Hellgate Elementary School

SOURCE WATER DELINEATION AND ASSESSMENT REPORT

Hellgate Elementary School
Public Water System

PWSID # MT0000845

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GLOSSARY
AND
LIST OF ACRONYMS*

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

Alkalinity The capacity of water to neutralize acids.

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

AST Aboveground storage tank.

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.

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

Delineation A process of mapping source water management areas.

DEQ Montana Department of Environmental Quality.

EPA United States Environmental Protection Agency.

GWIC Ground-Water Information Center online well database administered by the Montana Bureau of Mines and Geology.

Hardness Characteristic of water caused by presence of various chemical compounds. 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.

HazMat Hazardous Materials Response Team.

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 the area expected to contribute water to a public water supply within a fixed distance or a specified groundwater travel time.

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.

MGWPCS Montana Ground Water Pollution Control System.

MPDES Montana Pollution Discharge Elimination System.

NOAA National Oceanic and Atmospheric Administration.

Nitrate An important plant nutrient and type of inorganic fertilizer. In water, the major sources of nitrate pollution are septic tanks, sanitary sewers, feed lots and fertilizers.

Nonpoint-Source Pollution Pollution sources such as stormwater runoff that are diffuse and do not have a single point of origin or are not introduced into a receiving stream from a specific outlet.

NPL National Priority List (Superfund).

Pathogens Bacterial organisms 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.

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

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

Recharge Region Source water management region that is generally the entire area that could contribute water to an aquifer used by a public water system. Includes areas that could contribute water over long time-periods or under different water usage patterns.

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

SDWA Safe Drinking Water Act.

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.

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

Susceptibility (of a PWS) The potential for a public water system to draw water with contamination 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) Manmade organic chemical compounds such as herbicides and pesticides.

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

Transmissivity The ability of an aquifer to transmit water.

THMs Trihalomethanes Organic chemicals formed as disinfection byproducts.

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

UST Underground storage tank.

Volatile Organic Compounds (VOC) Any organic compound that evaporates readily to the atmosphere.

MWQA Montana Water Quality Act.

WQD Missoula Valley Water Quality District.

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

INTRODUCTION

This report is intended to meet the technical requirements for the completion of the delineation and assessment report for the Hellgate Elementary School PWS as required by the Montana Source Water Protection Program and the federal Safe Drinking Water Act (SDWA).

The Montana Source Water Protection Program is intended to be a practical and cost-effective approach to protecting public drinking water supplies from contamination. A major component of the Montana Source Water Protection Program is termed delineation and assessment. The emphasis of this delineation and assessment report is identifying significant potential contaminant threats to public drinking water sources and providing the information needed to develop a source water protection plan for the Hellgate Elementary School PWS.

Delineation is a process whereby areas that contribute water to aquifers or surface waters used for drinking water, called source water protection areas, are identified on a map. Geologic and hydrologic conditions are evaluated in order to delineate source water protection areas. Assessment involves identifying locations or regions in source water protection areas where contaminants may be generated, stored, or transported and then determining the potential for contamination of drinking water by these sources.

Delineation and assessment is the foundation of source water protection plans, the mechanism the Hellgate Elementary School PWS can use to protect their drinking water source. Although voluntary, source water protection plans are the ultimate focus of source water delineation and assessment. This delineation and assessment report is written to encourage and facilitate the Hellgate Elementary School PWS operator and the community to complete a source water protection plan that meets their specific needs.

CHAPTER 1
BACKGROUND

The Community

The city of Missoula is located in the Missoula Basin at the southern end of the Missoula-Ninemile Valley (Figure 1). The population of Missoula County in 2000 was 95,802 with 57,053 people living in the city of Missoula (Census 2000). The Bitterroot River enters Missoula from the south and the Clark Fork River enters from the northeast. US Highway 93 serves Missoula from the south and the north and Interstate 90 passes along the northern edge of Missoula (Figure 2). Major Missoula area employers include the University of Montana, and the two local hospitals, each employing more than 1000 people. Stimson Lumber operates a lumber and plywood mill in the Bonner area, and employs 450 people. Other economic contributors include Smurfit-Stone Container, several transportation companies, as well as tourism, small businesses and outlying agriculture and timber operations. Wastewater from the community is collected in one sanitary sewer system, which, after treatment, discharges into the Clark Fork River near the western edge of Missoula. Surrounding areas rely on onsite sewage disposal systems. Mountain Water Company supplies Missoula residents and businesses with the majority of the city's drinking water; depending on location, some properties are served by individual or small public water supply wells.

Geographic setting

Missoula is located in the southern end of the Missoula-Ninemile Valley as shown in Figure 1. The valley elevation ranges from approximately 3000 to 3200 feet above sea level, with surrounding mountain ranges, including the Sapphire Range to the east, the Bitterroot Range to the south, the Rattlesnake Range to the north, and the Ninemile Divide to the west, rising to elevations of 5000 to 8000 feet. The Clark Fork and Bitterroot Rivers drain the valley; the Clark Fork flows westward through the valley, and the Bitterroot flows across the southwest corner of the valley, and joins the Clark Fork at Kelly Island, approximately 4 miles west of the City of Missoula. Milltown Dam and Milltown Reservoir are located approximately 5 miles upstream from Missoula at the confluence of the Clark Fork and Blackfoot Rivers. Rattlesnake Creek was a main source of drinking water until an outbreak of illness associated with Giardia lamblia in 1983 prompted the local water company to discontinue use of Rattlesnake Creek water and rely exclusively on groundwater from the Missoula Aquifer. The Missoula Aquifer has been designated a "sole-source" aquifer by the United States Environmental Protection Agency.

The climate in Missoula is typical of western Montana. Missoula receives approximately 13.5 inches of rain per annum, and 45 inches of snow. The annual average temperature is 44°F with average maximum temperatures occurring in July (83°F) and average minimum temperatures occurring in January (15°F).

General description of the Source Water

The Hellgate Elementary School wells are completed in the Missoula Valley alluvial aquifer. The aquifer primarily consists of unconsolidated alluvial sand, gravel and cobbles and is recharged mainly by leakage from the Clark Fork River, flow from Tertiary sediments and fractures in Precambrian and Cambrian bedrock of the surrounding hills, leakage from irrigation canals, and underflow from the Clark Fork Valley and tributary drainages (Woessner, 1988; Smith, 1992).

The Public Water Supply

The Hellgate Elementary School PWS is a non-transient, non-community water system that obtains water from one well finished in the Missoula Valley Aquifer. The well is located on West Broadway, west of Missoula, in Missoula County. The well draws from 100 feet below the ground surface. The Hellgate Elementary School PWS currently serves an estimated population of 400 with 1 active service connections. The location of the well is shown in Figure 2. The well is linked to two captive air tanks, located in Building #1, prior to distribution. A general plan showing the layout of the distribution system is presented in Appendix A, with a copy of the sanitary survey.

Water Quality

Every PWS is required to perform monitoring for contamination to their water supply. Water is typically monitored for total coliform and fecal coliform, nitrates, metals and chemicals. The monitoring schedule depends on the population served, the number of wells and the source water for the PWS. DEQ defines monitoring programs and protocols that are specific to each PWS. Hellgate Elementary PWS 845 had a reported violation of the total coliform MCL in April of 2001. Table 1 lists typical levels of constituents for the Missoula Aquifer in this area.

The Milltown Dam and Reservoir "Superfund" site, approximately 4 miles upstream from Missoula, has been collecting runoff sediment from upstream mine tailings for decades and consequently harbors several million tons of toxic mine sediments that contain high levels of arsenic and copper. There is currently a plume of arsenic-contaminated groundwater, with arsenic levels exceeding Safe Drinking Water Act MCLs, in the Hellgate Valley Aquifer in Milltown, Montana, upgradient from Missoula. This groundwater contamination rendered several wells in Milltown unusable, and required development of a replacement water source for many residents. The plume appears to have been relatively stable during the period of monitoring, 1982 to present, based upon the existing limited distribution of monitoring wells. No immediate threat to wells in the Missoula area is indicated, because of dilution in the highly conductive aquifer. Furthermore, flow paths generated as part of this study indicate that water from the Hellgate School PWS primarily originates in the Grant Creek drainage and adjacent hills, rather than from the Clark Fork (see Figure 4), so the threat to this PWS should be negligible.

Portions of the Clark Fork River downstream could be threatened, as sediment from the reservoir is released during periodic events such as floods and ice jams, spreading contamination downstream. Data from a past ice jam event indicate that copper, which is highly toxic to fish but less toxic to humans, rather than arsenic, was the contaminant of concern after this event. Dam failure is also possible, and this would inundate downstream areas with toxic sediments.

The proposed removal of the dam and the most-contaminated sediments from behind the dam would largely eliminate this threat to downstream areas. The removal process may temporarily increase copper and arsenic levels downstream, but these levels are not expected to be hazardous to human health. In the long-term, dam and sediment removal should eliminate the arsenic-contaminated groundwater plume in Milltown, and improve downstream water quality. The Milltown Reservoir issue is further discussed in the *Inventory* section of this report.

Table 1. Sample water quality data for the Missoula Aquifer, Grant Cr. Area (WQD, 1996-2003; MDEQ analytical results, 1995-2001).

Sample date	Well #/ Location	pH	Ca Mg/L	$S0_4$ Mg/L	NO_3 Mg/L	Cl Mg/L	Fl^- (Mg/L	As Mg/L	Ba Mg/L	Organic Contaminants
1996 - 2003 (Ave.)	WQD # 4; PWS 437, 828, 3305. 13N19W 6,7; 14N19W 32	7.2	24.4	4.49	1.09	3.6	<0.0005	0.0006	0.15	None Detected

Table 2. Water quality data for Hellgate Elementary School (MDEQ, PWS analytical results, 1995-2003).

Sample Date	Well #/ Location	NO_3 (Mg/L)	Fl^- (Mg/L)	Ba (Mg/L)	Cd (Mg/L)	THMs (Mg/L)	Other Organic Contaminants
1995-2003 (Ave.)	PWS #845 – 13N19W, sect. 7	1.51	<0.0005	0.36	<0.0005	0.0013	None Detected

CHAPTER 2
DELINEATION

The source water protection area, the land area that contributes water to the Hellgate Elementary School PWS, is identified in this chapter. Four management areas are identified within the source water protection area: the control zone, inventory region, surface water buffer zone and recharge region. The control zone, also known as the exclusion zone, is an area at least 100-foot radius around the well. The inventory region represents the zone of contribution of the well, which approximates a three-year groundwater time-of-travel. Analytical equations describing ground water flow using estimates of pumping and aquifer characteristics and simple hydrogeologic mapping are used to calculate groundwater time-of-travel distance. The surface water buffer zone is delineated based on standard distance criteria of 10 miles upstream from the ground water inventory zone and encompasses ½ mile width of land area on each side of the drainages. The recharge region represents the entire portion of the aquifer that contributes water to the Hellgate Elementary School water system.

Hydrogeologic Conditions

Geologic and hydrogeologic studies of the Missoula area are listed in Table 3, with a summary of maps listed in Table 4. The following description is derived from these reports.

The Missoula Valley is part of a structural basin that began to open about 65 million years ago, during the early Tertiary crustal movement that created the Rocky Mountains. Precambrian metasedimentary rocks of the Belt Supergroup, and a few interspersed Paleozoic sedimentary rocks surround the valley, with peaks of 5000 to 7000 feet elevation. This relatively impermeable and deeply eroded landscape was partially filled with Tertiary and Quaternary alluvium, and Glacial Lake Missoula clays and silts. Portions of the Tertiary sediments were scoured from the valley during the repeated draining of Glacial Lake Missoula approximately 12,000 to 15,000 years ago, during the Wisconsin glacial stage, and were replaced with layers of sand, gravel and cobbles, deposited during these catastrophic events and more recent alluvium deposited along the river channel and flood plain. The sediments generally become finer to the southwest of the valley as a result of dissipating energy after sediment-carrying water flowed out of Hellgate Canyon and across the broader Missoula Valley, depositing coarser sediments first and then gradually allowing deposition of finer sediments.

The Missoula Aquifer is unconfined or semi-confined, depending on location, and composed mainly of unconsolidated Quaternary alluvium. The Quaternary alluvium consists of three main layers: a top sand/silt, gravel, cobble and boulder layer, which is most often above the water table, a middle clay-rich layer, which yields little water, and a bottom layer of sand, gravel and cobbles, which is the main water-bearing unit (Smith, 1992; Woessner, 1988). Layers of clay and silt deposited in Glacial Lake Missoula are interfingered with sand and gravel layers that were deposited between the multiple episodes of draining and refilling the Lake, creating a complex stratigraphy. Tertiary deposits (mostly Renova and Sixmile-Creek Equivalents) flank and underlie the area of Quaternary alluvium, but Renova Equivalent sediments are generally fine-grained and much less productive than the more recent deposits; probable Sixmile Creek Equivalent sediments do yield useable quantities of water in some parts of the valley. Some wells in the outlying areas of the valley are finished in Precambrian bedrock, but these derive water mainly from fractures and are also much less productive than the main water-bearing alluvium. Depth to the water table ranges from approximately 6 to 110 feet below land surface, depending on drought conditions and distance from rivers and tributary streams. The seasonal fluctuation of the groundwater table ranges from approximately 2 to 13 feet (Woessner, 1988) and

depends upon proximity to the recharge source and hydraulic conductivity of the surrounding aquifer sediments. The lateral extent of the Missoula Aquifer varies from about 0.25 miles wide at the mouth of Hellgate Canyon, to 6.25 miles wide between Maclay Flats and the mouth of Grant Creek; the overall length is approximately 20 miles. Groundwater flows generally southwest by westward through the Hellgate Elementary School area. The aquifer in this area is classified as having moderate source water sensitivity, because it is semi-confined and comprised of unconsolidated alluvium. The Missoula Valley Aquifer has been designated a "Sole Source Aquifer" by the U.S. EPA. A geologic map of the Missoula area is presented in Figure 3. Figure 4 represents a generalized ground water flow map. Geologic cross sections are shown in Figure 5.

Table 3. List of geologic or hydrogeologic investigations for the Missoula area.

Title of Project	Reference	Area Covered	Project Purpose.
Interactions Between the Clark Fork River and Missoula Aquifer, Missoula County, Montana	K.W. Clark, 1986	Missoula Valley	Define hydrogeology of Clark Fork River and Missoula Aquifer.
Hydrogeology and water resources of the Missoula Basin, Montana	A.L. Geldon, 1980	Missoula Basin	To determine the storage potential of the basin.
Geographic, Geologic, and Hydrologic Summaries of Intermontane Basins of the Northern Rocky Mountains, Montana	Kendy and Tresch, 1996.	Intermontane basins of the northern Rocky Mountains	Summarize the geographic, geologic and hydrologic characteristics of the Rocky Mountain region in western Montana.
Geology and Ground-water Resources of the Missoula Basin, Montana	McMurtrey, et. al, 1965	Missoula Basin	Summary of geology and hydrogeology
A Single Layer Transient Flow Model of the Missoula Aquifer	R.D. Miller	Missoula Valley	Computer model to define groundwater flow and hydraulic properties of the Missoula Aquifer.
The Source, Fate and Movement of Herbicides in an Unconfined, Sand and Gravel Aquifer in Missoula, Montana	M.H. Pottinger, 1988	North central Missoula Valley	Hydrologic properties and groundwater flow of aquifer to determine source and fate of herbicide contamination.
The Hydrogeology of the Central and Northwestern Missoula Valley	C.A. Smith, 1992	Portion of Missoula Valley	Geology, hydrologic properties, groundwater flow, interaction with river and water quality of the Missoula Aquifer.
Missoula Valley Aquifer Study: Hydrogeology of the eastern portion of the Missoula Aquifer, Missoula County, Montana	W.W. Woessner, 1988	Eastern portion of the Missoula Aquifer	To assess existing and future anthropogenic effects on the aquifer

Table 4. List of geologic or hydrogeologic maps available for the Missoula area.

Title or Description	Date	Area Covered	Reference
Geologic Map of the Missoula West 30' x 60' Quadrangle	1998	Missoula Valley west of Missoula, and Bitterroot Valley south to Stevensville, MT	Lewis, R.S., 1998. MBMG Open File 373.
Potentiometric Map, March 1993 and June 1993	1994	Hellgate Canyon, Missoula County	Gestring, S.L., 1994. The Interaction of the Clark Fork River and the Hellgate Valley on the Aquifer Near Milltown, MT
Geologic Map and Sections of the Bonner Quadrangle, Montana	1961	Bonner Quadrangle	Nelson and Dobell, 1961
Generalized geologic map of the Butte 1 X 2 degree quadrangle, Montana	1987	Approximately 100 X 70 mi. area of Missoula, Powell, Lewis & Clark and Deer Lodge Counties	Wallace, C.A., USGS Miscellaneous Field Studies Map MF-1925

Conceptual Model and Assumptions

A conceptual hydrogeologic model is a simplified representation of the hydrogeologic system. This section describes the conceptual model used for this report.

The ground water in this part of the Missoula Valley is generally semi-confined under discontinuous Glacial Lake Missoula silts and clays, and occurs primarily in unconsolidated Quaternary sand and gravel units, which are laterally and basally bounded by much less permeable tertiary sediments and bedrock. Tertiary sediments and fractured bedrock yield small quantities of water in some areas. Recharge is derived mainly from the Clark Fork River, underflow from the Clark Fork Valley, tributary drainages and Tertiary units flanking the valley. The Clark Fork River loses water to the aquifer along some stretches and gains water from the aquifer along other stretches of its path through the Missoula Valley (Smith, 1992; Woessner, 1988). Ground water flows generally west northwestward through this area (Figure 5).

Methods and Criteria

The Montana Department of Environmental Quality specifies the methods and criteria used for source water protection zone delineation for the Hellgate Elementary School PWS (DEQ, 1999). Because the Missoula Aquifer communicates with the Clark Fork River and tributary streams in the area, Surface Water Buffer Zones were applied to the Clark Fork River and tributary drainages. Time-of-travel calculations were completed for the ground water system using the uniform flow equation (U.S.E.P.A. 1991). Using published reports, estimates of the aquifer properties were made and are discussed in the following section. The recharge area is defined as the area where the aquifer is present upgradient from the well(s). The surface water buffer zones were delineated based on standard distance criteria of 10 miles upstream from the ground water inventory zone and encompassed ½ mile width of land area on each side of the drainages.

Well(s) Information

The well is located on Flynn Lane north of Mullan Road, in T13N, R19W, section 7, in Missoula County. Table 5 is a summary of the well information and Appendix B contains copies of the well log.

Table 5. Source well information for Hellgate Elementary School PWS.

Information	Well #1
PWS Source Code	**0845-002**
Well Location (T, R, Sec or lat, long)	**Lat: 46.8928° Long: - 114 .0547°**
MBMG#	**68367**
Water Right #	**C077796-00**
Date Well was Completed	**1/1/29**
Total Depth	**100 ft**
Perforated Interval	**--**
Static Water Level	**20 ft**
Pumping Water Level	**--**
Drawdown	**--**
Test Pumping Rate	**45 gom**
Specific Capacity	**--**

Model Input

Time-of-travel input values are conservative assumptions made to identify areas that potentially impact source water for the Hellgate Elementary School PWS. These values assume that the general characteristics of the aquifer are the same for both wells. The criteria for selection of each value used for this delineation is summarized as follows:

Thickness: The thickness of the aquifer is estimated to be 100 ft, inferred from area well logs and published estimates (Smith, 1992; Pottinger, 1988).

Hydraulic Conductivity: A value for hydraulic conductivity is estimated to be 800 ft/day, based upon specific capacity data from well logs, and typical hydraulic conductivities of unconsolidated alluvial deposits. We have chosen a value that should provide a conservative estimate of time-of-travel distances.

Transmissivity: The estimated value for transmissivity in this area is 80,000 ft^2/day (T = Kb, where K = hydraulic conductivity = 800 ft/day; b = aquifer thickness = 100 ft).

Hydraulic Gradient: The hydraulic gradient of 0.0084 is derived from Missoula Valley Water Quality District water level data from 1999.

Flow Direction: The estimated average flow direction for the purposes of this study is slightly southwest by westward (236 degrees), based on WQD water level data (1999).
Porosity: Effective porosity is the percent of rock/sediment volume occupied by interconnected voids, and is estimated at 25%. The estimated value is considered representative of unconsolidated sand and gravel, and is between two published estimates of 20% (Clark, 1986) and 40% (McMurtrey et al., 1965).
Pumping Rate: The estimated combined pumping rate of the wells is based on 25 gallons per day, estimated use per person (Salvato, 1992).

Time-of-Travel Calculation

Travel distances for 100 days, one year and three years are calculated based on input parameters summarized below. The one-year time-of-travel distance is used in Chapter 4 to rate the hazards of potential contaminant sources.

Table 6. Estimates of input parameters used to delineate the Hellgate Elementary School source water protection area.

Input Parameter	Range of Values	Values Used
PWS Source Code		**00845 –002**
Transmissivity	**45,000 – 210,000**	**80,000 ft^2/day**
Thickness	**90 – 140 ft.**	**100 ft.**
Hydraulic Conductivity	**100 - 1500 ft/day**	**800 ft/day**
Hydraulic Gradient	**0.0019 – 0.01**	**0.0084**
Flow Direction	**213 – 258 deg.**	**236 deg.**
Effective Porosity	**20 – 40%**	**25%**
Pumping Rate	**0.5 – 2.3 gpm**	**6.9 gpm**
100-day TOT	**239 – 7505 ft**	**2705 ft 0.51 miles**
1-Year TOT*	**870 – 27,500 ft**	**9875 ft 1.87 miles**
3-Year TOT*	**2605 – 82,250 ft**	**29,500 ft 5.59 miles**

*Time of Travel

Delineation Results

The results of the calculations indicate an estimated average distance of 2705 feet (0.51 miles) for a 100-day time of travel (TOT), an average distance of 9875 feet (1.87 miles) for a one-year TOT and an average distance of 29,500 feet (5.59 miles) for a three-year TOT. The delineated inventory zones are depicted in Figure 6 for the Hellgate Elementary School PWS. The surface water buffer zones for the Clark Fork River are shown in Figure 7. The recharge region for the aquifer comprises the aquifer upgradient from the supply wells, delineated in the inventory zone. A 45-degree range of groundwater flow directions was used to define the lateral boundaries of the inventory region (Figure 5).

Limiting Factors

This delineation is based on estimated aquifer properties, pumping conditions and groundwater flow conditions, and assumes uniform flow in a homogeneous aquifer. Conclusions based on this interpretation are uncertain because the extent and properties of the aquifer, and the direction and rate of groundwater flow are not known precisely, and the actual transient flow and heterogeneous stratigraphy can only be roughly approximated by the above assumptions. Time-of-travel distances are estimates based on available data. We have chosen input parameter values that will give us conservative but reasonable estimates of capture zones. This should provide a protective margin for inaccuracy inherent in calculations of this nature.

CHAPTER 3
INVENTORY

An inventory of potential sources of contamination was conducted for the Hellgate Elementary School PWS within the control and inventory regions. Potential sources of all primary drinking water contaminants and pathogens were identified, however, only significant potential contaminant sources were selected for detailed inventory. The significant potential contaminants in the Hellgate Elementary School PWS inventory region are nitrate, pathogens, fuels, solvents, herbicides, pesticides, and metals. The inventory for the Hellgate Elementary School PWS focuses on all activities in the control zone, municipal and private facilities in the inventory region, and general land uses and large facilities in the recharge region.

Inventory Method

Available databases were searched to identify businesses and land uses that are potential sources of regulated contaminants in the inventory region. A "windshield survey" was conducted to obtain additional information for this assessment. The following steps were followed:

Step 1: Urban and agricultural land uses were identified from the U.S. Geological Survey's Geographic Information Retrieval and Analysis System. Sewered and unsewered residential land use was identified from boundaries of sewer coverage obtained from municipal wastewater utilities. Septic system density outside of the sewered area was evaluated using the Montana Department of Revenue Computer Assisted Mass Appraisal (CAMA) database.

Step 2: EPA's Envirofacts System was queried to identify EPA regulated facilities located in the Inventory Region. This system accesses facilities listed in the following databases: Resource Conservation and Recovery Information System (RCRIS), Biennial Reporting System (BRS), Toxic Release Inventory (TRI), 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 to identify Concentrated Animal Feeding Operations with MPDES permits. The water system operator or other local official familiar with the area included in the inventory region 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 (USTs), hazardous waste contaminated sites (DEQ CECRA and WQA sites), landfills, abandoned mines and active mines including gravel pits. Any information on past releases and present compliance status was noted.

Step 5: County records were queried to identify businesses that generate, use, or store chemicals in the inventory region. The facilities include equipment manufacturing and/or repair facilities, printing or photographic shops, dry cleaners, farm chemical suppliers, and wholesale fuel suppliers.

Step 6: A "windshield survey" was undertaken to identify additional potential contaminant sources not listed in the databases.

Step 7: Major road and rail transportation routes were identified throughout the inventory region.

Step 8. 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/Control Zone

The area immediately surrounding the well is residential.

Inventory Results/Inventory Region

Significant potential contaminant sources for the Hellgate Elementary School PWS include nearby septic systems; fuel and chemical spills along transportation routes and pipelines; and toxic waste cleanup sites. Hellgate Elementary School is approximately ¾ miles from the railroad line and Highway 10, 1.6 miles from I-90, and 1.8 miles from the petroleum pipeline. Historic releases of fuel to groundwater have occurred at the Conoco/Yellowstone Pipeline Terminal and the Cenex gas station on North Reserve. In addition, there was a release of pesticides at the County Weed Control facility near the mouth of Grant Creek in the 1980's. None of these releases have impacted Hellgate Elementary wells and future impacts are unlikely. There are underground storage tanks at a Town Pump gas station, upgradient from Hellgate Elementary approximately 1 mile, and a removed UST at J.R. Dailey just over a mile upgradient. BFI landfill is approximately 2 miles upgradient from Hellgate wells. There is currently a plume of VOC contaminated groundwater beneath the landfill, and extending approximately 700 feet beyond the landfill; Hellgate Elementary is far enough away that no impacts from the landfill have been identified, and future impacts are unlikely, as the newer landfill cells are lined and drained, and have a soil vapor extraction system, all mitigating VOC migration. The Missoula White Pine Sash CECRA site, which impacted soil and groundwater with dioxin-laced pentachlorophenol and diesel fuel, is approximately 3.5 miles upgradient from Hellgate Elementary. However, the plume of contaminated groundwater extends offsite only several hundred feet, and appears to be relatively stable, so this should not threaten Hellgate wellsSeptic system density is approximately 85.3/mi^2 in the 1-year time-of-travel, and 72.7/mi^2 in the 3-year time-of-travel region.. The significant potential contaminant sources within the inventory zone are listed in Table 7. The general locations of these sources are shown in Figure 10.

Inventory Results/Surface Water Buffer Zones

Significant potential contaminant sources for the surface water buffer zone are pathogens and nitrates from sewage disposal systems and agricultural land use (which may also contribute pesticides and herbicides to surface waters), and chemicals from toxic release sites. Septic system density for the surface water buffer zone is 6.5/mi^2. There are no permitted confined animal feeding units listed in the EPA database for this area. Hellgate Elementary School is approximately 1.1 mile from the Clark Fork River.

Inventory Results/Recharge Region

The land use in the recharge area is primarily evergreen forest (73%), residential 1.36%, commercial/industrial (7%), crop/pasture (10%), grass/rangeland (9%).

Table 7a-j. Significant Potential Contaminant Sources for PWS #845 Inventory Region

Table 7a MPES Dischargers					
Npdes	**Permitname**	**Descript**	**Receiving water**	**County**	**Type**
MT0000094	Daily, John R., Inc. 001, 002	Total Discharge To River	Clark Fork River	Missoula	Industrial
MT0022594	Missoula (WWTP) 001	Wastewater Treatment Plant	Clark Fork River	Missoula	Municipal
MT0029840	Four B's Inn	Non-Contact Heat Exchanger	Grant Creek	Missoula	Industrial
MTR000305	BFI Waste Systems Of North America Inc	Storm Water - Industrial	Ephemeral Tributaries to Clark Fork River	Missoula	Storm Water
MTR000369	BFI Waste Systems Of North America Inc	Storm Water - Industrial	Missoula Municipal Storm Sewer	Missoula	Storm Water
MTR000390	US Postal Service	Storm Water - Industrial	Missoula Municipal Storm Sewer	Missoula	Storm Water
MTR000397	Mountain Line	Storm Water - Industrial	Storm Water Dry Wells	Missoula	Storm Water
MTR000400	Beach Transportation	Storm Water - Industrial	Missoula Municipal Storm Sewer	Missoula	Storm Water
MTX000099	Roseburg Forest Products	Wastewater	Groundwater	Missoula	Waste Water
MTX	Town Pump Travel Plaza	Wastewater	Groundwater	Bonner	Waste Water

Table 7b State Water Quality Act Sites Effective Date: February 18, 2004							
Name	**Address**		**Twn**	**Rng**	**Sec**	**Chemicals**	**Mt_rank**
Conoco/Exxon Missoula Terminal	3350 Raser Dr		13	19	8	Gasoline, diesel, ethanol, additives	R
Interstate Detroit Diesel (Old)	3757 N Reserve St		13	19	8	Diesel, waste oil, trichloroethylene	L
Long Machinery	3760 N Reserve St		13	19	8	Diesel, oil, solvent, battery fluid	N

Table 7c State and Federal Superfund Sites Sources: http://www.deq.state.mt.us/Rem/mwc/feds.asp						
Site Name	**Authority**	**Status**	**ID**	**Address**	**Description**	**Chemicals**
BN Fueling Facility	CERCLIS/CECRA	High	43	Railroad Ave and Higgins	Active railroad fueling facility	Diesel, chlorinated solvents
Missoula White Pine and Sash	CERCLIS/CECRA	High	130	1301 Scott St	inactive sawmill and wood products manufacturer	Pentachlorophenol, dioxin, diesel
Old Stickney Dump	CECRA	Medium	148	2 mi W on Mullan Rd & ½ mi S on Schmidt Lane	Illegal dump-possibly inactive	Not known
West Front Battery Site	CECRA	N	204	255 West Front St	Inactive auto repair shop	Lead

Table 7d UST Sites				
Site Name	Location	Release?	Active?	Removed?
AAA of Montana	275 W Main Street	Yes	No	No
Anr Freight Systems	1400 Cooley St	Yes	No	No
Anr Freight Systems	1400 Cooley St	1990	No	
BFI Landfill & Shop	Old Coal Mine Road	30-Nov-90	No	
BFI Waste Systems	1501 Rodgers St	Yes	No	No
Blue Star Canvas Products Inc	300 W Main	Yes	No	No
Callaghan Residence	3923 Timber Lane	06-May-02	No	
Cenex Bulk Plant (2)	4570 N Reserve St	1991-1998	No/Yes	
Cenex Self-Serve-Missoula	1108 W Central		No	
Cenex Tire Service	**400 W Front St**	**Yes**	**No**	**Yes**
Cenex Tire Service	**400 W Front St**	**14-Feb-91**	**Yes**	
Christopherson, Joan	223 W Broadway	16-Dec-92	No	
City Street Dept	800 W Broadway	Yes	No	No
Colonial Motel	1410 W Broadway	Yes	No	No
Conoco Products Terminal	**3330 Raser Dr**	**1991-2003**	**Yes**	
Consolidated Freightways	1500 Burns St	Yes	No	Yes
Costco Wholesale	3220 Northern Pacific Ave.	No		No
Courtesy Sinclair	541 E Broadway	Yes	No	No
Cummins Northwest, Inc.	4950 N Reserve St	09-Nov-89	No	
Deanos Truck Stop #14	5055 N Reserve	1989-1998	No	
Demarois	3115 W. Broadway	No		No
Earl's Dist. Inc.	3305 Great Northern Way	1991	No	
Eastgate Conoco	1002 E Broadway	Yes	No	No
Eastgate Oil	**1020 E Broadway**	**Yes**	**No**	**Yes**
Eastgate Oil	**1020 E Broadway**	**24-Jun-98**	**Yes**	
Economy One Motel	1144 W Broadway	Yes	No	No
El-Mar Rv/Mh Village Inc	3450 Tina Ave	11-Dec-97	No	
Felton Construction Co.	3660 Grant Creek Rd.	Yes	No	Yes
Finest Oil Co - Northgate	3695 Grant Creek Rd	26-Apr-99	No	
Finest Oil Company Eastgate	940-980 E Broadway	Yes	No	No/Yes
Former Grizzly Auto Center	2000 W Broadway	Yes	No	No
Former Schwink's Gas Station	**525 W Broadway**	**Yes**	**No**	**Yes**
Front St Ventures	117 W Front Street	Yes	No	No
Front St Ventures	117 W Front Street	07-Nov-90	No	
Frontier Gas & Grocery	2120 W Broadway	Yes	No	No
Garden City Market	**624 E. Broadway**	**Yes**	**Yes**	**Yes**
Garden City Market	**624 E Broadway**	**Yes**	**No**	**Yes**
Garden City Market	**624 E Broadway**	**24-Aug-01**	**Yes**	
Gary's West Broadway Sinclair	1340 W Broadway	Yes	No	No
Gary's West Broadway Sinclair	1340 W Broadway	25-May-99	No	
Gas Card Otto Site #032	2738 W Broadway	Yes	No	No
Goofy's West	**1111 W. Broadway**	**No**		**No**
Grant Creek Ranch	**Old Grant Cr Rd**	**No**	**No**	**Yes**
Greaves, David & Sharon	9295 Woodwind Trail	03-Aug-92	No	
Hellgate Conoco Service Center	711 E Broadway	Yes	No	No
Holiday Station Store #265	111 Orange St	Yes	No	No
Import Palace	1358 W. Broadway	Yes	No	No

Table 7d UST Sites				
J & D C-Store	624 E Broadway	1992-1994	No	
J R Daily Co	2900 Mullan Road	Yes	No	No
Jgl Landfarm Site	3700 Grant Creek Road	05-May-92	No	
Johnson Brothers Contracting	6675 Desmet Rd	03-Apr-03	No	
Karl Tyler Chevrolet	**3663 N. Reserve**	**No**		**No**
Larry Tabish Conoco	1451 W Broadway	Yes	No	No
Lithia Auto Center	5001 Grizzly Ct.	No		No
Long Machinery Co	3760 N Reserve		No	
Louisiana-Pacific Corporation	3300 Raser Dr	Yes	No	
MDOT Maintenance Shop	2100 W Broadway	Yes	No	No
Missoula Airport-Washington Hanger	5225 Hwy 10 W	28-Oct-92	No	
Missoula City Cemetery Shop	1820 Rodgers	No		Yes
Missoula County Airport Authority	**5225 Hwy 10 W**	**22-Jul-99**	**Yes**	
Missoula County Detention Ctr	2340 Mullan Rd	No		No
Missoula County Road Dept	3095 Stockyard Road	1990-1997	No	
Missoula Urban Transportation	1221 Shakespeare	Yes	No	No
Missoula White Pine Sash Co	**1301 Scott St**	**Yes**	**Yes**	**Yes**
Montana Rail Link/Yellow Freight Depot Building	Railroad Ave	Yes	No	No
Montana Snow Bowl	1700 Snowbowl Road	15-Dec-93	No	
Noon's #411	2738 W. Broadway	No		No
Noon's #435	**1540 Toole Ave.**	**No**		**No**
Noon's #458	**820 E. Broadway**	**Yes**	**No**	**No**
Noon's #57	**540 E Broadway**	**Yes**	**No**	**Yes**
Northwest Erection Inc.	9660 Summit Dr. Suite A	17-Nov-94	No	
Ole's Country Store	923 N. Orange	No		No
Ole's Country Store #8	4901 N Reserve		No	
Orange St. Sinclair	**400 W. Broadway**	**Yes**	**Yes**	**Yes**
Otto's Inc	**514 Defoe**	**Yes**	**No**	**Yes**
Palmer Bros Auto Supply	1421 W Broadway	Yes	No	No
Performance Auto	901 N Orange	Yes	No	No
Providence Center	**900 N. Orange**	**No**		**No**
PS Mini Mart	**930 N. Russell**	**No**		**No**
R. H. Grover, Inc.	9550 Derby Dr.	09-Feb-94	No	
Rangitsch Bros.	2001 W. Broadway	No		No
Real Log Homes, Inc.	9575 Futurity Dr	28-May-97	No	
Refrigeration Specialties	3535 Hwy 10 W	09-Jan-96	No	
Rocky Mountain Elk Foundation	2291 W Broadway	Yes	No	No
Sevenar Convenience Store	5310 Grant Creek Road	18-Sep-00	No	
Sewage Treatment Plant	Clarkfork Lane	16-Jul-91	No	
Short Stop	820 E Broadway	Yes	No	No
Sprint	2515 Railroad St W	No		No
St Mary's Cemetery	641 Turner	Yes	No	No
St Patrick Hospital	500 W Broadway	Yes	No	No
Stan Watkins Trucking, Inc	N 6400 Hwy 10 W	1998	No	
Sun Mountain Sports Inc. (2)	401 W Railroad	1990-2001	No/Yes	
Tabish Bros. Distr.	**955 Beech**	**Yes**	**No**	**No**

Table 7d UST Sites				
Tabish Brothers Distributing, Inc	501 Taylor	23-Feb-98	No	No
Thompson Medical Office	410 W. Spruce	Yes	Yes	Yes
Triple W Equipment	3201 W Broadway	29-May-98	No	
United Parcel Service	221 Expressway Ln	13-Jul-93	No	
Vehicle Maintenance Div.	800 W. Broadway	Yes	No	Yes
Washington Corporations	500 Taylor St.	Yes	No	Yes
Washington Corporations	500 Taylor Street	Yes	No	No
Washington Corporations	101 International Way	11-Jul-91	No	
Western Transport Crane & Rigging	100 Western Way	06-Jan-99	No	
Wines, Clarence	Hwy 10 W	26-Nov-90	No	

Table 7e RCRA Hazardous Waste Generators Source:http://www.epa.gov/enviro/html/nris_query_java.html 5-22-2003					
Handler Name	**Handler Id**	**Street**	**City**	**Handler Type**	**P2 Permit**
American Eagle	MTR000008227	6575 Butler Creek Rd	Msla	Small Generator	X
Big Sky Tile & Marble Works-Closed	MTR000000844	9525 Hwy 10 W	Msla	Small Generator	Not required
Conoco Missoula Product Terminal	MTT000622191	3330 Raser Drive	Msla	Large Generator	X
Missoula Textile Service	MTD035277359	111 E Spruce St	Msla	Small Generator	X
Missoula White Pine-Closed	MTD006229074	1301 Scott St	Msla	Small Generator	X
Roseburg Forest Products	MTD980807176	3300 Raser Drive	Msla	Small Generator	X
The Home Depot #3102	MTR000202127	2725 Radio Way	Msla	Small Generator	Not required

Table 7f Active WQD Pollution Prevention Permitted Facilities			
Facility Name	**Address**	**City**	**Reg Type**
BFI Missoula Hauling Company	1501 Rodgers St	Missoula	Diesel, New Oil, Waste Oil
BFI Missoula Landfill	Coal Mine Road	Missoula	Diesel, New Oil, Waaste Oil
Borden Chemical	3670 Grant Creek Rd	Missoula	Formaldehyde, Methanol, Phenol, Potassium Hydroxide, Sulfuric Acid, Ethylene Glycol, Mercury, Diesel
Cenex Harvest States	4570 N Reserve St	Missoula	Gasoline, Diesel, Kerosene, Lubricants
City Of Missoula Maintenance Shop	1305 B Scott St	Missoula	New Oil, Waste Oil, Gear Lube
Clawson Manufacturing Co	1225 Rodgers St	Missoula	Diesel, New Oil, Waste Oil
Conoco Phillips/Exxon Mobile	333o Raser Dr	Missoula	Gasoline, Diesel Ls#1 & #2,Transmix,Automate Red Bd 50, Ethanol, Octel Starreon 8500, Hitec 5423, Infinium 7594, Pur Add 5000, Hitec 6476
Costco Wholesale	3220 Northern Pacific	Missoula	Gasoline
Davis Transport Inc	216 Trade St	Missoula	New Oil, Waste Oil, Windshield Washer, Antifreeze, Quick Sorb, Solvent-Parts Washer
Deano’s Truck Plaza	5055 N Reserve St	Missoula	Gasoline, Diesel
Demarois Olds-Gmc	3115 W Broadway	Missoula	Gasoline

Table 7f Active WQD Pollution Prevention Permitted Facilities			
Facility Name	**Address**	**City**	**Reg Type**
Eko Compost, Inc	1125 Clark Fork Lane	Missoula	Ethylene Glycol, Gasoline, Diesel, Hydrodesulpher Kerosene
Elmar Rv/Mh Village Inc	3450 Tina Ave	Missoula	Gasoline, Diesel
Finest Oil Company Eastgate	980 E Broadway	Missoula	Gasoline, Diesel
Finest Oil Company Northgate	3665 Grant Creek Rd	Missoula	Gasoline, Diesel, Lube Oil Grease
Frontier Super Stop	2120 W Broadway	Missoula	Gasoline Diesel
Goofy's West	1111 W Broadway	Missoula	Gasoline
Great Western Petroleum	1002 E Broadway	Missoula	Gasoline, Diesel, New Oil, Bulk Hydraulic Oil
Hellgate Conoco	711 E Broadway	Missoula	Gasoline, New Oil, Used Oil
Hellgate Trading Post	6265 Mullan Rd	Missoula	Gasoline
Inland Truck Parts & Service	6550 Exress Way	Missoula	New Oil, Waste Oil
Interstate Detroit Diesel	5561 Express Way	Missoula	Diesel, Ethylene Glycol, Waste Oil
Jiffy Lube #1946	3640 N Reserve St	Missoula	New Oil, Waste Oil, Waste Anitfreeze, Antifreeze, Methanol
Karl Tyler Chevrolet, Inc	3663 N Reserve St	Missoula	Fuel, Used Oil, New Oil
Kls Hydraulics	3650 Grant Creek Rd	Missoula	Waste Oil
Ls Jensen Construction & Paving	4685 Mullan Rd	Missoula	Diesel #2, Diesel #1, Gas, New Oil, Antifreeze, W. Oil, Asphalt Cement, Ss1-Tack Oil, Heat Transfer, #2 Diesel, #4 Fuel Oil, Liquefied Propane
Mickelson Rock Products	7005 Butler Creek Rd	Missoula	Diesel Motor Oil
Minuteman Aviation	5225 Hwy 10 W	Missoula	Jet Fuel, Aviation Fasoline, Waste Oil, Unleaded Gas, Ethylene Glycol
Missoula International Airport	5225 Hwy 10 W	Missoula	Ethylene Clycol, Propylene, Aviation Fuel, Gasoline, Waste Oil, New Oil
Missoula Truck Sales Inc	2600 Charlo St	Missoula	New Oil, Waste Oil
Missoula Wastewater Treatment Plant	1100 Clark Fork Dr	Missoula	Diesel
Modern Machinery	101 International Way	Missoula	Gasoline, Diesel, New Oil, Waste Oil, Solvent
Montana Rail Link, Car Shop	1705 Rodgers St	Missoula	Gasoline, Diesel, New Oil, Waste Oil, Fuel Performance Catayst,Pertoleum Naphtha
Mountain Line	1221 Shakespeare	Missoula	Diesel, Waste Oil
Mountain Water Company Shop	1345 W Broadway	Missoula	Diesel, Sodium Hypochlorite Solution, Propane
Msla County Road Department	6089 Training Dr	Missoula	New Oil, Antifreeze, Waste Oil,Toluene, Hyd. Fluid, Gear Lube,Transmission Fluid
Mt Dept Of Transportation	2100 W Broadway	Missoula	Gasoline, Diesel, Waste Oil, Stripping Paint, Deicer, Waste Oil
Mullan Station	3420 Mullan Rd	Missoula	Gasoline, Diesel
Noon's #435	1540 Toole Ave	Missoula	Gasoline
Noon's #457	540 E Broadway	Missoula	Gasoline
Noon's #458	820 E Broadway	Missoula	Gasoline, Diesel
Ole's #12, Tri East Inc	3705 E Hwy 200 E	E Missoula	Gasoline, Diesel
Ole's #8 (Seven Bar R)	4901 N Reserve St	Missoula	Gasoline
Ole's Country Store #2	923 N Orange St	Missoula	Gasoline

Table 7f Active WQD Pollution Prevention Permitted Facilities			
Facility Name	**Address**	**City**	**Reg Type**
Otto Site #411	2738 W Broadway	Missoula	Gasoline
Otto's Site #432	2738 W Broadway	Missoula	Gasoline, Diesel
Pro Lube	1935 Cooper St	Missoula	Oil, Waste Oil
Providence Center	900 N Orange St	Missoula	Diesel
Ps Mini Mart	930 N Russell St	Missoula	Gasoline, Diesel
Qwest Missoula Central Office	201 N Pattee St	Missoula	Sulfuric Acid
Rangitsch Brothers	2001 W Broadway	Missoula	Gasoline
Rattlesnake Trading Post	1002 E Broadway	Missoula	Gasoline, Diesel
Roseburg Forest Products	3330 Raser Dr	Missoula	Gasoline, Diesel, New Oil, Formaldehyde, Butyl Acetate, Mibk, Thermal Oil
Sevenar	5310 Grant Creek Rd	Missoula	Gasoline, Diesel
Sorensen Transport	6575 Hwy 10 W	Missoula	Diesel, Oil, Waste Oil
Sprint Communications	2825 Stockyard Rd	Missoula	Diesel
St Patrick Hospital	500 W Broadway	Missoula	Diesel
Tabish Brothers Distributing	955 Beech St	Missoula	Gasoline, Diesel, New Oil, Hydraulic Oil
Thatcher Chemical Co	3200 Raser Dr	Missoula	Al Sulphate, Copper Sulphate, Sulphuric Acid, Sodium Hypochlorite,Sdoium Hydroxide, Hydrochloric Acid
Triple W Equipment	3201 W Broadway	Missoula	Oil, Waste Oil, Antifreeze
United Parcel Service	221 Express Way	Missoula	Gasoline, Used Oil New Oil
Washington Flight Department	5225 Hwy 10 W	Missoula	Jet Fuel
Watkins & Shepard Trucking Inc	6400 Hwy 10 W	Missoula	Diesel, New Oil, Waste Oil
Western States Equipment	3760 N Reserve St	Missoula	Diesel, New Oil, Waste Oil, Solvent, Battery Fluid
Wimmett Trucking	6600 Wimett Ln	Missoula	Diesel, Solvent, Aluminum Brine

Table 7g Mines											
Mine Name	MBMG #	Property Type	Product	Operation Type	Status	Location					
						Township	Range	Section	Lat	Long.	
L.S. Jensen	MI002916	Lode	Stone	Surface	Active	13N	19W	7	46.9028	-114.0417	
Wheeler's Mill	MI002754	Mill	Barium	Proc. Plant	Past Prod.	13N	19W	16	46.8856	-114.0169	

Table 7h Landfills			
Facility	Class	Status	Close Date
Browning Ferris Industries	II	Open	--
Browning Ferris Industries		Closed	8-20-81
Rainglo Services, Inc.	II	Closed	12-31-89
City of Missoula Northside			
Eko Compost		Open	
William Wheeler	III		

Table 7i Miscellaneous Potential Contaminant Sources			
Source Name	**Type**	**Potential Contaminants**	**Number**
I-90	Interstate Highway	Fuel, other chemical spills	1
Hwy 10	U.S. Highway	Fuel, other chemical spills	1
Montana Rail Link	Rail line	Fuel/chemical spills	1
Yellowstone Pipeline	Petroleum products Pipeline	Fuel	1
Stormwater Injection Wells	Parking lot and street	Fuel/chemicals	474

Table 7j Confirmed Groundwater Contamination			
Source Name	**Type**	**Contaminants**	**Year of Release**
Yellowstone Pipeline	Petroleum Pipeline	Fuel	1982
Conoco/Phillips Terminal	Pipeline Terminal	Fuel	
Cenex Station	Gas Station	Fuel	
Interstate Detroit Diesel	Repair Shop	Fuel, oil, solvents	
BFI Landfill	Landfill	VOCs	NA
Missoula County Weed District	Weed Control Operation	Pesticides	1991

Inventory Update

The certified operator will update the inventory every year. Changes in land uses or potential contaminant sources will be noted and additions made as needed. The complete inventory will be submitted to DEQ every five years to ensure re-certification of the source water delineation and assessment report.

Inventory Limitations

The accuracy of the inventory is limited by the accuracy of information provided by state and federal databases. The windshield survey provides a level of quality assurance that the information presented reflects actual conditions. The inventory is also limited by the accuracy of the delineation, which is discussed above.

CHAPTER 4
SUSCEPTIBILITY ASSESSMENT

The susceptibility of Hellgate Elementary School wells to significant potential contaminant sources is assessed in this chapter. Susceptibility is the potential for a well to be contaminated by one of the sources inventoried in the previous chapter. Hazard ratings and the presence of barriers determine susceptibility (Table 8). Hazard ratings are determined by the proximity of a potential point-source contaminant or the density of non-point source potential contaminants to the well. For the Hellgate Elementary School PWS, contaminant sources within the one-year TOT were given a high hazard rating and all other sources within the inventory region were given moderate hazard rating. The susceptibility is then determined based upon the hazard and any barriers that mitigate the hazard. Barriers can be engineered structures, management actions and/or natural conditions. Spill catchments for fueling facilities and leak detection for underground storage tanks are examples of engineered barriers. Emergency planning and availability of trained hazardous materials response team, and best management practices are examples of management barriers. Clay soils, deep wells and a thick layer of substrate above an aquifer can be considered natural barriers.

Table 8. Relative susceptibility to specific contaminant sources as determined by hazard and the presence of barriers.

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

For point sources, the relative hazard of the significant potential contaminant sources listed in Table 7 reflects the location of the sites relative to the PWS wells and how long ground water would take to travel from that site to the wells. For sites located within a time of travel distance of less than one year, the relative hazard is assigned as high. For the remaining sites located in the inventory region, the relative hazard assigned is moderate.

For non-point sources, the relative hazard is assigned based on the following table.

Table 9. Non-point source relative hazard ratings.

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

Table 10. Susceptibility assessment for significant potential contaminant sources in the Control Zone and Inventory Region.

Map ID#	Facility Name	Contaminant	Hazard	Barriers	Susceptibility	Management
	Stormwater injection wells	Mixed	High	HazMat Team	High	
	Septic density of 85.3/mi^2 (1-yr. TOT); 72.7/mi^2 (3-yr. TOT)	Pathogens & nitrate	Moderate		High	Connections to municipal sewer
Labeled	USTs	Fuel	High	WQD Pollution Prevention Permit; HazMat Team	Moderate	Leak prevention and detection
Labeled	I-90; Hwy 10; Montana Rail Link	Fuel/chemicals	Moderate	HazMat Team	Moderate	
Labeled	Yellowstone Pipeline	Petroleum products	Moderate	HazMat team	Moderate	Pipeline inspection and maintenance
Labeled	CECRA—Old illegal dump	Solvents?	Moderate	Old release; any contaminated soil or groundwater areas should be receding.	Moderate	--
Labeled	Conoco/Exxon Terminal Release	Gasoline	Moderate	Ongoing monitoring	Moderate	--
Non-point	Municipal Sewer <20%	Pathogens & nitrate	Moderate	New sewer mains; inspection program	Low	Continued monitoring of condition of mains

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APPENDIX A

PWS System Layout and Sanitary Survey

APPENDIX B

Well Log for PWS

One Page Site Report -- GWICMontana Bureau of Mines and Geology
Ground-Water Information Center Site Report
HELLGATE SCHOOL DISTRICT NO. 1 - WELL 1

Location Information

GWIC Id: 68367
Location (TRS):13N 19W 07 CCDD
County (MT): MISSOULA
DNRC Water Right: C077796-00
PWS Id: 00845002
Block:
Lot:
Addition:
Source of Data: COMBO
Latitude (dd): 46.8928
Longitude (dd) :-114.0547
Geomethod: MAP
Datum: 1927
Certificate of Survey:
Type of Site: WELL
Site Notes: LOCATED AT SE CORNER OF BUILDING 1 IN BASEMENT. TRACT LOCATION BASED ON LAT\LONG FROM DEQ.

Well Construction and Performance Data

Total Depth (ft): 100.00
Static Water Level (ft): 20.00
Pumping Water Level (ft):
Yield (gpm): 45.00
Test Type:
Test Duration:
Drill Stem Setting (ft):
Recovery Water Level (ft):
How Drilled:
Driller's Name:
Driller License:
Completion Date (m/d/y):1/1/1929
Special Conditions:
Is Well Flowing?:
Shut-In Pressure:
Geology/Aquifer:112ALVM

Recovery Time (hrs):
Well/Water Use: PUBLIC WATER SUPPLY

Well Notes:

Hole Diameter Information

From	To	Diameter
0.0	100.0	6.0

Casing Information1

From	To	Dia	Description
0.0	100.0	6.0	STEEL

Annular Seal Information
No Seal Records currently in GWIC.Completion Information1
No Completion Records currently in GWIC.

Lithology Information
No Lithology Records currently in GWIC.

1 - All diameters reported are inside diameter of the casing.
These data represent the contents of the GWIC databases at the Montana Bureau of Mines and Geology at the time and date of the retrieval. The information is considered unpublished and is subject to correction and review on a daily basis. The Bureau warrants the accurate transmission of the data to the original end user. Retransmission of the data to other users is discouraged and the Bureau claims no responsibility if the material is retransmitted. Note: non-reported casing, completion, and lithologic records may exist in paper files at GWIC.

APPENDIX C

MBMG-GWIC Well Logs for Area

Ground Water Information Center
Wells Report

Gwic Id	DNRC WR	Site Name	Location	Ver?	Type	Td	Pwl	Swl	Yield	Date	Use
68348		BIGGER COREY D.	13N19W07	NO	WELL	60.00	47.00	36.0	50.0	5/4/1983	UNKNOWN
68350		D'ORAYI Albert J. Rosemary	13N19W 07	NO	WELL	70.00		20.00	50.0		DOMESTIC/ IRRIGATION
120484		SAMMON'S TRUCKING	13N19W07	NO	WELL	80.00	50.00	37.0	50.0	8/10/1990	DOMESTIC
68349		SAMMONS TRUCKING	13N19W 07	NO	WELL	60.00	26.00	25.00	27.00	7/1/1972	DOMESTIC
68347		SHERATON HOTEL	13N19W 07	NO	WELL	138.00	47.00	46.00	215	2/3/1984	OTHER
68351		GERRITY TOM	13N19W 07	NO	WELL	60.00		45.00		1/1/1938	COMMERCIAL/DOMESTIC
68352		UNION CONSTRUCTION	13N19W 07A	NO	WELL	100.00	55.00	46.00	30.00	9/9/1957	INDUSTRIAL
68354		SCHRAMM JOHN W. #2	13N19W 07AA	NO	WELL			96.00	350	1/1/1930	INDUSTRIAL
68353		SCHRAMM JOHN W. #1	13N19W 07AACA	NO	WELL			96.00	350	1/1/1890	INDUSTRIAL
203098		HARTZ ELL JAMES &SUZANNE	13N19W 07AB	NO	WELL	118.00		80.00	30	5/7/2003	IRRIGATION
68356		BAKKE TIRE CO	13N19W 07AC	NO	WELL	79.00	50.00	39.00	60.00	8/5/1985	PUBLIC WATER SUPPLY
194438		BURTON DON	13N19W 07AC	NO	WELL	72.00				12/17/2001	
706330		DOUGHERTY JOHN	13N19W 07AC	NO	WELL	107.00				1/1/1947	IRRIGATION
187428		JTL GROUP	13N19W 07AC	NO	WELL	159.00	144.40	85.40	133	3/6/2001	OTHER
68355		WESTERN TRANSPORT	13N19W 07AC	NO	WELL	106.00	100.00	61.00	40.00	11/21/1979	UNKNOWN
140744	C088492-00	SAMMONS TRUCKING	13N19W 07ACBA	NO	WELL	81.00	60.00	53.00	30.00	12/23/1993	DOMESTIC
141334		4B'S WHOLESALE	13N19W 07AD	NO	WELL	100.00		57.00	40.00	3/18/1994	DOMESTIC
68362		BUD LAKE TRUCK STOP	13N19W 07AD	NO	WELL	62.00		60.00		1/1/1957	PUBLIC WATER SUPPLY
68363		BUD LAKE TRUCK STOP	13N19W 07AD	NO	WELL	87.00		60.00		1/1/1954	PUBLIC WATER SUPPLY
68358		EVANS WENDY	13N19W 07AD	NO	WELL	119.00	100.00	12.00	100	8/1/1985	DOMESTIC
68359		EVANS WENDY	13N19W 07AD	NO	WELL	95.00	90.00		100	8/9/1978	DOMESTIC
68361		LAKE HAROLD &MARY	13N19W 07AD	NO	WELL	76.00		60.00		1/1/1950	PUBLIC WATER SUPPLY
68360		PATTERSON SHEEP CO.	13N19W 07AD	NO	WELL	90.00		40.00	60	1/1/1947	DOMESTIC
68357	12236	RENTAL EQUIPMENT	13N19W 07AD	NO	WELL	138.00	95.00	68.00	75	2/4/1977	INDUSTRIAL
152136	P047644-00	IMPERIAL FOODS 4-BS WHOLESALE-WELL 3	13N19W 07ADCC	NO	WELL	100.00		51.00	50	10/11/1995	PUBLIC WATER SUPPLY
68364		WASHINGTON CORP	13N19W 07B	NO	WELL	122.00		47.00	25.00	4/22/1988	DOMESTIC
173203		MONTANA	13N19W	NO	WELL	78.00	70.00	45.00	38	3/12/1999	

		HOMES	07BA								
163046	6676	WILSON KEN	13N19W 07BB	NO	WELL	95.00		21.00	40.00	7/1/1997	DOMESTIC
171777		FOREST INN LOUNGE & APARTMENTS WELL 1	13N19W 07BBCC	NO	WELL						
706331		DOUGHERTY JOHN	13N19W 07BC	NO	WELL	36.00				1/1/1965	IRRIGATION
169302		NORDBERG JASON	13N19W 07BD	NO	WELL	110.00	27.00		30	8/21/1998	DOMESTIC
68366		DOUGHERTY JACK PATRICK	13N19W 07C	NO	WELL	62.00	55.00		8	7/4/1969	DOMESTIC
68365		GUEST JIM & SUSAN	13N19W 07C	NO	WELL	60.00	29.00	20.00	30	3/13/1984	DOMESTIC
183175		DAIGLE MIKE & SANDRA	13N19W 07CC	NO	WELL	77.00		25.00	30	5/16/2000	DOMESTIC
706332		HELLGATE SCHOOL	13N19W 07CC	NO	WELL					1/1/1997	PUBLIC WATER SUPPLY
151186		MISSOULA COUNTY WQD WELL W131907C	13N19W 07CCCA	YES	WELL	50.00		24.24		1/10/1995	MONITORING
123189	77805	HELLGATE ELEMENTARY SCHOOL	13N19W 07CCCC	YES	WELL	124.00	34.00	22.00	223	6/17/1991	IRRIGATION
197283	C004838-00	HELLGATE ELEMENTARY SCHOOL #2	13N19W 07CCDD	NO	WELL	71.00		19.00	150	7/15/1975	PUBLIC WATER SUPPLY
134202	C077805-00	HELLGATE ELEMENTARY SCHOOL #3	13N19W 07CCDD	NO	WELL	140.00	38.50	34.00	580	2/10/1993	PUBLIC WATER SUPPLY
68367	C077796-00	HELLGATE SCHOOL DISTRICT NO. 1 – WELL 1	13N19W 07CCDD	NO	WELL	100.00		20.00	45	1/1/1929	PUBLIC WATER SUPPLY
68373		D'ORAYI ALBERT J. & ROSEMARY *DUG WELL	13N19W 07D	NO	WELL					1/15/1872	DOMESTIC/ INDUSTRIAL
706333		EL MAR TRAILER	13N19W 07DA	NO	WELL	135.00				1/1/1997	PUBLIC WATER SUPPLY
706334		EL MAR TRAILER	13N19W 07DA	NO	WELL	57.00	55.00	35.00	50.00	1/1/1959	PUBLIC WATER SUPPLY
68374		STATE HIGHWAY DEPT.	13N19W 07DA	NO	WELL	69.00	47.00	47.00	25.00	12/13/1971	IRRIGATION
68375		ROARK DOUGLAS B.	13N19W 07DAB	NO	WELL	177.00	75.00	53.00	100	4/11/1077	COMMERCIAL/DOMESTIC
68368		EL MAR TRAILER VILLAGE – WELL 1	13N19W 07DABA	NO	WELL	165.00	41.00	36.00	40	7/21/1962	PUBLIC WATER SUPPLY
68369		EL MAR TRAILER VILLAGE – WELL 3	13N19W 07 DACC	NO	WELL	76.00	65.00	25.00	125	7/21/1965	PUBLIC WATER SUPPLY
68371		EL MAR TRAILER VILLAGE – WELL 5	13N19W 07DBAA	NO	WELL			24.00		1/1/1946	PUBLIC WATER SUPPLY

68377		DONALDSON EUGENE	13N19W 07DD	NO	WELL	71.00	30.00	27.00	45	5/30/1969	DOMESTIC
706335		DORAZI AL	13N19W 07DD	NO	WELL	70.00				1/1/1997	UNUSED
161959	102071	FRISTO JAMES	13N19W 07DD	NO	WELL	80.00		32.00	30	6/4/1997	DOMESTIC
68378		GERRITY THOMAS	13N19W 07DD	NO	WELL	101.00	60.00	26.00	20.00	5/25/1966	DOMESTIC
68376		WICK THOR J.	13N19W 07DD	NO	WELL	70.00	41.00	30.00	45.00	2/28/1983	UNKNOWN
159373		KAUFFMAN TERRY	13N19W 07DDA	NO	WELL	80.00		43.00	30	12/9/1996	DOMESTIC
68379		WILLIAMS DWAYNE C	13N19W 07DDAB	NO	WELL	100.00	95.00	34.00	75	8/11/1980	UNKNOWN
68370		EL MAR TRAILER VILLAGE – WELL 4	13N19W 07DDBB	NO	WELL	69.00	35.00	27.00	75	6/16/1969	PUBLIC WATER SUPPLY
129030		EL MAR TRAILER VILLAGE – WELL 6	13N19W 07DDBC	NO	WELL	75.5	50.00	32.00	100	5/12/1992	PUBLIC WATER SUPPLY
68380		MATRANGA GEORGE	13N19W 07DDC	NO	WELL	100.00	80.00	35.00	40	12/13/1963	DOMESTIC
68381		KOBLE FRANK & AUDREY	13N19W 07DDCD	NO	WELL	71.00	28.00	28.00	21	8/22/1966	DOMESTIC

Retrieval Statistics *

Field	Max	Min	Count	Avg
Total Depth	177.00	36.00	53	91.48
Pumping Water Level	144.40	26.00	31	58.71
Static Water Level	85.40	12.00	45	39.30
Yield (gpm)	580.00	8.00	43	73.49

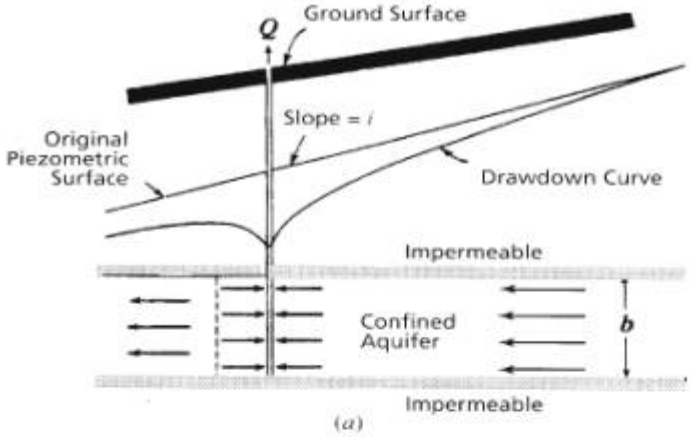
* These statistics do not take any geographic, topographic, or geologic factors into consideration. Negative swl values are reported for water levels that are above land surface.

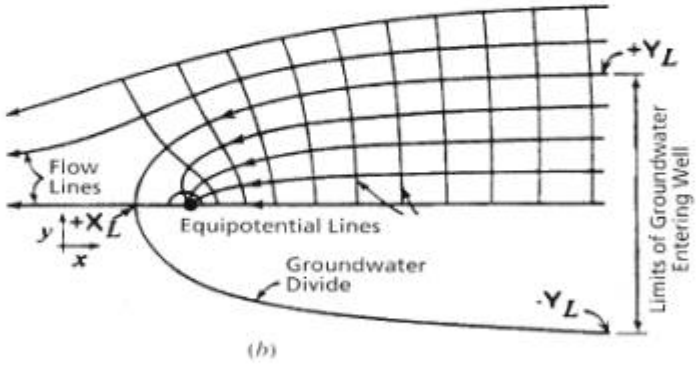
APPENDIX D

Time of Travel Calculations

UNIFORM GROUNDWATER FLOW EQUATION

Flow to a well penetrating a confined aquifer having a sloping plane piezometric surface - vertical section and plan view (Todd, 1980).





$$-\frac{Y}{X} = \tan\left(\frac{2\pi Kbi}{Q}Y\right)$$

Uniform-Flow Equation

$$X_L = -\frac{Q}{2\pi Kbi}$$

Distance to Down-Gradient Null Point

$$Y_L = \pm\frac{Q}{2Kbi}$$

Boundary Limit

Legend:

- Pumping Well

Where:

Q = Well Pumping Rate
K = Hydraulic Conductivity
b = Saturated Thickness
i = Hydraulic Gradient
π = 3.1416

TIME-OF-TRAVEL CALCULATION METHOD

The time of travel for water to move along a line parallel to the hydraulic gradient, from a point to a pumping well (EPA 1991).

$$T_x = \frac{n}{Ki}\left[X_L - \frac{Q}{2\pi Kbi}\ln\left(1 + \frac{2\pi Kbi}{Q}X_L\right)\right]$$

T_X	=	travel time from point x to a pumping well
n	=	porosity
X_L	=	distance from pumping well over which groundwater travels in T_X
Q	=	discharge
K	=	hydraulic conductivity
b	=	aquifer thickness
i	=	hydraulic gradient

APPENDIX E

Inventory Sheets

APPENDIX F

Checklist

Department of Environmental Quality
Source Water Protection Program

CERTIFICATION CHECKLIST

Source Water Delineation and Assessment Reports (SWDAR)
For Community and non-community non-transient PWSs

The following items represent the minimum requirements for certification of a completed SWDAR for Community and non-community non-transient PWSs. The SWDAR represents the technical component of the SWPP, and mush be completed per the 1996 amendments to the Federal Safe Drinking Water Act. This checklist should be used in conjunction with the information and general format provided in the template for preparing SWDAR documents. While the format of the template may be modified as needed, all requested information should be included for certification.

For any items that are not applicable or information is not available, note in checklist column and provide and explanation. Attach additional sheets for explanation, if necessary.

Name of System:		**Hellgate Elementary School**
PWS #:		**845**
Date Submitted:		**June 30, 2004**
Operator Name:		**Richard Riebe**
SWPP Contact:	Name:	Richard Riebe
	Address:	2385 Flynn Ln Missoula, MT 59808
	Phone:	(406) 728-5626
Person Preparing	Name:	Michelle Hutchins, Environmental Health Specialist
Plan Contact:	Address:	Missoula City County Health Department 301 W. Alder Missoula, MT 59802
	Phone:	(406) 258-4890

The following summary checklist is derived from the Source Water Delineation and Assessment Report template document. The completed plan should include summary discussions, when appropriate, for each listed item. Indicate the page and/or section number where this information is, or indicate not applicable (n/a) when appropriate. For items indicated as not applicable, the text should indicate why.

Introduction

	Page
Person who prepared document	iv
Name of system and county located in	iv
PWS Identification Number	iv
PWS contact person, with address and phone number	cover

Chapter 1 – Background

This section provides background information on the community served by the PWS.

	Page
1. The Community:	1
• Population	1
• Economic base	1
• Major water users	1
• Major waste generators	1
• Domestic sewage treatment and disposal	1
2. Geographic Setting	1
• Geographic setting, including surrounding area	1
• Physiographic features	1
• Streams and lakes	1
• Climate information (including annual precipitation and temperatures)	1
• A vicinity map at appropriate scale	Fig. 1

For surface water sources, or ground water systems influenced by surface water

• 8 and 11 digit USGS Hydrologic Units	n/a
• Montana Watershed Management Region	n/a
3. General Description of Source Water	1

Description of PWS system, including:

- Source of water (number of wells, depths, etc.) 2
- Well lithology and construction logs (in appendix) Appx B
- Distribution system 1, Appx A
- Number of connections and users 2
- PWS Treatment System 2

- Copy of latest Sanitary Survey (in appendix) Appx A

- A map indicating the general layout of the PWS. Appx A

4. Water Quality:

- Summarize enforcement actions in the past 5 years 2
- Describe background/regional water quality 2
- Table summarizing background water quality 3

For surface water sources, or ground water systems influenced by surface water

- Use classification n/a
- Threatened or impaired streams in watershed n/a
- TMDL development prioritization and status n/a

Chapter 2 – Delineation

This section provides information on the hydrogeology of the water supply for the PWS. Background information on the hydrogeologic setting should be assembled into a ***Hydrogeologic Conceptual Model*** that summarizes the ground water system in a simplified manner. The background information should support the process to delineate management areas.

		Page
1.	Hydrogeologic Conditions	4
•	Identification of references for hydrogeologic information	4
•	Summary tables of hydrogeologic studies and maps for area	5-6
•	Summary of wells in area from GWIC database	Appx C
•	Geologic map(s) included (if not, valid justification for omission)	Fig. 3
•	Geologic cross section(s) included	Fig. 5

For ground water systems:

- Identify aquifer 4
- Geologic setting of aquifer 4
- Aquifer properties (lithology, boundaries, etc.) 4
- Aquifer type (confined, unconfined, semi-confined) 4
- Connection with surface water 4
- Classify sensitivity of hydrogeologic setting of source water 4

For surface water sources, or ground water systems influenced by surface water

- Hydrogeologic setting of PWS watershed n/a
- Identification of references for hydrogeologic information n/a
- Stream flow characteristics n/a

2. Conceptual Model and Assumptions 6

- Seasonal trends in system 4
- Assumptions made to simplify model 9

For ground water systems:

- Aquifer boundaries 4
- Aquifer recharge areas 6
- Ground water flow direction 6
- Communication with surface water 6

For surface water sources, or ground water systems influenced by surface water

- Relationships of surface water with ground water system n/a

3. Well (or source) Information

For ground water systems:

- Well depths, construction details 7
- Well locations described 7
- Summary table of source information 7
  [Source information to include: PWS Source Code, Well Location, MBMG (GWID) No., MT Water Right No., Date Well completed, total depth, perorated interval, static water level, pumping water level, drawdown, test pumping rate, and specific capacity]

For surface water sources, or ground water systems influenced by surface water

- Description of source water intake system n/a
- Streamflow data, if available n/a

4. Delineation Methods and Criteria

- Overview of approach used for delineation 6

5. Model Input

For ground water systems:

- Identify analytical method used, with source reference 6
- Values of hydraulic parameters identified, with ranges 9
- Identify hydrogeologic parameter values used, with rationale 7-8
- Summary table of input values for model 9
- Reference and justification for assumed values 7-8
- Time of travel equations or model specifications 7-8

For surface water sources, or ground water systems influenced by surface water

- Time of travel calculations for surface water body n/a
- Summary of ranges for streamflow parameter values n/a
- Identify streamflow parameter values used with rationale n/a
- Summary table of input values for model n/a

6. Delineation Results

- Travel time calculation results, or computer model calibration criteria 9
- Management zones identified on map(s) Figs. 6 & 7
- Delineated areas reflect seasonal variations in hydrologic systems 9

7. Limiting factors

- Identify uncertainties in delineation approach based on assumptions 9
- Identify how uncertainties may effect delineated areas 9

Chapter 3 – Inventory

This section identifies all known and potential contaminant sources which may affect the PWS.

1. Inventory methods identified 10-11
2. Appropriate databases searched, with potential sources identified 10-11

For ground water systems:

- Control zone 11

Description of land uses
Description of potential contaminant sources
Worksheets completed for significant potential sources
Potential contaminant sources summarized in a table
Potential contaminant sources located on a base map

- Inventory Region 11

Description of land uses
Description of potential contaminant sources
Worksheets completed for significant potential sources
Potential contaminant sources summarized in a table
Potential contaminant sources located on a base map

- Surface Water Buffer 12

Description of land uses
Description of potential contaminant sources for pathogens (acute health hazards)

- Recharge Region 15

Description of land uses
Description of large potential contaminant sources
Large potential sources and land use shown on a map

For surface water sources, or ground water systems influenced by surface water

- Spill Response Region n/a

Description of land uses
Description of potential contaminant sources
Worksheets completed for significant potential sources
Potential contaminant sources summarized in a table
Potential contaminant sources located on a base map

- ***Watershed Region*** n/a

Description of land uses
Description of large potential contaminant sources
Map of watershed region showing significant potential contaminant sources
(e.g. MPDES permitted discharges, to the extent practical with existing databases)

For all systems

- Inventory update – procedures to update every five years 15
- Inventory limitations identified 15

Chapter 4 – Susceptibility Assessment

This section evaluates the potential for the PWS water supply to be contaminated by the significant potential sources of contamination identified in Chapter 3. This information can be used by local officials to prioritize management actions for the delineation control and inventory zones. Worksheets to be considered when completing each task are listed with each topic.
Attach completed worksheets as Appendices to final document

1. Hazard of potential contaminant sources identified 17-19

2. Barriers for each potential contaminant sources identified and evaluated 17-19

   - Supporting information for identification of features as barriers 17-19

3. Threats from significant potential contaminant sources ranked 17-19

References

All technical references are listed in the appropriate format 26-27

Appendices

All necessary supporting information is included in Appendices yes

List any Deficiencies:

none

APPENDIX G

Letter of Concurrence

Source Water Protection Section
Department of Environmental Quality
POB 200901
Helena, MT 59602-0901

RE: Source Water Delineation & Assessment Report

To Whom It May Concern:

The Hellgate Elementary School public water system has reviewed the source water delineation and assessment report (SWDAR) dated June 2004. We concur that the delineation component appears to describe current conditions at the water system based on reasonably available information and that the susceptibility assessment identifies the origins of regulated contaminants to the extent practical.

We understand that the Hellgate Elementary School PWS SWDAR will be made available to the public by DEQ as described in the Montana Source Water Protection Program. Also, we will make a copy of the report available for the public to view during our normal office hours and describe the results in subsequent releases of our consumer confidence report.

Signed,

_____

Signature Title and Date

Figures