GREYCLIFF REST STOP EASTBOUND

Source Water Delineation and Assessment Report

Public Water Supply: PWSID #MT0001957

Greycliff Rest Stop Eastbound
Montana Department of Transportation
Sweet Grass County
13 miles east of Big Timber, Montana
Interstate 90 Mile Post 380.9
Greycliff, Montana

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Contact: John Trewhella
MDT Billings Division
P.O. Box 20437
Billings, Montana 59104-0437
406-657-0246

INTRODUCTION

This delineation and assessment report is intended to meet the technical requirements of the Montana Source Water Protection Program (Montana Department of Environmental Quality [Montana DEQ], 1999) and the federal Safe Drinking Water Act (SDWA) Amendments of 1996 (P.L. 104-182). Tetra Tech EM Inc. prepared this report under contract with the Montana Department of Transportation (MDT). Information provided by MDT was used in preparing the reports. Well completion information was obtained from the Montana Ground Water Information Center (GWIC). Information on the water supply system was obtained from a sanitary survey prepared on July 24, 1997, by McNenny Environmental Engineering and Consulting (available from Montana DEQ upon request) and from John Trewhella of MDT (McNenny 1997 and Trewhella 2001). Water quality data are derived from the U.S. Environmental Protection Agency (U.S. EPA) Envirofacts Warehouse website (U.S. EPA 2001). Land use information was obtained from the Montana State Library; Natural Resource Information Service (NRIS) database (NRIS 2000).

This source water delineation and assessment report includes a site location topographic map and a land use map showing the inventory region of the source water protection area and the land uses and potential contaminant sources within that area (Figures 1 and 2 at end of this report). The report also includes a narrative description of the public water

supply (PWS), inventory region delineation, an inventory of land uses and activities that may impact the PWS, and a susceptibility assessment. Well information for the PWS is attached.

PURPOSE

The purpose of this delineation and assessment report is to assess possible threats to the water supply at the MDT Greycliff Rest Stop Eastbound located thirteen miles east of Big Timber, Montana using information obtained from published reports. Delineation is a process in which areas that contribute water used for drinking are identified on a map. Geologic and hydrologic conditions are evaluated in order to delineate source water protection areas. The source water protection area is assessed to identify locations or regions where contaminants may be generated, stored, or transported and then to evaluate the potential for contamination of drinking water by these sources.

PUBLIC WATER SUPPLY INFORMATION

The water system at this rest stop is classified as a transient, non-community PWS because it serves 25 or more persons per day but does not regularly serve the same persons for at least six months a year. Ten non-transient persons employed by the MDT are estimated to use the water supply daily. Approximately 2500 transient persons are estimated to use the rest stop per day during the summer, 500 persons per day in winter, resulting in a water supply demand of an estimated 12,600 gallons per day in summer and 2,550gallons per day in winter (U.S. EPA 1991).

Facility Description

The Greycliff Rest Stop Eastbound is located in Sweet Grass County on the south side of Interstate 90 at milepost 380.9 (Figure 1). The wellhead of the public water supply well is located about 100 feet east of the comfort station. A septic system drain field is located about 390 feet west of the public water supply well. The rest stop operates year round.

Public Water Supply System

The rest stop water supply well is located about 100 feet east of the comfort station. Well log information indicates that the well was drilled in June 1998, is cased to 101.5 feet below ground surface with a six-inch steel casing, and reaches a total depth of 101.5 feet (GWIC 2001). Static water level was at 58 feet below ground surface in 1998. The well is screened from 46.5 to the total depth of the well, 101.5 feet bgs. The DNRC well log is attached to this report. A three-horsepower submersible pump delivers water at about 46 gallons per minute to a single captive air pressure tank located in the utility room of the comfort station, and then to service throughout the building. Another well is used to supply the lawn irrigation system. The two well pump and distribution systems are not connected. The system is capable of supplying about 20,000 users per season (McNenny 1997).

Public Water Supply Quality

MDT is required to monitor the rest stop public water supply for coliform bacteria on a monthly basis and nitrate as nitrogen annually, or if nitrogen is present at concentrations less than 0.5 milligrams per liter (mg/L), once every three years. One health-based water quality violation from the new well has been reported to the Environmental Protection Agency within the past five years and is listed below (U.S. EPA 2001).

- Analytical results of water sampled from the PWS in May 1999 indicated that coliform exceeded the maximum contaminant level (MCL) by an unreported amount.

According to the Greycliff Rest Stop Eastbound Sanitary Survey (McNenny 1997), the well existing at the time the survey was completed needed to be replaced. The sanitary survey stated that a high nitrate problem experienced with the old well was due to natural concentrations in the aquifer. This has been done, and subsequent sampling and analysis of the well water has demonstrated that water quality has violated state standards (U.S. EPA 2001). The sanitary survey recommended the installation of a reverse-osmosis treatment and disinfection system (McNenny 1997).

Source Water Hydrogeology

The Greycliff Rest Stop Eastbound is located in the Yellowstone River valley about 3 miles east of Greycliff (Figure 1). Lithologic information from the well log indicates that the well is screened in consolidated sandstone at an interval depth of 47 to 101.5 feet below ground surface. The aquifer is confined by consolidated sandstone with a thickness of approximately 20 feet.

DELINEATION

An inventory region around the well-head and on either side of the Yellowstone River for 10 miles upstream from the well head has been delineated by the Montana DEQ Source Water Assessment Program personnel for the Greycliff Rest Stop Eastbound (Figure 1). The inventory region encompasses the area from which water or contaminants can flow to the well over a period of years. The control zone (100-foot radius from well head) is the most critical area within which direct introduction of contaminants into the well or immediate area can occur. The on-site septic system may fall within the well head control zone.

INVENTORY

The Montana Source Water Protection Program requires that land uses and all potential sources of nitrate and microbial contaminants be identified within the control zone and inventory region of non-community, transient public water supplies (Montana DEQ 1999).

Sanitary Survey Information

According to information in the Greycliff Rest Stop Eastbound Sanitary Survey, the system appears to be in good working order (McNenny 1997). No potential sources of microbial contaminants were identified but samples collected from the PWS well in 1997 and 1998 (McNenny 1997) and 1999 (U.S. EPA 2001) indicated the presence of coliform bacteria.

Land Use

Land use of the Greycliff Rest Stop Eastbound inventory region is summarized in Figure 2. Land use information was obtained from the Montana Natural Resources Information System website (NRIS 2000). Other sources of information include existing databases available through Montana DEQ and information provided by MDT.

Land use in the inventory region of the Greycliff Rest Stop Eastbound PWS well is primarily agricultural land, both irrigated and dryland crop, grassland pasture, fallow agricultural land, small grains, mixed forest, and shrubland. A transportation corridor exists along the highway. No animal feeding operations are located within the Greycliff Rest Stop Eastbound inventory region. Septic system density is low throughout the inventory region. Potential sources of nitrates or microbial contaminants include the rest stop septic system and irrigated cropland.

SUSCEPTIBILITY ASSESSMENT

Susceptibility of source water to contamination is a function of source water sensitivity, the presence of significant potential sources of microbial and nitrate contamination, and the presence of barriers to contamination from the sources. Source water susceptibility is based on the following factors:

- Source water sensitivity
- Documented water contamination in the previous five years
- Presence of potential contaminant sources within the inventory region
- Density of potential contaminant sources within the inventory region
- Presence and numbers of natural and engineered barriers to contaminant migration

Source Water Sensitivity

Source water sensitivity is defined as the relative ease with which contaminants can migrate to a source aquifer or surface water body. The Greycliff Rest Stop Eastbound has a low source water sensitivity rating because the source water aquifer is consolidated sandstone bedrock at a depth of 93 feet bgs.

Documented water contamination

Records from the U.S. EPA safe drinking water information website indicate that coliform in a sample collected from the Greycliff Rest Stop Eastbound well in 1999 exceeded MCLs by an unspecified amount (U.S. EPA 2001).

Intersystem Source Water Susceptibility

Documented water contamination in the previous five years indicates that the Greycliff Rest Stop Eastbound PWS has a high intersystem susceptibility to microbial contaminants. Intersystem susceptibility is determined by source sensitivity and exposure as indicated by documented water contamination. Documented exposure to contaminants regulated for their acute health effects (fecal coliform and nitrate) is given greater weight when determining intersystem susceptibility than exposure to contaminants regulated for non-acute health risks. Intersystem susceptibility of the Greycliff Rest Stop source water is summarized in Table 1.

Table 1

Intersystem Source Water Susceptibility Summary

Potential Contaminant	Documented Exposure	Source Water Sensitivity[a]	Intersystem Susceptibility[a]
Fecal Coliform	1999	Moderate	High
Nitrate	0	Moderate	Moderate
Nonacute contaminants	0	Moderate	Moderate

Notes:

[a]Based on Table 4, Section 5 (Montana DEQ 2001)

Hazard of Potential Contaminant Sources

The hazard posed by potential contaminant sources is a function of the type of and density of contaminant sources within the inventory region. Hazard of contaminant sources within the Greycliff Rest Stop Eastbound PWS inventory region are summarized in Table 2.

Table 2

Contaminant Source Hazard Rating Determination

Type of Contaminant Source	Density within Inventory Region	Hazard Rating[a]
Septic Systems	Less than 50 per square mile	Low
Municipal Sanitary Sewer	Less than 20 percent of region	Low
Cropped Agricultural Land	20 to 50 percent of region	Moderate
Contaminant Sources within Control Zone (confined aquifer)	None	Low
Contaminant Sources within control zone (unconfined aquifer)	None	Low

Notes:

[a]Based on Table 6, Section 5 of Montana Source Water Program Guidance (Montana DEQ 2001)

NA – not applicable

Barriers to Contamination

Barriers to contamination can be natural conditions, engineered structures, or management actions. Natural barriers to a groundwater source may include a continuous clay layer, a deep water table, contaminant attenuation capacity of vadose zone and aquifer materials, and dilution. Engineered barriers provide physical containment or early

detection of potential contaminants such as double walled underground storage tanks, spill catchment basins and monitoring wells installed for leak detection. PWS wells that meet state construction standards are considered engineered barriers to contamination in control zones. Contamination barriers for the Greycliff Rest Stop PWS are listed below.

- Well meets state construction standards.

Source Water Intrasystem Susceptibility

Intrasystem susceptibility is determined by the hazard associated with potential contaminant sources and the existence of barriers that may decrease the likelihood that contaminated water will flow to a PWS well or intake. A summary of all significant potential contaminant sources identified in the inventory region, their associated hazard, the presence of barriers, and relative susceptibility ratings is presented in Table 3.

The Greycliff Rest Stop Eastbound PWS has a high susceptibility to contamination from the on-site septic system and cropped agricultural land. Natural, engineered or management barriers include: well constructed in accordance with state construction standards. This is a barrier to contamination within the control zone.

Table 3

Source Water Intrasystem Susceptibility

Potential Source[a]	Contaminant	Hazard Rating[b]	Barrier	Susceptibility[c]
On-site septic system	Nitrates, Microbial contaminants	Moderate	Setback distance > 100 ft.	Moderate
Off-site septic systems	Nitrates Microbial contaminants	Low	None	Moderate
Cropped agricultural land	Nitrates	Moderate	None	High

Notes:

[a]Source based on land use within inventory zone.

[b]Hazard rating based on Table 6, Section 5 (Montana DEQ 2001)

[c]Susceptibility rating based on Tables 5, Section 5 (Montana DEQ 2001)

NA = Not Applicable

REFERENCES

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Figure 1. Location Map

Figure 2. Greycliff Rest Stop Inventory Region and Land Use

ATTACH WELL LOG