

**Rimrock Colony
Public Water System**

PWS ID # MT0001783

**Source Water Delineation
and Assessment Report**

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Table of Contents

EXECUTIVE SUMMARY	2
INTRODUCTION	4
Purpose	4
Limitations	4
BACKGROUND	5
The Community.....	5
Geographic Setting.....	5
Climate	5
General Description of the Source Water	6
The Public Water Supply	6
Water Quality	6
DELINEATION.....	7
General Geologic and Hydrogeologic Setting	7
PWS Well Information.....	7
Conceptual Model and Assumptions.....	8
Delineation	9
Limiting Factors	9
INVENTORY	10
Inventory Method.....	10
Control Zone Inventory Results	11
Inventory Region Results	11
Inventory Update.....	13
Inventory Limitations.....	13
SUSCEPTIBILITY ASSESSMENT	14
General Discussion.....	14
Hazard Determination	14
Discussion of Susceptibility	15
Management Recommendations	15
MONITORING WAIVERS.....	17
Waiver Recommendation.....	17
Monitoring Waiver Requirements.....	17
REFERENCES	19
GLOSSARY	20

Tables

Table 1. Period of Record Monthly Climate Summary Cut Bank Climate Station.....	5
Table 2. Rimrock Colony PWS Supply Well Information	8
Table 3. Source Water (Aquifer) Sensitivity Criteria	8
Table 4. Summary of Potential Contaminant Sources in the Inventory Region.....	12
Table 5. Hazard Assessment for Unconfined Aquifers	14
Table 6. Susceptibility Based on Hazard and Barriers	15
Table 7. Susceptibility Assessment of Significant Potential Contaminant Sources	16

Figures

[Figure 1.](#) Vicinity Map

[Figure 2.](#) Geology of the Area

[Figure 3.](#) Rimrock Colony Inventory Region and Potential Sources of Contamination

[Figure 4.](#) Land Cover in Recharge Region

Appendices

APPENDIX A – PWS Sanitary Survey and Site Plan

APPENDIX B – PWS Well Logs

APPENDIX C – Concurrence Letter

EXECUTIVE SUMMARY

This Source Water Delineation and Assessment Report was prepared under the requirements and guidance of the Federal Safe Drinking Water Act and the US Environmental Protection Agency, as well as a detailed Source Water Assessment Plan developed by a statewide citizen's advisory committee here in Montana. The Department of Environmental Quality (DEQ) is conducting these assessments for all public water systems in Montana. The Rimrock Colony SWDAR was prepared by Bill O'Connell of Montana Rural Water Systems, Inc. (MRWS) for DEQ. The purpose is to provide information so that the public water system staff/operator, consumers, and community citizens can begin developing strategies to protect your source of drinking water. The information that is provided includes the identification of the area most critical to maintaining safe drinking water, i.e., the Inventory Region, an inventory of potential sources of contamination within this area, and an assessment of the relative threat that these potential sources pose to the water system.

The drinking water for Rimrock Colony is supplied by one well (Well 2). The well feeds three 15,000-gallon storage tanks. Two service pumps are gravity fed from the tanks and supply the drinking water distribution system. Well 2 is located at latitude 48^o 53.87' and longitude 112^o 05.86'. A backup well, Well 1, is located at latitude 48^o 53.74' and longitude 112^o 05.33'. Well 1 pumps into a 44,000-gallon cistern and is used as a stockwater supply. While connections are present that would allow this well to be used as an additional supply, it was not included in the susceptibility analysis. This is based upon information provided by the colony regarding the use of this well.

Based on site work, the sanitary survey (2001), well logs, and the depth of the well, it appears that the Telegraph Creek Formation provides water to the PWS' well. In accordance with the Montana Source Water Protection Program criteria (1999), the aquifer (source water) is considered to have a low sensitivity because it is consolidated sandstone bedrock. Sensitivity is defined as the relative ease that contaminants can migrate to source water through the natural materials.

Three types of source water protection management regions for the Rimrock Colony public water system were mapped as part of this assessment. They are the control zone, inventory region, and the recharge region. Potential sources of contamination were identified within each of these three regions and the results are as follows:

- The goal of management in the control zone is to avoid introducing contaminants directly into the water supply's well or immediate surrounding areas. The control zone is delineated as a 100-foot radius around the well and all sources of potential contaminants should be excluded in this region. The colony access road passes through the control zone. Spraying should be prohibited along the access road. If a wellhead protection plan is developed for the colony, the likelihood of spills should be assessed for this potentially hazardous land use.
- The inventory region should be managed to prevent contaminants from reaching the well before natural processes reduce their concentrations. Agricultural chemicals and fuels are used within the Inventory Region. Livestock management and processing occurs within the Inventory Region.
- The goal of management in the recharge region is to maintain and improve water quality over long periods of time or increased usage. Recharge to the wells is likely from infiltration of precipitation and surface water into the Two Medicine Formation where this formation outcrops

upgradient west and north of the well. Potential contaminant sources identified within the recharge region are from agricultural activities.

Susceptibility is the potential for a public water supply to draw water contaminated by inventoried sources at concentrations that would pose concern. Susceptibility is determined by considering the hazard rating for each potential contaminant source and the existence of barriers that decrease the likelihood that contaminated water will flow to the public water supply wells. The hazard rating for all of the potential contaminant sources identified is moderate to low. With the limited types of land use and remote location of the Colony, the susceptibility of the Rimrock Colony well to potential contaminant sources is moderate to low. Moderate risk potential sources and potential sources located outside the Inventory Region, but within the Recharge Region may still pose a threat over time, but are not discussed in detail in this assessment. This provides a quick look at the existing potential sources of contamination that could, if improperly managed or released, impact the source water for the Rimrock Colony. The susceptibility analysis provides the community and the public water system with information on where the greatest risk occurs and where to focus resources for protection of this valuable drinking water resource.

The costs associated with contaminated drinking water are high. Developing an approach to protect this resource will reduce the risks contamination. In this report, we have summarized the local geology and well construction as they pertain to the quality of your drinking water source. We have identified the area we believe to be most critical to preserving your water quality (the Inventory Region) and have identified potential sources of contamination within that area. In addition, we provide you with recommendations, i.e., Best Management Practices, regarding the proper use and practices associated with some common potential contamination sources. We believe public awareness is a powerful tool for protecting drinking water. The information in this report will help you increase public awareness about the relationship between land use activities and drinking water quality.

INTRODUCTION

This Source Water Delineation and Assessment Report (SWDAR) was prepared for the Rimrock Colony Public Water Supply (PWS ID# MT0001783), located in Toole County. It was completed by Bill O'Connell of Montana Rural Water Systems, Inc. (MRWS) with review and assistance from the Source Water Protection Program at the Department of Environmental Quality. Phillip and Dave Hofer, the Rimrock Colony water system operators, also provided assistance.

PURPOSE

This report is intended to meet the technical requirements for the completion of the delineation and assessment report for the Rimrock Colony Public Water System (PWS) as required by the Montana Source Water Protection Program (DEQ, 1999) and the federal Safe Drinking Water Act (SDWA) Amendments of 1996 (Public Law 104-182). The Montana Source Water Protection Program is intended to be a practical and cost-effective approach to protect public drinking water supplies from contamination. A major component of the Montana Source Water Protection Program is *delineation* and *assessment*. Delineation is a process whereby areas that contribute water to aquifers or surface water bodies that are used to supply drinking water are identified on a map. These areas are called source water protection areas. Assessment involves identifying locations in the delineated areas where contaminants may be generated, stored, or transported, and then determining the relative potential for contamination of drinking water by these sources. The primary purpose of this source water delineation and assessment report is to provide information that helps Rimrock Colony protect its drinking water sources.

LIMITATIONS

This report was prepared to assess threats to Rimrock Colony's public water supply, and is based on published information and information obtained from local residents familiar with the community. The terms "drinking water supply" or "drinking water source" refer specifically to the source of the Rimrock Colony public water supply and not to any other public or private water supply. Not all potential or existing sources of groundwater or surface water contamination in the area of the Rimrock Colony public water supply are identified. Only potential sources of contamination in areas that contribute water to its drinking water source are considered.

The term "contaminant" is used in this report to refer to constituents for which maximum concentration levels (MCLs) have been specified under the national primary drinking water standards, and to certain constituents that do not have MCLs but are considered to potentially represent health threats.

CHAPTER 1 BACKGROUND

THE COMMUNITY

Rimrock Hutterite Colony is located in Toole County, in northern Montana, as shown in [Figure 1](#). The nearest town with commercial services is Sunburst (population 415), located approximately 10 miles east of the colony. The economy of the colony relies on the production of a variety of agricultural products.

The colony complex includes residential buildings, a kitchen building, and several other facilities that support the agricultural activities at the colony. A map showing the layout of the colony is included with Appendix A. Rimrock Colony serves 110 people through six service connections. Rimrock Colony's public water system (PWS) is classified as a Community PWS because it serves more than 25 residents. Drinking water for the colony is supplied by one well, located near the north entrance of the colony complex ([Figure 1](#)). Human waste and animal processing wastes are treated in wastewater treatment lagoons located in the southern part of the colony, away from the buildings.

GEOGRAPHIC SETTING

Rimrock Colony is located in the glaciated plains of north central Montana, at an elevation of approximately 4,000 feet (see [Figure 1](#)). The Rocky Mountains to the west and the Sweet Grass Hills east of the colony are the region's most significant topographic features. The topography around Rimrock Colony is more subdued. The hummocky topography includes features typical of continental glaciation, such as potholes and small lakes. The Montana Bureau of Mines and Geology (MBMG) Ground Water Information Center (GWIC) database includes 14 monitoring wells installed on the colony property. Well logs for these wells report glacial till ranging from 15 to 40 feet thick, and commonly over 30 feet.

The colony is located near the top of the west flank of the Sweet Grass Arch. The prominent feature of the sweet Grass Arch in this area is a north-south trending escarpment composed of Eagle Sandstone. The sandstone dips to the southwest. One mile east of the colony the topography drops off about 200 feet at the east edge of the Eagle Sandstone. The Sweet Grass Arch has eroded away east of the escarpment.

[Figure 1. Vicinity Map](#)

CLIMATE

Information on climate in the Rimrock area is based on the National Oceanic and Atmospheric Administration's (NOAA) Sweetgrass climate station. Average temperatures and total precipitation for the period of record are shown in Table 1.

**Table 1. Period of Record Monthly Climate Summary Cut Bank Climate Station
SWEETGRASS, MONTANA (248093)**

Period of Record Monthly Climate Summary

Period of Record : 5/25/1951 to 8/31/2003

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	29.4	35.3	42.3	55.4	66.0	73.7	81.4	80.9	70.3	59.1	41.8	32.3	55.7

Average Min. Temperature (F)	6.9	12.8	19.5	30.4	39.9	47.7	51.7	50.9	41.7	32.9	20.6	11.6	30.5
Average Total Precipitation (in.)	0.32	0.23	0.44	1.03	2.28	3.45	1.58	1.74	1.34	0.58	0.41	0.34	13.73
Average Total SnowFall (in.)	3.0	1.9	1.5	1.5	0.1	0.0	0.0	0.0	0.2	0.5	2.9	2.3	13.9
Average Snow Depth (in.)	1	1	0	0	0	0	0	0	0	0	0	1	0

Percent of possible observations for period of record.

Max. Temp.: 84.8% Min. Temp.: 85.1% Precipitation: 90.2% Snowfall: 69.2% Snow Depth: 61.7%

Check [Station Metadata](#) or [Metadata graphics](#) for more detail about data completeness.

Western Regional Climate Center, wrc@dr.edu

GENERAL DESCRIPTION OF THE SOURCE WATER

The MBMG identifies the Cretaceous Two Medicine Formation as the aquifer supplying the well. The Two Medicine Formation is a shale overlying the Virgelle sandstone, the basal unit of the Eagle sandstone. Both are included within the Montana Group of Upper Cretaceous sedimentary rocks. The Virgelle is an extensive formation with large outcrops visible between Shelby and Cut Bank. Outcrops of Virgelle sandstone form the escarpment that marks the eastern edge of the Sweet Grass Arch.

The author of this report has a different interpretation of which formations contain the aquifers supplying water to the Colony's wells. According to the well logs, Well 2 (GWIC# 899921) is 223 feet deep, which is 81 feet deeper than Well 1 (GWIC# 150152). Well 2 has a poorer water quality with Total Dissolved Solids (TDS) of 1,158 parts per million (ppm). The shallower well (Well 1) has a TDS of 781 ppm. The author believes that Well 1 is completed in the Virgelle member of the Eagle Sandstone Formation and that Well 2 is completed in the deeper Telegraph Creek Formation. The Telegraph Creek Formation is a sandy shale and underlies the Eagle Sandstone. See the water quality reports on pages 8 and 9 of this report.

THE PUBLIC WATER SUPPLY

Rimrock Colony serves 110 people through six service connections. Rimrock Colony is classified as a community public water system (PWS) since it serves at least 25 of the same people every day. Information on the water system was obtained from correspondence in the DEQ Public Water Supply Section files including the most recent sanitary surveys and onsite work. The Colony has completed major PWS and sewer upgrades since beginning the wellhead protection program.

The PWS has one well (Well 2), which is pumped into a series of three 5,000-gallon storage tanks. Service pumps then transfer the water to either the kitchen or to the laundry. Well 1 is a backup well that is pumped to a 44,000-gallon in-ground storage tank (cistern).

Well 2 is located at latitude 48⁰ 53.74' and longitude 112⁰ 05.33' in the NW1/4, SW1/4 of section 11, T36N, R4W. Backup Well 1 is located at latitude 48⁰ 53.87' and longitude 112⁰ 05.86' in the NW1/4, NW1/4, NW1/4 of section 11, T36N, R4W.

WATER QUALITY

Every PWS is required to perform monitoring for contamination to their water supply. The monitoring constituents include coliform and other signs of pathogenic organisms, nitrates, metals and multiple

organic chemicals. The monitoring schedule depends on many factors such as the size and source water for a PWS, the number of sources (e.g. wells), and the population served. Each PWS has a specific monitoring program tailored to their system that follows the general protocols for operation of a PWS defined by DEQ. PWS monitoring schedules are available at <http://nris.state.mt.us/wis/swap/swapquery.asp>. Rimrock Colony's monitoring data from DEQ's PWS database for the past five years was reviewed and is summarized in this section.

Coliform bacteria have been detected once in the last five years, in October 2003. Nitrate + Nitrite has been detected at low levels over the past few years (0.11 to 2.26 mg/L or milligrams per liter). Other compounds detected in Rimrock Colony's source water monitoring over the past 5 years include fluoride (0.28 mg/L) and selenium (0.01 mg/L). The compounds detected are all below EPA primary maximum contaminant levels (MCLs) where established. National secondary drinking water standards (SMCLs) are non-enforceable guidelines regarding contaminants that may cause cosmetic effects (such as taste, odor, or color) and are generally not a health risk. No violations are on record for the period reviewed.

CHAPTER 2 DELINEATION

The source water protection area, the land area that contributes water to the Rimrock Colony is identified in this chapter. Three management areas are identified for the PWS: the control zone, inventory region, and recharge region. The control zone, also known as the exclusion zone, is an area at least 100-foot radius around each well. The inventory region represents the zone of contribution of the wells, which typically approximates a three-year groundwater time-of-travel. For the Rimrock Colony, a 1,000-foot radius around the well was designated the inventory region. The recharge region represents the area where the source aquifer is replenished.

GENERAL GEOLOGIC AND HYDROGEOLOGIC SETTING

This section provides an overview of the geology and hydrology of the Rimrock Colony area, and is based on a primarily on a geologic map of the area by Alt (1988) and the well logs for the Rimrock Colony PWS wells and regional well logs available from the Montana Bureau of Mines and Geology (MBMG) Ground-Water Information Center (GWIC). A regional geologic map is provided in [Figure 2](#). The geology of the area can be used to determine the locations, boundaries, and hydraulic properties of local aquifers. An understanding of hydrogeologic conditions also provides an explanation for the sensitivity of local aquifers to potential contaminant sources.

The primary well (Well 2) is completed in the Telegraph Creek Formation. The Telegraph Creek Formation is the basal unit of the Montana Group. The Telegraph Creek is a sandy shale and is transitional between the overlying Eagle Sandstone and the underlying bentonitic shales of the Kevin Member of the Marias River Formation. The Two Medicine Formation is a shale that swells when wet and produces a "gumbo". The gumbo forms an impervious layer to surface water infiltration.

[Figure 2. Geology of the Area](#)

PWS WELL INFORMATION

Rimrock Colony's drinking water is supplied by one well (Well 2). Well 2 is located on the north edge of the access road to the Colony's building complex. The well is 223 feet deep and appears to be

completed with an open bottom that taps the Cretaceous Telegraph Creek Formation. The well log does not list the stratigraphy the driller encountered. Another well (Well 1) provides a backup supply. This well is 142 feet deep, and completed in the Virgelle member of the Eagle Sandstone.

Copies of the well logs are included in Appendix B and are summarized in Table 2.

Table 2. Rimrock Colony PWS Supply Well Information

PWS Name Well Number	Well #2	Well #1
DEQ Well Name/ Source Code	WL003	WL002
GWIC ID	89921	150152
DNRC Water Right	NA	NA
Well Location	48° 53.87'	48° 53.74'
Well Elevation	48° 53.86'	112° 05.33'
Date Completed	11/1/59	5/3/64
Total Depth (bgs)	223.0 ft	142.4 ft
Well Completion: Casing	Open bottom	Open bottom
Well Completion: Screen	NA	NA
Well Completion: Annular Seal	NA	NA
Static Water Level (at time of drilling)	200.0 ft	130.19 ft
Well Pump Test Data	10 gpm Norbeck MBMG 95	NA

CONCEPTUAL MODEL AND ASSUMPTIONS

Rimrock Colony's production well is located approximately three miles west of the north-south trending escarpment that forms the east end of the Sweet Grass Arch. The surface grade is to the east toward the escarpment. The formations dip to the east and north, (which is located within the Lower Missouri River Watershed Management Region for Montana) toward the Red River, which flows north and joins the Milk River in Canada.

Using DEQ Source Water Protection Program criteria for ranking aquifer sensitivity (Table 3), the Rimrock Colony's source water is considered as having **Low Source Water Sensitivity** to contamination because the aquifer is consolidated sandstone bedrock. Sensitivity is defined as the relative ease that contaminants can migrate to source water.

Table 3. Source Water (Aquifer) Sensitivity Criteria

Based on DEQ Source Water Protection Program Criteria (DEQ, 1999)

High	Moderate	Low
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<ul style="list-style-type: none"> • Surface water and GWUDISW • Unconsolidated Alluvium (unconfined) • Fluvial-Glacial Gravel • Terrace and Pediment Gravel • Shallow Fractured or Carbonate Bedrock 	<ul style="list-style-type: none"> • Semi-consolidated Valley Fill sediments (semi-confined) • Unconsolidated Alluvium (semi-confined) 	<ul style="list-style-type: none"> • Consolidated Sandstone Bedrock • Deep Fractured or Carbonate Bedrock • Semi-consolidated • Confined Aquifers 	<p>DELINE ATION Methods and criteria</p>
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for delineating source water protection areas are specified in the Montana Source Water Protection Program (DEQ, 1999). Source water protection areas delineated for the Rimrock Colony PWS include a control zone, an inventory region and a recharge region. The delineated inventory region for the well is shown on [Figure 3](#).

Control Zone – A 100-foot radius control zone is delineated for Rimrock Colony’s well. All sources of potential contaminants should be excluded in this region.

Inventory Region - For the Rimrock Colony well, the DEQ’s Source Water Protection Program criteria for a consolidated sandstone bedrock aquifer was followed. The inventory zone was delineated using a 1,000-foot radius centered on each well. The 1,000-foot radius is the default delineation and was chosen because of the isolated nature of the colony. All sources of potential contaminants are inventoried in this region.

Recharge Region –The recharge region lies to the south and east of the colony, where the formations are exposed in outcrop.

LIMITING FACTORS

Delineation of the source water protection areas for the Rimrock Colony wells is based on published reports and lithology indicated on the well logs. The delineation was completed using conservative assumptions to help ensure that the inventory zone reflects the actual area where contamination to the system may occur.

[Figure 3](#). . Rimrock Colony Inventory Region and Potential Sources of Contamination

CHAPTER 3

INVENTORY

INVENTORY METHOD

An inventory of significant potential contaminant sources was conducted to assess the susceptibility of Rimrock Colony's wells to contamination and to provide a foundation for source water protection planning. The inventory for Rimrock Colony focuses on point sources that generate, use, or store potential contaminants and certain land uses in the inventory region delineated in the previous section. Sources of primary drinking water contaminants and pathogens are identified, although only potential sources of contaminants that are the greatest threat to human health were selected for detailed inventory.

It is important to remember that the sites and areas identified in this section are only potential sources of contamination to the drinking water. Contamination of the drinking water is not likely to occur when potential contaminants are properly used and managed. Not all of these inventoried activities pose actual high risks to your public water supply. The day-to-day operating practices and contamination awareness varies considerably from one facility or land use activity to another.

The inventory for the Rimrock Colony PWS focuses on all activities in the control zones for the wells; certain types of municipal and private facilities or land uses in the inventory region; potential sources of nitrates and pathogens in the surface water buffer; and general land uses and large facilities in the Recharge Region. Databases were searched to identify businesses and land uses that are potential sources of regulated contaminants. The process for completing the inventory included several steps, which are summarized as follows:

Step 1: Land uses were identified from the U.S. Geological Survey's Geographic Information Retrieval and Analysis System (<http://nris.state.mt.us/gis/datalist.html>). Sewered and unsewered residential land uses were identified from boundaries of sewer coverage obtained from municipal wastewater utilities.

Step 2: EPA's Envirofacts System (<http://www.epa.gov/enviro/>) was queried to identify EPA regulated facilities located in the inventory region. This system accesses facilities listed in the following databases: Resource Conservation and Recovery Information System (RCRIS), Biennial Reporting System (BRS), Toxic Release Inventory (TRI), and Comprehensive Environmental Response Compensation and Liability Information System (CERCLIS) and the Permit Compliance System (PCS - for Concentrated Animal Feeding Operations with MPDES permits). The available reports were browsed for facility information including the Handler/Facility Classification to be used in assessing whether a facility should be classified as a significant potential contaminant source.

Step 3: Databases were queried to identify the following in the inventory region:

- Underground Storage Tanks (UST) (<http://www.deq.state.mt.us/UST/USTDownloads.asp>)
- Hazardous waste contaminated sites (DEQ hazardous waste site cleanup bureau),
- Landfills (<http://nris.state.mt.us/gis/datalist.html>), and
- Abandoned and active mines including gravel pits (<http://nris.state.mt.us/gis/datalist.html>)

Any information on past releases and present compliance status was noted.

Step 4: Major road and rail transportation routes were identified if within the inventory region (<http://nris.state.mt.us/gis/datalist.html>).

Step 5: Public water system officials, or someone they designated as knowledgeable of the area, were interviewed to identify potential sources that are not listed in databases or on maps elsewhere (such as animal feeding operations that are not required to obtain a permit) and to assist in locating potential sources listed in the state and federal databases.

Potential contaminant sources are designated as significant if they fall into one of the following categories:

1. Large quantity hazardous waste generators.
2. Landfills.
3. Underground storage tanks.
4. Known groundwater contamination (including open or closed hazardous waste sites, state or federal superfund sites, and UST leak sites).
5. Underground injection well.
6. Major roads or rail transportation routes.
7. Cultivated cropland greater than 20 % of the inventory region.
8. Animal feeding operations.
9. Wastewater treatment facilities, sludge handling sites, or land application areas.
10. Septic systems.
11. Sewer mains.
12. Storm sewer outflows.
13. Abandoned or active mines

CONTROL ZONE INVENTORY RESULTS

The control zone around the main PWS Well is near the main access road for the colony complex. Vehicle traffic could come within the control zone.

INVENTORY REGION RESULTS

The inventory results for Rimrock Colony's source water are summarized in Table 4 and are shown on [Figure 3](#). The inventory region includes:

- Underground storage tanks, one for unleaded gasoline and one for diesel, and one 10,000-gallon aboveground storage tank for farm diesel are located at the colony's shop.
- Agricultural herbicides are mixed at the shops.
- Human waste is piped through sewer mains from the colony to sewage lagoons east of the colony complex.

Additional point sources of potential pollutants (such as businesses or facilities listed on regulatory databases) were not identified in the inventory region.

Potential contaminants sources at the colony include cropped agricultural land, livestock management and grazing areas, the slaughterhouse, sewers and lagoons, vehicle/equipment shops, chemical storage/mixing/loading areas, and fuel storage tanks. The identified hazards are chemical or fuel spills, excess application of herbicides, spills at the chemical mixing station, runoff from the stockyard and slaughterhouse, and leakage from sewer mains (Table 4).

Land uses within the inventory region include primarily pasture and crops. Septic system density within the inventory region is low and is not considered a risk to the PWS drinking water. Additional point sources of potential pollutants (such as businesses or facilities listed on regulatory databases) were not identified in the inventory region.

Table 4. Summary of Potential Contaminant Sources in the Inventory Region

<i>Source Type</i>	<i>Potential Contaminants</i>	<i>Description/Concern</i>
Land Use Cover (Step 1)		
Agricultural crop land	Pathogens, nitrates, pesticides and herbicides	Over-application or improper handling of pesticides or fertilizers may impact drinking water.
Livestock barn and stockyards	Pathogens, nitrates	If not properly designed, maintained and removed the waste can show up in the aquifer initially as increased nitrate levels in the groundwater.
EPA Envirofacts Sites (Step 2)		
None Identified		
DEQ Databases (Step 3)		
None Identified		
Miscellaneous Others, including Steps 4 and 5		
Colony access road	Pesticides, herbicides, fuels	Spills of transported chemicals in Control Zone
Slaughterhouse and butcher shop	Pathogens and nitrates	Runoff and leaching in to groundwater
Fuel storage tanks	Petroleum compounds	Spills, leaks, leaching into groundwater
Chemical storage, mixing, loading areas	Pesticides, herbicides	Spills, leaks, leaching into groundwater
Sewage lagoons	Pathogens and nitrates	Leaks and spills

Recharge Region Inventory Results

Land cover in the recharge region is reported in the 1992 National Land Cover dataset (Figure 4) to be primarily pasture with small grain agricultural land. The percentage of agricultural land is considered a moderate risk to the drinking water supply. Grasslands are not considered potential sources of contamination unless there are significant grazing operations in the area.

Figure 4. Land Cover in Recharge Region

Septic system density within the watershed/recharge region is low and is not considered a

risk to the PWS drinking water.

Additional point sources of potential pollution (such as businesses or facilities listed on regulatory databases) were not identified in the recharge region.

INVENTORY UPDATE

To make this SWDAR a useful document for the years to come, the certified water system operator should update the inventory every year. Changes in land uses or potential contaminant sources should be noted and additions made as needed. The complete inventory should be submitted to DEQ every five years to ensure the source water delineation and assessment remains current.

INVENTORY LIMITATIONS

The potential contaminant sources described above are identified from readily available information. Consequently, unregulated activities or unreported contaminant releases may have been overlooked. The use of multiple sources of information, however, should ensure that the major threats to the source water for Rimrock Colony's public water supply are identified. That a potential contaminant source is not identified does not mean that the potential for contamination does not exist or there is not a threat. It is highly recommended that the colony enhance or refine the identification of the potential contamination sources through further research and local input.

CHAPTER 4

SUSCEPTIBILITY ASSESSMENT

GENERAL DISCUSSION

Susceptibility is the potential for a public water supply to draw water contaminated by inventoried sources at concentrations that would pose a concern. Susceptibility is assessed in order to prioritize potential pollutant sources for management actions by local entities, in this case the Rimrock Colony PWS managers and operators. The goal of Source Water Management is to protect the source water by 1) controlling activities in the control zone, 2) managing significant potential contaminant sources in the inventory region, and 3) ensuring that major land use activities or other significant activities in the recharge region pose minimal threat to the source water. Management priorities in the inventory region are determined by ranking the significant potential contaminant sources identified in the previous chapter according to susceptibility. Alternative management approaches that could be pursued by the PWS managers and operators to reduce susceptibility are recommended in this chapter.

HAZARD DETERMINATION

The proximity of a potential contaminant source to a spring or well intake, potential contaminant migration pathways, or the density of potential non-point contaminant sources determines the threat of contamination, referred to here as hazard (Table 5). Hazard and the existence of barriers to contamination determine susceptibility, which is described in Table 6. Table 5 below describes the criteria to determine hazard within the inventory region as it was delineated in this SWDAR. Note that this table is specific to unconfined aquifers. The determination of hazard is somewhat different for other types of water sources.

Table 5. Hazard Assessment for Unconfined Aquifers

Type of Potential Contaminant Source	High Hazard	Moderate Hazard	Low Hazard
Septic System Density (# per square mile)	More than 300 septic systems per sq. mile	Between 50 and 300 septic systems per sq. mile	Less than 50 septic systems per sq. mile
Municipal or Community Sanitary Sewer (% land use)	More than 50 percent of the inventory region	Between 20 and 50 percent of the inventory region	Less than 20 percent of the inventory region
Agricultural (% land use)	More than 50 percent of the inventory region	Between 20 and 50 percent of the inventory region	Less than 20 percent of the inventory region
Point sources of all contaminants	Within 1-year TOT	Between 1 to 3 years TOT	Over 3 years TOT

Note: Highlighted areas are those relevant to the Rimrock Colony inventory region

TOT – Time of travel

DISCUSSION OF SUSCEPTIBILITY

Susceptibility is determined by considering the hazard rating for each potential contaminant source and the existence of barriers that decrease the likelihood that contaminated water will flow to the Rimrock Colony PWS well intake (Table 6).

Table 6. Susceptibility Based on Hazard and Barriers

Presence Of Barriers	Hazard		
	High	Moderate	Low
No Barriers	Very High Susceptibility	High Susceptibility	Moderate Susceptibility
One Barrier	High Susceptibility	Moderate Susceptibility	Low Susceptibility
Multiple Barriers	Moderate Susceptibility	Low Susceptibility	Very Low Susceptibility

Barriers to contamination can be anything that decreases the likelihood that contaminants will reach a water source. Barriers can be engineered structures, management actions, or natural conditions. Examples of engineered barriers are spill catchment structures for industrial facilities and leak detection for underground storage tanks. Emergency planning and best management practices are considered management barriers. Thick clay-rich soils, a deep water table or a thick unsaturated zone above the well intake can be natural barriers.

A summary of the susceptibility assessment for Rimrock Colony PWS well is located in Table 7. Table 7 only includes the potential contaminant sources identified in Chapter 3 that were determined to present a significant potential risk to the drinking water supply. It is highly recommended that the PWS operator and community members familiar with the nature of businesses and land use in the area enhance the inventory through further research and local input.

MANAGEMENT RECOMMENDATIONS

It should be noted that even small releases of some chemicals in close proximity to a public water supply well can have significant negative impact on water quality, and therefore are a significant threat to the public water supply. Steps can be taken to reduce the likelihood of releases in the source water for the PWS or in the vicinity of the sources. Management recommendations for protecting Rimrock Colony's drinking water supply are detailed in the susceptibility table (Table 7). If these, and other, management recommendations are implemented, they may be considered additional barriers that will reduce the susceptibility of the intake to specific sources and contaminants.

Table 7. Susceptibility Assessment of Significant Potential Contaminant Sources

Potential Contaminant Source	Potential Contaminants	Hazard	Hazard Rating	Barriers	Susceptibility	Management Recommendations
Control Zone						
Colony access road	Fuels, pesticides, herbicides	Spills	N/A	None	N/A	Prohibit spraying along access road
Inventory Region						
Cropped Agricultural Areas	Nitrate and SOCs from fertilizer, pesticides and herbicides.	Contaminants leaching into groundwater	High	Low permeability soils, management actions	Moderate	Use agricultural best management practices (BMPs) and apply all chemicals according to label instructions. Reduce chemical use in inventory region.
Animal Waste Management Areas (Barns, Dairy, Stockyard, Corral Areas)	Pathogens, nitrates, stored chemicals	Leaching from animal wastes, spills of chemicals used	Moderate	Management actions, i.e. good housekeeping	Moderate	Use best management practices (BMPs) to ensure wastes do not impact groundwater. Monitor integrity of animal waste storage units/areas. Dispose of wastes outside of inventory region. Recycle/dispose of waste chemicals properly. Ensure good housekeeping in chemical use areas.
Slaughterhouse/Butcher Shop	Pathogens and nitrates	Spills, runoff, contaminants leaching into groundwater	Moderate	Good housekeeping, sealed floors	Low	Use best management practices (BMPs) to ensure wastes do not impact groundwater. Monitor integrity of animal waste storage areas. Dispose of wastes outside of inventory region. Ensure good housekeeping and integrity of sealed floors.
Sewer Lines/ Sewage Lagoons	Pathogens, nitrates	Ongoing or catastrophic leakage of sewage into groundwater	Moderate	Monitoring	Moderate	
Vehicle/Equipment Maintenance Areas/Shops	Petroleum products, VOCs, SOCs and others	Spills or leaks of chemicals used	Moderate	Good housekeeping, sealed concrete floors	Low	Protect area from fuel or other chemical spills. Maintain sealed concrete floors. Ensure proper chemical and waste use, storage, and disposal/recycling. Ensure good housekeeping.
Chemical/Waste Storage, Handling, Mixing, and Cleaning Areas	Various Chemicals	Spills, leaks, runoff, infiltration into groundwater	Moderate	Good housekeeping, sealed concrete floors	Low	Limit volumes stored. Provide secondary containment for large volumes. Ensure prompt and complete cleanup of spills. Maintain sealed concrete floors. Ensure proper chemical and waste use, storage, and disposal/recycling. Follow label instructions. Ensure good housekeeping.
Fuel Storage Tanks	Petroleum products and VOCs	Spills or leaks	Moderate	Compliance with 1998 upgrades, spill prevention	Low	Ensure proper operation and maintenance. Properly abandon and remove USTs if out-of-service. Comply with inspection and permitting regulations.

Notes: VOCs - Volatile organic compounds (i.e. solvents, fuel components)

SOCs - Synthetic Organic Compounds (i.e. pesticides, herbicides, plasticizers)

CHAPTER 5

MONITORING WAIVERS

WAIVER RECOMMENDATION

The Rimrock Colony PWS has a Phase 2 inorganic waiver. The waiver allows the PWS to collect one sample round for these constituents every nine-year cycle (the standard is one sample round per three-year cycle). In addition, the PWS was grandfathered under the radionuclide rule and is only required to sample once every nine years. Based on past monitoring results and the susceptibility assessment, the Rimrock Colony PWS may be eligible for other waivers as well, including Phase 5 inorganics and volatile organic compounds. Information on susceptibility and use waivers is provided in this section to give the PWS operators an opportunity to consider if waivers are available.

Before a susceptibility or use waiver is requested, the PWS Operators are encouraged to carefully review the following section on Monitoring Waiver Requirements. If after reviewing this section it is determined that an additional waivers are feasible, the PWS should submit a letter to DEQ requesting the specific monitoring waivers. The PWS must be in compliance with monitoring requirements to be considered. If requested by DEQ, the PWS may also need to provide additional information regarding chemical use in the area within the Inventory Region.

MONITORING WAIVER REQUIREMENTS

The 1996 Amendments to the Safe Drinking Water Act require that community and non-community PWSs sample drinking water sources for the presence of volatile organic chemicals (VOCs) and synthetic organic chemicals (SOCs). The US EPA has authorized states to issue monitoring waivers for the organic chemicals to systems that have completed an approved waiver application and review process. All PWSs in the State of Montana are eligible for consideration of monitoring waivers for several organic chemicals. The chemicals diquat, endothall, glyphosate, dioxins, ethylene dibromide (EDB), dibromochloropropane (DBCP), and polychlorinated biphenyls are excluded from monitoring requirements by statewide waivers.

Use Waivers

A Use Waiver can be granted if through a vulnerability assessment, it is determined that specific organic chemicals were not used, manufactured, or stored in the area of a water source (or source area). If certain organic chemicals have been used, or if the use is unknown, the system would be determined to be vulnerable to organic chemical contamination and ineligible for a Use Waiver for those particular contaminants.

Susceptibility Waivers

If a Use Waiver is not granted, a system may still be eligible for a Susceptibility Waiver, if a vulnerability assessment demonstrates that the water source would not be susceptible to contamination. Susceptibility is based on prior analytical or vulnerability assessment results, environmental persistence, and transport of the contaminants, natural protection of the source, wellhead protection program efforts, and the level of susceptibility indicators (such as nitrate and coliform bacteria). PWSs developed in unconfined aquifers should use a minimum fixed radius of one mile as an area of investigation for the use of organic chemicals. The purpose of the vulnerability assessment procedures outlined in Montana Source Water Delineation and Assessment Report

this section is to determine which of the organic chemical contaminants are in the area of investigation.

Given the wide range of landforms, land uses, and the diversity of groundwater and surface water sources across the state, additional information is often required during the review of a waiver application. Additional information may include well logs, pump test data, or water quality monitoring data from surrounding public water systems; delineation of zones of influence and contribution to a well; time-of-travel or attenuation studies; vulnerability mapping; and the use of computerized groundwater flow and transport models. DEQ's PWS Section and DEQ's Source Water Protection Program will conduct review of an organic chemical monitoring waiver application. Other state agencies may be asked for assistance.

Susceptibility Waiver for Unconfined Aquifers

Unconfined aquifers are the most common source of usable groundwater. Unconfined aquifers differ from confined aquifers in that the groundwater is not regionally contained within relatively impervious geologic strata. As a result, the groundwater surface or water table in an unconfined aquifer is not under pressure producing the hydrostatic head that is common in confined aquifers.

Unconfined aquifers are usually locally recharged from surface water or precipitation. In general, groundwater flow gradients in unconfined aquifers reflect surface topography, and the residence time of water in the aquifer is comparatively shorter than for water in confined aquifers. Similar water chemistry often exists between unconfined groundwater and area surface water, and physical parameters and dissolved constituents can be an indicator of the hydraulic connection between groundwater and surface water. Consequently, unconfined aquifers can be susceptible to contamination by organic chemicals migrating from the ground surface to groundwater.

The objective of the susceptibility waiver application is to assess the potential of organic chemical migration from the surface to the unconfined aquifer. The general procedures make use of a combination of site-specific information pertaining to the location and construction of the source development, monitoring history of the source, geologic characteristics of the unsaturated soil and vadose zones, and chemical characteristics of the organic chemicals pertaining to their mobility and persistence in the environment. The zone of contribution of the unconfined groundwater source must be defined and plotted. This should describe the groundwater flow directions, gradients, and a 3-year time-of-travel. All surface bodies within 1,000 feet of the PWS well must be plotted. Analytical monitoring history of the PWS well and any nearby should be provided as well.

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GLOSSARY

Acute Health Effect. A negative health effect in which symptoms develop rapidly.

Alkalinity. The capacity of water to neutralize acids.

Aquifer. A water-bearing layer of rock or sediment that will yield water in usable quantity to a well or spring.

Barrier. A physical feature or management plan that reduces the likelihood of contamination of a water source from a potential contaminant source

Best Management Practices (BMPs). Methods for various activities that have been determined to be the most effective, practical means of preventing or reducing non-point source pollution.

Biennial Reporting System (BRS). An EPA database that contains information on hazardous waste sites. The data can be accessed through the EPA Envirofacts website.

Chronic Health Effect. A negative health effect in which symptoms develop over an extended period of time.

Class V Injection Well. Any pit or conduit into the subsurface for disposal of waste waters. The receiving unit for an injection well typically represents the aquifer, or water-bearing interval.

Coliform Bacteria. A general type of bacteria found in the intestinal tracts of animals and humans, and also in soils, vegetation and water. Their presence in water is used as an indicator of pollution and possible contamination by pathogens.

Comprehensive Environmental Cleanup and Responsibility Act (CECRA). Passed in 1989 by the Montana State Legislature, CECRA provides the mechanism and responsibility to clean up hazardous waste sites in Montana.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). Enacted in 1980. CERCLA provides a Federal “Superfund” to clean up uncontrolled or abandoned hazardous-waste sites as well as accidents, spills, and other emergency releases of pollutants and contaminants into the environment. Through the Act, EPA was given power to seek out those parties responsible for any release and assure their cooperation in the cleanup.

Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS). A database that provides information about specific sites through the EPA Envirofacts website.

Confined Animal Feeding Operation (CAFO). Any agricultural operation that feeds animals within specific areas, not on rangeland. Certain CAFOs require permits for operation.

Confined Aquifer. A fully saturated aquifer overlain by a confining unit such as a clay layer. The static water level in a well in a confined aquifer is at an elevation that is equal to or higher than the base of the overlying confining unit.

Confining Unit. A geologic formation present above a confined aquifer that inhibits the flow of water and maintains the pressure of the groundwater in the aquifer. The physical properties of a confining unit may range from a five-foot thick clay layer to shale that is hundreds of feet thick.

Delineation. The process of determining and mapping source water protection areas.

Glacial. Of or relating to the presence and activities of ice or glaciers. Also, pertaining to distinctive features and materials produced by or derived from glaciers.

Geographic Information Systems (GIS). A computerized database management and mapping system that allows for analysis and presentation of geographic data.

Hardness. Characteristic of water caused by presence of various calcium and magnesium salts. Hard water may interfere with some industrial processes and prevent soap from lathering.

Hazard. A relative measure of the potential of a contaminant from a facility or associated with a land use to reach the water source for a public water supply. The location, quantity and toxicity of significant potential contaminant sources determine hazard.

Hydraulic Conductivity. A constant number or coefficient of proportionality that describes the rate water can move through an aquifer material.

Hydrology. The study of water and how it flows in the ground and on the surface.

Hydrogeology. The study of geologic formations and how they effect groundwater flow systems.

Inventory Region. A source water management area for groundwater systems that encompasses the area expected to contribute water to a public water supply within a fixed distance or a specified three year groundwater travel time.

Lacustrine. Pertaining to, produced by, or formed in a lake or lakes.

Large Capacity Septic System. Defined by Underground Injection Control regulations as an on-site septic system serving 20 or more persons.

Leaking Underground Storage Tank (LUST). A release from a UST and/or associated piping into the subsurface.

Maximum Contaminant Level (MCL). Maximum concentration of a substance in water that is permitted to be delivered to the users of a public water supply. Set by EPA under authority of the Safe Drinking Water Act to establish concentrations of contaminants in drinking water that are protective of human health.

Montana Bureau of Mines and Geology – Groundwater Information Center (MBMG/GWIC). The database of information on all well drilled in Montana, including stratigraphic data and well construction data, when available.

Montana Pollutant Discharge Elimination System (MPDES). A permitting system that utilizes a database to track entities that discharge wastewater of any type into waters of the State of Montana.

National Pollutant Discharge Elimination System (NPDES). A national permitting system that utilizes a database to track entities that discharge wastewater into waters of the United States.

Nitrate. An important plant nutrient and type of inorganic fertilizer that can be a potential contaminant in water at high concentrations. In water the major sources of nitrates are wastewater treatment effluent, septic tanks, feed lots and fertilizers.

Nonpoint-Source Pollution. Pollution sources that are diffuse and do not have a single point of origin or are not introduced into a receiving stream from a specific outlet. Examples of nonpoint- source pollution include agriculture, forestry, and run-off from city streets. Nonpoint sources of pollution, such as the use of herbicides, can concentrate low levels of these chemicals into surface and/or groundwaters at increased levels that may exceed MCLs.

Pathogens. A microorganism typically found in the intestinal tracts of mammals, capable of producing disease.

Phase II (and IIB) Rules. EPA updated or created legal limits on 38 contaminants. The rules became effective July 30, 1992 and January 1, 1993. Some of these contaminants are frequently-applied agricultural chemicals such as nitrate and others are industrial solvents.

Phase V Rule. EPA set standards for 23 contaminants in addition to those addressed by the Phase II Rules. The Phase V Rule became effective January 17, 1994. Some of these contaminants include inorganic chemicals such as cyanide and other Phase V contaminants are pesticides that enter water supplies through run-off from fields where farmers have applied them or by leaching through the soil into groundwater. Six are probable cancer-causing agents. Others can cause liver and kidney damage, or problems of the nervous system and brain.

Point Source. A stationary location or a fixed facility from which pollutants are discharged. This includes any single identifiable source of pollution, including but not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fracture, container, rolling stock (tanker truck), or vessel or other floating craft, from which pollutants are or may be discharged.

Pollutant. Generally, any substance introduced into the environment that adversely affects the usefulness of a resource (e.g. groundwater used for drinking water).

Permit Compliance System (PCS). An EPA database that provides information on the status of required permits for specific activities for specific facilities. The data can be accessed through the EPA Envirofacts website.

Public Water System (PWS). A system that provides water for human consumption through at least 15 service connections or regularly serves 25 individuals.

Pumping Water Level. Water level elevation in a well when the pump is operating.

Recharge Region. An area in which water is absorbed that eventually reaches the zone of saturation in one or more aquifers. As a source water management region, the term generally describes the entire area that could contribute water to an aquifer used by a public water supply. Includes areas that could contribute water over long time periods or under different water usage patterns.

Resource Conservation and Recovery Act (RCRA). Enacted by Congress in 1976. RCRA's primary goals are to protect human health and the environment from the potential hazards of waste disposal, to conserve energy and natural resources, to reduce the amount of waste generated, and to ensure that wastes are managed in an environmentally sound manner.

Resource Conservation and Recovery Information System (RCRIS). Is a database that provides information about specific sites through the EPA Envirofacts website.

Secondary Maximum Contaminant Levels (SMCL). The maximum concentration of a substance in water that is recommended to be delivered to users of a public water supply based on aesthetic qualities. SMCLs are non-enforceable guidelines for public water supplies, set by EPA under authority of the Safe Drinking Water Act. Compounds with SMCLs may occur naturally in certain areas, limiting the ability of the public water supply to treat for them.

Section Seven Tracking System (SSTS). SSTS is an automated system EPA uses to track pesticide producing establishments and the amount of pesticides they produce.

Source Water. Any surface water, spring, or groundwater source that provides water to a public water supply.

Source Water Delineation and Assessment Report (SWDAR). A report for a public water supply that delineates source water protection areas, provides an inventory of potential contaminant sources within the delineated areas, and evaluates the relative susceptibility of the source water to contamination from the potential contaminant sources under “worst-case” conditions.

Source Water Protection Areas. For surface water sources, the land and surface drainage network that contributes water to a stream or reservoir used by a public water supply. For groundwater sources, the area within a fixed radius or three-year travel time from a well, and the land area where the aquifer is recharged.

Spill Response Region. A source water management area for surface water systems that encompasses the area expected to contribute water to a public water supply within a fixed distance or a specified four-hour water travel time in a stream or river.

Standard Industrial Classification (SIC) Code. A method of grouping industries with similar products or services and assigning codes to these groups.

Static Water Level (SWL). Water level elevation in a well when the pump is not operating.

Susceptibility (of a PWS). The relative potential for a PWS to draw water contaminated at concentrations that would pose concern. Susceptibility is evaluated at the point immediately preceding treatment or, if no treatment is provided, at the entry point to the distribution system.

Synthetic Organic Compounds (SOC). Man made organic chemical compounds (e.g. herbicides and pesticides).

Total Dissolved Solids (TDS). The dissolved solids collected after a sample of a known volume of water is passed through a very fine mesh filter.

Total Maximum Daily Load (TMDL). The total pollutant load to a surface water body from point, nonpoint, and natural sources. The TMDL program was established by section 303(d) of the Clean Water Act to help states implement water quality standards.

Toxicity. The quality or degree of being poisonous or harmful to plants, animals, or humans.

Toxicity Characteristic Leachate Procedure. A test designed to determine whether a waste is hazardous or requires treatment to become less hazardous.

Toxic Release Inventory (TRI). An EPA database that compiles information about permitted industrial releases of chemicals to air and water. Information about specific sites can be obtained through the EPA Envirofacts website.

Transmissivity. A number that describes the ability of an aquifer to transmit water. The transmissivity is determined by multiplying the hydraulic conductivity time the aquifer thickness.

Turbidity. The cloudy appearance of water caused by the presence of suspended matter.

Unconfined Aquifer. An aquifer containing water that is not under pressure. The water table is the top surface of an unconfined aquifer.

Underground Storage Tanks (UST). A tank located at least partially underground and designed to hold gasoline or other petroleum products or chemicals, and the associated plumbing system.

Volatile Organic Compounds (VOC). Chemicals such as petroleum hydrocarbons and solvents or other organic chemicals that evaporate readily to the atmosphere.

Watershed. The region drained by, or contributing water to, a stream, lake, or other water body of water.

Appendix A
PWS Sanitary Survey

Appendix B
PWS Well Logs

Appendix C
PWS Water Quality Reports

Ground-Water Information Center

Site Name: RIMROCK COLONY Well 1

Water Quality Report

Report Date: 12/20/2004

Location Information

Sample Id/Site Id: 1996Q0178 / 150152

Location (TRS): 36N 04W 11 ACBB

Latitude/Longitude: 48° 53' 42" N 112° 5' 25" W

Datum: NAD27

Altitude:

County/State: TOOLE / MT

Site Type: WELL

Geology: 211TMDC

USGS 7.5' Quad: HILLSIDE COLONY

PWS Id: 01783002

Project: GLACCO, PWSINV

Sample Date: 8/2/1995 10:00:00 AM

Agency/Sampler: MBMG / PMN

Field Number: 360411C

Lab Date: 9/22/1995

Lab/Analyst: MBMG / TSH

Sample Method/Handling: PUMPED / 3120

Procedure Type: DISSOLVED

Total Depth (ft): 142.400

SWL-MP (ft): NR

Depth Water Enters (ft): NR

Major Ion Results

	mg/L	meq/L		mg/L	meq/L
Calcium (Ca)	76.900	3.837	Bicarbonate (HCO3)	510.770	8.372
Magnesium (Mg)	42.800	3.522	Carbonate (CO3)	0.000	0.000
Sodium (Na)	139.700	6.077	Chloride (Cl)	6.500	0.183
Potassium (K)	3.200	0.082	Sulfate (SO4)	250.000	5.208
Iron (Fe)	<.003	0.000	Nitrate (as N)	0.150	0.011
Manganese (Mn)	0.116	0.004	Fluoride (F)	0.190	0.010
Silica (SiO2)	9.600		Orthophosphate (OPO4)	<.1	0.000
Total Cations		13.611	Total Anions		13.783

Trace Element Results (µg/L)

Aluminum (Al):	<30.	Cadmium (Cd):	<2.	Mercury (Hg):	NR	Tin (Sn):	NR
Antimony (Sb):	<2.	Chromium (Cr):	<2.	Molybdenum (Mo):	<10.	Titanium (Ti):	<10.
Arsenic (As):	<1.	Cobalt (Co):	<2.	Nickel (Ni):	2.900	Thallium (Tl):	NR
Barium (Ba):	15.800	Copper (Cu):	5.700	Silver (Ag):	<1.	Uranium (U):	NR
Beryllium (Be):	<2.	Lead (Pb):	3.900	Selenium (Se):	<1.	Vanadium (V):	<5.
Boron (B):	319.000	Lithium (Li):	25.000	Strontium (Sr):	2,575.000	Zinc (Zn):	14.700
Bromide (Br):	<50.					Zirconium (Zr):	<20.

Field Chemistry and Other Analytical Results

**Total Dissolved Solids:	780.790	Field Hardness as CaCO3:	NR	Ammonia (mg/L):	NR
**Sum of Diss. Constituents:	1,039.950	Hardness as CaCO3:	368.180	T.P. Hydrocarbons (µg/L):	NR
Field Conductivity (µmhos):	1,151.000	Field Alkalinity as CaCO3:	NR	PCP (µg/L):	NR
Lab Conductivity (µmhos):	1,183.000	Akalinity as CaCO3:	418.920	Phosphate, TD (mg/L as P):	NR
Field pH:	7.200	Ryznar Stability Index:	5.784	Field Nitrate (mg/L):	NR
Lab pH:	8.200	Sodium Adsorption Ratio:	3.170	Field Dissolved O2 (mg/L):	NR
Water Temp (°C):	11.000	Langlier Saturation Index:	1.208	Field Chloride (mg/L):	NR
Air Temp (°C):	NR	Nitrite (mg/L as N):	<.05	Field Redox (mV):	NR

Additional Parameters

Phosphate T Dis (mg/L - P) L.2

Notes

Sample Condition:

Field Remarks:

Lab Remarks:

Explanation: mg/L = milligrams per Liter; µg/L = micrograms per Liter; ft = feet; NR = No Reading in GWICQualifiers: A = Hydride atomic absorption; E = Estimated due to interference; H = Exceeded holding time; K = Na+K combined; N = Spiked sample recovery not within control limits; P = Preserved sample; S = Method of standard additions; * = Duplicate analysis not within control limits; ** = Sum of Dissolved Constituents is the sum of major cations (Na, Ca, K, Mg, Mn, Fe) and anions (HCO3, CO3, SO4, Cl, SiO2, NO3, F) in mg/L. Total Dissolved Solids is reported as equivalent weight of evaporation residue.**Ground-Water Information Center**

Site Name: RIMROCK COLONY Well 2

Water Quality Report

Report Date: 12/20/2004

[Compare to Water Quality Standards](#)**Location Information**

Sample Id/Site Id: 1996Q0179 / 89921

Location (TRS): 36N 04W 11 BBADCD

Sample Date: 8/2/1995 9:40:00 AM

Agency/Sampler: MBMG / PMN

Latitude/Longitude: 48° 53' 53" N 112° 5' 53" W

Datum: NAD27

Altitude: 3995.00

County/State: TOOLE / MT

Site Type: WELL

Geology: 211TMDC

USGS 7.5' Quad: HILLSIDE COLONY 7 1/2'

PWS Id:

Project: GLACCO

Field Number: 360411B

Lab Date: 9/22/1995

Lab/Analyst: MBMG / TSH

Sample Method/Handling: PUMPED / 3120

Procedure Type: DISSOLVED

Total Depth (ft): 223.000

SWL-MP (ft): NR

Depth Water Enters (ft): NR

Major Ion Results

	mg/L	meq/L		mg/L	meq/L
Calcium (Ca)	54.400	2.715	Bicarbonate (HCO3)	605.120	9.918
Magnesium (Mg)	40.100	3.300	Carbonate (CO3)	0.000	0.000
Sodium (Na)	294.100	12.793	Chloride (Cl)	11.000	0.310
Potassium (K)	2.800	0.072	Sulfate (SO4)	450.000	9.374
Iron (Fe)	0.007	0.000	Nitrate (as N)	0.900	0.064
Manganese (Mn)	<.002	0.000	Fluoride (F)	0.220	0.012
Silica (SiO2)	6.700		Orthophosphate (OPO4)	<.1	0.000
Total Cations		18.962	Total Anions		19.678

Trace Element Results (µg/L)

Aluminum (Al):	<30.	Cadmium (Cd):	<2.	Mercury (Hg):	NR	Tin (Sn):	NR
Antimony (Sb):	<2.	Chromium (Cr):	<2.	Molybdenum (Mo):	<10.	Titanium (Ti):	<10.
Arsenic (As):	<1.	Cobalt (Co):	<2.	Nickel (Ni):	3.400	Thallium (Tl):	NR
Barium (Ba):	9.900	Copper (Cu):	7.900	Silver (Ag):	<1.	Uranium (U):	NR
Beryllium (Be):	<2.	Lead (Pb):	<2.	Selenium (Se):	6.500	Vanadium (V):	<5.
Boron (B):	422.000	Lithium (Li):	17.000	Strontium (Sr):	1,837.000	Zinc (Zn):	26.400
Bromide (Br):	<50.					Zirconium (Zr):	<20.

Field Chemistry and Other Analytical Results

**Total Dissolved Solids:	1,158.350	Field Hardness as CaCO3:	NR	Ammonia (mg/L):	NR
**Sum of Diss. Constituents:	1,465.380	Hardness as CaCO3:	300.890	T.P. Hydrocarbons (µg/L):	NR
Field Conductivity (µmhos):	1,715.000	Field Alkalinity as CaCO3:	NR	PCP (µg/L):	NR
Lab Conductivity (µmhos):	1,669.000	Alkalinity as CaCO3:	496.300	Phosphate, TD (mg/L as P):	NR
Field pH:	7.400	Ryznar Stability Index:	5.947	Field Nitrate (mg/L):	NR
Lab pH:	8.190	Sodium Adsorption Ratio:	7.380	Field Dissolved O2 (mg/L):	NR
Water Temp (°C):	11.000	Langlier Saturation Index:	1.121	Field Chloride (mg/L):	NR
Air Temp (°C):	NR	Nitrite (mg/L as N):	<.05	Field Redox (mV):	NR

Appendix D
Concurrence Letter