Rockport Colony

Public Water System

PWSID # MT0001778

SOURCE WATER DELINEATION AND ASSESSMENT REPORT

11/99

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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 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.

Community. A town, neighborhood or area where people live and prosper.

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 does not allow the flow of water, maintaining the pressure of the ground water in the aquifer. The physical properties of a confining unit may range from a five-feet thick clay layer to a shale that is hundreds of feet thick.

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

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

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 ground water flow systems.

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

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 – Ground Water Information Center (MBMG/GWIC). The database of information on all wells drilled in Montana, including stratigraphic data and well construction data, when available.

Montana Pollutant Discharge Elimination System (MPDES). Database system to track entities that discharge wastewater of any type into waters of the State of Montana.

National Pollutant Discharge Elimination System (NPDES). A national database system to track entities that discharge wastewater.

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. Nonpoint sources of pollution, such as the use of herbicides, can concentrate low levels of chemicals into surface and/or ground waters at increased levels that may exceed MCLs.

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

Point-Source. A stationary location or fixed facility from which pollutants are discharged.

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. 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. A source water management region that is generally 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. The Resource Conservation and Recovery Information System (RCRIS) 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 ground water source that provides water to a public water supply.

Source Water Assessment Report. A report for a public water supply that delineates source water protection areas, performs 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 ground water 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.

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.

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.

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 which evaporates readily to the atmosphere.

* Definitions adapted from EPA's Glossary of Selected Terms and Abbreviations (http://www.epa.gov/ceisweb1/ceishome/ceisdocs/glossary/glossary.html)

INTRODUCTION

This Delineation and Assessment Report was completed by James Swierc of the Source Water Protection Program at the Department of Environmental Quality with the assistance of Jacob Hofer of Rockport Colony. This Source Water Delineation and Assessment Report was prepared for the Rockport Hutterite Colony Public Water Supply, PWS ID# 01778, located in Teton County.

PURPOSE

This report is intended to meet the technical requirements for the completion of the delineation and assessment report for the Rockport Colony PWS as required by the Montana Source Water Protection Program (DEQ, 1999) and the federal Safe Drinking Water Act (SDWA) Amendments of 1996 (P.L. 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 of mapping source water protection areas, which contribute water used for drinking. Assessment involves identifying locations or regions in source water protection 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 the Rockport Colony PWS complete a source water protection plan to protect its drinking water source.

Limitations

This report was prepared to assess threats to the Rockport Colony 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 Rockport Colony public water supply and not any other public or private water supply. Also, not all potential or existing sources of groundwater or surface water contamination in the area of the Rockport 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 be significant health threats.

CHAPTER 1

BACKGROUND

The Community

The Rockport Hutterite Colony is located in Teton County, in north-central Montana, as shown in Figure 1. The nearest town is Pendroy which is located approximately 8 miles east of the colony. The nearest town with commercial services is Choteau (population 1802), located approximately 22 miles southeast of the colony. There are approximately 100 residents at the colony. The economy of the colony relies on the production of a variety of agricultural products.

The Colony complex comprises four 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. Human waste and animal processing wastes are treated in wastewater treatment lagoons located on the northeast part of the colony, away from the buildings.

Geographic setting

Rockport Colony is located in the foothills to the east of the central part of the Rocky Mountain Front Range (see Figure 1). The mountains in this area represent a significant feature with peaks that rise to an altitude of over 4,000 feet above the plains. The colony is located on the northern bank of the South Fork of the Dry Fork of the Marias River, which is an ephemeral stream in this area.

The climate is typical of northern Montana, with a limited amount of precipitation averaging 11.7 inches a year as measured at the Choteau Airport. The wettest months are May and June averaging 2.0 and 2.8 inches. The driest months are October through March, with monthly averages ranging from 0.3 to 0.5 inches per month. The temperature ranges from an average high of 82.2° F in July (minimum July average of 50.3° F) to an average of 33.5° F in January (minimum January average of 10.1° F).

General Description of the Source Water

The Rockport Hutterite Colony PWS draws water from three wells, located as shown in Figure 1. The well depths are approximately 87, 90 and 99 feet below ground surface. A fourth well was disconnected from the system due to elevated nitrate levels, and is maintained as a backup well for the system. The source aquifer comprises sandstones overlying shales of the lower part of the Two Medicine Creek Formation. The source aquifer is considered to be unconfined in the area of the colony. Bedrock is exposed in the hills surrounding the colony. The source aquifer is recharged by infiltration of surface water and precipitation in the area to the west of the colony. Shallow ground water flow in the area of the colony is considered likely to flow northeast from the recharge area,

generally following topography and the gradient of the South Fork of the Dry Fork of the Marias River, toward Rockport Colony. The area is located within the Marias River watershed (USGS Hydrologic Unit Code 10030203), located within the Upper Missouri River Watershed.

The Public Water Supply

The configuration of the public water supply for Rockport Colony is outlined in the most recent sanitary inspection report completed by Will Garvin on November 24, 1986. A copy of this report is included in Appendix A. The following discussion summarizes information obtained from this report.

The water system for Rockport Colony serves a resident population of 100 people through 10 service connections located in the colony residential and other buildings. The general layout of the colony buildings and distribution system is depicted in Appendix A. The McKee Road Well (Source 002) is located 1,400 feet south of the colony. The second well (Source 004) is located north of the road and is 1,300 feet east of the colony. The third well (Source 005) is located south of the road and is 1,200 feet east of the colony. The backup well is the Sullivan Hill Well (Source 003), located 800 feet north of the colony. Use of this well was discontinued due to elevated levels of nitrates. The source of the nitrates to the well has not been determined. The well lithology and construction logs for the main wells and the backup well are included in Appendix B.

Water from the three active wells is pumped into a 14,000-gallon cistern located on the hill to the north of the colony. Water flows by gravity from the cistern through the distribution system into the colony. There is currently no treatment for the water.

Water Quality

Every PWS is required to perform monitoring for contamination to their water supply. The monitoring parameters typically include coliforms (as an indicator of pathogenic organisms), nitrates, metals and multiple chemicals. The monitoring schedule depends on many factors such as the size of the system, the water source for the PWS, the number of sources (e.g. wells), and land use in the vicinity. A specific monitoring program is designed for each PWS that follows the general protocols for operation of a PWS defined by DEQ following the guidelines originally established in the federal Safe Drinking Water Act.

A review of the DEQ PWS monitoring results database for the Rockport Colony PWS does not show any significant violations of any drinking water quality standards. A sample collected from the distribution system on June 11, 1996 indicated 20.6 ug/L of di-2-ethylhexylphthalate, a SOC commonly associated with sources such as plastics (e.g. PVC piping) and a variety of human activities. This chemical may also be the result of laboratory contamination. The results of confirmation sampling of the system on August 21, 1996 did not detect any concentrations of this chemical. Based on the resampling

data, the result of the initial detection of this chemical were voided, and attributed to laboratory contamination.

There is no readily available published information on water quality in the area from the source aquifer used by the Rockport Colony PWS.

CHAPTER 2

DELINEATION

The source water protection area, the land area that contributes water to Rockport Colony is identified in this chapter. Three management areas are identified within the source water protection area. These three regions are 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 the well. The inventory region represents the zone of contribution of the well, which approximates a three-year groundwater time-of-travel. The recharge region represents the entire portion of the aquifer which contributes water to the Rockport Colony water system.

Hydrogeologic Conditions

There are no published reports on the hydrogeology of the area around Rockport Colony. The following discussion of the hydrogeologic setting of the area is based on application of basic principles of hydrogeology. The interpretation is based on the geologic map of the area (Ross et. al., 1955), as depicted in Figure 2. Well logs for the area from the Ground Water Information Center at the Montana Bureau of Mines and Geology provided additional information on local geology. However, the area is sparsely populated and only limited information is available.

The Rockport Colony is located within the valley of the South Fork of the Dry Fork of the Marias River, which has incised into the bedrock surface. The aquifer is present in sandstones of the Two Medicine Creek Formation, with a shale layer present at the base, at a depth of approximately 75 feet below the ground surface (see well logs in Appendix B). The aquifer may also include the upper part of the Virgelle Sandstone. Fracture flow may represent the primary porosity for the aquifer, especially in more fine-grained layers. The primary aquifer for the Rockport Colony is considered unconfined in the area as a shallow fractured bedrock system. Based on this criteria, the aquifer is classified as having a high source water sensitivity to contamination.

Ground water flow in the vicinity of Rockport Colony is considered to be generally northeastward, following topography. The source wells do not have a high continuous yield, suggesting that ground water flow in the aquifer is generally slow. The aquifer is recharged by infiltration of surface water and precipitation into the subsurface in the area from the south to the west of the colony. Ground water flow in the aquifer occurs in the primary porosity of the sandstone, and in fractures in the bedrock which provide secondary porosity. The shale at the base of the aquifer keeps the system locally perched above any deeper regional systems that may be present in the area.

Conceptual Model and Assumptions

Ground water is recharged from infiltration of surface water and precipitation into the subsurface in the area southwest of Rockport Colony. Ground water flow generally follows the topographic gradient to the northeast through the colony.

Well Information

Very little information is available about the McKee Road well. The Sullivan Hill well is approximately 90 feet deep. The North of Road well is completed to a depth of 87 feet with a 12 foot screened intake over sandstone. The South of Road well is approximately 99 feet deep, with a 35 foot screened intake over sandstone and shale. Both wells are constructed of PVC well materials and are protected with 6-inch diameter steel casing. The northern well yields 50 gpm, and the southern well yields 20 gpm. The well locations are depicted in Figure 1, and the well logs are included in Appendix B.

Table 1. Source well information for Rockport Colony.

Information	**Well #1** **"McKee Road Well"**	**Well #2** **"Sullivan Hill Well"** (inactive backup well)	**Well #3** **"North of Road Well"**	**Well #4** **"South of Road Well"**
PWS Source Code	002	003	004	005
Well Location	1400 ft S of colony	800 ft N of colony	1300 ft E of colony	1200 ft E of colony
MBMG #	*Not Listed*	*Not Listed*	M80184	M80185
Water Right #	*Not Listed*	*Not Listed*	51287	51286
Date Well was Completed	*Not Listed*	1970	May 6, 1983	May 3, 1983
Total Depth	*Not Listed*	90’	87’	99’
Perforated Interval	*Not Listed*	*Not Listed*	50’-62’	35’-70’

Static Water Level	*Not Listed*	*Not Listed*	28’	18’
Pumping Water Level	*Not Listed*	*Not Listed*	60’	70’
Drawdown	*Not Listed*	*Not Listed*	32’	52’
Test Pumping Rate	*Not Listed*	*Not Listed*	50gpm	20gpm
Specific Capacity	*Not Listed*	*Not Listed*	1.56 gpm/foot	0.38 gpm/foot

Methods and Criteria

The lack of any specific data on hydrologic characteristics of the area limits the ability to accurately estimate hydrologic flow rates. As a result, there is not sufficient data to estimate a three-year time of travel distance for the aquifer as required under the DEQ Source Water Protection program criteria for unconfined aquifers (DEQ, 1999). In order to establish an inventory zone that is protective of the water system at the Rockport Colony, the inventory zone is delineated based on a one-mile radius around the colony, biased towards the area hydrologically upgradient from the colony wells.

Delineation Results

The delineated management zones for the wells are depicted in Figure 3. The control zones comprise an area of a 100-foot radius around the wellheads. The inventory zone reflects an area with a one-mile radius around the wellheads. The recharge area reflects the areas within the inventory zone and south and west of the inventory zone.

Limiting Factors

The lack of site and regional hydrogeologic data represent the greatest potential source of error to accurate delineations of the management zones for the water sources at Rockport Colony. The inventory zone of a one-mile radius helps minimize the potential effects from the lack of hydrologic data for the area.

CHAPTER 3

INVENTORY

An inventory of potential sources of contamination was conducted for the Rockport Colony PWS within the control and inventory regions. Potential sources of all primary drinking water contaminants and Cryptosporidium were identified; however, only significant potential contaminant sources were selected for detailed inventory. The significant potential contaminants in the Rockport Colony PWS inventory region are nitrates and pathogens from the colony wastewater treatment systems and agricultural activities; and herbicides and pesticides from cropped agricultural land.

The inventory for the Rockport Colony PWS focuses on all activities in the control zone, certain sites or land use activities in the inventory region, and general land uses and large facilities in the recharge region.

Inventory Method

The inventory for Rockport Colony was obtained by visiting the colony, and discussing colony activities with representatives from the colony. Information on the PWS, land use, agricultural chemical storage and application, and waste disposal practices were identified at this time. Specific locations of relevant facilities were identified on a sketch map of the layout of the colony systems, provided to DEQ by the colony.

Urban and agricultural land uses were identified from the University of Montana GAP landuse analysis project (Redmond et. al., 1998). Major transportation routes through the area, including railroad lines, were also identified. This information is depicted in Figure 4.

As part of the standard inventory process, the information in available databases on environmental sites was reviewed. EPA's Envirofacts System 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), Permit Compliance System (PCS) and Comprehensive Environmental Response Compensation and Liability Information System (CERCLIS). DEQ Databases were queried to identify the following in the inventory region: Underground Storage Tanks (UST), hazardous waste contaminated sites (DEQ hazardous waste site cleanup bureau), landfills , abandoned mines, and active mines including gravel pits. Any information on past releases and present compliance status was noted.

- None of these types of facilities are located within a five-mile radius of Rockport Colony.

Inventory Results/Control Zone

All of the active PWS wells are located outside of the main area of the colony. As a result, the control zones for the wells are not located where any Colony agricultural activities occur. The control zones for the wells are not fenced. Chemical use in the control zones is limited to spot application of herbicides for weed control.

Inventory Results/Inventory Region

The inventory region for the PWS wells includes all of the farm facilities. No other potential contaminant sources were identified outside of the Colony. The potential contaminant sources include the dryland farming areas outside of the colony and the garden. The potential sources and the hazards are listed in Table 2, and identified in Figure 5.

Potential contaminant sources to the PWS wells, as identified in the inventory zone, include human and animal wastes, petroleum hydrocarbons, pesticides and herbicides. The primary hazards are chemical or fuel spills, excess application of herbicides/pesticides, runoff from the animal facilities into the ground water system, and leakage from sewer mains and lagoons.

Inventory Results/Recharge Region

The recharge region for the PWS wells is primarily used for dryland agriculture and cattle grazing. Use of weed control herbicides and fuels for farm machinery are the contaminants of concern in the recharge region.

Table 2. Significant potential contaminant sources in the inventory regions of Rockport Colony**.**

Source	Hazard
Housing	Leaking Sewer Lines
Barns (Chicken, Duck and Hogs)*	Leaking Sewer Lines or Collection System
Slaughterhouse/Butcher Shop	Leaching from Animal Wastes
Garden	Land Application of Animal Waste Spills and Excess Application of Herbicides
Truck, Tractor and Other Shops	Spills of chemicals used
Fuel Storage areas	Leakage of Tanks
Sewer Mains/Lagoons	Leaking and infiltration to ground water
Herbicide/Pesticide Storage	Leaking of stored chemical
Colonywide	Waste Chemical Spills
Access Road (County Road)	Spills of Transported Chemical
Cropped Agricultural Land	Land Application of Animal Waste Spills and Excess Application of Herbicides

* According to the PWS Operator, the Colony has a Confined Animal Feeding Operation Permit; however, the standard database queries did not identify the permit.

Inventory Update

The certified operator should update the inventory every year for his records. 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.

Inventory Limitations

The potential sources of contaminants for Rockport Colony are taken from data and reports that are readily available. Consequently, unregulated activities or unreported contaminant releases may have been missed. The use of multiple sources of data, however, should help assure that the identified contaminant sources represent the major threats to the source water for Rockport Colony.

CHAPTER 4

SUSCEPTIBILITY ASSESSMENT

Susceptibility is the potential for a public water supply to draw water contaminated by inventoried sources at concentrations that would pose concern. Susceptibility is assessed in order to prioritize potential pollutant sources for management actions by local entities, in this case the Rockport Colony PWS.

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 land use 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 are recommended as methods Rockport Colony can implement to reduce susceptibility of the PWS to contamination.

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 Rockport Colony PWS wells (Table 3). Hazard is rated by the proximity of the potential contaminant sources to the wells. Susceptibility ratings are presented individually for each significant potential contaminant source and each associated contaminant (Table 4). The susceptibility of each well to each potential contaminant source is assessed separately.

Table 3. Relative susceptibility to specific contaminant sources as determined by hazard and the presence of 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

For point sources, the relative hazard of the significant potential contaminant sources listed in Table 4 reflects the location of the sites relative to the PWS wells, and how long ground water would take to travel from that site to the wells. Sites located within a time of travel distance of less than one year are assigned a hazard ranking of high. Sites within a time of travel distance of one to three years are assigned a hazard ranking of moderate. The remaining sites located in the recharge region are assigned a hazard ranking of low.

For non-point sources, hazard levels are assigned based the following table:

Source Type	***High Hazard***	***Moderate Hazard***	***Low Hazard***
Septic Systems	> 300 per sq. mi.	50 – 300 per sq. mi.	< 50 per sq. mi.
Municipal Sanitary Sewer (% Land Use)	> 50% of region	20% – 50% of region	< 20% of region
Cropped Agricultural Land(% Land Use)	> 50% of region	20% – 50% of region	< 20% of region

For the Rockport Colony PWS, the majority of sites are assigned a relative hazard of high or moderate, with none of the identified sites located within the recharge region. All point sources for the colony are considered to be within a one-year time of travel distance. Since there is not sufficient data available to assess ground water flow rates, the assignment of relative hazards as high is to provide a conservative method of classifying the potential contaminant sources meeting DEQ program criteria. The primary barrier for

all of these is clay-rich soils that can inhibit migration of any released potential contaminants into the subsurface.

The results of the susceptibility assessment indicate that the colony buildings and activities all represent potential threats to the source water for the Rockport Colony PWS.

Table 4. Susceptibility assessment for significant potential contaminant sources**.**

Source	Contaminant	Hazard	Hazard Rating	Barriers	Susceptibility	Management
Housing and Domestic Sewers	Pathogens and Nitrate	Leaks	High	Low Permeability Soils	High	Leak Monitoring and Prompt Repair
Animal Barns	Pathogens and Nitrate	Leaks	High	Low Permeability Soils	High	Manage animal waste, Leak Monitoring and Prompt Repair
Slaughterhouse/ Butcher Shop	Pathogens and Nitrate	Runoff	High	Low Permeability Soils	High	Dispose of Wastes Outside Inventory Region
Garden	Pesticides/ Herbicides; Nitrate	Runoff	High	Low Permeability Soils	High	Use BMPs for chemical use
Truck, Tractor and other Shops	Various Chemicals	Spills	High	Low Permeability Soils	High	Develop BMPs for chemical use, storage and disposal
Fuel Storage	VOCs	Spills	High	Low Permeability Soils	High	Build Containment Around Storage Tanks
Chemical Storage	VOCs	Spills	High	Low Permeability Soils	High	Limit Volumes Stored, Provide Containment for Large Volumes
Sewer Lagoons	Pathogens and Nitrate	Leaking	High	Low Permeability Soils	High	Leak Monitoring and Prompt Repair
Animal Waste Collection System	Pathogens and Nitrate	Leaks	High	Low Permeability Soils	High	Leak Monitoring and Prompt Repair
Dairy Stockyards	Pathogens and Nitrate	Leaching	High	Low Permeability Soils	High	Follow Waste Management Plan

Waste Chemical Handling	VOCs, SOCs	Spills	High	Low Permeability Soils	High	Recycle / Dispose of Waste Chemicals Properly
Mixing Herbicides and Pesticides	SOCs	Spills	High	Low Permeability Soils	High	Apply Absorbent Material to Spills
Land Application of Human or Animal Wastewater	Pathogens and Nitrate	Leaching	High	Low Permeability Soils	High	Prohibit Within Inventory Region
Chemical Application (Cropped Agricultural Land)	SOCs	Leaching	High	Low Permeability Soils	High	Apply According to Label Instructions
Access Road	Various Chemicals	Spills	High	Low Permeability Soils	High	Develop emergency response protocol

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