

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



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by

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Table of Contents

| | |
|--|-----|
| Public Water Supply Profile | i |
| Documentation List | ii |
| Abbreviations | iii |
| Wellhead Protection Team | iv |
| Executive Summary..... | v |
| | |
| 1.0 Data Elements and Assessment | 1 |
| 1.1 Physical Environment Data Elements | 1 |
| 1.1.1 Precipitation... .. | 1 |
| 1.1.2 Geology..... | 1 |
| 1.1.3 Soils..... | 3 |
| 1.2.4 Water Resources..... | 5 |
| 1.2 Land Use Data Elements | 6 |
| 1.3. Water Quantity Data Elements | 6 |
| 1.3.1 Surface Water Quantity | 8 |
| 1.3.2 Groundwater Quantity | 9 |
| 1.4 Water Quality Data Elements | 11 |
| 1.4.1 Surface Water Quality | 11 |
| 1.4.2 Groundwater Quality | 13 |
| 1.5 Assessment of Data Elements..... | 14 |
| 1.5.1 Use of Municipal Wells..... | 14 |
| 1.5.2 Wellhead Protection Area Criteria..... | 14 |
| 1.5.3 Quality and Quantity of Water Supplying the Public Water Supply Wells..... | 14 |
| 1.5.4 Land and Groundwater Uses in the DWSMA..... | 14 |
| | |
| 2.0 Impact of Changes on the Public Water Supply Wells | 16 |
| 2.1 Potential Changes Identified..... | 16 |
| 2.1.1 Physical Environment..... | 16 |
| 2.1.2 Land Use | 16 |
| 2.1.3 Surface Water | 17 |
| 2.1.4 Groundwater..... | 18 |
| 2.1.5 Administrative, Technical, and Financial Considerations | 18 |
| | |
| 3.0 Issues, Problems, and Opportunities | 20 |
| 3.1 Physical Environmental Data Elements..... | 20 |
| 3.1.1 Source Water Aquifers | 20 |
| 3.1.2 Groundwater Quality | 20 |
| 3.1.2 Drinking Water Supply Management Areas..... | 21 |
| 3.2 Public Meeting/Written Comments | 22 |
| 3.3 Data Elements..... | 23 |
| 3.4 Local, State, and Federal Programs/Regulations | 23 |
| | |
| 4.0 Wellhead Protection Goals | 24 |

Table of Contents (Cont.)

| | |
|--|----|
| 5.0 Objectives and Plans of Action..... | 24 |
| 5.1 Public Education and Community Awareness..... | 26 |
| 5.2 Land Use BMPs..... | 27 |
| 5.2.1 Agricultural... .. | 28 |
| 5.2.2 Urban Turf and Landscape Management..... | 29 |
| 5.2.3 Hazardous Materials Management..... | 30 |
| 5.2.4 Storm Water..... | 31 |
| 5.2.5 Individual Sewage Treatment Systems (ISTS)..... | 33 |
| 5.2.6 Storage Tanks (AST/UST)..... | 35 |
| 5.2.7 Class V Wells (shallow disposal systems)..... | 37 |
| 5.2.8 Private Wells..... | 40 |
| 5.2.9 Substantial Land Alterations..... | 41 |
| 5.2.10 Spill Prevention and Response..... | 42 |
| 5.3 Interagency Cooperation..... | 44 |
| 5.4 Existing Program Assessment..... | 47 |
| 5.5 Water Conservation..... | 47 |
| 5.6 PCSI Evaluation..... | 48 |
| 5.7 Future Program Needs..... | 49 |
| | |
| 6.0 Evaluation of the WHP Program..... | 51 |
| | |
| 7.0 Alternative Water Supply Contingency Strategy..... | 52 |

Tables

| |
|---|
| Table 1: USGS Computer Model Recharge Rates & Percent Contribution of the St. Peter and Prairie du Chien Aquifers |
| Table 2: Major Impoundments in the Rochester Area |
| Table 3: Non-Community Water Supply Wells in the RPU Service Area |
| Table 4: Wells with a Surface Water Component |
| Table 5: Impaired Water in the Rochester Area |
| Table 6: Wells with a DWSMA Intersecting an Impaired Stream Reach |
| Table 7: RPU's High Vulnerable Wells |
| Table 8: RPU's Moderately Vulnerable Wells |
| Table 9: RPU's Low Vulnerable Wells |

Figures

| |
|---|
| Figure 1: DWSMA Locations |
| Figure 2: Fen Map |
| Figure 3: Land Use Map |
| Figure 4: Number of Private Wells in the County and their Source Water Aquifers |

Appendices

| |
|--|
| Appendix A: 2005 Drinking Water Consumer Confidence Report |
| Appendix B: Issues, Problems, and Opportunities Worksheet |
| Appendix C: RPU Emergency and Conservation Plan |
| Appendix D: WHP Plan Part I |

Public Water Supply Profile

Public Water Supply

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General Information

UNIQUE WELL NUMBER(S): 220666, 220833, 222525, 222528, 220822, 220681, 220662, 220625, 220828, 220660, 220819, 220675, 147451, 224212, 180567, 161425, 239761, 434041, 506819, 220627, 463536, 601335, 676687, 409455, 219560, 220628, 228168, 220818

SIZE OF POPULATION SERVED: 97,000

COUNTY: Olmsted

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 (LGU'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 Recieved: | |

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 |
| E&C Plan | Emergency and Conservation Plan |
| 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 |
| SEMNRWB | 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 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 (Figure 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.

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.

The information and data contained in Chapters 1 through 3 of this Plan provide support, and a basis, for the approaches taken to address the potential contaminate sources identified during the planning process. These chapters provide the framework for the selection of the overall goals of WHPP as well as the development of the management strategies that will be incorporated to protect the DWSMAs from potential sources of contamination. RPU will be concentrating its efforts on increasing public awareness about the program; adoption of best management practices by local residents and businesses; improve coordination between local; state and federal agencies; utilize existing programs and regulatory controls; enhance water conservation efforts; and identify future program needs.

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 problems/conflicts to the public water supply system, and assist in providing a framework for developing management strategies for protecting the community's DWSMAs.

1.1.1 Precipitation

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

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 southeast Minnesota region 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. 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, is 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

Evaluating existing soil conditions in the area is not only important for gaining a better understanding of the sensitivity of each aquifer but also helps in determining future land cover and land use patterns that could impact the community's water supply system. 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.

Based upon the information provided in the Olmsted County Soil Survey, 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. 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 profile, 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-Kolmorville 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-Kolmorville 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%.

Hydric soils are defined as soils that are formed under conditions of saturation, flooding or that have experienced enough ponding during the growing season to develop anaerobic conditions in the upper soil layers. Hydric soils identified in the Rochester area include the following soil types: Garwin, Maxfield, Haverhill, and Palms. Additionally, several floodplain soils with hydric characteristics have been identified in the Rochester area including: Marshan, Kalmarville, Sawmill, Otter, Root, and Kato. Determining the locations of the hydric soil features is important since it is one of three essential characteristics for determining the existence of a wetland (along with the hydrology and hydrophytic vegetation of the site). The Olmsted County Soil Survey provides possible locations where hydric soils are likely present; however, specific site information is needed to determine the existence of a wetland.

1.1.4 Water Resources

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-Wasbasha 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, Kings Run, Silver Creek, Hadley Creek and Willow Creek. Stream-discharge measurements conducted by the USGS in 1991 (*Delineation of Recharge Areas for Selected Wells in the St. Peter-Prairie du Chien-Jordan Aquifer, Rochester, Minnesota*, G.N. Delin and J.E.

Almendinger) 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 (an aquiclude is 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 (Delin and Almendinger), 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 (it is 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 1).

Table 1 -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 Aquifer-shed (an aquifer-shed is a hydrogeologic feature defined by the local topography as well as the regional geological setting). This aquifer-shed is about 140 square miles with an approximate regional hydraulic gradient of 10 to 20 feet/mile. The boundaries of the Rochester-Zumbro Aquifer-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 aquifer-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 Aquifer-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 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. 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. Smaller groundwater-fed wetlands appear side hill seeps adjacent to outcroppings of the Decorah Shale bedrock unit or as perched water discharge points on the glacial till plain or along its outcrop edges. 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 requiring a higher level of protection and are more stringently regulated than the other waters in the state because of their high quality and/or are unique value as a water resource. Four of these calcareous fens exist within the City of Rochester: the Airport Fen (formerly the High Forest Fen), the Mutchler Fen, the Stonedhedge 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 2020 Urban Service Area.

1.2 Land Use Data Elements

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, 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. 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

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 storm water management ponds located within the City limits.

Table 2 – 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.

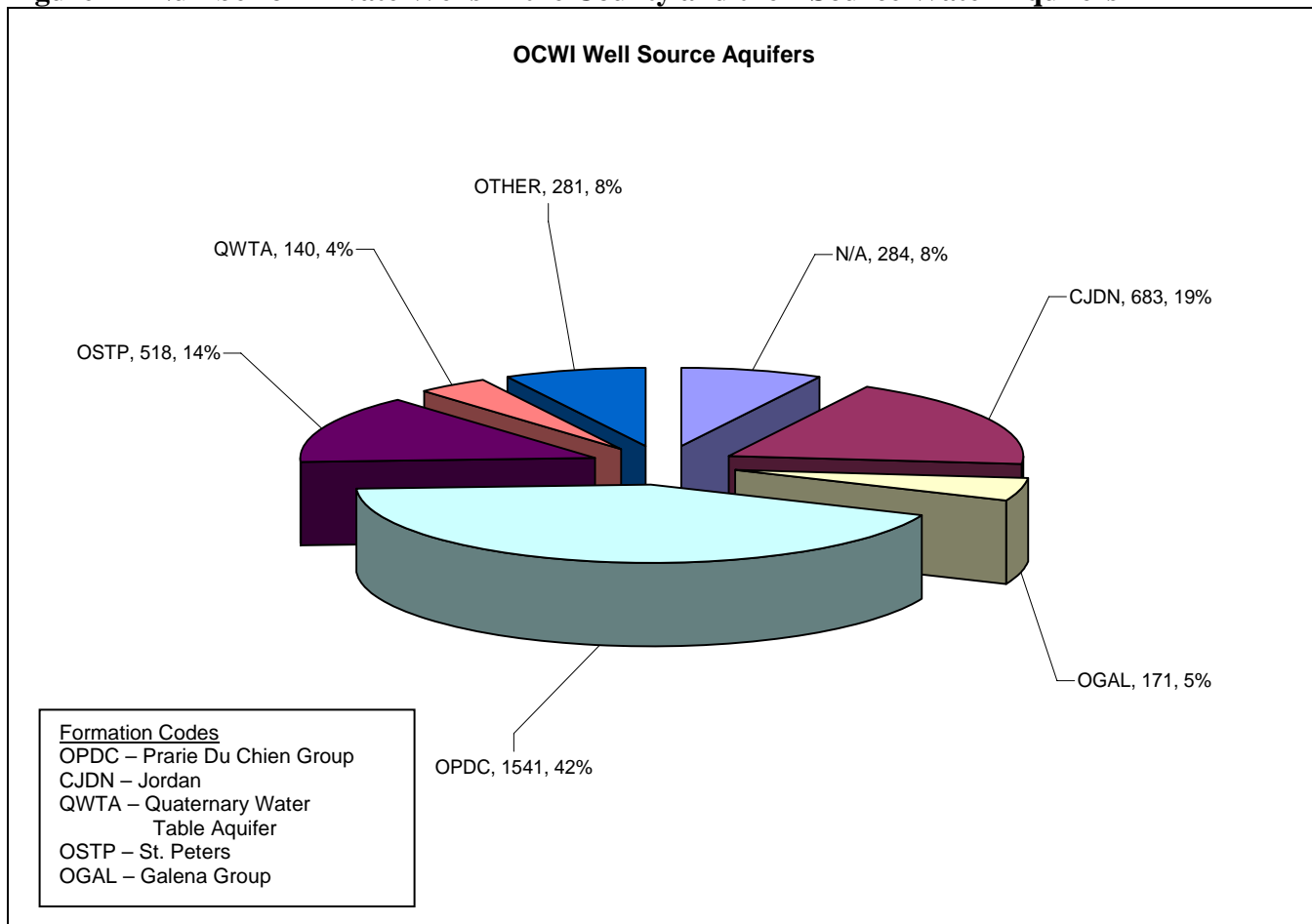
RPU currently owns and operates 28 active high capacity wells. The majority of these municipal wells are open to the Jordan aquifer; however, several are multi-aquifer wells open from the Prairie du Chien to the deeper Ironston Galesville and Mt. Simon aquifers. Part I of this Plan identified 24 non-community 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 3). 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 (Figure 1).

Table 3 - 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. Marys Hospital Well | 231890 | 530 | Jordan |
| 16 | Sargents 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.

Figure 1 – 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. Because of these potential conflicts/problems, Chapter 5 of this Plan provides specific strategies for managing quantity issues related to 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. Several wells in the RPU water supply system have been identified as having surface water components (Table 4). The 1991 USGS study (Delin and Almendinger) and a subsequent investigation by RPU in 2002, identified a couple of locations near municipal wells where the surface water lost stream flow. The USGS study found the reach of the South Fork Zumbro River near Well #11 lost stream flow during two-separate stream-gauging periods at the time the high capacity well was

pumping. In 2002, RPU conducted a gauging study along Silver Creek near Well #27. The study found that there was a loss in stream flow near the well when it was actively pumping groundwater. Furthermore, several wells in the RPU water supply system were identified in Part I of this Plan as being vulnerable based on water chemistry and ground water age dating information. This hydraulic connection between the surface waters and the aquifers serving these wells requires the wellhead protection plan to incorporate specific goals, actions and objectives for maintaining and improving the surface water contribution area (SWCA) for each of the wells identified as having a source water component.

Table 4 - 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 |

Several stream reaches in the South Zumbro River Watershed do not meet water surface water quality standards of the EPA and are listed on the Minnesota Pollution Control Agency’s (MPCA) draft 2006 303(d) list of impaired waters (Table 5). The MPCA identified several reaches of stream in the South Zumbro Watershed 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. Table 6 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 5 – 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 6 – 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

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. RPU has been adding one well approximately every other year. 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 is covered in Chapter 7 and the DNR Water 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

The quality of water produced by RPU currently meets or exceeds standards of the Federal SDWA. VOC's 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. 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.

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

There Land uses within the DWSMA's will affect source water protection efforts and management strategies for the DWSMA's. Through the potential contaminant source inventory 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.

In Part I of the Plan, high-capacity wells were identified in the area. The potential hydrogeologic effects from these wells were incorporated into the delineation of the WHPA's and the delineation of the DWSMA's. Changes in the use of high capacity wells could potentially alter groundwater flow and affect the boundaries and geometry of the WHPA's and DWSMA's 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. In addition, 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, this Plan identifies specific goals, objectives and action items for the dynamic climate conditions of the Rochester area.

The anticipated changes in the geology and soils of the area are related to the urban development patterns of the community. Additionally, the interrelationship of the land's natural features, climate, land use and built environment affect the water quality and quantity functions of the community's water resources. Changes to these physical environment features are addressed below in the Land Use section of this document.

2.1.2 Land Use

As describe earlier, Rochester is among the fastest growing cities in the state. The City's focuses is 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 system. 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 (Delin and Almendinger) 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. 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 increase due to several factors: the current wet 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. 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.

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.

Water resource changes in the community include the future development of Cascade Lake, which will be located on the western side of the City in the Cascade Creek subwatershed. Cascade Lake is anticipated to be approximately a 100-acre lake with recreational amenities such as boating, fishing and swimming. This future lake is located in the SWCA of Well #18. Since this well does have a surface component, based on the groundwater modeling performed in Part I, anticipated changes to the water resources were considered in the development of management strategies for this well.

2.1.4 Groundwater

RPU is anticipating the quantity and quality of the groundwater in the Rochester-Zumbro Aquifer to remain high. 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.

2.1.5 Administrative, Technical, and Financial Considerations

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 needs to establish 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. 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. The WHPT identified several management strategies aimed at protecting the community's source water aquifers:

- Raise awareness of the groundwater resource;
- Improve coordination between RPU and the local land use planning entities;
- Implement an active community-wide water conservation program;
- Coordinate with other local large appropriators to address water quantity needs and issues;
- Promote the use of land use best management practices;
- Utilize existing land use programs and regulatory controls;
- Promote the use of land conservation design practices;
- Work with the local MS4 communities with implementing their SWPPP; and
- Identify future research needs.

3.1.2 Groundwater Quality

Groundwater is one of the most important natural resources for the City of Rochester, supplying water for residential, industrial and commercial uses. 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. 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.

The WHPT identified several management strategies aimed at protecting the quality of the City of Rochester groundwater:

- Promote the use of best management practices;
- Continue to maintain good communication with MDH’s Drinking Water Protection Program;
- Improve coordination with local land use planning entities regarding the review of general development plans;
- Support administration/implementation of the City and County Decorah Edge Ordinances;
- Encourage efforts by state agencies to fully implement existing regulatory programs;
- Utilize existing hazardous waste management programs;
- Development of a groundwater monitoring network;
- Continue current water management services;
- Assessment of local and state programs/regulations that might affect the WHP Plan; and
- Facilitate improvements to the Rochester Groundwater Flow Model.

3.1.3 Drinking Water Supply Management Areas

Part I of this Plan identified 15 wells as being highly vulnerable to contamination (Table 7), 5 wells were classified as having a moderate level of vulnerability (Table 8), and 8 wells had a low vulnerability rating (Table 9). 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 7 – 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 | Plateville 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 8 - 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 9- 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. The WHPT identified several management strategies for the DWSMAs:

- Raise public awareness of the DWSMAs;
- Study and develop recommendations for major land alterations;
- Promote the use of best management practices;
- Expand the RPU well sealing grant program;
- Identify future program needs; and
- Develop a contingency action plan for the municipal system.

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, Rochester's citizens tend to be highly educated. Since several land and water resource educational programs currently exist, RPU will focus on collaborating with local and state entities already providing these services.

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.

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

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 Storm Water

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

6 Interagency Cooperation

7 Existing Program Assessment

8 Water Conservation

9 PCSI Evaluation

10 Future Program Needs

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, \$1,000/yr for the Children's Water Festival, \$5,000/yr for 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 RAB's Developers & Commercial Builders Council meetings every other year. Annually publish WHP articles in RAB'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, RCTC'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 MDA'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: 2007/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: 2007/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: 2007/Biannual

Resource Requirements: Staff time, Mailing & printing costs

Action Measurement: Record the number of hazardous waste generators contacted.

5.2.4 Storm Water

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 Storm Water 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 DWSMA's.

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 evaluate existing storm water control systems that have the potential to impact the drinking water supply system, and 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 potential for developing storm water infiltration BMP's.

Action 4: 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.

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: 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 4: 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 5: 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 6: 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 DWSMA's.

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. In addition, review/evaluate the current IWMZ inspection process in order to determine if any problems exist with tracking isolation distances and land alterations within these zones.

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/Bi-annual

Resource Requirements: Staff Time

Action Measurement: Track and record updates.

Action 2: 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 IWMZ's.

Source of action: WHP Manager

Responsible Agency(s): RPU Water Operators

Projected Time Frame: 2008/Bi-annual

Resource Requirements: Staff time

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

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.

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 an Emergency and Conservation (E&C) Plan to the DNR Division of Waters – Appropriation Permit Program (Appendix C). RPU's E&C Plan fulfills the requirements of Minnesota Rules Chapter 4750.5280 for this Plan.