Conrad Water Department
Public Water System
PWSID # MT0000186

SOURCE WATER DELINEATION AND ASSESSMENT REPORT

11/99

Date of Report: 08/21/02

City of Conrad
15 4th Ave SW
Conrad, MT 59425
(406) 278-3623

Contact Person:
Stephen Ruhd
4112 ½ South Main
Conrad, MT 59425

System Phone: (406) 278-5821

Certified Operators:
Stephen Ruhd
Douglas Wayne Moritz
Richard L. Anderson

Table of Contents

INTRODUCTION

This Delineation and Assessment Report was prepared by Perri Phillips, Hydrogeologist, and Kristine Berg in the Source Water Protection Program of the Montana Department of Environmental Quality (DEQ). The DEQ PWS identification number, contact person, and operator name for the Conrad Water Department PWS evaluated in this report appear on the title page of this report.

Purpose

This report is intended to meet the technical requirements for the completion of the source water delineation and assessment report for the Conrad Water Department 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 the protection of public drinking water supplies from contamination. The primary purpose of this source water delineation and assessment report is to provide information to assist the Conrad Water Department operator in the identification of potential contaminant sources in the vicinity of the Conrad Water Department surface water intake at Lake Frances, and the need for a source water protection plan to protect the Conrad Water Department drinking water source. Conrad Water Department may be a proposed source for the regional water system.

Delineation and assessment constitute major components of the Montana Source Water Protection Program. Delineation entails mapping the boundaries of source water protection areas, which encompass ground water and/or surface waters contributing to public water supply sources. Assessment involves identifying locations or regions within source water protection areas where contaminants may be generated, stored, transported, or disposed, and determining the relative susceptibility of drinking water to contamination from these sources.

Limitations

This report was prepared to assess threats to Conrad Water Department public water supply, and is based on published data and information obtained from local residents familiar with the community. The terms “drinking water supply” and “drinking water source” refer specifically to the sources of the Conrad Water Department PWS, 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 Conrad Water Department PWS are identified. Only potential sources of contamination in areas that contribute water to the identified drinking water sources are considered.

The terms “contaminant” and “toxin” are 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 carcinogenic or toxic constituents that do not have MCLs but are considered to be significant health threats.

CHAPTER 1
BACKGROUND

The Community

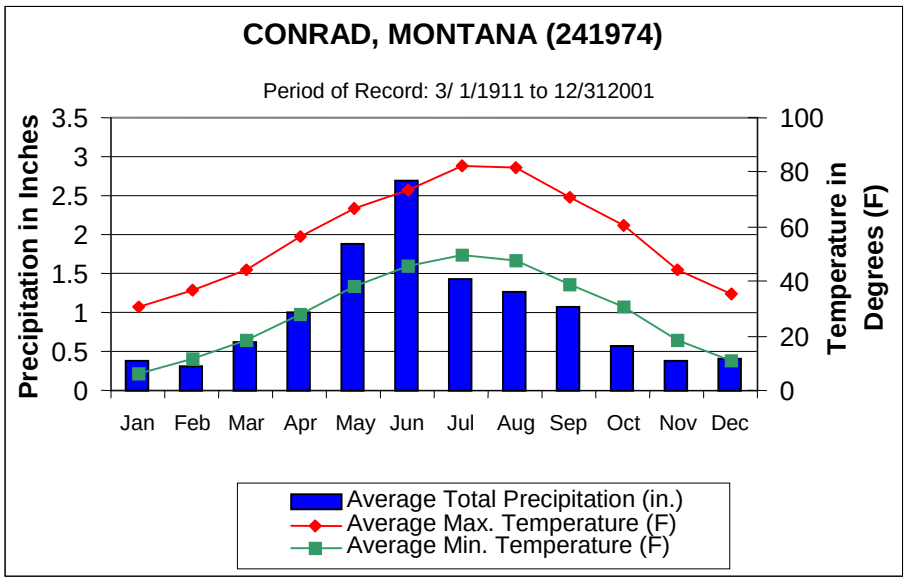
The City of Conrad is located in the eastern area of Pondera County, of which it is the county seat (Figure 1). The town is situated south of Pondera Coulee, a tributary to the Marias River. Conrad is located 54 miles northwest of Great Falls on Interstate 15. Interstate 15 connects Conrad with Brady to the south and Shelby to the north. According to the 2000 U.S. Census Bureau, Pondera County has a population of 6424, of which approximately 2880 reside in Conrad. The Burlington Northern Railroad runs north – south through Conrad.

The City of Conrad, established in 1903, was named after W. G. Conrad, who owned much of the land in the vicinity as part of his investment company. The town served as a station on the Great Northern Railroad branch line that ran from Great Falls to Shelby and then up to the Canadian border. Agriculture has sustained a large part of the economy near Conrad. Winter wheat, barley, spring crops and numerous livestock are produced in the Conrad area. The largest revenue-generating industries in Pondera County in 2000 were state and local government, 17.4 percent of earnings; services, 17.2 percent; and construction, 16.7 percent. A shift in industrial activities from farm to state and government can be seen, for in 1990, farm occupied 38.0 percent of the industries in Pondera County. (www.bea.doc.gov/bea/regional/bearfacts).

Within Conrad town limits, residents obtain their drinking water from the Conrad Water Department PWS. No additional community, transient, or non-community, non-transient PWSs are located in the vicinity of the City of Conrad. The municipal sanitary sewer serves town residents and the Conrad Wastewater Treatment Plant, located north of town, discharges into a tributary to the Dry Fork Marias River.

Climate

Figure 2. Conrad Average Temperatures and Precipitation



The climate in the Conrad area is considered semi-arid. It can be characterized by short, hot, dry summers and cold, dry winters (Garvin, 1975). Based on Western Regional Climatic Center data for the March 1, 1911 to December 31, 2001 period of record at the nearby weather station, annual precipitation averages 12.01 inches. Monthly average precipitation ranges from 0.32 inches in February to 2.69 inches in June (Figure 2).

Geographic Setting

Conrad is located in the Great Plains physiographic province of North America (Rocky Mountain Association of Geologist, 1972). The elevation of Conrad is approximately 3535 feet above mean sea level. Conrad is situated approximately 15 miles southeast of Lake Frances, which is the source of water for the town PWS. The elevation of Lake Frances is approximately 3811 feet above mean sea level when the lake is full. The lake is filled by canal diversions from Dupuyer Creek.

The Blackfeet Indian Reservation is located northeast of Lake Frances and covers approximately 1.5 million surface acres. Glacier National Park borders the Blackfeet Indian Reservation to the east and covers approximately 1.2 million surface acres.

The City of Conrad is located in the Marias watershed although the source water for the town PWS is obtained from the Two Medicine watershed. The U.S. Geological Survey hydrologic unit code for the Two Medicine watershed is 10030201. The Two Medicine drainage is oriented west of the City of Conrad, with a flow direction from the west to the east-northeast.

Geology

This section provides an overview of the geology of Lake Frances, the source waters for the Conrad Water Department. An understanding of hydrogeologic conditions also provides an explanation for the sensitivity of local aquifers and streams to potential contamination sources.

Tertiary terrace deposits underlie the area around Lake Frances (CH2M Hill, 1980). These deposits are composed of unconsolidated gravelly silty sand and sandy silt. The terrace deposits overlie a basal sandstone of the Cretaceous Two Medicine Formation. The Two Medicine Formation dips gently to the northwest in the vicinity of Lake Frances, located on the western flank of the Marias River Saddle section of the Sweetgrass structural arch (CH2M Hill, 1980) (Figure 3).

General Description of the Source Water

The Conrad Water Department PWS obtains its water from Lake Frances, which is located west and southwest of the town of Valier. Lake Frances is a natural lake that was expanded from 10,000 acre-feet to over 112,000 acre-feet by damming. The lake has a surface area of approximately 5,300 acres.

According to the Lake Frances Dams Inspection Report completed by CH2M Hill, the construction for the dams and expansion of the lake was completed in approximately 1909. Since, numerous equipment modifications and operating changes have been made throughout the life of the Lake Frances project. Currently the Pondera County Canal and Reservoir Company owns the project. Lake Frances is utilized for agricultural water supply for area lands and municipal drinking water for the City of Conrad. The Conrad Water Department water supply outlet is located below the East Dam outlet of Lake Frances.

Two U.S.G.S gauging stations are located in the Lake Frances vicinity and describe stream flow in the Lake Frances area. A U.S.G.S. gauging station (06098100) is located on Birch Creek northwest from Lake Frances. Although Birch Creek does not flow into Lake Frances, this gauging station provides a more recent description of stream flow in the Lake Frances area. Based on stream gauging data collected from 1977-1983, the mean monthly discharge at this station varies from 34.5 cubic feet per second (cfs) in August to 227 cfs in June. The average annual stream flow recorded at this station varies from 67.9 cfs in 1978 to 132 cfs in 1979.

Another U.S.G.S. gauging station (06098000) is located on Dupuyer Creek southwest from Lake Frances; Dupuyer Creek flows into Lake Frances by mean of canal diversion. Based on stream gauging data

collected from 1912-1937, the mean monthly discharge at this station varies from 20.3 cfs in December to 152 cfs in June. The average annual stream flow recorded at this station varies from 7.67 cfs in 1931 to 7.67 cfs in 1955.

The Public Water Supply

The Conrad Water Department PWS is classified as a community system under the Federal Safe Drinking Water Act, because the system serves at least 25 year-round residents through at least 15 service connections. The PWS serves approximately 2880 Conrad residents and 100 non-residents via 1278 active service connections (DEQ PWS AREV Database).

The intake, or pumping station, is below the outlet of the Lake Frances east dam and approximately 100 yards off of South Division Road. The raw water is pumped to a filtration plant located near the pumping station. Water from Lake Frances undergoes treatment before it is distributed. Treatment includes disinfection by gas chlorination, liquid alum, a flocculation agent, and a sediment treatment train. The treated water flows to the distribution system by means of gravity. See Appendix A for a diagram of the facility configuration and the most recent technical assistant evaluation report.

Because the Conrad Water Department obtains its drinking water from Lake Frances, a surface water supply, the source water sensitivity is classified as highly sensitive to contamination, in accordance with Montana Source Water Protection Program aquifer sensitivity criteria (DEQ, 1999). These criteria are discussed in the next chapter.

Water Quality

Public water systems must conduct routine monitoring for contaminants in accordance with Federal Safe Drinking Water Act requirements. Parameters such as coliform bacteria, lead, copper, nitrate, nitrite, volatile organic chemicals (including hydrocarbons and chlorinated solvents), inorganic chemicals (including metals), synthetic organic chemicals (including pesticides), and radiological contaminants must be sampled in community PWSs and non-community, non-transient PWSs in accordance with schedules specified in the Administrative Rules of Montana. Transient, non-community PWSs are required to conduct routine monitoring for pathogens (including coliform bacteria), nitrate, and nitrite. All contaminant concentrations detected in required samples must comply with numeric maximum contaminant levels (MCLs) specified in the Federal Safe Drinking Water Act.

Dupuyer Creek and Lake Frances have been classified as B-1 waters by DEQ. Waters classified B-1 are suitable for drinking, culinary and food processing purposes, after conventional treatment; bathing, swimming and recreation; growth and marginal propagation of salmonid fishes and associated aquatic life, water fowl and furbearers; and agricultural and industrial water supply.

Section 303(d) of the federal Clean Water Act (and related regulations) requires states to assess the condition of their waters to determine where water quality is impaired (does not fully meet standards) or threatened (is likely to violate standards in the near future). A DEQ database was queried to determine if any waterbodies in the Two Medicine-Dupuyer Creek watershed are listed as 303(d) waterbodies. The 2000 Montana 303(d) list indicated both Dupuyer Creek and Lake Frances are suspected to be 303(d) waterbody but are not on the 303(d) list due to lack in adequate data and information. As a result, the support impairments and probable causes and sources of impairments for Dupuyer Creek and Lake Frances have not been assessed by DEQ. The DEQ assessment record sheet for Lake Frances noted mercury in fish tissue limits the quantity of fish that can be eaten.

Background Birch Creek Water Quality

Water quality samples were not available for Dupuyer Creek; as a result, water quality data was obtained from the U.S.G.S. gauging station (06098100) on Birch Creek. This gauging station near Valier collected water quality samples from 1977-1995. Data displayed in table one represents water quality in the Birch Creek Vicinity

Table 1. Dissolved constituent concentrations in Birch Creek approximately 9 miles northwest from the surface water intake were obtained from the U.S.G.S. gauging station, site number (U.S. Geological Survey, NWIS, 2002).

Constituent	Sampling Dates (years)	Range of Dissolved Concentrations	MCL	MCLG
NO_2 & NO_3 (as N) (mg/l)	1977-1995	0.970-0.000	**10 mg/l**	N/A
Ca (mg/l)	1977-1995	75.0-30.0	N/A	N/A
Mg (mg/l)	1977-1995	34.0-16.0	N/A	N/A
Na (mg/l)	1977-1995	150-8.4	N/A	N/A
K (mg/l)	1977-1995	7.70-0.5	N/A	N/A
Cl (mg/l)	1977-1995	7.0-0.5	**N/A**	N/A
Fl (mg/l)	1977-1995	0.6-0.2	**4.0mg/l**	4.0 mg/l
Alkalinity as $CaCO_3$ (mg/l)	1977-1982	300-130	N/A	N/A
Total Dissolved Solids (tons/day)	1977-1982	472-19.7	N/A	N/A

Conrad Water Department PWS Water Quality

The Conrad Water Department's water is routinely monitored for compliance with drinking water standards. In January of 1999, the Conrad Water Treatment Plant exceeded the maximum turbidity contaminant level specified in the Administrative Rules of Montana (ARM). The violation was considered a non-acute maximum turbidity contaminant level violation. Treatment processes were corrected immediately and the turbidity level returned to compliance with drinking water standards the following day (Appendix B).

In the past five years, the Conrad Water Department PWS has received no additional violations with regards to water quality standards, nor has DEQ taken any additional enforcement actions against the Conrad Water Department PWS. (DEQ PWS Database, AREV and SDWIS).

CHAPTER 2
DELINEATION

The source water protection area, the land area that contributes water to the Conrad Water Department public water supply, is identified in this chapter. This delineated area is subdivided into spill response and watershed regions, each with separate management goals. Potential contaminant sources are identified in Chapter 3. Relative susceptibility to significant potential contaminant sources is evaluated and management solutions are recommended in Chapter 4.

Hydrologic Conditions

The headwaters of Dupuyer Creek are located approximately 35 miles southwest of Lake Frances where many small streams meet in the Lewis and Clark National Forest and Bob Marshall Wilderness. Dupuyer Creek flows as a result of snow melt, direct precipitation, surface runoff and lateral inflow from alluvial and bedrock aquifers. Water is diverted from Dupuyer Creek to Lake Frances by means of canal (C-3 Canal).

Using DEQ Source Water Protection Program criteria for ranking aquifer sensitivity (Table 2), the Conrad Water Department source water is considered highly sensitive to contamination because it is derived from surface. Sensitivity is defined as the relative ease with which contaminants can migrate to source water.

Table 2. Source water sensitivity criteria (DEQ, 1999).

Source Water Sensitivity
High Source Water Sensitivity
Surface water and GWUDISW
Unconsolidated Alluvium (unconfined)
Fluvial-Glacial Gravel
Terrace and Pediment Gravel
Shallow Fractured or Carbonate Bedrock
Moderate Source Water Sensitivity
Semi-consolidated Valley Fill sediments
Unconsolidated Alluvium (semi-confined)
Low Source Water Sensitivity
Consolidated Sandstone Bedrock
Deep Fractured or Carbonate Bedrock
Semi-consolidated Valley Fill Sediments (confined)

Conceptual Model and Assumptions

Contaminants, if spilled directly into water bodies upstream or in the immediate vicinity of the Conrad Water Department PWS surface water intake, could potentially reach the intake before water operators could close it. Over a longer time frame, contaminants that accumulate throughout the watershed could be flushed into Dupuyer Creek or Lake Frances. During periods of spring run-off, contaminants in groundwater can also enter the source water in areas where it is hydraulically connected to shallow aquifers.

Methods and Criteria

DEQ's Source Water Protection Program specifies the methods and criteria used to delineate subregions of the source water protection area for Conrad Water Department PWS intake. Because this is considered a surface water system, a spill response region and a watershed region have been delineated in accordance with SWPP delineation criteria (DEQ, 1999).

Delineation Results

Spill Response Region

The spill response region for the Conrad Water Department PWS extends 10 miles upstream and ½ mile downstream from the intake, and includes a ½-mile wide buffer adjacent to all shorelines. Hydrogeoleogic mapping was utilized to express areas of surface water and/or shallow ground water contribution from the town of Valier to Lake Frances. Therefore, the spill response boundary through the town of Valier also represents the Two Medicine watershed boundary. The location of the intake is 48.2592° latitude and -112.2008° longitude (Figure 4).

Watershed Region

The watershed region for the Conrad Water Department PWS extends upstream from the surface water intake to the watershed boundaries and represents all the land within the topographic boundaries of the Lower-Missouri-Two Medicine-Dupuyer Creek watershed or drainage. Hydrogeologic mapping was utilized to encompass areas of surface water contribution to Lake Frances and the Conrad Water Department surface water intake. (Figure 6).

Limiting Factors

The delineation method involves fixed-distance and watershed mapping. The ability to track the flow of water contributing to Lake Frances is limited due to availability of stream flow data and locations of canals diverging and merging with Dupuyer Creek. The spill response region represents an approximation of an area within which minimal dilution of introduced contaminant concentration may occur within Lake Frances and contributing streams before reaching the PWS intake. Numerous assumptions are associated with these SWPP criteria for spill response region delineations. Contaminant transport rates and concentrations will vary depending on stream flow or canal conditions, ground water flux into the stream or canals , contributions from overland flow, soil types, slope, characteristics of riparian vegetation, the extent of riparian vegetation buffer zones, the extent and duration of contamination, contaminant solution density, adsorption, mechanical dispersion, biological transformation, dilution, molecular diffusion, adsorption, precipitation, oxidation, complexation, and volatilization. As a result, some areas within the spill response region may be more conducive to contaminant transport than others, and should be designated as higher priority areas for source water protection efforts.

CHAPTER 3
INVENTORY

An inventory of potential sources of contamination was conducted to assess the susceptibility of the Conrad Water Department PWS to contamination and to identify priorities for source water protection planning. These inventories were conducted within the spill response and watershed regions assigned to the PWS. The inventory for the Conrad Water Department PWS focuses on facilities that generate, use, store, transport, or dispose potential contaminants, and on land types on which potential contaminants are generated, used, stored, transported, or disposed. Additionally, the inventory identifies potential sources of all primary drinking water contaminants and Cryptosporidium. Only significant potential contaminant sources were selected for detailed inventory. The significant contaminants posing potential threats to the Conrad Water Department PWS include metals, nitrate, pathogens, solvents, herbicides, pesticides, VOCs, SOCs, and petroleum hydrocarbons. The inventory for the Conrad Water Department PWS also focuses on all activities in certain sites or land use activities in the spill response region, and general land uses and large potential contaminant sources in the watershed region.

Inventory Method

Available databases were initially searched to identify businesses and land uses that are potential sources of regulated contaminants in the spill response region. The following steps were followed:

Step 1: Land cover is identified from the National Land Cover Dataset compiled by the U.S. Geological Survey and U.S. Environmental Protection Agency (U.S.G.S., 2000). Land cover types in this dataset were mapped from satellite imagery at 30-meter resolution using a variety of supporting information.

Step 2: EPA's Envirofacts System was queried to identify EPA regulated facilities. This system accesses 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). The available reports were browsed for facility information including the Handler/Facility Classification to be used in assessing whether a facility is a significant potential contaminant source.

Step 3: DEQ databases were queried to identify Underground Storage Tanks (UST), hazardous waste contaminated sites, landfills, and abandoned mines.

Step 4: A business phone directory was consulted to identify businesses that generate, use, or store chemicals in the spill response region. Equipment manufacturing and/or repair facilities, printing or photographic shops, dry cleaners, farm chemical suppliers, and wholesale fuel suppliers were targeted by Standard Industrial Codes.

Step 5: Major road and rail transportation routes were identified.

Step 6. All significant potential contaminant sources, land uses, and facilities that generate, store, transport, or dispose large quantities of hazardous materials were identified in the spill response and watershed regions.

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) Hazardous waste contaminated sites
4) Underground storage tanks
5) Major roads or rail transportation routes
6) Agricultural land
7) Animal feeding operations
8) Wastewater lagoons or spray irrigation
9) Septic systems
10) Sewered residential areas
11) Storm sewer outflows
12) Floor drains, sumps, or dry wells
13) Abandoned or active mines

Inventory Results/Spill Response Region

Symbols on the map legend (Figure 4 and Figure 5) identify the locations of potential contaminant sources in the spill response region, and correspond to potential contaminant sources listed in Table 3.

The Conrad Water Department PWS surface water intake is located on grassland owned by Crawford and Adams Inc. Land cover within the Conrad Water Department PWS spill response region consists of 36 percent agricultural land (row crops, small grains, and pasture/hay production) and 54 percent open water (Figure 4). Mismanagement or over application of fertilizers and/or pesticides poses a potential threat to the Conrad Water Department PWS, due to the large portion of the spill response region over which fertilizers and/or pesticides may be applied.

The town of Valier municipal sewer system accounts for 4.4 percent of the spill response region (Figure 4). A main break or leak could potentially contaminate shallow ground water hydraulically connected to surface water, releasing nitrates and pathogens that could reach the Conrad Water Department intake.

An airport is located near the town of Valier and within the spill response region (Figures 4 & 5). VOCs originating from jet/plane fuel spills may reach the PWS intake by means of surface runoff and infiltration into shallow ground water hydraulically connected to surface water.

Montana Highway 44 is located in the spill response region near the northwest corner of Lake Frances(Figure 4). Spills of fertilizers, pesticides, volatile organic compounds (VOCs), and synthetic organic compounds (SOCs) could occur along Montana Highway 44.

Several businesses located in the spill response region are considered hazardous waste handlers or facilities that generate, use, store, transport, or dispose potential contaminants (Figure 5). In the event of accidental spills or improper management of potential contaminants and subsequent release to sumps, floor drains, highway storm drains, or city storm drains, these contaminants may pose threats to shallow ground water hydraulically connected to surface water.

Table 3. Significant potential contaminant sources in the spill response region for the Conrad Water Department PWS.

Source	Location	Potential Contaminants	Hazard
Agricultural lands	See Figure 4	SOCs, herbicides, pesticides, pathogens, and nitrate	Spills, excessive application of Ag. Chemicals, surface runoff
Valier Municipal Sewer	See Figure 4	Nitrate, pathogens	Collection system main breaks, leaking connections, infiltration of untreated effluent into ground water.
Valier Airport	See Figures 4 & 5	VOCs, metals	Spills, storm water runoff, infiltration into ground water
Montana Highway 44	See Figure 4 & 5	Pesticides, fertilizers, VOCs,	Spills, storm water runoff, infiltration into ground water
Wheller Saddlery/Ken Wheller Septic Pumping	1441 Valier Hwy/Figure 5	Metals, SOCs, VOCs, Nitrate, pathogens	Spills, storm water runoff, infiltration into ground water
Lvi Environmental Services, Inc./S&H Construction/Swank Construction	615 Pondera Ave./Figure 5	Metals, SOCs, VOCs	Spills, storm water runoff, infiltration into ground water
B&B Enterprises	Valier Airport/Figure 5	Metals, SOCs, VOCs	Spills, storm water runoff, infiltration into ground water
Cargill Inc.	301 Montana/Figure 5	Metals, SOCs, VOCs	Spills, storm water runoff, infiltration into ground water
Co-Op Supply Center Inc.	60 Montana St./Figure 5	Metals, SOCs, VOCs	Spills, storm water runoff, infiltration into ground water

Inventory Results/Watershed Region

All potential contaminant sources in the watershed region are inventoried. These sources inventoried may be classified as large significant potential contaminant sources based on three criteria 1.) contaminants associated with each source, 2.) the distance between the source and intake, and 3.) quantity of contaminants that may originate from the source. Symbols on the map legend (Figure 6) identify the locations of all potential contaminant sources in the watershed region, and correspond to potential contaminant sources listed in Table 4.

Agricultural land occupies 28 percent of the watershed region. Mismanagement or over application of fertilizers and/or pesticides poses a potential threat to the Conrad Water Department PWS, due to the portion of the watershed region over which fertilizers and/or pesticides may be applied. Other principal land covers in the watershed region are grassland (47%), and forest (9%) (Figure 6). Low septic densities occupy 99.8 percent of the watershed region

Two closed landfills and one confined animal feeding operation (CAFO) are located in the watershed region and represent possible sources of pathogen and/or nitrate contamination (Figure 6).

Spills of fertilizers, pesticides, volatile organic compounds (VOCs), and synthetic organic compounds (SOCs) could occur along the BNSF railroad tracks, U.S. Highway 89, or Montana Highway 44 (Figure 6).

Numerous additional potential contaminant sources in the watershed are located in or near the town of Valier, but outside the spill response region. USTs/LUSTs are located in Valier along with the Valier wastewater treatment facility and municipal sewage lagoon located northeast of the town. A list of hazardous waste handlers located in this area can be found in Appendix C.

Table 4. Potential contaminant sources in the watershed region for the Conrad Water Department PWS.

Source	Location	Potential Contaminants	Hazard
Large Significant Potential Contaminant Sources			
Agricultural lands	See Figure 6	SOCs, herbicides, pesticides, pathogens, and nitrate	Spills, excessive application of Ag. Chemicals, surface runoff
U.S. Highway 89/Montana Highway 44	See Figures 5 & 6	Pesticides, fertilizers, VOCs	Spills, storm water runoff, infiltration into ground water
Burlington Northern Sante Fe Railway	See Figure 6	Pesticides, fertilizers, VOCs,	Spills, storm water runoff, infiltration into ground water
Inventoried Potential Contaminant Sources			
CAFOs	See Figure 6	Nitrate, pathogens	Surface runoff or discharge to surface water
Valier Wastewater Treatment System/Lagoon	See Figures 5 & 6	Nitrate, pathogens	System failure, system overload, infiltration of untreated effluent into ground water
Two Landfills	See Figure 6	Metals, nitrate, pathogens, SOCs, VOCs	Infiltration of leachate into shallow ground water and subsequent discharging to irrigation canals and Arod Lake; unauthorized dumping
USTs/LUSTs	See Figure 5 & 6	VOCs	Migration of residual soil contamination into shallow ground water
Oil and Gas Wells	See Figure 6	Petroleum, hydrocarbons	Migrations of brine wastewater, or other contaminants, into shallow ground water discharging to surface water; surface runoff to surface water.

Inventory Update

The certified operators of the Conrad Water Department PWS 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 re-certification of the source water delineation and assessment report.

Inventory Limitations

The extent of the potential contaminant source inventory is limited in several respects. The inventory is based on data readily available through state documents, published reports, and GIS data. Documentation may not be readily available on some potential sources. As a result, all potential contaminant sources may not have been identified. In some instances, inadequate location information precluded the inclusion of potential sources in the inventory.

CHAPTER 4
SUSCEPTIBILITY ASSESSMENT

Susceptibility of Conrad Water Department's source water is determined by two factors: the potential of a contaminant reaching the intake and the resulting health hazard. Susceptibility is assessed in order to prioritize potential pollutant sources in the spill response region and large potential pollutant sources in the watershed region. The susceptibility results will guide management actions undertaken by local entities, in this case the Conrad Water Department, the town of Valier, and Pondera County.

The goal of source water management is the protection of source water through 1) managing significant potential contaminant sources in the spill response region, 2.) large potential contaminant sources in the watershed region, and 3) ensuring that land use activities in the watershed region pose minimal threats to the source water. Management priorities in the spill response 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 Conrad Water Department PWS owners and operators to reduce susceptibility are also included in this section of the report.

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 reach the PWS intake (Table 5). The hazard presented by point sources of contaminants in the Conrad Water Department spill response and watershed regions depends on whether contaminants can discharge directly to Lake Frances or tributaries/canals to Lake Frances. Point source hazard is also dependent on the health affects associated with potential contaminants (Table 6). Hazard ratings for nonpoint sources are assigned based on criteria listed in Table 6 for septic systems, sanitary sewers, and cropped agricultural land. Barriers can be anything that decreases the likelihood that contaminated water will reach Conrad Water Department's surface water intake. Examples of barriers include a vegetated riparian area, protective forest management practices, and dilution.

Table 5. Hazard of potential contaminant sources for the Conrad Water Department public water system intake.

	High Hazard	**Moderate Hazard**	**Low Hazard**
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

Table 6. Susceptibility to potential contaminant sources based on hazard and the presence of barriers.

	High Hazard	Moderate Hazard	Low Hazard
Point Sources of Nitrate or Microbes	Potential for direct discharge to source water	Potential for discharge to groundwater hydraulically connected to source water	Potential contaminant sources in the watershed region
Point Sources of VOCs, SOCs, or Metals	Potential for direct discharge of large quantities from roads, rails, or pipelines	Potential for direct discharge of small quantities to source water	Potential for discharge to groundwater hydraulically connected to source water
Septic Systems	More than 300 per sq. mi.	50 – 300 per sq. mi.	Less than 50 per sq. mi.
Municipal Sanitary Sewer (% land use)	More than 50 % of region	20 to 50 % of region	Less than 20 % of region
Cropped Agricultural Land (% land use)	More than 50 % of region	20 to 50 % of region	Less than 20 % of region

Susceptibility Assessment Results

Table 7 displays the susceptibility assessment results for the Conrad PWS surface water intake. The towns surface water intake is susceptible to a number of different contaminants, including pathogens, nitrates, fertilizers, pesticides, SOCs, VOCs, and petroleum hydrocarbons.

The susceptibility results for each significant potential contaminant source identified follow:

Agricultural lands – The potential hazard imposed by SOCs, herbicides, pesticides, pathogens, and nitrate originating from agricultural lands is moderate. Agricultural lands constitute 28 percent of the watershed region and 36 percent of the spill response region. There are no barriers present, therefore the susceptibility of the intake to these sources of contamination is high.

Valier Municipal Sanitary Sewer – The municipal sanitary sewer constitutes 4.4 percent of the spill response region. Low septic densities occupy the remaining 95.6 percent of the spill response region and 99.8 percent of the watershed region. The hazard imposed by pathogens and nitrate originating from this source is low and the subsequent susceptibility of the intake is moderate because there are no barriers present.

Valier Airport – VOCs originating from fuel spills at the municipal airport pose a moderate hazard to the Conrad PWS intake. The susceptibility of the intake to this source of contamination is ranked moderate because dilution acts as a barrier.

Montana Highway 44 – The potential hazard imposed by pesticides, fertilizers, VOCs and SOCs originating from Montana Highway 44 is high. The highway poses a high hazard because there is a potential for large quantities of contaminants to discharge directly to Lake Frances. The susceptibility of the intake to Montana Highway 44 is high because dilution is a barrier.

Hazardous Waste Handlers – The potential hazard imposed by businesses that generate, use, store, transport, or dispose chemicals is moderate because groundwater hydraulically connected to surface water may become contaminated. Dilution is a barrier. Therefore, the susceptibility of the PWS intake to chemicals originating from hazardous waste handlers is moderate

Montana Highway 89 – The potential hazard imposed by pesticides, fertilizers, VOCs and SOCs originating from Montana Highway 89 is high. The highway poses a high hazard because there is a potential for direct discharge of large quantities of VOCs and SOCs Dupuyer Creek or canals upstream from the intake. The susceptibility of the intake to Montana Highway 89 is high because dilution the only effective barrier to prevent contaminants from reaching the PWS intake.

Burlington Northern Sante Fe railway – Two BNSF railways are located in the watershed region. A spill originating on the tracks could cause infiltration of large quantities of contaminants, such as pesticides, fertilizers, VOCs, and SOCs, into groundwater. According to the direction of groundwater flow, the contaminants are very unlikely to reach groundwater that is hydraulically connected to source water for the PWS. The susceptibility of the PWS to pesticides, fertilizers, VOCs and SOCs originating from the railway is ranked low because dilution acts as a barrier.

Table 7 lists all significant potential contaminant sources identified in the spill response region and the large significant potential contaminant sources in the watershed region for the Conrad Water Department PWS surface water intake. Management recommendations associated with each possible contaminant source are also listed.

Table 7. Susceptibility assessment for significant potential contaminant sources in spill response and watershed regions for the Conrad Water Department PWS surface water intake.

Source	Location	Contaminants	Hazard	Hazard Rating	Barriers	Susceptibility	Management Recommendations
Spill Response Region							
Agricultural lands	See Figures 4 and 6	SOCs, herbicides, pesticides, pathogens, and nitrate	Spills, excessive application of Ag. Chemicals, surface runoff	Moderate	None	High	Educate landowners on the proper handling, storage, and disposal of pesticides and fertilizers; utilization of agricultural best management practices
Valier Municipal Sewer	See Figure 5	Nitrate, pathogens	Leaks, system failure, system overload, infiltration of untreated effluent into shallow ground water.	Low	None	Moderate	Ensure proper maintenance and operation of system
Valier Airport	See Figures 4 & 5	VOCs, SOCs, herbicides, pesticides,	Spills, storm water runoff, infiltration into ground water	Moderate	Dilution	Moderate	Maintain preparedness of local emergency personnel through active training, develop emergency response plan
Montana Highway 44	See Figure 4, 5, & 6	Pesticides, fertilizers, VOCs,	Spills, storm water runoff, infiltration into ground water	High	Dilution	High	Maintain preparedness of local emergency personnel through active training, develop emergency response plan
Wheller Saddlery/ Ken Wheller Septic Pumping	1441 Valier Hwy, Figure 5	Metals, SOCs, VOCs, Nitrate, pathogens	Spills, storm water runoff, infiltration into ground water	Moderate	Dilution	Moderate	Inventory; Educate business owners and the public on proper waste disposal and recycling
Lvi Environment	615 Pondera	Metals, SOCs, VOCs	Spills, storm water runoff, infiltration	Moderate	Dilution	Moderate	Inventory; Educate business owners and the

al Services, Inc./S&H Construction /Swank Construction	Ave., Figure 5		into ground water				public on proper waste disposal and recycling
B&B Enterprises	Valier Airport, Figure 5	Metals, SOCs, VOCs	Spills, storm water runoff, infiltration into ground water	Moderate	Dilution	Moderate	Inventory; Educate business owners and the public on proper waste disposal and recycling
Cargill Inc.	301 Montana, Figure 5	Metals, SOCs, VOCs	Spills, storm water runoff, infiltration into ground water	Moderate	Dilution	Moderate	Inventory; Educate business owners and the public on proper waste disposal and recycling
Co-Op Supply Center Inc.	60 Montana St., Figure 5	Metals, SOCs, VOCs	Spills, storm water runoff, infiltration into ground water	Moderate	Dilution	Moderate	Inventory; Educate business owners and the public on proper waste disposal and recycling
Large Sources in Watershed Region							
U.S. Highway 89	See Figure 6	Pesticides, fertilizers, VOCs	Spills, infiltration into ground water	High	Dilution	High	Maintain preparedness of local emergency personnel through active training, develop emergency response plan
Burlington Northern Sante Fe Railway	See Figures 4, 5, & 6	Pesticides, fertilizers, VOCs,	Spills, infiltration into ground water	Low	Dilution	Low	Maintain preparedness of local emergency personnel through active training , develop emergency response plan

Management Recommendations

Management recommendations are included in the susceptibility table for Conrad Water Department PWS (Table 7). If these management recommendations are implemented, they may be considered additional barriers that will reduce the susceptibility of Conrad Water Department's surface water intake to specific sources and contaminants.

Management recommendations fall into the following categories:

- Agricultural best management practices
- Sewer maintenance and leak detection
- Stormwater management
- CAFO management
- Education
- Emergency Response Plan

Agricultural best management practices (BMPs) – BMPs that address application and mixing of fertilizer and pesticides are a viable alternative to prohibition of their use. BMPs are generally voluntary but their implementation can be encouraged through education and technical assistance. BMPS may also be utilized to minimize surface runoff and soil erosion on cultivated fields.

Sewer maintenance and leak detection – Early warning of leaks and scheduled replacement of aging sewer lines in the town of Valier will reduce the susceptibility of Conrad's intake to contamination from sanitary wastes.

Stormwater management – Stormwater planning should address source and drainage control. Source control can be accomplished through educational programs focussing on residential and commercial chemical use, disposal and recycling. Drainage control and pollutant removal can be accomplished through the use of vegetated detention basins at outfall locations.

CAFO management – Management actions taken by CAFO owners will reduce the likelihood of contaminants reaching Conrad's intake. A shelterbelt, irrigation ditch, or cropland may be placed upgradient from the CAFO to divert runoff and prevent it from entering a CAFO. Manure storage and disposal BMPs or manure management plan should be in place, and limits on number or timing of livestock allowed to graze.

Emergency Response Plan – Pondera County should compile and Emergency Response Plan that incorporates the Conrad Water Department PWSs source water protection goals. The effectiveness of these response plan will be maximized if it is updated on an annual basis t reflect changes in emergency contacts, emergency numbers, and resources available within the counties to respond to an emergency situation, such as a hazardous material spill.

Education - Educational workshops provided to the general public by the city, county, or state promote safe handling and proper storage, transport, use, and disposal of hazardous materials. Ongoing training provided to designated emergency personnel will promote the efficiency and effectiveness of emergency responses to hazardous material spills. Likewise, educational workshops provided to rural homeowners will promote the proper maintenance and replacement of residential septic systems. The EPA and the State of Montana can provide educational materials on these topics.

These management recommendations should be considered by the Conrad Water Department PWS operator, the City of Conrad, and Pondera County administration. Should contamination reach the Conrad Water Department intake, the City and County will likely need to work cooperatively to address remediation or relocation of the PWS source. Editorial contributions from the Conrad Water Department PWS operator have been solicited and incorporated into this report.

Monitoring Waivers

Monitoring Waiver Requirements

The 1986 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 allowed 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 through a vulnerability assessment it is demonstrated 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). The vulnerability assessment of a surface water source must consider the watershed area above the source, or a minimum fixed radius of 1.5 miles upgradient of the surface water intake. PWSs developed in unconfined aquifers should use a minimum fixed radius of 1.0 miles as an area of investigation for the use of organic chemicals. Vulnerability assessment of spring water sources should use a minimum fixed radius of 1.0 miles as an area of investigation for the use of organic chemicals. Shallow groundwater sources under the direct influence of surface water (GWUDISW) should use the same area of investigation as surface water systems; that is, the watershed area above the source, or a minimum fixed radius of 1.5 miles upgradient of the point of diversion. The purpose of the vulnerability assessment procedures outlined in 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 will 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. Review of an organic chemical monitoring waiver application will be conducted by DEQ's PWS Section and DEQ's Source Water Protection Program. Other state agencies may be asked for assistance.

Susceptibility Waiver for Surface Water

Shallow unconfined aquifers and surface water bodies are the most common source of usable groundwater in Montana. Unconfined aquifers and many surface water bodies are usually locally recharged by precipitation. In general, shallow 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. Residence time in surface water bodies such as streams and narrow lakes is considered small, as the water moves through the system rather quickly. Water contained in large lakes and reservoirs may have variable residence times based on seasonal turnover, inversions, stagnant depths or reaches of the lake water, and throughput of water in the water body. Similar water chemistry often exists between shallow unconfined groundwater and 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. Alternately, surface water bodies directly or indirectly receive a considerable percentage of their water from groundwater. Therefore, surface water can be susceptible to contamination by organic chemicals migrating from groundwater into the surface water.

The objective of the susceptibility waiver application is to assess the potential of organic chemical migration of contaminants into surface water that is used as a source. The general procedures make use of a combination of site specific information pertaining to the location and construction of the water source development, monitoring history of the source, geologic/hydrologic characteristics of the source water, and chemical characteristics of the organic chemicals pertaining to their mobility and persistence in the

environment. The area of contribution to the surface water body at the PWS intake must be defined and plotted. This should describe the water flow directions, stream discharge and velocity, residence time of water in the lake or reservoir (if the information is available). All surface bodies within a 1,000 feet of the PWS well(s) must be plotted. The Montana DEQ Source Water Protection Program typically will delineate and assess a larger (more conservative) area called a Spill Response Region that extends 1/2 mile downstream and approximately 10 miles upstream of the PWS surface water intake. It encloses the shoreline of any lakes along the length of the region. The width of the region extends 1/2 mile surrounding any lakes and on either side of the primary stream tributaries. Analytical monitoring history of the PWS intake should also be provided as part of the susceptibility waiver application.

Waiver Recommendation

Based on past monitoring results and the susceptibility assessment of the Conrad Water Department PWS intake, the PWS appears to be eligible for additional monitoring waivers. See Table 8 for the affect of identified potential contaminant sources on monitoring waiver eligibility. Currently, Conrad Water Department has a monitoring waiver for Phase II and V inorganic chemicals (barium, cadmium, chromium, fluoride, mercury, and selenium; antimony, thallium, beryllium, and nickel. The Conrad Water Department PWS may be eligible for a semivolatile organics waiver. For further monitoring waiver consideration, the Conrad Water Department PWS should submit a letter to DEQ requesting additional monitoring waivers. The PWS also needs to provide additional information to DEQ regarding chemical use within the spill response region.

Table 8. The affect of identified potential contaminant sources on monitoring waiver eligibility for the Chester PWS.

Source	Location	Contaminants	Susceptibility	Waiver Eligibility
Agricultural lands	See Figures 4 and 6	SOCs, herbicides, pesticides, pathogens, and nitrate	High	May preclude wavier for some chemicals
Valier Municipal Sewer	See Figure 5	Nitrate, pathogens	Moderate	No effect on waiver eligibility
Valier Airport	See Figures 4 & 5	VOCs, SOCs, herbicides, pesticides,	Moderate	May preclude wavier for some chemicals
Montana Highway 44	See Figure 4, 5, & 6	Pesticides, fertilizers, VOCs,	High	May preclude wavier for some chemicals
Wheller Saddlery/ Ken Wheller Septic Pumping	1441 Valier Hwy, Figure 5	Metals, SOCs, VOCs, Nitrate, pathogens	Moderate	No effect on waiver eligibility
Lvi Environmental Services, Inc./S&H Construction/ Swank Construction	615 Pondera Ave., Figure 5	Metals, SOCs, VOCs	Moderate	May preclude wavier for some chemicals
B&B Enterprises	Valier Airport, Figure 5	Metals, SOCs, VOCs	Moderate	May preclude wavier for some chemicals
Cargill Inc.	301 Montana, Figure 5	Metals, SOCs, VOCs	Moderate	May preclude wavier for some chemicals
Co-Op Supply Center Inc.	60 Montana St., Figure 5	Metals, SOCs, VOCs	Moderate	May preclude wavier for some chemicals

REFERENCES

CH2M Hill, 1980. Inspection Report: Lake Frances Dams, Valier Montana, Pondera County, MT. United States Army Corps of Engineers, Seattle District.

Montana Department of Health and Environmental Sciences. Environmental Sciences Division. Water Qualtiy Bureau. Garvin, W. H. and M. K. Botz, 1975. Water Quality Inventory and Management Plan Marias River Basin, Montana.

Montana Department of Environmental Quality. Pollution Prevention Bureau. Source Water Protection Section. Montana Source Water Protection Program Document, 1999.

Rocky Mountain Association of Geologists, 1972. Geologic Atlas of the Rocky Mountain Region, United States of America, Denver, Colorado, 331p.

United States Geological Survey. National Landcover Dataset, Montana. 2000.

APPENDICES

APPENDIX A

TA EVALUATION & FACILITY CONFIGURATION

APPENDIX B

AFFIDAVIT OF PUBLICATION RE: TURBIDITY VIOLATION

APPENDIX C

HAZARDOUS WASTE HANDLERS

APPENDIX D

CONCURRENCE LETTER