City of Hawley

WELLHEAD PROTECTION PLAN

Part 2:

- **Potential Contaminant Source Inventory**
- **Impacts of Expected Changes to Land and Water Resources**
- **Issues, Problems & Opportunities**
- **Wellhead Protection Plan Goals**
- **Management Strategies**
- **Evaluation Plan**
- **Emergency/Contingency Plan**

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PUBLIC WATER SUPPLY PROFILE

PUBLIC WATER SUPPLY

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PART 2 EXECUTIVE SUMMARY

This portion of the wellhead protection (WHP) plan for the City of Hawley includes:

- the results of the Potential Contaminant Source Inventory,
- the Wellhead Protection Management Strategies,
- the Emergency/Alternative Water Supply Contingency Plan, and
- the Wellhead Protection Program Evaluation Plan.

Part 1 of the wellhead protection plan presented the 1) delineation of the wellhead protection area (WHPA) and the drinking water supply management area (DWSMA) and 2) the vulnerability assessments for the system's wells and the aquifer within the DWSMA. Part 1 of the WHP plan was submitted to the Minnesota Department of Health (MDH) and approved on May 17, 2016. The boundaries of the WHPA and DWSMA are shown in Figure 1.

The vulnerability assessment for the aquifer within the DWSMA was performed using available information and indicates that the aquifer used by the system is considered to be non-vulnerable to contamination because there is clay-rich sediments that overlie the city's aquifer prevent water and contaminants from moving quickly from the land surface into the city's aquifer and implies a vertical time travel of decades or longer. Consequently, the principal potential sources of contamination to the aquifer are other wells that reach or penetrate it, shallow disposal-type wells. This information was presented to the WHP Team during the Second Scoping meeting held with the MDH when the necessary requirements for the content of Part 2 were outlined and discussed in detail.

The vulnerability assessment for the public water supply system's wells indicates that the wells are non-vulnerable to contamination based on the well construction, because the wells themselves do not provide a pathway for contaminants to enter the aquifer used by the public water supplier.

The information and data contained in Chapters 1-4 of this part of the WHP Plan support the approaches taken to address potential contamination sources that have been identified as potentially affecting the aquifer used by the public water supply. The reader is encouraged to concentrate attention on Chapters 1-4 in order to better understand why a particular management strategy is included in Chapter 5.

In Chapter 1, the required data elements indicated by MDH in the Scoping 2 Decision Notice are addressed, as well as the assessment of data elements. Pertinent data elements include information about the geology, water quality, water quantity, land use, and the public utility services. The data elements and information supplied in Part 1 of the WHP Plan are based on the assessment that the aquifer providing drinking water for this system is low vulnerable to contamination from land uses, such as other wells that penetrate the same aquifer and land uses that either store liquids in tanks or dispose of liquids below the land surface.

Chapter 2 addresses the possible impacts that changes in the physical environment, land use, and water resources have on the public water supply. Only small changes in land use are expected and likely will not have significant impacts on the aquifer. Neither surface water nor groundwater changes are expected to impact the aquifer. The City of Hawley has evaluated the support necessary to implement its wellhead protection plan. Limited resources do pose a challenge due to the size of the community and the city will focus efforts on building partnerships with local and state resource agencies to cooperate and collaborate on drinking water protection efforts.

The problems and opportunities concerning land use issues relating to the aquifer, well water, and the DWSMA, and those issues identified at public meetings are addressed in Chapter 3. The non-vulnerable status of the aquifer and the good quality of water currently produced by the system's wells leaves the following major concerns to be addressed by this plan: 1) other wells located within the DWSMA that could become pathways for contamination to enter the aquifer; wells 75 feet or greater in depth in the Hawley area. And 2) shallow disposal-type wells. No shallow disposal wells were identified in the DWSMA. The city will proactively monitor the establishment of other high capacity wells.

The drinking water protection goals that the city would like to achieve with this plan are listed in Chapter 4. In essence, the City would like to, "Promote public health, economic development and community infrastructure by maintaining a potable public drinking water supply for the community."

The objectives and action plans for managing potential sources of contamination are contained in Chapter 5. Actions aimed toward educating the general public about groundwater and drinking water protection issues, proper well management, and collecting data relevant to wellhead protection planning are the general focus.

Chapter 6 contains a guide to evaluate the implementation of the identified management strategies of Chapter 5. The wellhead protection program implementation efforts for the City of Hawley will be evaluated by the city at a minimum of every 2 ½ years.

An emergency/contingency plan is included to address the possibility that the water supply system is interrupted due to disruption caused by contamination or mechanical failure. Chapter 7 contains details about the water supply distribution system, emergency contact numbers, equipment listings as well as other information to assist the system in responding quickly and effectively in emergency situations.

Summary of Wellhead Protection Actions:

PUBLIC EDUCATION AND OUTREACH:										
Description	**Implementation Time Frame**									
	2019	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**
WHP Measure (#1): Provide residents with an article that explains the importance of WHP.	X							X		
WHP Measure (#2): Request a large map of the DWSMA from MDH and display at city hall for the general public to review.	X									
POTENTIAL CONTAMINATION SOURCE MANAGEMENT:										
Description	**Implementation Time Frame**									
	2019	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**
WHP Measure (#3): Provide property owners, who have a well in the DWMSA materials on proper management of the well.		X					X			
WHP Measure (#4): If the City is made aware of any unused wells in DWSMA apply for a grant to pay the costs to seal them.	As Occurs									
WHP Measure (#5): The City will collaborate with the MDH Source Water Protection Unit in the identification of new high-capacity wells that are proposed for construction within the DWSMA or within one mile of the DWSMA. The WHP Manager will share the location of pending high capacity well with the MDH Hydrologist.	As Occurs									
WHP Measure (#6): WHP Team and Manager will update the PCSI map and table.					X					
WHP Measure (#7): Old muni well is thought to exist at the Fairground. The exact location isn't known, although the city will work with MDH and others to try and find the location of this well.				X						
WHP Measure (#8): If any of the old muni wells are found, the city will apply for a grant and if successful have the wells sealed.	If Opportunity Arises									

WHP Measure (#9): WHP Team will assess the security of the public water supply wells and apply for a MDH grant to secure facility if needed.			X							
WHP Measure (#10): Inform MDH if a Class V well is identified within the DWSMA.	As Occurs									
WHP Measure (#11): It is always difficult to foresee or plan for the future. The City will use its planning and management capabilities within this plan to help respond to new/unknown source water protection issues that may impact the quality or quantity of its drinking water in the future.	As Occurs									
WHP Measure (#12): Re-sample Wells 3, 4,and 5 during year six of plan implementation for vulnerability parameters determined in consultation with MDH (tritium, chloride, bromide, stable isotopes, nitrate and ammonia); contingent on funding assistance from MDH.						X				

LAND USE MANAGEMENT:

Description	Implementation Time Frame									
	2019	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**
WHP Measure (#13): Send Clay County a map of the DWSMA and letter discussing the importance of WHP. Ask to be notified of any requests for changes in land use or zoning which are located within the DWSMA.			X						X	

DATA COLLECTION:

Description	Implementation Time Frame									
	2019	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**
WHP Measure (#14): Resample wells for vulnerability parameters determined by the MDH, provided MDH will cover the costs.						X				

IWMZ MANAGEMENT:

Description	Implementation Time Frame									
	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
WHP Measure (#15): Implement measures that are specified in the IWMZ PCSI report.	X	X	X	X	X	X	X	X	X	X
WHP Measure (#16): Monitor the 200 ft. radius around the wells to ensure that setback distances for new potential contamination sources are met.	X	X	X	X	X	X	X	X	X	X
WHP Measure (#17): Request MDH assistance to update the Inner Wellhead Management Zone Inventory for the public water supply wells.					X					X

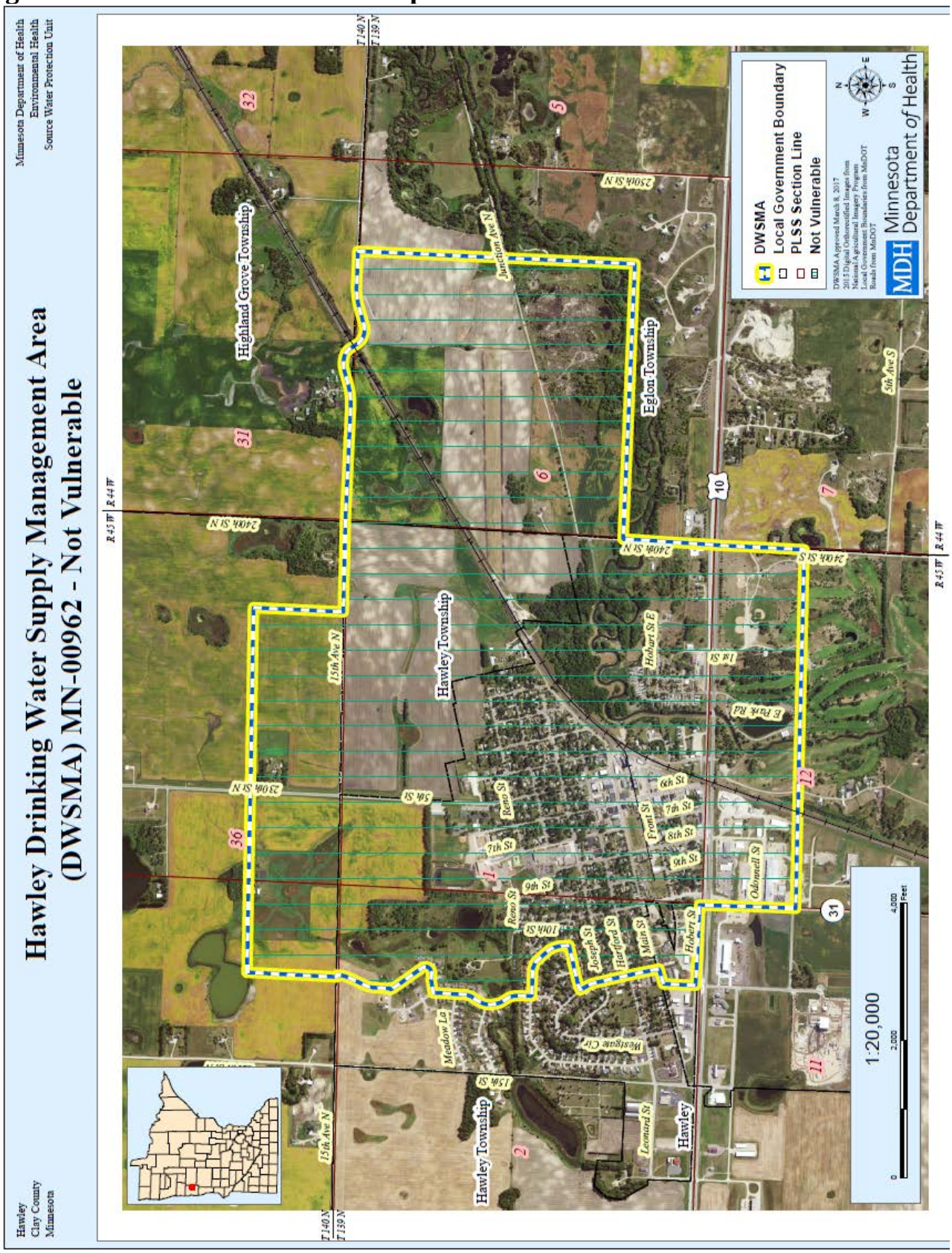
REPORTING AND EVALUATION:

Description	Implementation Time Frame									
	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
WHP Measure (#18): Prepare an evaluation of WHP plan implementation efforts every 2 ½ years.			X			X		X		
WHP Measure (#19): Summarize all WHP Plan implementation efforts in a report to MDH prior to the Scoping 1 meeting for the WHP Amendment.								X		

WATER USE AND CONTINGENCY STRATEGY

Description	Implementation Time Frame									
	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
WHP Measure (#20): Review the contingency strategy portion of the city's wellhead protection plan every 2 ½ years to ensure that it reflects current personnel contact information and changes in the water supply system infrastructure and other needs and concerns.			X			X		X		
WHP Measure (#21): Implement recommendations and needs that are specified in the contingency plan provided necessary grant funds are available.				X		X			X	

Figure 1—WHPA and DWSMA Map



CHAPTER ONE

DATA ELEMENTS, ASSESSMENT (4720.5200)

REQUIRED DATA ELEMENTS

Physical Environment Data Elements

Precipitation – This data element does not apply because there is not a direct hydraulic connection between the land surface and surface waters and the aquifer serving this water supply system.

Geology – This data element is required and is presented in detail in the first part of the WHP Plan and thus is only summarized here. The water supply for the city of Hawley is obtained from three primary wells. The geologic condition at the wells identified as Well 3 (473631) , Well 4 (520967) and Well 5 (775413) include a cover of clay-rich geologic materials over the aquifer that may retard the vertical movement of contaminants. No tritium or nitrate was detected in samples from the wells, confirming the non-vulnerable nature of the wells. In addition, the chloride and bromide results confirm that the wells have not been impacted by land-use activities. There were no known boreholes, excavations geophysical records or studies. Additional information is included in Part 1 and included in this Plan as Exhibit 8.

Soils – This data element does not apply because there is not a direct hydraulic connection between the land surface and the aquifer serving this water supply system.

Water Resources – This data element, as defined by the state wellhead rule, does not apply because there is not a direct hydraulic connection between the land surface and the aquifer serving this water supply system.

Land Use Data Elements

Land Use – These data elements include information about parcel boundaries, political boundaries, potential contaminant sources, land use maps and zoning maps. A map showing the political boundaries and land survey map is included as Figure 1. The city's zoning map is included as Exhibit 5 in the Appendix, although the city does have a comprehensive land use map to include in this plan. The parcel boundaries map shows the parcels for the properties located within the DWSMA is included in the Exhibit 7 and can also be found on the County website.

Land use within the DWSMA is a mixture of commercial and residential, although the majority being residential. The Highway 10 corridor has attracted an increasing share of the commercial development due to the ease of access and the heightened expose on Highway 10. A generalized land cover map and table is included as Exhibit 2 in the Appendix.

The Inner Wellhead Management Zone (IWMZ) is a fixed two-hundred foot radius around City wells. The public water supplier is responsible to manage all potential contaminant sources identified within that area. The IWMZ was inventoried for potential contaminant sources for this planning process and that information can be found in the Appendix as Exhibit 3. Management strategies for the IWMZ are included in Chapter 5.

Due to the non-vulnerable designation of the DWSMA determined during the Part I WHP planning process, an inventory of other wells and shallow disposal wells located within the DWSMA is required, as identified in the Scoping 2 Decision Notice. A listing of potential contaminants inventoried within the DWSMA and a map showing their locations are included in the Appendix as Exhibit 4. At this time no shallow disposal wells (Class V wells) have been identified.

Public Utility Services – Records of well construction and maintenance is used to support the development of Chapter 7 of this plan, which details an emergency plan for this system. These records are kept by city staff at city hall.

The main transportation route and corridor through the DWSMA is State Highway 10, which runs east/west on the southern side of the DWSMA (See Figure 1). This is a fairly busy roadway used by residents and commercial vehicles. The Highway is south of the Emergency Response Area (ERA).

The City regularly maintains its sanitary sewer and public water supply system. The City does not have maps of size to include in the plan of the sanitary sewer and public water supply system. Maps are available and can be viewed at city hall. There are no gas or oil pipelines located within the DWSMA, nor are there any public drainage systems.

As necessary the city hires a licensed well driller to perform standard maintenance on the city wells. The city has copies of applicable documents at city hall.

Water Quantity Data Elements

Surface Water Quantity – This data element does not apply because there is not a direct hydraulic connection between surface waters and the aquifer serving this water supply system.

Groundwater Quantity – Groundwater levels are adequate for the amounts that the City of Hawley is permitted for under the groundwater appropriations program that is administered by the Minnesota Department of Natural Resources (DNR). There is currently no other high-capacity wells within the DWSMA for which well interference complaints with the city's wells have been documented, and no water use conflicts are known to exist.

At this time, there appears to be sufficient groundwater quantity, based upon the existing pumping capacity of well(s) completed in the aquifer used by the system. This data element applies as it relates to future groundwater uses that may influence the ability of the aquifer to yield water to the City. Increased water use may result in a reduction in aquifer yield or increase the likelihood that contaminants of human or natural origin may affect the quality of drinking water.

Water Quality Data Elements

Surface Water Quality – This data element does not apply because there is not a direct hydraulic connection between surface waters and the aquifer serving this water supply system.

Groundwater Quality – These data elements include information about the overall water quality of the aquifer the City of Hawley is using for City purposes as well as other groundwater quality information generated from groundwater contamination studies.

A general overview of water quality data can be found in the city's Consumer Confidence Report which is provided to residents yearly. It is important to note that these water quality results do pertain to the water after treatment. All three wells meet construction standards, meaning the well itself should not provide a pathway for contaminants to enter the aquifer. As such, there is a moderate probability that current land use has a direct impact on the quality of drinking water. Tests conducted by MDH lacked detectable tritium (detection indicated the presence of young water), so they are not considered vulnerable at this time. This is reinforced by the low chloride/bromide ratios.

Arsenic, a naturally occurring contaminant, has been found in the city wells above the Safe Drinking Water Act health-based standards and is being removed through treatment from the raw water supply. At present, o other contaminants for which the Safe Drinking Water Act has established health-based standards is found above maximum allowable levels in the city's water supply

ASSESSMENT OF DATA ELEMENTS

A. Use of the Wells –

The city currently uses Well 3 (473631), Well 4 (520967) and Well 5 (775413) as the primary public water supply wells. The city plans to keep this arrangement into the future.

One other high capacity well was identified near the DWSMA during the Part I WHP planning process. At the present time it is expected that the aquifer will yield sufficient quantities of water for the City of Hawley over the life of this plan.

Wellhead Protection Area Delineation Criteria – See the Part 1 WHP Plan for documentation regarding how the delineation criteria were applied to determine the boundaries of the WHPA. The Part 1 WHP Plan is included as Exhibit 8 in the Appendix.

The Part I WHP Plan also discusses in detail an assessment of the data elements used for delineation purposes. The MDH Hydrologist also proposes three recommendations to improve the data set for future delineation efforts. These recommendations are included as management strategies in Chapter 5 of this plan.

Quality and Quantity of Water Supplying the Public Water Supply Well – Water quality monitoring results for this public water supply indicate evidence of contamination from 1) human-origin, such as fuel and fuel break-down products, pesticides, or commercial fertilizer, or 2) naturally-occurring contaminants such as arsenic and boron. At this time, problems with water quality are not an issue as the system has enjoyed water quality that meets standards in the Federal Safe Drinking Water Act.

The Land and Groundwater Uses in the DWSMA –
Proactive management of existing wells, unsealed or unused wells, shallow disposal wells, are of concern in the non-vulnerable area of the aquifer. The management strategies selected and documented in Chapter 5 of this Plan will focus on activities that have the most potential to impact the aquifer this city is using for its drinking water supply.

Table 1 - Potential Contamination Sources and Assigned Risk for the IWMZ

Source Type	Total	Level of Risk
SBM - Buried Sewer Line	2	L
SD1-Storm drain pipe	1	L
WEL-PWS Wells	3	L
HS3-Hazardous substance tank/container	1	L

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

Potential Source Type	Total Number	Number Within Emergency Response Area and Level of Risk		Number Within Remainder of the DWSMA and Level of Risk	
City Wells	*3*	*3*	*L*	*0*	-
Domestic Well	*9*	*0*	-	*9*	*H*
Class 5 Well	*0*	*0*	-	*0*	-

CHAPTER TWO

IMPACT OF CHANGES ON PUBLIC WATER SUPPLY WELL(S) (4720.5220)

I. CHANGES IDENTIFIED IN:

A. Physical Environment -- Large-scale changes in the physical environment within the DWSMA are not anticipated during the 10-year period that the WHP Plan is in effect.

B. Land Use -- Land uses that result in additional water wells in the DWSMA are fairly unlikely, although would likely have little impact on the aquifer unless water demand is increased to the point that 1) additional loss in hydraulic head occurs within the aquifer used by the City, or 2) pumping changes the boundaries of the WHPA. Constructing additional wells into the aquifer may increase the points of entry, alter the WHPA, or draw naturally-occurring or human-caused contaminants towards the City wells. The old depot building and generators were removed from just north of city hall in 2018. A hole or old water well was found and sealed under the flooring and the building was removed.

Land use inside the Inner Wellhead Management Zone: The land within the 200-foot radius consists primarily of city-owned property although the school is another large land use within

the IWMZ. Large scale land use changes are not expected to occur during the next 10 years within the IWMZs. Changes in land uses should be closely monitored due to the susceptibility of the aquifer to contamination from some types of activities at the land surface.

C. Surface Water -- There appears to be either no direct, or a limited, hydraulic connection between surface water and the aquifer used by the public water supply system as a drinking water source. Therefore, any changes to the conditions of surface waters will have little or no impact on the quality or quantity of the public water supply.

D. Groundwater -- The City wells have historically provided groundwater of acceptable quality and quantity. As of the date of Plan approval, the City does not anticipate a large increase in water use or is not aware of any such water use expansions in the DWSMA or immediately adjacent area.

II. IMPACT OF CHANGES – List, Describe and Assess Impacts on Aquifer From:

A. Expected Changes Identified Above -

The city anticipates a few new homes within the DWSMA, significant impacts on the aquifer are not expected. Neither surface water nor groundwater changes are expected to impact the aquifer.

B. Influence of Existing Water and Land Government Programs & Regulation -

A number of local and state programs exist that may provide assistance and benefits in managing potential contaminant sources identified in the DWSMA. Following is a brief description of the major programs that have drinking water protection interactions.

The Minnesota Department of Health regulates well construction through the Minnesota well code. Code requirements include minimum isolation distances as well as construction criteria designed to protect the well and aquifer. The MDH has a Source Water Protection grant program to assist in covering costs associated in the protection of source water. The Minnesota Pollution Control Agency has a tank storage program and has developed Best Management Practices (BMPs) for tank owners to help ensure proper and safe tank operation and maintenance. In addition, the MPCA manages a petroleum remediation program that addresses leaking tanks. This program has direct interaction with MDH staff in determining potential impacts to drinking water sources. The Clay County Soil and Water Conservation District administers cost share dollars for well sealing. The Clay County Local Water Management Plan has identified the protection of groundwater-based drinking water sources as a priority.

There may be existing land use ordinances by local governments that could be revised in the future to address new private wells within the DWSMA. The DWSMA extends outside of the city limits into Cromwell, Highland Grove, Hawley and Eglon Townships. The Township zoning is done at the county level, Clay County. However, there is no discussion or intention at this time of requiring additional regulation related to managing wells or storage tanks within the system's DWSMA. The City requires homes and businesses to be connected to sewer and water where it is provided. The City enforces a zoning ordinance provides oversight and control to make sure orderly growth occurs within the city.

C. Administrative, Technical, and Financial Considerations -

The City of Hawley assembled a Wellhead Protection Team early in the process of developing this Plan. Many of the activities during the planning process have been accomplished through efforts of this group, with assistance from studies provided by other units of government. For the WHP Plan to be effective:

1. The City will need to raise public awareness of the issues affecting the quality or quantity of its drinking water supply through public educational programs.
2. Administrative duties will remain with the Wellhead Protection Manager who will report to the governing authority, coordinate implementation of wellhead protection management action plans, and conduct regular meetings.
3. The City has limited funds available for new programs and the implementation of wellhead protection activities. The City plans to utilize other sources of funding or in-kind services to help achieve the goals set forth in this Plan's Chapter 4 and include 1) the Clay County Soil and Water Conservation District and their well sealing cost-share program; 2) the MDH grant program; and 3) the Minnesota Rural Water Association providing technical assistance during the wellhead protection implementation phase.

CHAPTER THREE

ISSUES, PROBLEMS, AND OPPORTUNITIES (4720.5230)

I. LAND USE ISSUES, PROBLEMS, AND OPPORTUNITIES

The WHP Team identified water use and land use issues, problems, and opportunities related to the:

- aquifer serving the public water supply well,
- well water, and
- drinking water supply management area.

The issues, problems, and opportunities were identified by assessing: problems and opportunities discussed at public meetings; data elements described in Chapter One; and the status and adequacy of official controls, plans, and other local, state, and federal programs on water use and land use.

At the beginning of the planning process other Local Units of Government (LUGs) were identified and informed that the system was beginning the wellhead protection planning process. Each unit of government was also sent a copy of the delineated WHPA and DWSMA and vulnerability assessment for the wells and DWSMA. To date, no comments from the LUGs have been received. The general public was also given opportunities to participate in the planning process and to comment at the Public Informational Meeting and Public Hearing. No concerns from the general public have been expressed at this time.

A. The Aquifer – The aquifer used by the city is considered to exhibit a low geologic sensitivity because the over-lying clay-rich sediments that protect the aquifer prevent water and contaminants from moving quickly from the land surface into the city's aquifer and implies a vertical time travel

of decades or longer. The principal threats to this aquifer are unsealed abandoned wells that penetrate through this clay layer. Such wells are 75 fee or greater in depth in the Hawley area.

B. The Well Water -- The wellhead protection plan is primarily concerned with other water supply wells, and shallow disposal wells located within the DWSMA. The potential contaminant source inventory performed by the Wellhead Protection Team indicated the types of wells, as listed in Tables 1 and 2.

The placement of additional high-capacity wells, increased pumping from existing wells, or significant changes in current groundwater appropriations within the DWSMA may have an impact on 1) groundwater availability to all users, 2) increased risk that contamination may enter the part of the aquifer used by the public water supply wells, or 3) change the delineated WHPA and the DWSMA boundaries. At the present time there are not any other high capacity wells, although the City of Fertile will work with the DNR and MDH to become aware of any proposed high-capacity well within the DWSMA.

C. Drinking Water Supply Management Area - The state's Wellhead Protection Rule requires that existing information be utilized in developing the initial WHP Plan. Much of the data collected and utilized to delineate the city's WHPA and DWSMA and to determine the vulnerability of the aquifer to possible contamination comes from small-scale or regional studies. There is a limited amount of subsurface information available to define local groundwater flow conditions and the groundwater chemistry of the aquifer within the DWSMA. The direction of groundwater flow was evaluated to address concerns that the current amount of subsurface information does not permit an unquestioned determination of local groundwater flow conditions toward the system's water supply wells. As a result, delineation of the WHPA represents a composite of capture zones generated by varying aquifer properties, within limits determined by MDH.

The City has limited legal capabilities to regulate well construction and sealing in the DWSMA. Changes in land use that increase pumping of the aquifer used by the City well need to be assessed for its possible impacts on water availability and quality. Finally, the City has no regulatory authority over water appropriations and must rely on the State of Minnesota to address issues and concerns related to pumping. The city has no boreholes or observation wells in the PCSI.

A portion of the DWSMA lies within the city limits and the city has a zoning ordinance and comprehensive plan to address land use within this area. The remainder of the DWSMA lies outside of city limits in Cromwell, Highland Grove, Hawley and Elgon Townships. They do not have zoning regulations and rely on Clay County to administer applicable zoning. The WHP Team assessed the current and future land use changes in the DWSMA and concluded little or benign land use changes are likely.

The City plans to utilize public education opportunities, both existing and proposed to address potential contamination of the aquifer by other wells, shallow disposal wells, and other contaminant sources. Additionally, the City will work in cooperation with the Clay County Soil & Water Conservation District to utilize the well sealing cost-share program currently available, and participate in the MDH grant program. The WHP Team has identified four wells in the DWSMA which are presently being utilized by private residences because city services do not extend to the properties. The City will set high priority on well sealing for wells which might be found later that are unused or not properly maintained. Further, the City will work with MDH to 1) identify

proposed wells that may present groundwater conflict concerns, 2) ensure these wells are properly constructed, and 3) determine whether an alternative aquifer could be used.

The old depot building and generators were removed from just north of city hall in 2018. A hole/pit or old water well was found and sealed under the flooring and the building was removed. The City will continue to work with MPCA, MDA and MDH to 1) track current and likely future locations of tanks, 2) promote best management practices for all tanks, and 3) provide educational material to tank owners/operators.

Shallow disposal wells (also called Class V Injection Wells) are regulated by the U.S. EPA. No Class V Injection Wells were identified during the potential contaminant source inventory. However, the WHP Team is aware of the drinking water protection issues connected with this type of disposal system and will be monitoring for these types of facilities during the life of the plan. If a Class V Injection Well is identified in the future, the city will inform MDH of it suspected location.

During the initial WHP Plan Implementation process for the original plan, the city met with MRWA and reviewed the Old muni well report and documented what they knew at that time. MDH updated the old municipal well report and provided it back to the city. A copy of this report is available at city hall.

There are many tools available to the regulating agencies that may be used to achieve the wellhead protection planning goals identified by the WHP Team. State and local governmental units, such as MDH, Clay County, and the DNR, regulate:

- ✓ Well construction – MDH;
- ✓ Well sealing – MDH;
- ✓ State groundwater appropriation permits – DNR;
- ✓ Public water supply quality – MDH;
- ✓ Setbacks for specific contaminant sources from a well – MDH and local governments through conditional use permitting;
- ✓ Land use controls – Local governments;
- ✓ Tank control program – MPCA, MDA;
- ✓ Shallow disposal wells - U.S. EPA.

The WHP Team recommends that no additional regulations be imposed at this time and are confident that local issues may be adequately addressed through existing processes. Processes include public education, adoption of best management practices for different types of wells, tank maintenance, and communication with landowners in the DWSMA.

One issue identified by the WHP Team concerned whether there are adequate resources to implement wellhead protection activities. The small size of the City and the limited availability of time for staff indicate that it will be a challenge to implement the WHP Plan. The WHP Team will focus its efforts on fostering partnerships to help achieve wellhead protection goals. The MDH and Minnesota Rural Water Association were identified as valuable partners.

CHAPTER FOUR
WELLHEAD PROTECTION GOALS (4720.5240)

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:

- Promote public health, economic development and community infrastructure by maintaining a potable public drinking water supply for the community.

CHAPTER FIVE
OBJECTIVES AND PLANS OF ACTION (4720.5250)

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, 2) the potential contaminant source inventory, 3) the impacts that changes in land and water use present and 4) issues, problems, and opportunities referenced to administrative, financial, and technical considerations.

Objectives

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

1. Create awareness and general knowledge about the importance of WHP in the City of Fertile.
2. Properly inventory and manage potential contaminant sources to protect the drinking water supply for the City of Hawley.
3. Gather additional information within the DWSMA in order to better understand the size and vulnerability of the DWSMA.
4. Effectively track and report the implementation efforts and wellhead protection plan progress to all governing authorities.
5. Manage the Inner Wellhead Management Zone to prevent contamination of the aquifer near the public supply wells.
6. Effectively prepare the City of Hawley for disruptions to the water distribution system.

WHP Measures and Action Plan

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:

1. Public Education and Outreach
2. Potential Contamination Source Management
3. Land Use Management
4. Data Collection
5. IWMZ Management
6. Reporting and Evaluation
7. Water Use and Contingency Strategy

Establishing Priorities

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 time, legal, financial, and technical resources.

The City of Hawley defines a priority for implementing a WHP measure as an action that protects their drinking water supply from contamination from the potential contaminant source or any other possible threat to the quality or quantity of its drinking water supply. The following table lists each measure that will be implemented over the 10-year period that the city's WHP plan is in effect, including the priority assigned to each measure.

WHP Plan of Action

PUBLIC EDUCATION AND OUTREACH:

Description	Objective	Priority	Responsible Party & Cooperators	Cost	Implementation Time Frame									
					2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
WHP Measure (#1): Provide residents with an article that explains the importance of WHP.	1	High	City, MRWA	$300	X							X		
WHP Measure (#2): Request a large map of the DWSMA from MDH and display at city hall for the general public to review.	1	Low	City	$50	X									

POTENTIAL CONTAMINATION SOURCE MANAGEMENT:

Description	Objective	Priority	Responsible Party & Cooperators	Cost	Implementation Time Frame									
					2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
WHP Measure (#3): Provide property owners, who have a well in the DWMSA materials on proper management of the well.	2	Medium	City, MRWA	$100		X					X			
WHP Measure (#4): If the City is made aware of any unused wells in DWSMA apply for a grant to pay the costs to seal them.	2	High	City, MDH, MRWA	Based on bids received	As Occurs									
WHP Measure (#5): The City will collaborate with the MDH Source Water Protection Unit in the identification of new high-capacity wells that are proposed for construction within the DWSMA or within one mile of the DWSMA. The WHP Manager will share the location of pending high capacity well with the MDH Hydrologist.	2	Medium	City, MDH, DNR	$100	As Occurs									

WHP Measure (#6): WHP Team and Manager will update the PCSI map and table.	2	Medium	City, MRWA	$1,000					X					
WHP Measure (#7): Old muni well is thought to exist at the Fairground. The exact location isn't known, although the city will work with MDH and others to try and find the location of this well.	2	Medium	City, MRWA, MDH	Based on bids received				X						
WHP Measure (#8): If any of the old muni wells are found, the city will apply for a grant and if successful have the wells sealed.	2	Medium	City, MRWA, MDH	Based on bids received	If Opportunity Arises									
WHP Measure (#9): WHP Team will assess the security of the public water supply wells and apply for a MDH grant to secure facility if needed.	2	Medium	City, MDH	Based on bids received			X							
WHP Measure (#10): Inform MDH if a Class V well is identified within the DWSMA.	2	Medium	City, MDH	$125	As Occurs									
WHP Measure (#11): It is always difficult to foresee or plan for the future. The City will use its planning and management capabilities within this plan to help respond to new/unknown source water protection issues that may impact the quality or quantity of its drinking water in the future.	2	Low	City, MDH	Staff time with unknown associated project costs	As Occurs									
WHP Measure (#12): Re-sample Wells 3, 4,and 5 during year six of plan implementation for vulnerability parameters determined in consultation with MDH (tritium, chloride, bromide, stable isotopes, nitrate and ammonia); contingent on funding assistance from MDH.	2	Low	City, MDH	Staff time with unknown associated project costs						X				

LAND USE MANAGEMENT:

Description	Objective	Priority	Responsible Party & Cooperators	Cost	Implementation Time Frame									
					2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
WHP Measure (#13): Send Clay County a map of the DWSMA and letter discussing the importance of WHP. Ask to be notified of any requests for changes in land use or zoning which are located within the DWSMA.	1	Low	City, MRWA	$100			X						X	

DATA COLLECTION:

Description	Objective	Priority	Responsible Party & Cooperators	Cost	Implementation Time Frame									
					2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
WHP Measure (#14): Resample wells for vulnerability parameters determined by the MDH, provided MDH will cover the costs.	3	Medium	City, MDH	*$1,000						X				

IWMZ MANAGEMENT:

Description	Objective	Priority	Responsible Party & Cooperators	Cost	Implementation Time Frame									
					2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
WHP Measure (#15): Implement measures that are specified in the IWMZ PCSI report.	5	High	City	$400	X	X	X	X	X	X	X	X	X	X
WHP Measure (#16): Monitor the 200 ft. radius around the wells to ensure that setback distances for new potential contamination sources are met.	5	High	City	$100	X	X	X	X	X	X	X	X	X	X
WHP Measure (#17): Request MDH assistance to update the Inner Wellhead Management Zone Inventory for the public water supply wells.	5	High	City, MDH	$100					X					X

REPORTING AND EVALUATION:

Description	Objective	Priority	Responsible Party & Cooperators	Cost	Implementation Time Frame									
					2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
WHP Measure (#18): Prepare an evaluation of WHP plan implementation efforts every 2 ½ years.	4	Low	City	$200			X			X		X		
WHP Measure (#19): Summarize all WHP Plan implementation efforts in a report to MDH prior to the Scoping 1 meeting for the WHP Amendment.	4	Low	City, MDH, MRWA	$300								X		

WATER USE AND CONTINGENCY STRATEGY:

Description	Objective	Priority	Responsible Party & Cooperators	Cost	Implementation Time Frame									
					2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
WHP Measure (#20): Review the contingency strategy portion of the city's wellhead protection plan every 2 ½ years to ensure that it reflects current personnel contact information and changes in the water supply system infrastructure and other needs and concerns.	6	Medium	City, MRWA	$300			X			X		X		
WHP Measure (#21): Implement recommendations and needs that are specified in the contingency plan provided necessary grant funds are available.	6	Medium	City, MDH	To be determined with bids				X		X			X	

These costs are estimates and actual costs will be will be determined prior to completion of measure

CHAPTER SIX

EVALUATION PROGRAM (4720.5270)

The success of the wellhead protection management program must be evaluated in order to determine whether the plan is actually accomplishing what the City of Hawley set out to do. The following activities will be implemented to:

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

1) The City system will continue to cooperate with MDH in the annual monitoring of the water supply to determine whether the management strategies are having a positive effect and to identify water quality problems that may arise, which must be addressed.
2) It is recommended that the WHP Team meets on an annual basis , although will meet a minimum of once every 2 ½ years, to review the results of each strategy implemented during the previous plan year and identify and discuss whether modifications are needed for those strategies, and additional strategies for the coming plan year.
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 SEVEN

CONTINGENCY PLAN
City of McIntosh

Table of Contents

1. Purpose

The purpose for a contingency plan is to establish, provide, and keep updated emergency response procedures and information that is needed to effectively respond to partial or total loss of public water supply services that are caused by contamination or mechanical failure. In particular, the 1) pumping capacity of each well, 2) the vulnerability of each well due to its construction, and 3) the aquifer vulnerability at the well were considered in determining how to respond to contamination issues.

2. Public Water Supply Characteristics

The water supply distribution system that is operated by Public Water Supplier provides drinking water to 467 customers and is summarized in this section.

2.1 Water Supply Source(s) - Information describing the water supply well(s) used by the Public Water Supplier is presented in Table 4 that is taken from the discussion of the public water supply system in the WHP plan.

Table 1. Water Supply Well Information (Primary = P)

Local Well Name	Unique Number	Use/ Status[1]	Casing Diameter (inches)	Well Depth (feet)
Well 3	473631	Primary	12	136
Well 4	520967	Primary	10	134
Well 5	775413	Primary	12	136

2.2 Treatment - The city treats the water with fluoride.

2.3 Water Storage and Distribution System –The city has a 250,000 gallon water tower and a 100,00 gallon below ground storage tank. Connections to the system are metered. The water system contains all other necessary valving and piping necessary to isolate problems within the distribution system.

2.4 Maps/Plans - Maps of the water distribution system are on file at city hall and Moore Engineering, Fargo.

3. Priority Water Users During a Water Supply Emergency

The following table identifies the priority that water users will receive in the event of a major system disruption, failure or an emergency.

Table 2. Water Use Priority Grouping

Priority Group and Rank	Maximum Daily Use (gal per day)	Minimum Daily Use (gal per day)
Residential /Commercial	350,000	140,000
Unaccounted		

4. Alternative Water Supply Options

4.1 Bottled water or bulk water delivery supplies, delivery and distribution: The Public Water Supplier has made arrangements with this business to provide bottled water to residents upon notification of interruption of the public water supply system. Larger quantities of bottled water for long-term distribution will be provided by:

1. Tony's Supervalu – Hawley – 218-483-3339
2. Wal Mart – Detroit Lakes – 218-847-1126
3. Wal Mart - Fargo– 701-281-3971

4.2 Construct New well. No other new wells are planned as part of the routine maintenance and capital improvement plan of the water supply system. However, in the event that a city well goes down permanently, the Public Water Supplier will contact the MDH district engineer to initiate procedures for constructing a replacement water supply well under emergency circumstances.

4.3 Emergency Backup Well(s). The Public Water Supplier has three primary wells and can use one of the other wells if one of them fails. Manually alternate wells.

5. Inventory of Available Emergency Equipment and Materials

The following table identifies the services, equipment and supplies that are available to the Public Water Supplier for responding to a disruption of its water supply. The items listed should be adequate to respond to the water system emergencies that are most likely to affect the city.

Table 3. Available Emergency Response Equipment and Suppliers

Description	Owner	Telephone	Location	Acquisition Time
Well Repair	Thein Wells	1-320-796-2111	Spicer	5 hours
Pump Repair	Sweeney Controls	1-701-232-3644	Fargo	1 hours
Electrician	Lewis Electric	218-	Hawley	Less than 1 hr
Plumber	High Ten	218-	Hawley	Less than 1 hr
Backhoe/ Excavator	Sellin Bros.	218-483-3522	Hawley	Less than 1 hr
Chemical Feed	Hawkins	701-293-9618	Fargo	2 hours
Meter Repair	Core and Main	701-367-1060	Fargo	2 hours
Valves, pipe fittings, etc.	RDO	701-367-1060	Moorhead	2 hours

6. Emergency Response Procedures

The emergency response coordinator is:

Name: James Joy
Address: Hawley
Work Phone: (701) 566-2442
Alternate contact number: (701)566-2442

E-mail contact: jjoy@ci.hawley.mn.us

The alternate response coordinator is:

Name: Gerry Kluck
Address: Hawley
Work Phone: 701-361-4803
Alternate contact number: 701-238-7657
E-mail contact: **gkluck@arvig.net**

The duties of the response coordinator or the alternate are listed in the following table.

Table 4: Duties of the Emergency Response Coordinator or the Alternate

Incident	Response Procedure & Comments
Identify Disruption (Mechanical Failure or Contamination)	Identifies the nature of the water supply disruption and communicates this information to the city government, the alternate response coordinator, and members of the emergency oversight committee.
Notify Response Personnel	Notifies city staff and others who will be responding to the water supply emergency about the disruption and coordinates their efforts to correct it.
Incident Direction and Control	Identifies the actions that are needed to correct the water supply emergency and directs responders to implement corrective actions.
Internal Communication	Communicates the status of response efforts to the primary spokesperson and the emergency oversight committee as needed to keep these parties informed of progress.
Assess Incident Response on Continual Basis	Assesses the efforts to correct the water supply disruption on a continual basis so that the emergency oversight committee can take additional corrective actions and the city government and public are updated on issues and progress.
Define the Extent of a Contamination Disruption	Coordinates efforts to define the extent and level of the contamination with local, state, and federal agencies. This may continue after initial corrective actions have been implemented.
Define the Extent of a Mechanical Disruption	Coordinates efforts to define the cause(s) of the mechanical failure and the equipment, data, and expertise that are needed to correct it. Identifies measures for reducing the likelihood that a similar mechanical failure will not occur in the future.
Identify Need for an Alternate Water Supply	Evaluates the need to obtain an alternate water supply, the time period it is needed before the water supply emergency is corrected, and the actions that are needed to achieve it.

7. Notification Procedures

7**.1 Responder Contacts –**The table contains the names and telephone numbers of the local and state agency contacts as well as other individuals, businesses, or members of the public that will be notified depending on the nature of the public water supply emergency. The emergency response coordinator Kevin Nephew will use this list to select the members of an Emergency Oversight Committee. The

committee will meet throughout the duration of the emergency to aid in decision-making and to update the city regarding their roles in correcting the problem.

Table 5: Emergency Contact Listing

Personnel	Name	Home Telephone	Work Telephone
Mayor/Board Chair	James Joy	701-566-2442	701-566-2442
Council Members	Sean Mork	701-866-8262	701-866-8262
Council Members	Ben Gunkelman	218-486-591	218-486-591
Council Members	Stacy Riedberger	218-329-9261	218-329-9261
Council Members	Jonathan Donnelly	701-261-2484	701-261-2484
Response Coordinator	Gerry Kluck	701-361-4803	218-681-6674
Alt. Response Coordinator	Kim Mattson Paul Thompson	701-238-0785	701-866-1221
State Incident Duty Officer	None	N/A	800-422-0798
County Emergency Director	Brian Green	218-299-7357	911
Fire Chief	Justin Martin		911
Sheriff	Dale Berquist	218-299-5151	911
Police Chief	Joe Backlund		911
System Operator	Gerry Kluck	701-361-4803	701-361-4803
Alt. System Operator	Kim Mattson Paul Thompson	701-238-0785	701-866-1221
School Superintendent	Phil Jenson	218-483-4647	218-563-2900
Ambulance	Clay County EMS	218-945-3110	218-945-6050
Hospital	Sanford Health	701-234-2000	701-234-4700
Power Company	City of Hawley		
Co. Highway Department	Clay County	218-299-5099	218-483-444
Telephone Company	Arvig/Century Link		1-888-992-7844
Neighboring Water System	Lake Park	218-238-5337	218-687-2545
MRWA Technical Services	Kurt Haakinson		320-760-5886
MDH District Engineer	Todd Johnson		218-308-2110
MDH Source Water Protection	Jenilynn Marchand		218-308-2153

7.2 Critical Assessment Team

Table 6. Emergency Oversight Committee

Title	Name	Response Assignment
Response Coordinator	Gerry Kluck	Assess Emergency coordinate and contact people and recourses needed in an emergency situation
Alt. Response Coordinator	Kim Mattson Paul Thompson	Assess Emergency coordinate and contact people and recourses needed in an emergency situation
Water Operator	Gerry Kluck	Assess Emergency coordinate and contact people and recourses needed in an emergency situation
Alt. Water Operator	Kim Mattson Paul Thompson	Assess Emergency coordinate and contact people and recourses needed in an emergency situation
Primary Spokesperson	James Joy	Answer questions from residents and media.
MDH District Engineer	Todd Johnson	Assist and advise Response & Alt Response Coordinators to get emergency resolved and get water back on line
MRWA Contact	Kurt Haakinson	Assist and advise Response & Alt Response Coordinators to get emergency resolved and get water back on line

7.3 Public Information Plan

Primary Spokesperson:
Name: James Joy
Address: Hawley
Work Phone: 701-566-2442
Alternate contact number: 701-566-2442
E-mail contact: jjoy@ci.hawley.mn.us

The responsibilities of the primary spokesperson are to:

1. Give public statements that have been prepared by the city regarding the water supply emergency;
2. Coordinate and compile information submitted by responders to the water supply emergency;
3. Schedule official meetings between the city and members of the media; and
4. Coordinate efforts to keep the public informed about the water supply emergency.

Public Information Center Location during Emergency:
Fire Hall-305 6th Street, Hawley, MN would remain open as needed in the event of an emergency.

Information to be conveyed to the public and media:

1. Name of the Water System;
2. Nature of the water supply emergency;
3. Steps being taken to replace the water supply;
4. *If applicable*- Contaminant(s) of concern & date first detected;
5. *If applicable* - Source(s) of contamination;
6. *If applicable* - Public health impacts of the contamination or water supply interruption;
7. Steps the public should be taking;
8. Other responders who are cooperating with the city; and
9. Steps being taken to eliminate the source of contamination or mechanical failure.

7.4 Media Contacts:

Contact Information

Media	Name	Telephone	Address
Newspaper	Hawley Herald	218-483-3306	Hawley
Television	KVLY	701-772-3481	Fargo
Radio	KRCQ	218-847-5624	Detroit Lakes

8. Mitigation and Water Conservation Plan

8.1 Mitigation of a water supply interruption that is related to mechanical failure involves direct participation by MDH to ensure that all state and federal regulations relating to the design and approval of mitigation efforts are met. Also, possible sources of funding or the continued use of the emergency alternative water supply will be identified with the assistance of the emergency oversight committee.

Mitigation of a water supply interruption that is related to high levels of chemical contamination or pathogen contamination will involve the direct participation of the MDH and likely the Minnesota Pollution Control Agency. Short-term versus long-term mitigation efforts will need to be developed through the emergency oversight committee.

The Public Water Supplier will take the following preventative steps to avoid the interruption of the water supply due to mechanical failure:

1. Infrastructure maintenance/upgrades/maps: The water system is flushed 2 times a year. The city maintains maps and records of system maintenance at City Shop and City Hall.

2. Regular inspection of tower, well, pump house: All of these facilities are inspected daily. The pump house has keyed entry and are locked.

3. Our staff is licensed for this facility and attends annual training through the Minnesota Rural Water Association.

4. The city has assessed the likelihood that vandalism or terrorism may disrupt its water supply and has determined that much of this can be avoided by locking all facilities and have keyed entries to buildings.

APPENDIX A

REFERENCED DATA FOR PART 2

Acronym List
Glossary of Terms
Exhibit 1: Political Boundaries & Land Survey Map
Exhibit 2: Land Cover Map
Exhibit 3: Inner Wellhead Management Zone (IWMZ) Reports
Exhibit 4: Potential Contaminant Source Inventory List and Map
Exhibit 5: Zoning Map
Exhibit 6: Comprehensive Land Use Map
Exhibit 7: Parcel Boundary Map
Exhibit 8: WHP Plan Part 1
Exhibit 9: Consumer Confidence Report (CCR)

Acronym List

BMPs – Best Management Practices
CCR – Consumer Confidence Report
DNR – Department of Natural Resources
DWSMA – Drinking Water Supply Management Area
ERA - Emergency Response Area
IWMZ – Inner Wellhead Management Zone
LUGs – Local Unit of Government
MDA – Minnesota Department of Agriculture
MDH – Minnesota Department of Health
MPCA – Minnesota Pollution Control Agency
MRWA – Minnesota Rural Water Association
PCSI – Potential Contaminant Source Inventory
PWS – Public Water Supply
SWCD - Soil and Water Conservation District
US EPA – United States Environmental Protection Agency
WHP - Wellhead Protection
WHPA – Wellhead Protection Area

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 wells 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 City 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.

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 City or 2) an aquifer that is a source of public drinking water.

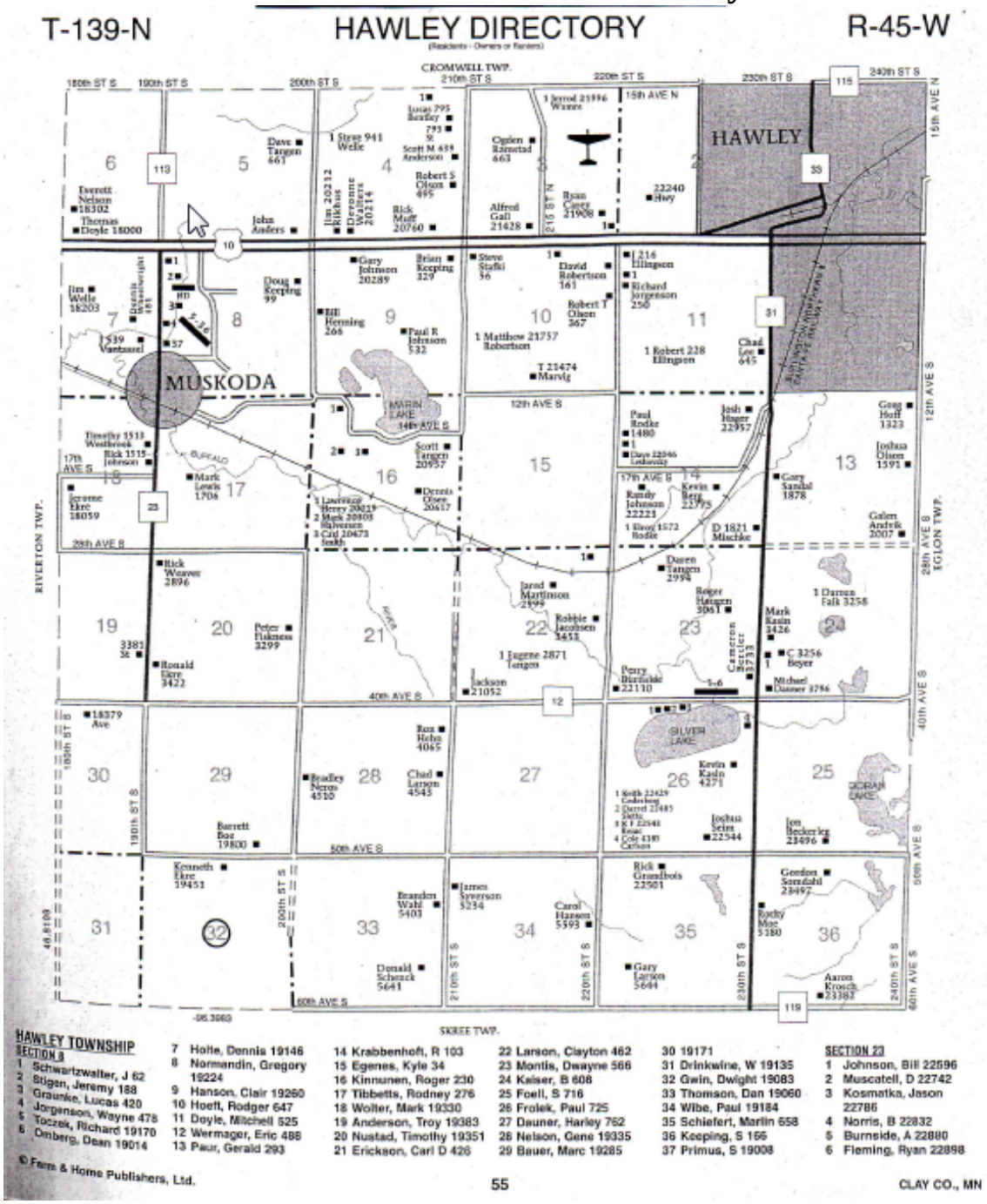
WHP Area (WHPA). The surface and subsurface area surrounding a well or well field that supplies a public water system, through which contaminants are likely to move toward and reach the well or well field (Minnesota Statutes, part 103I.005, subdivision 24).

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 City 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.

Exhibit 1: Political Boundaries & Land Survey

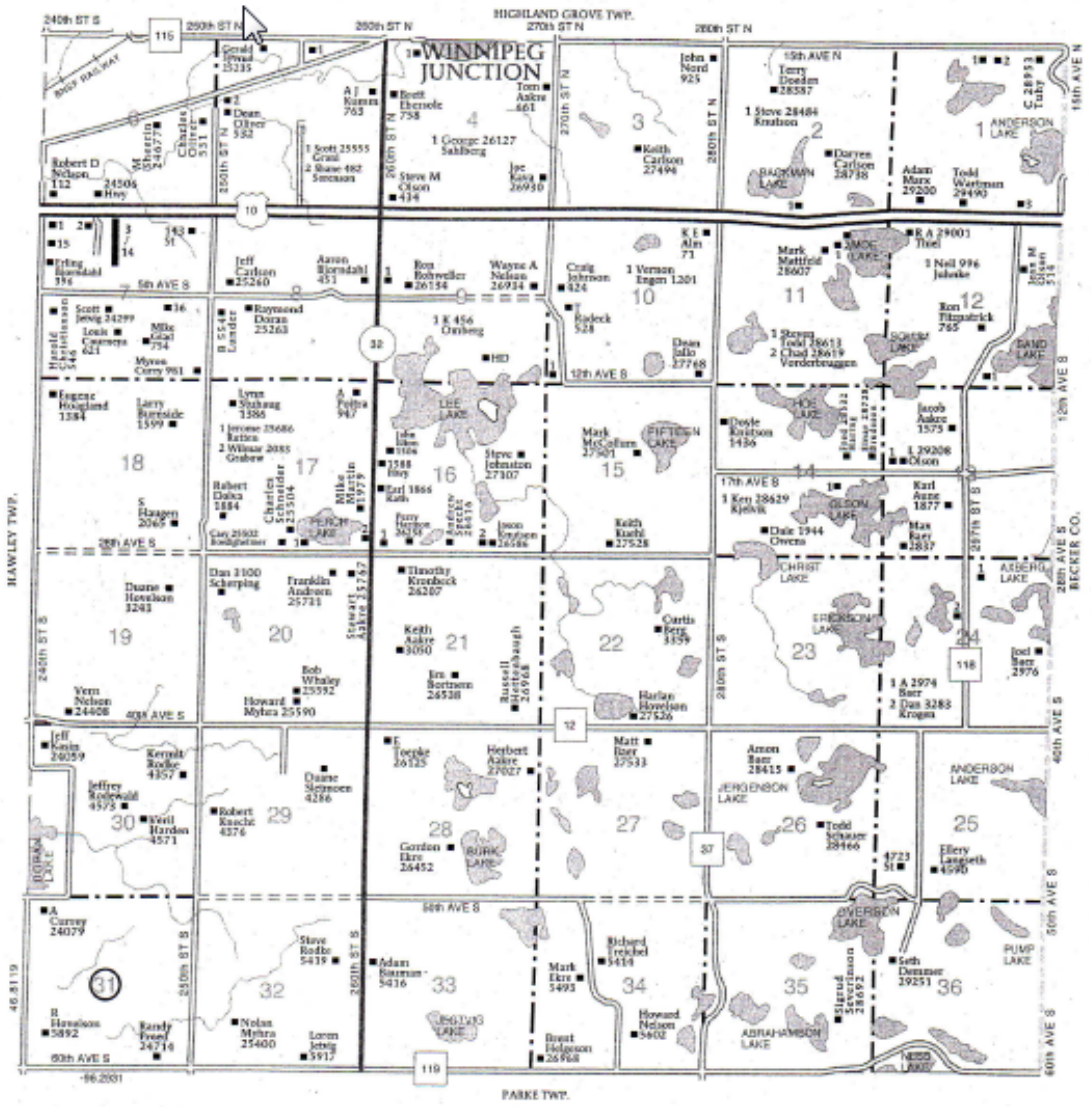


T-139-N

EGLON DIRECTORY

(Residents - Owners or Renters)

R-44-W



EGLON TOWNSHIP

SECTION 1
1 Soyring, Harold 29509
2 Becker, A L 29751
3 Veit, Richard 29744

SECTION 7
1 Samuelson, Roy 24233
2 Hansen, Tim L 24285
3 Jetvig, L 6
4 Burnside, Richard 66
5 Burnside, J 46
6 Volker, Don 118
7 Novotny, Gary 174
8 Rogers, Gary 293
9 Krause, Greg 43
10 Lowe, Mark 101
11 Mangel, Merle 195
12 Newton, Alan 278
13 Larson, Dewayne
14 Burnside, Leroy 24507
15 Siggerud, Charles 126
16 DeHaan, Christopher 559

SECTION 13
1 Schermerhorn, Donald 29104

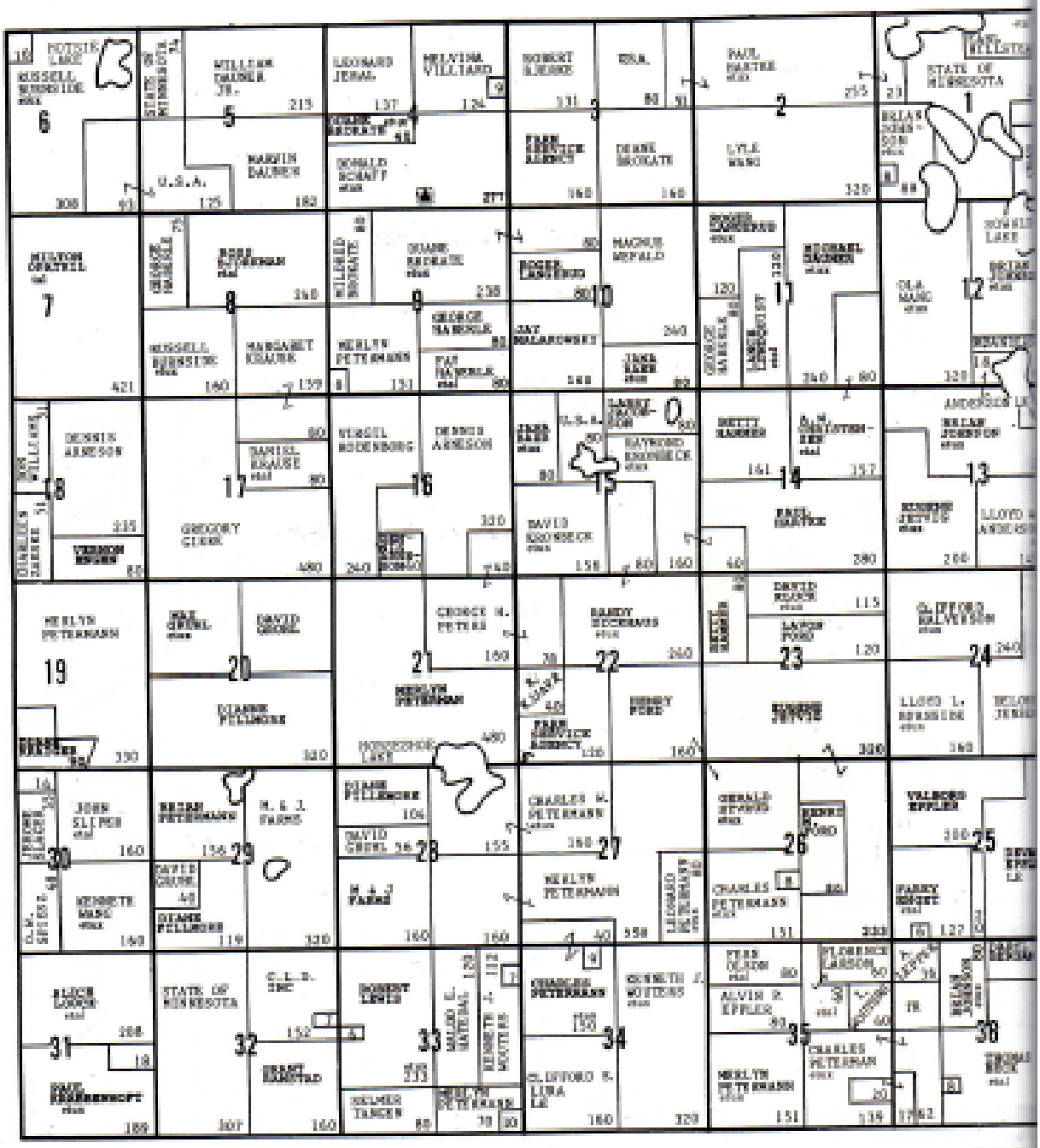
SECTION 18
1 Olson, Virgil 2164
2 Knutson, Tim 26584

T-140-N

CROMWELL PLAT

(landowners)

R-45-W



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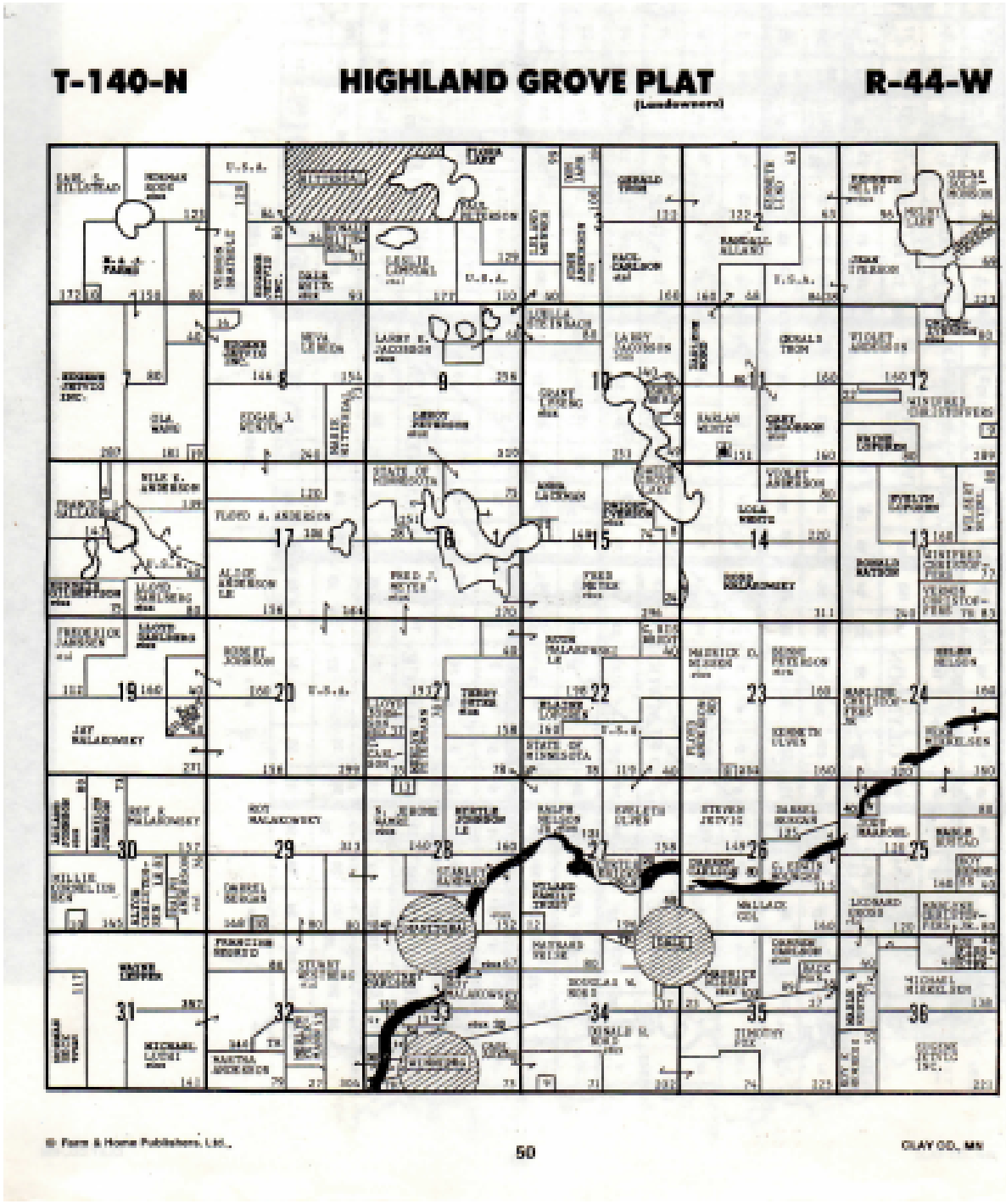
T-140-N
HIGHLAND GROVE PLAT
(Landowners)
R-44-W
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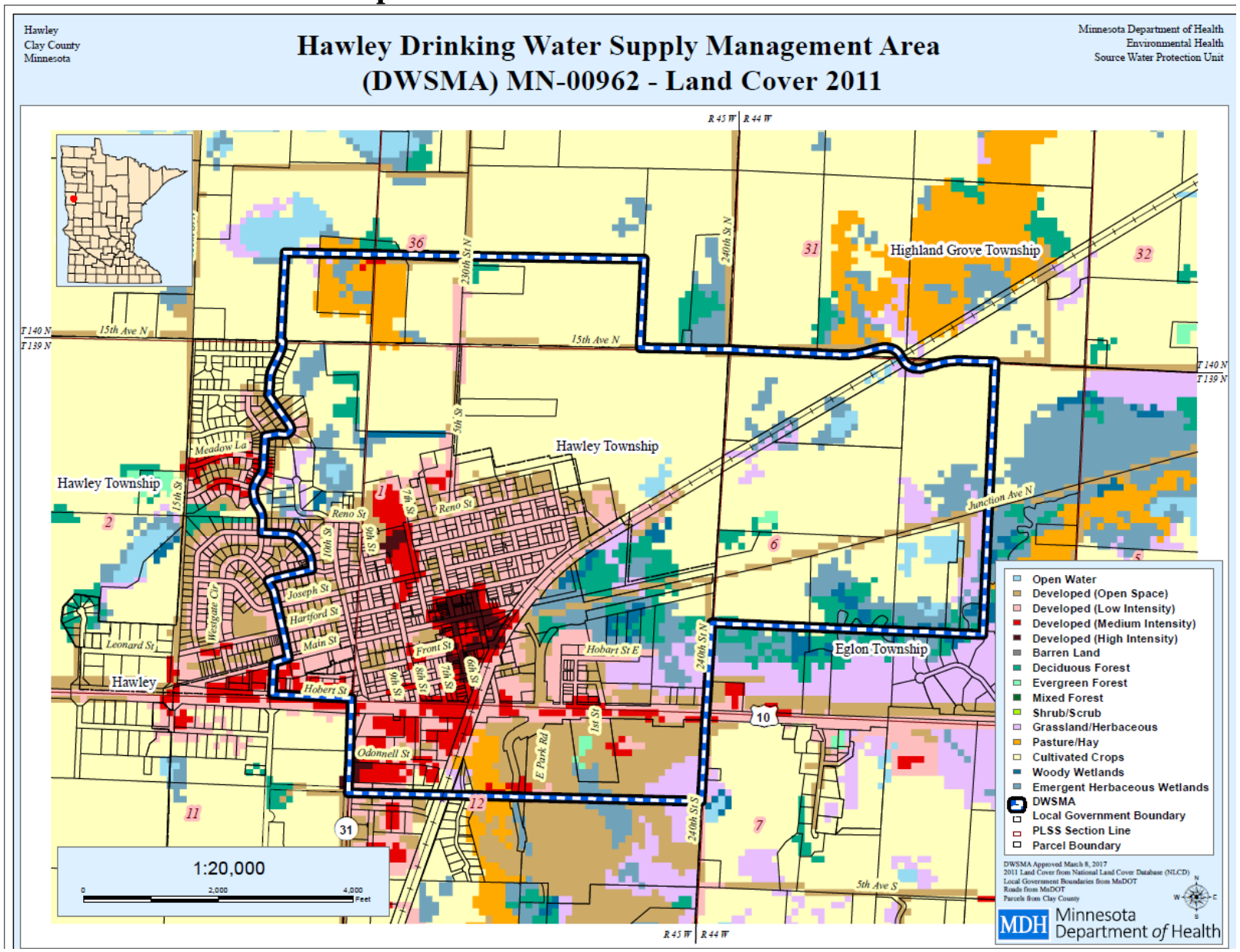
50
OLAY CO., MN

Exhibit 2: Land Cover Map & Table



Land Cover Table

DWS_ID	LCOV_C	LAND_COVER	ORIG_SQM	ADJ_SQM	ACRES	PERCENT	YEAR
962	11	Open Water	65700	65756	16.25	1.09	2011
962	21	Developed, Open Space	743400	744029	183.85	12.32	2011
962	22	Developed, Low Intensity	1054800	1055692	260.87	17.49	2011
962	23	Developed, Medium Intensity	316800	317068	78.35	5.25	2011
962	24	Developed, High Intensity	80100	80168	19.81	1.33	2011
962	41	Deciduous Forest	188100	188259	46.52	3.12	2011
962	42	Evergreen Forest	10800	10809	2.67	0.18	2011
962	71	Grassland/Herbaceous	228600	228793	56.54	3.79	2011
962	81	Pasture/Hay	135900	136015	33.61	2.25	2011
962	82	Cultivated Crops	2747700	2750023	679.55	45.55	2011
962	90	Woody Wetlands	72900	72962	18.03	1.21	2011
962	95	Emergent Herbaceous Wetlands	387000	387327	95.71	6.42	2011
962	99	Total	6031800	6036900	1491.75	100.00	2011

Exhibit 3: IWMZ Reports

Environmental Health Division
Drinking Water Protection Section
P.O. Box 64975
St. Paul, Minnesota 55164-0975

INNER WELLHEAD MANAGEMENT ZONE (IWMZ) - POTENTIAL CONTAMINANT SOURCE INVENTORY (PCSI) REPORT

PUBLIC WATER SYSTEM INFORMATION

PWS ID	1140006 **COMMUNITY**
NAME	Hawley
ADDRESS	Hawley Water Superintendent, City Hall, P.O. Box 69, Hawley, MN 565490069

FACILITY (WELL) INFORMATION

NAME	Well #5
FACILITY ID	S04
UNIQUE WELL NO.	775413
COUNTY	Clay

IS THERE A WELL LOG OR ADDITIONAL CONSTRUCTION INFORMATION AVAILABLE?
☐ **YES** (Please attach a copy)
☐ **NO** ☐ **UNDETERMINED**

PWS ID / FACILITY ID	1140006 S04	**UNIQUE WELL NO.**	775413

PCSI CODE	ACTUAL OR POTENTIAL CONTAMINATION SOURCE	ISOLATION DISTANCES (FEET)				LOCATION	
		Minimum Distances		Sensitive Well[4]	Within 200 Ft. Y / N / U	Dist. from Well	Est. (?)
		Community	Non-community				
Agricultural Related							
*AC1	Agricultural chemical buried piping	50	50		N		
*AC2	Agricultural chemical multiple tanks or containers for residential retail sale or use, no single tank or container exceeding, but aggregate volume exceeding 56 gal. or 100 lbs. dry weight	50	50		N		
ACP	Agricultural chemical tank or container with 25 gal. or more or 100 lbs. or more dry weight, or equipment filling or cleaning area without safeguards	150	150		N		
ACS	Agricultural chemical storage or equipment filling or cleaning area with safeguards	100	100		N		
ACR	Agricultural chemical storage or equipment filling or cleaning area with safeguards and roofed	50	50		N		
ADW	Agricultural drainage well[2] (Class V well - Illegal[3])	50	50		N		
AAT	Anhydrous ammonia tank (stationary tank)	50	50		N		
AB1	Animal building, feedlot, confinement area, or kennel, 0.1 to 1.0 animal unit (stockyard)	50	20	100/40	N		
AB2	Animal building or poultry building, including a horse riding area, more than 1.0 animal unit	50	50	100	N		
ABS	Animal burial area, more than 1.0 animal unit	50	50		N		
FWP	Animal feeding or watering area within a pasture, more than 1.0 animal unit	50	50	100	N		
AF1	Animal feedlot, unroofed, 300 or more animal units (stockyard)	100	100	200	N		
AF2	Animal feedlot, more than 1.0, but less than 300 animal units (stockyard)	50	50	100	N		
AMA	Animal manure application	use discretion	use discretion		N		
REN	Animal rendering plant	50	50		N		
MS1	Manure (liquid) storage basin or lagoon, unpermitted or noncertified	300	300	600	N		
MS2	Manure (liquid) storage basin or lagoon, approved earthen liner	150	150	300	N		
MS3	Manure (liquid) storage basin or lagoon, approved concrete or composite liner	100	100	200	N		
MS4	Manure (solid) storage area, not covered with a roof	100	100	200	N		
OSC	Open storage for crops	use discretion	use discretion		N		
SSTS Related							
AA1	Absorption area of a soil dispersal system, average flow greater than 10,000 gal./day	300	300	600	N		
AA2	Absorption area of a soil dispersal system serving a facility handling infectious or pathological wastes, average flow 10,000 gal./day or less	150	150	300	N		
AA3	Absorption area of a soil dispersal system, average flow 10,000 gal./day or less	50	50	100	N		
AA4	Absorption area of a soil dispersal system serving multiple family residences or a non-residential facility and has the capacity to serve 20 or more persons per day (Class V well)[2]	50/300/150[4]	50/300/150[4]	100/600/300[4]	N		
CSP	Cesspool	75	75	150	N		
AGG	Dry well, leaching pit, seepage pit	75	75	150	N		
*FD1	Floor drain, grate, or trough connected to a buried sewer	50	50		N		
*FD2	Floor drain, grate, or trough if buried sewer is air-tested, approved materials, serving one building, or two or less single-family residences	50	20		N		
*GW1	Gray-water dispersal area	50	50	100	N		
LC1	Large capacity cesspools (Class V well - Illegal)[2]	75	75	150	N		
MVW	Motor vehicle waste disposal (Class V well - Illegal)[2]	Illegal	Illegal		N		

PWS ID / FACILITY ID	1140006 S04	UNIQUE WELL NO.	775413

PCSI CODE	ACTUAL OR POTENTIAL CONTAMINATION SOURCE	ISOLATION DISTANCES (FEET)				LOCATION	
		Minimum Distances		Sensitive Well*	Within 200 Ft. Y / N / U	Dist. from Well	Est. (?)
		Community	Non-community				
PR1	Privy, nonportable	50	50	100	N		
PR2	Portable (privy) or toilet	50	20		N		
*SF1	Watertight sand filter; peat filter; or constructed wetland	50	50		N		
SET	Septic tank	50	50		N		
HTK	Sewage holding tank, watertight	50	50		N		
SS1	Sewage sump capacity 100 gal. or more	50	50		N		
SS2	Sewage sump capacity less than 100 gal., tested, conforming to rule	50	20		N		
*ST1	Sewage treatment device, watertight	50	50		N		
SB1	Sewer, buried, approved materials, tested, serving one building, or two or less single-family residences	50	20		N		
SB2	Sewer, buried, collector, municipal, serving a facility handling infectious or pathological wastes, open-jointed or unapproved materials	50	50		N		
*WB1	Water treatment backwash holding basin, reclaim basin, or surge tank with a direct sewer connection	50	50		N		
*WB2	Water treatment backwash holding basin, reclaim basin, or surge tank with a backflow protected sewer connection	20	20		N		
Land Application							
SPT	Land spreading area for sewage, septage, or sludge	50	50	100	N		
Solid Waste Related							
COS	Commercial compost site	50	50		N		
CD1	Construction or demolition debris disposal area	50	50	100	N		
*HW1	Household solid waste disposal area, single residence	50	50	100	N		
LF1	Landfill, permitted demolition debris, dump, or mixed municipal solid waste from multiple persons	300	300	600	N		
SVY	Scrap yard	50	50		N		
SWT	Solid waste transfer station	50	50		N		
Storm Water Related							
SD1	Storm water drain pipe, 8 inches or greater in diameter	50	20		Y	99	N**
SWI	Storm water drainage well[2] (Class V well - illegal[3])	50	50		N		
SM1	Storm water pond greater than 5000 gal.	50	35		N		
Wells and Borings							
*EB1	Elevator boring, not conforming to rule	50	50		N		
*EB2	Elevator boring, conforming to rule	20	20		N		
MON	Monitoring well	record dist.	record dist.		N		
WEL	Operating well	record dist.	record dist.		Y	63	
WEL	Operating well	record dist.	record dist.		Y	116	
WEL	Operating well	record dist.	record dist.		Y	37	
UUW	Unused, unsealed well or boring	50	50		N		
General							
*CR1	Cistern or reservoir, buried, nonpressurized water supply	20	20		N		
PLM	Contaminant plume	50	50		N		
*CW1	Cooling water pond, industrial	50	50	100	N		
DC1	Deicing chemicals, bulk road	50	50	100	N		
*ET1	Electrical transformer storage area, oil-filled	50	50		N		
GRV	Grave or mausoleum	50	50		N		
GP1	Gravel pocket or French drain for clear water drainage only	20	20		N		
*HS1	Hazardous substance buried piping	50	50		N		
HS2	Hazardous substance tank or container, above ground or underground, 56 gal. or more, or 100 lbs. or more dry weight, without safeguards	150	150		N		
HS3	Hazardous substance tank or container, above ground or underground, 56 gal. or more, or 100 lbs. or more dry weight with safeguards	100	100		Y	30	N**
HS4	Hazardous substance multiple storage tanks or containers for residential retail sale or use, no single tank or container exceeding 56 gal. or 100 lbs., but aggregate volume exceeding	50	50		N		
HWF	Highest water or flood level	50	N/A		N		
*HG1	Horizontal ground source closed loop heat exchanger buried piping	50	50		N		
*HG2	Horizontal ground source closed loop heat exchanger buried piping and horizontal piping, approved materials and heat transfer fluid	50	10		N		
IWD	Industrial waste disposal well (Class V well)[2]	Illegal[3]	Illegal[3]		N		
IWS	Interceptor, including a flammable waste or sediment	50	50		N		
OH1	Ordinary high water level of a stream, river, pond, lake, reservoir, or drainage ditch (holds water six months or more)	50	35		N		

PWS ID / FACILITY ID	1140006 S04	UNIQUE WELL NO.	775413

PCSI CODE	ACTUAL OR POTENTIAL CONTAMINATION SOURCE	ISOLATION DISTANCES (FEET)				LOCATION	
		Minimum Distances		Sensitive Well[1]	Within 200 Ft. Y / N / U	Dist. from Well	Est. (?)
		Community	Non-community				
*PP1	Petroleum buried piping	50	50		N		
*PP2	Petroleum or crude oil pipeline to a refinery or distribution center	100	100		N		
PT1	Petroleum tank or container, 1100 gal. or more, without safeguards	150	150		N		
PT2	Petroleum tank or container, 1100 gal. or more, with safeguards	100	100		N		
PT3	Petroleum tank or container, buried, between 56 and 1100 gal.	50	50		N		
PT4	Petroleum tank or container, not buried, between 56 and 1100 gal.	50[5]	20		N		
PU1	Pit or unfilled space more than four feet in depth	20	20		N		
PC1	Pollutant or contaminant that may drain into the soil	50	50	100	N		
SP1	Swimming pool, in-ground	20	20		N		
*VH1	Vertical heat exchanger, horizontal piping conforming to rule	50	10		N		
*VH2	Vertical heat exchanger (vertical) piping, conforming to rule	50	35		N		
*WR1	Wastewater rapid infiltration basin, municipal or industrial	300	300	600	N		
*WA1	Wastewater spray irrigation area, municipal or industrial	150	150	300	N		
*WS1	Wastewater stabilization pond, industrial	150	150	300	N		
*WS2	Wastewater stabilization pond, municipal, 500 or more gal./acre/day of leakage	300	300	600	N		
*WS3	Wastewater stabilization pond, municipal, less than 500 gal./acre/day of leakage	150	150	300	N		
*WT1	Wastewater treatment unit tanks, vessels and components (Package plant)	100	100		N		
*WT2	Water treatment backwash disposal area	50	50	100	N		
Additional Sources (If there is more than one source listed above, please indicate here).							
Potential Contamination Sources and Codes Based on Previous Versions of this Form							
SBM	Sewer, buried collector, municipal, pressurized, open jointed, or unapproved materials	50	50		Y	109	N**
BLD	Building (does not contain any actual or potential contaminant sources.)	3	3		Y	151	N**
ETL	Electric transmission line	5/10	5/10		Y	156	N**
ETL	Electric transmission line	5/10	5/10		Y	122	N**
FFH	Fire or flushing hydrant	10	N/A		Y	95	N**
FFH	Fire or flushing hydrant	10	N/A		Y	36	N**
PLE	Property line or easement	50	N/A		Y	139	N**
PLE	Property line or easement	50	N/A		Y	25	N**
PLE	Property line or easement	50	N/A		Y	67	N**

* New potential contaminant source.

** This number is the estimated distance that this potential source is from this well even though it was identified during an inventory for an adjacent well.

[1] A sensitive well has less than 50 feet of watertight casing, and which is not cased below a confining layer or confining materials of at least 10' in thickness.

[2] These sources, known as Class V underground injection wells, are regulated by the federal U.S. Environmental Protection Agency.

[3] These sources are classified as illegal by Minnesota Rules, Chapter 4725.

[4] Isolation distance is determined by average flow per day or if a facility handles infectious or pathological wastes.

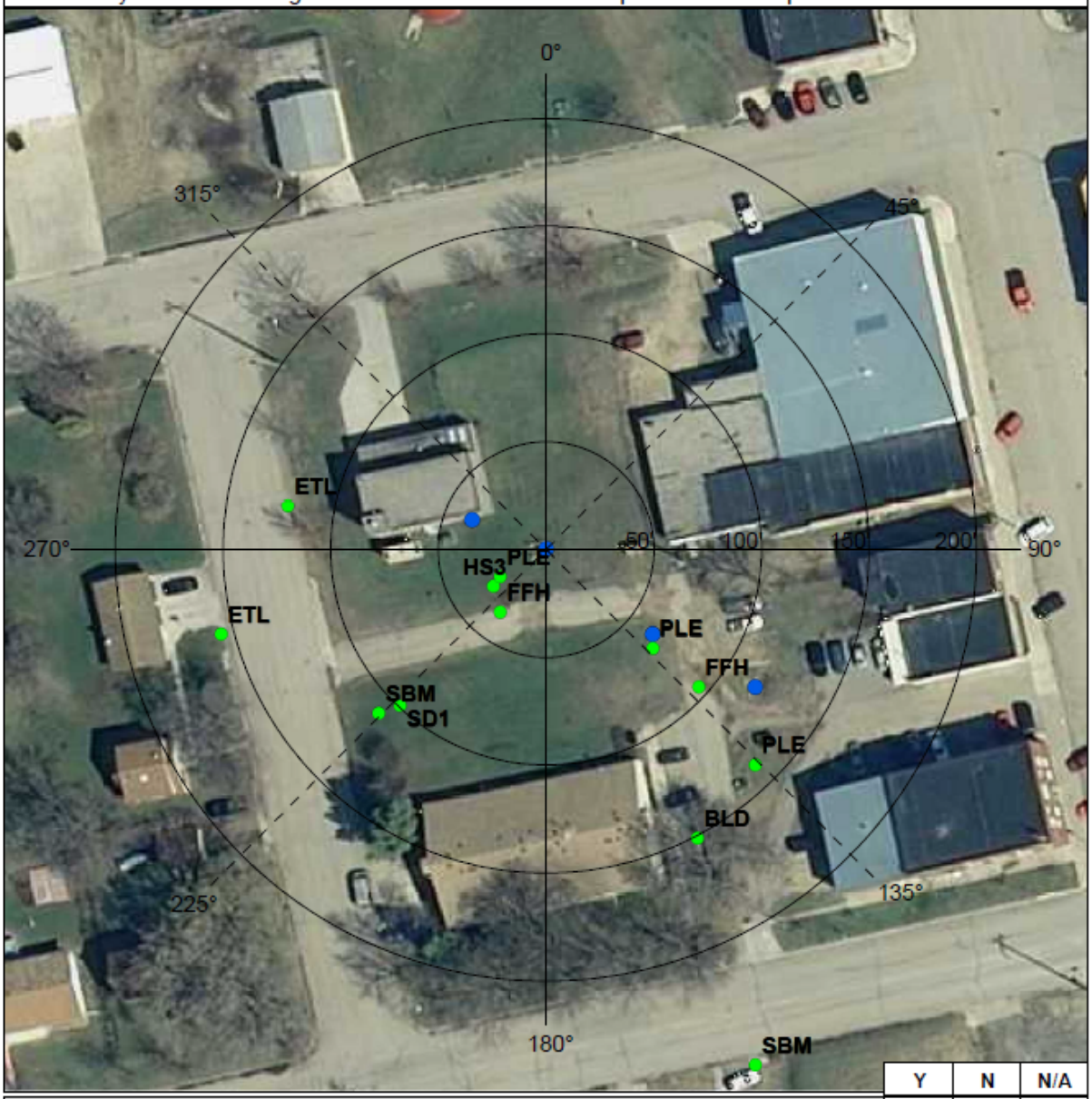
[5] A community public water-supply well must be a minimum of 50 feet from a petroleum tank or container, unless the tank or container is used for emergency pumping and is located in a room or building separate from the community well; and is of double-wall construction with leak detection between walls; or is protected with secondary containment.

This form is based on the new isolation distances in Minnesota Rules, Chapter 4725, related to wells and borings adopted August 4, 2008, and Minnesota Rules, Chapter 4720, related to wellhead protection.

PWS ID / FACILITY ID	1140006 S04	UNIQUE WELL NO.	775413

SETBACK DISTANCES	All potential contaminant sources must be noted on sketch.

Record the distance and approximate compass bearing of each potential contaminant source from the well, and identify the source using the "Source Code". Unlabeled points on the map are unsealed wells.



	Y	N	N/A
Were the isolation distances maintained for the new sources of contamination?			
Is the system monitoring existing nonconforming sources of contamination?			

Reminder Question: Were the wellhead protection measure(s) implemented?

INSPECTOR	Neiman, Dave	DATE	7 - 30 - 2015

PWS ID / FACILITY ID	1140006 S04	UNIQUE WELL NO.	775413

RECOMMENDED WELLHEAD PROTECTION (WHP) MEASURES	WHP MEASURE IMPLEMENTED? Y or N	DATE VERIFIED

COMMENTS

For further information, please contact:

Minnesota Department of Health
Drinking Water Protection Section
Source Water Protection Unit
P.O. Box 64975
St. Paul, Minnesota 55164-0975

Section Receptionist: 651-201-4700
Division TDD: 651-201-5797 or MN Relay Service @ 1-800-627-3529 and ask for 651-201-5000

Environmental Health Division
Drinking Water Protection Section
P.O. Box 64975
St. Paul, Minnesota 55164-0975

INNER WELLHEAD MANAGEMENT ZONE (IWMZ) - POTENTIAL CONTAMINANT SOURCE INVENTORY (PCSI) REPORT

PUBLIC WATER SYSTEM INFORMATION

PWS ID	1140006	**COMMUNITY**
NAME	Hawley	
ADDRESS	Hawley Water Superintendent, City Hall, P.O. Box 69, Hawley, MN 565490069	

FACILITY (WELL) INFORMATION

NAME	Well #3
FACILITY ID	S02
UNIQUE WELL NO.	473631
COUNTY	Clay

IS THERE A WELL LOG OR ADDITIONAL CONSTRUCTION INFORMATION AVAILABLE?

☐ **YES** (Please attach a copy)
☐ **NO** ☐ **UNDETERMINED**

PWS ID / FACILITY ID	1140006 S02	**UNIQUE WELL NO.**	473631

PCSI CODE	ACTUAL OR POTENTIAL CONTAMINATION SOURCE	ISOLATION DISTANCES (FEET)				LOCATION	
		Minimum Distances		Sensitive Well*	Within 200 Ft. Y / N / U	Dist. from Well	Est. (?)
		Community	Non-community				
Agricultural Related							
*AC1	Agricultural chemical buried piping	50	50		N		
*AC2	Agricultural chemical multiple tanks or containers for residential retail sale or use, no single tank or container exceeding, but aggregate volume exceeding 56 gal. or 100 lbs. dry weight	50	50		N		
ACP	Agricultural chemical tank or container with 25 gal. or more or 100 lbs. or more dry weight, or equipment filling or cleaning area without safeguards	150	150		N		
ACS	Agricultural chemical storage or equipment filling or cleaning area with safeguards	100	100		N		
ACR	Agricultural chemical storage or equipment filling or cleaning area with safeguards and roofed	50	50		N		
ADW	Agricultural drainage well[2] (Class V well - Illegal[3])	50	50		N		
AAT	Anhydrous ammonia tank (stationary tank)	50	50		N		
AB1	Animal building, feedlot, confinement area, or kennel, 0.1 to 1.0 animal unit (stockyard)	50	20	100/40	N		
AB2	Animal building or poultry building, including a horse riding area, more than 1.0 animal unit	50	50	100	N		
ABS	Animal burial area, more than 1.0 animal unit	50	50		N		
FWP	Animal feeding or watering area within a pasture, more than 1.0 animal unit	50	50	100	N		
AF1	Animal feedlot, unroofed, 300 or more animal units (stockyard)	100	100	200	N		
AF2	Animal feedlot, more than 1.0, but less than 300 animal units (stockyard)	50	50	100	N		
AMA	Animal manure application	use discretion	use discretion		N		
REN	Animal rendering plant	50	50		N		
MS1	Manure (liquid) storage basin or lagoon, unpermitted or noncertified	300	300	600	N		
MS2	Manure (liquid) storage basin or lagoon, approved earthen liner	150	150	300	N		
MS3	Manure (liquid) storage basin or lagoon, approved concrete or composite liner	100	100	200	N		
MS4	Manure (solid) storage area, not covered with a roof	100	100	200	N		
OSC	Open storage for crops	use discretion	use discretion		N		
SSTS Related							
AA1	Absorption area of a soil dispersal system, average flow greater than 10,000 gal./day	300	300	600	N		
AA2	Absorption area of a soil dispersal system serving a facility handling infectious or pathological wastes, average flow 10,000 gal./day or less	150	150	300	N		
AA3	Absorption area of a soil dispersal system, average flow 10,000 gal./day or less	50	50	100	N		
AA4	Absorption area of a soil dispersal system serving multiple family residences or a non-residential facility and has the capacity to serve 20 or more persons per day (Class V well)[2]	50/300/150[4]	50/300/150[4]	100/600/300[4]	N		
CSP	Cesspool	75	75	150	N		
AGG	Dry well, leaching pit, seepage pit	75	75	150	N		
*FD1	Floor drain, grate, or trough connected to a buried sewer	50	50		N		
*FD2	Floor drain, grate, or trough if buried sewer is air-tested, approved materials, serving one building, or two or less single-family residences	50	20		N		
*GW1	Gray-water dispersal area	50	50	100	N		
LC1	Large capacity cesspools (Class V well - Illegal)[3]	75	75	150	N		
MVW	Motor vehicle waste disposal (Class V well - Illegal)[3]	Illegal	Illegal		N		

PWS ID / FACILITY ID	1140006 S02	UNIQUE WELL NO.	473631

PCSI CODE	ACTUAL OR POTENTIAL CONTAMINATION SOURCE	ISOLATION DISTANCES (FEET)				LOCATION	
		Minimum Distances		Sensitive Well[4]	Within 200 Ft. Y / N / U	Dist. from Well	Est. (?)
		Community	Non-community				
PR1	Privy, nonportable	50	50	100	N		
PR2	Portable (privy) or toilet	50	20		N		
*SF1	Watertight sand filter; peat filter; or constructed wetland	50	50		N		
SET	Septic tank	50	50		N		
HTK	Sewage holding tank, watertight	50	50		N		
SS1	Sewage sump capacity 100 gal. or more	50	50		N		
SS2	Sewage sump capacity less than 100 gal., tested, conforming to rule	50	20		N		
*ST1	Sewage treatment device, watertight	50	50		N		
SB1	Sewer, buried, approved materials, tested, serving one building, or two or less single-family residences	50	20		N		
SB2	Sewer, buried, collector, municipal, serving a facility handling infectious or pathological wastes, open-jointed or unapproved materials	50	50		Y	200	N
*WB1	Water treatment backwash holding basin, reclaim basin, or surge tank with a direct sewer connection	50	50		N		
*WB2	Water treatment backwash holding basin, reclaim basin, or surge tank with a backflow protected sewer connection	20	20		N		
Land Application							
SPT	Land spreading area for sewage, septage, or sludge	50	50	100	N		
Solid Waste Related							
COS	Commercial compost site	50	50		N		
CD1	Construction or demolition debris disposal area	50	50	100	N		
*HW1	Household solid waste disposal area, single residence	50	50	100	N		
LF1	Landfill, permitted demolition debris, dump, or mixed municipal solid waste from multiple persons	300	300	600	N		
SVY	Scrap yard	50	50		N		
SWT	Solid waste transfer station	50	50		N		
Storm Water Related							
SD1	Storm water drain pipe, 8 inches or greater in diameter	50	20		Y	165	N
SWI	Storm water drainage well[2] (Class V well - Illegal[3])	50	50		N		
SM1	Storm water pond greater than 5000 gal.	50	35		N		
Wells and Borings							
*EB1	Elevator boring, not conforming to rule	50	50		N		
*EB2	Elevator boring, conforming to rule	20	20		N		
MON	Monitoring well	record dist.	record dist.		N		
WEL	Operating well	record dist.	record dist.		Y	116	
WEL	Operating well	record dist.	record dist.		Y	53	
WEL	Operating well	record dist.	record dist.		Y	152	
UUW	Unused, unsealed well or boring	50	50		N		
General							
*CR1	Cistern or reservoir, buried, nonpressurized water supply	20	20		N		
PLM	Contaminant plume	50	50		N		
*CW1	Cooling water pond, industrial	50	50	100	N		
DC1	Deicing chemicals, bulk road	50	50	100	N		
*ET1	Electrical transformer storage area, oil-filled	50	50		N		
GRV	Grave or mausoleum	50	50		N		
GP1	Gravel pocket or French drain for clear water drainage only	20	20		N		
*HS1	Hazardous substance buried piping	50	50		N		
HS2	Hazardous substance tank or container, above ground or underground, 56 gal. or more, or 100 lbs. or more dry weight, without safeguards	150	150		N		
HS3	Hazardous substance tank or container, above ground or underground, 56 gal. or more, or 100 lbs. or more dry weight with safeguards	100	100		Y	130	N
HS4	Hazardous substance multiple storage tanks or containers for residential retail sale or use, no single tank or container exceeding 56 gal. or 100 lbs., but aggregate volume exceeding	50	50		N		
HWF	Highest water or flood level	50	N/A		N		
*HG1	Horizontal ground source closed loop heat exchanger buried piping	50	50		N		
*HG2	Horizontal ground source closed loop heat exchanger buried piping and horizontal piping, approved materials and heat transfer fluid	50	10		N		
IWD	Industrial waste disposal well (Class V well)[2]	Illegal[3]	Illegal[3]		N		
IWS	Interceptor, including a flammable waste or sediment	50	50		N		
OH1	Ordinary high water level of a stream, river, pond, lake, reservoir, or drainage ditch (holds water six months or more)	50	35		N		

PWS ID / FACILITY ID	1140006 S02	UNIQUE WELL NO.	473631

PCSI CODE	ACTUAL OR POTENTIAL CONTAMINATION SOURCE	ISOLATION DISTANCES (FEET)				LOCATION	
		Minimum Distances		Sensitive Well[1]	Within 200 Ft. Y / N / U	Dist. from Well	Est. (?)
		Community	Non-community				
*PP1	Petroleum buried piping	50	50		N		
*PP2	Petroleum or crude oil pipeline to a refinery or distribution center	100	100		N		
PT1	Petroleum tank or container, 1100 gal. or more, without safeguards	150	150		N		
PT2	Petroleum tank or container, 1100 gal. or more, with safeguards	100	100		N		
PT3	Petroleum tank or container, buried, between 56 and 1100 gal.	50	50		N		
PT4	Petroleum tank or container, not buried, between 56 and 1100 gal.	50[5]	20		N		
PU1	Pit or unfilled space more than four feet in depth	20	20		N		
PC1	Pollutant or contaminant that may drain into the soil	50	50	100	N		
SP1	Swimming pool, in-ground	20	20		N		
*VH1	Vertical heat exchanger, horizontal piping conforming to rule	50	10		N		
*VH2	Vertical heat exchanger (vertical) piping, conforming to rule	50	35		N		
*WR1	Wastewater rapid infiltration basin, municipal or industrial	300	300	600	N		
*WA1	Wastewater spray irrigation area, municipal or industrial	150	150	300	N		
*WS1	Wastewater stabilization pond, industrial	150	150	300	N		
*WS2	Wastewater stabilization pond, municipal, 500 or more gal./acre/day of leakage	300	300	600	N		
*WS3	Wastewater stabilization pond, municipal, less than 500 gal./acre/day of leakage	150	150	300	N		
*WT1	Wastewater treatment unit tanks, vessels and components (Package plant)	100	100		N		
*WT2	Water treatment backwash disposal area	50	50	100	N		
Additional Sources (If there is more than one source listed above, please indicate here).							
Potential Contamination Sources and Codes Based on Previous Versions of this Form							
SBM	Sewer, buried collector, municipal, pressurized, open jointed, or unapproved materials	50	50		Y	175	N
SBM	Sewer, buried collector, municipal, pressurized, open jointed, or unapproved materials	50	50		Y	175	N
BLD	Building (does not contain any actual or potential contaminant sources.)	3	3		Y	75	N
FFH	Fire or flushing hydrant	10	N/A		Y	27	N
FFH	Fire or flushing hydrant	10	N/A		Y	123	N**
PLE	Property line or easement	50	N/A		Y	36	N
PLE	Property line or easement	50	N/A		Y	129	N**
PLE	Property line or easement	50	N/A		Y	51	N**

* New potential contaminant source.

** This number is the estimated distance that this potential source is from this well even though it was identified during an inventory for an adjacent well.

[1] A sensitive well has less than 50 feet of watertight casing, and which is not cased below a confining layer or confining materials of at least 10' in thickness.

[2] These sources, known as Class V underground injection wells, are regulated by the federal U.S. Environmental Protection Agency.

[3] These sources are classified as illegal by Minnesota Rules, Chapter 4725.

[4] Isolation distance is determined by average flow per day or if a facility handles infectious or pathological wastes.

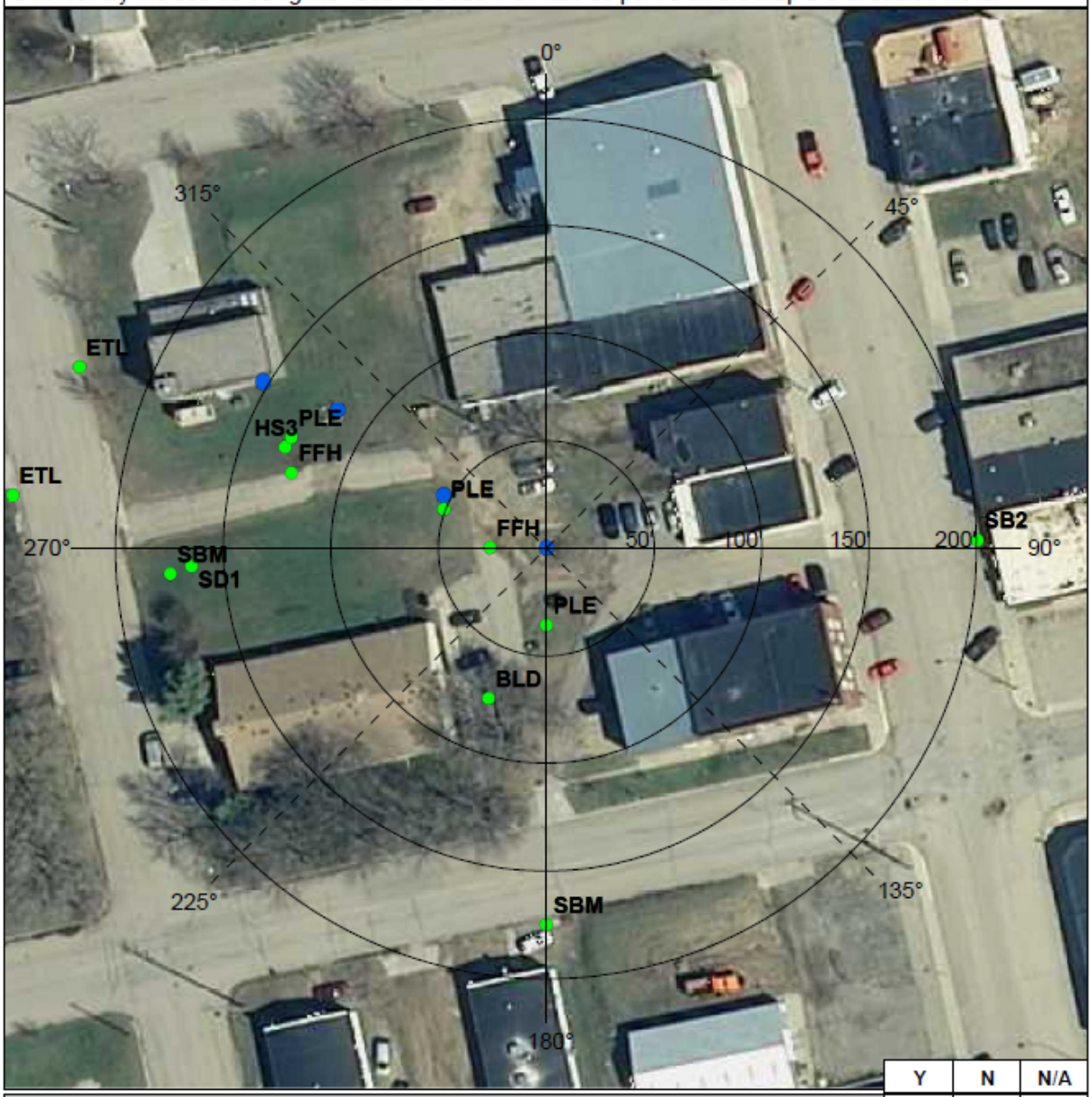
[5] A community public water-supply well must be a minimum of 50 feet from a petroleum tank or container, unless the tank or container is used for emergency pumping and is located in a room or building separate from the community well; and is of double-wall construction with leak detection between walls; or is protected with secondary containment.

This form is based on the new isolation distances in Minnesota Rules, Chapter 4725, related to wells and borings adopted August 4, 2008, and Minnesota Rules, Chapter 4720, related to wellhead protection.

PWS ID / FACILITY ID	1140006 S02	UNIQUE WELL NO.	473631

SETBACK DISTANCES	All potential contaminant sources must be noted on sketch.

Record the distance and approximate compass bearing of each potential contaminant source from the well, and identify the source using the "Source Code". Unlabeled points on the map are unsealed wells.



	Y	N	N/A
Were the isolation distances maintained for the new sources of contamination?			
Is the system monitoring existing nonconforming sources of contamination?			

Reminder Question: Were the wellhead protection measure(s) implemented?

INSPECTOR	Neiman, Dave	DATE	7 - 30 - 2015

PWS ID / FACILITY ID	1140006 S02	UNIQUE WELL NO.	473631

RECOMMENDED WELLHEAD PROTECTION (WHP) MEASURES	WHP MEASURE IMPLEMENTED? Y or N	DATE VERIFIED

COMMENTS

9/7/2003 - Location for PCSI Type BLD (bearing = 225, distance = 0 , inventory date: 3/23/1999) could not be determined.
9/7/2003 - Location for PCSI Type ETL (bearing = 270, distance = 0 , inventory date: 3/23/1999) could not be determined.
9/7/2003 - Location for PCSI Type GSP (bearing = 0, distance = 18 , inventory date: 3/23/1999) could not be determined.
9/7/2003 - Location for PCSI Type PSA (bearing = 0, distance = 100 , inventory date: 3/23/1999) could not be determined.
9/7/2003 - Location for PCSI Type SBM (bearing = 0, distance = 0 , inventory date: 3/23/1999) could not be determined.
9/7/2003 - Location for PCSI Type UFS (bearing = 0, distance = 0 , inventory date: 3/23/1999) could not be determined.

For further information, please contact:

Minnesota Department of Health
Drinking Water Protection Section
Source Water Protection Unit
P.O. Box 64975
St. Paul, Minnesota 55164-0975

Section Receptionist: 651-201-4700
Division TDD: 651-201-5797 or MN Relay Service @ 1-800-627-3529 and ask for 651-201-5000

Environmental Health Division
Drinking Water Protection Section
P.O. Box 64975
St. Paul, Minnesota 55164-0975

INNER WELLHEAD MANAGEMENT ZONE (IWMZ) - POTENTIAL CONTAMINANT SOURCE INVENTORY (PCSI) REPORT

PUBLIC WATER SYSTEM INFORMATION

PWS ID	1140006	**COMMUNITY**
NAME	Hawley	
ADDRESS	Hawley Water Superintendent, City Hall, P.O. Box 69, Hawley, MN 565490069	

FACILITY (WELL) INFORMATION

NAME	Well #4
FACILITY ID	S03
UNIQUE WELL NO.	520967
COUNTY	Clay

IS THERE A WELL LOG OR ADDITIONAL CONSTRUCTION INFORMATION AVAILABLE?

☐ **YES** (Please attach a copy)
☐ **NO** ☐ **UNDETERMINED**

PWS ID / FACILITY ID	1140006 S03	**UNIQUE WELL NO.**	520967

PCSI CODE	ACTUAL OR POTENTIAL CONTAMINATION SOURCE	ISOLATION DISTANCES (FEET)				LOCATION	
		Minimum Distances		Sensitive Well[4]	Within 200 Ft. Y / N / U	Dist. from Well	Est. (?)
		Community	Non-community				
Agricultural Related							
*AC1	Agricultural chemical buried piping	50	50		N		
*AC2	Agricultural chemical multiple tanks or containers for residential retail sale or use, no single tank or container exceeding, but aggregate volume exceeding 56 gal. or 100 lbs. dry weight	50	50		N		
ACP	Agricultural chemical tank or container with 25 gal. or more or 100 lbs. or more dry weight, or equipment filling or cleaning area without safeguards	150	150		N		
ACS	Agricultural chemical storage or equipment filling or cleaning area with safeguards	100	100		N		
ACR	Agricultural chemical storage or equipment filling or cleaning area with safeguards and roofed	50	50		N		
ADW	Agricultural drainage well[2] (Class V well - Illegal[3])	50	50		N		
AAT	Anhydrous ammonia tank (stationary tank)	50	50		N		
AB1	Animal building, feedlot, confinement area, or kennel, 0.1 to 1.0 animal unit (stockyard)	50	20	100/40	N		
AB2	Animal building or poultry building, including a horse riding area, more than 1.0 animal unit	50	50	100	N		
ABS	Animal burial area, more than 1.0 animal unit	50	50		N		
FWP	Animal feeding or watering area within a pasture, more than 1.0 animal unit	50	50	100	N		
AF1	Animal feedlot, unroofed, 300 or more animal units (stockyard)	100	100	200	N		
AF2	Animal feedlot, more than 1.0, but less than 300 animal units (stockyard)	50	50	100	N		
AMA	Animal manure application	use discretion	use discretion		N		
REN	Animal rendering plant	50	50		N		
MS1	Manure (liquid) storage basin or lagoon, unpermitted or noncertified	300	300	600	N		
MS2	Manure (liquid) storage basin or lagoon, approved earthen liner	150	150	300	N		
MS3	Manure (liquid) storage basin or lagoon, approved concrete or composite liner	100	100	200	N		
MS4	Manure (solid) storage area, not covered with a roof	100	100	200	N		
OSC	Open storage for crops	use discretion	use discretion		N		
SSTS Related							
AA1	Absorption area of a soil dispersal system, average flow greater than 10,000 gal./day	300	300	600	N		
AA2	Absorption area of a soil dispersal system serving a facility handling infectious or pathological wastes, average flow 10,000 gal./day or less	150	150	300	N		
AA3	Absorption area of a soil dispersal system, average flow 10,000 gal./day or less	50	50	100	N		
AA4	Absorption area of a soil dispersal system serving multiple family residences or a non-residential facility and has the capacity to serve 20 or more persons per day (Class V well)[2]	50/300/150[4]	50/300/150[4]	100/600/300[4]	N		
CSP	Cesspool	75	75	150	N		
AGG	Dry well, leaching pit, seepage pit	75	75	150	N		
*FD1	Floor drain, grate, or trough connected to a buried sewer	50	50		N		
*FD2	Floor drain, grate, or trough if buried sewer is air-tested, approved materials, serving one building, or two or less single-family residences	50	20		N		
*GW1	Gray-water dispersal area	50	50	100	N		
LC1	Large capacity cesspools (Class V well - Illegal)[2]	75	75	150	N		
MVW	Motor vehicle waste disposal (Class V well - Illegal)[2]	Illegal	Illegal		N		

PWS ID / FACILITY ID	1140006 S03	UNIQUE WELL NO.	520967

PCSI CODE	ACTUAL OR POTENTIAL CONTAMINATION SOURCE	ISOLATION DISTANCES (FEET)				LOCATION	
		Minimum Distances		Sensitive Well*	Within 200 Ft. Y / N / U	Dist. from Well	Est. (?)
		Community	Non-community				
PR1	Privy, nonportable	50	50	100	N		
PR2	Portable (privy) or toilet	50	20		N		
*SF1	Watertight sand filter; peat filter; or constructed wetland	50	50		N		
SET	Septic tank	50	50		N		
HTK	Sewage holding tank, watertight	50	50		N		
SS1	Sewage sump capacity 100 gal. or more	50	50		N		
SS2	Sewage sump capacity less than 100 gal., tested, conforming to rule	50	20		N		
*ST1	Sewage treatment device, watertight	50	50		N		
SB1	Sewer, buried, approved materials, tested, serving one building, or two or less single-family residences	50	20		N		
SB2	Sewer, buried, collector, municipal, serving a facility handling infectious or pathological wastes, open-jointed or unapproved materials	50	50		N		
*WB1	Water treatment backwash holding basin, reclaim basin, or surge tank with a direct sewer connection	50	50		N		
*WB2	Water treatment backwash holding basin, reclaim basin, or surge tank with a backflow protected sewer connection	20	20		N		
Land Application							
SPT	Land spreading area for sewage, septage, or sludge	50	50	100	N		
Solid Waste Related							
COS	Commercial compost site	50	50		N		
CD1	Construction or demolition debris disposal area	50	50	100	N		
*HW1	Household solid waste disposal area, single residence	50	50	100	N		
LF1	Landfill, permitted demolition debris, dump, or mixed municipal solid waste from multiple persons	300	300	600	N		
SVY	Scrap yard	50	50		N		
SWT	Solid waste transfer station	50	50		N		
Storm Water Related							
SD1	Storm water drain pipe, 8 inches or greater in diameter	50	20		Y	122	N**
SWI	Storm water drainage well[2] (Class V well - Illegal[3])	50	50		N		
SM1	Storm water pond greater than 5000 gal.	50	35		N		
Wells and Borings							
*EB1	Elevator boring, not conforming to rule	50	50		N		
*EB2	Elevator boring, conforming to rule	20	20		N		
MON	Monitoring well	record dist.	record dist.		N		
WEL	Operating well	record dist.	record dist.		Y	63	
WEL	Operating well	record dist.	record dist.		Y	53	
WEL	Operating well	record dist.	record dist.		Y	99	
UUW	Unused, unsealed well or boring	50	50		N		
General							
*CR1	Cistern or reservoir, buried, nonpressurized water supply	20	20		N		
PLM	Contaminant plume	50	50		N		
*CW1	Cooling water pond, industrial	50	50	100	N		
DC1	Deicing chemicals, bulk road	50	50	100	N		
*ET1	Electrical transformer storage area, oil-filled	50	50		N		
GRV	Grave or mausoleum	50	50		N		
GP1	Gravel pocket or French drain for clear water drainage only	20	20		N		
*HS1	Hazardous substance buried piping	50	50		N		
HS2	Hazardous substance tank or container, above ground or underground, 56 gal. or more, or 100 lbs. or more dry weight, without safeguards	150	150		N		
HS3	Hazardous substance tank or container, above ground or underground, 56 gal. or more, or 100 lbs. or more dry weight with safeguards	100	100		Y	77	N**
HS4	Hazardous substance multiple storage tanks or containers for residential retail sale or use, no single tank or container exceeding 56 gal. or 100 lbs., but aggregate volume exceeding	50	50		N		
HWF	Highest water or flood level	50	N/A		N		
*HG1	Horizontal ground source closed loop heat exchanger buried piping	50	50		N		
*HG2	Horizontal ground source closed loop heat exchanger buried piping and horizontal piping, approved materials and heat transfer fluid	50	10		N		
IWD	Industrial waste disposal well (Class V well)[2]	Illegal[3]	Illegal[3]		N		
IWS	Interceptor, including a flammable waste or sediment	50	50		N		
OH1	Ordinary high water level of a stream, river, pond, lake, reservoir, or drainage ditch (holds water six months or more)	50	35		N		

PWS ID / FACILITY ID	1140006 S03	UNIQUE WELL NO.	520967

PCSI CODE	ACTUAL OR POTENTIAL CONTAMINATION SOURCE	ISOLATION DISTANCES (FEET)				LOCATION	
		Minimum Distances		Sensitive Well*	Within 200 Ft. Y / N / U	Dist. from Well	Est. (?)
		Community	Non-community				
*PP1	Petroleum buried piping	50	50		N		
*PP2	Petroleum or crude oil pipeline to a refinery or distribution center	100	100		N		
PT1	Petroleum tank or container, 1100 gal. or more, without safeguards	150	150		N		
PT2	Petroleum tank or container, 1100 gal. or more, with safeguards	100	100		N		
PT3	Petroleum tank or container, buried, between 56 and 1100 gal.	50	50		N		
PT4	Petroleum tank or container, not buried, between 56 and 1100 gal.	50[5]	20		N		
PU1	Pit or unfilled space more than four feet in depth	20	20		N		
PC1	Pollutant or contaminant that may drain into the soil	50	50	100	N		
SP1	Swimming pool, in-ground	20	20		N		
*VH1	Vertical heat exchanger, horizontal piping conforming to rule	50	10		N		
*VH2	Vertical heat exchanger (vertical) piping, conforming to rule	50	35		N		
*WR1	Wastewater rapid infiltration basin, municipal or industrial	300	300	600	N		
*WA1	Wastewater spray irrigation area, municipal or industrial	150	150	300	N		
*WS1	Wastewater stabilization pond, industrial	150	150	300	N		
*WS2	Wastewater stabilization pond, municipal, 500 or more gal./acre/day of leakage	300	300	600	N		
*WS3	Wastewater stabilization pond, municipal, less than 500 gal./acre/day of leakage	150	150	300	N		
*WT1	Wastewater treatment unit tanks, vessels and components (Package plant)	100	100		N		
*WT2	Water treatment backwash disposal area	50	50	100	N		
Additional Sources (If there is more than one source listed above, please indicate here).							
Potential Contamination Sources and Codes Based on Previous Versions of this Form							
SBM	Sewer, buried collector, municipal, pressurized, open jointed, or unapproved materials	50	50		Y	132	N**
BLD	Building (does not contain any actual or potential contaminant sources.)	3	3		Y	97	N**
ETL	Electric transmission line	5/10	5/10		Y	200	N
ETL	Electric transmission line	5/10	5/10		Y	179	N**
FFH	Fire or flushing hydrant	10	N/A		Y	32	N**
FFH	Fire or flushing hydrant	10	N/A		Y	71	N**
PLE	Property line or easement	50	N/A		Y	77	N**
PLE	Property line or easement	50	N/A		Y	76	N**
PLE	Property line or easement	50	N/A		Y	6	N

* New potential contaminant source.

** This number is the estimated distance that this potential source is from this well even though it was identified during an inventory for an adjacent well.

[1] A sensitive well has less than 50 feet of watertight casing, and which is not cased below a confining layer or confining materials of at least 10' in thickness.

[2] These sources, known as Class V underground injection wells, are regulated by the federal U.S. Environmental Protection Agency.

[3] These sources are classified as illegal by Minnesota Rules, Chapter 4725.

[4] Isolation distance is determined by average flow per day or if a facility handles infectious or pathological wastes.

[5] A community public water-supply well must be a minimum of 50 feet from a petroleum tank or container, unless the tank or container is used for emergency pumping and is located in a room or building separate from the community well; and is of double-wall construction with leak detection between walls; or is protected with secondary containment.

This form is based on the new isolation distances in Minnesota Rules, Chapter 4725, related to wells and borings adopted August 4, 2008, and Minnesota Rules, Chapter 4720, related to wellhead protection.

PWS ID / FACILITY ID	1140006 S03	UNIQUE WELL NO.	520967

SETBACK DISTANCES	All potential contaminant sources must be noted on sketch.

Record the distance and approximate compass bearing of each potential contaminant source from the well, and identify the source using the "Source Code". Unlabeled points on the map are unsealed wells.

	Y	N	N/A
Were the isolation distances maintained for the new sources of contamination?			
Is the system monitoring existing nonconforming sources of contamination?			

Reminder Question: Were the wellhead protection measure(s) implemented?			
INSPECTOR	Neiman, Dave	DATE	7 - 30 - 2015

PWS ID / FACILITY ID	1140006 S03	UNIQUE WELL NO.	520967

RECOMMENDED WELLHEAD PROTECTION (WHP) MEASURES	WHP MEASURE IMPLEMENTED? Y or N	DATE VERIFIED

COMMENTS

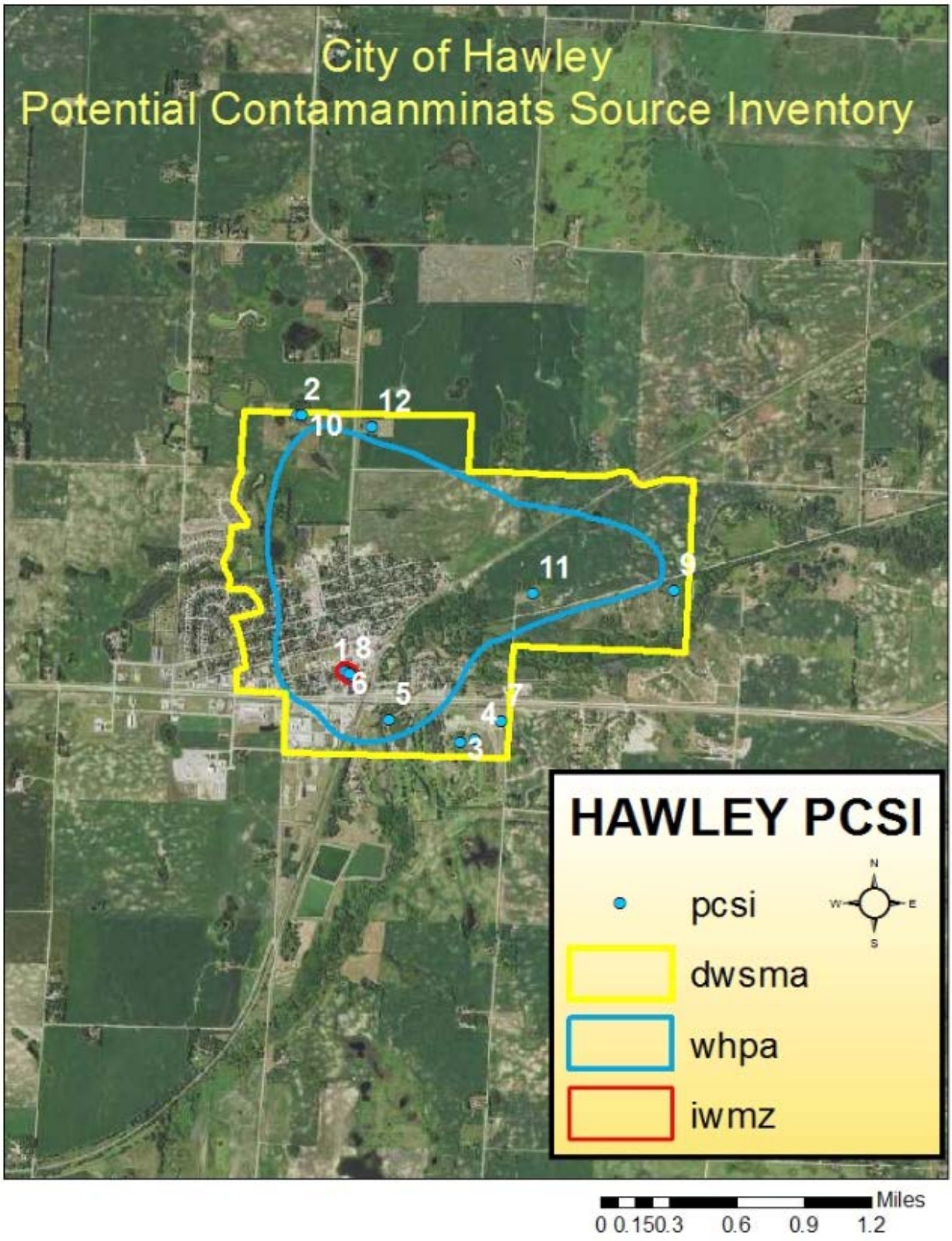
9/7/2003 - Location for PCSI Type GSP (bearing = 0, distance = 25 , inventory date: 3/23/1999) could not be determined.
9/7/2003 - Location for PCSI Type UFS (bearing = 0, distance = 0 , inventory date: 3/23/1999) could not be determined.

For further information, please contact:

Minnesota Department of Health
Drinking Water Protection Section
Source Water Protection Unit
P.O. Box 64975
St. Paul, Minnesota 55164-0975

Section Receptionist: 651-201-4700
Division TDD: 651-201-5797 or MN Relay Service @ 1-800-627-3529 and ask for 651-201-5000

Exhibit 4: Potential Contaminant Source Inventory List and Map



Hawley PCSI

PCSI_ID	PIN	FAC_NAME	ADDRESS	CITY	ZIP5_(	PCS_C	STAT	COMMENT
1	56.650.3270	Hawley #4	P.O. Box 69	Hawley	56549	WEL	A	Unique # 00520967
2	03.0363.301	Thompson, Gerald	P.O. Box 51	Hawley	56549	WEL	A	Unique # 0221977
3	56.900.0670	Hawley Golf Course	102 Maple Street (P.O. Box 734)	Hawley	56549	WEL	A	Unique # 0465120
4	56.900.0670	Hawley Golf Course	102 Maple Street (P.O. Box 734)	Hawley	56549	WEL	A	Unique # 0161069
5	56.900.0690	Village of Hawley	P.O. Box 69	Hawley	56549	WEL	A	Unique# 0247067
6	56.650.32.70	Hawley #2	P.O. Box 69	Hawley	56549	WEL	A	Unique # 0239627
7	56.900.0670	Hawley Golf Course	102 Maple Street (P.O. Box 734)	Hawley	56549	WEL	A	Unique # 0161055
8	56.650.3270	Hawley #3	P.O. Box 69	Hawley	56549	WEL	A	Unique # 0473631
9	04.006.1300	Sheerin, Mary/Quacken M	24677 Junction Ave. N. Box 631	Hawley	56549	WEL	A	Unique # 0626478
10	03.0354.401	Thompson, Gerald	P.O. Box 51	Hawley	56549	WEL	A	Unique # 0634501
11	04.0063.003	Nelson, Troy	470-240 Street N.	Hawley	56549	WEL	A	Unique # 0683123
12	03.0363.401	Martin, Steve/Nanette M	1664-230 Street N	Hawley	56549	WEL	A	Unique # 0745635

Exhibit 5: Zoning Map

***** County has a zoning map at Court house for Cromwell, Highland Grove, Hawley and Elgon Township**

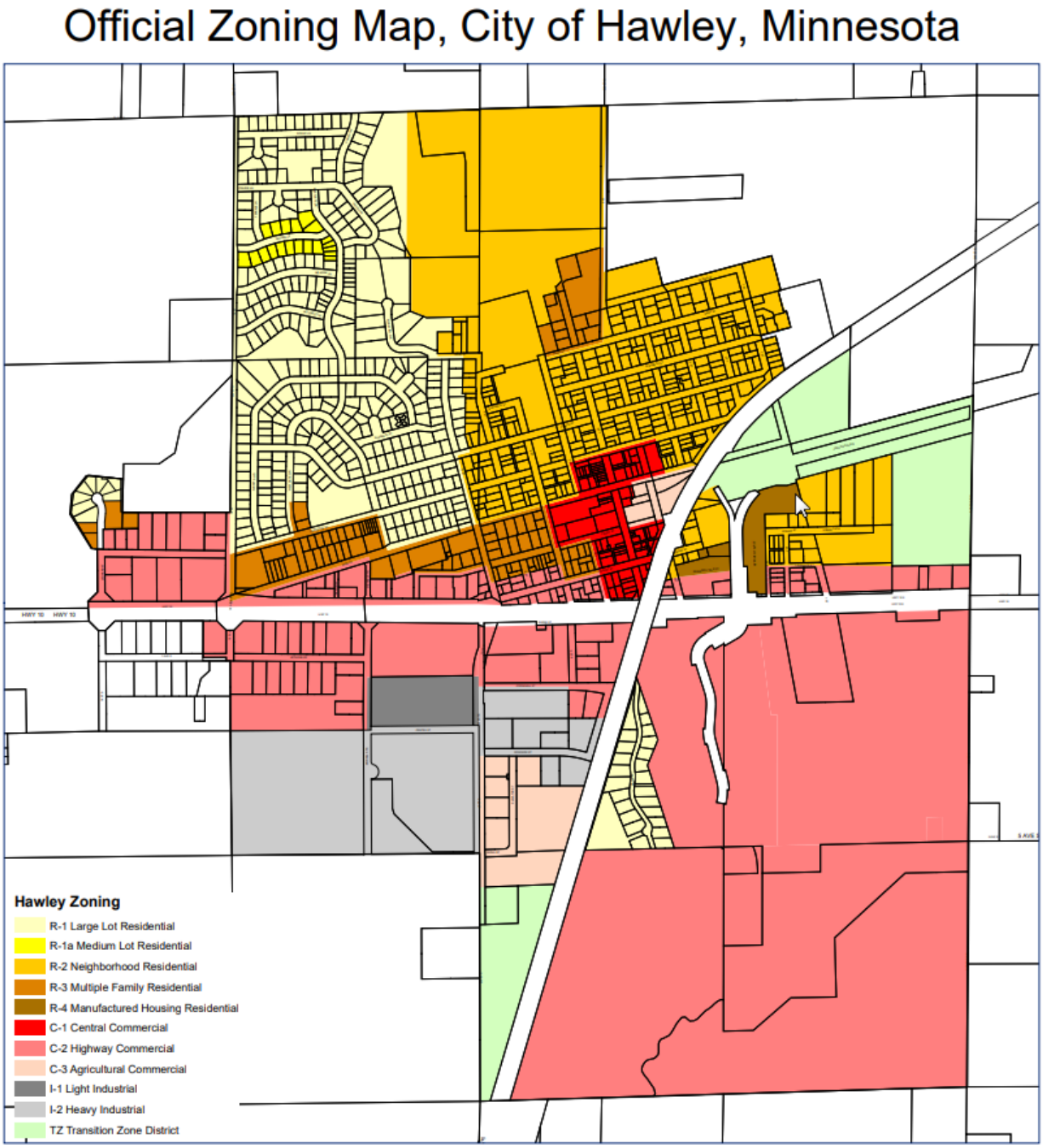


Exhibit 6: Comprehensive Land Use Map

Figure 16
1999 Land Use

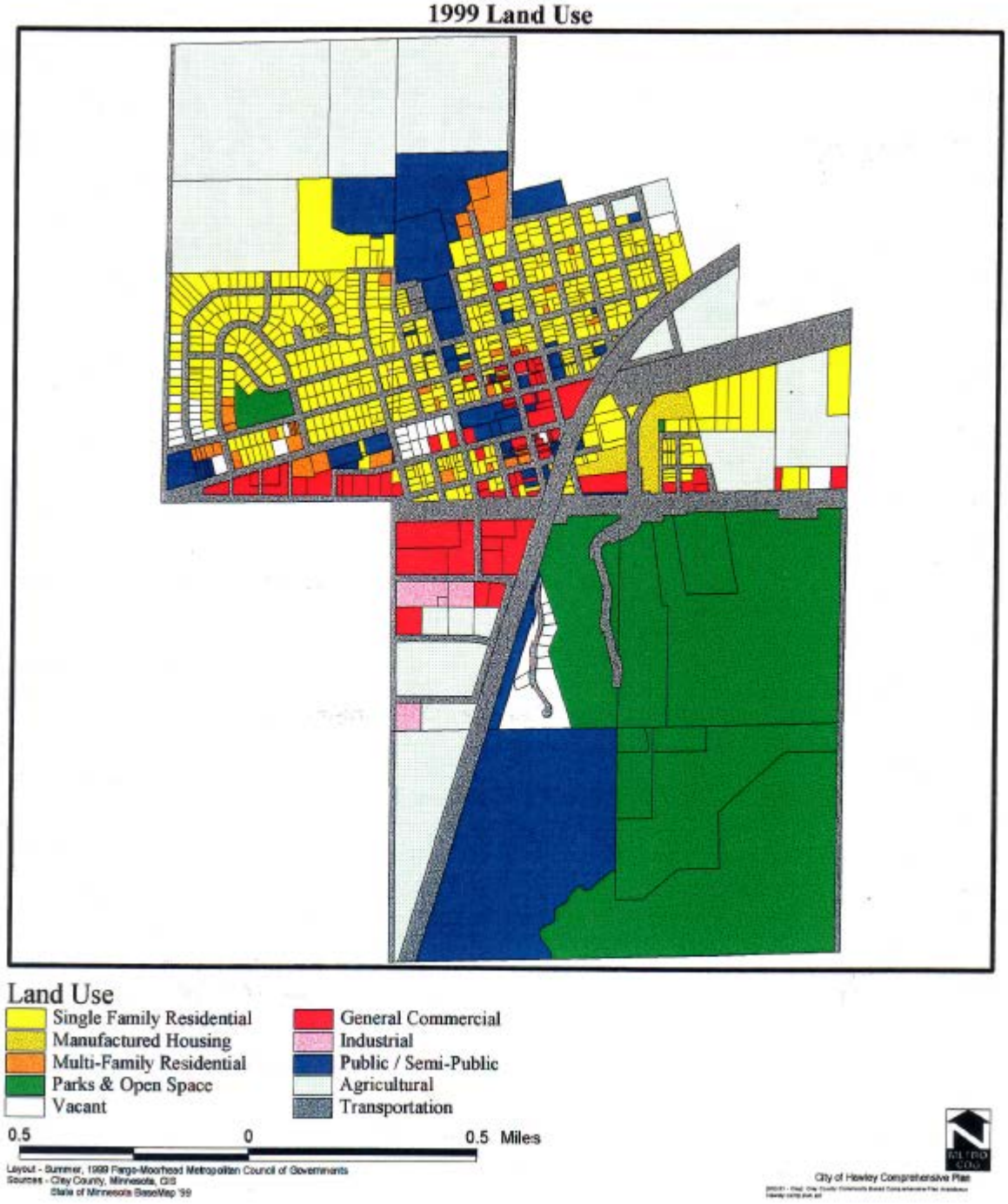


Exhibit 7: Parcel Boundary Map

Parcel map is too large to include and is available at:
https://map.claycountymn.gov/link/jsfe/index.aspx

Exhibit 8: WHP Plan Part 1

Part I

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

For

City of Hawley

April 2019

Trent Farnum, P.G. Hydrologist
Source Water Protection Unit

I hereby certify that this plan, document, or report was prepared by me or under my direct supervision, and that I am a duly Licensed Professional Geologist under the laws of the State of Minnesota.

Signature: _____ Date: _____

Printed Name: Trent Farnum License Number: 50326

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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 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.

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.

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.

Wellhead Protection (WHP). 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, section 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.

Acronyms

AMSL – Above Mean Sea Level

CWI - County Well Index

DNR - Minnesota Department of Natural Resources

EPA - United States Environmental Protection Agency

FSA - Farm Security Administration

MDA - Minnesota Department of Agriculture

MDH - Minnesota Department of Health

MGS - Minnesota Geological Survey

MnDOT - Minnesota Department of Transportation

MnGEO - Minnesota Geospatial Information Office

MODFLOW - Three-Dimensional Finite-Difference Groundwater Model

MPCA - Minnesota Pollution Control Agency

NRCS - Natural Resource Conservation Service

SWCD - Soil and Water Conservation District

UMN - University of Minnesota

USDA - United States Department of Agriculture

USGS - United States Geological Survey

1. Executive Summary

Protection Areas - The recharge area for the wells is known as the wellhead protection area, or WHPA, and represents the area that contributes water to the city wells within a 10-year time period. The area that contributes water within a one-year time period is known as the emergency response area, or ERA. Practical reasons require the designation of a management area that fully envelops the wellhead protection area, called the drinking water supply management area, or DWSMA. Each of these areas is shown in Figure 1.

Geology and Groundwater Flow - The city of Hawley has three primary wells screened in a sand and gravel aquifer that is buried beneath a layer of clay-rich sediment. Such aquifers are known generically as Quaternary Buried Artesian Aquifers (QBAA). The depth of the wells are approximately 135 feet deep (Table 1). Regionally, groundwater flow is to the southwest.

Table 1 - Water Supply Well Information

Local Well ID	Unique Number	Use/ Status	Casing Diameter (inches)	Casing Depth (feet)	Well Depth (feet)	Date Constructed/ Reconstructed	Aquifer	Well Vulnerability
Well #3	473631	Primary	12	120	136	9/21/1990	QBAA	Not Vulnerable
Well #4	520967	Primary	10	116	134	11/23/1992	QBAA	Not Vulnerable
Well #5	775413	Primary	12	116	136	8/17/2010	QBAA	Not Vulnerable

Well Vulnerability - The vulnerability of individual wells is assessed based on 1) well construction details, especially conformance with standards required by the state well code, 2) the geologic sensitivity of the aquifer, and 3) past monitoring results. All three wells meet construction standards, meaning the well itself should not provide a pathway for contaminants to enter the aquifer. All three wells draw from an aquifer that is geologically protected. Also, water samples from Wells 3, 4 and 5 lacked detectable tritium (detection indicates the presence of young water), so they are not considered vulnerable at this time. This is reinforced by the low chloride/bromide ratios presented below.

Table 2 - Isotope and Water Quality Results

Unique Number (Well Name)	Tritium (TU)	Nitrate (mg/L)	Chloride/Bromide ratio	Chloride (mg/L)	Bromide (mg/L)
473631 (Well #3)	<0.8 (10/10/2012)	<0.05 (10/7/2014)	116	4.63 (10/7/2014)	0.04 (10/7/2014)
520967 (Well #4)	<0.8 (5/5/2015)	<0.05 (3/7/2016)	147	5.88 (3/7/2016)	0.04 (3/7/2016)
775413 (Well #5)	<0.8 (10/10/2012)	<0.05 (12/16/2014)	74	2.96 (12/16/2014)	0.04 (12/16/2014)

DWSMA vulnerability -The vulnerability of the city's aquifer throughout the DWSMA is based on the geologic sensitivity ratings of wells and their monitoring data. Based on this information MDH has assigned a low vulnerability to the DWSMA. This suggests that the clay-rich sediments that overlie the city's aquifer prevent water and contaminants from moving quickly from the land surface into the city's aquifer and implies a vertical time of travel of decades or longer. The principal threats to this aquifer are unsealed abandoned wells that penetrate through this clay layer. Such wells are 75 feet or greater in depth in the Hawley area.

Water Quality Concerns - Arsenic, a naturally occurring contaminant, has been found in the city wells above the Safe Drinking Water Act health-based standards and is being removed through treatment from the raw water supply. At present, no other contaminants for which the Safe Drinking Water Act has established health-based standards is found above maximum allowable levels in the city's water supply, nor are any present at one-half of those levels.

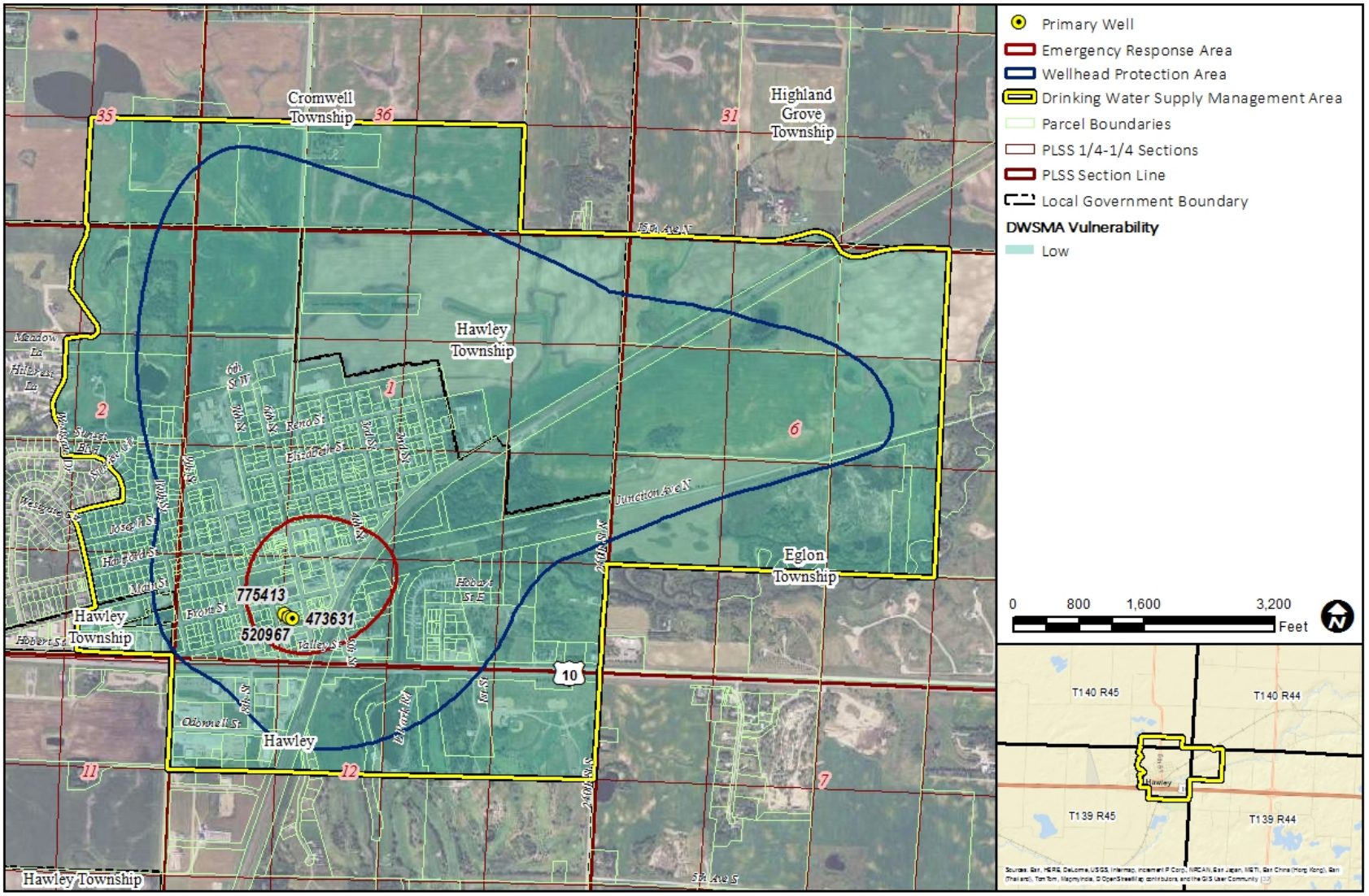
Recommendations - Three recommendations have been generated to improve future delineations and vulnerability assessments and should be considered for inclusion as management strategies in the city's wellhead protection plan. These include: well locating, an aquifer test and water quality monitoring. Further details can be found in Section 8 of this report.

Clay County
Minnesota

Figure 1
Drinking Water Supply Management Area and Vulnerability
City of Hawley

MDH Minnesota Department of Health

CLEAN WATER LAND & LEGACY AMENDMENT



2. Introduction

The Minnesota Department of Health (MDH) developed Part I of the wellhead protection (WHP) plan at the request of the city of Hawley (PWSID 1140006). The work was performed in accordance with the Minnesota Wellhead Protection Rule, parts 4720.5100 to 4720.5590.

This report presents delineations of the wellhead protection area (WHPA) and drinking water supply management area (DWSMA), and the vulnerability assessments for the public water supply wells and DWSMA. Figure 1 shows the boundaries for the WHPA and the DWSMA. The WHPA is defined by a 10-year time of travel. Figure 1 also shows the emergency response area (ERA), which is defined by a one-year time of travel. Definitions of rule-specific terms used are provided in the "Glossary of Terms."

In addition, this report documents the technical information required to prepare this portion of the WHP plan in accordance with the Minnesota Wellhead Protection Rule. Additional technical information is available from MDH.

Table 1 lists all the wells in the public water supply system. Only wells listed as primary are required to be included in the WHP plan.

3. Assessment of the Data Elements

MDH staff met with representatives of the city of Hawley on May 17, 2016, for a scoping meeting that identified the data elements required to prepare Part I of the WHP plan. Table 3 presents the assessment of these data elements relative to the present and future implications of planning items specified in Minnesota Rules, part 4720.5210.

Table 3 - 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
Subsurface data	M	H	H	H	MGS, MDH
Borehole geophysics	M	H	H	H	None Available
Surface geophysics	L	L	L	L	None Available
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	Clay County
Political boundaries map	L	H	L	L	MnGEO, City of Hawley
Public Land Survey map	L	H	L	L	MnGEO
Land use map and inventory					
Comprehensive land use map					
Zoning map					
Public Utility Services					
Transportation routes and corridors	L	L	L	L	MnDOT, MnGEO
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
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-No Relevant Data Found
Water levels	H	H	H	H	DNR-No Relevant Data Found

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	
Surface Water Quality					
Stream and lake water quality management classification					
Monitoring data summary					
Groundwater Quality					
Monitoring data	H	H	H	H	MDH
Isotopic data	H	H	H	H	MDH
Tracer studies	H	H	H	H	None Available
Contamination site data	M	M	M	M	MPCA-No Relevant Data Found
Property audit data from contamination sites					
MPCA and MDA spills/release reports	M	M	M	M	MPCA/MDA-No Relevant Data Found

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

Acronyms used in this report are listed on page ii, after the "Glossary of Terms."

4. General Descriptions

4.1 Description of the Water Supply System

The city of Hawley obtains its drinking water supply from three primary wells. Table 1 summarizes general construction information and vulnerability status.

4.2 Description of the Hydrogeologic Setting

The city of Hawley lies within Clay County and draws groundwater from a Quaternary Buried Artesian Aquifer. This type of aquifer consists of discontinuous lenses of fine to coarse sand and gravel that are isolated from the land surface and from one another by clay-rich sediment. These materials were deposited by melting glaciers and are part of a package of approximately 300-feet of glacial sediment in the Hawley area (Bauer, 2014). The aquifer tapped by the city wells appears to be part of the Hewitt Formation, which may comprise a number of possibly interconnected sand units deposited on till (Bauer, 2014).

The construction records for the city wells reveal a complex layering of sandy and clayey sediments, with city wells likely being screened in a sand body that is approximately 20 to 31 feet thick and which occurs approximately 100 to 130 feet below the land surface. Despite the complexity of the physical

processes that deposited the glacial materials, some patterns can be observed locally. Cross-sections (Figures 3, 4 and 5) show that many of the closest wells encounter sand at a similar elevation to the city wells suggesting its continuity, and the overlying clay-rich horizons also appear laterally continuous.

A description of the hydrogeologic setting for the aquifer used to supply drinking water is presented in Table 4.

Table 4 - Description of the Local Hydrogeologic Setting

Attribute	Descriptor	Data Source
Aquifer Material	Sand and gravel	CWI
Porosity Type and Value	Primary: 20 percent	Fetter, 2001
Aquifer Thickness	Variable: 3 – 86 ft 31 ft proximal to city wells	CWI; geologic cross-sections (Figures 4 and 5)
Stratigraphic Top Elevation	~1015 - 1075 ft., AMSL	CWI; geologic cross-sections (Figures 4 and 5)
Stratigraphic Bottom Elevation	~1005 - 1045 ft., AMSL	CWI; geologic cross-sections (Figures 4 and 5)
Hydraulic Confinement	Confined	CWI; geologic cross-sections (Figures 4 and 5)
Transmissivity	Range of Values: 77 – 31,200 ft^2/day 24,000 ft^2/day at city wells	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. See Table 5 for the reference value.
Hydraulic Conductivity	Range of Values: 8 - 1,486 ft/day 774 ft/day at city wells	The range of values was derived using specific capacity data obtained from well records and/or from additional aquifer test results listed in the “Selected References” section of this report.
Groundwater Flow Field	Groundwater flow is southwesterly, with an approximate compass direction of 210° and gradient of 0.002 (Figure 2).	Defined by using static water level elevations from well records in the CWI database and documents listed in the “Selected References” section of this report.

The distribution of the aquifer and its stratigraphic relationships with adjacent geologic materials are shown in Figures 3, 4, and 5. They were prepared using well record data contained in the CWI database. The geological maps and studies used to further define local hydrogeologic conditions are provided in the “Selected References” section of this report.

5. Delineation of the Wellhead Protection Area

5.1 Delineation Criteria

The boundaries of the WHPA for the city of Hawley are shown in Figure 1. Table 5 describes how the delineation criteria specified under Minnesota Rules, part 4720.5510, were addressed.

Table 5 - Description of WHPA Delineation Criteria

Criterion	Descriptor	How the Criterion was Addressed
Flow Boundary	Hydrologic Boundary	The Buffalo River was added as a head boundary in the flow model.
Flow Boundary	Geologic Boundary	Analysis of specific capacity data suggests the transmissivity of the aquifer system varies with proximity to the city wells. Aquifer test and specific capacity analysis of the city wells shows abnormally high transmissivity values. As it is unrealistic that such high transmissivity values are prevalent throughout the aquifer, a varying of the hydraulic conductivity spatially away from the city wells was justified.
Flow Boundary	Other High-Capacity Wells Table 7	The pumping amounts were determined using the same approach used for the public water supply wells. The pumping amounts of these other wells were included in the methods used for the delineation.
Daily Volume of Water Pumped	See Table 6	Pumping information was obtained from the DNR, Appropriations Permit No. 1980-1064, and was converted to a daily volume pumped by a well.
Groundwater Flow Field	Groundwater flow is southwesterly, with an approximate compass direction of 210° and gradient of 0.002 (Figure 2).	Oneka was used to evaluate the uncertainty of the wells' capture areas based on the simplified conceptual model and regional flow, recharge, and local well data.
Aquifer Transmissivity (T)	Reference Value: 24,000 ft^2/day	The aquifer test plan was approved on December 8, 2016, and T was determined from aquifer and specific capacity tests. Uncertainty regarding aquifer transmissivity was addressed as described in Section 5.4.
Time of Travel	10 years	The public water supplier selected a 10-year time of travel.

Pumping data was obtained from the DNR Permit and Reporting System (MPARS) for the public water supply's Appropriations Permit No. 1980-1064. These values, confirmed by the public water supplier, were used to identify the maximum volume of water pumped annually by each well over the previous five-year period, as shown in Table 6. An estimate of the pumping for the next five years is also shown. The maximum daily volume of discharge used as an input parameter in the model was calculated by dividing the greatest annual pumping volume by 365 days.

Table 6 - Annual Volume of Water Discharged from Water Supply Wells

Well Name	Unique No.	2011	2012	2013	2014	2015	5-Year Projection	Daily Volume (cubic meters)
Well #3	473631	20.056	20.297	22.346	26.136	**28.080**	30.888	320.34
Well #4	520967	20.038	22.274	21.812	26.178	**27.669**	30.436	315.65
Well #5	775413	19.543	19.520	23.008	22.974	**25.284**	27.812	288.44

(Expressed as million gallons. Bolding indicates greatest annual pumping volume.)

In addition to the wells used by the public water supplier, Table 7 shows other high-capacity wells included in the delineation to account for their pumping impacts on the capture areas for the public water supply wells. Pumping data was obtained from the DNR MPARS database.

Table 7 - Other Permitted High-Capacity Wells

Unique Number	Well Name	DNR Permit Number	Aquifer	Use	Annual Volume of Water Pumped (million gallons)	Daily Volume (cubic meters per day)
161055	Hawley Golf & Country Club	1989-1053	QBAA	Irrigation	11.863	123

5.2 Method Used to Delineate the Wellhead Protection Area

The WHPA for the city of Hawley's wells was determined using a combination of two methods. The first method utilized a groundwater flow model created using the software code MODFLOW (McDonald and Harbaugh, 1988). The second method used the stochastic analytical groundwater flow method Oneka (Barnes and Soule, 2002). The resulting WHPA boundaries are a composite of the capture zones calculated using these two approaches (Figure 1). The input files for both models are available at MDH upon request.

MODFLOW Model: MODFLOW was developed by the USGS and is publically available. The specific software code used for this delineation was MODFLOW-NWT (Niswonger et al., 2011). The program has been thoroughly documented, is widely used by consultants, government agencies, and researchers and consistently accepted in regulatory proceedings. MODFLOW is also an extremely versatile program capable of simulating groundwater flow in up to three dimensions while offering a

variety of boundary condition options, confined or unconfined aquifer conditions and allowing for vertical discretization through the use of layering.

The numerical groundwater model that was constructed consisted of 185 rows, 185 columns, and two layers. The model incorporates a variable areal grid spacing ranging from 2.5 meters near the city's wells and grading to 320 meters at the boundaries of the model domain. Layer 1 corresponds to the clay overlying the sand aquifer (averages 90 feet thick) with Layer 2 corresponding to the sand aquifer (averages 30 feet thick). Layer tops and bottoms were derived from CWI logs within the model domain. General head boundaries represent a head-dependent boundary normally used along the edge of a model to allow groundwater flow into and out of a model establishing a regional flow field. River head boundaries represent cells where water is flowing both into and out of the aquifer and were used to simulate the Buffalo River within the model domain within Layer 1. No flow boundaries are cells where flow cannot occur and are implicitly represented as the boundaries of the model domain and the bottom of Layer 2. Vertical recharge was applied to Layer 1 of the model using modified values published by the U.S Geological Survey (Delin et al., 2007). Ranges of hydraulic conductivity values were first estimated from literature review (Layer 1) and then refined with specific capacity data within the model domain (layer 2).

Due to the heterogeneity of the unconsolidated sand and the lack of contiguous lenses for discretization of hydraulic conductivity zones, site specific data within the model domain was interpolated using the Parameter Estimation (PEST) tool. PEST is a calibration tool developed by John Doherty of Watermark Computing and is most commonly used to estimate aquifer hydraulic conductivity (Doherty, 2010). Typical zonation of hydraulic conductivity introduces zones of different hydraulic conductivity in the model domain at locations where the modeler feels they would do the most good. The parameter zonation process would then be repeated until the fit between model outcomes and field observations was acceptable. Characterization of geologic heterogeneity in the model domain by zones of piecewise uniformity is not in harmony with the nature of the alluvial material, therefore any zonation pattern that is finally decided upon is only defensible on the basis that it is better to employ such a zonation scheme than to ignore geologic heterogeneity altogether. To overcome this problem the distribution of hydraulic conductivity within the model domain was described by a set of pilot points. The pilot point locations and values in the model domain were derived from specific capacity data at domestic wells and aquifer test data for the city's wells. These values were then smoothed with the geostatistical method of kriging and input into the model. The pilot point method allowed for hydraulic conductivity values to be representative of the city well data proximal to the city well field and then be smoothed further away.

To determine the WHPA, the groundwater flow model was used along with a particle tracking program called MODPATH (Pollock, 2012). MODPATH is used to evaluate advective transport of simulated particles moving through the simulated flow system. A series of 36 particles were launched at each well. A porosity of 20 percent was used and a reverse time of travel was calculated at 10 years.

Oneka Model: Oneka was used to assess the probability of impacts that local variations in hydrogeologic conditions may have on a well capture zone. This is a simple model that uses local groundwater elevations, the estimated aquifer thickness ,and hydraulic conductivity with the uncertainty of these values to determine a probabilistic capture area. If a single aquifer thickness and hydraulic conductivity is used in Oneka, the capture area reflects the uncertainty of the groundwater elevations. For example, groundwater elevation values with a very high uncertainty will result in a probability grid showing a circular capture area. If the uncertainty of hydraulic conductivity is included, Oneka generates a grid showing the different probabilities of groundwater capture by the well that reflects the combined uncertainty of the groundwater elevations and the hydraulic conductivity. As a matter of practice, adding the uncertainty of the aquifer thickness is often unnecessary because it is typically an insensitive parameter compared to the uncertainty in the hydraulic conductivity. The locations of wells, water levels, and the aquifer geometry were evaluated using information from the CWI database. Oneka then evaluates the probability of the capture of a given point based on the number of times it is included in the capture areas generated by the total number of solutions. The output from the model is a capture zone probability map for the specified time of travel (10 years). The threshold probability value used to generate the Oneka portion of the WHPA was greater than or equal to 60 percent.

The combined output from the MODFLOW and Oneka models were composited to create the final WHPA (Figure 1).

5.3 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 city of Hawley MODFLOW model was calibrated to the CWI database water level targets. Ninety- eight wells were selected based on the likelihood that they were completed in the same aquifer used by the city wells. A qualitative evaluation of the calibration can be made by comparing the simulated potentiometric surface (Figure 2) with observed water level targets obtained from the CWI database. Upon review the calibrated flow model generally captures the major features of the groundwater flow system along with the elevation, shape, magnitude, and gradient of the CWI database observed flow field.

A quantitative measure by which to evaluate the success obtained during calibration is to compare the root mean square of the residuals (RMSE) and the maximum observed head difference of the calibration dataset. The calibration dataset included water level information from wells in an approximate six mile radius of the city wells. The residual root mean square (RMS) error of the calibration well set was approximately 2.36 meters with a normalized RMSE of 2.9 percent. It is noted that this error is within the calibration target of 10 percent (Waterloo, 2005). The calibration targets (wells) with the greatest residual difference between measured and simulated heads were generally at locations beyond the 10-year WHPA to the city wells.

The Oneka Model is used to support the MODFLOW results by using an iterative process which provides the best fit for the ranges of values assigned to its input parameters. This helps to define the subset of values for which the delineation results are most likely to reflect local hydrogeologic conditions and, therefore, provide the best calibration results.

Model sensitivity is the amount of change in model results caused by the variation of a particular input parameter. Because of the simplicity of the MODFLOW model, the direction and extent of the modeled capture zone may be very sensitive to any of the input parameters:

- The pumping rate directly affects the volume of the aquifer that contributes water to the well. An increase in pumping rate leads to an equivalent increase in the volume of aquifer within the capture zone, proportional to the porosity of the aquifer materials. However, the pumping rate is based on the results presented in Table 6 and, therefore, is not a variable factor that will influence the delineation of the WHPA.
- The direction of groundwater flow determines the orientation of the capture area. Variations in the direction of groundwater flow will not affect the size of the capture zone but are important for defining the areas that are the source of water to the well. The ambient groundwater flow field defined in Figure 2 provides the basis for determining the extent to which each model run reflects the conceptual understanding of the orientation of the capture area for a well.
- A hydraulic gradient of zero produces a circular capture zone, centered on the well. As the hydraulic gradient increases, the capture zone changes into an elliptical shape, with the well centered on the down-gradient focal point. The hydraulic gradient was determined by using water level elevations that were taken from wells that have verified locations (Figure 2). Generally, the accuracy of the hydraulic gradient determination is directly proportional to the amount of available data that describes the distribution of hydraulic head in the aquifer.
- The aquifer thickness, hydraulic conductivity, and porosity influence the size and shape of the capture zone.
    - A decrease in porosity causes a linear, proportional increase in the areal extent of the capture zone. A literature value of 20 percent was used for the delineation and this value was not varied (Fetter, 2001).
    - Thickness and hydraulic conductivity each factor into the transmissivity, which defines the relative proportions of the capture zone width to length. A decrease in thickness or hydraulic conductivity decreases the length of the capture zone and increases the distance to the stagnation point, making the capture zone more circular in shape and centered around the well. A variable aquifer thickness exists throughout the model extent consistent with the values shown in Table 4. Hydraulic conductivity was also decreased/increased by 50 percent to account for uncertainty in the specific capacity calculation.

5.4 Addressing Model Uncertainty

Using computer models to simulate groundwater flow involves representing a complicated natural system in a simplified manner. Local geologic conditions may vary within the capture areas of the public water supply wells, but the amount of existing information needed to accurately define this degree of variability is often not available for portions of the WHPA. In addition, the current

capabilities of groundwater flow models may not be sufficient to represent the natural flow system exactly. However, the results are valid within a range defined by the reasonable variation of input parameters for this delineation setting.

The steps employed for this delineation to address model uncertainty were:

1) Pumping Rate - For each well, a maximum historical (five-year) pumping rate or an engineering estimate of future pumping, whichever is greater (Minnesota Rules, part 4720.5510, subpart 4).
2) Hydraulic Conductivity – Hydraulic conductivity within Layer 2 of the MODFLOW model was adjusted plus and minus 50 percent. This parameter was also varied in the Oneka Model, as shown in Table 9.
3) Probability Analysis - The Oneka Model was used to estimate capture zone probability.

Capture areas were developed for a range of groundwater flow directions, aquifer permeabilities, and times of travel of one and of ten years (Figure 6). As the model code uses constant input values for each run, several runs were required to include all variations in input parameters. Table 8 documents the variables used to address MODFLOW uncertainty.

Table 8 - Model Parameters Used in Base Case and Uncertainty Runs

File Name	Cumulative City Well Discharge (m^3/day)	Model Domain Hydraulic Conductivity (m/day)	Area Proximal to City Wells Hydraulic Conductivity (m/day)	Porosity (%)	Remarks
Calibrated Steady State	924.4	Spatially variable: 2 – 243	243	20	Calibrated Steady State Model used as base scenario
Conductivity-50 Percent	924.4	Spatially variable: 1 – 121.5	121.5	20	Calibrated Steady State Model with Kx, Ky and Kz multiplied by 0.5
Conductivity+50 Percent	924.4	Spatially variable: 3 – 364.5	364.5	20	Calibrated Steady State Model with Kx, Ky and Kz multiplied by 1.5

For the Oneka Model, uncertainty related to water levels reported on well records is based on the accuracy of the ground elevation assigned to the well using topographic maps and the transient variability of the water levels in the aquifer over time. Water levels that are probably inaccurate were identified using data from the CWI database. Only water levels that fit the flow field (Figure 2) were used for the Oneka analysis.

The Oneka Model helps to address uncertainties related to aquifer parameters as variations of the flow field. A 10-year capture zone probability map (Figure 6) was generated for the public water supply wells. The values used for the Oneka Model are shown in Table 9. These hydraulic conductivity values represent the 95 percent confidence interval of the geometric mean based on the modeled frequency distribution of specific capacity data within six miles of the city wells. The Oneka results fit well with the capture zones calculated by MODFLOW. The probability map for the public water supply wells shows that uncertainty of the capture zone increases as the distances from the public water supply wells increase (Figure 6).

Table 9 - Ranges of Values Used for the Oneka Model

Well Number	File Name	Hydraulic Conductivity (meters/day)	Thickness (meters)	Porosity (%)
Well 3, 4, 5	Hawley	12 – 24.7	9.4	20

6. Delineation of the Drinking Water Supply Management Area

The boundaries of the Drinking Water Supply Management Area (DWSMA) were defined by the city of Hawley using the following features (Figure 1):

- Center-lines of highways, streets, roads, or railroad rights-of-ways
- Public Land Survey coordinates
- Property or fence lines

7. Vulnerability Assessments

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

7.1 Assessment of Well Vulnerability

The vulnerability assessments for each well used by the city of Hawley are listed in Table 1 and are based upon the following conditions:

4) Well construction at all three wells meets current State Well Code specifications (Minnesota Rules, part 4725), meaning that the well itself should not provide a pathway for contaminants to enter the aquifer used by the public water supplier.
5) The geologic conditions at the well sites include a cover of clay-rich geologic materials over the aquifer that is sufficient to retard or prevent the vertical movement of contaminants.
6) None of the human-caused contaminants regulated under the federal Safe Drinking Water Act have been detected at levels indicating that the well itself serves to draw contaminants into the aquifer as a result of pumping (Alexander and Alexander, 1989).

7) Water samples were collected from Well #3 (473631), Well #4 (520967) and Well #5 (775413) in 2012, 2014, 2015, and 2016 and were analyzed for tritium, nitrate, chloride and bromide (Table 2). No tritium or nitrate was detected in the samples, confirming the non-vulnerable nature of the wells (Alexander and Alexander, 1989). In addition, the chloride and bromide results confirm that the wells have not been impacted by land-use activities (Mullaney, et. al, 2009).

7.2 Assessment of Drinking Water Supply Management Area Vulnerability

The vulnerability of the DWSMA is low and is based upon the following information:

8) Water chemistry data from wells located within the DWSMA indicate the aquifer contains water that has no detectable levels of tritium or human-caused contamination.

9) Review of the geologic logs contained in the CWI database, geological maps, and reports indicate that the aquifer exhibits a moderate to low geologic sensitivity throughout the DWSMA and is isolated from the direct vertical recharge of surface water. Stable isotope data from the city wells generally confirm this assessment by plotting on the meteoric water line, although some results varied, possibly due to suspect sample handling. The future sampling proposed below should help clarify these relationships.

Therefore, given the information currently available, it is prudent to assign a low vulnerability rating to the DWSMA, in accordance with the Minnesota Wellhead Protection Rule (parts 4720.5100 to 4720.5590).

8. Recommendations

The following recommendations have been generated to inform the next amendment of the city of Hawley's Wellhead Protection Plan.

1. Well Locating: This delineation is based on very little well data. If wells are constructed within two-miles of the city or one mile of the DWSMA, their locations should be verified. This information may allow a better understanding of the extent and thickness of the city's aquifer and the overlying clay confining unit and result in a more refined WHPA in the future.
2. Aquifer Test: Performing a short term eight hour aquifer test at the city wells might help to refine the hydraulic conductivity of the aquifer near the wells and confirm any potential geologic barriers or leakage for the next amendment.
3. Water Quality Monitoring: Re-sample Wells 3, 4, and 5 (or whatever primary wells exist at that time) during year six of plan implementation for vulnerability parameters determined in consultation with MDH (likely tritium, chloride, bromide, stable isotopes, nitrate, and ammonia); contingent on funding assistance from MDH for sampling and analysis. The city may need to collect the samples and ship them to MDH. This information will be used to update our understanding of the vulnerability of the city's wells and aquifer to contamination risk.

9. Selected References

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Figures

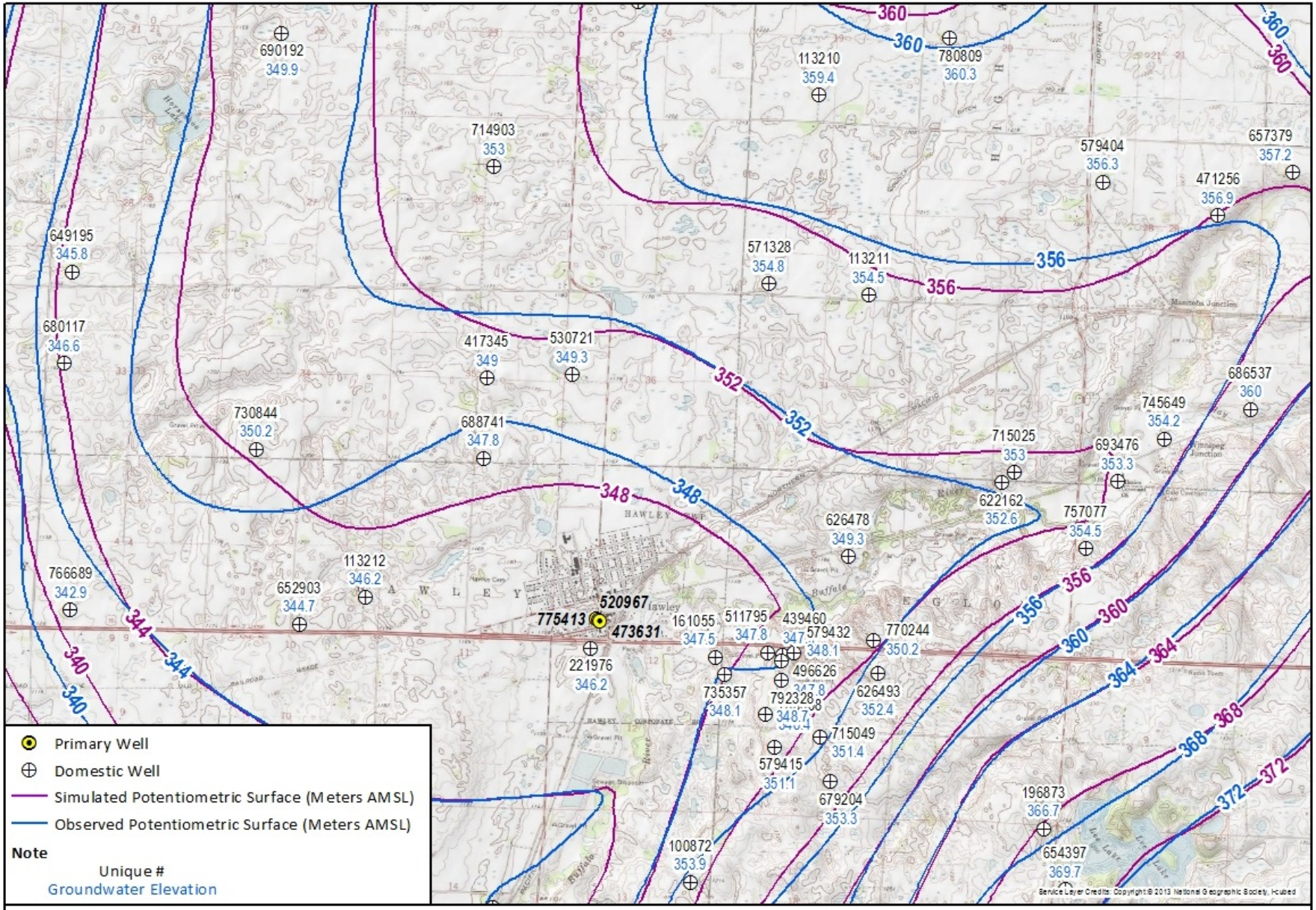


Figure 2
Simulated and Observed Flow Field
City of Hawley

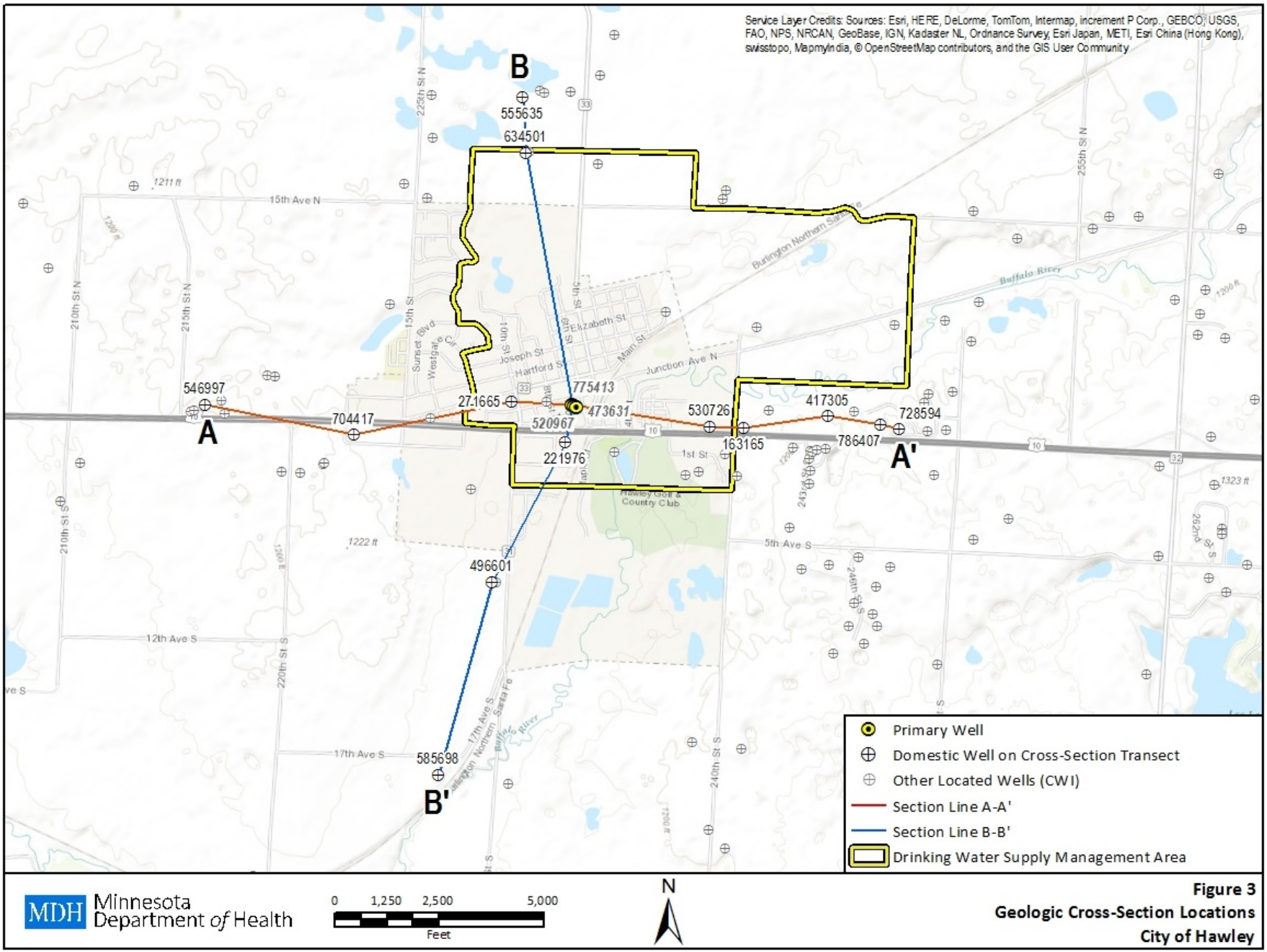
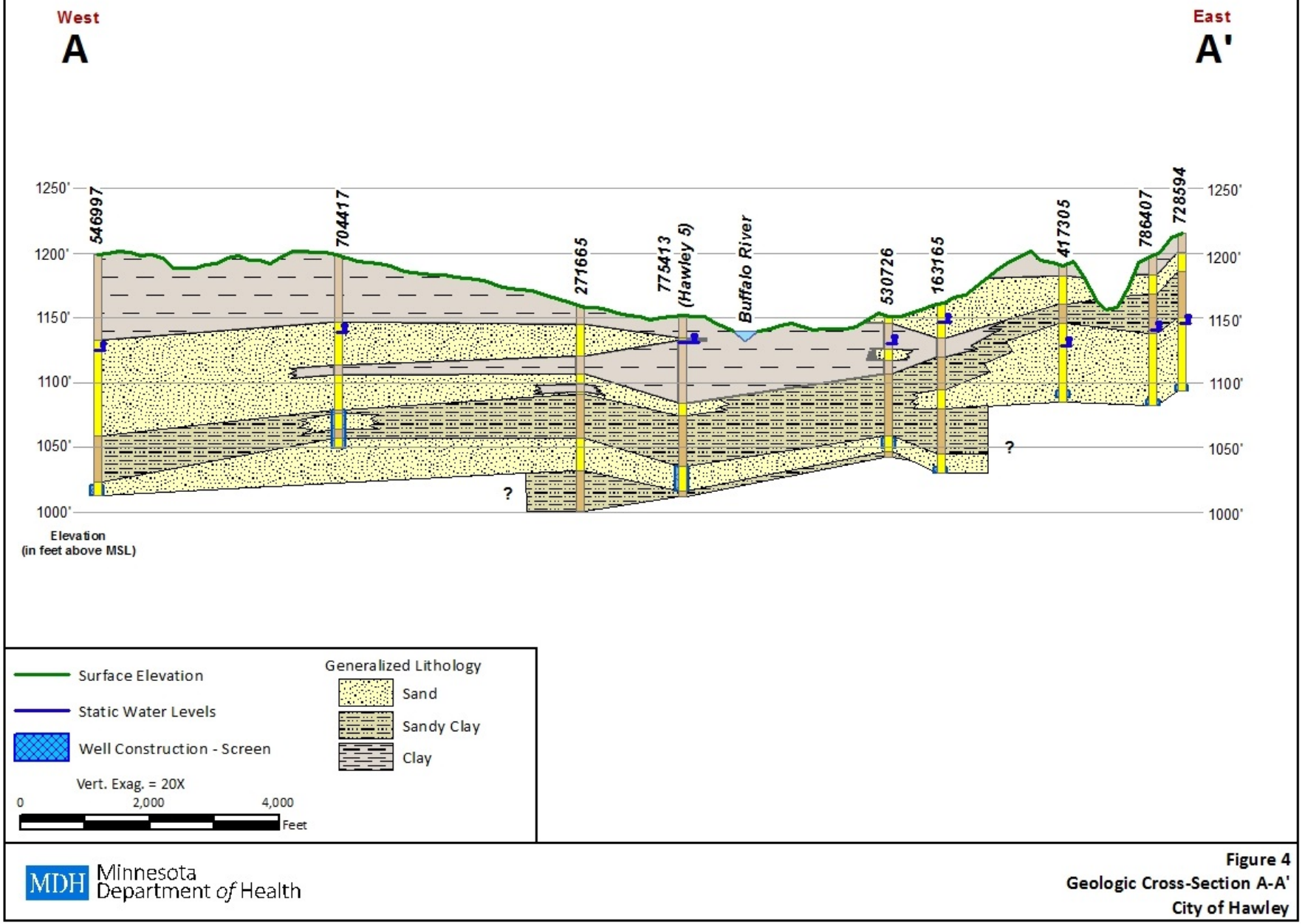
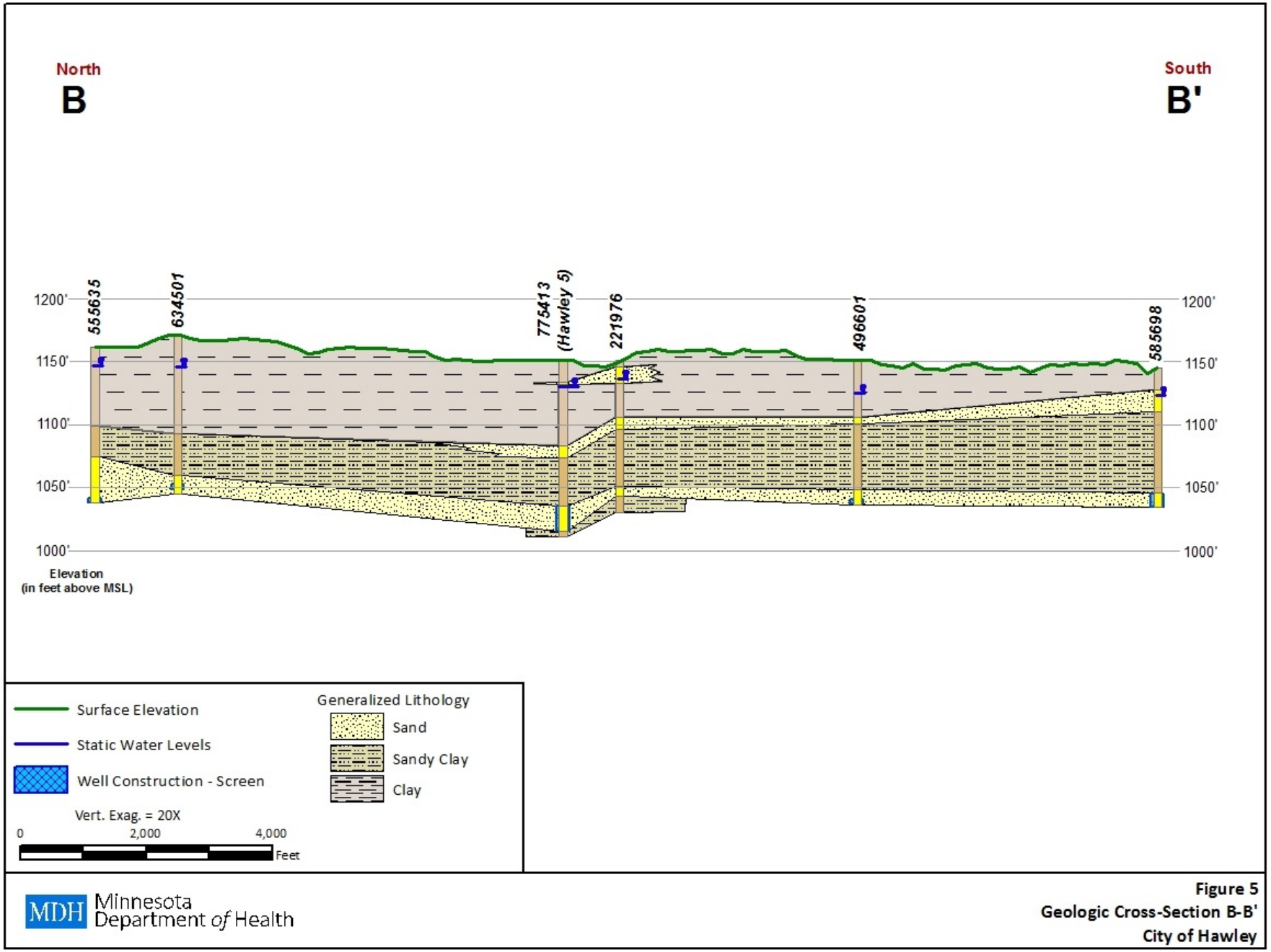


Figure 3
Geologic Cross-Section Locations
City of Hawley



MDH Minnesota Department of Health

Figure 4
Geologic Cross-Section A-A'
City of Hawley



MDH Minnesota Department of Health

Figure 5
Geologic Cross-Section B-B'
City of Hawley

Exhibit 9: Consumer Confidence Report

HAWLEY 2017 DRINKING WATER REPORT

Making Safe Drinking Water - Your drinking water comes from a groundwater source: three wells ranging from 134 to 136 feet deep, that draw water from the Quaternary Buried Artesian aquifer. Hawley works hard to provide you with safe and reliable drinking water that meets federal and state water quality requirements. The purpose of this report is to provide you with information on your drinking water and how to protect our precious water resources. Contact Gerry E. Kluck, Public Works Superintendent, at 218-483-3331 or gkluck@ci.hawley.mn.us if you have questions about Hawley's drinking water. You can also ask for information about how you can take part in decisions that may affect water quality. The U.S. Environmental Protection Agency sets safe drinking water standards. These standards limit the amounts of specific contaminants allowed in drinking water. This ensures that tap water is safe to drink for most people. The U.S. Food and Drug Administration regulates the amount of certain contaminants in bottled water. Bottled water must provide the same public health protection as public tap water. Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the Environmental Protection Agency's Safe Drinking Water Hotline at 1-800-426-4791.

Hawley Monitoring Results This report contains our monitoring results from January 1 to December 31, 2017.

We work with the Minnesota Department of Health to test drinking water for more than 100 contaminants. It is not unusual to detect contaminants in small amounts. No water supply is ever completely free of contaminants. Drinking water standards protect Minnesotans from substances that may be harmful to their health. Learn more by visiting the Minnesota Department of Health's webpage Basics of Monitoring and Testing of Drinking Water in Minnesota (http://www.health.state.mn.us/divs/eh/water/factsheet/com/sampling.html).

How to Read the Water Quality Data Tables

The tables below show the contaminants we found last year or the most recent time we sampled for that contaminant. They also show the levels of those contaminants and the Environmental Protection Agency's limits. Substances that we tested for but did not find are not included in the tables.

We sample for some contaminants less than once a year because their levels in water are not expected to change from year to year. If we found any of these contaminants the last time we sampled for them, we included them in the tables below with the detection date. We may have done additional monitoring for contaminants that are not included in the Safe Drinking Water Act. To request a copy of these results, call the Minnesota Department of Health at 651-201-4700 or 1-800-818-9318 between 8:00 a.m. and 4:30 p.m., Monday through Friday.

Definitions: **AL (Action Level)**: The concentration of a contaminant which, if exceeded, triggers treatment or other requirements which a water system must follow. **EPA:** Environmental Protection Agency **MCL (Maximum contaminant level)**: The highest level of a contaminant that is allowed in drinking water. MCLs are set as close to the MCLGs as feasible using the best available treatment technology. **MCLG (Maximum contaminant level goal)**: The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety. **Level 1 Assessment**: A Level 1 assessment is a study of the water system to identify potential problems and determine (if possible) why total coliform bacteria have been found in our water system. **Level 2 Assessment**: A Level 2 assessment is a very detailed study of the water system to identify potential problems and determine (if possible) why an E. coli MCL violation has occurred and/or why total coliform bacteria have been found in our water system on multiple occasions. **MRDL (Maximum residual disinfectant level)**: The highest level of a disinfectant allowed in drinking water. There is convincing evidence that addition of a disinfectant is necessary for control of microbial contaminants. **MRDLG (Maximum residual disinfectant level goal)**: The level of a drinking water disinfectant below which there is no known or expected risk to health. MRDLGs do not reflect the benefits of the use of disinfectants to control microbial contaminants. **NA (Not applicable)**: Does not apply. **NTU (Nephelometric Turbidity Units)**: A measure of the cloudiness of the water (turbidity). **pCi/l (picocuries per liter)**: A measure of radioactivity. **ppb (parts per billion)**: One part per billion in water is like one drop in one billion drops of water, or about one drop in a swimming pool. ppb is the same as micrograms per liter (µg/l). **ppm (parts per million)**: One part per million is like one drop in one million drops of water, or about one cup in a swimming pool. ppm is the same as milligrams per liter (mg/l). **PWSID**: Public water system identification. **TT (Treatment Technique)**: A required process intended to reduce the level of a contaminant in drinking water. **Variances and Exemptions**: State or EPA permission not to meet an MCL or a treatment technique under certain conditions.

Contaminant (Date, if sampled in previous years)	EPA's Limit MCL	EPA's Ideal Goal (MCLG)	Level Found		Typical Source of Contaminant
			Range of detected test results	Highest avg. or highest single test result	
Arsenic	10.4 ppb	0 ppb	N/A	6.33 ppb	Erosion of natural deposits; Runoff from orchards; Runoff from glass and electronics production wastes.
Nitrate	10.4 ppm	2	N/A	.85	Discharge of drilling wastes; Discharge from metal refineries; Erosion of natural deposits.
Barium	2 ppm	2 ppm	N/A	.03	Discharge of drilling wastes; Discharge from metal refineries; erosion of natural deposit
Fluoride (ppm)	4	4	.56 ppm	.54-.60 ppm	State of Minnesota requires all municipal water systems to add fluoride to the drinking water to promote strong teeth; Erosion of natural deposits; Discharge from fertilizer and aluminum factories.

Contaminant (units)	EPA's Action Level	EPA's Ideal Goal (MCLG)	90% of results were less than	Number of Homes with High Levels	Violation	Typical Sources
Copper (06/26/2017)	90% of homes less than 1.3 ppm	1.3	.56 ppm	0 out of 10	No	Corrosion of household plumbing
Lead (06/26/2017)	90% of homes less than 15 ppb	15	1.5 ppb	0 out of 10	No	Corrosion of household plumbing

Potential Health Effects and Corrective Actions (If Applicable)

Arsenic: While your drinking water meets EPA's standard for arsenic, it does contain low levels of arsenic. EPA's standard balances the current understanding of arsenic's possible health effects against the costs of removing arsenic from drinking water. EPA continues to research the health effects of low levels of arsenic, which is a mineral known to cause cancer in humans at high concentrations and is linked to other health effects such as skin damage and circulatory problems.
Fluoride: If your drinking water fluoride levels are below the optimal concentration range of 0.7 to 1.2 ppm, please talk with your dentist about how you can protect your teeth and your family's teeth from tooth decay and cavities. For more information, visit: MDH Drinking Water Fluoridation (http://www.health.state.mn.us/divs/eh/water/com/fluoride/index.html). Fluoride is nature's cavity fighter, with small amounts present naturally in many drinking water sources. There is an overwhelming weight of credible, peer-reviewed, scientific evidence that fluoridation reduces tooth decay and cavities in children and adults, even when there is availability of fluoride from other sources, such as fluoride toothpaste and mouth rinses. Since studies show that optimal fluoride levels in drinking water benefit public health, municipal community water systems adjust the level of fluoride in the water to a concentration between 0.5 to 1.5 parts per million (ppm), with an optimal fluoridation goal between 0.7 and 1.2 ppm to protect your teeth. Fluoride levels below 2.0 ppm are not expected to increase the risk of a cosmetic condition known as enamel fluorosis.

Some People Are More Vulnerable to Contaminants in Drinking Water

Some people may be more vulnerable to contaminants in drinking water than the general population. Immuno-compromised persons such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly, and infants can be particularly at risk from infections. The developing fetus and therefore pregnant women may also be more vulnerable to contaminants in drinking water. These people or their caregivers should seek advice about drinking water from their health care providers. EPA/Centers for Disease Control (CDC) guidelines on appropriate means to lessen the risk of infection by *Cryptosporidium* and other microbial contaminants are available from the Safe Drinking Water Hotline at 1800426 4791.

IF YOU CAN BE ONE THING BE KIND

Learn More about Your Drinking Water

Drinking Water Sources

Minnesota's primary drinking water sources are groundwater and surface water. Groundwater is the water found in aquifers beneath the surface of the land. Groundwater supplies 75 percent of Minnesota's drinking water. Surface water is the water in lakes, rivers, and streams above the surface of the land. Surface water supplies 25 percent of Minnesota's drinking water. Contaminants can get in drinking water sources from the natural environment and from people's daily activities. There are five main types of contaminants in drinking water sources. **Microbial contaminants,** such as viruses, bacteria, and parasites. Sources include sewage treatment plants, septic systems, agricultural livestock operations, pets, and wildlife. **Inorganic contaminants** include salts and metals from natural sources (e.g. rock and soil), oil and gas production, mining and farming operations, urban storm water runoff, and wastewater discharges. **Pesticides and herbicides** are chemicals used to reduce or kill unwanted plants and pests. Sources include agriculture, urban storm water runoff, and commercial and residential properties. **Organic chemical contaminants** include synthetic and volatile organic compounds. Sources include industrial processes and petroleum production, gas stations, urban storm water runoff, and septic systems. **Radioactive contaminants** such as radium, thorium, and uranium isotopes come from natural sources (e.g. radon gas from soils and rock), mining operations, and oil and gas production.

The Minnesota Department of Health provides information about your drinking water source(s) in a source water assessment, including:

How Hawley is protecting your drinking water source(s); Nearby threats to your drinking water sources; How easily water and pollution can move from the surface of the land into drinking water sources, based on natural geology and the way wells are constructed. Find your source water assessment at Source Water Assessments (www.health.state.mn.us/divs/eh/water/swp/swa/) or call 651-201-4700 or 1-800-818-9318 between 8:00 a.m. & 4:30 p.m., Monday - Friday.

Lead in Drinking Water

You may be in contact with lead through paint, water, dust, soil, food, hobbies, or your job. Coming in contact with lead can cause serious health problems for everyone. There is no safe level of lead. Babies, children under six years, and pregnant women are at the highest risk. Lead is rarely in a drinking water source, but it can get in your drinking water as it passes through lead service lines and your household plumbing system. Hawley provides high quality drinking water, but it cannot control the plumbing materials used in private buildings. Read below to learn how you can protect yourself from lead in drinking water.

Let the water run for 30-60 seconds before using it for drinking or cooking if the water has not been turned on in over six hours. If you have a lead service line, you may need to let the water run longer. A service line is the underground pipe that brings water from the main water pipe under the street to your home.

You can find out if you have a lead service line by contacting your public water system, or you can check by following the steps at: Are your pipes made of lead? Here's a quick way to find out (https://www.mprnews.org/story/2016/06/24/npr-find-lead-pipes-in-your-home).

The only way to know if lead has been reduced by letting it run is to check with a test. If letting the water run does not reduce lead, consider other options to reduce your exposure. Use cold water for drinking, making food, and making baby formula. Hot water releases more lead from pipes than cold water.

Test your water. In most cases, letting the water run and using cold water for drinking and cooking should keep lead levels low in your drinking water. If you are still concerned about lead, arrange with a laboratory to test your tap water. Testing your water is important if young children or pregnant women drink your tap water. Contact a Minnesota Department of Health accredited laboratory to get a sample container and instructions on how to submit a sample: Environmental Laboratory Accreditation Program (https://apps.health.state.mn.us/eldo/public/accreditedlabs/labsearch.seam)

The Minnesota Department of Health can help you understand your test results. Treat your water if a test shows your water has high levels of lead after you let the water run. Read about water treatment units: Point-of-Use Water Treatment Units for Lead Reduction (http://www.health.state.mn.us/divs/eh/water/factsheet/com/poulead.html) Learn more: Visit Lead in Drinking Water (http://www.health.state.mn.us/divs/eh/water/contaminants/lead.html#Protect)