Source Water Delineation and Assessment Report

Public Water Supply: **Terry Downtown Water Users Association (PWSID #MT0003822)**
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Contact Person: **Gary Twiford**
P.O. 660
Terry, MT 59349
(406) 635-2135

Introduction

This delineation and assessment report is intended to meet the technical requirements of the Montana Source Water Protection Program (DEQ, 1999) and the federal Safe Drinking Water Act (SDWA) Amendments of 1996 (P.L. 104-182). Jim Stimson, Hydrogeologist with the Montana Department of Environmental Quality (DEQ) prepared the final report with assistance from intern Marilee Simons. Information on land use and potential contaminant sources comes from a variety of sources including a preliminary land cover data layer produced by the United States Geological Survey (USGS), DEQ Public Water Supply files (including sanitary surveys), and other public sources of information. A web-based GIS application was also used to query and generate maps to support writing this report. This application is called the Source Water Protection Program Query System and is available at the following web address or URL: http://nris.state.mt.us/wis/swap/swapquery.asp. The application was developed by the DEQ Source Water Protection Program (SWPP) and provides access to data from the U.S. EPA, DEQ, Montana Bureau of Mines and Geology (MBMG) and other sources.

Purpose

The purpose of this delineation and assessment report is to assess threats to the Terry Downtown Water Users Association (WUA) public water supply using information obtained from personnel managing the site, the most recent sanitary survey, which was completed in June 2001 by Keith Brown of Brown and Associates, a subcontractor of The Cadmus Group, Inc. (available from DEQ upon request), and from published reports. Delineation is a process whereby areas that contribute water to aquifers or surface waters used for drinking water are identified on a map. These areas are referred to as source water protection areas. Assessment involves identifying locations or regions in source water protection areas where contaminants may be generated, stored, or transported and then determining the potential for contamination of drinking water by these sources.

Public Water Supply Information

Terry Downtown WUA is a public water supply located in downtown Terry, Montana, which serves three businesses and three private residences (Figure 1-B). A single artesian well located in a vacant lot on the northeast side of town serves the system. A submersible pump and two captive air pressure tanks pressurize the system. The water supply serves a resident population of 7 people year-round and a transient population of 100-150 people in the summer and 50-75 people in the winter through 5 service connections. Because the water supply does not regularly serve the same 25 persons for at least six months a year, it is classified as a transient, non-community public water supply. Water demand is

approximately 1100-2000 gallons per day depending on the season, assuming water use is 10 gallons per day per person in the restaurant/bar and 50-75 gallons per day per person in residences (EPA, 1991).

A well log is available for Terry Downtown WUA and is included at the end of this report (Figure 3). According to the well log,(Figure 3) the well was drilled in 1994 to a depth of 735 feet and is grouted down to 315 feet with cement and bentonite. An 8-inch steel surface casing extends to 54 feet below ground, while a 2-inch steel casing and a 5-inch plastic casing extend the depth of the well. Screened interval is shown from 630-730 feet below ground surface. Well yield at the time of completion was 20 gallons per minute and the shut-in pressure was noted to be 12 psi. The average production of this well is 18 gallons per minute (gpm) and the maximum production is 26,000 gpm. A one horsepower submersible pump pumps the water into the building at a rate of 18 gpm. Two captive air pressure tanks pressurize the system. The 1995 sanitary survey notes that the well and pressure tanks are located in an underground well pit that is about 8 feet in diameter and 8 feet deep.

The MBMG has identified the aquifer as the Colgate Member of the Fox Hills Formation. A consolidated confined sandstone bedrock aquifer like the Colgate Member is assigned a low sensitivity rating to potential contaminant sources in the area, in accordance with the Source Water Protection Guideline document (MT DEQ, 1999). For more information concerning the hydrogeology in the vicinity of Terry refer to the Source Water Delineation and Assessment Report (SWDAR) for the Prairie Community Hospital Public Water Supply (Prairie Community Hospital SWDAR, July 2003).

Terry Downtown WUA is located just south of Highway 10, which represents a potential source of contamination if accidents or spills occur near the site. The town of Terry is served by a city sewer system and a wastewater treatment facility located northeast of the town. It is assumed that all businesses and residences served by this water supply are connected to the city sewer system. According to the sanitary survey, the well water is not treated. The survey notes that bacteriological samples have showed no contamination.

The sanitary survey for Terry Downtown WUA listed one recommendation that may be helpful in the future. It states that the well pit may pose a confined space entry hazard due to its depth and narrow entry hatch. Use of harnesses and entry teams to access the wellhead and pressure tanks will reduce the hazard posed by the pit.

Terry Downtown WUA is required to test for microbiological contaminants and nitrate. The well system must complete monthly bacteriological samples, as well as an annual nitrate sample. It appears as though the water users association has an agreement with the DEQ Public Water Supply program to take bacteriological samples quarterly rather than monthly beginning 8/11/98. The monitoring history is consistent and the system has had no bacterial hits in the past five years. The highest nitrate reading in the past five years is 0.6 mg/L in 2000, although no data is available for 1998 or 1999. The maximum concentration level (MCL) for nitrate is 10 mg/L set by the U.S. Environmental Protection Agency (EPA).

Delineation

Three source water protection zones are delineated for Terry Downtown WUA. They include a 100-foot radius control zone and a one-mile radius inventory region (Figure 1-A, B). Ground water flow direction in this area is interpreted to be from the south to the north towards the Yellowstone River (Figure 1-B). Usually there would also be a surface water buffer zone delineated for the Yellowstone

River because the river is located within the one-mile fixed radius inventory region. However, the surface water buffer zone is not delineated due to the fact that the river is located nearly 2/3 mile away in a down-gradient direction from the well (Figure 1-B). The control zone is the most critical area from which direct introduction of contaminants into the well or immediate area can occur. The inventory region encompasses the area from which water or contaminants can flow into the public water supply over a period of months to years.

Inventory

The Montana Source Water Protection Program (Montana DEQ, 1999) requires that land uses and all potential sources of nitrate and microbial pathogens within the control zone and inventory region be identified.

Analysis of the area surrounding the WUA well reveals that the predominant land covers include agricultural land (50%), grassland (25%), and residential/commercial land (20%). The remaining land covers include open water (3%) and forest (2%). See figure 2 for a pie chart summarization of this data. The amount of agricultural land present in this region poses a possible threat to the water supply, although the threat is reduced as much of the landuse is cross and down-gradient of the well. The concern is the potential for mismanagement or over-application of fertilizers and/or pesticides on the ag-land that occupies such a large portion of the inventory region. The amount of residential/commercial land represents a possible threat to the well due to the presence of sewer mains and smaller lines running within the city sewer district. This landuse is concentrated in the town of Terry and appears to be in a cross-gradient position to the well. As a result, the commercial landuse likely does not pose a threat to the source water.

No areas of high or medium septic density exist in the inventory region (Figure 1-B). About 78% of the land is of a low septic density and 22% is city sewered. As previously mentioned, the city sewer poses a threat due to sewer mains and lines. It is assumed that the businesses and residences served by the well are connected to the city sewer so leaks or breaks in lines near the well could impact source water. Highway 10 runs close to the well and could be a potential source of contamination to the well if spills or accidents occur near the site.

Susceptibility Assessment

Susceptibility to potential contaminant sources is assessed for a public water supply well. A well log is available for Terry Downtown WUA, which indicates that the source water for the water supply originates from a deep confined consolidated sandstone aquifer identified as the Colgate Member of the Fox Hills Formation. This type of aquifer is assigned a low sensitivity to potential contaminant sources located in the area (Montana DEQ, 2000, Table 2). Well log information helps verify that the well is constructed properly and helps identify the aquifer that the well is completed in. When constructed properly, shallow ground water that is more vulnerable to contaminant sources at the land surface is prevented from entering the well's bore hole and co-mingling with water from the deeper aquifer. Under some circumstances, the well bore would act as a conduit for contaminants entering the deeper aquifer. Multiple barriers have been identified for the WUA water supply system.

Terry Downtown WUA's well system is susceptible to nitrate and bacterial contaminants from surrounding ag-land, the municipal sewer mains, Highway 10, and possibly Class V injection wells.

As mentioned previously, 50% of the land cover surrounding the well is used for agricultural purposes. There is potential for mismanagement or over-application of fertilizers and/or pesticides on the ag-land. This percentage of ag-land present in the inventory region is considered to represent a low hazard (Montana DEQ, 2000, Table 9c). Because most of the ag-land is cross- and down-gradient of the water supply and due to the depth to the aquifer, two barriers have been invoked and the susceptibility to the ag-land is rated as very low (Montana DEQ, 2000, Table 10).

Because residential/commercial lands make up 20% of the land cover in the inventory region and the city sewer covers 22%, the municipal sewer represents a low hazard (Montana DEQ, 2000, Table 9c). The depth to the aquifer is considered as one barrier and the cross-gradient location of the city relative to the supply well is counted as another barrier. As a result, susceptibility is classified as very low (Montana DEQ, 2000, Table 10).

Because Highway 10 lies in close proximity to the well, hazard for this transportation corridor is rated as moderate (Montana DEQ, 2000, Table 9c). Emergency response planning and the depth to the aquifer have been classified as barriers and susceptibility is rated as low (Montana DEQ, 2000, Table 10). Class V Injection Wells could represent a possible hazard although the rating and susceptibility is unknown as no data is available to inventory.

Management Options

Possible management options for potential contamination from individual and municipal septic systems includes encouraging and supporting efforts to extend the city sewer, and promoting the maintenance of septic tanks and distribution lines. Options for managing contamination by ag-land surrounding the well include encouraging and supporting efforts to provide educational information, materials, and resources to land owners on the proper application and storage of pesticides and fertilizers and implementing agricultural BMPs. Being aware of accidents on the highway, especially those of tanker trucks, is a way to manage potential contamination from those sources. To manage potential contamination by Class V injection wells, options include encouraging efforts to inventory such wells and provide educational information to business owners and the public on proper waste disposal and recycling. The hazard and susceptibility ratings for each potential contaminant source as well as management options are summarized in the table below.

Table 1

Source	Contaminant	Hazard Rating	Barriers	Susceptibility	Management
Highway 10	Pathogens, nitrate	Moderate	- Emergency Response Planning - Depth to aquifer > 100 ft.	Low	Remain vigilant to accidents and spills especially those involving tanker trucks and cars.
Municipal Sewer	Pathogens, nitrate	Low	- Depth to aquifer > 100 ft. - Largely cross-gradient location	Very Low	Encourage and support city and county efforts to provide educational information and materials on the proper storage, handling, and disposal of household wastes and hazardous materials.
Cultivated Croplands	Fertilizers, pesticides, pathogens, nitrate	Low	- Estimated 60% of this landuse is cross- and down-gradient from the PWS - Depth to aquifer > 100 ft.	Very Low	Encourage and support city and county efforts to provide educational information, materials and resources to land owners on the proper application and storage of pesticide and fertilizers; implement agricultural BMPs
Class V Injection Wells	VOCs, SOCs, pathogens, nitrate	Unknown	None	Unknown	Encourage city and county efforts to inventory Class V wells, to provide educational information, materials and resources to business owners and the public on proper waste disposal and recycling.

References:

DEQ Permitting and Compliance Division, 2001. Sanitary Survey for Terry Downtown Water Users Association, PWS- PWS ID: #MT0003822.

Montana DEQ, 1999. Montana Source Water Protection Program, Approved by EPA in November 1999.

Montana DEQ, 2000. Montana Source Water Protection Program, Template for Non-Community Transient Public Water Supplies, Revised 2002.

Montana State Library - Natural Resources Information System (NRIS) 2000 map base of the USGS Topographical coverage at 1:24,000 scale in MrSID format.

Prairie Community Hospital SWDAR, July 2003, Montana DEQ Source Water Protection Report. Available from the Source Water Protection Program and on the web at: http://nris.state.mt.us/wis/swap/swapquery.asp

U.S. EPA, Office of Water, 1991. Manual of Small Public Water Supply Systems, EPA 570/9-91-003, 211 p.

U.S. Geological Survey, 2000. National Landcover Dataset, Montana. 30-meter electronic digital landcover/land use dataset interpreted from satellite imagery.