SPIRIT HILLS SUBDIVISION

PUBLIC WATER SUPPLY

PWS ID No. MT0004208

SOURCE WATER DELINEATION & ASSESSMENT REPORT

PREPARED BY:

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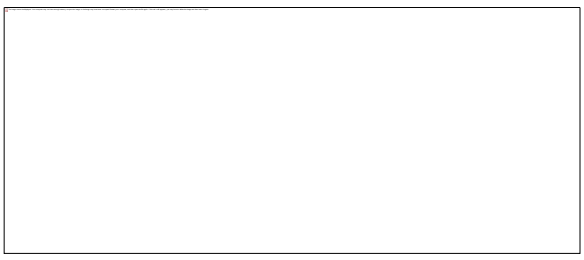

EXECUTIVE SUMMARY

This Source Water Delineation and Assessment Report (SWDAR) was prepared as required by the Federal Safe Drinking Water Act, according to a detailed Source Water Assessment Plan developed by a statewide Montana citizens' advisory committee, and approved by the US Environmental Protection Agency. The Department of Environmental Quality (DEQ) is completing assessment and delineation reports for all public water systems in Montana. These reports are intended to provide information so that the public water system staff/operator, consumers, and community citizens can develop strategies to protect drinking water sources. The information provided includes the delineation of the area most critical to maintaining safe drinking water (the inventory region), an inventory of significant potential sources of contamination within this area, and an assessment of the relative threat that these sources pose to the water system.

The Spirit Hills Subdivision's drinking water is supplied by three wells. The water source is groundwater. According to the Source Water Protection Program (DEQ, 1999) the source aquifer for the wells is considered to have **moderate sensitivity** to potential contamination, since the aquifer is semiconfined Tertiary alluvial fan deposits.

As part of this assessment, three types of source water protection management areas were mapped for the Spirit Hills subdivision public water system. They are: the control zone, the inventory region, and the recharge region. Control zones (sometimes called exclusion zones) are 100-foot radius circles around the wellheads. The goal of management in the control zone is to avoid introducing contaminants directly into the water supply's well or immediate surrounding areas. The inventory region was delineated to correspond to an estimated three-year capture zone. The recharge region represents the area that will contribute water to the wells over long periods of time. This is mapped as the upgradient extent of unconsolidated deposits, to the foot of the Bridger Range. Potential sources of contamination were inventoried within the control zone and inventory region and the results are as follows:

- No potential sources of contamination were identified within the control zones. The control zones are delineated as circles of 100-foot radius around the wellheads.
- No UST/LUST facilities were identified in the inventory region. The Spirit Hills subdivision is mapped as having a moderate septic system density. Of the identified potential contaminant sources, the Source Water Protection Program has determined that significant potential contaminant sources are limited to the areas of moderate septic system density.
- Contaminant sources are not inventoried within the recharge region. Land use patterns are identified and evaluated. The recharge region is relatively undeveloped, but additional residential growth could reasonably be expected.

Low risk potential sources and potential sources located outside the inventory region, but within the recharge region, may still pose a threat over time. These are not considered in this assessment, however. The susceptibility analysis is intended to provide the operator with information on where the greatest risk occurs. To this end, the assessment is focused on potential contaminant sources that the Source Water Protection Section has determined to be significant. These are detailed in Chapter 4.

Mitigating and managing potential sources of contamination identified within the inventory region are often beyond the scope of what an operator of a relatively small PWS may accomplish. The SWP section recommends that whenever possible, the operator should illustrate to residents the potential hazards associated with the onsite septic systems, and the need for regular maintenance.

The costs associated with contaminated drinking water are high, and prevention is vastly preferable to treatment. Public awareness is a powerful tool for protecting drinking water. The information in this

report is intended to help increase public awareness about the relationship between land use activities and drinking water quality.

TABLE OF CONTENTS

FIGURES

APPENDICES

1.0 INTRODUCTION

The primary purpose of this source water delineation and assessment report (SWDAR) is to provide information that helps the Spirit Hills subdivision public water supply (PWS) protect its drinking water sources. The Montana Source Water Protection Program is intended to be a practical and cost-effective approach to protect public drinking water supplies. The Spirit Hills subdivision PWS is classified as a community PWS, as it serves more than 25 year-round residents.

This Source Water Delineation and Assessment Report is intended to meet the technical requirements for delineation and assessment of the Spirit Hills Subdivision Public Water System as required by the Montana Source Water Protection Program (DEQ, 1999) and the federal Safe Drinking Water Act (SDWA) Amendments of 1996 [U.S. Code Title 42, Chapter 6A, Subchapter XII, Part E, § 300j-13-(a) Source Water Assessment].

Eric Sivers, a hydrogeologist with the Montana Department of Environmental Quality (DEQ) Source Water Protection Section, completed the Spirit Hills subdivision SWDAR. Information on the PWS was obtained from the most recent sanitary survey (May 2004) and other DEQ files. Additional references are detailed at the end of this report.

2.0 BACKGROUND

The Spirit Hills subdivision is located in Gallatin County in southwestern Montana, approximately five miles north of Bozeman (Figure 1). According to the Census Bureau, the population of Gallatin County in 2000 was 67,831. Approximately 200 persons reside in the Spirit Hills subdivision.

2.1 PHYSICAL SETTING

2.1.1 Geography and Geology

The PWS lies at the northeastern edge of the Gallatin Valley. The elevation is approximately 4,700 feet above mean sea level.

The Gallatin Valley extends over roughly 520 square miles of southwestern Montana. The valley is bounded by the Horseshoe Hills to the north, the Gallatin and Madison ranges to the south, the Bridger range to the east, and the Western Three Forks Valley to the west (Kendy and Tresch, 1996). The valley is drained by the Gallatin River and its tributaries.

The valley is an east-tilted graben (a downdropped fault block). Precambrian rocks probably floor the valley, but the majority of the basin is filled with Tertiary sedimentary rocks, over which Quaternary alluvium was deposited. The mountains surrounding the basin are composed of metamorphic, sedimentary and igneous bedrock. The bedrock is generally less permeable than the unconsolidated basin sediments, although fractures or carbonate dissolution features create significant local flow conduits.

The subdivision is situated on an alluvial fan that was deposited by the ancestral Sypes Creek. This alluvial fan is older than the Cottonwood Creek fan to the north. The alluvial fan deposits are bouldery gravels with significant interbeds of silt (Lonn and English, 2002).

More detailed information on the hydrogeology of the study area is provided in Section 2.1.3.

2.1.2 Climate

Climate in the area is typical of intermontane valleys in southwestern Montana. The climate summary is based upon data from the MSU Bozeman climate station, which is located at a lower elevation than the PWS. Annual total precipitation is 16.3 inches, and occurs year

round. The area receives an annual average of 56.2 inches of snow, mainly from October to May. Climate data is provided by the Western Regional Climate Center, operated by the Desert Research Institute of Reno, Nevada. See Table 1 for additional climate information.

Table 1. Monthly Climate Summary: Bozeman MSU Climate Station (241044)

Period of Record: 04/08/1892 to 09/30/2004

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
Ave. Max. Temp (F)	31.3	35.3	42.3	53.7	63.1	71.5	81.1	80.2	69.1	57.5	42.0	33.6	55.1
Ave. Min. Temp. (F)	11.8	15.2	21.2	30.5	38.5	45.2	51.0	49.5	41.1	32.8	22.1	14.6	31.1
Ave Tot. Precip. (in.)	0.88	0.74	1.33	1.81	2.87	2.88	1.36	1.24	1.74	1.48	1.08	0.86	18.27
Ave. Tot. Snowfall (in.)	12.7	10.2	16.1	12.2	4.2	0.5	0.0	0.1	0.8	5.3	11.0	11.6	84.7
Ave Snow Depth (in.)	5	5	3	1	0	0	0	0	0	0	2	3	2

2.1.3 Source Water

The hydrogeology of the Gallatin Valley is broadly described in Hackett *et al*., (1960), and is summarized in this discussion. According to Hackett, within the Gallatin Valley are two primary aquifer systems: a shallow Quaternary alluvial system, and underlying Tertiary deposits. The Quaternary alluvial system fills a valley eroded into the Tertiary beds during pre-modern times. The Quaternary alluvial aquifer includes relatively coarse sand and gravel deposited in the floodplain of the Gallatin River and its tributaries, including the East Gallatin River. This aquifer is unconfined and in direct communication with the surface waters in the Gallatin River drainage system. Recent geologic mapping (summarized in Lonn and English, 2002) has shown that the importance and relative abundance of the Quaternary deposits was overstated. The Quaternary is better characterized as a time of downcutting and minimal deposition, compared to significant deposition that occurred within the Tertiary Period.

The surface drainage system and related alluvial deposits are superimposed on a sequence of Tertiary sediments. These deposits form a deeper aquifer system in consolidated to semi-consolidated lenses of coarse-grained material deposited in both alluvial and lacustrine environments. The Tertiary units fill the Gallatin and Madison River Valleys as a single system in a structurally defined geologic basin. These Tertiary sediments are exposed in the Camp Creek Hills that separate the Madison and Gallatin drainages. The total thickness of the Tertiary strata in the Gallatin Valley may exceed 4,000 feet, based on exploratory drilling for oil (Hackett *et al*., 1960). The aquifer system within the Tertiary strata is considered semi-confined due to the thick clay sequences present in some areas.

Based on their depths and the lithologic descriptions, it is likely that the PWS supply wells are completed in sediments of a Tertiary alluvial fan deposited at the foot of the Bridger Range.

2.2 THE PUBLIC WATER SUPPLY

2.2.1 Water Supply System

Two wells provide groundwater to the system. The locations of these sources are indicated on Figure 1 and Figure 2. The wells transmit water to the distribution system without treatment. The PWS distributes water through 74 service connections. A buried concrete tank provides 140,000 gallons of storage. The Spirit Hills Subdivision PWS is classified as a community public water supply since it serves more than 25 year-round residents.

2.2.2 Supply Well Information

Both wells were drilled in 1996, and the logs suggest that they were well constructed.

Well 1 is 463 feet deep. The well includes two (wire-wrap) screened intervals (357-377 and 390-400 feet below grade, or ftbg). The well is 8 inches in diameter to a depth of 357 ftbg, and 7 inches in diameter below that. The well is grouted with cement to 342 ftbg. Well 1 yields 100 gallons per minute (gpm), and has a static water level of 114 ftbg. After 72 hours of pumping at 100 gpm, the water level was reported to be 377 ftbg.

Well 2 is 463 feet deep. The well is (wire-wrap) screened from 377 to 417 ftbg. The well is 8 inches in diameter. The well is grouted with cement to 310 ftbg. Well 2 has a static water level of 120 ftbg, and yields 180 gpm. After 32 hours of pumping at this rate, the pumping water level was reported to be 374 ftbg.

Construction details for the wells are provided on the well logs, which are attached as Appendix A.

2.3 WATER QUALITY

Each PWS performs regular sampling of its water supply to detect contamination. The analytical parameters for a community PWS include: coliform bacteria, nitrates, metals, petroleum hydrocarbons, synthetic organic chemicals, and radionuclides. The monitoring schedule depends on factors such as the type of PWS, type of source water (surface water or groundwater), the number of supplies (e.g. wells, springs or intakes), and the population served. Monitoring programs are tailored to each system, following the general protocols defined by DEQ and the US EPA. Monitoring schedules are available online at: <http://nris.state.mt.us/wis/swap/swapquery.asp>. The Spirit Hills subdivision PWS monitoring data from DEQ's database for the past five years was reviewed and is summarized in this section. Analytical results are reported in units of milligrams per liter (mg/L, equivalent to one part per million) or micrograms per liter (µg/L, equivalent to one part per billion). The results are compared to quality standards established by the US EPA. Maximum Contaminant Levels (MCLs) are enforceable standards limiting the amount of a contaminant in drinking water. National Secondary Drinking Water Standards (known as SMCLs) are non-enforceable guidelines regarding contaminants that may cause aesthetic (color, odor, taste) or cosmetic (staining, skin/tooth discoloration) issues.

2.3.1 Public Water Supply Monitoring Results

Coliform bacteria have been detected in the Spirit Hills Subdivision PWS water on several occasions within the past five years. Nitrate levels are below 1 mg/L, with the maximum reported concentration in the period reviewed of 0.60 mg/L. Dissolved solids are low, with low levels of barium (0.05), fluoride (0.13 mg/L) and sulfate (3 mg/L) reported. Radionuclides are present at low levels (gross alpha of 1.5 pCi/L). Radium was not detected. In general, the water quality appears to be high.

Based on a (limited) review of available water quality and well construction information, it appears that the coliform detections are more likely to be related to storage or distribution, than to the source water. The water quality analysis summary reports are attached as Appendix B.

2.3.2 Background Water Quality Monitoring Results

Background water quality data was not identified for the subject PWS. Background water quality typically includes general water quality parameters: major dissolved ions (calcium,

magnesium, sodium, potassium, iron, manganese, silica, bicarbonate, carbonate, chloride, sulfate, nitrate, fluoride and orthophosphate), trace elements, and metals.

3.0 MANAGEMENT AREA DELINEATION

This report delineates three source water management areas. The goal of source water management is protection of the source water by 1) controlling activities in the control zone(s), 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. Methods and criteria for delineating source water protection areas for public water supplies are specified in the Montana Source Water Protection Program (DEQ, 1999).

3.1 DELINEATION

Control Zone – A 100-foot radius control zone is delineated around each of the sources. Ideally, all sources of potential contaminants would be excluded from these areas, and they would be isolated from passers-by, traffic, livestock and wildlife.

Inventory Region – The inventory region is generally the area that is expected to contribute water to the water supply over three years; this is sometimes referred to as a three-year capture zone. All potentially signification contaminant sources are inventoried in these regions. The time-of-travel distance was estimated according to DEQ protocol for the limited data provided on well logs (Appendix C). The estimated three-year time-of-travel distance is 1,300 feet. The calculations involve numerous assumptions and estimates, and the actual capture zone may be larger than the delineated inventory region.

Recharge Region – The recharge area is delineated as the extent of Tertiary and Quaternary alluvial fan deposits between the PWS and the foot of the Bridger Range (Figure 3).

4.0 INVENTORY

Significant potential contaminant sources in the source water management areas were inventoried to assess the susceptibility of the Spirit Hills Subdivision PWS source water to contamination, and to provide a foundation for source water protection planning. The inventory for the PWS focuses on facilities or features that generate, use, store, or transport potential contaminants, as well as certain land uses in the inventory and recharge regions. It is important to remember that the sources identified in this section are only potential sources of contamination to the drinking water. Contamination of drinking water sources is less likely when potential contaminants are properly managed.

4.1 INVENTORY METHOD

Information on facilities and land uses that are potential sources of regulated contaminants was obtained from a number of databases. The process for completing the inventory includes the following:

- Step 1: The Montana State Library Natural Resources Information System (NRIS) GIS database was queried to identify septic land application sites, wastewater treatment plants, animal feeding operations, septic system density, sewer systems, and agricultural land uses.
- Step 2: The DEQ PWS files were reviewed to identify agricultural activities or wastewater treatment in the vicinity of the PWS.
- Step 3: The US Environmental Protection Agency's (EPA) Envirofacts System <http://www.epa.gov/enviro/> was queried to identify EPA-regulated facilities located in the management areas. This system accesses facilities listed in the following databases: Resource

Conservation and Recovery Information System (RCRIS), Biennial Reporting System (BRS), Toxic Release Inventory System (TRIS), and Comprehensive Environmental Response Compensation and Liability Information System (CERCLIS) and the Permit Compliance System (PCS - for Concentrated Animal Feeding Operations with MPDES permits). The available reports were browsed for facility information including the Handler/Facility Classification to be used in assessing whether a facility should be classified as a significant potential contaminant source.

- Step 4: Montana DEQ databases were queried to identify any of the following in the management areas:

  Underground storage tanks (USTs) <http://www.deq.state.mt.us/UST/USTDownloads.asp>

  Hazardous waste contaminated sites, above ground storage tanks (ASTs), landfills, and abandoned and active mines, including gravel pits <http://nris.state.mt.us/gis/bundler/>

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

Potential contaminant sources are considered significant if they fall into one or more 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 leaking UST sites).
5. Underground injection well.
6. Major roads or rail transportation routes.
7. Cultivated cropland exceeding 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

4.2 INVENTORY RESULTS

4.2.1 Control Zone Inventory Results

No significant potential sources of contamination were identified within the 100-foot radius control zones. As a blanket statement, the control zone should be isolated from traffic and passers-by, and drainage away from the wellheads should be maintained.

4.2.2 Inventory Region Results

Point Sources: No USTs, LUSTs or spills were identified within the inventory region.

Nonpoint Sources: The inventory region is an area of moderate septic system density. No irrigated agricultural land was identified.

Of the identified potential contaminant sources, the Source Water Protection Program has determined that significant potential contaminant sources are limited to the septic system density. The PWS' susceptibility to these potential contaminants will be assessed in Section 5, and presented in Table 2.

4.2.3 Recharge Region Results

Contaminant sources are not inventoried within the recharge region. However, land use patterns are identified and evaluated. The recharge area is currently lightly developed, although the density of residential land use is expected to increase.

5.0 SUSCEPTIBILITY ASSESSMENT

Susceptibility is the degree of likelihood for a public water supply to be impacted by inventoried contaminant sources. Susceptibility is determined in accordance with the DEQ Source Water Protection Program (DEQ, 1999). This guidance document is available on the DEQ Source Water Protection website (see the Reference section), or by request.

Susceptibility is determined by considering the *hazard* that significant potential contaminant source presents to the PWS source water, relative to any *barriers* to the contaminant. Hazard is determined by the proximity or density of significant potential contaminant sources, according to a formula laid out in the Source Water Protection Program (DEQ, 1999). Barriers to contamination are anything that decreases the likelihood of contaminants reaching a water source. One barrier is identified for the PWS: depth to groundwater exceeding 100 feet.

Inventory results and management recommendations for the Spirit Hills Subdivision PWS are provided in Table 2. In some cases the management recommendations are fairly site-specific and can be implemented by the public water supply. However, other management options can only be implemented by federal, state, county or local governmental entities. When the latter options are mentioned, it is not implied or suggested that this public water supply should lead or spearhead the effort to implement the management option. It is assumed that representatives from this public water supply would participate in the public process sponsored by various governmental entities to develop and implement any of these management options.

Table 2. Susceptibility Assessment of Significant Potential Contaminant Sources

Potential Contaminant Source	Potential Contaminants	Hazard	Hazard	Barriers	Susceptibility	Management Recommendations
Inventory Region						
Septic Systems	Pathogens, nitrate (NO_3)	System failure could result in discharge of untreated effluent	Moderate	Depth to groundwater (>100 feet)	Moderate	Encourage septic system owners in PWS community to properly maintain their septic systems.

While it is not considered a barrier, the semi-confined nature of the aquifer probably affords some degree of protection from shallow contaminants. This is recognized in the 'moderate' sensitivity rating assigned to this type of aquifer.

These ratings are derived from the procedures established by the DEQ Source Water Protection Program (DEQ, 1999). The 'moderate' susceptibility rating for the septic systems is probably conservative, in light of the low nitrate concentrations. The susceptibility rating is not a prediction of contamination. Instead, it identifies the most likely sources of contaminants, so that these may be managed and problems may be prevented.

6.0 LIMITATIONS

This Source Water Delineation and Assessment Report is intended to meet the technical requirements for delineation and assessment of the Spirit Hills subdivision Public Water System (PWS) as required by the Montana Source Water Protection Program (DEQ, 1999) and the federal Safe Drinking Water Act (SDWA) Amendments of 1996 [U.S. Code Title 42, Chapter 6A, Subchapter XII, Part E, § 300j-13-(a) Source Water Assessment]. The following limitations should be noted:

- Not every potential or existing source contamination in the Spirit Hills Subdivision area has been identified. Consideration was limited to potential sources of contamination that are within the inventory region and of a type determined by the DEQ to be significant.
- Potential sources of contamination were identified using online databases and available overhead and map imagery. Field surveys and inspections of the inventory region were not conducted. It is highly recommended that the operator or other persons knowledgeable about the community review the inventory, and revise it as necessary.
- The inventory region was delineated on the basis of a basic groundwater time-of-travel estimate. The calculation required estimating a number of hydrogeologic parameters, and the margin of error is significant.
- The potential contaminant sources described in the inventory are identified from readily available information, as described in Chapter 4. Consequently, unregulated activities or unreported contaminant releases may have been overlooked. Multiple data sources are used to increase the likelihood that major threats to the source water are identified. The inventory is not exhaustive. Absence of a potential contaminant in the inventory or susceptibility assessment of this report does not mean that the potential for contamination does not exist, or that there is no threat.

7.0 CONCLUSIONS

The Spirit Hills Subdivision's drinking water is supplied by three wells. The water source is groundwater. According to the Source Water Protection Program (DEQ, 1999) the source aquifer for the wells is considered to have **moderate sensitivity** to potential contamination, since the aquifer is semiconfined Tertiary alluvial fan deposits.

As part of this assessment, three types of source water protection management areas were mapped for the Spirit Hills subdivision public water system. They are: the control zone, the inventory region, and the recharge region. Control zones (sometimes called exclusion zones) are 100-foot radius circles around the wellheads. The goal of management in the control zone is to avoid introducing contaminants directly into the water supply's well or immediate surrounding areas. The inventory region was delineated to correspond to an estimated three-year capture zone. The recharge region represents the area that will contribute water to the wells over long periods of time. This is mapped as the upgradient extent of unconsolidated deposits, to the foot of the Bridger Range. Potential sources of contamination were inventoried within the control zone and inventory region and the results are as follows:

- No potential sources of contamination were identified within the control zones. The control zones are delineated as circles of 100-foot radius around the wellheads.
- No UST/LUST facilities were identified in the inventory region. The Spirit Hills subdivision is mapped as having a moderate septic system density. Of the identified potential contaminant sources, the Source Water Protection Program has determined that significant potential contaminant sources are limited to the areas of moderate septic system density.
- Contaminant sources are not inventoried within the recharge region. Land use patterns are identified and evaluated. The recharge region is relatively undeveloped, but additional residential growth could reasonably be expected.

Low risk potential sources and potential sources located outside the inventory region, but within the recharge region, may still pose a threat over time. These are not considered in this assessment, however. The susceptibility analysis is intended to provide the operator with information on where the greatest risk occurs. To this end, the assessment is focused on potential contaminant sources that the Source Water Protection Section has determined to be significant. These are detailed in Chapter 4.

Mitigating and managing potential sources of contamination identified within the inventory region are often beyond the scope of what an operator of a relatively small PWS may accomplish. The SWP section recommends that whenever possible, the operator should illustrate to residents the potential hazards associated with the onsite septic systems, and the need for regular maintenance.

8.0 REFERENCES

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9.0 GLOSSARY

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Sensitivity. The relative ease with which contaminants can migrate to source water through the natural materials

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

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

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

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

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

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

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

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

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

FIGURES

APPENDIX A

WELL LOG & PWS SANITARY SURVEY

APPENDIX B

WATER QUALITY ANALYTICAL RESULTS

APPENDIX C

GROUNDWATER TIME-OF-TRAVEL ESTIMATES

APPENDIX D

MONITORING WAIVER RECOMMENDATIONS

MONITORING WAIVERS

Waiver Recommendation

The PWS currently has no waivers beyond those granted to all PWSs statewide. Diquat, endothall, glyphosate, dioxins, ethylene dibromide (EDB), dibromochloropropane (DBCP), polychlorinated biphenyls (PCBs), cyanide and asbestos (at the source) are excluded from monitoring requirements by statewide waivers.

The monitoring history suggests the PWS may be eligible for Phase II inorganic (barium, cadmium, chromium, fluoride, mercury and selenium) and Phase V inorganic (antimony, thallium, beryllium and nickel) waivers. Under these waivers, the monitoring schedule for these parameters is reduced to every nine years, rather than every three years. The PWS may also be eligible for VOC and SOC susceptibility waivers.

The PWS must be in compliance with monitoring requirements to be considered. Written waiver requests must be sent to DEQ at the address below:

Greg Butts
Montana DEQ, PWS Section
109 Cooperative Way
Suite 105
Kalispell, MT 59901

Upon receipt of a waiver request, DEQ will review the system's compliance history, historical monitoring results and source water setting. If waivers are considered appropriate, DEQ will provide the operator with application forms, guidance and technical assistance. If requested by DEQ, the PWS may also need to provide additional information regarding chemical use in the area within the Inventory Region. A site visit will be required to further investigate VOC and SOC use within the inventory region.

Monitoring Waiver Requirements

Use Waivers

A Use Waiver may be granted if it is determined that target organic chemicals were/are not used, manufactured, or stored in the area of a water source. The residential landuse and roads within the inventory region preclude use waivers for VOCs and SOCs

Susceptibility Waivers

If a Use Waiver is not granted, a system may be eligible for a Susceptibility Waiver, if it is demonstrated that the water source would not be susceptible to contamination. 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. PWSs developed in unconfined aquifers should use a minimum fixed radius of one mile as an area of investigation for the use of organic chemicals. Vulnerability assessment of spring water sources should use a minimum fixed radius of one mile as an area of investigation for the use of organic chemicals. Surface water and shallow groundwater sources under the direct influence of surface water (GWUDISW) should assess the watershed area above the source, or a minimum fixed radius of one and one-half miles upgradient.

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

APPENDIX E

CONCURRENCE LETTER

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