) in accordance with the Public Health Security and Bioterrorism Preparedness and Response Act of 2002. The purpose of the EMR is to provide RPU personnel with emergency management information and procedures needed for responding rapidly and effectively to a disruption in the municipal water supply system. This EMR incorporates structural, management, and municipal strategies/actions for securing and protecting the system during a partial or total service emergency. Due to the information included in the EMR and the heightened security of the public water supply system, this plan is not included in this document. RPU has also prepared and submitted a Water Emergency and Conservation Plan to the DNR Division of Waters – Appropriation Permit Program (Appendix C). RPU's DNR Water Emergency and Conservation Plan fulfills the requirements of Minnesota Rules Chapter 4750.5280 for this Plan.