Fallon Water Well Association
Source Water Delineation and Assessment Report

Public Water Supply:	**Fallon Water Well Association (PWSID #MT0003252)**
Report Date:	**December 2, 2004**
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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). Laura Rennick, an intern with the Source Water Protection Program (SWPP) at the Montana Department of Environmental Quality (DEQ) prepared this report and Jim Stimson, Hydrogeologist with the SWPP reviewed and edited the report. 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 the writing of 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 Fallon Water Well Association public water supply using information obtained from personnel managing the site, the most recent sanitary survey, which was completed April 18, 2001 by Keith E. Brown, of the Cadmus Group, 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

The Fallon Water Well Association is located on Railway Avenue in the town of Fallon, about 40 miles northeast of Miles City on Highway 94. The water for this system is supplied from an artesian well located in a well pit behind the JD Bar (Figure 1). The water system supplies water to a residential population of 23 people year round, and a transient population of about 25 people daily in the summer and winter. 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.

No well log is available for Well #1 and as a result, no well completion information is available. The artesian well is located in a pit 4 feet wide and 8 feet deep. The wellhead is flush with the ground in the pit. There is no information about the depth of the well, the casing, or the casing size. The Association's well is drilled into a confined aquifer where the water is under sufficient pressure to raise the level of water in the well above the point at which it was first encountered. Static pressure for the system was measured at 40 psi. Well logs from nearby wells indicate that a good number of the wells in Fallon are on the order of 600 to 900 feet deep. Most of these wells are completed in the Fox Hills – Hell Creek Formation and the water is under substantial artesian pressure and flows to the surface. The well logs show that there are multiple clay layers above the water-bearing sandstone beds. An example of a well log from one of the deep wells is included at the end of this report. Wells completed in confined aquifers are considered to have a low sensitivity to potential contaminant sources in the area, in accordance with the Source Water Protection Guideline document (MT DEQ, 1999). There is no treatment processes on this system. The distribution system consists of relatively new PVC and PE plastic piping. There are 21 total connections 13 of which were active at the time of the sanitary survey (Sanitary Survey, 2001).

Interstate 94 is located about ½ mile northwest of Well #1 in a down gradient location from the well, this assumes groundwater flow is from the south-southeast to the north-northwest. Closer to the river the ground water is interpreted to flow parallel to the river. There is a Burlington Northern Railroad line about 500 feet south-southeast of Well #1. The railroad represents a high hazard because of its proximity to the well and the relatively large volumes of potentially hazardous material routinely transported on the railroad. The town of Fallon has two wastewater treatment facilities. The first is a wastewater treatment plant located about ¼ mile north-northwest of the well. Because of the down gradient location of the well the wastewater plant is assigned a hazard rating low. Sewer mains servicing the JD Bar, fire station, surrounding residences and businesses are considered to be potential contaminant sources. The second wastewater treatment facility is located at a concentrated animal feeding operation located about one mile southwest of the well. This facility is a low hazard because of its cross-gradient location to the well. Neither of the two-wastewater plants pose a threat to the well. There is a landfill located about 1.5 miles east of the well as a result of this distance; the landfill poses no threat to the well.

An evaluation of landuse in the area around Fallon indicates that about 90% of the land in the inventory region is agricultural. Agricultural land is considered to be a potential source of contamination. The concern is the potential for mismanagement or over-application of fertilizers and/or pesticides on the ag-land in the inventory region.

There is no water treatment process on this system. All bacteriological samples for the past five years have shown no contamination. It would be beneficial to locate a well log documenting the construction of the well so that this assessment report can be as accurate as possible. If a well log is obtained, please forward a copy to DEQ.

The Fallon Water Well Association is required to test for microbiological contaminants and nitrate. The well system must complete quarterly bacteriological samples, as well as an annual nitrate sample. In the past five years, the water supply has had no positive total coliform detects. The highest nitrate reading recorded for Well #1 in the past five years was 0.01 mg/L in 2002, 2003, and 2004. The lowest nitrate reading recorded for the well in the past five years was 0.0005 mg/L in 2000 and 2001. The average nitrate reading for the past five years is 0.0042 mg/L. These levels are well below the maximum concentration level (MCL) for nitrate 10 mg/L set by the U.S. Environmental Protection Agency (EPA).

Delineation

Two source water protection zones are delineated for The Fallon Water Well Association. They include a 100-foot radius control zone and a one-mile radius inventory region (Figure 1 and 2). Ground water flow direction in this area is interpreted to be generally from the south-southeast to the north-northwest, towards the Yellowstone River (Figure 1 and 2). Close to the river the ground water flow direction is interpreted to be generally parallel to the river. A surface water buffer zone was not delineated for the Yellowstone River as the river is located down-gradient almost 1.3 miles from the well (Figure 1 and 2). 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 well 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 Fallon Water Well Association reveals that the predominant land covers are agriculture (90%), grasslands (7%), urban (2%), and forest (1%). See Figure 2 for a pie chart summarization of this data. Urban land use represents transportation corridors (like Highway 94 and the Burlington Northern Railroad), residential areas, as well as industrial areas. Some of this landuse is up-gradient of the well and may be a potential source of contamination. Some of the agricultural land in the

inventory region is located in an up-gradient location from the well and may be a potential source of contamination to the well. As mentioned previously, the concern is the potential for mismanagement or over-application of fertilizers and/or pesticides on the agricultural-land in the inventory region.

The town of Fallon has a municipal sewer system. However, land areas outside of the town limits are not connected to the town's wastewater treatment system. About 99% of the land in the inventory region is of a low septic density, and 1% is medium density. Low, medium, and high-density lands represent the extent of individual septic tanks in the area, which can be potential sources of contamination (Figure 1).

Susceptibility Assessment

Susceptibility to potential contaminant sources is assessed for a public water supply well. No well log is available for the Fallon Water Well Association that indicates that it was properly sealed and completed. 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. The Fallon Water Well Association Well is an artesian well. In this case, the aquifer is considered to be confined and is assigned a low sensitivity to potential contaminant sources located in the area (Montana DEQ, 2000, Table 2). In addition, the artesian pressure would prevent contaminants from being able to flow down into the confined aquifer and acts as a substantial barrier to contaminant sources located at the land surface. The cross and down-gradient locations of some of the potential contaminant sources is also used as a barrier for the well.

Potential sources of nitrate and bacterial contamination in the area include the sewer mains and service lines near the well, residential/commercial land, agricultural land, the animal feeding operation, the waste water treatment plant and possibly Class V injection wells.

The sewer mains and service lines near the well are given a hazard rating of high. With the artesian pressure and well depth used as barriers, the susceptibility rating is set to low. The wastewater treatment plant is given a hazard rating of low, with multiple barriers applied, the susceptibility is set at very low. (Montana DEQ, 2000, Table 9b).

Because urban lands make up only 2% of the land cover in the inventory region, it is assigned a low hazard rating. The agriculture lands on the other hand make up 90%, of the inventory region and is located up-gradient of the well. The ag-lands are assigned a high hazard rating and with the artesian pressure and well depth used as barriers, the susceptibility is set at low. The Burlington Northern Railroad is also up-gradient from the well and is assigned a high hazard rating. As mentioned previously the hazard rating is often set to high for railroads because of the relatively large volumes of potentially

hazardous material routinely transported. With the artesian pressure and well depth used as barriers, the susceptibility is set at low. (Montana DEQ, 2000, Table 9b).

The animal feeding operation is assigned a hazard rating of low. The distance to the well and the cross-gradient location are both counted as barriers and the susceptibility is set at very low (Montana DEQ, 2000, Table 9b).

Class V Injection Wells could represent a possible hazard although the rating and susceptibility is unknown as no inventory data is available from local, state, or federal sources.

Management Options

Possible management options for potential contamination from individual and large capacity septic systems and municipal sewer lines includes routine maintenance, providing guidance and educational material to citizens on the proper disposal of household hazardous wastes, and supporting efforts to extend a city sewer. Being aware of accidents on the highway and railroad, 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 Table 1 on page 7.

References:

DEQ Permitting and Compliance Division, 2003. Sanitary Survey for The Fallon Water Well Association PWS- PWS ID: #MT0003252.

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.

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.

Table 1. Susceptibility Assessment of Significant Potential Contaminant Sources

Potential Contaminant Source	Potential Contaminants	Hazard	Hazard Rating	Barriers	Susceptibility	Management Recommendation
Cropped Agricultural Land Use (90% of inventory region)	SOCs, Nitrates, Pathogens	Contaminants leaching into groundwater	**High**	Artesian pressure and well depth.	**Low**	Notify landowners of well and protection area locations. Encourage and support efforts to provide educational information, materials, and resources to land owners on the proper application and storage of pesticides and fertilizers and implementing agricultural best management practices (BMPs).
Municipal Sewer Mains	VOCs, SOCs, metals, pathogens, nitrates, others	Ongoing or catastrophic leakage of sewage into groundwater	**High**	Artesian pressure and well depth.	**Low**	Support maintenance, rehabilitation, or replacement of existing sewer mains; use of sewer main liners; and rapid response planning for leaks or ruptures.
Transportation Routes **Highway** **Railroad**	Pesticides, fertilizers, VOCs, SOCs, other	Spills, routine spraying, storm water runoff, infiltration into groundwater	**High** **High**	Distance from the well, down-gradient* Emergency Response Artesian pressure and well depth.	**Low** **Low**	Notify landowners of well and protection area locations. Encourage and support emergency planning, training of local emergency response personnel, use of levees and engineered storm drainage to carry any spills away and prevent infiltration into ground, cooperation with railroad managers or MDOT to reduce herbicide use.

Wastewater treatment facilities (lagoons), sludge handling sites, or land application areas	VOCs, SOCs, metals, pathogens, nitrates, others	Ongoing or catastrophic leakage of sewage into groundwater	**Low**	Located down-gradient* from the Inn's well Treatment plant is operating within its regulatory permit. Artesian pressure and well depth.	**Very Low**	Review permit status (contact DEQ Permitting and Compliance Water Protection Bureau – 406-444-3080 for more information) and ensure proper operation and maintenance, emergency planning, training of local emergency response personnel, groundwater monitoring, spill prevention and BMPs.
Animal Feeding Operation	Nitrates, Pathogens	Improper storage and management of animal wastes may impact drinking water supply.	**Low**	Distance from the well and a cross-gradient location. Artesian pressure and well depth.	**Very-Low**	Notify landowners of well and protection area locations. Encourage use of agricultural best management practices (BMPs) to ensure wastes do not impact groundwater. Support efforts to monitor integrity of animal waste storage units/areas and encourage disposal of wastes outside of inventory region. Encourage use of agricultural best management practices (BMPs) in the watershed to keep cattle away from the wells and stream especially directly upstream of the well locations.
Class V Injection Wells	VOCs, SOCs, pathogens, nitrate	Infiltration of contaminants into aquifer	**Unknown**	Artesian pressure and well depth.	**Unknown**	Encourage EPA to inventory the area Support providing educational information, materials and resources to business owners and the public on proper waste disposal and recycling

Well Log – Well located near Fallon and similar in depth to the Water Well Association's Well.
Location Information

Montana Bureau of Mines and Geology [Plot this site on a topographic map]
Ground-Water Information Center Site Report
LAPP JOHN

GWIC Id:	25432	Source of Data:	LOG
Location (TRS):	13N 52E 35 BD	Latitude (dd):	46.8419
County (MT):	PRAIRIE	Longitude (dd):	-105.1069
DNRC Water Right:		Geomethod:	TRS-TWN
PWS Id:		Datum:	NAD27
Block:		Altitude (feet):	2200.00
Lot:		Certificate of Survey:	
Addition:		Type of Site:	WELL

Well Construction and Performance Data

Total Depth (ft):	870.00	How Drilled:	ROTARY
Static Water Level (ft):		Driller's Name:	JOHNSON
Pumping Water Level (ft):		Driller License:	WWC154
Yield (gpm):	75.00	Completion Date (m/d/y):	11/24/1972
Test Type:	OPEN FLOW	Special Conditions:	
Test Duration:	48.00	Is Well Flowing?:	YES
Drill Stem Setting (ft):		Shut-In Pressure:	
Recovery Water Level (ft):		Geology/Aquifer:	211FHHC
Recovery Time (hrs):		Well/Water Use:	DOMESTIC STOCKWATER
Well Notes:			

Hole Diameter Information

No Hole Diameter Records currently in GWIC.

Casing Information[1]

From	To	Dia	Wall Thickness	Pressure Rating	Joint	Type
0.0	45.0	6.0				STEEL
0.0	870.0	2.0				STEEL

Annular Seal Information

No Seal Records currently in GWIC.

Completion Information[1]

From	To	Dia	# of Openings	Size of Openings	Description
740.0	780.0	2.0			3/8IN HOLE PERF
780.0	810.0	2.0			3/8IN HOLE PERF

Lithology Information

From	To	Description
0.0	37.0	SAND
37.0	45.0	GRAVEL
45.0	72.0	CLAY & COAL
72.0	76.0	ROCK
76.0	105.0	SANDSTO0NE & CLAY
105.0	115.0	COAL
115.0	135.0	CLAY
135.0	155.0	SOAPSTONE

155.0	175.0	COAL
175.0	210.0	CLAY & COAL
210.0	230.0	SAND & CLAY
230.0	233.0	ROCK
233.0	380.0	CLAY & COAL
380.0	460.0	SAND & CLAY
460.0	560.0	CLAY & ROCK
560.0	620.0	SANDSTONE (15 GPM)
620.0	740.0	CLAY
740.0	780.0	SANDSTONE (40 GPM)
780.0	810.0	CLAY
810.0	868.0	SANDSTONE (60 GPM)
868.0	870.0	ROCK