WELLHEAD PROTECTION PLAN
FOR THE

CITY OF MEDINA

Low Vulnerable Setting

This plan is in effect from:
August 6, 2013 to August 6, 2023

Forward

This document presents the wellhead protection (WHP) plan for the City of Medina that will help provide for an adequate and safe drinking water supply for community residents. It contains the following components:

- Assessment of the data elements used to prepare the plan;
- Delineation of the wellhead protection area;
- Delineation of the drinking water supply management area;
- Assessments of well and drinking water supply management area vulnerability;
- Impact of land and water use changes on the public water supply well(s) used by the water supplier;
- Issues, problems, and opportunities affecting the well(s), well water, and the drinking water supply management area;
- Wellhead protection goals for this plan;
- Objectives and plan of action for achieving the wellhead protection goals;
- Evaluation program for assessing the effectiveness of this plan; and
- Contingency strategy to address an interruption of the water supply.

Water Supply Wells Included in This Plan

Unique Number	Well Name or Number	Use/Status[1]
208009	**Medina Morningside #1**	**P**
223378	**Medina Morningside #2**	**P**
100219	**Independence Beach #1**	**P**
448765	**Independence Beach #2**	**P**
158087	**Hamel #2**	**E**
122239	**Hamel #3**	**P**
520048	**Hamel #4**	**P**
709925	**Hamel #5**	**P**
747666	**Hamel #6**	**P**
759809	**Hamel #7**	**P**

[1]P = Primary Water Supply Well, E = Emergency Backup Well, S = Seasonal Well

WHP Plan Manager
Steve Scherer, City of Medina Public Works Director
2052 County Road 24
Medina, MN 55340

WHP Team Members
Steve Scherer, City of Medina Public Works Director
Linda Lane, City of Medina Public Works/Planning Administrative Assistant
Dusty Finke, City of Medina Planner

Written By
Linda Lane, City of Medina Public Works/Planning Administrative Assistant
Steve Scherer, City of Medina Public Works Director
Dusty Finke, City of Medina Planner

Table of Contents

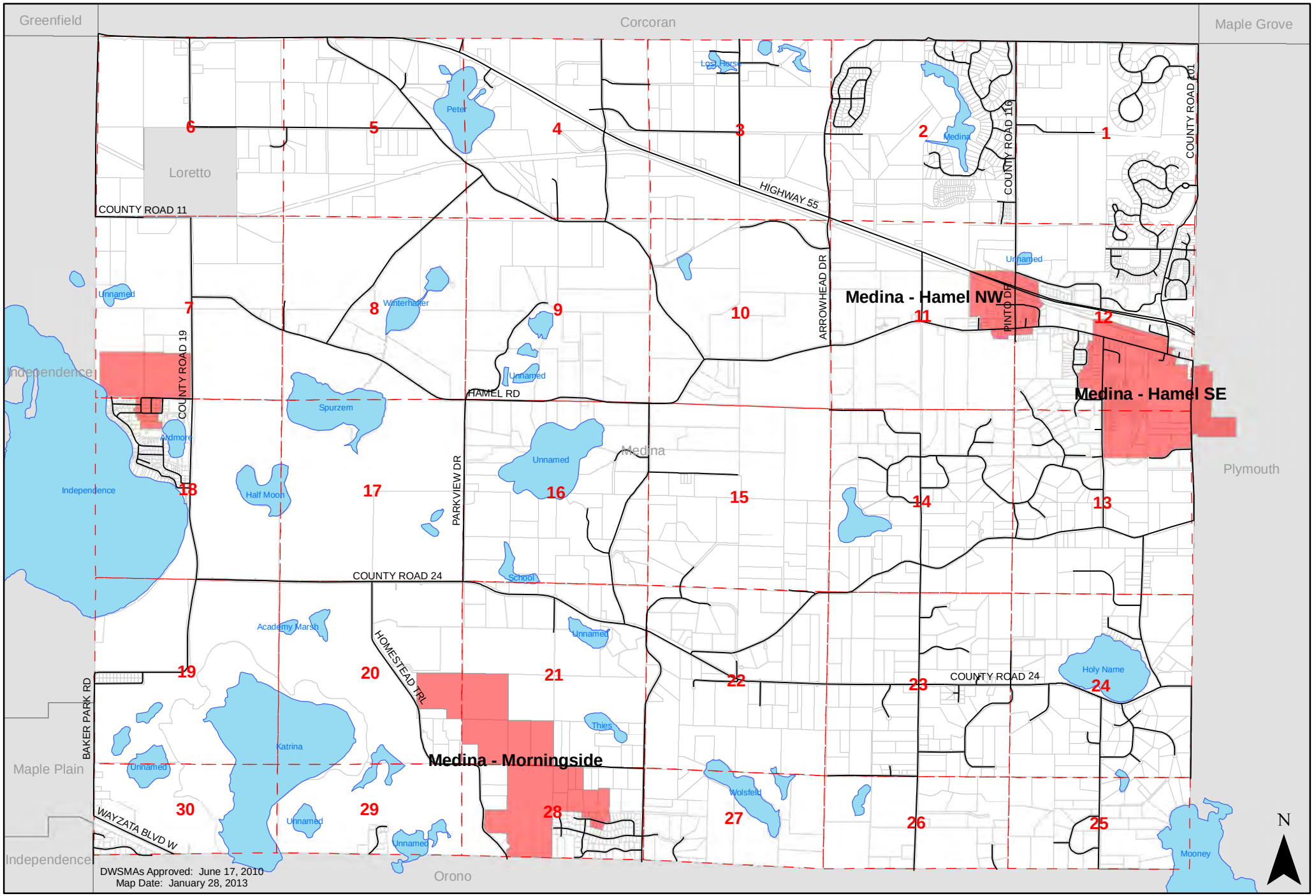
List of Figures

List of Tables

List of Appendices

Drinking Water Supply Management Areas

(Map also illustrates neighboring jurisdictions and sections within township 118, range 23)



Zoning Map

- Agricultural Preserve (AG)
- Rural Residential (RR)
- Rural Residential 1 (RR-1)
- Rural Residential 2 (RR-2)
- Rural Residential-Urban Reserve (RR-UR)
- Suburban Residential (SR)
- Urban Residential (UR)
- Multiple Family Residential (MR)
- Two Family Residential (R2)
- Mixed Use (MU)
- Uptown Hamel-1 (UH-1)
- Uptown Hamel-2 (UH-2)
- Public/Semi-Public (PS)
- Rural Public/Semi-Public (RPS)
- Business Park (BP)
- Business (B)
- Rural Business Holding (RBH)
- Industrial Park (IP)
- Commercial Highway (CH)
- Commercial Highway-Railroad (CH-RR)
- Commercial General (CG)
- Rural Commercial Holding (RCH)
- Closed Sanitary Landfill (SL)
- Planned Unit Development (PUD)

Please contact the Planning Department (763-473-4643) for more information regarding property within PUDs (Planned Unit Developments)

Map Updated: May 17, 2011

0 0.25 0.5 0.75 1 Miles

Map 5-1
Existing Land Use

2007 Existing Land Use

- Agriculture
- Rural Residential
- Single Family Large Lot
- Single Family Small Lot
- Multi-Family Res
- Commercial
- Industrial
- Public/Semi-Public
- Open Space
- Parks and Recreation
- Private Recreation
- ROW
- Undeveloped Land

*This map is not perfectly precise. Actual boundaries may vary, and should be field verified.

Adopted: November 17, 2009
Parcel current as of October 2006
UTM, Zone 15N, NAD 83

Scale: 1:30,000

Mile
0 0.25 0.5 1

Map 5-2
Future Land Use Plan

MEDINA

Guide Plan

- Rural Residential
- Agriculture
- Developing-Post 2030
- Low Density Res 2.0 - 3.49 U/A
- Medium Density Res 3.5 - 6.99 U/A
- High Density Res 7 - 30 U/A
- Mixed Use 3.5 - 6.99 U/A
- Mixed Use - Business 7 - 45 U/A
- Commercial
- General Business
- Industrial Business
- Private Recreation (PREC)
- Parks and Recreation
- P-R - State or Regional
- Open Space
- Public Semi-Public 0 U/A
- Closed Sanitary Landfill
- Right-of-Way

*This map is not perfectly precise. Actual boundaries may vary, and should be field verified.

Map Updated: 2-23-2012
Last Amended: May 17, 2011
Adopted: November 17, 2009

Parcel data current as of October 2006
UTM, Zone 15N, NAD 83

Scale: 1:30,000

Miles
0 0.25 0.5 1

Chapter 1 - Introduction

1.1 Background

The Wellhead Protection plan (WHP) for the City of Medina was prepared in cooperation with the Minnesota Department of Health (MDH). It contains specific actions that the city will take to fulfill WHP requirements that are specified under Minnesota Rules, part 4720.5510 to 4720.5590. Also, the support that Minnesota state agencies, federal agencies, Hennepin County, and others will provide is presented to identify their roles in protecting the city's drinking water supply. The plan is effective for 10 years after the approval date specified by MDH and the city is responsible for implementing its WHP plan of action, as described in Table 9 of this report. Furthermore, the city will evaluate the status of plan implementation at least every two-and-one-half years to identify whether its WHP plan is being implemented on schedule.

1.2 Plan Appendices

Much of the technical information that was used to prepare this plan is contained in the appendices but is summarized in the main body of this plan. In particular:

- Appendix I contains the first part of the plan, consisting of the delineation of the wellhead protection area (WHPA), the drinking water supply management area (DWSMA), and the vulnerability assessments for the public water supply well(s) and the DWSMA. This part of the plan is summarized in Chapter 3.
- Appendix II contains the inventory of potential contamination sources. This inventory is discussed in Chapter 4 in terms of assigning risk to the city's water supply and is also discussed in Chapter 6, relating to issues, problems or opportunities.
- Appendix III contains the contingency strategy, on file at city hall, to provide for an alternate water supply if there is a disruption caused by contamination or mechanical failure. This information is discussed in Chapter 11.
- Appendix IV contains scoping decision notices, well vulnerability sheets from MNDWIS, as well as City/State well construction information.

Chapter 2 - Identification and Assessment of the Data Elements Used to Prepare the Plan

The data elements that are included in this plan were used to 1) delineate the WHPA and the DWSMA and to assess DWSMA and well vulnerability and 2) document the need for the WHP measures that will be implemented to help protect the city's water supply from potential sources of contamination. The city met with representatives from MDH on two occasions to discuss data elements that are specified in Minnesota Rules, part 4720.5400, for preparing a WHP plan.

The first scoping meeting, held on November 2, 2009, addressed the data elements that were needed to support the delineation of the WHPA, the DWSMA, and the well(s) and DWSMA vulnerability assessments. The second scoping meeting, held on August 10, 2010, discussed the data elements required to 1) identify potential risks to the public water supply and 2) develop effective management strategies to protect the public water supply in relation to well and DWSMA vulnerability. The results of each meeting were communicated to the city by MDH through a formal scoping decision notice.

Not all of the data elements listed in the WHP rule had to be addressed in the WHP plan because of the nonvulnerable nature of the city's source of drinking water.

The following table presents the data element assessment results relative to the overall impact that each data element has on the four items listed.

Table 1 is the assessment of the present and future implications of the data elements on the four planning activities. The data elements that are marked high (H) are considered to have a direct implication or impact on the activity. Data elements that have an indirect or marginal impact on an activity are shown as moderate (M). A data element that has little if any impact is shown as low (L). The source of the data is shown under "Data Source."

Table 1 - Assessment Results for the Data Elements

Data Element	Present and Future Implications				Data Source
	Use of the Well (s)	Delineation Criteria	Quality and Quantity of Well Water	Land and Groundwater Use in DWSMA	
Geology					
Maps and geologic descriptions	M	H	M	H	MGS, DNR, USGS, Consultant Reports
Subsurface data	H	H	H	H	MGS, MDH, MPCA, DNR, MDA
Borehole geophysics	H	H	L	H	MGS, Consultant Reports
Surface geophysics	M	M	L	M	DNR, MPCA, Consultant Reports
Land Use					
Parcel boundaries map	L	H	L	H	County
Political boundaries map	L	H	L	L	County Metro Council
PLS map	L	H	L	L	City, MGEO
Land use map and inventory	H	L	H	H	Sanborn Fire Maps, Historical Society, City Records, County
Comprehensive land use map	M	L	H	H	City, County
Zoning map	M	L	H	H	City, County
Public Utility Services					
Records of well construction, maintenance, and use	H	H	H	M	City, CWI, MDH files
Surface Water Quantity					
Stream flow data	L	L	L	L	DNR, USGS, Metro Council
Groundwater Quantity					
Permitted withdrawals	H	H	H	H	DNR
Groundwater use conflicts	M	M	H	H	DNR
Water levels	H	H	H	M	DNR, MPCA, MDA, MDH, City
Groundwater Quality					
Monitoring data	H	H	H	H	MPCA, MDH
Isotopic data	M	M	M	M	MDH
Tracer studies	M	M	M	M	Not Available

Chapter 3 - Delineation of the Wellhead Protection Area, Drinking Water Supply Management Area and Vulnerability Assessments

A detailed description of the process used for 1) delineating the WHPA and the DWSMA, and 2) preparing the vulnerability assessments of the city water supply well(s) and DWSMA is presented in Appendix I. The City of Medina requested that MDH do this work and it was performed by Amal M. Djerrari, P.E. Hydrologist, Minnesota Department of Health, licensed as a geoscientist by the State of Minnesota.

3.1 WHPA and DWSMA Delineation

Figures 1a, 1b, and 1c show the boundaries of the WHPA and the DWSMA. The WHPA was delineated using computer simulations of groundwater movement to generate the underground capture zones for the following city wells: Medina Morningside #1 (Unique No. 208009), Medina Morningside #2 (Unique No. 223378), Independence Beach #1 (Unique No. 100219), Independence Beach #2 (Unique No. 448765), Hamel #3 (Unique No. 122239), Hamel #4 (Unique No. 520048), Hamel #5 (Unique No. 709925), Hamel #6 (Unique No. 747666), and Hamel #7 (Unique No. 759809). The WHPA for these water supply wells is shown in Figure 1a, 1b, and 1c.

The WHPA for Hamel Well #2 (Unique No. 158087) is defined by a using a circular area with a 200-foot radius that is called the inner wellhead management zone (IWMZ). This well does not have a formal capture zone because it is pumped for emergency use only. However, the IWMZ is used to protect the well from potential contamination sources that may cause an acute health impact should the well become operational. The map showing the IWMZ for this well is shown in Figure 1b.

The DWSMA boundaries were designated using the following criteria:

- Center-lines of highways, streets, roads, or railroad rights-of-ways;
- Public Land Survey coordinates;
- Property or fence lines; and
- Political boundaries.

3.2 Well Vulnerability Assessment

The construction and water quality obtained from each primary and emergency backup well used by the City of Medina is included in the assessment of well vulnerability. The vulnerability of the city wells is considered low because they are constructed so that each well is adequately sealed into the borehole and does not pump water that contains human-caused contaminants.

3.3 DWSMA Vulnerability Assessment

The low vulnerability assigned to the DWSMA (Figures 1a, 1b, and 1c) was determined using geologic, soils, and groundwater chemistry information and indicates that at least 10 feet of clay-rich geological material covers the source water aquifer. The very low vulnerability assigned to the DWSMA was determined using geologic, soils, and groundwater chemistry information and indicates that the source water aquifer is covered by at least 50 continuous feet of clay-rich geological material.

Chapter 4 - Establishing Priorities and Assigning Risk to Potential Contamination Sources

The types of potential contamination sources that may exist within the DWSMA were derived from the information collected to satisfy the data element requirements (Chapter 2). The impact assigned to each data element as part of the assessment process (Table 1) was used to assess the types of potential contamination sources that may present a risk to the city's drinking water supply. The low vulnerability assessment for the DWSMA indicates that, generally, only wells, other types of boreholes, excavations that may reach the aquifer and certain types of Environmental Protection Agency Class V Wells are likely to impact the city wells.

4.1 Contaminants of Concern

None of the human-caused contaminants regulated under the federal Safe Drinking Water Act have been detected at levels indicating that any well itself serves to draw contaminants into the aquifer as a result of pumping.

4.2 Inventory Results and Risk Assessment

A description of the locations of potential contamination sources is presented in Appendix II. A summary of the results for the IWMZ is listed in Table 2, and Table 3 presents these results for the remainder of the DWSMA. The priority assigned to each type of potential contamination source addresses 1) the number inventoried, 2) its proximity to a city well, 3) the capability of local geologic conditions to absorb a contaminant, 4) the effectiveness of existing regulatory controls, 5) the time required for the City of Medina to obtain cooperation from governmental agencies that regulate it, and 6) the administrative, legal, technical, and financial resources needed. A **high (H)** risk potential implies that the potential source type has the greatest likelihood to negatively impact the city's water supply and should receive highest priority for management. A **low (L)** risk potential implies that a lower priority for implementing management measures is assigned.

Table 2 - Potential Contamination Sources and Assigned Risk for the IWMZ

Source Type	Total	Level of Risk
Independence Beach Domestic Well	1	H
City Test Wells	3	H

Table 3 - Potential Contamination Sources and Assigned Risk for the Rest of the DWSMA

Potential Source Type	Total Number	Number Within Emergency Response Area and Level of Risk		Number Within Remainder of the DWSMA & Level of Risk	
Monitoring Well	6			6	M
Domestic Well <100 feet deep	1	0	-	1	L
MM Domestic Well 100-200 ft dp	0	0	-	-	-
MM Domestic Well >200 ft dp	6			6	1 (M) 5 (L)
IB Domestic Well 100-200 ft dp	2			2	L
IB Domestic Well >200 ft dp	1			1	L
Hamel Domestic Well 100-200 ft dp	8			8	5 (M) 3 (L)
Hamel Domestic Well >200 ft dp	1			1	L
Potential wells with depths unknown	49			49	unknown

Chapter 5 - Impact of Land and Water Use Changes on the Public Water Supply Well(s)

The city estimates that the following changes to the physical environment, land use, surface water, and groundwater may occur over the 10-year period that the WHP plan is in effect (Table 4). This is needed to determine whether new potential sources of contamination may be introduced in the future and to identify future actions for addressing these anticipated sources. Land and water use changes may introduce new contamination sources or result in changes to groundwater use and quality. The anticipated changes may occur within the jurisdictional authority of the city, although some may not. Table 4 describes the anticipated changes to the physical environment, land use, and surface water or groundwater in relationship to the 1) influence that existing governmental land and water programs and regulations may have on the anticipated change, and 2) administrative, technical, and financial considerations of the City of Medina and property owners within the DWSMA.

Table 4 - Expected Land and Water Use Changes

Expected Change (Physical Environment, Land Use, Surface Water, Groundwater)	Impact of the Expected Change On the Source Water Aquifer	Influence of Existing Government Programs and Regulations on the Expected Change	Administrative, Technical, and Financial Considerations Due to the Expected Change
Physical Environment: No change anticipated.	Does not apply	Does not apply	Does not apply
Land Use: Ongoing Urban Development within Hamel DWSMA.	City will need to construct another water supply well. Sealing of any domestic wells in the developed area.	The City will need to get permits from the MDH. Zoning ordinance that requires wells to be sealed.	Cost of new well… Cost to seal wells – City will look into possible grant funding. Coordination with City of Plymouth.
New homes constructed and private wells drilled within Morningside DWSMA and Independence DWSMA.	New private domestic wells will be drilled.	Relevant state permitting required for well drilling.	Cross-agency coordination to ensure that new wells are monitored as additional contamination sources and that educational material is provided to property owners.
Surface Water: Urbanized development will require stormwater management.	None expected	Does not apply	Does not apply
Groundwater: The city may construct another water supply well.	This may alter current DWSMA boundaries and may increase the rate at which surface water recharges the aquifer, depending on where well is constructed.	The city will have to amend its groundwater appropriations permit from the DNR when we near our current allocation. The city also may need to amend its Wellhead Protection Plan according to MDH rule requirements.	The city will have to hire a consultant to design the well and submit plans to MDH for approval.
City instituted an Irrigation Well Policy.	These wells could have an effect on water levels in aquifers, and could be a contamination risk.	The city will secure access to future irrigation wells to gather information on water levels, usage and geological structure.	The city will secure its access to the wells through a development agreement.

Chapter 6 - Issues, Problems, and Opportunities

6.1 Identification of Issues, Problems and Opportunities

The City of Medina has identified water and land use issues and problems and opportunities related to 1) the aquifer used by the city water supply wells, 2) the quality of the well water, or 3) land or water use within the DWSMA. The city assessed 1) input from public meetings and written comments it received, 2) the data elements identified by MDH during the scoping meetings, and 3) the status and adequacy of the city's official controls and plans on land and water uses, in addition to those of local, state, and federal government programs. The results of this effort are presented in the following table, which defines the nature and magnitude of contaminant source management issues in the city's DWSMA. Identifying issues, problems and opportunities, including resource needs, enables the city to 1) take advantage of opportunities that may be available to make effective use of existing resources, 2) set meaningful priorities for source management, and 3) solicit support for implementing specific source management strategies.

6.2 Comments Received

There have been several occasions for local governments, state agencies, and the general public to identify issues and comment on the city's WHP plan. At the beginning of the planning process, local units of government were notified that the city was going to develop its WHP plan and were given the opportunity to identify issues and comment. A public information meeting was held to review the results of the delineation of the wellhead protection area, DWSMA, and the vulnerability assessments. The meetings of the city's wellhead protection team were open to the public. Also, a public hearing was held before the completed WHP plan was sent to MDH for state agency review and approval. The following issues were identified during comment periods:

- No comments have been received as of yet.

Table 5 - Issues, Problems, and Opportunities

Issue Identified	Impacted Feature	Problem Associated with the Identified Issue	Opportunity Associated with the Identified Issue	Adequacy of Existing Controls to Address the Issue
Many unused wells within DWSMAs have likely been sealed, but no sealing record has been found.	Won't know until the city looks into it further.	Results in "false" potential sources which unnecessarily take resources to manage.	The city can greatly reduce the number of potential sources by confirming these wells have been sealed.	Incomplete data sources exist, so the City will need to seek information in other ways.
There are numerous unused and unsealed wells on residential properties.	Aquifer well water quality for all three DWSMA areas.	The city needs to assess which wells present a threat to the aquifer based upon their depth, construction, and state of repair.	The city can partner with Hennepin County to help property owners pay for the costs of properly sealing unused wells. Look for grant opportunities.	The city does not have authority to require that unused wells be properly sealed. The MDH has authority to require well sealing.

Addition of a new city well.	More water being pumped from the Aquifer.	None that we can foresee at this time	Contact the MDH Hydrologist about need to conduct an aquifer test plan and work with MDH to develop a work plan.	Monitor water tables
The city recognizes this is a 10 year plan and that issues, problems, and opportunities can change, which can impact the implementation strategies.	Public Health, Aquifer, DWSMA and Well Water Quality.	The city needs to have the flexibility to address changing situations.	The city has the opportunity to work with other local units of government to address those issues, problems and opportunities that may change over the next 10 years.	At the present time the city, local, and state governments have existing controls in place to address most issues as they occur. Some issues are uncontrollable and unforeseen and additional controls might need to be considered to address new issues. The city, local and state governments are continually updating land use controls as new issues, problems and opportunities occur.
The city has limited resources to implement all of the management strategies contained within this WHP Plan.	DWSMA	With limited resources the implementation of the WHP Plan will be a challenge to the city.	Form working partnerships with local units of government and state agencies that have regulatory authority and/or programs to help with implementation. The city will look for grant opportunities.	The city has limited time and resources for implementation.
Note: Add issues from the public comment process.	Aquifer DWSMA Well water quality			

Chapter 7 - Existing Authority and Support Provided by Local, State, and Federal Governments

In addition to its own controls, the City of Medina will rely upon partnerships formed with local units of government, state agencies, and federal agencies with regulatory controls or resource management programs in place to help implement its WHP plan. The level of support that a local, state, and federal agency can provide depends on its legal authority, as well as the resources available to local governments.

7.1 Existing Controls and Programs of the City of Medina

Table 6 shows the legal controls and/or programs that the city has identified to support the management of potential contamination sources within the DWSMA.

Table 6 - Controls and Programs of the Public Water Supplier

Type of Control	Program Description
Building Permits	Provides an opportunity to require performance standards to offset potential risk posed by a land use.
Ordinance Requiring Hookup to City Services Water Ordinance Chapter 7: 710.01-710.75	Reduces the likelihood that the pumping of other wells will impact contaminant movement to the city wells.
Limit Drilling of private wells Water Ordinance Chapter 7: 710.01-710.75	The city of Medina limits the drilling of private wells in its service area and prohibits drilling if it impacts the city wellhead protection area, which reduces the likelihood of possible contamination.
Zoning Ordinance and Conditional Use Permits (CUP)	Provides oversight and control to make sure orderly growth occurs within the city. Specifies performance standards needed to offset potential risks posed by land use.
Comprehensive Plan	Establishes city wide goals and priorities towards orderly growth and protecting water resources.

7.2 Local Government Controls and Programs

The following departments or programs within Hennepin County may be able to assist the city with issues relating to potential contamination sources that 1) have been inventoried or 2) may result from changes in land and water use within the DWSMA:

Table 7 - Local Agency Controls and Programs

Government Unit	Name of Control/Program	Program Description
Hennepin County Environmental Department	Household Hazardous Waste Collection	Provides education to landowners and a collection program for disposing of household hazardous waste.
	Water Planning	Establishes countywide goals and priorities towards protecting water resources.
MPCA	Stormwater MS4 Permit	Issue permit to regulate stormwater standards according to SWPPP.

7.3 State Agency and Federal Agency Support

MDH will serve as the contact for enlisting the support of other state agencies on a case-by-case basis regarding technical or regulatory support that may be applied to the management of potential contamination sources. Participation by other state agencies and the federal government is based on legal authority granted to them and resource availability. Furthermore, MDH 1) administers state regulations that affect specific potential sources of contamination and 2) can provide technical assistance to property owners to comply with these regulations.

The following table identifies the specific regulatory programs or technical assistance that state and federal agencies may provide to the City of Medina to support implementation of the WHP plan. It is likely that other opportunities for assistance may be available over the 10-year period that the plan is in effect, due to changes in legal authority or increases in funding granted to state and federal agencies. Therefore, the table references opportunities available when the city's WHP plan was first approved by MDH.

Table 8 - State and Federal Agency Controls and Programs

Government Unit	Type of Program	Program Description
MDH	State Well Code (Minnesota Rules, Chapter 4725)	MDH has authority over the construction of new wells and the sealing of wells. MDH staff in the Well Management Program offer technical assistance for enforcing well construction codes, maintaining setback distances for certain contamination sources, and well sealing.
MDH	WHP	MDH has staff that will help the city identify technical or financial support that other governmental agencies can provide to assist with managing potential contamination sources.
DNR	Water appropriation permitting (Minnesota Rules, Chapter 6115)	DNR can require that anyone requesting an increase in existing permitted appropriations, or to pump groundwater, must address concerns regarding the impacts to drinking water if these concerns are included in a WHP plan.
Environmental Protection Agency (EPA)	40 Code of the Federal Regulations 144 Subpart G	Automatic closure of the Class V automotive waste disposal wells in a WHPA, inventory of class V Wells.

7.4 Support Provided by Nonprofit Organizations

The Minnesota Rural Water Association (MRWA) has provided technical assistance to the City of Medina throughout the development of this WHP Plan and will assist the city with implementing its WHP Plan by providing: 1) referenced educational and outreach materials for land owners, 2) technical assistance for implementing individual WHP action items listed in this Plan, and 3) support to the city for assessing the results of Plan implementation.

Chapter 8 - Goals

Goals define the overall purpose for the WHP plan, as well as the end points for implementing objectives and their corresponding actions. The WHP team identified the following goals after considering the impacts that 1) changing land and water uses have presented to drinking water quality over time and 2) future changes that need to be addressed to protect the community's drinking water:

- Maintain a safe and adequate drinking water supply for community residents.
- Prevent contaminants from reaching levels that present a risk to people's health.
- Educate the general public regarding the importance of water conservation in order to promote the wise use of drinking water resources.
- Educate the general public and especially property owners within the DWSMA of the appropriate best management practices for drinking water aquifer protection.

Chapter 9 - Objectives and Plan of Action

Objectives provide the focus for ensuring that the goals of the WHP plan are met and that priority is given to specific actions that support multiple outcomes of plan implementation.

Both the objectives and the wellhead protection measures (actions) that support them are based on assessing 1) the data elements (Chapter 2), 2) the potential contaminant source inventory (Chapter 4), 3) the impacts that changes in land and water use present (Chapter 5) and 4) issues, problems, and opportunities referenced to administrative, financial, and technical considerations (Chapter 6).

9.1 Objectives

The following objectives have been identified to support the goals of the WHP plan for the City of Medina:

1. Create public awareness and general knowledge about the importance of WHP for maintaining an adequate and safe drinking water supply in the Medina community and the City of Medina DWSMA.
2. Properly inventory and manage potential contaminant sources to protect the drinking water supply for the City of Medina.
3. Manage the Wellhead Management Zone to prevent contamination of the aquifer near the public supply wells.
4. Effectively track and report the implementation efforts and wellhead protection plan progress to all governing authorities.

9.2 WHP Measures and Action Plan

Based upon the factors, the WHP team has identified WHP measures that will be implemented by the city over the 10-year period that its WHP plan is in effect. The objective that each measure supports is noted as well as 1) the lead party and any cooperators, 2) the anticipated cost for implementing the measure and 3) the year or years in which it will be implemented.

The following categories are used to further clarify the focus that each WHP measure provides, in addition to helping organize the measures listed in the action plan:

- Public Education and Outreach
- Potential Contamination Source Management
- Data Collection
- IWMZ Management
- Land Use Management
- Reporting and Evaluation
- Water Use and Contingency Strategy

9.3 Establishing Priorities

WHP measures reflect the administrative, financial, and technical requirements needed to address the risk to water quality or quantity presented by each type of potential contamination source. Not all of these measures can be implemented at the same time, so the WHP team assigned a priority to each. A number of factors must be considered when WHP action items are selected and prioritized (part 4720.5250, subpart 3):

- Contamination of the public water supply wells by substances that exceed federal drinking water standards.

- Quantifiable levels of contamination resulting from human activity.
- The location of potential contaminant sources relative to the wells.
- The number of each potential contaminant source identified and the nature of the potential contaminant associated with each source.
- The capability of the geologic material to absorb a contaminant.
- The effectiveness of existing controls.
- The time needed to acquire cooperation from other agencies and cooperators.
- The resources needed, i.e., staff, money, time, legal, and technical resource.

Table 9 - WHP Plan of Action

PUBLIC EDUCATION AND OUTREACH:

Description	Objective	Priority	Responsible Party & Cooperators	Cost	Implementation Time Frame									
					2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
WHP Measure (#1): Provide city residents with an article in the city newsletter that explains the importance of WHP; as well as the need to seal priority unused wells and the city's willingness to help with costs associated if funding is available.	1	High	City, MRWA, SWCD	Staff time	X				X				X	
WHP Measure (#2): Distribute materials to property owners relating to the proper management of wells.	1	Medium	City, MRWA	Staff time	X					X				
WHP Measure (#3): Have a booth at the annual City of Medina Celebration Day providing information about WHP and proper well maintenance. Afterward assess the effectiveness to see if it warrants attendance in future years.	1	Low	City	Staff time	X									
WHP Measure (#4): Post articles, educational materials and other applicable WHP materials on the City's website.	1	Low	City	Staff time		X				X				
WHP Measure (#5): Provide information to property owners about the hazards of unused wells and options for correctly managing them by having them properly sealed or returning them to operating condition.	1	Medium	City	Staff time		X								

Table 9 - WHP Plan of Action - Continued

POTENTIAL CONTAMINATION SOURCE MANAGEMENT:

Description	Objective	Priority	Responsible Party & Cooperators	Cost	Implementation Time Frame									
					2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
WHP Measure (#6): City staff will continue to gather property owner's names, addresses, parcel identification numbers, status of wells or other applicable information on the wells in order to complete the PCSI.	2	High	City, Consultant	Staff time or consultant fee	ONGOING									
WHP Measure (#7): The city will apply for grant funds to help seal unused wells located in the DWSMA. If they are successful they will use the money to seal the wells. If they do not receive a grant, the city will work cooperatively with the local units of government to provide as much cost share as possible to help seal the wells.	3	High	City, MDH, SWCD, MRWA	Staff time and grant money	ONGOING									
WHP Measure (#8): The City will seek funding to further refine the well inventory to obtain status and construction information regarding the wells in order to identify which wells reach or penetrate the same aquifer as the city wells.	2	High	City, Consultant	Staff time or consultant fee	ONGOING									
WHP Measure (#9): The wellhead protection team/manager will continually attempt to locate potential contaminant sources in the DWSMA.	2	High	City	Staff time	ONGOING									

Table 9 - WHP Plan of Action - Continued

LAND USE MANAGEMENT:

Description	Objective	Priority	Responsible Party & Cooperators	Cost	Implementation Time Frame									
					2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
WHP Measure (#10): Identify the WHP and DWSMA in the City of Medina Comprehensive Land Use Plan and land use maps.	2	Medium	City	Staff time	X					X				
WHP Measure (#11): Mail letter requesting to be notified by all jurisdictions with planning and zoning authority about land use permits in the DWSMA which may impact the public water supply wells and aquifer.	3	Medium	City	Staff time		X								
WHP Measure (#12): Adopt a WHP ordinance regulating installation of wells within the DWSMA.	3	Medium	City	Staff time		X								

Table 9 - WHP Plan of Action - Continued

DATA COLLECTION:

Description	Objective	Priority	Responsible Party & Cooperators	Cost	Implementation Time Frame									
					2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
WHP Measure (#13): When planning for a new municipal well, city will contact MDH Hydrologist about the need to conduct an aquifer test plan and work with MDH to develop a work plan.	3	Medium	City, MDH	Staff time										
WHP Measure (#14): Update the well inventory (spreadsheet and map) every 2.5 years. Review the status of existing wells and add new wells identified in the DWSMA.	2	High	City, MDH	Staff time			X			X		X		
WHP Measure (#15): Video log the municipal well casing to determine its construction and state of repair, or to complete geophysical logging to collect geologic information to substantiate well vulnerability issues.	3	Medium	City	Staff time	In conjunction with well repairs									
WHP Measure (#16): Work with MDH Hydrologist to collect geochemical data to determine whether the quality of the well water is changing over time due to pumping or deterioration of the well.	4	Medium	City, MDH	Staff time	X	X	X	X	X	X	X	X	X	X

WHP Measure (#17): Continue to do water level monitoring in all municipal wells, keeping track of pumping records and water quality reports.	4	Medium	City	Staff time	X	X	X	X	X	X	X	X	X	X

IWMZ MANAGEMENT:

Description	Objective	Priority	Responsible Party & Cooperators	Cost	Implementation Time Frame									
					2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
WHP Measures (#18): Monitor and maintain the 200 ft. radius around the wells to ensure that setback distances for new potential contamination sources are met.	3	Medium	City	Staff time	ONGOING									
WHP Measures (#19): Contact your MDH Planner if changes to the locations or construction of potential contaminant sources are proposed in the IWMZ.	3	Medium	City, MDH	Staff time	ONGOING									
WHP Measures (#20): Implement measures that are specified in the IWMZ PCSI Report.	3	Medium	City	Staff time	ONGOING									
WHP Measures (#21): Update the Inner Wellhead Management Zone Inventory for the public water supply wells.	3	Medium	City	Staff time	ONGOING									

Table 9 - WHP Plan of Action - Continued

REPORTING AND EVALUATION:

Description	Objective	Priority	Responsible Party & Cooperators	Cost	Implementation Time Frame									
					2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
WHP Measures (#22): Complete and submit an annual year-end report on completed WHP activities to the city council, through the PW Department Update Report.	4	Medium	City	Staff time	EVERY YEAR									
WHP Measures (#23): Maintain a "WHP folder" that contains documentation of WHP activities you have completed and a date that it was done.	4	High	City	Staff time	ONGOING									
WHP Measures (#24): Complete an Evaluation Report every 2.5 years that evaluates the progress of plan of action and the impact of any contaminant release on the aquifer supplying the public water supply well.	4	High	City	Staff time	EVERY 2 ½ YEARS									
WHP Measures (#25): Summarize all WHP Plan Implementation efforts in a report to MDH in the 8th year.	4	High	City	Staff time	2020									
WHP Measures (#26): Yearly DNR water pumping permit reports and MN Department of Health Consumer Confidence Reports to all residents.	4	High	City	Staff time	EVERY YEAR									

9.4 Commitments from Cooperators

The agencies listed in Table 10 have indicated they will support the City of Medina with implementing the WHP measure(s) in which they are identified.

Table 10 - Cooperating Agencies List

Agency	Measure	Actions Agency Will Take
Minnesota Rural Water Association (MRWA)	1 & 2	Provide referenced educational and outreach materials for land owners, technical assistance for implementing individual WHP action items listed in this Plan, and support to the City for assessing the results of Plan implementation.
AWWA	1 & 2	Provide the City with education opportunities and certification.

Chapter 10 - Evaluation Program

Evaluation is used to support plan implementation and is required under Minnesota Rules, part 4720.5270, prior to amending the city's WHP plan. Plan evaluation is specified under Objective 4 and provides the mechanism for determining whether WHP action items are achieving the intended result or whether they need to be modified to address changing administrative, technical, or financial resource conditions within the DWSMA. The city has identified the following procedures that it will use to evaluate the success with implementing its WHP plan:

1. An annual briefing to the city council will provide the basis for documenting whether each action step for that year was implemented.
2. The WHP team will meet, at a minimum, every two-and-one-half years to assess the status of plan implementation and to identify issues that impact the implementation of action steps throughout the DWSMA and complete an evaluation report.
3. The city will assess the results of each action item that has been taken annually to determine whether the action item has accomplished its purpose or whether modification is needed. Assessment results will be presented in the annual report to the city council.
4. The city will prepare a written report that documents how it has assessed plan implementation and the action items that were carried out. The report will be presented to MDH at the first scoping meeting held with the city to begin amending the WHP plan.

Chapter 11 - Contingency Strategy

The WHP plan includes a contingency strategy that addresses disruption of the water supply caused by either contamination or mechanical failure. The city has a contingency water supply plan in effect that was approved by the Minnesota Department of Natural Resources and fulfills the contingency planning requirements for wellhead protection. A copy of this plan is located in the City of Medina's 2010-2030 Comprehensive Plan, Chapter 10, Appendix A: Water Emergency & Conservation Plan, and is available for public review during regular business hours at City Hall.

Chapter 12 - Glossary of Terms

Data Element. A specific type of information required by the Minnesota Department of Health to prepare a wellhead protection plan.

Drinking Water Supply Management Area (DWSMA). The surface and subsurface areas surrounding a public water supply well, including the wellhead protection area, that must be managed by the entity identified in the wellhead protection plan. (Minnesota Rules, part 4720.5100, subpart 13). This area is delineated using identifiable landmarks that reflect the scientifically calculated wellhead protection area boundaries as closely as possible.

Emergency Response Area (ERA). The part of the wellhead protection area that is defined by a one-year time of travel within the aquifer that is used by the public water supply well (Minnesota Rules part 4720.5250, subpart 3). It is used to set priorities for managing potential contamination sources within the DWSMA.

Emergency Standby Well. A well that is pumped by a public water supply system only during emergencies, such as when an adequate water supply cannot be achieved because one or more primary or seasonal water supply well cannot be used.

Inner Wellhead Management Zone (IWMZ). The land that is within 200 feet of a public water supply well (Minnesota Rules, part 4720.5100, subpart 19). The public water supplier must manage the IWMZ to help protect it from sources of pathogen or chemical contamination that may cause an acute health effect.

Nonpoint Source Contamination. Refers to contamination of the drinking water aquifer that is caused by polluted runoff or pollution sources that cannot be attributed to a specifically defined origin, e.g., runoff from agricultural fields, feedlots, or urban areas.

Point Source Contamination. Refers to contamination of the drinking water aquifer that is attributed to pollution arising from a specifically defined origin, such as discharge from a leaking fuel tank, a solid waste disposal site, or an improperly constructed or sealed well.

Primary Water Supply Well. A well that is regularly pumped by a public water supply system to provide drinking water.

Seasonal Water Supply Well. A well that is only used to provide drinking water during certain times of the year, either when pumping demand cannot be met by the primary water supply well(s) or for a facility, such as a resort, that is closed to the public on a seasonal basis.

Vulnerability. Refers to the likelihood that one or more contaminants of human origin may enter either 1) a water supply well that is used by the public water supplier or 2) an aquifer that is a source of public drinking water.

Wellhead Protection Area (WHPA). The surface and subsurface area surrounding a well or well field that supplies a public water system, through which contaminants are likely to move toward and reach the well or well field (Minnesota Statutes, part 103I.005, subdivision 24).

WHP Plan Goal. An overall outcome of implementing the WHP plan, e.g., providing for a safe and adequate drinking water supply.

WHP Measure. A method adopted and implemented by a public water supplier to prevent contamination of a public water supply, and approved by the Minnesota Department of Health under Minnesota Rules, parts 4720.5110 to 4720.5590.

WHP Plan Objective. A capability needed to achieve one or more WHP goals, e.g., implementing WHP measures to address high priority potential contamination sources within 5 years.

APPENDIX I:

Wellhead Protection Plan Part I

(Includes WHPA and DWSMA Delineations and Vulnerability Assessments)

MINNESOTA MDH DEPARTMENT OF HEALTH

Protecting, maintaining and improving the health of all Minnesotans

April 5, 2010

Mr. Steve Scherer
Public Works Superintendent - City of Medina
2052 County Road 24
Medina, Minnesota 55340

Dear Mr. Scherer:

Subject: Wellhead Protection Plan Part I - Draft Report - PWSID 1270023

Enclosed is the draft copy of the Part I report, which delineates the wellhead protection area and drinking water supply management (DWSMA) area for the city of Medina. The report describes technical details for the delineation of these areas and their vulnerability assessments, based on our guidelines and the information we have available.

Please review this report and note any areas where you have questions. We would like the opportunity to meet with you to discuss the delineation and any modifications you may like to incorporate. However, if you would like to have the Part I report approved without modifications, you must send us a formal letter requesting that the Minnesota Department of Health (MDH) approve Part I of the Wellhead Protection Plan, and keep the enclosed report for your files. It seems a convoluted process in the sense that you ask us to approve work we have done for you, but it is a way to document that you formally accept the Part I report. I have enclosed a template letter requesting approval that you could use.

Once the delineation of the wellhead protection area, DWSMA, and vulnerability assessments have been formally approved by MDH, you must notify local units of government of this information and hold a public information meeting. The MDH wellhead planner and I will work with you to meet these requirements. You will then be able to move on to working on Part II of your Wellhead Protection Plan.

I would appreciate your reviewing the Part I report within the next two weeks and then contacting me to let me know how you want to proceed. We look forward to working with the city of Medina on the completion of your wellhead protection plan.

Sincerely,

Amal Djerrari

Amal M. Djerrari, Hydrologist
Source Water Protection Unit
Environmental Health Division
P.O. Box 64975
St. Paul, Minnesota 55164-0975
651-201-4677

AMD:kmc
Enclosures
cc: Terry Bovee, MDH Planner, Mankato District Office

April 9, 2010

Minnesota Department of Health
Amal M. Djerrari, Hydrologist
Source Water Protection Unit
Environmental Health Division
P.O. Box 64975
St. Paul, MN 55164-0975

RE: City of Medina Wellhead Protection Program - Part I

Dear Mr. Djerrari:

In accordance with the Minnesota Wellhead Protection Rule (4720.5300, subpart 1) the City of Medina formally requests that the MDH review the enclosed Wellhead Protection Plan, Part 1 report for approval. The approval pertains to the following work products:

1. The proposed Wellhead Protection Plan Report;
2. The Wellhead Protection Area and Drinking Water Supply Management Area delineations; and
3. The vulnerability assessments of the wells and the aquifer within the Drinking Water Supply Management Area.

We thank you for your assistance, and look forward to receiving your comments.

Sincerely,

Steve Scherer
Public Works Superintendent
2052 County Road 24
Medina, MN 55340

Wellhead Protection Plan

Part I

Delineation of Wellhead Protection Area
Drinking Water Supply Management Area Delineation
Well and Drinking Water Supply Management Area Vulnerability Assessments

Prepared for

The City of Medina

March 2010

Amal M. Djerrari, P.E., Hydrologist
Minnesota Department of Health

Table of Contents

List of Tables

Table of Contents - Continued

Page

List of Figures

Glossary of Terms

Data Element. A specific type of information that is required by the Minnesota Department of Health to prepare a wellhead protection plan.

Drinking Water Supply Management Area (DWSMA). The area delineated using identifiable land marks that reflects the scientifically calculated wellhead protection area boundaries as closely as possible (Minnesota Rules, part 4720.5100, subpart 13).

Drinking Water Supply Management Area Vulnerability. An assessment of the likelihood that the aquifer within the DWSMA is subject to impact from land and water uses within the wellhead protection area. It is based upon criteria that are specified under Minnesota Rules, part 4720.5210, subpart 3.

Wellhead Protection. A method of preventing well contamination by effectively managing potential contamination sources in all or a portion of the well's recharge area.

Wellhead Protection Area (WHPA). The surface and subsurface area surrounding a well or well field that supplies a public water system, through which contaminants are likely to move toward and reach the well or well field (Minnesota Statutes, part 103I.005, subdivision 24).

Well Vulnerability. An assessment of the likelihood that a well is at risk to human-caused contamination either due to its construction or indicated by criteria that are specified under Minnesota Rules, part 4720.5550, subpart 2.

1. Introduction

The Minnesota Department of Health (MDH) developed Part I of the wellhead protection (WHP) plan at the request of the city of Medina (public water supply identification number 1270023). The work was performed in accordance with the Minnesota Wellhead Protection Rule, parts 4720.5100 to 4720.5590.

This report presents the delineation of the wellhead protection area (WHPA), the drinking water supply management area (DWSMA), and the vulnerability assessments for the public water supply wells and DWSMA. It also documents the technical information that was required to prepare this portion of the WHP plan in accordance with the Minnesota Wellhead Protection Rule. Additional technical information is available from the MDH. Definition of rule-specific terms that are used are provided in the "Glossary of Terms."

The wells included in the WHP plan are listed in Table 2.

2. Assessment of the Data Elements

MDH staff met with representatives of the city of Medina on November 2, 2009, for a scoping meeting that identified the data elements required to prepare Part 1 of the WHP plan. Table 1 presents the assessment of these data elements relative to the present and future implications of planning items that are specified in Minnesota Rules, part 4720.5210.

Table 1 - Assessment of Data Elements

Data Element	Present and Future Implications				Data Source
	Use of the Well (s)	Delineation Criteria	Quality and Quantity of Well Water	Land and Groundwater Use in DWSMA	
Precipitation					
Geology					
Maps and geologic descriptions	M	H	H	H	MGS, DNR, USGS, Consultant Reports
Subsurface data	M	H	H	H	MGS, MDH, MPCA, DNR, MDA
Borehole geophysics	M	H	H	H	MGS, Consultant Reports
Surface geophysics	L	L	L	L	DNR, MPCA, Consultant Reports
Maps and soil descriptions					
Eroding lands					
Water Resources					
Watershed units					
List of public waters					
Shoreland classifications					
Wetlands map					
Floodplain map					
Land Use					
Parcel boundaries map	L	H	L	L	
Political boundaries map	L	H	L	L	
PLS map	L	H	L	L	

Data Element	Present and Future Implications				Data Source
	Use of the Well (s)	Delineation Criteria	Quality and Quantity of Well Water	Land and Groundwater Use in DWSMA	
Land use map and inventory	M	H	M	M	Sanborn Fire Maps, Historical Society, City Records, County
Comprehensive land use map	L	L	L	L	City, County
Zoning map	L	L	L	L	City
Public Utility Services					
Transportation routes and corridors					
Storm/sanitary sewers and PWS system map					
Oil and gas pipelines map					
Public drainage systems map or list					
Records of well construction, maintenance, and use	H	H	H	H	City, CWI, MDH files
Surface Water Quantity					
Stream flow data					
Ordinary high water mark data					
Permitted withdrawals					
Protected levels/flows					
Water use conflicts					
Groundwater Quantity					
Permitted withdrawals	H	H	H	H	DNR
Groundwater use conflicts	H	H	H	H	DNR
Water levels	H	H	H	H	DNR, MPCA, MDA, MDH, City
Surface Water Quality					
Stream and lake water quality management classification					
Monitoring data summary					
Groundwater Quality					
Monitoring data	H	H	H	H	MPCA, MDH. MDA, USGS
Isotopic data	H	H	H	H	MPCA, MDH. MDA, USGS, County, UMN
Tracer studies	H	H	H	H	DNR, MPCA
Contamination site data	M	M	M	M	MPCA, MDA
Property audit data from contamination sites					
MPCA and MDA spills/release reports	L	L	L	L	City, MPCA

Definitions Used for Assessing Data Elements:

High (H) - the data element has a direct impact

Moderate (M) - the data element has an indirect or marginal impact

Low (L) - the data element has little if any impact

Shaded - the data element was not required by MDH for preparing the WHP plan

3. General Descriptions

3.1 Description of the Water Supply System

The city of Medina obtains its drinking water supply from eight primary wells. Table 2 summaries information regarding them.

3.2 Description of the Hydrogeologic Setting

The description of the hydrologic setting for the aquifers that are used to supply drinking water is presented in Tables 3a through 3g.

Figures 3, 4a, and 4b show the distribution of the aquifer and its stratigraphic relationships with adjacent geologic materials. They were prepared using well record data that is contained in the County Well Index (CWI) database. The geological maps and studies that were used to further define local hydrogeologic conditions are provided in the "Selected References" section of this report.

Table 2 - Water Supply Well Information

Local Well Id.	Unique Number	Use/ Status[1]	Casing Diameter (inches)	Casing Depth (feet)	Well Depth (feet)	Date Constructed/ Reconstructed	Well Vulnerability	Aquifer[2]	Aquifer Vulnerability
Hamel 2	158087	E	8	353	601	06/1978	Not Vulnerable	FIG	Not Vulnerable
Morningside 1	208009	P	6	187	205	06/1961	Not Vulnerable	QBAA	Not Vulnerable
Morningside 2	223378	P	12	185	204	09/1960	Not Vulnerable	QBAA	Not Vulnerable
Hamel 3	122239	P	10	420	590	06/1983	Not Vulnerable	FIG	Not Vulnerable
Independence 1	100219	E	12	200	240	08/1975	Not Vulnerable	QBAA	Not Vulnerable
Independence 2	448765	P	8	201	241	08/1988	Not Vulnerable	QBAA	Not Vulnerable
Hamel 4	520048	P	30x24x20x16	683	770	11/1993	Not Vulnerable	Mt. Simon	Not Vulnerable
Hamel 5	709925	P	12	195	242	08/2004	Not Vulnerable	QBAA	Not Vulnerable
Hamel 6	747666	P	20x14	311	385	05/2007	Not Vulnerable	CJDN	Not Vulnerable
Hamel 7	759809	P	14	312	410	06/2008	Not Vulnerable	CJDN	Not Vulnerable

[1] Primary Well (P), Emergency Backup Well (E)

[2] QBAA: Quaternary Buried Artesian Aquifer
FIG: Franconia-Ironton-Galesville Sandstones
CJDN: Jordan Sandstone
Mt. Simon: Mt. Simon Sandstone

Table 3a - Description of the Hydrogeologic Setting at Well Independence 2 (448765)

	Attribute	Descriptor	Data Source
Aquifer: Quaternary Buried Artesian Aquifer (QBAA)	Aquifer Material	Sand and Gravel	Well Logs
	Primary Porosity	0.25	Estimated
	Aquifer Thickness (ft)	135	Well Logs
	Stratigraphic Top Elevation	886	Well Logs
	Stratigraphic Bottom Elevation	751	Well Logs
	Hydraulic Confinement	Confined	Well Logs
	Transmissivity (T)	84,191 ft^2/day	The aquifer test plan was approved on 11/10/2009 and T was determined from specific capacity.
	Hydraulic Conductivity	624 ft/day	The reference value was obtained from the reference transmissivity value.
	Groundwater Flow Field	Flow to the southeast. Hydraulic Gradient: 1.1 x 10^{-3} feet/ft	Hennepin County Atlas

Table 3b - Description of the Hydrogeologic Setting at Wells Morningside 1 (208009) and 2 (223378)

	Attribute	Descriptor	Data Source
Aquifer: Quaternary Buried Artesian Aquifer (QBAA)	Aquifer Material	Sand and Gravel	Well Logs
	Primary Porosity	0.25	Estimated
	Aquifer Thickness (ft)	20	Well Logs
	Stratigraphic Top Elevation	870	Well Logs
	Stratigraphic Bottom Elevation	850	Well Logs
	Hydraulic Confinement	Confined	Well Logs
	Transmissivity (T)	6,520 ft^2/day	The aquifer test plan was approved on 11/10/2009 and T was determined from specific capacity.
	Hydraulic Conductivity	327 ft/day	The reference value was obtained from the reference transmissivity value.
	Groundwater Flow Field	Flow to the southeast. Hydraulic Gradient: 1.1 x 10^{-3} feet/ft	Hennepin County Atlas

Table 3c - Description of the Hydrogeologic Setting at Well Hamel 5 (709925)

	Attribute	Descriptor	Data Source
Aquifer: Quaternary Buried Unconfined Aquifer (QBUA)	Aquifer Material	Sand and Gravel	Well Logs
	Primary Porosity	0.25	Estimated
	Aquifer Thickness (ft)	144	Well Logs
	Stratigraphic Top Elevation	917	Well Logs
	Stratigraphic Bottom Elevation	773	Well Logs
	Hydraulic Confinement	Unconfined	Well Logs
	Transmissivity (T)	15,210 ft^2/day	The aquifer test plan was approved on 11/10/2009 and T was determined from a pump test at the well.
	Hydraulic Conductivity	105.6 ft/day	The reference value was obtained from the reference transmissivity value.
	Groundwater Flow Field	Flow to the southeast. Hydraulic Gradient: 1.1×10^{-3} feet/ft	Hennepin County Atlas

Table 3d - Description of the Hydrogeologic Setting at Well Hamel 6 (747666)

	Attribute	Descriptor	Data Source
Aquifer: Jordan Sandstone Aquifer (CJDN)	Aquifer Material	Sandstone	Well Logs
	Primary Porosity	0.20	Estimated
	Aquifer Thickness (ft)	88	Well Logs
	Stratigraphic Top Elevation	699	Well Logs
	Stratigraphic Bottom Elevation	611	Well Logs
	Hydraulic Confinement	Confined	Well Logs
	Transmissivity (T)	2,840 ft^2/day	The aquifer test plan was approved on 11/10/2009 and T was determined from a pump test at the well.
	Hydraulic Conductivity	32.3 ft/day	The reference value was obtained from the reference transmissivity value.
	Groundwater Flow Field	Flow to the southeast. Hydraulic Gradient: 1.3×10^{-3} feet/ft	Hennepin County Atlas

Table 3e - Description of the Hydrogeologic Setting at Well Hamel 7 (759809)

	Attribute	Descriptor	Data Source
Aquifer: Jordan Sandstone Aquifer (CJDN)	Aquifer Material	Sandstone	Well Logs
	Primary Porosity	0.20	Estimated
	Aquifer Thickness (ft)	102	Well Logs
	Stratigraphic Top Elevation	713	Well Logs
	Stratigraphic Bottom Elevation	611	Well Logs
	Hydraulic Confinement	Confined	Well Logs
	Transmissivity (T)	2,015 ft^2/day	The aquifer test plan was approved on 11/10/2009 and T was determined from a pump test at the well.
	Hydraulic Conductivity	19.8 ft/day	The reference value was obtained from the reference transmissivity value.
	Groundwater Flow Field	Flow to the southeast. Hydraulic Gradient: 1.3×10^{-3} feet/ft	Hennepin County Atlas

Table 3f - Description of the Hydrogeologic Setting at Hamel Well 3 (122239)

	Attribute	Descriptor	Data Source
Aquifer: Franconia-Ironton-Galesville Sandstones Aquifer (FIG)	Aquifer Material	Sandstone	Well Logs
	Primary Porosity	0.20	Estimated
	Aquifer Thickness (ft)	198	Well Logs
	Stratigraphic Top Elevation	618	Well Logs
	Stratigraphic Bottom Elevation	420	Well Logs
	Hydraulic Confinement	Confined	Well Logs
	Transmissivity (T)	723 ft^2/day	The aquifer test plan was approved on 11/10/2009 and T was determined from specific capacity.
	Hydraulic Conductivity	3.7 ft/day	The reference value was obtained from the reference transmissivity value.
	Groundwater Flow Field	Flow to the southeast. Hydraulic Gradient: 1.8×10^{-3} feet/ft	Hennepin County Atlas

Table 3g - Description of the Hydrogeologic Setting at Hamel Well 4 (520048)

	Attribute	Descriptor	Data Source
Aquifer: Mt. Simon Sandstone Aquifer (CMTS)	Aquifer Material	Sandstone	Well Logs
	Primary Porosity	0.20	Estimated
	Aquifer Thickness (ft)	98	Well Logs
	Stratigraphic Top Elevation	338	Well Logs
	Stratigraphic Bottom Elevation	240	Well Logs
	Hydraulic Confinement	Confined	Well Logs
	Transmissivity (T)	3,969 ft^2/day	The aquifer test plan was approved on 11/10/2009 and T was determined from specific capacity.
	Hydraulic Conductivity	39.3 ft/day	The reference value was obtained from the reference transmissivity value.
	Groundwater Flow Field	Flow to the southeast. Hydraulic Gradient: 2.5×10^{-3} feet/ft	Hennepin County Atlas

4. Delineation of the Wellhead Protection Area

4.1 Delineation Criteria

The boundaries of the WHPA for the city of Medina are shown in Figures 1a, 1b, and 1c. Table 4 (below) describes how the delineation criteria that are specified under Minnesota Rules, part 4720.5510, were addressed.

Table 4 - Description of WHPA Delineation Criteria

Criterion	Descriptor	How the Criterion was Addressed
Flow Boundary	Mississippi, Minnesota, Crow Rivers	The rivers provided boundary conditions to the model, extending to these natural boundaries. They were included in the model and set the regional groundwater flow.
Flow Boundary	Other High-Capacity Wells, Table 6	The pumping amounts were determined based on the averaged 1998-2007 pumped volumes. The pumping amounts of these high-capacity wells were included in the methods used for the delineation.
Daily Volume of Water Pumped	See Table 5	Pumping information was obtained from the Minnesota Department of Natural Resources Appropriations Permits PA 1960-0424, PA 1976-6030, and PA 1983-6007. The annual pumped volumes were converted to a daily volume pumped by each well.
Groundwater Flow Field	See Figure 2	The model calibration process addressed the relationship between the calculated versus observed groundwater flow field.
Aquifer Transmissivity	See Tables 3a - 3g	A range of transmissivity values was used to reflect changes in aquifer composition and thickness, as well as uncertainties related to the quality of existing aquifer test data.
Time of Travel	10 years	The public water supplier selected a 10 year time of travel.

Information provided by the city of Medina was used to identify the maximum volume of water pumped annually by each well over the previous five-year period, as shown in Table 5. Also, the estimated pumping for the next five years is shown. Previous pumping values have been reported to the DNR, as required by the city's Groundwater Appropriation Permits PA 1960-0424, PA 1976-6030, and PA 1983-6007. The maximum daily volume of discharge used as an input parameter in the model was calculated by dividing the future annual pumping volume by 365 days.

In addition to the wells used by the city of Medina, Table 6 shows other high-capacity wells that were included in the delineation to account for their pumping impacts on the capture areas for the city wells. Pumping data was obtained from the DNR State Water Use Database System (SWUDS).

Table 5
Annual Volume of Water Discharged from Water Supply Wells

Well Name	Unique Number	Use Status[1]	Annual Volume Pumped[2] (gallons)					Future Pumping (gal/yr)	Daily Volume[3] (gal/day)
			2005	2006	2007	2008	2009		
Morningside 1	208009	P	2,278,300	2,345,500	3,010,400	2,540,400	2,246,000	**3,500,000**	9,582
Morningside 2	223378	P	3,608,500	3,862,800	4,805,700	4,148,800	4,563,600	**5,000,000**	13,689
Independence 1	100219	E	750,000	769,000	1,043,000	**1,101,000**	1,079,000	0	0
Independence 2	448765	P	12,505,700	**15,637,500**	13,523,870	13,248,000	12,560,900	14,000,000	42,813
Hamel 2	158087	E	**18,479,000**	13,736,000	2,302,000	844,000	4,000	0	0
Hamel 3	122239	P	22,220,122	**23,897,700**	16,226,000	9,730,000	8,607,000	10,000,000	65,428
Hamel 4	520048	P	27,982,050	48,957,140	**117,956,000**	87,172,000	32,170,000	50,000,000	322,946
Hamel 5	709925	P				**26,864,000**	4,682,000	15,000,000	73,893
Hamel 6	747666	P				24,803,000	38,974,000	**50,000,000**	136,893
Hamel 7	759809	P					**63,773,000**	50,000,000	174,601
Totals			87,823,672	109,205,640	158,866,970	170,451,200	168,659,500	198,400,000	839,502

[1] - Primary Well (P), Emergency Backup Well (E)
[2] - Bolding indicates greatest annual pumping volume.
[3] - Daily volume used in the WHPA delineations.

Table 6 - Other Permitted High-Capacity Wells

Unique Number	Well Name	Permitted	DNR Permit Number	Resource Type	Aquifer	Use	Average Withdrawal (1998,2007) gallons/year
208009	1	MEDINA, CITY OF	1960-0424	Groundwater	QBAA	Waterworks	2,830,000
233378	2	MEDINA, CITY OF	1960-0424	Groundwater	QBAA	Waterworks	3,750,000
667910	1A	LONG LAKE, CITY OF	1965-0980	Groundwater	OPDCCJDN	Waterworks	19,840,000
509097	3	ORONO, CITY OF	1970-1351	Groundwater	OPCJ	Waterworks	23,990,000
240631	1	LORETTO, CITY OF	1975-6217	Groundwater	CFRNCMTS	Waterworks	630,000
208973	2	LORETTO, CITY OF	1975-6217	Groundwater	CJDN	Waterworks	13,630,000
596647	3	LORETTO, CITY OF	1975-6217	Groundwater	CFRNCIGL	Waterworks	9,180,000
236616	3	THREE RIVERS PARK DISTRICT	1975-6267	Groundwater	CSTL	Water Level Maintenance	2,080,000
100219	1	MEDINA, CITY OF	1976-6030	Groundwater	QBAA	Waterworks	1,300,000
448765	2	MEDINA, CITY OF	1976-6030	Groundwater	QBAA	Waterworks	12,780,000
100286	1	WAHLFORS, JACK B	1977-6402	Groundwater	QBAA	Major Crop Irrigation	460,000
207090	1	MAPLE PLAIN, CITY OF	1977-6403	Groundwater	CFRNCIGL	Waterworks	380,000
207407	2	MAPLE PLAIN, CITY OF	1977-6403	Groundwater	CFRNCIGL	Waterworks	85,680,000
112238	3	MAPLE PLAIN, CITY OF	1977-6403	Groundwater	CMTS	Waterworks	4,540,000
	1	HENNEPIN COUNTY PARKS	1979-6239	Groundwater		Waterworks	960,000
158087	2	MEDINA, CITY OF	1983-6007	Groundwater	CSTLCIGL	Waterworks	14,780,000
122239	3	MEDINA, CITY OF	1983-6007	Groundwater	CFRNCIGL	Waterworks	18,810,000
520048	4	MEDINA, CITY OF	1983-6007	Groundwater	CMTS	Waterworks	56,290,000
709925	5	MEDINA, CITY OF	1983-6007	Groundwater	QWTA	Waterworks	13,960,000
	1	ROLLING GREEN COUNTRY CLUB	1983-6141	Groundwater		Non-Crop Irrigation	9,610,000
	2	ROLLING GREEN COUNTRY CLUB	1983-6141	Groundwater		Non-Crop Irrigation	6,700,000
204208	1	HOLLYDALE GOLF CLUB	1986-6081	Groundwater	CJDN	Non-Crop Irrigation	4,030,000
483951	2	HOLLYDALE GOLF CLUB	1986-6081	Groundwater	OPDC	Non-Crop Irrigation	0
553550	1	ELM CREEK GOLF COURSE INC	1986-6119	Groundwater	QWTA	Non-Crop Irrigation	10,810,000
460092	2	ELM CREEK GOLF COURSE INC	1986-6119	Groundwater	QBAA	Non-Crop Irrigation	1,920,000
705716	1	LEJEUNE, LAURENCE	2005-3107	Groundwater	CSTLCFRN	Non-Crop Irrigation	2,280,000

4.2 Method Used to Delineate the Wellhead Protection Area

The WHPA for the city of Medina was determined using an existing regional MODFLOW model (Metro Model) that was developed by Barr Engineering Company for the Metropolitan Council (Metro Council, 2009). MODFLOW is a 3D, cell-centered, finite difference, saturated flow model developed by the U.S. Geological Survey (McDonald and Harbaugh, 1988; Harbaugh et al., 2000).

The regional Metro Model consists of nine layers that represent the major aquifers and aquitards within the seven-county metropolitan area. These layers represent, from top to bottom, the following units: (1) surficial aquifer of glacial deposits; (2) St. Peter Sandstone or Quaternary Buried Artesian Aquifer; (3) Prairie du Chien Group; (4) Jordan Sandstone; (5) St. Lawrence Formation (aquitard); (6) Franconia Formation; (7) Ironton-Galesville Aquifer, (8) Eau Claire Formation (aquitard); and (9) Mt. Simon Sandstone. The regional groundwater model was calibrated to steady-state water levels and river base flows.

A regional model limited to Hennepin and Carver Counties was extracted from the regional seven-county model. This model has a regular grid spacing of 250 meters and extends to the natural hydraulic boundaries, the Mississippi River to the north and east, the Minnesota River to the south, and the Crow River to the northwest. These river boundaries, along with wells, lakes, and infiltration, provided the model boundary conditions.

The regional Hennepin-Carver Counties model was used to construct three sub-models that were then used to delineate the wellhead protection areas. For the construction of these sub-models, unnecessary layers were dropped and their effects replaced by the leakage computed from the Hennepin-Carver Counties model. Dropping unnecessary layers made it possible to further refine the grid. A variable grid spacing was used, ranging from 1.2 meters near the city of Medina wells to 250 meters at the edge of the grid near the city wells. This refinement was required for an accurate computation of the particle flow paths and, therefore, WHPA delineation.

The three sub-models used for the WHPA analysis were as follows:

- A Mt. Simon model, consisting of one layer extracted from Layer 9 of the original Metro Model, was used to delineate the capture zone for Well Hamel 4 (520048).
- A Franconia-Ironton Galesville model, consisting of two layers extracted from Layers 6 and 7 of the original Metro Model, was used to delineate the capture zones for Well Hamel 3 (122239).
- A Quaternary Prairie du Chien-Jordan model, consisting of four layers extracted from Layers 2, 3, 4, and 5 of the original Metro Model, was used to delineate the capture zones for glacial deposit Wells Morningside 1 (208009), Morningside 2 (223378), Independence 2 (448765), and Hamel 5 (709925), and for Jordan Wells Hamel 6 (747666) and Hamel 7 (759809). The fourth layer, representing the St. Lawrence Formation, was not really modeled but was assigned specified heads everywhere. Its function was to control and assign the leakage across the base of the Jordan Aquifer.

Prior to their use in the delineations, the following modifications were incorporated in the refined models:

- A local area of modified horizontal conductivity was included in the models to reflect the transmissivities in Tables 3a through 3g.
- The pumping rates from Table 5 were assigned to the city of Medina wells.

The delineation was performed by backtracking particles from the wells to a 10-year time of travel using the particle tracking MODPATH code. A series of 50 particles were launched at each well. A porosity of 20 percent was used for the Jordan, Franconia, Ironton-Galesville, and Mt. Simon Sandstone Aquifers. A porosity of 25 percent was used for the glacial deposits aquifers.

The resulting WHPA boundaries are a composite of the 10-year capture zones calculated using these models for the base case parameters and the parameter values used in the sensitivity analysis and discussed in the following section. The WHPA boundaries are shown on Figures 1a, 1b, and 1c. The input files for all models are available upon request at the MDH.

4.3 Results of Model Calibration and Sensitivity Analysis

Model calibration is a procedure that compares the results of a model based on estimated input values to measured or known values. This procedure can be used to define model validity over a range of input values, or it helps determine the level of confidence with which model results may be used. As a matter of practice, groundwater flow models are usually calibrated using water elevation or flux.

The regional Metro Model was calibrated to the CWI database water level targets and stream flow targets by Metro Council (2009). The calibration of the regional model was performed applying an automated calibration procedure using PEST, a parameter estimation code that automatically adjusts the recharge rates and hydraulic conductivity values and compares modeled piezometric heads against measured values at observation well locations until a satisfactory fit is obtained.

The calibrated regional Metro Model provided the boundary conditions at the head-specified cells at the boundaries of the Hennepin County model and the three refined models. After construction, the refined MODFLOW model calibrations were verified by comparing modeled head results to the static water elevations in wells that were selected from the CWI database. The selected wells were completed in aquifers used by the city of Medina, i.e., the Quaternary Aquifer, the Jordan Sandstone Aquifer, the Ironton-Galesville Sandstone Aquifer, and the Mt-Simon Sandstone Aquifer.

The graph of computed versus observed piezometric heads for wells in the Jordan Aquifer, along with the calibration statistics, are displayed in Figure 5. The model residuals and the modeled groundwater elevation contour map are depicted in Figure 2. For each model, the standard deviation of the model prediction error represented less than 15 percent of the total change in measured heads across the model domain, which is within an acceptable range for a calibrated model.

Model sensitivity is the amount of change in model results caused by the variation of a specific input parameter while keeping the others constant. Using computer models to simulate groundwater flow involves representing a complicated natural system in a more simplified manner. Local geologic conditions likely vary within the capture area of the wells, but existing information for the area around the city of Medina is not sufficiently detailed to define this. As a result, the MODFLOW model cannot represent the natural flow system exactly, but the results are valid when they are based upon a reasonable variation of input parameters. This is accomplished by performing an uncertainty analysis to evaluate uncertainties in the hydrogeologic data that may affect the size and shape of the capture zone for each well.

The following discussion identifies the model input parameters that have the most significant impacts on the well capture zone analyses direction and the extent to which the modeled capture zone may be sensitive.

- Recharge through leakage may have an impact on the WHPA delineation when aquifers exhibit leaky confined hydraulic conditions. Changes in leakage were evaluated by varying the vertical hydraulic conductivity of the overlying till by a factor of 100. Decreasing the leakage to an aquifer significantly affects the length and shape of the capture zone.
- Pumping Rates have an impact on the WHPA delineation. The city of Medina has just added two new wells to their Hamel well field and, therefore, there are not enough historical data for these two wells to estimate their historical maximum pumping. The city of Medina estimated the projected future pumping rates at the city wells. The city estimated their projected withdrawal to be around 198.4 million gallons/year. These values were used to compute an initial delineation of the 10-year capture zone. A second set of pumping rates (based on the MDH procedure) was used to compute a second delineation of the 10-year capture zone. This second delineation was performed with a total withdawal at the wells of 306.6 million gallons/year (an increase of 54 percent over the base case). Increasing the pumped volume significantly affects the length and shape of the capture zone.

Addressing Model Sensitivity - A composite of the results, obtained by varying the input parameters that impacted sensitivity, was used to delineate the capture zones for the primary wells used by the city of Medina (Figures 1a-1c). This provided a conservative approach to addressing model sensitivity and produced capture zones that will most likely be protective of public health.

5. Delineation of the Drinking Water Supply Management Area

Figures 1a, 1b, and 1c show the boundaries of the Drinking Water Supply Management Area (DWSMA) and were defined by the city of Medina using the following features:

- Center-lines of highways, streets, roads, or railroad rights-of-ways;
- Public Land Survey coordinates;
- Property or fence lines; and
- Political boundaries.

6. Vulnerability Assessments

The Part 1wellhead protection plan includes the vulnerability assessments for the public water supply wells and the DWSMA. These vulnerability assessments are used to help define potential contamination sources within the DWSMA and to select appropriate measures for reducing the risk that they present to the public water supply.

6.1 Assessment of Well Vulnerability

The vulnerability assessment for each well used by the city of Medina is listed in Table 2 and is based upon the following conditions:

1) Well construction meets current state Well Code specifications (Minnesota Rule 4725) and the wells themselves do not provide a pathway for contaminants to enter the aquifers used by the public water supplier.
2) The geologic conditions at the well sites include a cover of clay-rich geologic materials over the aquifers that is sufficient to retard or prevent the vertical movement of contaminants.
3) None of the human-caused contaminants regulated under the federal Safe Drinking Water Act have been detected at levels indicating that any well itself serves to draw contaminants into any aquifer as a result of pumping.

6.2 Assessment of Drinking Water Supply Management Area Vulnerability

The vulnerability of the DWSMA is shown in Figures 6a, 6b, and 6c and is based upon the following information:

1) Isotopic and water chemistry data from wells located within the DWSMAs indicate that the aquifers contain water that has no detectable levels of tritium or human-caused contamination.
2) Review of the geologic logs contained in the CWI database and geological maps and reports indicate that the aquifers exhibit a low geologic sensitivity throughout the DWSMAs and are isolated from the direct vertical recharge of surface water.

7. Selected References

Balaban, N.H., (Ed.) (1989), *Geologic atlas of Hennepin County, Minnesota,* County Atlas Series, C-4, Minnesota Geological Survey, St. Paul, Minn., 9 plates, scale 1:100,000 and smaller.

Geologic Sensitivity Project Workgroup (1991), *Criteria and guidelines for assessing geologic sensitivity of ground water resources in Minnesota,* Minnesota Department of Natural Resources, Division of Waters, St. Paul, Minn., 122 p.

Harbaugh, A.W., Banta, E.R., Hill, M.C., and McDonald, M.G. (2000), *MODFLOW-2000, the U.S. Geological Survey modular ground-water model--user guide to modularization concepts and the ground-water flow process,* Open-File Report, 00-92, U.S. Geological Survey, Reston, Va., 121 p.

Kanivetsky, R. (1989), Bedrock hydrogeology, in *Geologic atlas of Hennepin County, Minnesota,* Balaban, N.H., (Ed.), County Atlas Series, C-4, Plate 6, Minnesota Geological Survey, St. Paul, Minn., scale 1:150,000.

McDonald, M.G., and Harbaugh, A.W. (1988), *A modular three-dimensional finite-difference ground-water flow model*, Techniques of Water-Resource Investigation, 06-A1, U.S. Geological Survey, 576 p.

Metro Council (2009), *Twin cities metropolitan area groundwater flow model (metro model)*, http://www.metrocouncil.org/environment/WaterSupply/metrogroundwatermodel.htm.

Meyer, G.N., and Hobbs, H.C. (1989), Surficial geology, in *Geologic atlas of Hennepin County, Minnesota,* Balaban, N.H., (Ed.), County Atlas Series, C-4, Plate 3, Minnesota Geological Survey, St. Paul, Minn., scale 1:100,000.

Selected References - Continued

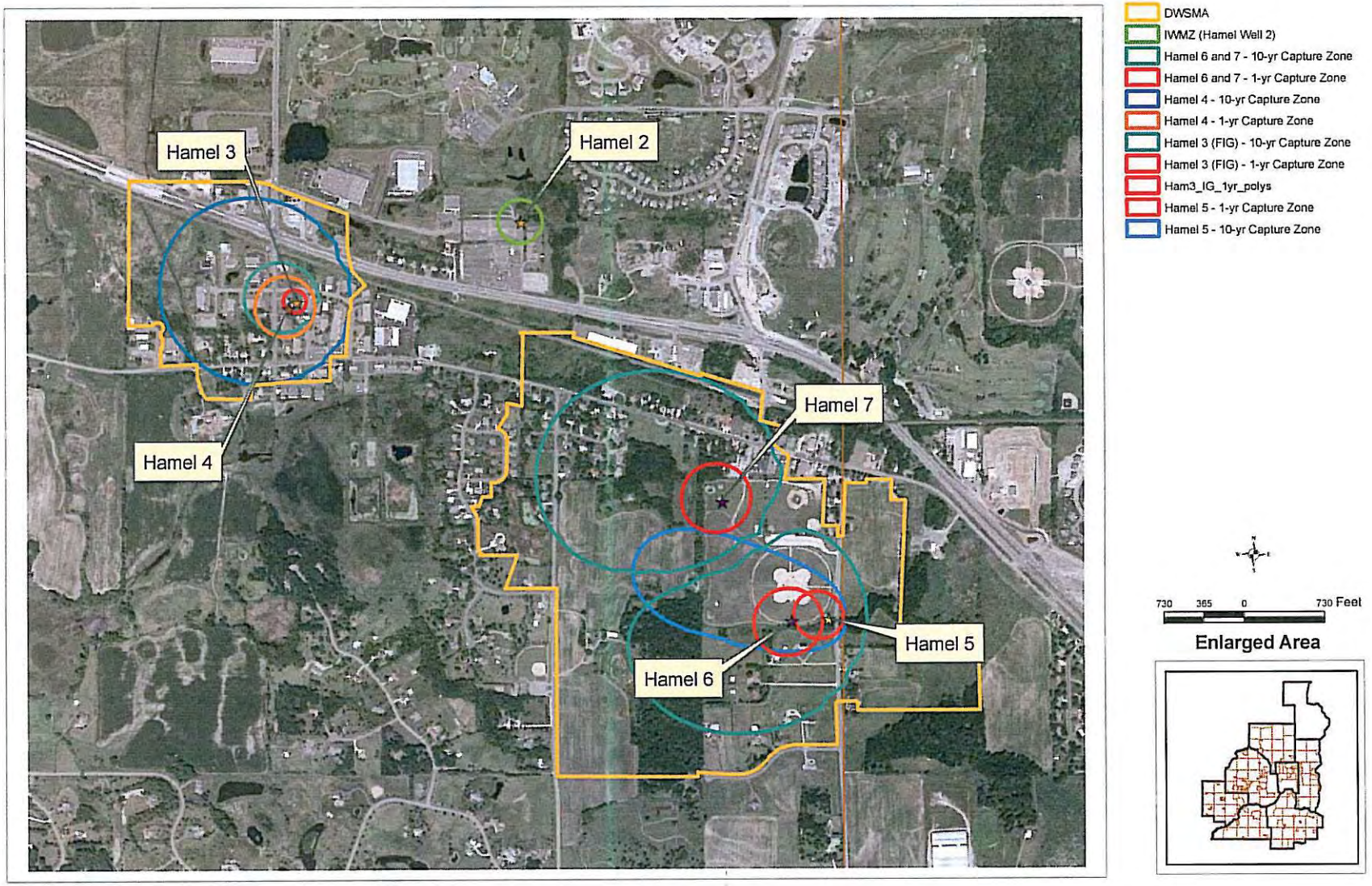
Mossler, J.H. (1972), Paleozoic structure and stratigraphy of the Twin City region, in *Geology of Minnesota: A centennial volume,* Sims, P.K., and Morey, G.B., (Eds.), Minnesota Geological Survey, St. Paul, Minn., p. 485-497.

Piegat, J, (1989), Sensitivity of ground-water systems to pollution, in *Geologic atlas of Hennepin County, Minnesota,* Balaban, N.H., (Ed.), County Atlas Series, C-4, Plate 7, Minnesota Geological Survey, St. Paul, Minn., scale 1:100,000.

Runkel, A.C., Tipping, R.G., Alexander, E.C. Jr., Alexander, S.C. (2006), *Hydrostratigraphic characterization of intergranular and secondary porosity in part of the Cambrian sandstone aquifer system of the cratonic interior of North America: improving predictability of hydrogeologic properties,* Sedimentary Geology, 184, p. 281-304.

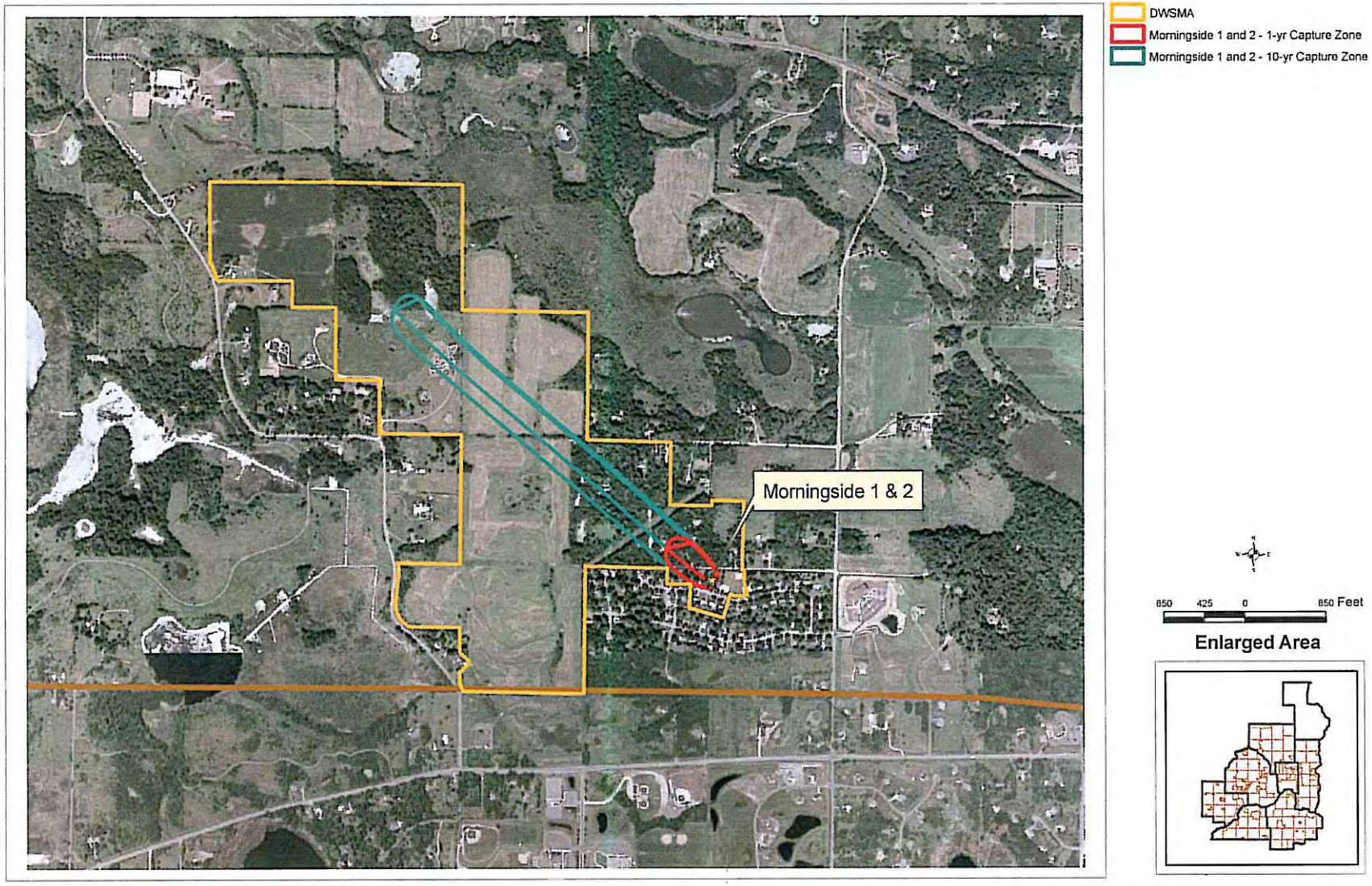
Steffen, K. (2004), *Soil survey of Hennepin County, Minnesota*, Soil Survey, U.S. Department of Agriculture, Soil Conservation Service, Washington, D.C., 1059 p., 64 sheets, scale 1:12,000.

Figures



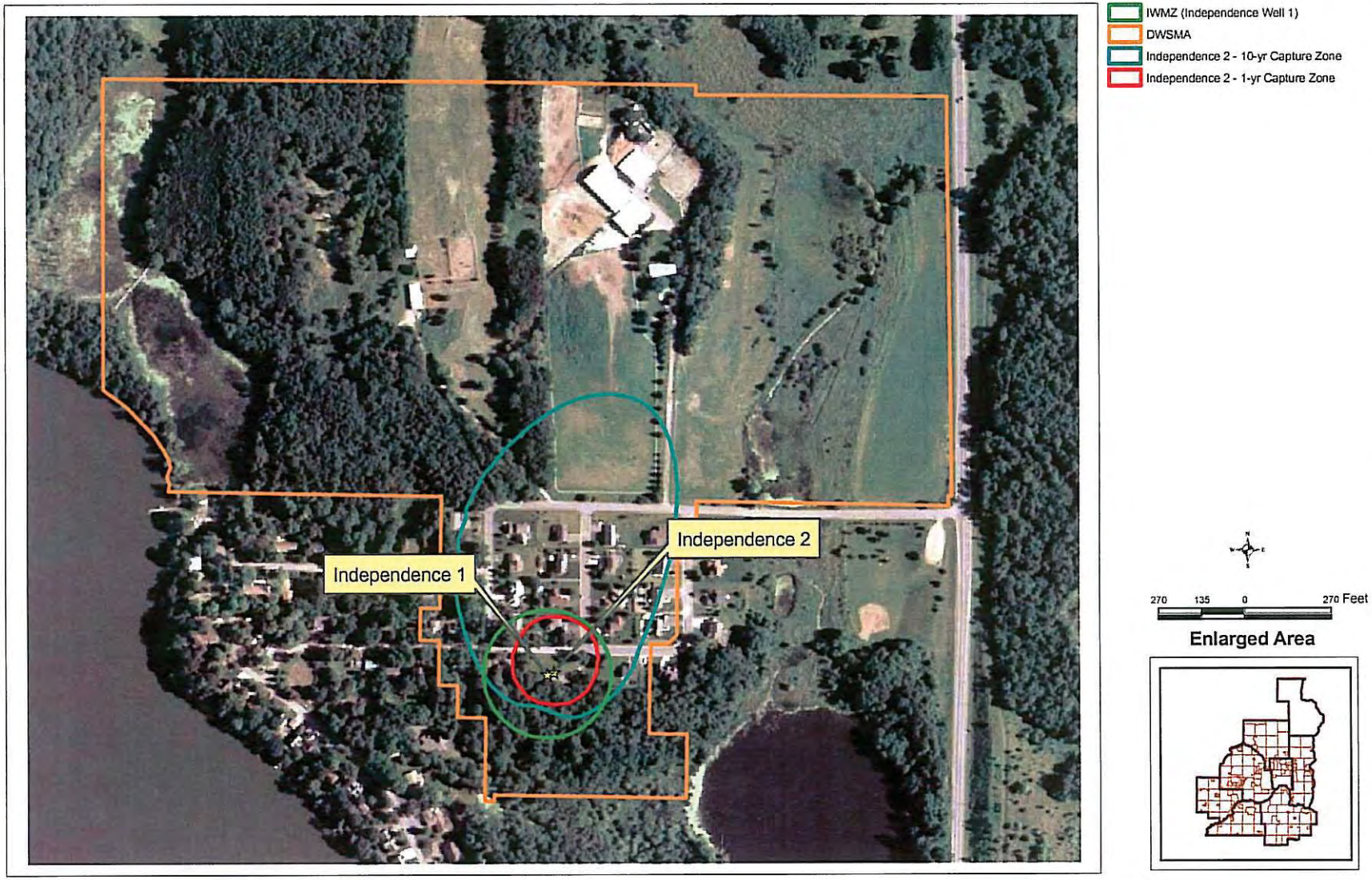
MINNESOTA MDH DEPARTMENT OF HEALTH

Figure 1a
Drinking Water Supply Management Area
Hamel Well Field
(City of Medina, MN)



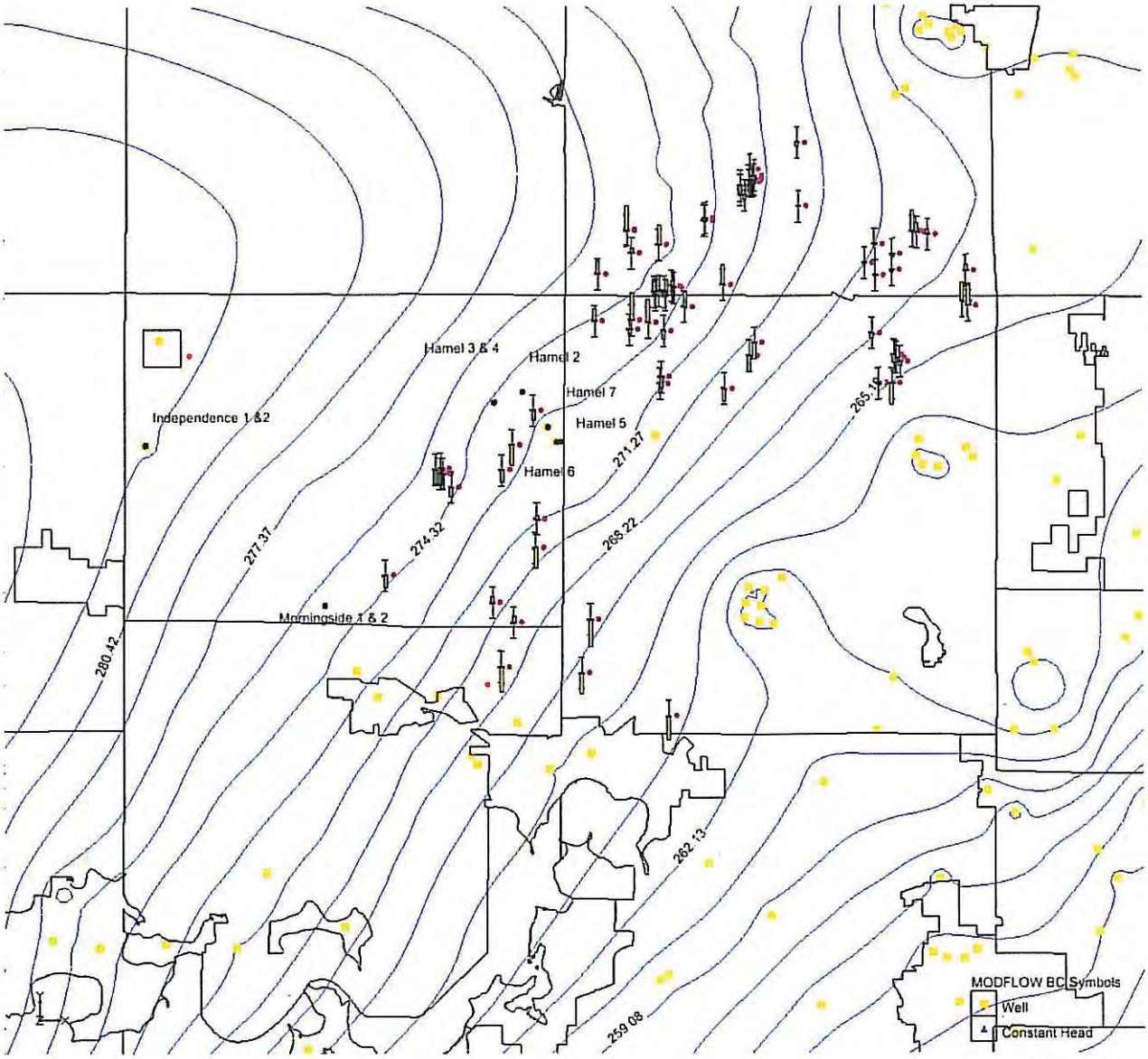
MINNESOTA MDH DEPARTMENT OF HEALTH

Figure 1b
Drinking Water Supply Management Area
Morningside Well Field
(City of Medina, MN)



MINNESOTA MDH DEPARTMENT OF HEALTH

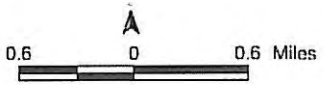
Figure 1c
Drinking Water Supply Management Area
Independence Well Field
(City of Medina, MN)



Red: 10m < |Residual|
Yellow: 10m < |Residual| < 10m
Green: |Residual| < 5m

MINNESOTA MDH DEPARTMENT of HEALTH

Figure 2
Modeled Groundwater Flow Field and Spatial Distribution of Modeling Errors
Jordan Aquifer



Blown-Up Area

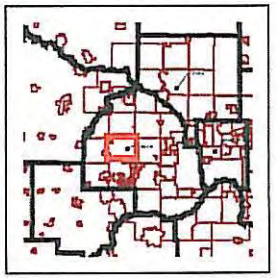
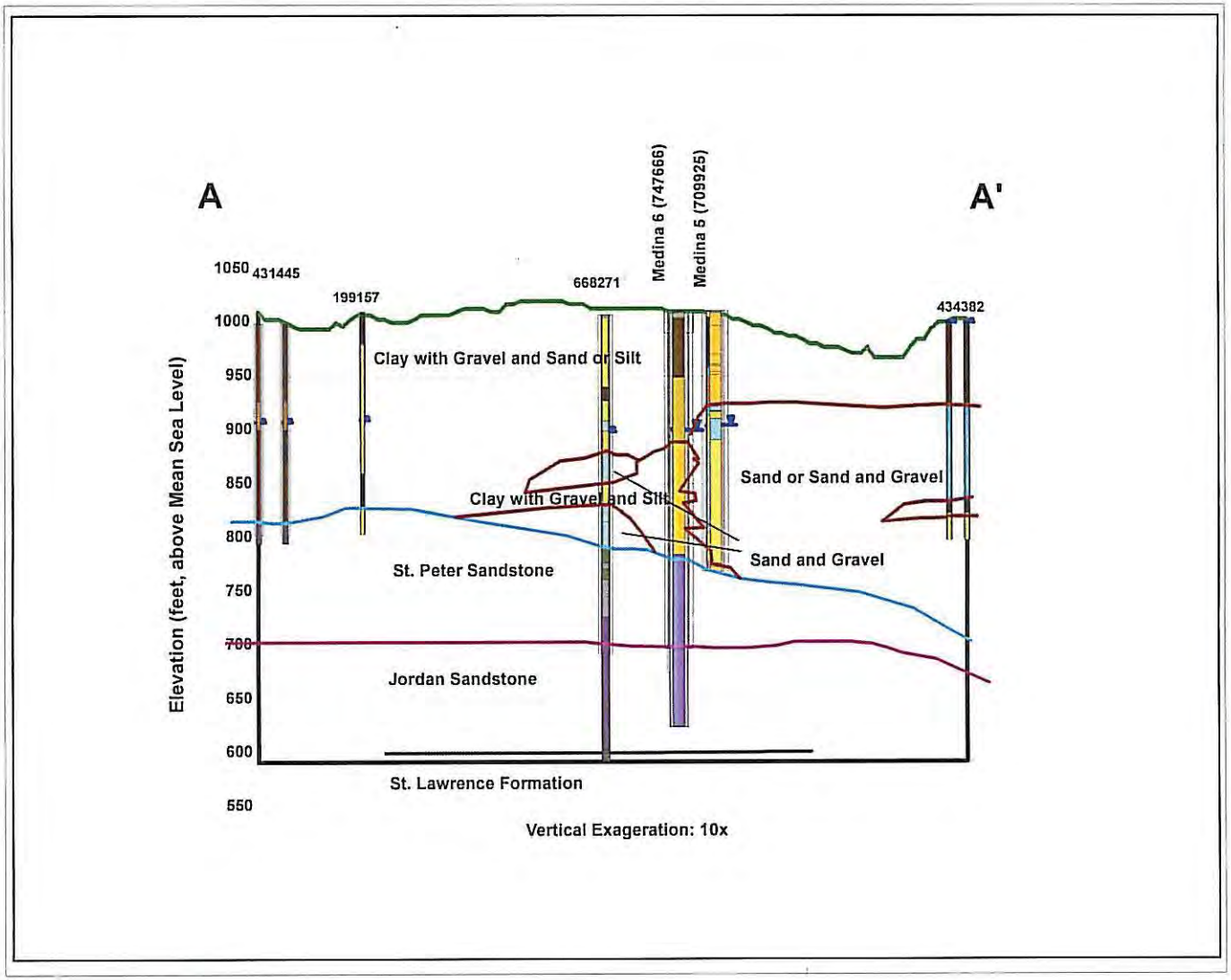
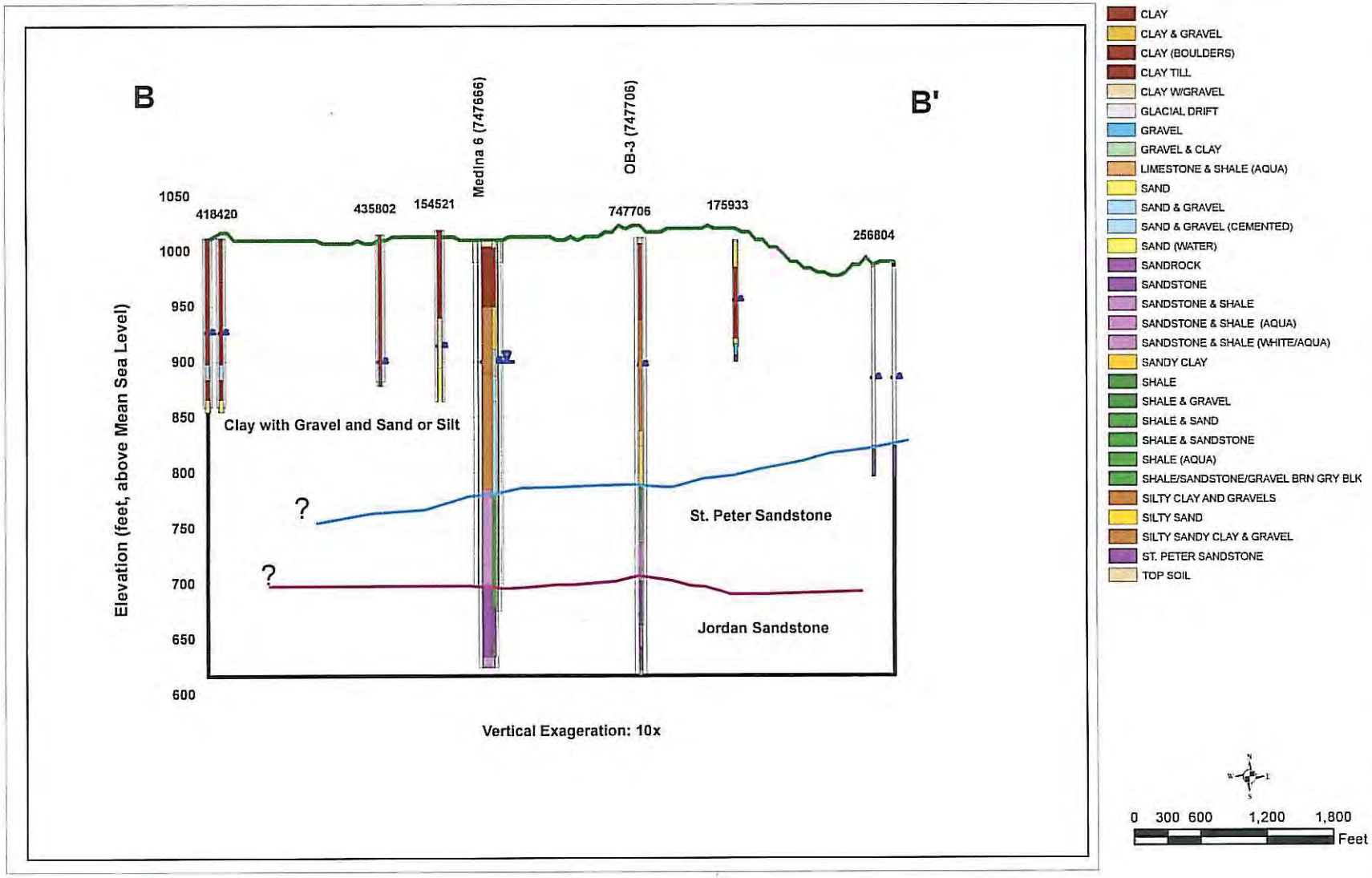


Figure 3
CROSS-SECTION LOCATIONS
(City of Medina, MN)



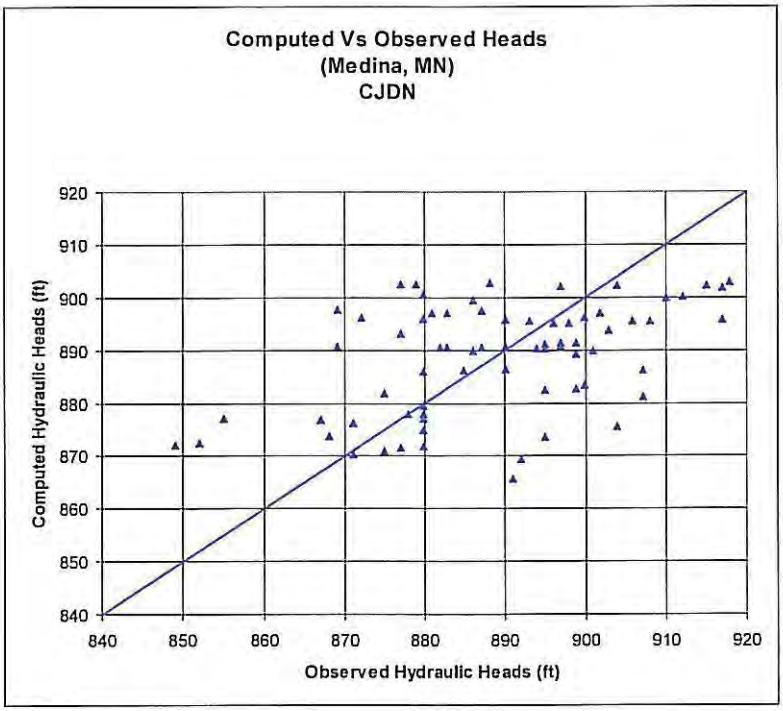
MINNESOTA MDH DEPARTMENT OF HEALTH

Figure 4a
Cross-Section A-A'
(City of Medina, MN)



MINNESOTA MDH DEPARTMENT OF HEALTH

Figure 4B
Cross-Section B-B'
(City of Medina, MN)

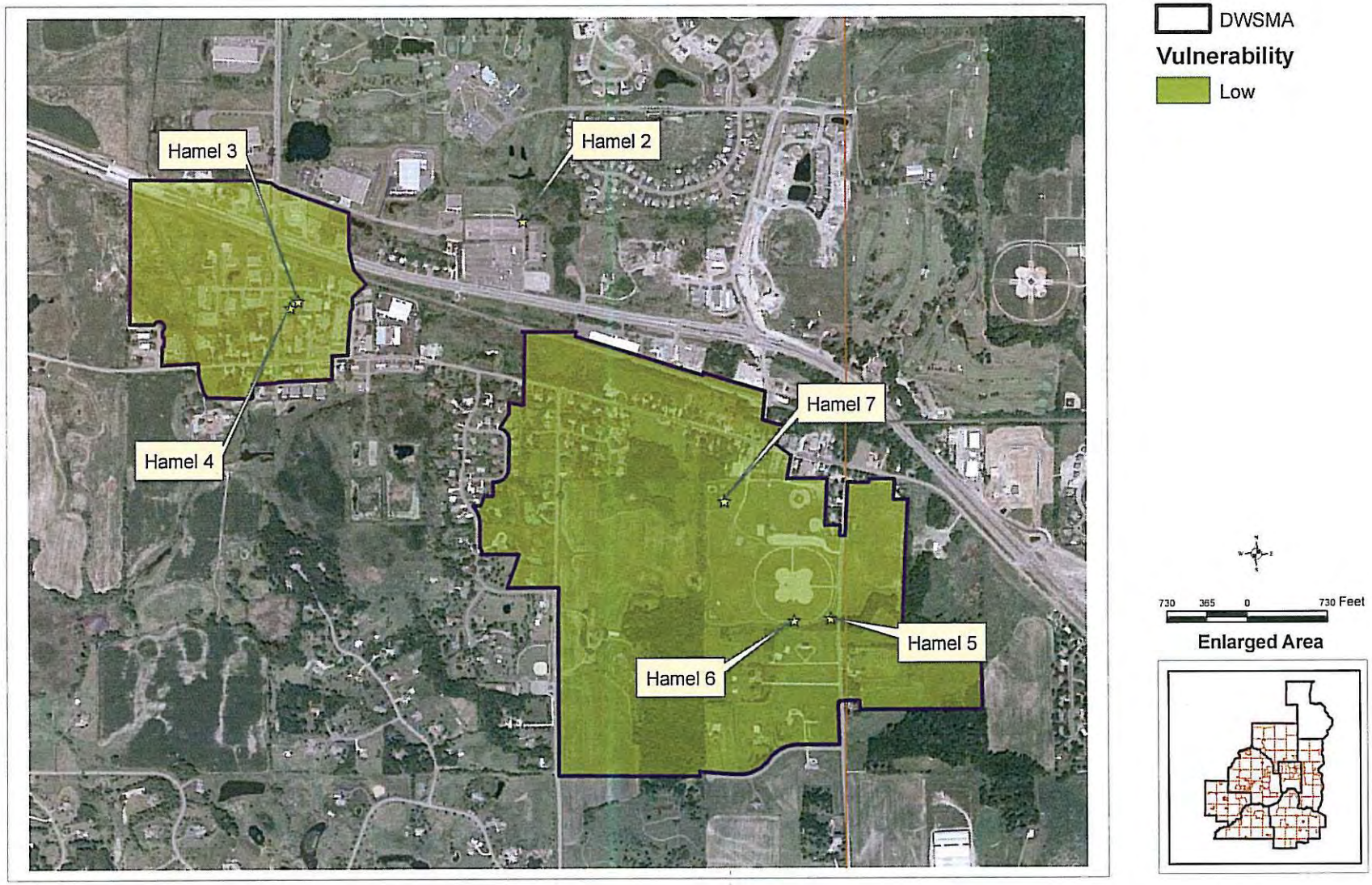


Local Model
Calibration Statistics

Residulal Mean (ft)	-0.31
Coefficient of Correlation	0.469
Coefficient of Determination	0.22
number of observations	72
Absolute Max Head	917.98
Absolute Min Head	849.08
Residual Standard Dev.	7.524
Res Std Dev./Range	10.92%

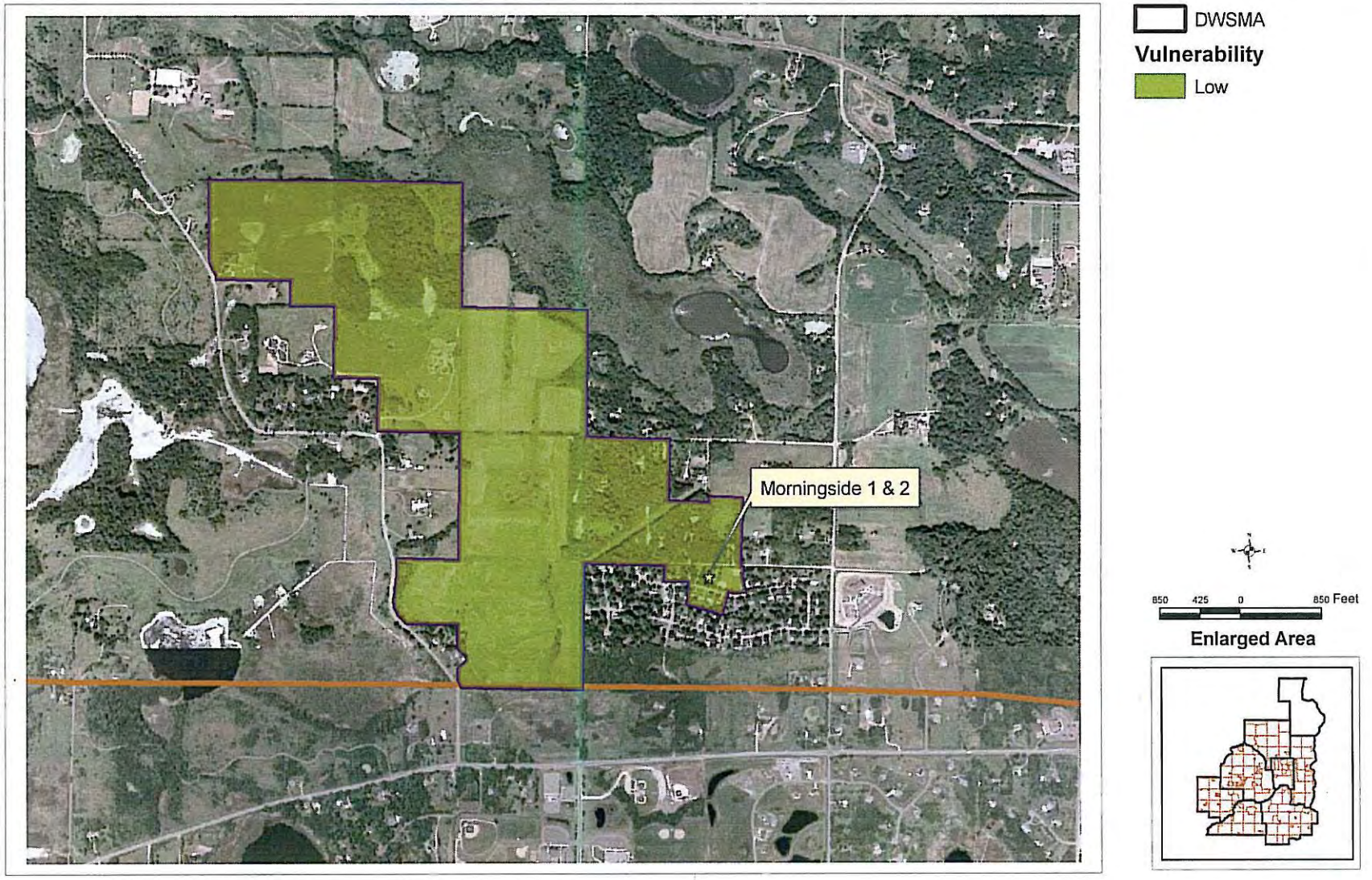
MINNESOTA MDH DEPARTMENT OF HEALTH

Figure 5
Local Model Calibration Statistics
Jordan Aquifer
City of Medina, MN



MINNESOTA MDH DEPARTMENT OF HEALTH

Figure 6a
Drinking Water Supply Management AreaVulnerability
Hamel Well Field
(City of Medina, MN)



MINNESOTA MDH DEPARTMENT OF HEALTH

Figure 6b
Drinking Water Supply Management Area Vulnerability
Morningside Well Field
(City of Medina, MN)

MINNESOTA MDH DEPARTMENT OF HEALTH

Figure 6c
Drinking Water Supply Management Area Vulnerability
Independence Well Field
(City of Medina, MN)

APPENDIX II:

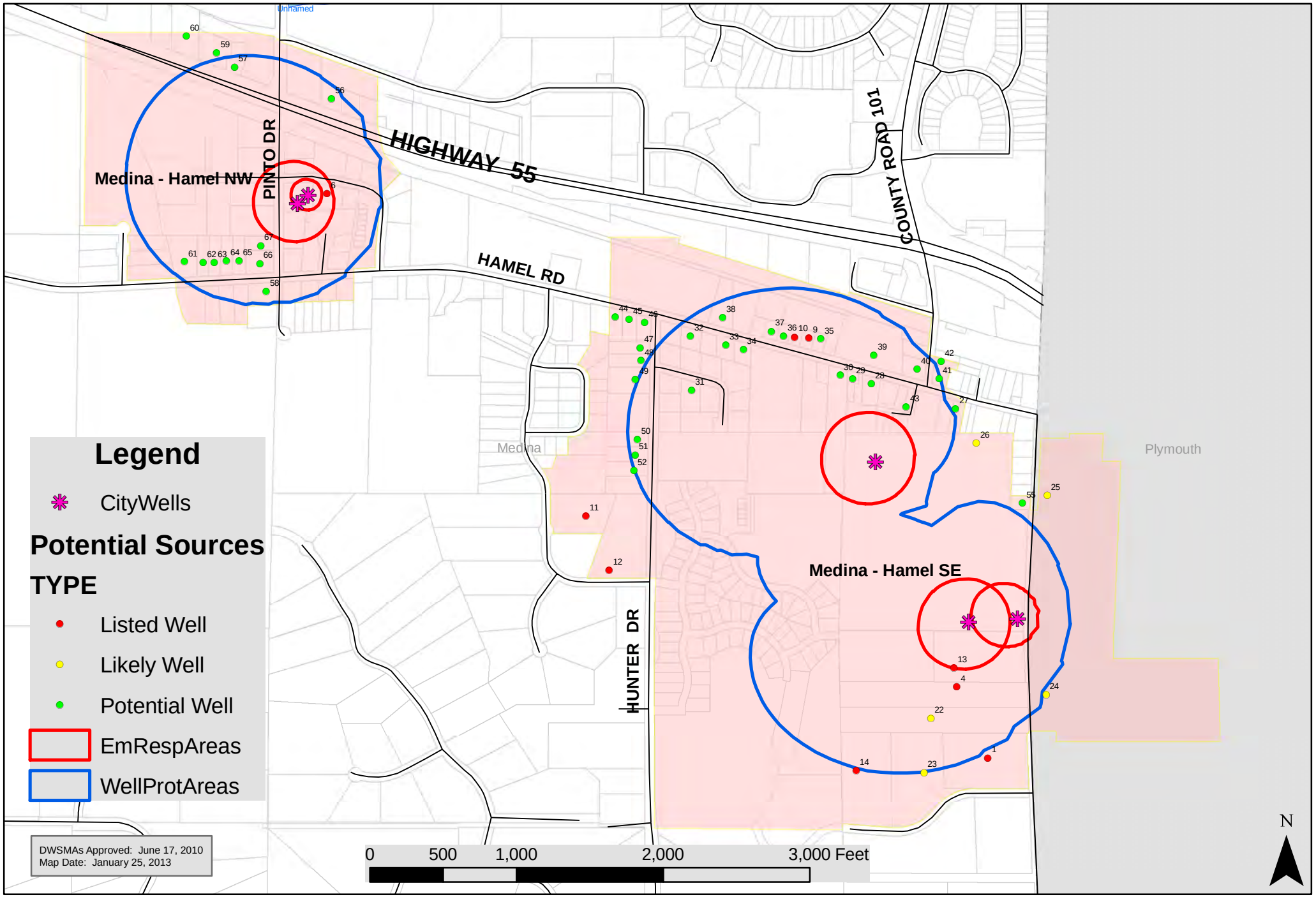
Inventory of Potential Contamination Sources and Maps Showing Locations

INVENTORY OF POTENTIAL CONTAMINATION SOURCES

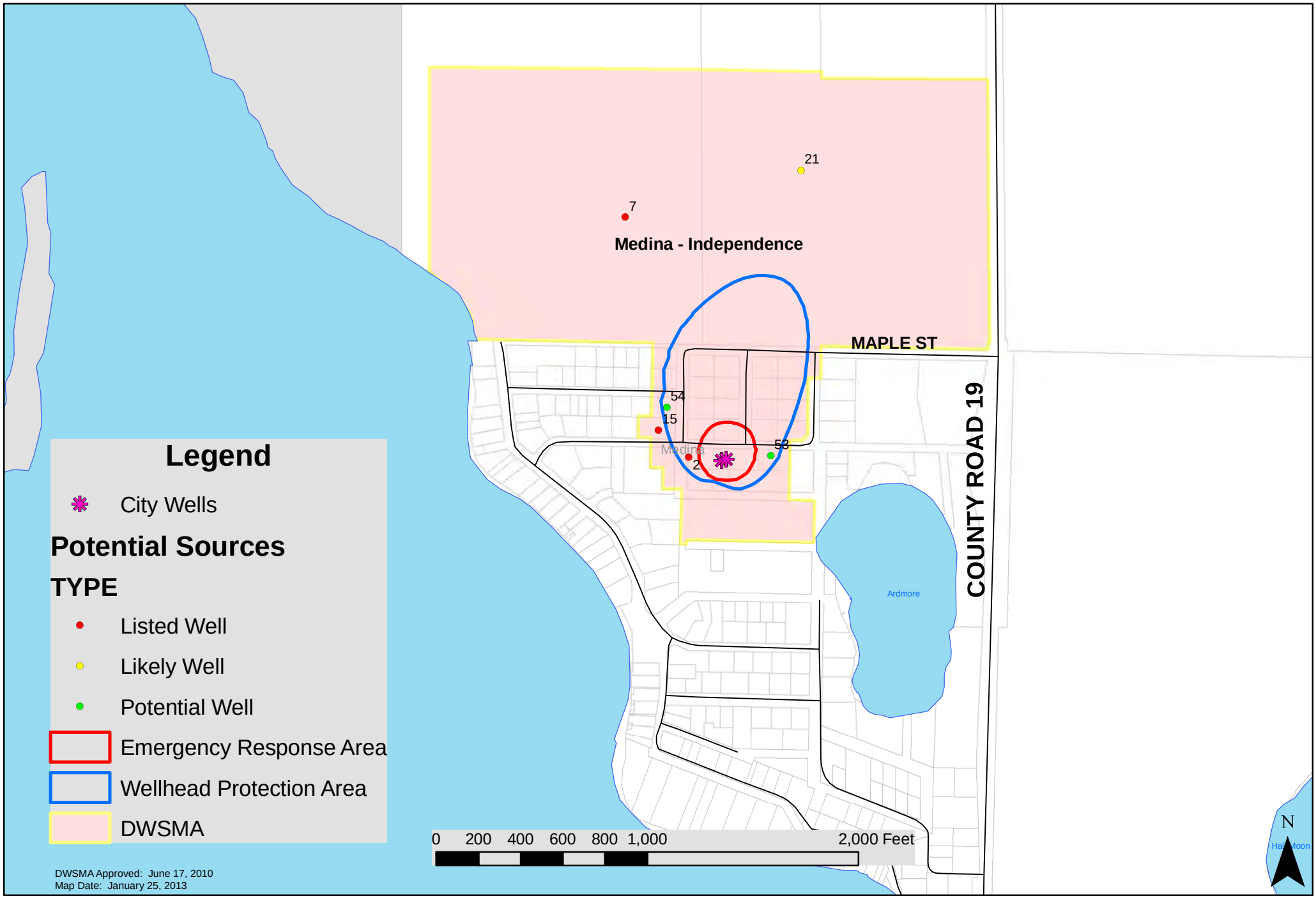
UNIQUE_N	DEPTH_DRLL	PID	ADDRESS	NOTES	SOURCECODE	FACILCODE	STATUS	RISKLEVEL	TYPE	WELLZONE	ID
00435802	137.00	1311823110009	50 Navajo Road E.	Enclave Development - will be sealed	WEL	1000		Low	Listed Well	Hamel E	1
00206872	252.00	1811823220098	4595 Walnut Street		WEL	1000		Low	Listed Well	Independence	2
00158440	317.00	1811823120006	1471 Willow Drive		WEL	1000		Low	Listed Well	Morningside	3
00154521	155.00	1311823110007	4245 Brockton Lane	Enclave Brockton Development - should be sealed	WEL	1000		Medium	Listed Well	Hamel E	4
00136608	367.00	2811823110006	1461 Willow Drive		WEL	1000		Low	Listed Well	Morningside	5
00208976	310.00	1211823230061	795 Tower Drive	Likely is sealed - Medina Well #1 mis-mapped	WEL	1000		Low	Listed Well	Hamel W	6
00100309	169.00	0711823320001			WEL	1000		Low	Listed Well	Independence	7
00190016	206.00	2811823120007	1465 Willow Drive		WEL	1000		Medium	Listed Well	Morningside	8
00175933	110.00	1211823420008	252 Hamel Road	Likely incorrectly mapped from 1211823420009	WEL	1000		Low	Listed Well	Hamel E	9
00175933	110.00	1211823420009	242 Hamel Road	Well on PID 1211823420008 should likely be here	WEL	1000		Low	Listed Well	Hamel E	10
163877	182.00	1211823340006	3402 Elm Creek Drive	Location not known	WEL	1000		Low	Listed Well	Hamel E	11
426897	182.00	1211823340008	3392 Elm Creek Drive	Location not known	WEL	1000		Low	Listed Well	Hamel E	12
154521	155.00	1311823110005	4425 Brockton Lane	Location not known	WEL	1000		Low	Listed Well	Hamel E	13
453870	175.00	1311823110011	150 Navajo Road E.	Enclave Brockton Development - will be sealed	WEL	1000		Medium	Listed Well	Hamel E	14
	122.00	1811823220160	4612 Walnut Street		WEL	1000		Low	Listed Well	Independence	15
594940	284.00	2811823120002	2635 Deerhill Road		WEL	1000		Low	Listed Well	Morningside	16
767738	275.00	2811823120003	2665 Deerhill Road		WEL	1000		Low	Listed Well	Morningside	17
554832	298.00	2111823330001	1582 Homestead Trail		WEL	1000		Low	Listed Well	Morningside	18
	0.00	2111823320001	1822 Homestead Trail		WEL	1000		Low	Likely Well	Morningside	19
	0.00	2811823120010	2725 Deerhill Road		WEL	1000		Low	Likely Well	Morningside	20
	0.00	0711823340003	4650 Maple Street		WEL	1000		Low	Likely Well	Independence	21
	0.00	1311823110008	4225 Brockton Lane	Enclave Brockton - will be sealed	WEL	1000		Medium	Likely Well	Hamel E	22
	0.00	1311823110012	100 Navajo Road E.	Enclave Brockton - will be sealed	WEL	1000		Medium	Likely Well	Hamel E	23
	0.00	1811822220003	4420 Brockton Lane	In City of Plymouth	WEL	1000		Medium	Likely Well	Hamel E	24
	0.00	0711822330006	4640 Brockton Lane	In City of Plymouth	WEL	1000		Low	Likely Well	Hamel E	25
	0.00	1211823440017	3200 Mill Drive	Irrigation well in park	WEL	1000		Low	Likely Well	Hamel E	26
	0.00	1211823400059	95 Hamel Road		WEL	1000		Unknown	Potential Well	Hamel E	27
	0.00	1211823410038	195 Hamel Road	Built 1916; city water 1968	WEL	1000		Unknown	Potential Well	Hamel E	28
	0.00	1211823410040	205 Hamel Road	Built 1940; city water 1968	WEL	1000		Unknown	Potential Well	Hamel E	29
	0.00	1211823420001	215 Hamel Road	Built 1910; city water 1968	WEL	1000		Unknown	Potential Well	Hamel E	30
	0.00	1211823420032	365 Comanche Trail	Built 1965; clty water 1968	WEL	1000		Unknown	Potential Well	Hamel E	31
	0.00	1211823420023	365 Hamel Road	Built 1965; city water 1968	WEL	1000		Unknown	Potential Well	Hamel E	32
	0.00	1211823420005	345 Hamel Road	Built 1960; city water 1968	WEL	1000		Unknown	Potential Well	Hamel E	33
	0.00	1211823420006	305 Hamel Road	Built 1966; city water 1968	WEL	1000		Unknown	Potential Well	Hamel E	34

	0.00	1211823420003	242 Hamel Road	Built 1900; city water 1968	WEL	1000		Unknown	Potential Well	Hamel E	35
	0.00	1211823420010	272 Hamel Road	Built 1940; city water 1968	WEL	1000		Unknown	Potential Well	Hamel E	36
	0.00	1211823420037	282 Hamel Road	Built 1959; city water 1968	WEL	1000		Unknown	Potential Well	Hamel E	37
	0.00	1211823420015	342 Hamel Road	Built 1920; city water 1968	WEL	1000		Unknown	Potential Well	Hamel E	38
	0.00	1211823410018	200 Hamel Road	St. Anne's	WEL	1000		Unknown	Potential Well	Hamel E	39
	0.00	1211823410065	172 Hamel Road	Built 1938; city water 1968	WEL	1000		Unknown	Potential Well	Hamel E	40
	0.00	1211823410066	122 Hamel Road	Built 1936; city water 1968	WEL	1000		Unknown	Potential Well	Hamel E	41
	0.00	1211823410023	3482 Sioux Drive	Built 1966; city water 1968	WEL	1000		Unknown	Potential Well	Hamel E	42
	0.00	1211823410035	155 Hamel Road	Built 1915; city water 1968	WEL	1000		Unknown	Potential Well	Hamel E	43
	0.00	1211823310012	445 Hamel Road	Built 1958; city water 1968	WEL	1000		Unknown	Potential Well	Hamel E	44
	0.00	1211823310011	425 Hamel Road	Built 1958; city water 1968	WEL	1000		Unknown	Potential Well	Hamel E	45
	0.00	1211823310010	405 Hamel Road	Built 1958; city water 1968	WEL	1000		Unknown	Potential Well	Hamel E	46
	0.00	1211823310008	3475 Hunter Drive	Built 1958: city water 1968	WEL	1000		Unknown	Potential Well	Hamel E	47
	0.00	1211823310009	3465 Hunter Drive	Built 1959; city water 1968	WEL	1000		Unknown	Potential Well	Hamel E	48
	0.00	1211823310006	3445 Hunter Drive	Built 1962; city water 1968	WEL	1000		Unknown	Potential Well	Hamel E	49
	0.00	1211823340001	3395 Hunter Drive	Built 1960; city water 1968	WEL	1000		Unknown	Potential Well	Hamel E	50
	0.00	1211823340002	3375 Hunter Drive	Built 1962; city water 1968	WEL	1000		Unknown	Potential Well	Hamel E	51
	0.00	1211823340003	3355 Hunter Drive	Built 1962; city water 1968	WEL	1000		Unknown	Potential Well	Hamel E	52
	0.00	1811823210016	4525 Walnut Street	Built 1960; city water 1975	WEL	1000		Unknown	Potential Well	Independence	53
	0.00	1811823220052	3145 Cedar Avenue	Built 1970; city water 1975	WEL	1000		Unknown	Potential Well	Independence	54
	0.00	1211823440008	4625 Brockton Lane	Built 1960; city water 1968	WEL	1000		Unknown	Potential Well	Hamel E	55
	0.00	1211823230010	752 Highway 55	Built 1960; city water 1968	WEL	1000		Unknown	Potential Well	Hamel W	56
	0.00	1111823140004	842 Highway 55	Built 1960; city water 1968	WEL	1000		Unknown	Potential Well	Hamel W	57
	0.00	1111823410001	805 Hamel Road	Built 1958; city water 1968	WEL	1000		Unknown	Potential Well	Hamel W	58
	0.00	1111823140006	872 Highway 55	Built 1961; city water 1968	WEL	1000		Unknown	Potential Well	Hamel W	59
	0.00	1111823110010	902 Highway 55	Built 1960; city water 1968	WEL	1000		Unknown	Potential Well	Hamel W	60
	0.00	1111823410015	882 Hamel Road	Built 1967; city water 1968	WEL	1000		Unknown	Potential Well	Hamel W	61
	0.00	1111823410014	872 Hamel Road	Built 1966; city water 1968	WEL	1000		Unknown	Potential Well	Hamel W	62
	0.00	1111823410013	862 Hamel Road	Built 1956; city water 1968	WEL	1000		Unknown	Potential Well	Hamel W	63
	0.00	1111823410012	852 Hamel Road	Built 1965; city water 1968	WEL	1000		Unknown	Potential Well	Hamel W	64
	0.00	1111823410011	842 Hamel Road	Built 1965; city water 1968	WEL	1000		Unknown	Potential Well	Hamel W	65
	0.00	1111823410010	812 Hamel Road	Built 1965; city water 1968	WEL	1000		Unknown	Potential Well	Hamel W	66
	0.00	1111823410009	3575 Pinto Drive	Built 1964; city water 1968	WEL	1000		Unknown	Potential Well	Hamel W	67

Hamel NW DWSMA and Hamel SE DWSMA
Potential Contamination Sources

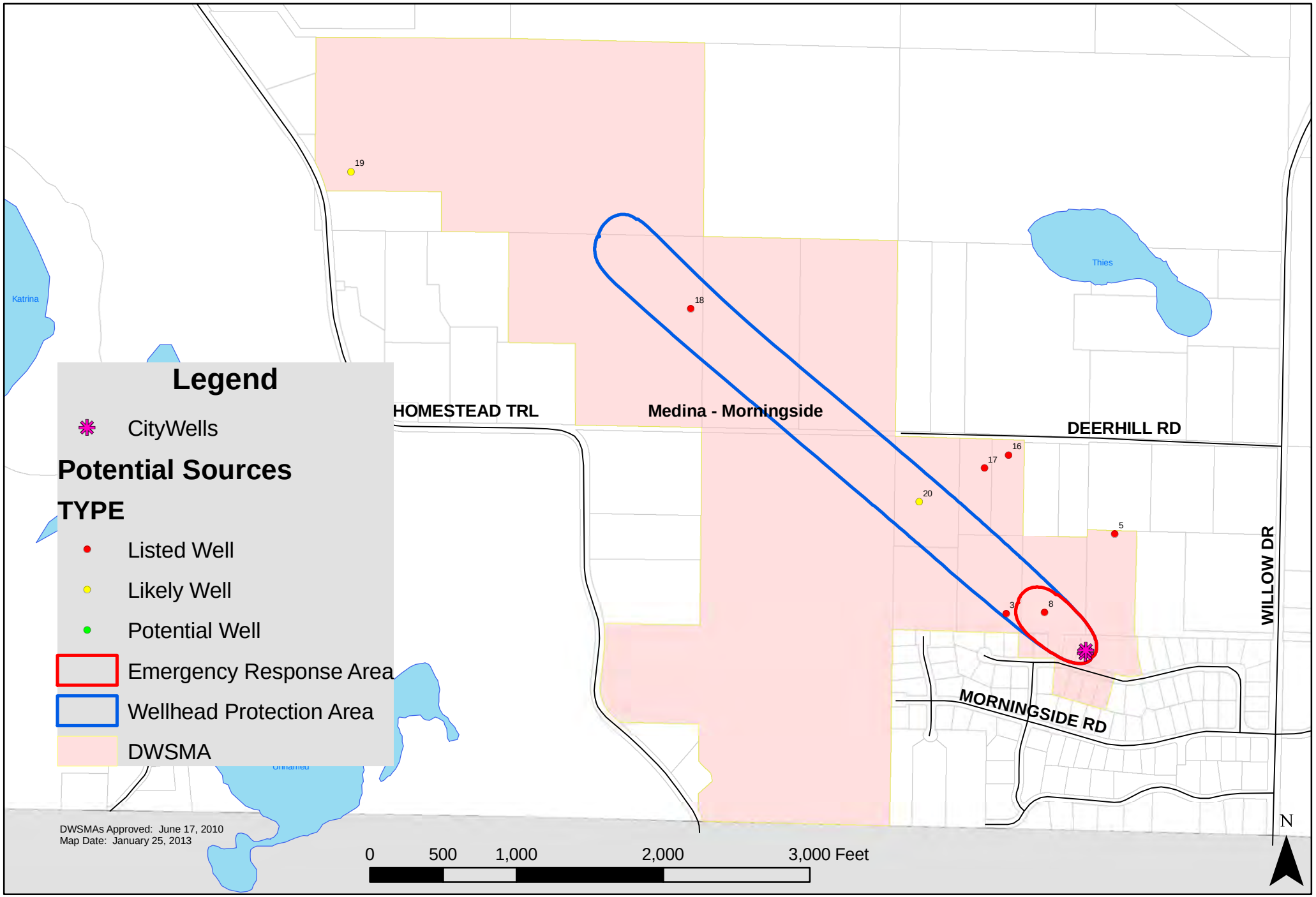


Independence Beach DWSMA
Potential Contamination Sources



DWSMA Approved: June 17, 2010
Map Date: January 25, 2013

Morningside DWSMA
Potential Contamination Sources



APPENDIX IV:

Scoping Decision Notices

MINNESOTA MDH DEPARTMENT of HEALTH

Protecting, maintaining and improving the health of all Minnesotans

February 5, 2010

Mr. Steve Scherer
Public Works Superintendent - City of Medina
2052 County Road 24
Medina, Minnesota 55340

Dear Mr. Scherer:

Subject: Scoping Decision Notice No. 1 for the City of Medina, PWSID 1270023

This letter provides notice of the results of the Scoping 1 meeting that we held with you, Mark Janovec (Bonestroo Rosene Anderlik & Associates), and Terry Bovee (Minnesota Department of Health) on November 2, 2009. During the meeting, we discussed the preparation of Part I of the Wellhead Protection Plan that will document the 1) delineation of a wellhead protection area, 2) delineation of a drinking water supply management area, and 3) assessments of well and aquifer vulnerability related to these areas for the primary water supply wells used by the City of Medina. The wellhead protection area is the surface and subsurface area surrounding your public water supply wells through which contaminants are likely to move and affect your drinking water supply. The drinking water supply management area is the area delineated using identifiable landmarks that reflect the wellhead protection area boundaries as closely as possible.

It is our understanding that the city also has two wells, Hamel Well 2 (158087) and Independence Well 1 (100219) that it retains for emergency standby use. The city must manage an inner wellhead management zone that is defined by a 200-foot radius around each emergency standby well. A wellhead protection area is not defined for these wells because the wells only pump during emergency water needs.

According to the state wellhead protection rule, the city will have until August 12, 2013, to complete its entire Wellhead Protection Plan, Part I and Part II. As we discussed, the rule describes the criteria used for determining the time period for completion of the Wellhead Protection Plan (Minnesota Rules, part 4720.5130). The Minnesota Department of Health (MDH) highly recommends that half of the time allotted be dedicated to completing Part II of the plan. If the Medina wellhead protection area lies in more than two governmental jurisdictions, the city will have an automatic six-month extension to complete the plan. Once Part I has been approved by the MDH and a Scoping 2 meeting held with the city, a Scoping 2 letter and decision notice will be sent to the city and will include any revised completion date.

It is our understanding that the MDH will assist the city with the preparation of its Part I report. There will be no cost to the city for any involvement by MDH staff with this work. It will be the responsibility of the City of Medina to assist with data collection to aid in the delineation and vulnerability assessments.

At our meeting, we discussed rule requirements and the types of information needed to prepare the Part I report. The Wellhead Protection Plan must be prepared in accordance with Minnesota Rules, parts 4720.5100 to 4720.5590. General wellhead protection requirements, criteria for delineating the wellhead protection area, and data reporting are presented in Minnesota Rules, parts 4720.5500 to 4720.5510.

The enclosed Scoping Decision Notice No. 1 formally identifies the information the city must provide to the MDH to meet rule requirements for preparing Part I of the Wellhead Protection Plan. The wellhead rule refers to the existing information required for wellhead planning as data elements. Much of this information is available in the public domain, as described in the Scoping Decision Notice No. 1 form. You only need to provide the information that is not in the public domain and, therefore, not available to MDH. The Scoping Decision Notice No. 1 form also 1) lists the Minnesota unique well number and well construction for each well that will be included in the Wellhead Protection Plan [Table 1], 2) lists the pumping volumes for each well [Table 2], 3) lists high-capacity wells which may have an influence on your wellhead protection area [Table 3] and 4) includes a map of the well locations (Figure 2). A summary of the information the city needs to provide is included at the end of the Scoping Decision Notice No. 1 form.

Finally, it is our understanding that you will serve officially as the wellhead protection manager on behalf of the city. You are responsible for providing written notice to local units of government of the city's intent to develop a Wellhead Protection Plan, as required by the wellhead protection rule (part 4720.5300, subpart 3). A copy of this notice should be forwarded to MDH and must include a list of the city wells, their unique well numbers, and contact information for you as Wellhead Protection Plan manager. It is my understanding that Terry Bovee, Source Water Protection Unit Planner, has provided you with a template of the notification of intent.

In closing, we look forward to working with you on completion of your Wellhead Protection Plan. If you have any questions regarding our comments, please contact me at 651/201-4577 or at amal.djerrari@state.mn.us.

Sincerely,

Amal M. Djerrari, Hydrologist
Source Water Protection Unit
Environmental Health Division
P.O. Box 64975
St. Paul, Minnesota 55164-0975

AMD:kmc
Enclosures: Scoping Decision Notice No. 1, Summary of Data Requested, Map of Well Locations (Figure 2), Table 1 - Public Water Supply Well Information, Table 2 - Annual Volume of Water Pumped From PWS Wells, Table 3 - Permitted High-Capacity Wells
cc: Terry Bovee, Planner, Source Water Protection Unit, Mankato District Office
bcc: Stephen C. Thompson, Water Monitoring Section, Minnesota Pollution Control Agency
Laurel Reeves, Division of Waters, Minnesota Department of Natural Resources
Brian Williams, Pesticide & Fertilizer Mgmt. Division, Minnesota Department of Agriculture
Eric Mohring, Hydrologist, Board of Water and Soil Resources

SCOPING DECISION NOTICE No. 1
(Nonvulnerable Setting)

The purpose for the first Scoping Meeting, as required by Minnesota Rule 4720.5310, is to discuss the information necessary for preparing a Part I Report of a Wellhead Protection Plan. The Part I Report identifies the area that provides the source of drinking water for the public water supply (PWS) so that the PWS can develop land use or management practices to protect their groundwater resource from contamination. Specifically, the Part I Report documents the delineation of the wellhead protection area (WHPA), the delineation of the drinking water supply management area (DWSMA), and assesses the vulnerability of the PWS well(s) and DWSMA.

The wellhead rule (Minnesota Rule 4720.5310) refers to the information required for wellhead planning as data elements. This form lists the data elements that are stated in Minnesota Rule 4750.5400. The Minnesota Department of Health (MDH) uses this form to designate which data elements are needed to prepare the Part I Report, based on the hydrogeological setting, vulnerability of the well(s), and aquifer information known at the time of the Scoping 1 Meeting.

Name of Public Water Supply		**Date**
(PWSID = 1270023)		**10/19/2009**
Name of the Wellhead Protection Manager		
Steve Scherer		
Address	**City**	**Zip**
Medina City Hall 2052 County Road 24	Hamel, Minnesota	55340
Unique Well Numbers		**Phone**
158087, 208009, 223378, 122239, 448765, 520048, 709925, 747666, 759809,100219		(763)473-4643

Instructions for Completing the Scoping No. 1 Form

N	D	V	S	
X				**N =** If this box is checked with an "X," this data element is **NOT** necessary for the **Part I Report** of your Wellhead Protection Plan. This data element may be identified later at the Scoping 2 Meeting and used for the Part 2 Report. Please go to the next data element.

N	D	V	S	
	X			**D =** If this box is checked with an "X," the preparer of the Part I Report is **required** to use this information for the **DELINEATION** of the WHPA or the DWSMA. If there is no check in the "S" box, this information is available in the public domain or is on-file at MDH.

N	D	V	S	
		X		**V =** If this box is checked with an "X," the preparer of the Part I Report is **required** to use this information for the **VULNERABILITY** assessment of the PWS well or the DWSMA. If there is no check in the "S" box, this information is available in the public domain or is on-file at MDH.

N	D	V	S	
			X	**S =** If this box is checked with an "X," the PWS **must SUBMIT** the information to the MDH.

DATA ELEMENTS ABOUT THE PHYSICAL ENVIRONMENT

A. PRECIPITATION

N	D	V	S	
X				A.1: An existing map or list of local precipitation gauging stations.

Technical Assistance Comments:

N	D	V	S	
X				A.2: An existing table showing the average monthly and annual precipitation, in inches, for the preceding five years.

Technical Assistance Comments:

B. GEOLOGY

N	D	V	S	
	X	X	X	B.1: An existing geologic map and a description of the geology, including aquifers, confining layers, recharge areas, discharge areas, sensitive areas as defined in Minnesota Statutes, section 103H.005, subdivision 13, and groundwater flow characteristics.

Technical Assistance Comments: Information of this type is required to characterize the geologic and hydrogeologic setting of the PWS well field(s). This information is used to define aquifer geometry, location and magnitude of the recharge and discharge areas, and groundwater flow information. Aquifer tests or alternatives listed in MN Rules 4720.5510, subpart 6, can be used to help characterize flow in the aquifer. Reference all information used to develop the conceptual model of the geologic setting and submit to MDH only the information that is not available in the public domain.

N	D	V	S	
	X	X	X	B.2: Existing records of the geologic materials penetrated by wells, borings, exploration test holes, or excavations, including those submitted to the department.

Technical Assistance Comments: Information of this type may be useful to refine the understanding of the geologic and hydrogeologic setting on a local basis. Submit only if the PWS or city has information of test drilling or site investigations conducted by the city that is not available in the public domain.

N	D	V	S	
	X	X	X	B.3: Existing borehole geophysical records from wells, borings, and exploration test holes.

Technical Assistance Comments: Information from geophysical records may provide additional information about aquifer thickness, well construction, and water level information at a local scale. Submit only if the information is not available in the public domain.

N	D	V	S	
	X	X	X	B.4: Existing surface geophysical studies.

Technical Assistance Comments: Information from geophysical studies may be useful to refine the understanding of the geology on a local basis. Submit only if the information is not available in the public domain.

C. SOILS

N	D	V	S	
X				C.1: Existing maps of the soils and a description of soil infiltration characteristics.

Technical Assistance Comments:

N	D	V	S	
X				C.2: A description or an existing map of known eroding lands that are causing sedimentation problems.

Technical Assistance Comments:

D. WATER RESOURCES				
N	**D**	**V**	**S**	D.1: An existing map of the boundaries and flow directions of major watershed units and minor watershed units.
X				
Technical Assistance Comments:				
N	**D**	**V**	**S**	D.2: An existing map and a list of public waters as defined in Minnesota Statutes, section 103G.005, subdivision 15, and public drainage ditches.
X				
Technical Assistance Comments:				
N	**D**	**V**	**S**	D.3: The shoreland classifications of the public waters listed under sub-item (2), pursuant to part 6120.3000 and Minnesota Statutes, sections 103F.201 to 103F.221.
X				
Technical Assistance Comments:				
N	**D**	**V**	**S**	D.4: An existing map of wetlands regulated under Chapter 8420 and Minnesota Statutes, section 103G.221 to 103G.2373.
X				
Technical Assistance Comments:				
N	**D**	**V**	**S**	D.5: An existing map showing those areas delineated as floodplain by existing local ordinances.
X				
Technical Assistance Comments:				

DATA ELEMENTS ABOUT THE LAND USE

E. LAND USE				
N	**D**	**V**	**S**	E.1: An existing map of parcel boundaries.
	X		**X**	
Technical Assistance Comments: This information may be helpful in delineating the DWSMA, if available. If this information is provided, identification numbers must be provided for each parcel. An electronic format for the map is preferable.				
N	**D**	**V**	**S**	E.2: An existing map of political boundaries.
	X		**X**	
Technical Assistance Comments: Please provide this information if the boundaries have been updated/changed. This information may help delineate the DWSMA. An electronic format for the map is preferable.				
N	**D**	**V**	**S**	E.3: An existing map of public land surveys, including township, range, and section.
	X			
Technical Assistance Comments: This information is available in the public domain and may be used to delineate the DWSMA.				
N	**D**	**V**	**S**	E.4: A map and an inventory of the current and historical agricultural, residential, commercial, industrial, recreational, and institutional land uses and potential contaminant sources.
X				
Technical Assistance Comments:				
N	**D**	**V**	**S**	E.5: An existing, comprehensive land-use map.
X				
Technical Assistance Comments:				
N	**D**	**V**	**S**	E.6: Existing zoning map.
X				
Technical Assistance Comments:				

F. PUBLIC UTILITY SERVICES

N	D	V	S	
	X			F.1: An existing map of transportation routes or corridors.

Technical Assistance Comments: This information is available in the public domain and may be used to delineate the DWSMA.

N	D	V	S	
X				F.2: An existing map of storm sewers, sanitary sewers, and the public water supply systems.

Technical Assistance Comments:

N	D	V	S	
X				F.3: An existing map of gas and oil pipelines used by gas and oil suppliers.

Technical Assistance Comments:

N	D	V	S	
X				F.4: An existing map or list of public drainage systems.

Technical Assistance Comments:

N	D	V	S	
	X	X	X	F.5: An existing record of construction, maintenance, and use of the public water supply well(s) and other wells within the drinking water supply management area.

Technical Assistance Comments: Please provide 1) the pumping rates for the current and previous years, and the projected annual pumping rates for the next five years for each well in the PWS; and 2) well record(s) for the PWS well(s) if the information is different than that on-file with MDH. Information about the PWS well(s) may affect the vulnerability assessment due to rehabilitation/reconstruction of a well or changes in pumping rates.

DATA ELEMENTS ABOUT WATER QUANTITY

G. SURFACE WATER QUANTITY

N	D	V	S	
X				G.1: An existing description of high, mean, and low flows on streams.

Technical Assistance Comments:

N	D	V	S	
X				G.2: An existing list of lakes where the state has established ordinary high water marks.

Technical Assistance Comments:

N	D	V	S	
X				G.3: An existing list of permitted withdrawals from lakes and streams, including source, use, and amounts withdrawn.

Technical Assistance Comments:

N	D	V	S	
X				G.4: An existing list of lakes and streams for which state protected levels or flows have been established.

Technical Assistance Comments:

N	D	V	S	
	X	X	X	G.5: An existing description of known water-use conflicts, including those caused by groundwater pumping.

Technical Assistance Comments: Please notify MDH of surface water/well interference problems of which the PWS is aware, because this information would be used to delineate the WHPA or determine or confirm the vulnerability rating.

H. GROUNDWATER QUANTITY

N	D	V	S	
	X	X	X	H.1: An existing list of wells covered by state appropriation permits, including amounts of water appropriated, type of use, and aquifer source.

Technical Assistance Comments: Please submit this information for wells that are not permitted by the DNR because this information may be useful in identifying the hydrologic boundary conditions that could affect the size and shape of the WHPA boundaries.

N	D	V	S	
	X	X	X	H.2: An existing description of known well interference problems and water-use conflicts.

Technical Assistance Comments: Please notify MDH of well interference problems of which the PWS is aware. Interference problems with other wells, if present, likely indicate a hydrologic boundary that would need to be considered in making the WHPA delineation.

N	D	V	S	
	X	X	X	H.3: An existing list of state environmental boreholes, including unique well number, aquifer measured, years of record, and average monthly levels.

Technical Assistance Comments: Only submit monthly water level measurements (with unique well numbers and dates) if this information is not available in the public domain.

DATA ELEMENTS ABOUT WATER QUALITY

I. SURFACE WATER QUALITY

N	D	V	S	
X				I.1: An existing map or list of the state water quality management classification for each stream and lake.

Technical Assistance Comments:

N	D	V	S	
X				I.2: An existing summary of lake and stream water quality monitoring data, including: 1. bacteriological contamination indicators; 2. inorganic chemicals; 3. organic chemicals; 4. sedimentation; 5. dissolved oxygen; and 6. excessive growth or deficiency of aquatic plants.

Technical Assistance Comments:

J. GROUNDWATER QUALITY

N	D	V	S	
	X	X	X	J.1: An existing summary of water quality data, including: 1) bacteriological contamination indicators; 2) inorganic chemicals; and 3) organic chemicals.

Technical Assistance Comments: Submit if the PWS has information that is not available in the public domain, because the information may help explain groundwater flow paths.

N	D	V	S	
	X	X	X	J.2: An existing list of water chemistry and isotopic data from wells, springs, or other groundwater sampling points.

Technical Assistance Comments: Submit if the PWS has information that is not available in the public domain, because the information may help explain groundwater flow paths.

N	D	V	S	
	X	X		J.3: An existing report of groundwater tracer studies.

Technical Assistance Comments: Submit if the PWS has information that is not available in the public domain, because the information may help explain groundwater flow paths.

N	D	V	S	
		X	X	J.4: An existing site study and well water analysis of known areas of groundwater contamination.

Technical Assistance Comments: Submit if the PWS has information on contaminant sources not available in the public domain, because these reports may contain additional geologic or hydrogeologic information.

N	D	V	S	
X				J.5: An existing property audit identifying contamination.

Technical Assistance Comments:

N	D	V	S	
	X	X		J.6: An existing report to the Minnesota Department of Agriculture and the Minnesota Pollution Control Agency of contaminant spills and releases.

Technical Assistance Comments: Notify MDH of reports on spills or contaminant releases that are on-file with the PWS or city but are not in the public domain. These reports do not need to be submitted but the MDH staff would like to review the reports.

Summary of Data Request
Specific Data to be Provided to MDH by PWS

As discussed during the first Scoping Meeting on November 2, 2009, the PWS will supply the following information for Part I of their Wellhead Protection Plan to the Minnesota Department of Health. The number of the data element that refers to the information needed to prepare the Part I Report is listed in the parenthesis at the end of each request.

1) Municipal well information: Use Tables 1 and 2, the well records for the public water supply (PWS) wells, and a map showing the locations of all the PWS wells, to review the accuracy of 1) all PWS well construction, 2) well locations, and 3) pumping information. (F.5)

   Table 1 lists well use and construction for each of the PWS wells. Have you reconstructed any wells? Are there well records for reconstructed wells?

   The enclosed map shows the locations of the primary public water supply well(s). Please let us know if you feel the wells are not correctly located. These locations must be used to delineate your wellhead protection areas.

   Table 2 shows the available pumping information and indicates what information the PWS needs to provide for the delineation of the capture zone. Please provide 1) the pumping data for the last two years that was sent to the Minnesota Department of Natural Resources, 2) whether this rate was measured or estimated, and 3) the projected annual pumping amounts for the next five years.

2) Please provide a copy of any aquifer test or specific capacity information for the PWS wells that was obtained during well construction, maintenance, or repair. (B.1)

3) Is there an existing map of parcel and/or political boundaries that could be used for defining the Drinking Water Supply Management Area (DWSMA)? If you wish to use parcel lines, please provide the parcel identification number for each parcel boundary along with the map. Have the city boundaries changed? If the city boundaries have changed, please provide the new boundaries. The boundaries of the DWSMA may be larger if political boundaries are used instead of the parcel boundaries. (E.1 and E.2)

4) If there are private well records, soil boring reports, geophysical studies, or water level measurements in your files that MDH staff did not identify at the scoping meeting and that would be available for MDH staff to review and copy, please notify MDH. (B.2, B.3, B.4, and H.3)

5) Please identify reports that you have on-file relating to leaks/contamination sites that may be a concern to your drinking water supply that MDH may review and copy. (J.4)

6) If your files contain water chemistry data, such as bacteria, virus, inorganic, organic, or isotopic results from wells or other groundwater sampling points, that are not currently available to MDH that MDH may review and copy, please notify MDH. (J.1 and J.2)

7) Please provide information about other high-capacity wells in your area that may not be permitted and are not listed on the attached Table 3. (H.1)

8) Please describe any conflicts over water use that the PWS has been involved with, such as 1) private wells that went dry (or well interference) or 2) springs or wetlands that were affected. Was the Department of Natural Resources involved in resolving the conflict? (G.5 and H.2)

Table 1
Water Supply Well Information
City of Medina

Local Well Id.	Unique Number	Use/ Status[1]	Casing Diameter (inches)	Casing Depth (feet)	Well Depth (feet)	Date Constructed/ Reconstructed	Well Vulnerability	Aquifer	Aquifer Vulnerability
Hamel 2	158087	E	8	353	601	06/1978	Not Susceptible	FIG	Not Vulnerable
Morningside 1	208009	P	6	187	205	06/1961	Not Susceptible	QBAA	Not Vulnerable
Morningside 2	223378	P	12	185	204	09/1960	Not Susceptible	QBAA	Not Vulnerable
Hamel 3	122239	P	10	420	590	06/1983	Not Susceptible	FIG	Not Vulnerable
Independence 1	100219	E	12	200	240	08/1975	Not Susceptible	QBAA	Not Vulnerable
Independence 2	448765	P	8	201	241	08/1988	Not Susceptible	QBAA	Not Vulnerable
Hamel 4	520048	P	30x24x20x16	683	770	11/1993	Not Susceptible	Mt. Simon	Not Vulnerable
Hamel 5	709925	P	12	195	242	08/2004	Not Susceptible	QBAA	Not Vulnerable
Hamel 6	747666	P	20x14	311	385	05/2007	Not Susceptible	CJDN	Not Vulnerable
Hamel 7	759809	P	14	312	410	06/2008	Not Susceptible	CJDN	Not Vulnerable

[1] Primary (P), Emergency backup (E) well, Seasonal Use (S)

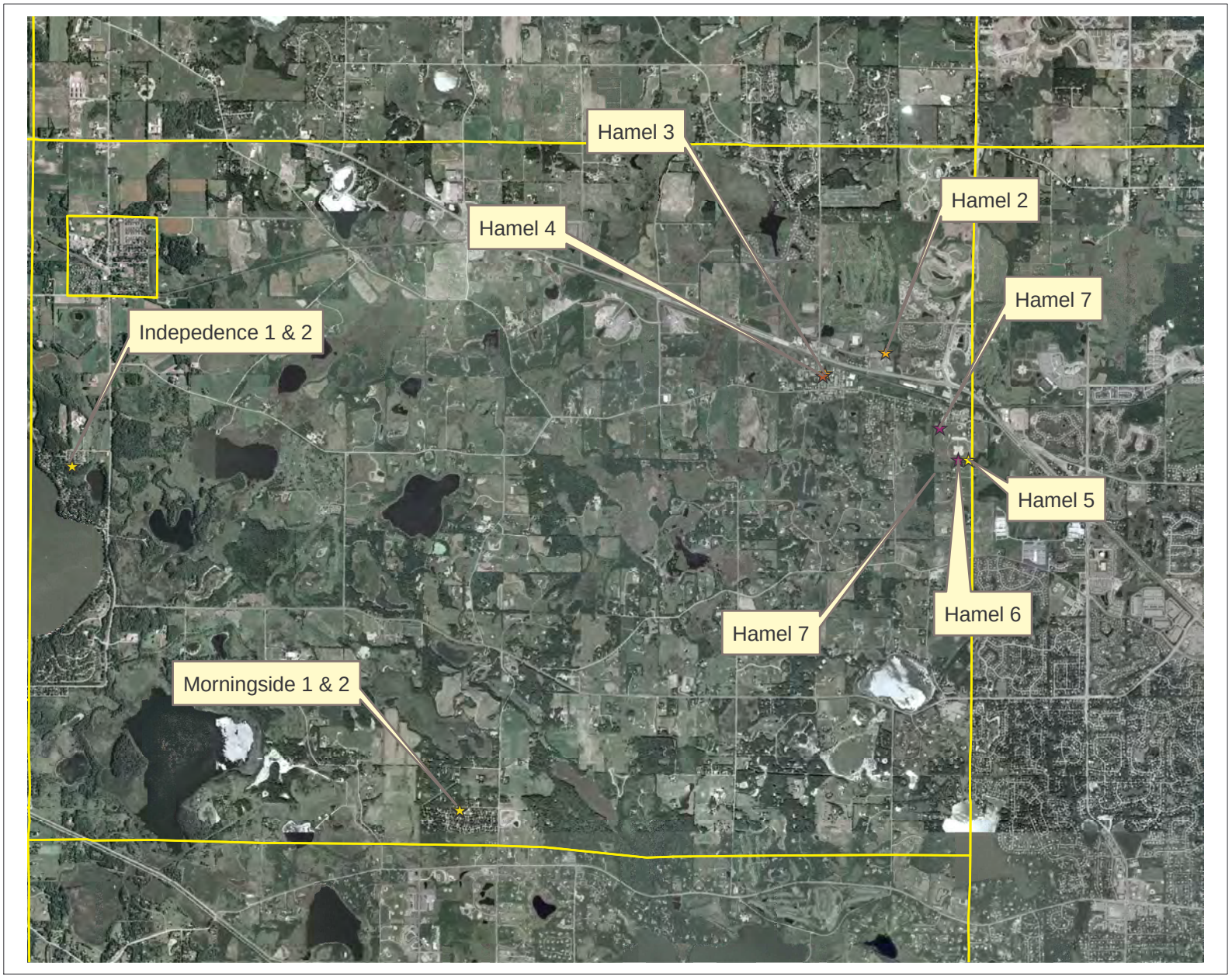
Table 2
Annual Volume of Water Pumped from Well (Gallons)
City of Medina

Well Name	Unique Number	Use Status[2]	Annual Volume Pumped[3]					Future Pumping (gal/yr)
			2005	2006	2007	2008	2009	
Morningside 1	**208009**	**P**	2,278,300	2,345,500	**3,010,400**	2,540,400	2,246,000	3,500,000
Morningside 2	**233378**	**P**	3,608,500	3,862,800	**4,805,700**	4,148,800	4,563,600	5,000,000
Independence 1	**100219**	**E**	750,000	769,000	1,043,000	**1,101,000**	1,079,000	900,000
Independence 2	**448765**	**P**	12,505,700	**15,637,500**	13,523,870	13,248,000	12,560,900	14,000,000
Hamel 2	**158087**	**E**	**18,479,000**	13,736,000	2,302,000	844,000	4,000	0
Hamel 3	**122239**	**P**	22,220,122	**23,897,700**	16,226,000	9,730,000	8,607,000	10,000,000
Hamel 4	**520048**	**P**	27,982,050	48,957,140	**117,956,000**	87,172,000	32,170,000	50,000,000
Hamel 5	**709925**	**P**				**26,864,000**	4,682,000	15,000,000
Hamel 6	**747666**	**P**				**24,803,000**	38,974,000	50,000,000
Hamel 7	**759809**	**P**					**63,773,000**	50,000,000
Totals			87,823,672	109,205,640	158,866,970	170,451,200	168,659,500	198,400,000

[2] Primary (P), Emergency backup (E) well, Seasonal Use (S)
[3] Expressed as gallons. Bolding indicates greatest annual pumping volume.

Table 3 Other Permitted High Capacity Wells

Unique Number	Well Name	Permitted	DNR Permit Number	Resource Type	Aquifer	Use	Average Withdrawal (1997,2007) gallons/year (gal/yr)
208009	1	MEDINA, CITY OF	1960-0424	Ground water	QBAA	Waterworks	2,830,000
233378	2	MEDINA, CITY OF	1960-0424	Ground water	QBAA	Waterworks	3,750,000
667910	1A	LONG LAKE, CITY OF	1965-0980	Ground water	OPDCCJDN	Waterworks	19,840,000
509097	3	ORONO, CITY OF	1970-1351	Ground water	OPCJ	Waterworks	23,990,000
240631	1	LORETTO, CITY OF	1975-6217	Ground water	CFRNCMTS	Waterworks	630,000
208973	2	LORETTO, CITY OF	1975-6217	Ground water	CJDN	Waterworks	13,630,000
596647	3	LORETTO, CITY OF	1975-6217	Ground water	CFRNCIGL	Waterworks	9,180,000
236616	3	THREE RIVERS PARK DISTRICT	1975-6267	Ground water	CSTL	Water Level Maintenance	2,080,000
100219	1	MEDINA, CITY OF	1976-6030	Ground water	QBAA	Waterworks	1,300,000
448765	2	MEDINA, CITY OF	1976-6030	Ground water	QBAA	Waterworks	12,780,000
100286	1	WAHLFORS, JACK B	1977-6402	Ground water	QBAA	Major Crop Irrigation	460,000
207090	1	MAPLE PLAIN, CITY OF	1977-6403	Ground water	CFRNCIGL	Waterworks	380,000
207407	2	MAPLE PLAIN, CITY OF	1977-6403	Ground water	CFRNCIGL	Waterworks	85,680,000
112238	3	MAPLE PLAIN, CITY OF	1977-6403	Ground water	CMTS	Waterworks	4,540,000
	1	HENNEPIN COUNTY PARKS	1979-6239	Ground water		Waterworks	960,000
158087	2	MEDINA, CITY OF	1983-6007	Ground water	CSTLCIGL	Waterworks	14,780,000
122239	3	MEDINA, CITY OF	1983-6007	Ground water	CFRNCIGL	Waterworks	18,810,000
520048	4	MEDINA, CITY OF	1983-6007	Ground water	CMTS	Waterworks	56,290,000
709925	5	MEDINA, CITY OF	1983-6007	Ground water	QWTA	Waterworks	13,960,000
	1	ROLLING GREEN COUNTRY CLUB	1983-6141	Ground water		Non-Crop Irrigation	9,610,000
	2	ROLLING GREEN COUNTRY CLUB	1983-6141	Ground water		Non-Crop Irrigation	6,700,000
204208	1	HOLLYDALE GOLF CLUB	1986-6081	Ground water	CJDN	Non-Crop Irrigation	4,030,000
483951	2	HOLLYDALE GOLF CLUB	1986-6081	Ground water	OPDC	Non-Crop Irrigation	0
553550	1	ELM CREEK GOLF COURSE INC	1986-6119	Ground water	QWTA	Non-Crop Irrigation	10,810,000
460092	2	ELM CREEK GOLF COURSE INC	1986-6119	Ground water	QBAA	Non-Crop Irrigation	1,920,000
705716	1	LEJEUNE, LAURENCE	2005-3107	Ground water	CSTLCFRN	Non-Crop Irrigation	2,280,000



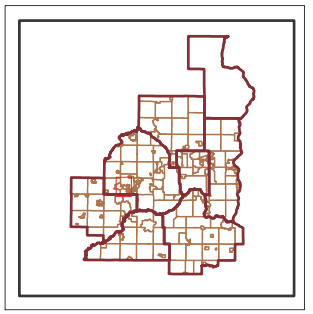
City Wells

AQUIFER

- CFIG
- CJDN
- CMTS
- QBAA
- QBUA

3,000 1,500 0 3,000 Feet

Enlarged Area



MINNESOTA MDH DEPARTMENT OF HEALTH

Figure 2
City Well Location Map
(City of Medina, MN)

MINNESOTA MDH DEPARTMENT OF HEALTH

Protecting, maintaining and improving the health of all Minnesotans

September 8, 2010

Mr. Steve Scherer
City of Medina
2052 County Road 24
Medina, Minnesota 55340

Dear Mr. Scherer:

Subject: Second Scoping Decision Notice

This letter provides notice of the results of a scoping meeting held with you, Greg Leuer and Ivan Dingmann (city of Medina), Terry Bovee (Minnesota Department of Health), and me on August 19, 2010, at the Medina Public Works building regarding wellhead protection (WHP) planning. During the meeting, we discussed the data elements that must be included and used to prepare the part of the WHP plan related to the management of potential contaminants in the approved drinking water supply management area. The enclosed Scoping 2 Decision Notice lists the data elements that were discussed at the meeting.

The city of Medina has distributed copies of the first part of the wellhead protection plan to local units of government and held an informational meeting for the public. The city of Medina will have until August 12, 2013, to complete Part II of its wellhead protection plan.

If a data element is marked on the enclosed notice as a data element that must be used and it does not exist, it is helpful if your plan notes this. The city of Medina will be responsible for developing the remainder of the wellhead protection plan. John will be available for technical assistance throughout the process and will be contacting you to review the progress of the development of Part II of your plan. If you have any questions regarding the enclosed notice, contact John by email at john.freitag@state.mn.us or by phone at 651/201-4669.

Sincerely,

John J. Freitag, Principal Planner
Source Water Protection Unit
Environmental Health Division
625 North Robert Street
St. Paul, Minnesota 55155

Terry L. Bovee, Principal Planner
Source Water Protection Unit
Environmental Health Division
12 Civic Center Plaza - Suite 2105
Mankato, Minnesota 56001 - 7789

JJF:dcc
Enclosures
cc: Terry Bovee, MDH Planner, Mankato District Office
Byron Adams, Water Monitoring Section, Minnesota Pollution Control Agency
Joe Richter, Division of Waters, Minnesota Department of Natural Resources
Brian Williams, Pesticide & Fertilizer Mgmt. Division, Minnesota Department of Agriculture
Eric Mohring, Hydrologist, Board of Water and Soil Resources
Chad Adams, City Administrator, City of Medina

SCOPING 2 DECISION NOTICE

ɔ Remainder of the Wellhead Protection Plan

Name of Public Water Supply:		Date:
City of Medina	PWSID 1270023	September 8, 2010
Name of the Wellhead Protection Manager:		
Mr. Steve Scherer, Public Works Superintendant		
Address:	**City:**	**Zip:**
2052 County Road 24	Medina	55340
Unique Well Numbers:		**Phone:**
208009 (Morningside Well 1) 448765 (Independence Well 2) 520048 (Hamel Well 4) 747666 (Hamel Well 6) 100219 (Independence Well 1 - Emergency)* 158087 (Hamel Well 2 - Emergency)*	223378 (Morningside Well 2) 122239 (Hamel Well 3) 709925 (Hamel Well 5) 759809 (Hamel Well 7)	763/473-4643

*Emergency wells only use the IWMZ Form for data collection.

Instructions for Completing the Scoping 2 Form

N	R	S	
X			**N = Not required.** If this box is checked, this data element is **NOT** necessary for your wellhead protection plan because it is not needed or it has been included in the first scoping decision notice. **Please go to the next data element.**

N	R	S	
	X		**R = Required for the remaiuder of the plan.** If this box is checked, this data **MUST** be used for the **"remainder of the plan."**

N	R	S	
		X	**S = Submit to MDH.** If this box is checked, this data element **MUST** be included in your **wellhead protection plan and submitted to MDH.** If there is **NO** check mark in the **"S"** box but there is an Ax@ in the **"R"** box, this data element **MUST** be included in your plan, but should **NOT be submitted to MDH.** This box will only be checked if MDH does not have access to this data element. This will help to reduce the cost by reducing the amount of paper and time to reproduce the data element.

Note: Any data elements required in the first scoping decision notice must also be used to complete the remainder of the wellhead protection plan.

DATA ELEMENTS ABOUT THE PHYSICAL ENVIRONMENT

PRECIPITATION

N	R	S	
X			An existing map or list of local precipitation gauging stations.

Technical Assistance Comments:

N	R	S	
X			An existing table showing the average monthly and annual precipitation in inches for the preceding five years.

Technical Assistance Comments:

GEOLOGY

N	R	S	
	X		An existing geologic map and a description of the geology, including aquifers, confining layers, recharge areas, discharge areas, sensitive areas as defined in Minnesota Statutes, section 103H.005, subdivision 13, and groundwater flow characteristics.

Technical Assistance Comments: The management of all the Drinking Water Supply Management Area(s) must reflect what is known about these data elements.

N	R	S	
	X		Existing records of the geologic materials penetrated by wells, borings, exploration test holes, or excavations, including those submitted to the department.

Technical Assistance Comments: The management of all the Drinking Water Supply Management Area(s) must reflect what is known about these data elements.

N	R	S	
	X		Existing borehole geophysical records from wells, borings, and exploration test holes.

Technical Assistance Comments: The management of all the Drinking Water Supply Management Area(s) must reflect what is known about these data elements.

N	R	S	
	X		Existing surface geophysical studies.

Technical Assistance Comments: The management of all the Drinking Water Supply Management Area(s) must reflect what is known about these data elements.

SOILS

N	R	S	
X			Existing maps of the soils and a description of soil infiltration characteristics.

Technical Assistance Comments:

N	R	S	
X			A description or an existing map of known eroding lands that are causing sedimentation problems.

Technical Assistance Comments:

WATER RESOURCES			
N	R	S	An existing map of the boundaries and flow directions of major watershed units and minor watershed units.
X			
Technical Assistance Comments:			

N	R	S	An existing map and a list of public waters as defined in Minnesota Statutes, section 103G.005, subdivision 15, and public drainage ditches.
X			
Technical Assistance Comments:			

N	R	S	The shoreland classifications of the public waters listed under subitem (2), pursuant to part 6120.3000 and Minnesota Statutes, sections 103F.201 to 103F.221.
X			
Technical Assistance Comments:			

N	R	S	An existing map of wetlands regulated under chapter 8420 and Minnesota Statutes, section 103G.221 to 103G.2373.
X			
Technical Assistance Comments:			

N	R	S	An existing map showing those areas delineated as floodplain by existing local ordinances.
X			
Technical Assistance Comments:			

DATA ELEMENTS ABOUT THE LAND USE

LAND USE			
N	R	S	An existing map of parcel boundaries.
	X	X	
Technical Assistance Comments: The management of all the Drinking Water Supply Management Area(s) must reflect what is known about this data element.			

N	R	S	An existing map of political boundaries.
	X	X	
Technical Assistance Comments: The management of all the Drinking Water Supply Management Area(s) must reflect what is known about this data element.			

N	R	S	An existing map of public land surveys including township, range, and section.
	X		
Technical Assistance Comments: The management of all the Drinking Water Supply Management Area(s) must reflect what is known about this data element.			

N	R	S	A map and an inventory of the current and historical agricultural, residential, commercial, industrial, recreational, and institutional land uses and potential contaminant sources.
	X	X	

Technical Assistance Comments: The inventory, mapping, and management of land uses and potential sources of contamination for all the Drinking Water Supply Management Area(s) must reflect what is known about these data elements, as follows:

Low Vulnerability - 1) All potential contaminant sources and facility designations as listed on the attachment, 2) a land use/land cover map and table, and 3) an inventory of the Inner Wellhead Management Zone (IWMZ).

As a starting point, MDH will provide a 1992 or 2001 land cover map and table from federal data bases. This data set must be used unless an alternative electronic data set that is more current and detailed is available.

Management strategies must be developed for all land uses and potential sources of contamination.

N	R	S	An existing comprehensive land-use map.
	X	X	

Technical Assistance Comments: The management of all the Drinking Water Supply Management Area(s) must reflect what is known about this data element. Include any urban fringe planning areas.

N	R	S	Existing zoning map.
	X	X	

Technical Assistance Comments: The management of all the Drinking Water Supply Management Area(s) must reflect what is known about this data element.

PUBLIC UTILITY SERVICES

N	R	S	An existing map of transportation routes or corridors.
X			

Technical Assistance Comments:

N	R	S	An existing map of storm sewers, sanitary sewers, and public water supply systems.
X			

Technical Assistance Comments:

N	R	S	An existing map of the gas and oil pipelines used by gas and oil suppliers.
X			

Technical Assistance Comments:

N	R	S	An existing map or list of public drainage systems.
X			

Technical Assistance Comments:

N	R	S	An existing record of construction, maintenance, and use of the public water supply well(s) and other wells within the drinking water supply management area.
	X		

Technical Assistance Comments: The management of all the Drinking Water Supply Management Area(s) must reflect what is known about these data elements.

DATA ELEMENTS ABOUT WATER QUANTITY

SURFACE WATER QUANTITY

N	R	S	
X			An existing description of high, mean, and low flows on streams.

Technical Assistance Comments:

N	R	S	
X			An existing list of lakes where the state has established ordinary high water marks.

Technical Assistance Comments:

N	R	S	
X			An existing list of permitted withdrawals from lakes and streams, including source, use, and amounts withdrawn.

Technical Assistance Comments:

N	R	S	
X			An existing list of lakes and streams for which state protected levels or flows have been established.

Technical Assistance Comments:

N	R	S	
X			An existing description of known water-use conflicts, including those caused by groundwater pumping.

Technical Assistance Comments:

GROUNDWATER QUANTITY

N	R	S	
	X		An existing list of wells covered by state appropriation permits, including amounts of water appropriated, type of use, and aquifer source.

Technical Assistance Comments: The management of all the Drinking Water Supply Management Area(s) must reflect what is known about these data elements.

N	R	S	
	X		An existing description of known well interference problems and water use conflicts.

Technical Assistance Comments: The management of all the Drinking Water Supply Management Area(s) must reflect what is known about these data elements.

N	R	S	
	X		An existing list of state environmental bore holes, including unique well number, aquifer measured, years of record, and average monthly levels.

Technical Assistance Comments: The management of all the Drinking Water Supply Management Area(s) must reflect what is known about this data element.

DATA ELEMENTS ABOUT WATER QUALITY

SURFACE WATER QUALITY

N	R	S	
X			An existing map or list of the state water quality management classification for each stream and lake.

Technical Assistance Comments:

N	R	S	
X			An existing summary of lake and stream water quality monitoring data, including: 1. bacteriological contamination indicators; 2. inorganic chemicals; 3. organic chemicals; 4. sedimentation; 5. dissolved oxygen; and 6. excessive growth or deficiency of aquatic plants.

Technical Assistance Comments:

GROUNDWATER QUALITY

N	R	S	
	X		An existing summary of water quality data, including: 1. bacteriological contamination indicators; 2. inorganic chemicals; and 3. organic chemicals.

Technical Assistance Comments: The management of all the Drinking Water Supply Management Area(s) must reflect what is known about these data elements.

N	R	S	
	X		An existing list of water chemistry and isotopic data from wells, springs, or other groundwater sampling points.

Technical Assistance Comments: The management of all the Drinking Water Supply Management Area(s) must reflect what is known about these data elements.

N	R	S	
	X		An existing report of groundwater tracer studies.

Technical Assistance Comments: The management of all the Drinking Water Supply Management Area(s) must reflect what is known about this data element.

N	R	S	
	X		An existing site study and well water analysis of known areas of groundwater contamination.

Technical Assistance Comments: The management of all the Drinking Water Supply Management Area(s) must reflect what is known about these data elements.

N	R	S	
	X		An existing property audit identifying contamination.

Technical Assistance Comments: The management of all the Drinking Water Supply Management Area(s) must reflect what is known about this data element.

N	R	S	
	X		An existing report to the Minnesota Department of Agriculture and the Minnesota Pollution Control Agency of contaminant spills and releases.

Technical Assistance Comments: The management of all the Drinking Water Supply Management Area(s) must reflect what is known about this data element.