Swan Valley Elementary School District 33

Public Water Supply

PWS ID #MT0002491

SOURCE WATER DELINEATION AND ASSESSMENT REPORT

Date of Report: July 29, 2004

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INTRODUCTION

This Delineation and Assessment Report was completed by Erin M. Carlson, an intern with Montana Department of Environmental Quality (DEQ) Source Water Protection Program (SWPP) and was reviewed by Jeffrey Frank Herrick, a hydrogeologist also with DEQ SWPP. This report was prepared for:

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Purpose

This report is intended to meet the technical requirements for the completion of the delineation and assessment report for the Swan Valley Elementary School 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 twofold, to provide information that helps the Swan Valley Elementary School PWS protect its drinking water source and to lay the groundwork for the development of source water protection planning.

Limitations

This report was prepared to assess threats to the Swan Valley Elementary School PWS public water supply, and is based on published information and information obtained from persons familiar with the community. The terms "drinking water supply" or "drinking water source" refer specifically to the source of the Swan Valley Elementary School 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 PWS are identified. Only potential sources of contamination in areas estimated to 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

Swan Valley Elementary School is located in northwestern Montana's Swan Valley in Missoula County (Figure 1- Figure 2). The town nearest the school is Condon, which is approximately three miles north of the school. Condon was not listed on the 2000 United States Census, but Seeley Lake, which is approximately 24 miles south of the school, was reported as having 1,436 residents. Missoula County has 95,802 people, with over half of its population residing in the county seat, Missoula. Numerous industries support the economic base in Missoula County, with private businesses and service industries being the largest contributors. Median household income in the county is just over $34,000 per year.

Geographic Setting

The Swan Valley is a north-northwest-trending intermontane basin approximately 40 miles in length. It is bounded by the Mission Range on the west, Swan Lake on the north, and the Swan Range on the east. The subtle topographic divide between the Swan and the Clearwater River drainages forms the southern basin boundary. The Swan River flows from south to north through the valley, eventually emptying into Swan Lake. The valley ranges in altitude from 3,190 feet at Swan Lake to 5,500 feet above mean sea level in the glaciated mountain foothills.

The climate of the Swan Valley is typical of mid-elevation intermontane basins of the Northern Rocky Mountains west of the Continental Divide. Summers are generally mild and winters are cold and humid. Average high and low temperatures in January are 29.8° and 9.7° F, respectively, and average high and low temperatures in July are 81.3° and 43.4° F, respectively. The area received 21.33 inches of precipitation on an annual basis, and 124.7 inches of snow fall yearly, mostly during the months of December, January, February and March.

Table 1. Table of Climatic Data

Seeley Lake Ranger Station (247448), 7/1/1948 to 3/31/2004

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	29.8	37.3	43.9	53.5	63.6	71.4	81.3	81.3	70.7	57.1	39.5	30.5	55.0
Average Min. Temperature (F)	9.7	13.3	18.8	26.8	34.4	40.9	43.4	42.1	35.5	29.2	21.8	13.1	27.4
Average Total Precipitation (in.)	2.72	1.79	1.50	1.24	1.89	2.29	1.11	1.21	1.35	1.43	2.21	2.59	21.33
Average Total SnowFall (in.)	34.6	18.9	15.9	3.8	0.9	0.1	0.0	0.0	0.0	1.7	16.7	32.1	124.7
Average Snow Depth (in.)	19	23	17	3	0	0	0	0	0	0	2	10	6

Source: Western Regional Climate Center, wrcc@dri.edu

General Description of the Source Water

The well serving the Swan Valley Elementary School public water supply is likely installed into Pleistocene glacial outwash. It may additionally withdraw water from shallower Holocene

alluvium that is found along the Swan River and appears to lay on top of the glacial outwash in many places. Groundwater in the area of the school likely flows parallel or subparallel to the river, which eventually drains into Swan Lake north of the public water supply.

Some water quality data have been collected in the area by the DEQ TMDL program to determine classification of local major streams and the need for inclusion in the listing of impaired waterways. The Swan River has received B-1 classification under the Administrative Rules of Montana (17.30.623). According to B-1 classification standards, water from the Swan River is suitable for drinking, culinary and food processing purposes after conventional treatment; bathing, swimming and recreation; growth and propagation of salmonid fishes and associated aquatic life, waterfowl, and furbearers; and agricultural and industrial water supply.

It does not appear that there is any community sewer system servicing Swan Valley Elementary School. As such, the school is likely serviced by an onsite private septic system. The density of private onsite systems in the area is addressed in the inventory section of this SWDAR.

The Public Water Supply

According to the most recent sanitary survey, conducted on February 13, 2003 by Edward G. Zuleger, R.S. for the Missoula City-County Health Department, the public water supply well at Swan Valley Elementary serves 45 students and 14 staff members daily during the school year. During summer months, the PWS remains operational, but only 2 staff members utilize the facilities. There are three active residential/non-transient service connections, and none of these connections are metered. One well, known as Well #1 and located west of the school, provides water to the system. Though no well log is available for this well, it is believed to extend to approximately 81 feet below ground surface (bgs). It was likely drilled in 1980. The well has 6-inch diameter casing that extends to the bottom of the well and an open bottom intake. DNRC documents indicate that the well yield is approximately 12 gallons per minute (gpm). Well #1 is equipped with a submersible pump, but the rated capacity of this pump is not known. One 30-gallon captive air tank is present inside a room on the west side of the school building. The system uses a water softener for treatment of hot water.

Table 2. PWS Facilities and Well Information

Swan Valley Elementary School District 33 PWS (#MT0002491)

Contact Information	**Karen Anderson, Admin. /Financial Contact** **1330 Highway 2 W** **Kalispell, MT 59901** **(406) 755-5341**	**Darlene L. Kearney, Certified Operator** **884 Old Barn Road** **Seeley Lake, MT 59868** **(406) 754-7540**
PWS Class	Non-Transient Non-Community (NTNC)	
Well/Intake Source Code	WL002	
Well/Intake Name	Well 1	
Status	Active	
Latitude and Longitude	47° 29’ 26” 113° 41’ 41”	
Treatment System	TP001 Treatment System Active	

Table 2. PWS Facilities and Well Information

Swan Valley Elementary School District 33 PWS (#MT0002491)

Pressure Control Assembly	PC001 Pressure Control for Well 1 Active
Distribution System	DS001 Distribution System Active
Storage Tanks	None Listed

Water Quality

The detection of coliform bacteria in samples from the Swan Valley Elementary School PWS well resulted in one health advisory in 2001. No other analytes have been detected in noteworthy levels during the past five years. Monitoring results are included with the DEQ PWS database output in Appendix A of this report.

Chapter 2
DELINEATION

Delineation Process

The source water protection regions are identified in this chapter. They are the delineated land areas that contribute water to the sources at Swan Valley Elementary School District 33 PWS. Three management or source water protection regions are usually identified. 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 PWS wellhead, spring collection box, or surface water intake. Human activity in this area can have an immediate impact on water quality by introducing contaminants into the area directly above a well screen or other intake structure. As such, management of this control zone is critical to protect a PWS. For groundwater sources the inventory region usually represents the zone of contribution of the well, which can approximate a three-year groundwater time-of-travel distance or a 1-mile radius around a wellhead. The inventory region comprising a 1-mile radius circle around a well is often a conservative value that is used either for convenience or when insufficient geologic or hydrogeologic information is available about an area or details are lacking on the construction of a production well. In certain circumstances where a PWS well taps into an aquifer that has been characterized as being confined, the inventory region can be limited to an approximate 1,000-foot radius around the wellhead, and the inventory of potential contaminant sources is only completed for those sources within 1,000-feet of the well. Activities or contaminant releases within the inventory region have the potential to reach a PWS well in a period approximating less than 3 years. The recharge region represents the entire portion of the aquifer or an area that contributes water to the local aquifer and over time supplies water to a well. This extended region of groundwater recharge is often, but not always, inclusive of the limits of a watershed. At times an entire watershed is too large to be realistically manageable by a PWS or community, so a subsection of that watershed is delineated as the recharge region. Long-term water quality at a PWS can be affected by contaminant releases or certain land use activities in the recharge region. Table 3 summarizes how these source water protection regions are determined.

Table 3. Methods and Criteria for Delineating Source Water Protection Regions

If Your Source of Water Is	Delineate These Water Protection Regions	Method For Each Region	Minimum Distance Values & Type of Inventory Required
Ground Water that is:			
• **Unconfined or Semi-confined**	Control Zone Inventory Region Recharge Region	Fixed radius Fixed radius Topography	Distance - 100 feet Distance - 1 mile or 3 year groundwater TOT Limits of the watershed
• **Confined**	Control Zone Inventory Region Recharge Region	Fixed radius Fixed radius Topography	Distance - 100 feet Distance - 1000 feet Limits of the watershed
*Ground Water that is hydraulically Connected to Surface Water also needs the following ---------->>	Surface Water Buffer Zone	Fixed Distance	In addition to the Inventory Region, a one-half mile surface water buffer will extend upstream a distance corresponding to a 4-hour TOT but not to exceed ten miles or the nearest intake. The buffer will not exceed the extent of the watershed. Inventory is limited to pathogens and nitrate sources.
Surface water*	Spill Response Region	Fixed Distance	One-half mile buffer extending upstream a distance corresponding to a 4-hour TOT but not to exceed ten miles or the nearest intake. Buffer will not exceed the extent of the watershed. Inventory is for all regulated contaminants for that PWS.
	Watershed Region	Topography	Limits of the watershed

Hydrogeologic Conditions

The following is a description of the sediments, bedrock, and groundwater in the Swan Valley and surrounding area. This information is relevant because the rock units and sediments comprise the aquifer(s) (the water bearing formations) into which the Swan Valley Elementary well is installed. The hydrogeology is a description of the presence and movement of groundwater within the valley. This discussion is intended to help the reader understand where the PWS well is obtaining its groundwater and the vulnerability of that source of water to potential contamination. DEQ Source Water Protection Section personnel compiled most of the information contained in this section during previous assessments. See Figure 3 for a surficial geologic map of the area.

Geology

According to Kendy and Tresch (1996), the Swan Valley occupies the southern tip of the eastern extension of the Rocky Mountain Trench, a zone of closely-spaced normal faults. Metasedimentary rocks of the Middle Proterozoic Belt Supergroup surround the basin. These rocks consist primarily of argillite, siltite, and quartzite to the northeast and southwest of the basin, and limestone and dolomite to the northwest and southeast. No Tertiary sediments are exposed in the area. It is likely though, that this basin, like others in the Rocky Mountain

Trench, probably consists of thousands of feet of Tertiary sediments beneath its glacial and alluvial veneer. No wells are known to penetrate Tertiary sediments in the basin.

Quaternary deposits in the Swan Valley include glacial till, glacial outwash, and flood-plain alluvium. The thickness of Quaternary deposits is unknown, though one area well that extends to 425 feet bgs penetrates glacial deposits throughout its entire depth. Pleistocene glacial till covers most of the basin. On the valley floor, the till is light brown, brown, and reddish-brown. It is an unsorted, unconsolidated to partially consolidated mixture of gravel- to boulder-sized clasts in a sandy matrix. Till on the foothills is similar. Areas of glacial outwash are found at the mouths of a few tributaries and in small, isolated areas where glacial meltwater was channeled by ice. Holocene alluvium underlies the flood plain of the Swan River and commonly overlies glacial outwash deposits. It consists of light brown, brown, and brownish-gray, well-bedded, well-sorted, unconsolidated silt, sand, gravel, pebbles, and some cobbles in a clayey matrix. Although it is difficult to differentiate alluvium from the underlying glacial deposits, drillers' logs indicate that Holocene alluvium generally is less than about 20 feet thick along the Swan River. Based on the above information, it seems likely that the well at Swan Valley Elementary School PWS is installed into glacial outwash deposits, which are overlain by alluvium. As was previously mentioned, no well log exists for this well, but logs of other area wells with similar depths suggest this conclusion to be reasonable.

Hydrogeology

The Swan River is the principal stream in the Swan Valley. The river flows in a north-northwesterly direction through the basin, eventually dumping into Swan Lake. North of Swan Lake, the Swan River flows through the southeastern part of the Kalispell Valley and eventually empties into Flathead Lake. Numerous lakes, ponds, and wetlands mark the Swan Valley. These fill potholes left by melting glacial ice in the poorly drained glacial till throughout the basin. Holland and Lindbergh Lakes, which are both in close proximity to Swan Valley Elementary School, are perched on top of glacial till in the foothills of the Swan and Mission Mountain Ranges, respectively.

Groundwater is an important resource in the Swan Valley, and it provides domestic water for most residents. Most surface water sources used in the past have been replaced by groundwater sources. Quaternary deposits comprise the major aquifer in the Swan Valley. Wells found in the Swan River flood plain are usually less than 100 feet deep (bgs). Most wells, in fact, are less than 60 feet deep (bgs). The well at Swan Valley Elementary, at 80 feet deep, likely fits with this group of wells. It withdraws water from the underlying Pleistocene glacial outwash, as well as from Holocene alluvium. Because of shallow water levels and high permeability, the combined alluvium and glacial outwash deposits compose a reliable aquifer, which appears to be unconfined in this area.

Based on the above hydrogeologic conditions, the Swan Valley Elementary School District PWS well is characterized as having high source water sensitivity to contamination. Table 4 below details the determination of the sensibility rating; highlighting shows classifications that may pertain to the well at the school.

Table 4. Source Water (Aquifer) Sensitivity

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

Public Water Supply Source/Well Information

Included in Appendix B are the well logs for many of the wells found in proximity to the PWS well. Information regarding the source at Swan Valley Elementary School is summarized in Table 5 below.

Table 5. PWS Source/Well Information

Swan Valley Elementary School District 33 PWS (#MT0002491)

Source Name	**Well 1**
Source Code	WL002
Status	Active
Latitude and Longitude	47° 29’ 26” 113° 41’ 41”
MBMG GWIC #	None
Water Right #	Unknown
Date completed	~1980
Total Depth (feet bgs)	~81
Perforated Interval (ft bgs)	None
Static Water Level (ft bgs)	Unknown
Pumping Water Level (ft bgs)	Unknown
Draw Down (ft)	Unknown
Test Pumping Rate (gpm)	Unknown
Yield (gpm)	12

Delineation Results

In all instances, a 100-foot radius control zone is delineated around the wellhead. This is done in order to ensure that the area immediately surrounding the well remains free of contamination. Thus a 100-foot radius control zone has been delineated and inventoried around the well at Swan Valley Elementary.

A one-mile fixed radius inventory region was delineated around the well, and the resulting inventory region is shown in Figure 4. This inventory region includes a portion of the Swan River and a stretch of Montana Highway 83.

No recharge region was delineated for Swan Valley Elementary School. Surrounding topography as well as lack of contaminant sources made delineation of this protection region unnecessary. Those responsible for the operation and maintenance of the PWS facilities are, of course, encouraged to remain informed of and involved in activities in areas surrounding the PWS well in order to ensure its protection and the protection of public health.

Limiting Factors

Groundwater behavior in general terms is reasonably well understood in the Swan Valley, but is not easily predictable beneath specific locations and especially around a certain well that is drawing water from a specific depth. Groundwater flow direction fluctuates seasonally and from year to year. Here, several conservative assumptions were made in the delineation of the source water protection areas and the development of this report. Also, reliance on some basic hydrogeologic principals to define the aquifer boundaries and groundwater movement was employed. The SWDAR, however, can and should be revised if more data becomes available that alters the assumed groundwater flow direction(s).

Chapter 3
INVENTORY

Inventory Method

An inventory of potential sources of contamination was conducted for the Swan Valley Elementary School District PWS within the control zone and inventory region. Potential sources of all primary drinking water contaminants and *Cryptosporidium* were also identified and noted, however, only significant potential contaminant sources were selected for detailed inventory and the susceptibility evaluation that occurs in Chapter 4 of this SWDAR. It should be noted that the inventory emphasizes potential contaminant sources. Inclusion of a facility or business in the inventory does not indicate that it is an actual polluter, with the exceptions of known hazardous waste sites where past releases have occurred, areas with known onsite contamination, locations with leaking underground storage tanks (LUSTs), or wastewater dischargers.

The inventory for the Swan Valley Elementary School District PWS focuses on all activities in the control zone around the well and certain types of municipal and private facilities in the inventory region. The following databases have been searched in an effort to identify generators, storage facilities, and land uses that could be potential generators of contamination in the inventory region.

Step 1: Urban and agricultural 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. Septic density (the density of private onsite septic systems) was determined based on the 2000 US Census and obtained from the Montana State Library's Natural Resource Information System (NRIS) Thematic Mapper (http://nris.state.mt.us/mapper/) and (http://nris.state.mt.us/wis/swap/swapquery.asp)

Step 2: As appropriate, 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). 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: The Permit Compliance System (PCS) was queried using Envirofacts (http://www.epa.gov/enviro/) to identify Concentrated Animal Feeding Operations with MPDES permits. The PWS system operator and/or system managers are familiar with the area included in the Inventory Region will have identified animal feeding operations that are not required to obtain a permit.

Step 4: Databases were queried to identify the following in the Inventory Region: Underground Storage Tanks (UST) (http://webdev.deq.state.mt.us/UST/), hazardous

waste contaminated sites (DEQ hazardous waste site cleanup bureau), landfills (http://nris.state.mt.us/gis/datalist.html), abandoned mines (http://nris.state.mt.us/gis/datalist.html) and active mines including gravel pits. Any information on past releases and present compliance status was noted.

Step 5: Major road and rail transportation routes were identified throughout the Inventory Region (http://nris.state.mt.us/gis/datalist.html).

Step 6: All land uses and facilities that generate, store, or use large quantities of hazardous materials were identified within the Recharge Region and identified on the base map.

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 wells.
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.

Inventory Results

Results of inventory for each of the three protection regions are presented below. A tabular summary is presented in Table 6 at the end of the section.

Inventory Results/Control Zone

Recent sanitary surveys and other documents examined during the writing of this SWDAR do not suggest the presence of any potential contaminant sources within the control zone. The exact location of the drain field for the school's septic system is not known though, so it is possible that this drain field is found within the control zone.

Inventory Results/Inventory Region

A large capacity septic system is assumed to be present at Swan Valley Elementary School. A large capacity septic system is defined as having 20 or more users per day, but unfortunately, no records are available regarding the exact locations of these facilities. They are often present at businesses, schools, residential developments, and other similar facilities though, so it seems likely that Swan Valley Elementary School has a large capacity septic system. This system is in all probability the most significant potential contaminant source for the well at the school, as it is likely in relatively close proximity to the well. Along the same lines, Hungry Bear Steakhouse, found in the southern part of the inventory region, probably also has a large capacity septic system. The steakhouse is up-gradient from the school's well. Additionally, an area of increased density of private septic systems is found just north of the school. This is believed to be down-gradient from the school's well. Any one of these potential contaminant sources could pollute the well, as wastewater discharged to drain fields may contain improperly disposed chemicals or nitrate and pathogens that may not have been completely eliminated from the effluent.

Montana Highway 83 runs in a north-south manner through the inventory region. Spills or accidents along this route, though infrequent could prove catastrophic to the public water supply well at Swan Valley Elementary School, causing its contamination with any number of hazardous materials.

Analysis of the predominant land covers in the inventory region shows that the area is mostly forest (94%) (Figure 5). Small areas of grassland (5%) and transitional land (1%) are also found. None of these land uses is typically thought to represent a potential contaminant source for a PWS well.

Table 6. Noteworthy Potential Contaminant Sources

Swan Valley Elementary School District 33 PWS (#MT0002491)

Source	Contaminants	Description
Large Capacity Septic Systems (Onsite and at other facilities in the IR)	Pathogens, nitrates, other organic and inorganic chemicals	Wastewater discharged to drain fields may contain improperly disposed chemicals or may not completely eliminate nitrate and pathogens from the effluent.
Area of High Septic Density (Just north of school in IR)	Pathogens, nitrates, other organic and inorganic chemicals	Wastewater discharged to drain fields may contain improperly disposed chemicals or may not completely eliminate nitrate and pathogens from the effluent.
Montana Highway 83 (North-south route through IR)	Hazardous materials (VOCs, SOCs, metals, other)	Large scale spills of hazardous or other materials could occur.

Note: IR=Inventory Region

Inventory Update

To make this SWDAR a useful document in the years to come, the owners, manager, or the water system operator for the Swan Valley Elementary School District public water supply should update the inventory for their records every year. Changes in land uses or the presence of new potential contaminant sources should be noted and additions made as needed. This updated inventory should be submitted to DEQ at least every 5 years to ensure that this report/plan stays current in the public record.

Inventory Limitations

The extent of the potential contaminant source inventory is limited in several respects. The inventory is based on data that is readily available through state documents, published maps and reports, GIS data, and discussions with people that are familiar with the area. Also, documentation may not be readily available on some potential sources. This is the case with large capacity septic systems that are present in the inventory region. As a result, all potential contaminant sources may not have been identified or recognized as being significant potential contaminant sources. The author of this SWDAR is depending on local PWS owners and/or operators for site-specific knowledge. Their initial review of this document was sought and their comments were incorporated.

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 concern. Susceptibility is assessed in order to prioritize potential pollutant sources for management actions by local entities, in this case Swan Valley Elementary School District PWS owners and operator(s). 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 owners and the operator to reduce susceptibility are recommended in this chapter.

Hazard Determination

The susceptibility of the Swan Valley Elementary School District PWS water sources to various types of contamination is assessed in the following paragraphs. 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 7). Hazard and the existence of barriers to contamination determine susceptibility, which is described in Table 8. Table 7 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 PWSs that draw their water from unconfined aquifers.

Table 7. Hazard of Potential Contaminant Sources

For Wells Drawing Water From Unconfined Aquifers

Potential Contaminant Source	High Hazard	Moderate Hazard	Low Hazard
Point Sources	Within 1 year TOT	Between 1 to 3 years TOT	Over 3 years TOT
Density of Private Septic Systems (# per square mile)	More than 300 per sq. mi.	50 – 300 per sq. mi.	Less than 50 per sq. mi.
Municipal Sanitary Sewer (Percent land use)	More than 50 percent of region	20 to 50 percent of region	Less than 20 percent of region
Cropped Agricultural Land (Percent land use)	More than 50 percent of region	20 to 50 percent of region	Less than 20 percent of region

Susceptibility Determination

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 PWS source intake. First, hazard is rated by the proximity of a potential contaminant source to the water source or based on the percentage of the inventory region occupied by a

certain type of contaminant source (from Table 7). Then the presence of barriers is used to determine susceptibility. Susceptibility ratings are determined individually for each significant potential contaminant source and/or contaminant based on Table 7. These susceptibility ratings are the evaluation of the vulnerability of wells to the more significant potential contaminant sources and are presented on Table 9.

Table 8. 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

Discussion of Susceptibility

A summary of the susceptibility assessment for the Swan Valley Elementary School PWS water sources is located in Table 9. Below is a brief discussion of the susceptibility assessment for the significant potential contaminant sources. Other sources of contamination may also exist and may pose threats to the public water supply at the school. It is prudent to make further attempts to identify these sources, especially if they are up-gradient from the PWS, and to understand the treats they pose.

Table 9. Susceptibility Assessment

Assessment of Hazards in Inventory Region (IR) only—Swan Valley Elementary School District 33 (#MT0002491)

Source	Contaminants	Hazard	Hazard Rating	Barriers	Susceptibility	Management
Large Capacity Septic Systems (Onsite and at other facilities in the IR)	Pathogens, nitrates, other organic and inorganic chemicals	Waste water discharged to drain fields that may contain chemicals, nitrates, and pathogens	**High Hazard**	• None Identified	**Very High Susceptibility**	Promote the design and installation of advanced septic systems in the area and education (including posters and placards) to reduce improper disposal of chemicals. Involvement of PWS managers/operators in this process is critical.
Localized Area of High Septic Density	Pathogens, nitrates, other organic and inorganic chemicals	Waste water discharged to drain fields that may contain chemicals, nitrates, and pathogens	**High Hazard**	• Well is likely up-gradient of area	**High Susceptibility**	Promote the design and installation of advanced septic systems in the area, education (including posters and placards) to reduce improper disposal of chemicals, and possible creation of a community sewer district and the development of a wastewater treatment plant for the area. Involvement of PWS managers/operators in

Table 9. Susceptibility Assessment

Assessment of Hazards in Inventory Region (IR) only—Swan Valley Elementary School District 33 (#MT0002491)

Source	Contaminants	Hazard	Hazard Rating	Barriers	Susceptibility	Management
						this process is critical.
MT Highway 83	Hazardous materials (VOCs, SOCs, metals, other)	Large scale spills of hazardous or other materials	**High Hazard**	• Local and regional emergency response measures including training of responders and resources for spill cleanup in the area	**High Susceptibility**	Emergency planning, training of local emergency response personnel, and allocation of resources/funding for emergency response

Large Capacity Septic Systems

Large capacity septic systems are rated as a high hazard to the public water supply well at Swan Valley Elementary School District PWS. No barriers to contamination could be identified at this time, so the well has very high susceptibility to contamination from large capacity septic systems.

Area of High Septic Density

An area of high septic density found in the northern part of the inventory region is rated as a high hazard to the PWS well at the school. Because the well is likely up-gradient of the potential contaminant source, one barrier is in place. The well has high susceptibility to contamination from this source.

Montana Highway 83

The highway represents a high hazard for the public water supply well at Swan Valley Elementary. Local and regional emergency response measures, including the training of emergency responders and allocation of resources for spill cleanup in the area constitute one barrier. Thus, the well has high susceptibility to contamination from Montana Highway 83.

Summary of Susceptibility Assessment

The Swan Valley Elementary School District PWS uses one well that is installed into glacial outwash materials believed to constitute an unconfined aquifer. The inventory region was delineated as a circle with a fixed radius of one mile, as shown in Figure 4. Potential contaminant sources within the inventory region are also shown in Figure 4. Groundwater beneath the area is believed to flow parallel or subparallel to the river, which flows north toward Swan Lake.

The public water supply well at the school has very high susceptibility to contamination from large capacity septic systems, high susceptibility to contamination from an area of high septic density, and high susceptibility to contamination from Montana Highway 83.

Waiver Recommendation

This section addresses the Swan Valley Elementary School District 33 public water supply that DEQ has classified as a non-transient non-community (NTNC) system. Recommendations are based on the susceptibility assessment above.

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 up-gradient 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 mile 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 up-gradient 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 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 overlain by relatively impervious geologic strata. As a result, the upper groundwater surface or water table in an unconfined aquifer is not under pressure that produces hydrostatic head common to confined aquifers.

Unconfined aquifers are often locally recharged from surface water or precipitation. In general, groundwater flow gradients in unconfined aquifers may reflect surface topography, and the residence time of water in the aquifer is typically comparatively shorter than for water in confined aquifers. Similar water chemistry may often exist between unconfined groundwater and area surface water, and physical parameters and dissolved constituents can be indicators 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 or surface water 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, monitoring history of the source, geologic characteristics of the vadose zones, and mobility and persistence characteristics of the organic chemicals. The zone of contribution of the unconfined groundwater source must be defined and plotted. Groundwater flow directions, gradients, and a 3-year time-of-travel should be described. All surface bodies within 1,000 feet of the PWS well(s) must be plotted. Analytical monitoring history of the PWS well and nearby wells should also be provided.

Waiver Recommendations

Based on the monitoring history for the well, the results of the inventory, the susceptibility assessment of this SWDAR, the geology of the area, the nature of the aquifer from which the well draws water, the Swan Valley Elementary School District 33 PWS production well may be eligible for volatile organics (VOCs), synthetic organic chemicals (SOCs), and some inorganic chemical (IOCs) waivers. For monitoring waiver consideration, the PWS should submit a letter to DEQ requesting the specific monitoring waivers. If requested by DEQ, the PWS may also need to provide additional information.

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GLOSSARY

Acute Health Effect. An adverse health effect in which symptoms develop rapidly.

Alkalinity. The capacity of water to neutralize acids.

Best Management Practices (BMPs). Methods that have been determined to be the most effective, practical means of preventing or reducing pollution from nonpoint sources.

Coliform Bacteria. Bacteria found in the intestinal tracts of animals. Their presence in water is an indicator of pollution and possible contamination by pathogens.

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 that inhibits the flow of water.

Delineation. A process of mapping source water management areas.

Effective Porosity. The percent of soil, sediment, or rock through which fluids, such as air or water, can pass. Effective porosity is always less than total porosity because fluids cannot pass through all openings.

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

Hazard. A measure of the potential of a contaminant leaked from a facility to reach a public water supply source. Proximity or density of significant potential contaminant sources determines hazard.

Hydraulic Conductivity. A coefficient of proportionality describing the rate at which water can move through an aquifer.

Inventory Region. A source water management area that encompasses an area expected to contribute water to a public water supply well within a fixed distance or a specified groundwater time-of-travel distance.

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.

Nitrate. An important plant nutrient and type of inorganic fertilizer. In water the major sources of nitrates are 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.

Pathogens. A bacterial organism or virus 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.

Porosity. The percent of soil, sediment, or rock filled by air, water, or other fluid.

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

SIC Code. The U.S. Standard Industrial Classification (SIC) Codes classify categories of businesses. SIC Codes cover the entire range of business categories that exist within the economy.

Source Water Protection Area. For surface water sources, the land and surface drainage network that contributes water to a stream or reservoir used by a public water supply.

Susceptibility (of a PWS). The 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. 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, non-point, and natural sources. The TMDL program was established by section 303(d) of the Clean Water Act to help states implement water quality standards.

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

Transmissivity. The ability of an aquifer to transmit water.

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

Volatile Organic Compounds (VOC). Any organic compound that evaporates readily to the atmosphere (e.g. fuels and solvents).

Recharge Region / Watershed. The land area that drains into a stream; the watershed for a major river may encompass a number of smaller watersheds that ultimately combine at a common delivery point.

**Definitions taken from EPA's Glossary of Selected Terms and Abbreviations and other sources.

APPENDICES

Appendix A

DEQ PWS's Database Output

Water Quality Data

Appendix B

Sanitary Surveys

Other Relevant Well Information

Lithologic and Construction Logs (GWIC Well Information) for Other Area Wells

Appendix C

Concurrence Letter