Town of Fairview
Public Water Supply
PWSID # MT0000213

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SOURCE WATER DELINEATION AND ASSESSMENT REPORT

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INTRODUCTION

This Delineation and Assessment Report was prepared by Jim Stimson, a hydrogeologist with the Source Water Protection Program of the Montana Department of Environmental Quality (DEQ). Fairview public water supply (PWS) is located in Richland County, Montana, about 12 miles northeast of Sidney (Figure 1). The DEQ PWS identification number, operator name, and operator number for the Fairview PWS appear on the title page of this report.

Purpose

This report is intended to meet the technical requirements for the completion of the source water delineation and assessment report for the Fairview PWS as required by the Montana Source Water Protection Program (DEQ, 1999) and the federal Safe Drinking Water Act (SDWA) Amendments of 1996 (P.L. 104-182). The Montana Source Water Protection Program is intended to be a practical and cost-effective approach to the protection of public drinking water supplies from contamination. The primary purpose of this source water delineation and assessment report is to provide information to assist the Fairview PWS operator in the identification of potential contaminant sources near and up-gradient from the Town's wells, and to encourage the development of a source water protection plan to help protect the Town's drinking water for the long term.

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

Limitations

This report was prepared to assess threats to the Fairview public water supply and is based on published data including the most recent sanitary survey, and information obtained from local residents familiar with the community. The terms "drinking water supply" and "drinking water source" refer specifically to the sources of Fairview's public water supply, and not any other public or private water supply. Also, not all of the potential or existing sources of ground-water or surface-water contamination in the area of Fairview are identified. Only potential sources of contamination in areas that contribute water to the identified drinking water sources are considered.

The term "contaminant" is used in this report to refer to constituents for which maximum concentration levels (MCLs) have been specified under the national primary drinking water standards, and to certain carcinogenic or toxic constituents that do not have MCLs but are considered to be significant health threats.

CHAPTER 1
BACKGROUND

The Community

Fairview is located in Richland County near the Montana – North Dakota border. State Highways 200 and 201 intersect at Fairview, and the Great Northern Railroad passes south of town (Figures 1 and 3). The U.S. Census Bureau estimates the 2000 population of Richland County at 10,716 people, 709 of whom reside in Fairview. Richland County's population has decreased about 6% since the 1990 census. Fairview's economy is based primarily on agriculture but periodically the mining and oil and gas industries have played a significant role in the local and regional economy.

Within the town limits, residents obtain their drinking water from the municipal public water supply. The municipal sewer district services all residents within town limits and some areas outside the town limits. The town is also served by a wastewater treatment plant with multi-celled lagoons located about one mile south of town (Figure 1). Residents in areas outlying town limits where sewer services are not available utilize on-site septic systems for waste disposal. Besides the town, there is one other public water supply in the area (Table 1).

Table 1. Public Water Supplies in the Fairview area.

PWSID	Source ID	Primary Name	Source Name	Source Type	City	Resident Pop.	Non-Res Pop.
MT0000213	WL004, 5 & 6	Fairview, Town of	Wells 4,5, & 6	Ground water	Fairview	709	0
MT0001625	WL002	The Powder Keg	Well # 1	Ground water	Fairview	0	40

Climate

Based on Western Regional Climatic Center data for the period of record, annual precipitation averages 14.03 inches. Monthly average precipitation ranges from 0.3 inches in February to 3.6 inches in June. Summer thunderstorms and winter snows provide a majority of the precipitation in the area. The annual mean snowfall in Fairview is 1.2 inches. A summary of the available climatic data for the Fairview area is presented in Table 2 below.

Figure 2. Average Temperatures and Precipitation

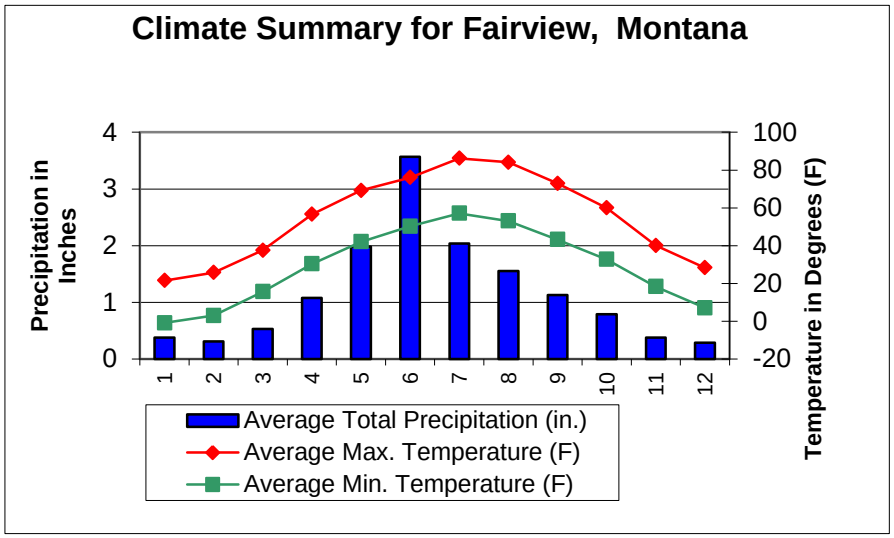

Table 2. Climate Summary.

FAIRVIEW, MONTANA (242867)

Period of Record Monthly Climate Summary
Period of Record : 10/1/1932 to 1/31/1956

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	22	26	38	57	69.2	76	86	84.1	72.9	60	40.1	28.3	54.9
Average Min. Temperature (F)	-0.9	3	16	30	42	50	57	53	43.2	33	18.3	7	29.3
Average Total Precipitation (in.)	0.4	0.3	0.5	1.1	1.98	3.6	2	1.55	1.13	0.8	0.38	0.29	14.03

Western Regional Climate Center, wrcc@dri.edu

Geographic Setting

Fairview is located in the glaciated portion of the Great Plains physiographic province of North America (Rocky Mountain Association of Geologists, 1972). This area is also designated as the glaciated central ground-water region of the United States (Heath, 1984). The elevation at Fairview is approximately 1,900 feet above mean sea level (Figures 1 and 3). Topographic relief in the area is low with highlands rising about 50 to 100 feet above Fairview.

Geology

This section provides an overview of the geology and hydrology of the vicinity of Fairview and Sidney. Reports used for this section include Reiten (1998), Smith et al. (2000), Slagle et al (1984), Stoner and Lewis, (1980), Howard, A. D., 1960, Torrey, A. E., and Swenson, F. A., 1951. The geology of the area can be used to determine the locations, boundaries, and hydraulic properties of local aquifers. An understanding of hydrogeologic conditions also provides an explanation for the sensitivity of local aquifers to potential contamination sources. Geology is not just important for understanding the

hydrologic conditions related to ground water but it is also valuable for public water supplies that use surface water. For example, the timing and runoff patterns of streams are influenced in part by the geology within a watershed. Watersheds with large areas of low hydraulic conductivity bedrock tend to respond quickly to precipitation and snowmelt events. Hydrographs from streams within such a watershed show numerous high flow peaks or spikes. On the other hand, streams within watersheds underlain by bedrock that has high hydraulic conductivity tend to have more subdued hydrographs, that is, fewer and more rounded high flow peaks. Infiltration of precipitation and snowmelt waters makes the high flow events rise more gradually and have more rounded peaks. Surface water quality can also be affected by the geology within a watershed and information in this section can be useful for gaining a better understanding of factors that control erosion and sedimentation.

Unconsolidated alluvium is present in the Yellowstone River valley and in many of the tributaries to the Yellowstone (Figure 4). The alluvium consists of lenses of unconsolidated clay, sand, and gravel. As much as 100 feet of alluvium is present in the Yellowstone valley and less thick deposits present in some of the tributaries (Smith et al (2001). The Yellowstone River alluvium yields economic quantities of water to wells and in most places represents an unconfined aquifer. Terrace deposits are also present within the main river valley and the tributaries. Some of the terraces are between tens and hundreds of feet above the streams and are considered to be Quaternary age, ranging from Pleistocene to Recent. These terrace deposits consist of gravel, sand, silt, and clay.

Early Wisconsin age glacial drift is present in the Sidney area and extends southwest to a terminus near the town of Intake (Howard, 1960). The drift is composed of till and small deposits of glaciofluvial sediment that are distinct from the stratified drift. Lithology of the drift is distinct from other drift deposits to the north in the Missouri River watershed, with a composition that is lower in carbonate pebbles and clasts, and higher in granitic and foliated metamorphic rocks (Howard, 1960). Maximum thickness of the Early Wisconsin drift is unknown but Howard reports deposits in the range of "several tens of feet" thick. Howard also mapped numerous abandoned channels, lake shore lines, and swales associated with buried channels that are related to the glacial activity in the area. Sedimentary deposits within some of the buried channels are important aquifers in this area.

Bedrock exposed at the land surface in the vicinity of Fairview ranges in age from Upper Cretaceous to Tertiary. Around Fairview the Fort Union Formation dominates the landscape (Figure 4). The Fort Union can be on the order of 1,600 feet thick and can be divided into three members in descending order: the Tullock, Lebo Shale, and Tongue River. There are outcrops of red metamorphosed sedimentary rocks within the Fort Union Formation. These beds are referred to as "clinker" and formed when underlying coal beds were ignited and baked the sandstone, siltstone, and shale beds. In some places the heat was so intense that the overlying rocks were metamorphosed into rock resembling volcanic rocks known as scoria. The Hell Creek Formation (Upper Cretaceous) is below the Fort Union, is up to 900 feet thick, and contains beds of silty shale, mudstone, sandstone, and coal. The Hell Creek is exposed at the land surface to the south of Sidney near Glendive and along the axis of the Cedar Creek Anticline. It is also exposed near the Poplar Dome about 45 miles northwest of Sidney. Generally, the Hell Creek is more fine grained and contains less coal than the overlying Fort Union. Sandstone beds are more abundant in the lower part of the Hell Creek Formation. The Fox Hills Formation and Pierre Shale lie beneath the Hell Creek and are not exposed at the land surface near Sidney. Sandstone beds of the Fox Hills Formation and the Pierre Shale are found at the land surface along the Cedar Creek Anticline and on the flanks of the Poplar Dome. The upper part of the Fox Hills in known as the Colgate Member and consists of light gray

and white sandstone that is fine to medium grained. The Colgate Member is an important aquifer in this region.

The Public Water Supply

The Fairview PWS is classified as a community system under the Federal Safe Drinking Water Act, because the system serves at least 25 year-round residents through at least 15 service connections. The PWS services about 709 residents via approximately 360 active service connections.

According to the most recent sanitary survey, Fairview has 2 active supply wells and one backup well ranging between 145 and 150 feet deep. The active wells are located in a park on the northeast corner of town and water from these sources is pumped to the water treatment plant that is also located in the park (Figure 3). There is some confusion over the numbering system used to identify the town's wells as mentioned in the sanitary survey. The sanitary survey lists the active wells as Well 5 and 6, and the backup well as Well 3. The DEQ Drinking Water Program database lists the active wells a Well 6 and Well 7, and Well 3 is listed as abandoned. The confusion over well numbers also makes it difficult to identify the correct well logs for the active and backup wells. For future reference it would be advisable for the operators to clearly document the well numbers for the active and backup wells.

Treatment consists of chlorination and iron and manganese removal. Fairview uses one water storage reservoirs with a capacity of about 300,000 gallons. Based on well log information from multiple wells in the area, Fairview's source water originates from sand and gravel beds in the lower terrace deposits, or possibly sandstone beds in the upper Fort Union Formation. There is a dark clay or silty clay layer that is laterally extensive in the Fairview vicinity between 30 to 50 feet below the land surface that ranges between 10 and 50 feet thick. The clay layer appears to act as a confining unit above the water bearing beds tapped by the Fairview wells, and other wells in the area. The water bearing sands, gravels, and sandstone beds are interpreted to be a deep (>100 feet) confined aquifer. The source water is classified as having a low sensitivity to contamination in accordance with Montana Source Water Protection Program criteria (1999), see Table 3.

Table 3. Source water sensitivity criteria (DEQ, 1999).

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

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

Fairview PWS Water Quality

Within the past five years, no positive fecal coliform samples were collected during routine contaminant monitoring. No MCL exceedances were noted for any other constituents monitored over the past five years, this includes nitrate. There was one sample taken in 1995 that indicated nitrate at 7.98 milligrams per liter (mg/l), which is considered high but all of the other samples taken show nitrate well below the MCL for nitrate. The average value of 1.2 mg/l which is significantly below the MCL of 10 mg/l (Appendix B).

CHAPTER 2
DELINEATION

The source water protection areas for the Fairview public water system are delineated in this chapter. The purpose of delineation is to map the land areas that contribute water to the aquifer used by the Fairview public water supply and to define areas that help prioritize source water protection efforts. The management areas identified within this Source Water Protection analysis included the control zone, Inventory Region, and Recharge Region. The control zone is an area at least 100-foot radius around the well. The management goal of the control zone, also known as the exclusion zone, is to protect against the direct introduction of contaminants into the wells or in the immediate area surrounding each well. The Inventory Region represents the zone of contribution of the well. Several methods of establishing the Inventory Region are available including fixed radius circles, hydrogeologic mapping, and analytical methods. The management goal of the Inventory Region is to focus on pollution prevention activities at potential contaminant sources where it is likely that contaminated water would flow into the wells within a relatively short time frame of months or years. The Recharge Region represents the portion of the aquifer that contributes water to the Fairview water system. Management in the Recharge Region should focus on maintaining and improving the quality of ground water that could reach each well over longer time frames or with increased water usage.

General Hydrogeologic Setting

Aquifers in this region have been grouped together based on their depth from the land surface. The groups are referred to as hydrologic units. The shallow hydrologic unit represents aquifers within 200 feet of the land surface (Slagle et al. 1983, Smith et al. 2000). In most places this includes aquifers with in the unconfined alluvium and terrace deposits, and sandstones in the upper part of the Fort Union Formation. Ground-water flow within this shallow hydrologic unit is generally from upland areas toward local stream tributaries and major streams. Recharge to the shallow hydrologic unit comes primarily from infiltration of precipitation; to a lesser extent recharge also comes from water loses from some stream channels, irrigation ditches, and return flows from irrigated fields (Smith et al. 2000). Below 200 feet a deeper hydrologic unit is present above the pervasive claystone and shale beds in the upper Hell Creek Formation. Ground-water flow within the deep hydrologic unit is from upland areas toward major streams and is generally thought to bypass or flow beneath local tributary valleys. Recharge areas for the deep hydrologic unit comes from near the Sheep Mountains in northern Prairie County and areas in south-southeastern Fallon County. Sandstones in the lower Hell Creek - upper Fox Hills represent a third hydrologic unit in this region. The Colgate Member of the Fox Hills is an important drilling target in this hydrologic unit (Smith et al, 2000). Ground-water flow in the lower Hell Creek - upper Fox Hills is generally toward major stream including the Yellowstone and Missouri rivers. Recharge appears to come outcrop areas along the western flank of the Cedar Creek Anticline and from upland areas south-southeast of the Fairview area (Smith et al. 2000).

Local Hydrogeologic Setting

Fairview's public water supply consists of two active wells and one backup well. The sanitary survey lists the active wells as Well 5 and 6, and the backup well as Well 3. However, the DEQ Public Drinking Water Program database lists the active wells as Well 6 and 7, and no backup well is listed. It would be advisable for the Fairview PWS operators to correctly identify the active, and backup, wells and their locations for future sanitary surveys and for the DEQ database. The two active wells are located near the water treatment facility in a park on the northeast corner of town. According to the sanitary survey and well logs, the wells range from 145 to 150 feet deep. Based on lithology information from multiple wells in the area, the source water is interpreted to come from a deep confined aquifer in the lower part of the terrace deposits. The aquifer could include the upper part of the Fort Union Formation, as some well logs indicate water production comes from consolidated sandstone. Recharge for the aquifer appears to come from upland areas west and northwest of Fairview.

About 70 percent of the wells in the Yellowstone River Area are completed in the shallow hydrologic unit (Smith et al, 2000). Yield from this hydrologic unit range from 10 gallons per minute (gpm) to 35 gpm, with the higher yields coming from well completed in the alluvial deposits adjacent the Yellowstone River. About 12 percent of the wells in the region are completed in the deep hydrologic unit with yields most often reported as less than 15 gpm (Smith et al, 2000). Ten percent of the wells in the region are completed in the Fox Hills-lower Hell Creek hydrologic unit and report yields routinely less than 15 gpm with some exceptional wells with yields approaching 100 gpm (Smith et al, 2000).

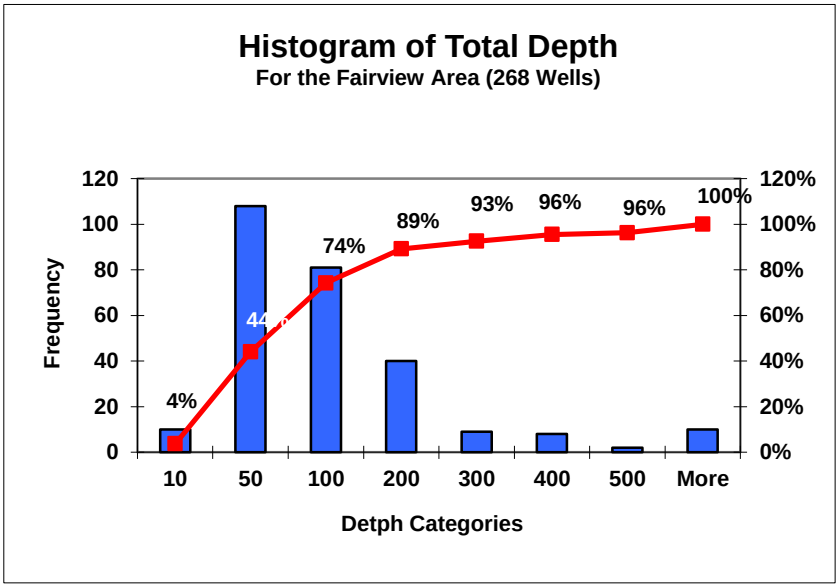

Figure 5. Well Depth Histogram for wells in the Fairview area.

Examining well data from the Montana Ground Water Information Center (GWIC) for 268 wells in the vicinity of Fairview reveals that 90% of wells are less than 200 feet deep so they are likely completed in the shallow hydrologic unit (Figure 5). Average drilling depth for these wells is 126 feet below the land surface and the deepest well in the area is 1,488 feet. Average yield for these wells is 24 gpm and the highest yield reported is 800 gpm.

Conceptual Model and Assumptions

Source water for the Fairview public water supply comes from water bearing sands and gravels in the lower portions of the terrace deposits, and possibly from sandstone beds in the upper part of the Fort Union Formation. The aquifer is about 150 feet below the land surface and appears to be confined by a dark clay layer that is fairly extensive in the vicinity of Fairview. The source water is interpreted to come from a deep confined aquifer with a low sensitivity to potential sources of contamination located at the

land surface. Recharge for the aquifer comes generally from west and northwest from upland areas and areas where the terrace deposits and Fort Union Formation are exposed at the land surface.

Source Well

According to the most recent sanitary survey, two active wells and one backup well are used to supply water for the Fairview public water supply. Table 4 summarizes well data for the Town's wells.

Table 4. Information from drillers logs from wells near Fairview.

MBMG # **DNRC WR#**	148162 NA Well 5 (??)	188834 NA Well 6 (??)	148161 NA Well 3 (??)
Location	24N 60E 08 DABB	24N 60E 08 ADCA	24N 60E 08 DABB
Date Completed	1/1/1981	-	1/1/1981
Depth (ft bgs*)	148	150	145
Screened Interval (ft**)	-	-	-
SWL Depth (ft bgs*)	-	-	-
PWL Depth (ft bgs*)	-	-	-
Drawdown (ft**)	-	-	-
Test Pumping Rate (gpm***)	-	500	-
Specific Capatown (gpm/ft****)	-	-	-

*ft bgs = feet below ground surface, **ft = feet, ***gpm = gallons per minute, ****gpm/ft = gallons per minute per foot of drawdown.

Delineation Results

Control Zones

The control zones for each of the town's active wells consists of a 100 foot fixed radius circle, in accordance with the criteria specified in the Source Water Protection Program Document (1999). All potential sources of contamination are inventoried within the control zone.

Inventory Region

Based on the drillers logs from multiple wells in the area, the aquifer tapped by the town's active wells is interpreted to be deep (>100 feet) and confined. The Inventory Region for each well is delineated as a 1,000 foot fixed radius circle In accordance with the Source Water Protection Program guidelines. Because the active wells appear to be close to each other, a single Inventory Region is delineated. All potential sources of contamination are inventoried within the each of the Inventory Regions.

Table 5 is not filled in because a Time-Of-Travel calculation is not used to delineate the Inventory Regions for the Town's wells.

Recharge Region

The Recharge Region for the Fairview well's encompasses the land area within the Lower Yellowstone Watershed (Fifth Code: 101000043001) (Figures 7 and 8). The watershed has an area of about 41 square miles. General land uses and large potential contaminant sources are inventoried in this region.

Limiting Factors

The Town of Fairview owns multiple wells and there is disagreement between information sources (sanitary survey, DEQ PWS database, and the MBMG GWIC database) on the numbers assigned to the wells. An assumption is made to delineate the Inventory Region around two wells in the park on the northeast corner of town. For this report, the active wells are assumed to be located relatively close together so one Inventory Region is used for both wells. If this assumption is incorrect and the town uses wells located outside of the park, then the inventory and susceptibility analysis will not be valid. In addition, the identification of potential contaminant sources that could threaten the source water will be incomplete.

The reader needs to recognize that the Inventory Regions delineation for the Town of Fairview PWS wells are simple fixed radius circles that are not results of analytical calculations. Fixed radius circles are a standard delineation for the Inventory Region used by the Montana Source Water Protection Program when the source water comes from a confined aquifer. In the case of Fairview, the 1,000 foot fixed radius circle is used based on the interpretation that Fairview's source water comes from a deep (>100 feet) confined aquifer. Based on available information this interpretation is reasonable, however, it is worth noting that the clay confining layer appears to have some saturated sections in it and probably allows ground water from the shallow system to flow into the aquifer, albeit slowly. In short, the confining layer may not be an affective barrier to contamination sources at the land surface in some areas.

CHAPTER 3
INVENTORY

An inventory of potential sources of contamination was conducted to assess the susceptibility of the Fairview PWS to contamination, and to identify priorities for source water protection planning. Inventories were conducted within the control zones and the Inventory Region. The inventory focuses on facilities that generate, use, store, transport, or dispose of potential contaminants, and on land types on which potential contaminants are generated, used, stored, transported, or disposed. Additionally, the inventory identifies potential sources of all primary drinking water contaminants and Cryptosporidium. Only significant potential contaminant sources were selected for detailed inventory. As a result, the inventory focuses on land areas within the Inventory Regions and a watershed west of Fairview (Figure 3). The inventory is less detailed for the Recharge Region, focusing only on large facilities and sources of pathogens and nitrate.

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

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

Step 2: EPA's Envirofacts System was queried to identify EPA regulated facilities. This system accesses the following databases: Resource Conservation and Recovery Information System (RCRIS), Biennial Reporting System (BRS), Toxic Release Inventory (TRI), Permit Compliance System (PCS), and Comprehensive Environmental Response Compensation and Liability Information System (CERCLIS). The available reports were browsed for facility information including the Handler/Facility Classification to be used in assessing whether a facility is a significant potential contaminant source.

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

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

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

Step 6. All significant potential contaminant sources were identified in the Inventory Region and land uses and facilities that generate, store, transport, or dispose large quantities of hazardous materials were identified within the Recharge Region.

Potential contaminant sources are designated as significant if they fall into one of the following categories:

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

Inventory Results/Control Zones

Fairview's wells are located on the northeastern corner of town (Figure 3). The Control Zones for both wells include primarily undeveloped land within the park. Potential contaminant sources within the control zones may include: fertilizer and herbicide application in the park.

Inventory Results/Inventory Region

A single 1,000-foot Inventory Region is delineated for the active wells and encompasses a portion of the park where the wells are located, developed home lots west and south of the wells, a segment of Highway 200, and part of a rail yard on the east edge of town. It also appears to include a small area of pasture or hay land just north of the park (Figure 6). Table 6 summarizes the significant potential contaminant sources that are located within the Inventory Region (Figure 3).

Land use in the Inventory Region includes %), low density residential and commercial (about 55%), forest (16%), agricultural land (15%), grassland (10%), and wetlands (4%) (Figure 6).
Low density residential and the commercial / transportation land uses are considered a potential threat to the source water due to the fact that most of these land types are served by sewer and storm water sewer systems. The main pipelines can leak and expose ground water to a variety of contaminants including fuels and solvents (VOCs), pesticides (SOCs), wastes saturated with nitrate, metals, and household chemicals. In addition, use of fertilizers, herbicides and pesticides on lawns, gardens, and undeveloped lots can be a concern if the chemicals are used in larger volumes or are applied relatively close to a public water supply well.

Agricultural land (pasture or hay) is also considered be a significant potential contaminant source if ag-chemicals are used on the land parcel. Over application of fertilizers and/or pesticides can result in those ag-chemicals infiltrating into ground water and running off in to surface water bodies that may have hydraulic connection with aquifers that supply water. The percentage of ag-land in the Inventory Regions for Fairview's wells is relatively small but on the other hand, the parcel is relatively close to the public water supply wells. It would be advisable for the water supply operators to verify whether any ag-chemicals are applied to the pasture or hay parcel. If no ag-chemicals are applied, the hazard rating for this parcel could be lowered or eliminated.

Other significant and non-significant potential contaminant point sources in the Fairview area are located south of the wells (Figure 3). This includes underground fuel storage tanks, relatively long segments of the railroad and highway, and the town's sewage treatment lagoons. Based on the ground

water flow direction in the area, the significant potential contaminant sources just mentions are located in a cross-gradient or down-gradient position from the town's wells and do not pose a threat to the source water.

Table 6. Significant potential contaminant sources in the Inventory Region for Fairview PWS.

Potential Source	ID Number On Maps	Potential Contaminants	Hazard
Municipal Sewer mains (About 50% of the Inventory Region is underlain by sewer mains, primarily for Well 6)	Not Numbered	Nitrate and pathogens	Leaks resulting in Infiltration into ground water
Great Northern Railroad	Not Numbered	VOCs, and SOCs, , pathogens, nitrate, and other hazardous materials	Accidents and spills involving large tank cars
Highway	Not Numbered	VOCs, and SOCs, , pathogens, nitrate, and other hazardous materials	Accidents and spills involving large trucks
Cultivated Cropland (15 % of the Inventory Region)	Not Numbered	Fertilizers, Pesticides, Herbicides Nitrate Pathogens	Spills, over application, surface runoff
Irrigation Canals	Not Numbered	Nitrate and pathogens	Water loss resulting in Infiltration into ground water
Lawns and Gardens	Not Numbered	Fertilizers, Pesticides, Herbicides Nitrate Pathogens	Spills, over application, surface runoff if applied near a well head.
Assorted businesses in town	Not Numbered	VOCs, SOCs, petroleum hydrocarbons, metals, pathogens, nitrate	Releases or spills, mishandling of chemicals, improper disposal of chemicals anywhere near the river
Class V Injection Wells (existence and locations are not known) where storm and/or wastewater is concentrated and recharges groundwater.	Not Numbered	VOCs, SOCs, petroleum hydrocarbons, metals, pathogens, nitrate	Leaks, spills, improper handling and disposal/discharge of chemicals used by various businesses and are released to systems that allow infiltration of contaminants to the subsurface or to the storm water system

From the above list of potential contaminant sources, some are considered significant based upon the following factors: the volume of potential releases, the volume of hazardous materials typically handled, the potential of the released materials to impact nearby surface water or groundwater, and the proximity of the sources to the PWS surface water intakes or wells. Significant potential contaminant

sources from the above list are discussed individually in the following section on susceptibility assessment and they are listed in Table 10.

Inventory Results/Recharge Region

Table 7 summarizes the significant potential contaminant sources that are located within the Recharge Region (Figures 7 and 8). Potential contaminant sources include: State Highway 200, the Great Northern Railroad, several segments of petroleum pipelines, oil and gas wells and test holes, agricultural land, and one hazardous spill site.

Predominant land covers in the Recharge Region include ag-land (63%), grassland (32%), and relatively small areas of forest, residential, and commercial (Figure 7). Ag-land located west-northwest of Fairview is in an up-gradient position from the town's wells and is considered to be a significant potential contaminant source. As mentioned above, the concern is that mismanagement or over application of fertilizers and/or pesticides can result in those ag-chemicals infiltrating into ground water and running off in to surface water bodies that may be in hydraulic connection with aquifers used for water supplies. Grassland is the other dominant type of landcover within the Recharge Region. Grassland and forestland are not considered to be potential contaminant sources. Low septic densities occur over the largest portion of the Recharge Region.

Table 7. Significant potential contaminant sources in the Recharge Region for Fairview.

Potential Source	ID Number on Maps	Potential Contaminants	Hazard
Gas and Oil Wells	Not Numbered	Total Dissolved Solids, Petroleum Hydrocarbons	Migration of brine wastewater into shallow groundwater discharging to surface water, surface runoff to surface water
State Highways	Not Numbered	Pesticides, fertilizers, VOCs, other	Spills, storm water runoff, infiltration into ground water.
Great Northern Railroad	Not Numbered	VOCs, and SOCs, , pathogens, nitrate, and other hazardous materials	Accidents and spills involving large tank cars
Watts-Penzoil Hazardous Spill Site	Not Numbered	Likely a petroleum spill but there is no detailed information on the site	Storm water runoff and infiltration into ground water.
Pipelines	Not Numbered	Petroleum Products	Spills and leaks
Cultivated Cropland	Not Numbered	Fertilizers, pesticides, pathogens, nitrate	Spills, over application, surface runoff

From the above list of potential contaminant sources, some are considered significant based upon the following factors: volume of potential releases, the volume of hazardous materials typically handled, the potential of the released materials to impact nearby surface water or groundwater, and the proximity of the sources to the Town's wells. Susceptibility ratings are not assigned to potential sources listed in Table 7 in accordance with the Source Water Protection Program guidelines.

Inventory Update

To make this SWDAR a useful document in the years to come, the owners, manager, or the certified water system operator(s) for the public water supply should update the inventory for their records every year. Changes in land uses or potential contaminant sources should be noted and additions made as

needed. The complete inventory should be submitted to DEQ at least every 5 years to ensure that this report/plan stays current in the public record.

Inventory Limitations

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

CHAPTER 4
SUSCEPTIBILITY ASSESSMENT

Susceptibility is the potential for a public water supply to draw water contaminated by inventoried sources. Susceptibility is assessed in order to prioritize potential pollutant sources for management actions by local entities, in this case the Town of Fairview and Richland County.

The goal of source water management is to protect the source water by 1) controlling activities in the control zone, 2) managing significant potential contaminant sources in the Inventory Region, and 3) ensuring that land use activities in the Recharge Region pose minimal threats to the source water. Management priorities in the Inventory Region are determined by ranking the significant potential contaminant sources identified in the previous chapter according to susceptibility. Alternative management approaches that could be pursued by the Fairview PWS operators, city, and county officials to reduce susceptibility are recommended.

Susceptibility is determined by considering the hazard rating for each potential contaminant source and the existence of barriers that decrease the likelihood that contaminated water will flow to the PWS well(s) (Tables 8 and 9). For point sources, hazard is assigned based on several factors including: 1) the potential contaminant source's proximity to the public water supply, and 2) whether the public water supply wells are properly sealed or grouted. Potential sources of contamination that are non-point sources like ag-land or septic density, are assigned hazard based on: 1) the percent of the delineation region they occupy, and 2) whether the public water supply wells are properly sealed or grouted. Proximity of a non-point source is also considered in assigning hazard.

As stated previously, Fairviews wells are completed in a deep confined aquifer. The aquifer has a low sensitivity to potential sources of contamination. Well logs for the Fairview wells are not complete and do not have sufficient detail to determine if they are all properly sealed. One well log indicates that it is sealed from the land surface to a depth of 116 feet. The other two logs do not list seal details. Based on this information it appears that one of the wells in the Inventory Region is properly sealed but the construction details for the other two wells cannot be determined. Considering this information the highest hazard assigned to potential contaminate sources in the Inventory Region is moderate (Table 8).

Table 8. Hazard of potential contaminant sources for public water system wells.

Potential Contaminate Sources	The PWS well is not sealed through the confining layer	Other wells in the Inventory Region are not sealed through the confining layer	All wells in the Inventory Region are sealed through the confining layer
Point Sources	High	Moderate	Low
Septic Systems (# per square mile)	High: > 300 Moderate: 50 to 300 Low: < 50	Moderate: > 300 Low: < 300	Low
Sanitary Sewer (% land use)	High: > 50 Moderate: 20 to 50 Low: < 20	Moderate: > 50 Low: < 50	Low
Cropland (% land use)	High: > 50 Moderate: 20 to 50 Low: < 20	Moderate: > 50 Low: < 50	Low

Barriers to contamination can be anything that decreases the likelihood that contaminants will reach a spring or well. Barriers can be engineered structures, management actions, or natural conditions. Examples of engineered barriers are spill catchment structures for industrial facilities and leak detection for underground storage tanks. Emergency planning and best management practices are considered management barriers. Thick clay-rich soils, a deep water table or a thick saturated zone above the well intake can be natural barriers. Table 9 shows how barriers are used to adjust the final susceptibility ratings.

Table 9. Susceptibility of Source Water based on Hazard rating and the presence of Barriers

	High Hazard Rating	Moderate Hazard Rating	Low Hazard Rating
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

Susceptibility ratings are presented individually for each significant potential contaminant source and each associated contaminant on the following page (Table 10).

Susceptibility Assessment Results

Table 10. Susceptibility Assessment Significant Potential Contaminant Sources in the Inventory Region Fairview PWS (Figure 3)

Inventory Region							
Source	**ID Number on Maps See Figure 3**	**Contaminant**	**Hazard**	**Hazard Rating**	**Barriers**	**Susceptibility**	**Management Recommendations**
Municipal Sewer mains (About 50% of the Inventory)	Not Numbered	Nitrate, pathogens	Leaks in mains/lines, system failure, infiltration of untreated effluent into ground water, , or surface water hydraulically connected with ground water	**Moderate**	-Depth to screened interval (100 feet or more)	**Moderate**	Ongoing testing and maintenance of lines and system, replacement of old lines, compliance with current regulations for discharges
Highways	Not Numbered	VOCs, and SOCs, , pathogens, nitrate, and other hazardous materials	Spills, storm water runoff, infiltration into ground water.	**Moderate**	- Depth to screened interval (100 feet or more) - Relatively low traffic volume.	**Low**	Be vigilant for accidents involving large vehicles Develop an emergency response plan and support training and preparation of local and county response personnel
Cultivated Cropland (15% in the Inventory Region, 63% in the Recharge Region)	Not Numbered	Fertilizers, pesticides, pathogens, nitrate	Spills, over application, surface runoff	**Low**	- Depth to screened interval (100 feet or more)	**Low**	Support the agricultural community's educational efforts to distribute materials and resources to land owners on the proper application and storage of pesticide and fertilizers; implement agricultural BMPs
Irrigation Canals	Not Numbered	Nitrate and pathogens	Water loss resulting in Infiltration into ground water	**Moderate**	- Depth to screened interval (100 feet or more) -Operates seasonally when dilution would be expected to be most effective	**Low**	Support efforts to line canals to reduce water loss. Support the agricultural community's educational efforts to distribute materials and resources to land owners on the proper application and storage of pesticide and fertilizers; implement agricultural BMPs

Table 10. Susceptibility Assessment Significant Potential Contaminant Sources in the Inventory Region Fairview PWS (Figure 3)

Inventory Region							
Source	**ID Number on Maps See Figure 3**	**Contaminant**	**Hazard**	**Hazard Rating**	**Barriers**	**Susceptibility**	**Management Recommendations**
Lawns and Gardens	Not Numbered	Fertilizers, Pesticides, Herbicides Nitrate Pathogens	Spills, over application, surface runoff if applied near a well head.	**Moderate**	- Depth to screened interval (100 feet or more) - Relatively small volumes and seasonal use	**Low**	-Provide educational materials on storage and application of yard and garden chemicals -Provide signage to prevent applications near the wellheads.
Assorted businesses in town	Not Numbered	VOCs, SOCs, petroleum hydrocarbons, metals, pathogens, nitrate	Releases or spills, mishandling of chemicals, improper disposal of chemicals anywhere near the river	**Low**	- Depth to screened interval (100 feet or more) - Most sites are not commercial	**Very Low**	Support efforts to provide educational workshops to the general public by the city, county, or state promote safe handling and proper storage, transport, use, and disposal of hazardous materials. Scheduled days for the collection of hazardous wastes from the public.
Great Northern Railroad	Not Numbered	VOCs, and SOCs, , pathogens, nitrate, and other hazardous materials	Spills, storm water runoff, infiltration into ground water.	**Moderate**	Depth to screened interval (100 feet or more) -Cross- or Down-gradient location	**Very Low**	Be vigilant for accidents Develop an emergency response plan and support training and preparation of local and county response personnel
Class V Injection Wells (existence and locations are not known) where storm and/or wastewater is concentrated and recharges groundwater.	Not Numbered	VOCs, SOCs, petroleum hydrocarbons, metals, pathogens, nitrate	Leaks, spills, improper handling and disposal/discharge of chemicals used by various businesses and are released to systems that allow infiltration of contaminants to the subsurface or to the storm water system	**Unknown**	**Unknown**	**Unknown**	Inventory; Provide educational information, materials and resources to business owners and the public on proper waste disposal and recycling

The susceptibility assessment results for each significant potential contaminant source identified is described below:

Municipal Sewer Mains – About 50% of the Inventory Region is underlain by sewer lines and main lines (Figure 3). Hazard is assigned as moderate (Table 8), and with well depth counted as a barrier susceptibility is rated as moderate.

Highway- State Highway 200 is located about 1 block west of the park where the town wells are located (Figure 3). Accidents on the highway could result in a variety of hazardous materials spilled on or along the highway. The highway is not a major trucking route for hauling hazardous material. Hazard is assigned as moderate, and with several barriers identified, susceptibility is set a low.

Cultivated Crop lands – The potential hazard from pathogens and nitrate originating from agricultural lands is rated as low based on the percentage of ag-land in the Inventory Region and the depth of the aquifer. The susceptibility is rated as low with well depth used as a barrier.

Irrigation Canal – The Main Canal passes just outside the Inventory Region up-gradient from the town's wells. Water loss from canals is common and in some cases results in a substantial volume of water moving from the canal into the aquifer system below. The concern here is that the canal may receive water that is lower quality than the aquifer prior to flowing past Fairview. Based on the available well log information, it can not be determined if there is hydraulic connection and exchange of water between shallow and deeper aquifers in the Fairview area. Hazard is assigned as moderate and with several barriers identified, the susceptibility is rated as low.

Lawns and gardens – About ¼ of the Inventory Region that is up-gradient of the park and the town's wells is occupied by developed home lots. The concern here is that home lawn and garden products could be used in close proximity to the well and in an up-gradient location from the well. The greater concern is for chemical use near the wellhead. Most likely the volume of chemicals used would be small and seasonal. Hazard is set at moderate, susceptibility is set at low with multiple barriers identified.

Assorted Businesses in Town- The main part of Fairview's main street and business district is outside of the Inventory Regioin and in a cross-gradient location relative to the town's wells. As in most communities, the businesses simply do not use, store, or transport sufficient volumes of hazardous material to be considered a significant potential contaminant source or to pose a threat to the source water. Hazard for businesses in town is low, susceptibility is very low.

Class V Injection Wells – The potential hazard imposed by VOCs, SOCs, pathogens, nitrate, and other contaminants originating from the class V injection wells cannot be determined due to the fact that no inventory of Class V wells is complete for most of Montana or the current inventory is inadequate. The susceptibility of the intake to contaminants originating from this source is unknown.

Management Recommendations

It should be noted that even small releases of some chemicals in close proximity to a well can have significant negative impact on water quality, and is therefore a significant threat to the public water supply. Steps can be taken to reduce the likelihood of releases in the source water for the PWS or in the vicinity of the sources. Some of these steps (considered management recommendations) are listed below.

Some management recommendations are also included in the susceptibility table for the Fairview PWS (Table 10). If these, and other, management actions are implemented, they may be considered additional barriers that will reduce the susceptibility of the intake to specific sources and contaminants.

Management recommendations fall into the following categories:

- Sewer maintenance and leak detection
- Municipal sewer extension
- Agricultural best management practices
- Stormwater management
- Proper disposal and monitoring of oil and gas production wastewater
- Education
- Emergency Response Planning

Sewer Maintenance and leak detection – Early warning of leaks and scheduled replacement of aging sewer lines may reduce the susceptibility of the Town's PWS to contamination from municipal septic wastes, and could also benefit other public water supplies in the area.

Sewer Extension – Installation of advanced septic treatment systems such as sand filters can limit contamination from new rural residential development, however, annexation and extension of sewers is the only way to reduce contamination from existing unsewered developments.

Agricultural and silvicultural best management practices (BMPs) – BMPs that address application and mixing of fertilizer and pesticides are a viable alternative to prohibition of their use. BMPs may also be utilized to minimize surface runoff and soil erosion on cultivated fields. Erosion control, selective logging, and other silvicultural practices (essentially BMPs) should be considered on a county-wide basis. BMPs are generally voluntary but their implementation can be encouraged through education and technical assistance. County planning can help promote the implementation of BMP on lands that are outside town limits but indirectly affect the town PWS.

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

Hazardous Materials Collection Days – Several counties in the state that have vulnerable water supplies have implemented scheduled days for the collection of hazardous wastes from the public. These vary in the inclusiveness of what materials are collected, how the materials are handled, and how they are disposed of, but they all act to reduce the amount of unauthorized or improper disposal of these wastes. Used motor oil collection station could be established and available to the public on a regular basis.

Emergency Response Plan – Several counties have compiled Emergency Response Plans that were then adopted by the local communities. The usefulness and effectiveness of a response plan are maximized if it contains a clear listing of all emergency contacts, emergency numbers, and resources available within the county to respond to an emergency situation, such as a hazardous material spill. Emergency plans are not

difficult to develop or distribute, but have a significant benefit to the citizens and municipalities within the county.

CHAPTER 5
MONITORING WAIVERS

Waiver Recommendation

It appears that the Town of Fairview does not have any water quality waivers. Based on the lack of information on the town's active wells it does not seem prudent to recommend any water quality monitoring waivers. Continued monitoring of a full suite of water quality parameters will play a major role in early detection of source water quality changes and in protecting the public health. In addition, due to the presence of several significant potential contaminant sources relatively close to the town's wells, Fairview PWS would likely not be eligible for monitoring waivers based on the Public Drinking Water Supply Program's criteria. However, to be sure that eligibility for all available waivers is considered, the PWS Operators are encouraged to carefully review the following section on Monitoring Waiver Requirements. If after reviewing this section it is determined that an additional waivers are feasible, the Fairview PWS should submit a letter with the proper documentation to DEQ requesting monitoring waivers. Table 11 is not filled out for this report because the Source Water Protection Program is not recommending monitoring waivers.

Table 11. Not Included:

Monitoring Waiver Requirements

The 1986 Amendments to the Safe Drinking Water Act require that community and non-community PWSs sample drinking water sources for the presence of volatile organic chemicals (VOCs) and synthetic organic chemicals (SOCs). The US EPA has authorized states to issue monitoring waivers for the organic chemicals to systems that have completed an approved waiver application and review process. All PWSs in the State of Montana are eligible for consideration of monitoring waivers for several organic chemicals. The chemicals diquat, endothall, glyphosate, dioxins, ethylene dibromide (EDB), dibromochloropropane (DBCP), and polychlorinated biphenyls are excluded from monitoring requirements by statewide waivers.

Use Waivers

A Use Waiver can be allowed if through a vulnerability assessment, it is determined that specific organic chemicals were not used, manufactured, or stored in the area of a water source (or source area). If certain organic chemicals have been used, or if the use is unknown, the system would be determined to be vulnerable to organic chemical contamination and ineligible for a Use Waiver for those particular contaminants.

Susceptibility Waivers

If a Use Waiver is not granted, a system may still be eligible for a Susceptibility Waiver, if through a vulnerability assessment it is demonstrated that the water source would not be susceptible to contamination. Susceptibility is based on prior analytical or vulnerability assessment results, environmental persistence, and transport of the contaminants, natural protection of the source, wellhead protection program efforts, and the level of susceptibility indicators (such as nitrate and coliform bacteria). The vulnerability assessment of a surface water source must consider the watershed area above the source, or a minimum fixed radius of 1.5 miles upgradient of the surface water intake. PWSs developed in unconfined aquifers should use a minimum fixed radius of 1.0 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 1.0 mile as an area of investigation for the use of organic chemicals. Shallow groundwater sources under the direct influence of surface water (GWUDISW) should use the same area of investigation as

surface water systems; that is, the watershed area above the source, or a minimum fixed radius of 1.5 miles upgradient of the point of diversion. The purpose of the vulnerability assessment procedures outlined in this section is to determine which of the organic chemical contaminants are in the area of investigation.

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

Susceptibility Waiver for Confined Aquifers

Confined groundwater is isolated from overlying material by relatively impermeable geologic formations. A confined aquifer is subject to pressures higher than atmospheric pressure that would exist at the top of the aquifer if the aquifer were not geologically confined. A well that is drilled through the impervious layer into a confined aquifer will enable the water to rise in the borehole to a level that is proportional to the water pressure (hydrostatic head) that exists at the top of a confined aquifer.

The susceptibility of a confined aquifer relates to the probability of an introduced contaminant to travel from the source of contamination to the aquifer. Susceptibility of an aquifer to contamination will be influenced by the hydrogeologic characteristics of the soil, vadose zone (the unsaturated geologic materials between the ground surface and the aquifer), and confining layers. Important hydrogeologic controls include the thickness of the soil, the depth of the aquifer, the permeability of the soil and vadose zones, the thickness and uniformity of low permeability and confining layers between the surface and the aquifer, and hydrostatic head of the aquifer. These factors will control how readily a contaminant will infiltrate and percolate toward the groundwater.

The Susceptibility waiver has the objective of assessing the potential of contaminants reaching the groundwater used by the PWS. A groundwater source that appears to be confined from surface infiltration in the immediate area of the wellhead may eventually be affected by contaminated groundwater flow from elsewhere in the recharge area. Contaminants could also enter the confined aquifer through improper well construction or abandonment where the well provides a hydraulic connection from the surface to the confined aquifer. The extent of confinement of an aquifer is critical to limiting susceptibility to organic chemical contamination. Regional conditions that define the confinement of a groundwater source must be demonstrated by the PWS in order to be considered for a confined aquifer susceptibility waiver. Confinement of an aquifer can be demonstrated by pump test data (storage coefficient), geologic mapping, and well logs. Site specific information is required to sufficiently represent the recharge area of the aquifer and the zone of contribution to the PWS well. The following information should be provided:

- Abandoned wells in the region (zone of contribution to the well),
- Other wells in the region (zone of contribution to the well),
- Nitrate/Coliform bacteria analytical history of the PWS well,
- Organic chemical analytical history of the PWS well,

Susceptibility Waiver for Unconfined Aquifers

Unconfined aquifers are the most common source of usable groundwater. Unconfined aquifers differ from confined aquifers in that the groundwater is not regionally contained within relatively impervious geologic

strata. As a result, the upper groundwater surface or water table in an unconfined aquifer is not under pressure that produces hydrostatic head common to confined aquifers.

Unconfined aquifers are usually locally recharged from surface water or precipitation. In general, groundwater flow gradients in unconfined aquifers reflect surface topography, and the residence time of water in the aquifer is comparatively shorter than for water in confined aquifers. Similar water chemistry often exists between unconfined groundwater and area surface water, and physical parameters and dissolved constituents can be an indicator of the hydraulic connection between groundwater and surface water. Consequently, unconfined aquifers can be susceptible to contamination by organic chemicals migrating from the ground surface to groundwater.

The objective of the susceptibility waiver application is to assess the potential of organic chemical migration from the surface to the unconfined aquifer. The general procedures make use of a combination of site specific information pertaining to the location and construction of the source development, monitoring history of the source, geologic characteristics of the unsaturated soil and vadose zones, and chemical characteristics of the organic chemicals pertaining to their mobility and persistence in the environment. The zone of contribution of the unconfined groundwater source must be defined and plotted. This should describe the groundwater flow directions, gradients, and a 3-year time-of-travel. All surface bodies within 1,000 feet of the PWS well(s) must be plotted. Analytical monitoring history of the PWS well and those nearby should be provided as well.

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GLOSSARY*

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

Alkalinity. The capatown of water to neutralize acids.

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

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

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

Confining Unit. A geologic formation that inhibits the flow of water.

Delineation. A process of mapping source water management areas.

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

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

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

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

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

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

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

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

Pathogens. A bacterial organism or virus typically found in the intestinal tracts of mammals, capable of producing disease.

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

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

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

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

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

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

Synthetic Organic Compounds (SOC). Man made organic chemical compounds (e.g. pesticides).

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

Total Maximum Daily Load (TMDL). The total pollutant load to a surface water body from point, non-point, and natural sources. The TMDL program was established by section 303(d) of the Clean Water Act to help states implement water quality standards.

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

Transmissivity. The ability of an aquifer to transmit water.

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

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

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

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

FIGURES

Figure 1. General Location Map.

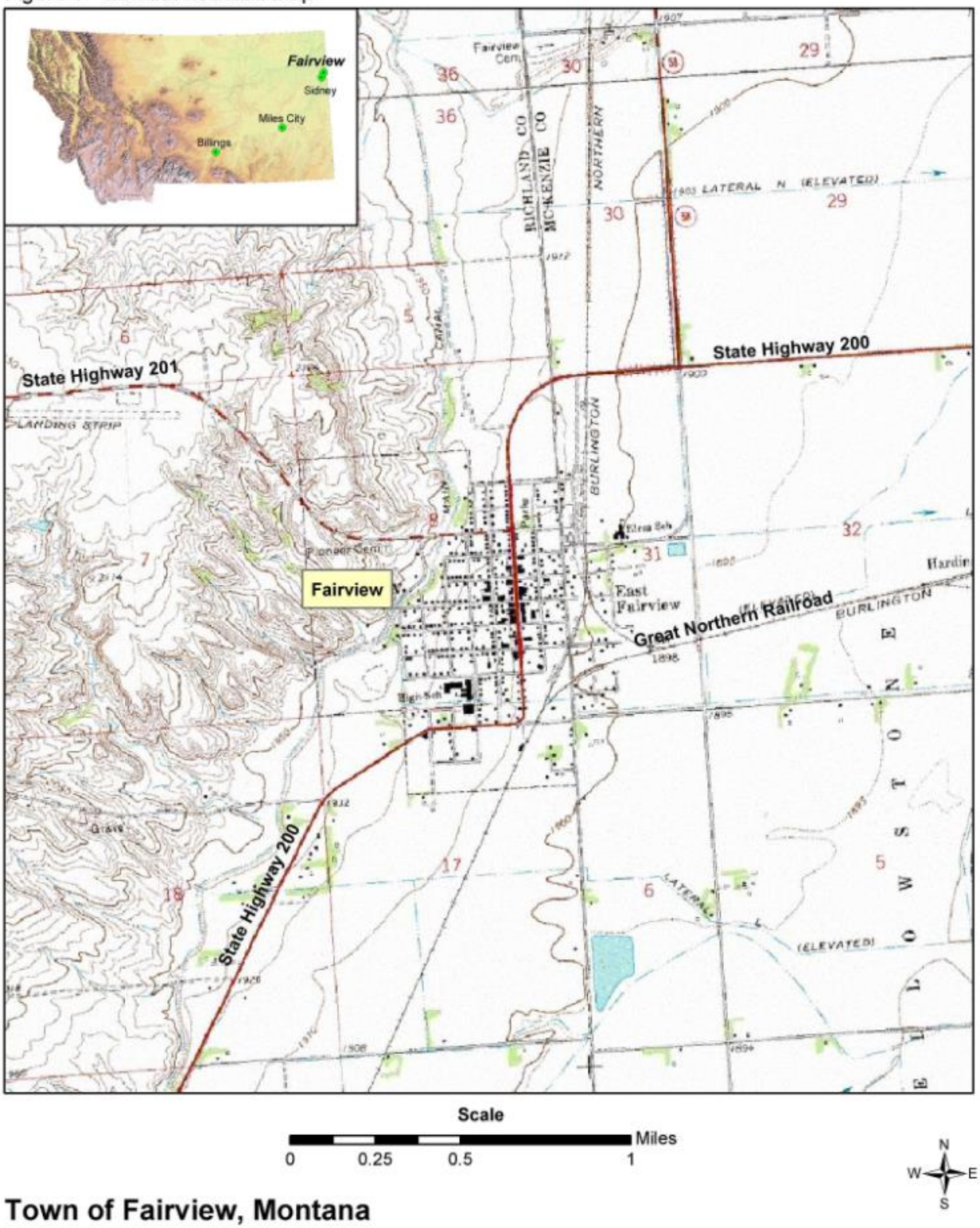


Figure 2. Climate Summary– Imbedded in text on page 5.

Figure 3. Inventory of Potential Contaminant Sources

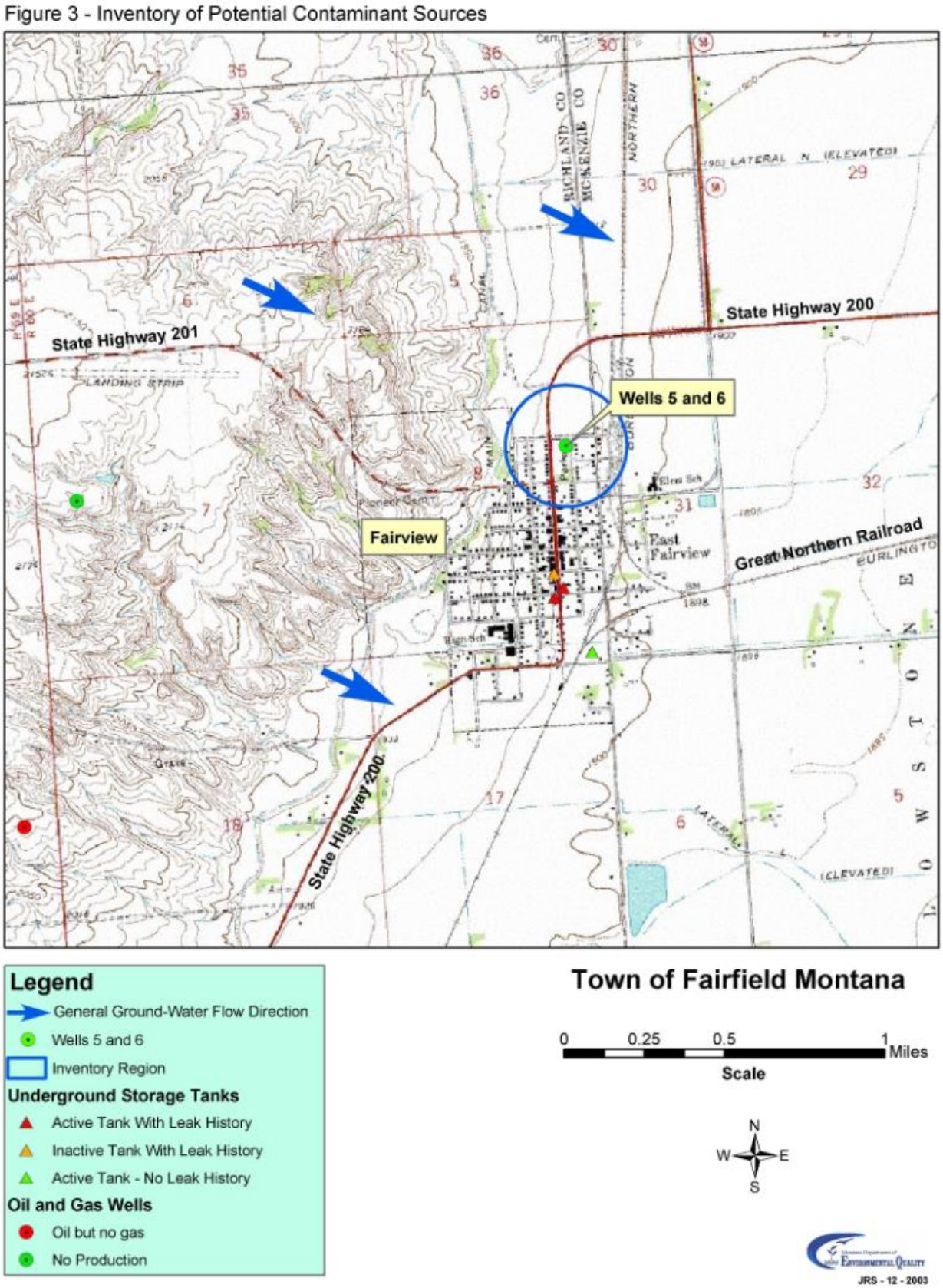
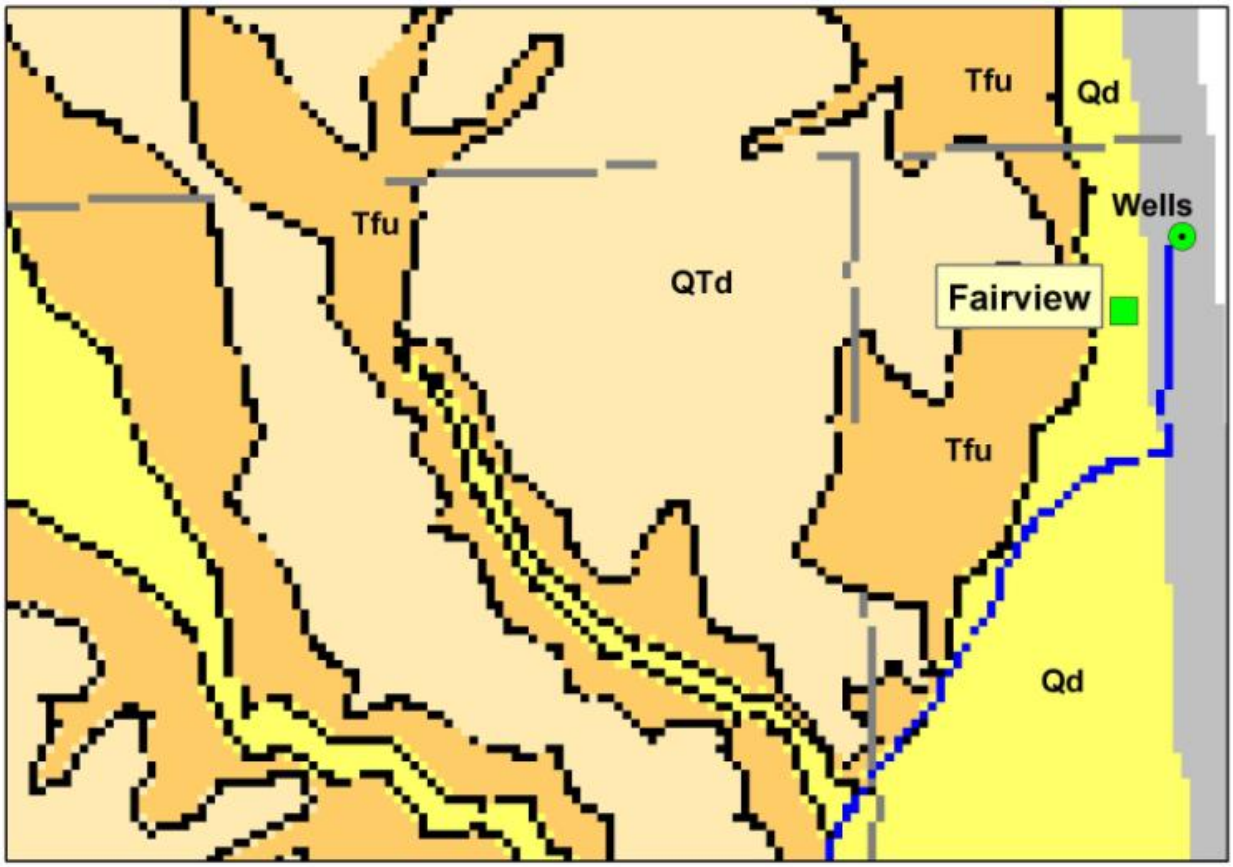


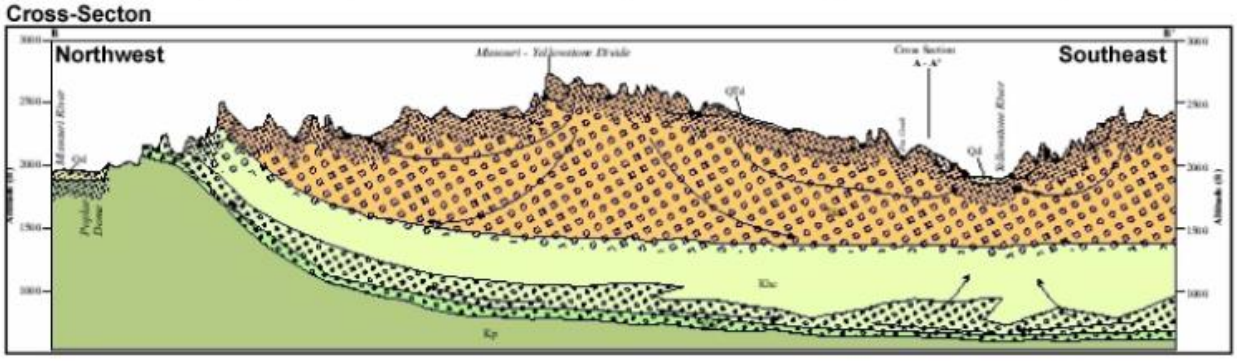
Figure 4. General Geology Map.

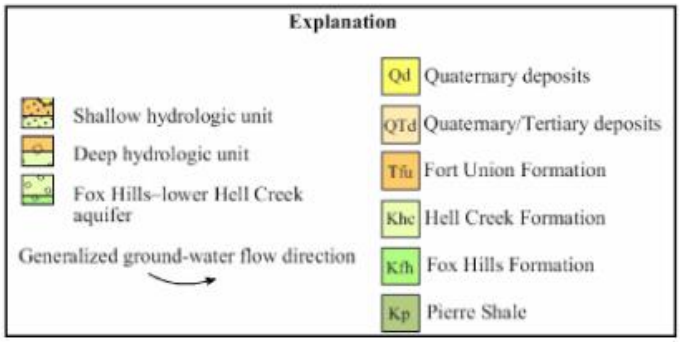
Figure 4 - General Geology (Modified from MBMG Ground-Water Assessment Atlas No. 1 Parts A & B)



Source: Smith et al., 1998, Montana Ground-Water Assessment Atlas 1, Part B Map 1. Note: Maps on this page are for illustration purposes only and are not drawn to original scale. The original scale for the map is 1:500,000.

Cross-Secton





JRS - 12 - 2003

Figure 5. Well Depth Histogram for wells in the Fairview area – Imbedded in text on page 10.

Figure 6. Inventory Region Map with Landcover / Landuse.

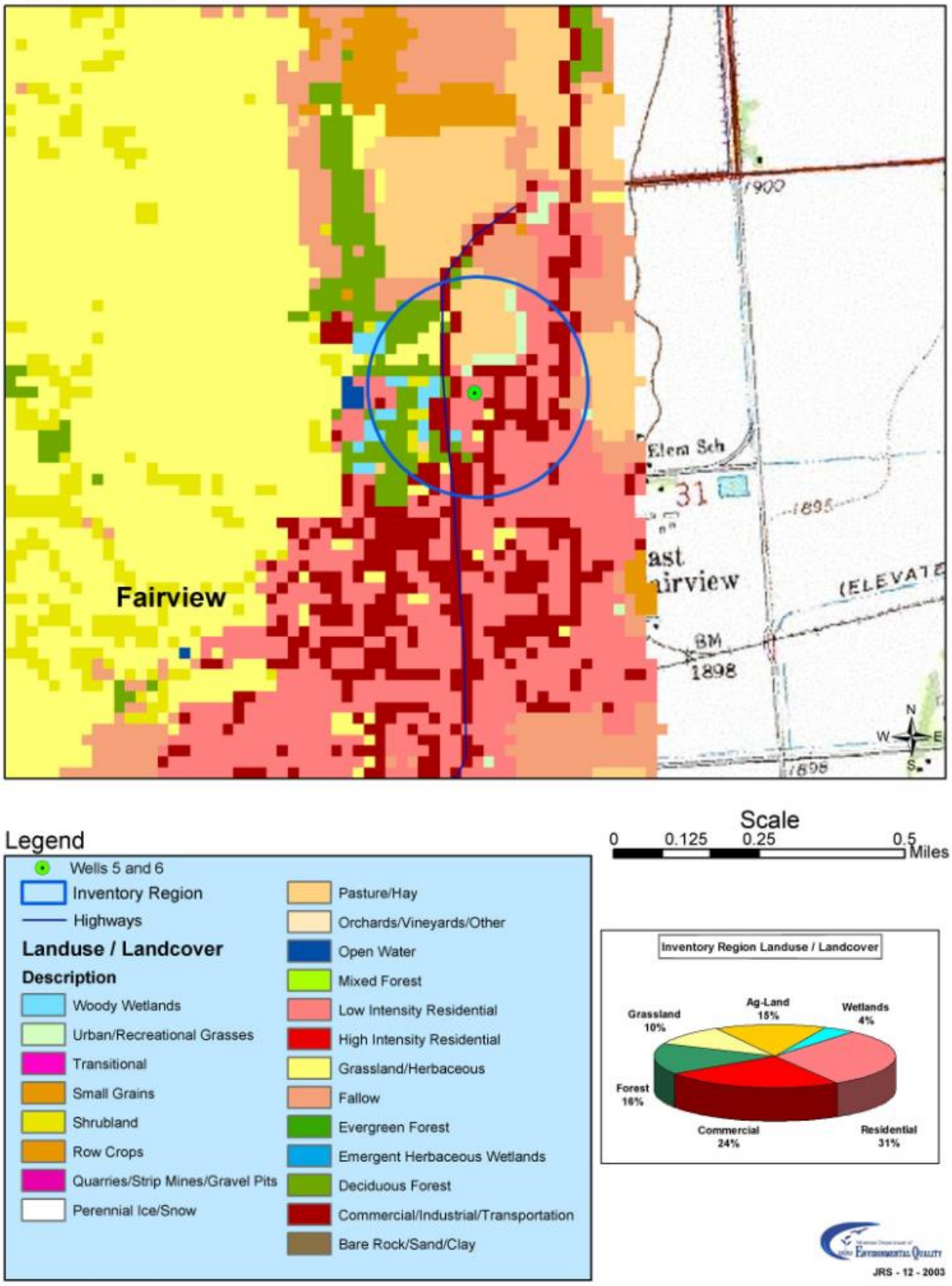


Figure 7: Recharge Region Map with Landcover / Landuse

Figure 7 - Recharge Region With Landcover / Landuse.

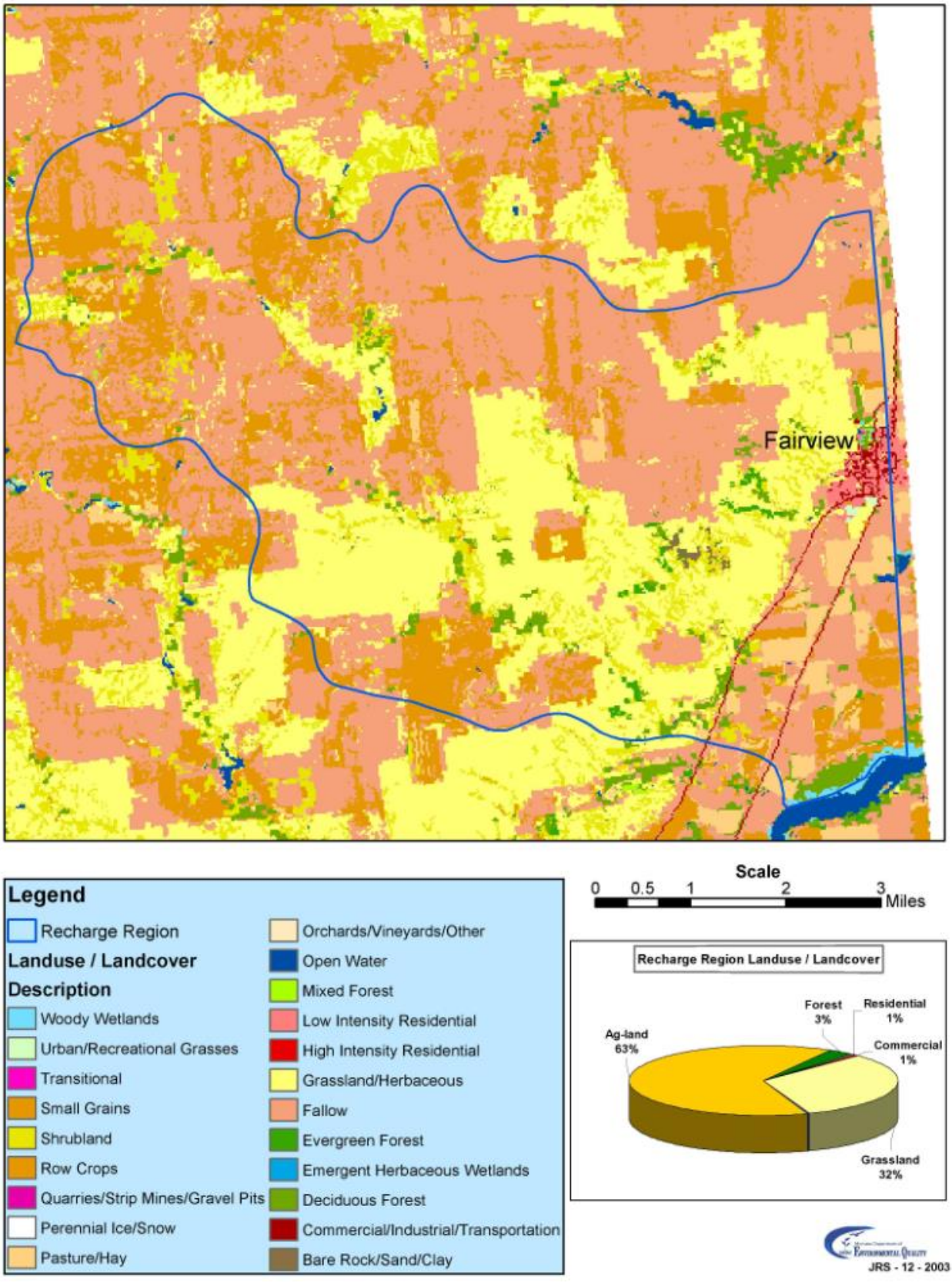
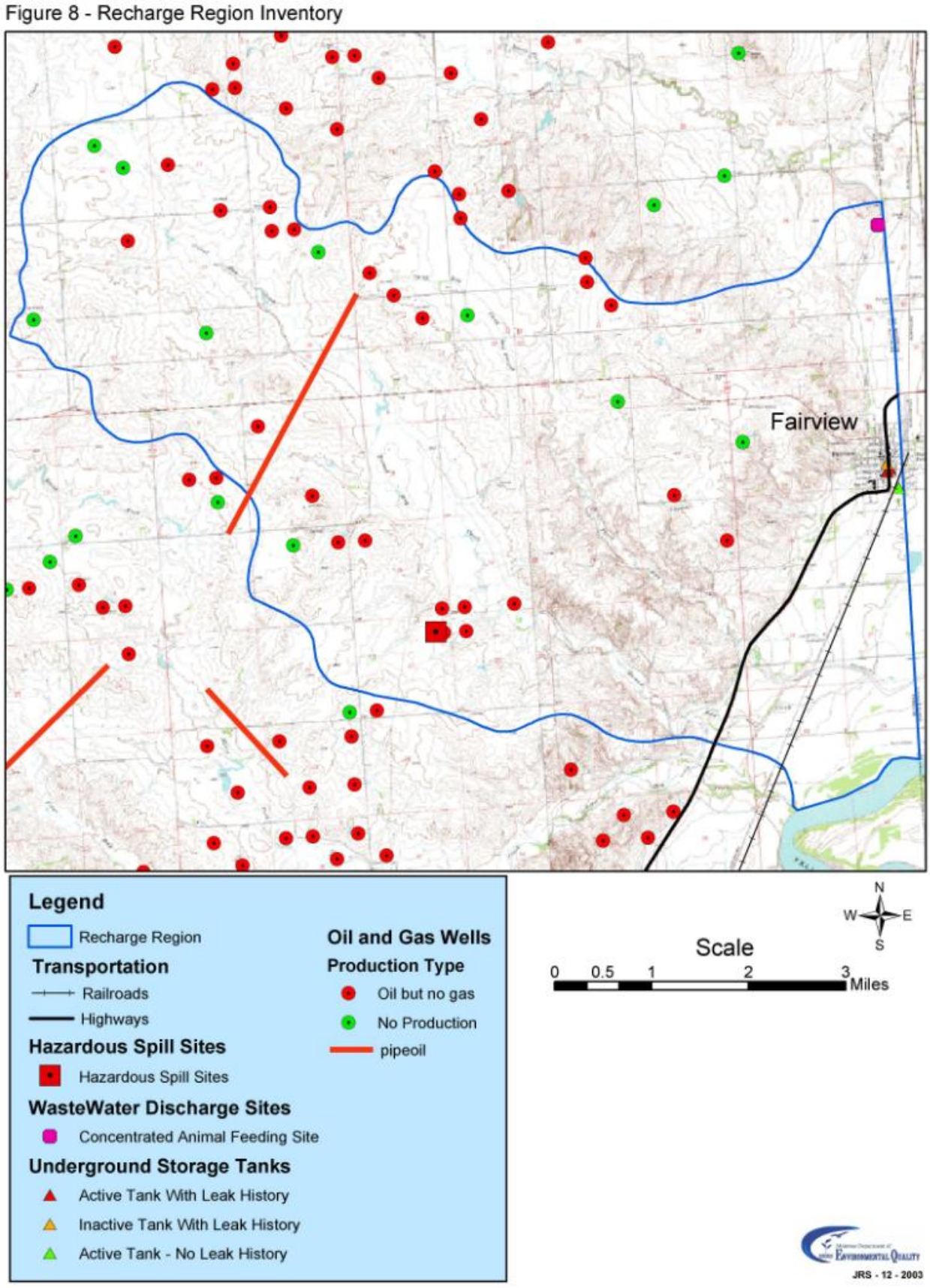


Figure 8: Recharge Region Inventory Map



APPENDICES

Available upon request
Driller's logs are included below

APPENDIX A - Listing of Potential Contaminant Sources based on SIC Code – Not included in this report. No SIC listing found for Fairview.

APPENDIX B - DEQ PWS's Database Output

APPENDIX C – Well Logs – Town's Active and Backup Wells (?)

Montana Bureau of Mines and Geology
Ground-Water Information Center Site Report
CITY OF FAIRVIEW - WELL 4

Plot this site on a topographic map

Location Information

GWIC Id:	148162	Source of Data:	QW
Location (TRS):	24N 60E 08 DABB	Latitude (dd):	47.8564
County (MT):	RICHLAND	Longitude (dd):	-104.0444
DNRC Water Right:		Geomethod:	MAP
PWS Id:	00213005	Datum:	NAD27
Block:		Certificate of Survey:	
Lot:		Type of Site:	WELL
Addition:			

Well Construction and Performance Data

Total Depth (ft):	148.00	How Drilled:	
Static Water Level (ft):		Driller's Name:	
Pumping Water Level (ft):		Driller License:	
Yield (gpm):		Completion Date (m/d/y):	1/1/1981
Test Type:		Special Conditions:	
Test Duration:		Is Well Flowing?:	
Drill Stem Setting (ft):		Shut-In Pressure:	
Recovery Water Level (ft):		Geology/Aquifer:	125FRUN
Recovery Time (hrs):		Well/Water Use:	PUBLIC WATER SUPPLY
Well Notes:			

Hole Diameter Information

No Hole Diameter Records currently in GWIC.

Casing Information[1]

No Casing Records currently in GWIC.

Annular Seal Information

No Seal Records currently in GWIC.

Completion Information[1]

No Completion Records currently in GWIC.

Lithology Information

No Lithology Records currently in GWIC.

Montana Bureau of Mines and Geology
Ground-Water Information Center Site Report
CITY OF FAIRVIEW - WELL 6

Plot this site on a topographic map

Location Information

GWIC Id:	188834	Source of Data:	DEQ
Location (TRS):	24N 60E 08 ADCA	Latitude (dd):	47.8578
County (MT):	RICHLAND	Longitude (dd):	-104.0432
DNRC Water Right:		Geomethod:	MAP
PWS Id:	00213007	Datum:	NAD27
Block:		Certificate of Survey:	
Lot:		Type of Site:	WELL
Addition:			

Well Construction and Performance Data

Total Depth (ft):	150.00	How Drilled:	
Static Water Level (ft):		Driller's Name:	
Pumping Water Level (ft):		Driller License:	
Yield (gpm):	500.00	Completion Date (m/d/y):	
Test Type:		Special Conditions:	
Test Duration:		Is Well Flowing?:	
Drill Stem Setting (ft):		Shut-In Pressure:	
Recovery Water Level (ft):		Geology/Aquifer:	Not Reported
Recovery Time (hrs):		Well/Water Use:	PUBLIC WATER SUPPLY

Well Notes: WELL RECORD CREATED FROM DEQ SANITATION SURVEY. THIS WELL REPLACED AN EXISTING WELL AND WAS ADDED TO SYSTEM IN 1997.

Hole Diameter Information

No Hole Diameter Records currently in GWIC.

Casing Information[1]

From	To	Dia	Description
0.0	116.0	10.0	

Annular Seal Information

From	To	Description
0.0	116.0	

Completion Information[1]

No Completion Records currently in GWIC.

Lithology Information

No Lithology Records currently in GWIC.

Plot this site on a topographic map

Montana Bureau of Mines and Geology
Ground-Water Information Center Site Report
CITY OF FAIRVIEW - WELL 3

Location Information

GWIC Id:	148161	Source of Data:	QW
Location (TRS):	24N 60E 08 DABB	Latitude (dd):	47.8564
County (MT):	RICHLAND	Longitude (dd):	-104.0444
DNRC Water Right:		Geomethod:	MAP
PWS Id:	00213004	Datum:	NAD27
Block:		Certificate of Survey:	
Lot:		Type of Site:	WELL
Addition:			

Well Construction and Performance Data

Total Depth (ft):	145.00	How Drilled:	
Static Water Level (ft):		Driller's Name:	
Pumping Water Level (ft):		Driller License:	
Yield (gpm):		Completion Date (m/d/y):	1/1/1981
Test Type:		Special Conditions:	
Test Duration:		Is Well Flowing?:	
Drill Stem Setting (ft):		Shut-In Pressure:	
Recovery Water Level (ft):		Geology/Aquifer:	125FRUN
Recovery Time (hrs):		Well/Water Use:	PUBLIC WATER SUPPLY
Well Notes:			

Hole Diameter Information

No Hole Diameter Records currently in GWIC.

Casing Information[1]

No Casing Records currently in GWIC.

Annular Seal Information

No Seal Records currently in GWIC.

Completion Information[1]

No Completion Records currently in GWIC.

Lithology Information

No Lithology Records currently in GWIC.

Well Logs – Other Wells Owned By Fairview

Montana Bureau of Mines and Geology
Ground-Water Information Center Site Report
CITY OF FAIRVIEW

Location Information

GWIC Id:	37412	Source of Data:	LOG
Location (TRS):	24N 60E 08	Latitude (dd):	47.8484
County (MT):	RICHLAND	Longitude (dd):	-104.0427
DNRC Water Right:		Geomethod:	TRS-TWN
PWS Id:		Datum:	NAD27
Block:	52	Certificate of Survey:	
Lot:	19	Type of Site:	WELL
Addition:	S E NEWLAND 2ND WELL		

Well Construction and Performance Data

Total Depth (ft):	129.00	How Drilled:	UNKNOWN
Static Water Level (ft):	25.00	Driller's Name:	ROMO
Pumping Water Level (ft):		Driller License:	
Yield (gpm):	432.00	Completion Date (m/d/y):	8/29/1949
Test Type:	WEIR	Special Conditions:	
Test Duration:		Is Well Flowing?:	
Drill Stem Setting (ft):		Shut-In Pressure:	
Recovery Water Level (ft):		Geology/Aquifer:	112TRRC
Recovery Time (hrs):		Well/Water Use:	UNKNOWN
Well Notes:	POSSIBLE UPDATE ON WELL DEPTH FROM 129' TO 148'. SEE QW 95Q0334		

Hole Diameter Information

No Hole Diameter Records currently in GWIC.

Casing Information[1]

From	To	Dia	Description
0.0	93.0	10.0	
83.0	129.0	8.0	

Annular Seal Information

No Seal Records currently in GWIC.

Completion Information[1]

From	To	Dia	Description
83.0	129.0	8.0	SLOTS

Lithology Information

From	To	Description
0.0	1.0	SURFACE CLAY
19.0	39.0	MIXED GRAVEL
39.0	50.0	DARK CLAY
50.0	85.0	QUICK SAND
85.0	129.0	GRAVEL-SAND AND SMALL GRAINS OF COAL;SOME QUICK SAND IN THE GRAVEL BUT SCREENS VERY WELL.

Montana Bureau of Mines and Geology
Ground-Water Information Center Site Report
CITY OF FAIRVIEW

Plot this site on a topographic map

Location Information

GWIC Id:	37406	Source of Data:	LOG
Location (TRS):	24N 60E 08	Latitude (dd):	47.8484
County (MT):	RICHLAND	Longitude (dd):	-104.0427
DNRC Water Right:		Geomethod:	TRS-TWN
PWS Id:		Datum:	NAD27
Block:		Certificate of Survey:	
Lot:		Type of Site:	WELL
Addition:			

Well Construction and Performance Data

Total Depth (ft):	56.00	How Drilled:	CABLE
Static Water Level (ft):	23.00	Driller's Name:	GENDRON
Pumping Water Level (ft):	30.00	Driller License:	WWC177
Yield (gpm):	30.00	Completion Date (m/d/y):	7/6/1974
Test Type:		Special Conditions:	
Test Duration:	1.00	Is Well Flowing?:	
Drill Stem Setting (ft):		Shut-In Pressure:	
Recovery Water Level (ft):		Geology/Aquifer:	112TRRC
Recovery Time (hrs):		Well/Water Use:	UNUSED
Well Notes:			

Hole Diameter Information

No Hole Diameter Records currently in GWIC.

Casing Information[1]

No Casing Records currently in GWIC.

Annular Seal Information

No Seal Records currently in GWIC.

Completion Information[1]

No Completion Records currently in GWIC.

Lithology Information

From	To	Description
0.0	19.0	BROWN CLAY
19.0	32.0	GRAVEL- WATER
32.0	56.0	GRAY SHALE

Montana Bureau of Mines and Geology
Ground-Water Information Center Site Report
CITY OF FAIRVIEW

Plot this site on a topographic map

Location Information

GWIC Id:	37407	Source of Data:	LOG
Location (TRS):	24N 60E 08	Latitude (dd):	47.8484
County (MT):	RICHLAND	Longitude (dd):	-104.0427
DNRC Water Right:		Geomethod:	TRS-TWN
PWS Id:		Datum:	NAD27
Block:		Certificate of Survey:	
Lot:		Type of Site:	WELL
Addition:			

Well Construction and Performance Data

Total Depth (ft):	80.00	How Drilled:	
Static Water Level (ft):	23.00	Driller's Name:	GENDRON
Pumping Water Level (ft):		Driller License:	WWC177
Yield (gpm):		Completion Date (m/d/y):	7/12/1974
Test Type:		Special Conditions:	
Test Duration:		Is Well Flowing?:	
Drill Stem Setting (ft):		Shut-In Pressure:	
Recovery Water Level (ft):		Geology/Aquifer:	112TRRC
Recovery Time (hrs):		Well/Water Use:	UNUSED
Well Notes:			

Hole Diameter Information

No Hole Diameter Records currently in GWIC.

Casing Information[1]

No Casing Records currently in GWIC.

Annular Seal Information

No Seal Records currently in GWIC.

Completion Information[1]

No Completion Records currently in GWIC.

Lithology Information

From	To	Description
0.0	30.0	BROWN CLAY
30.0	70.0	SAND BENTONITE
70.0	78.0	SAND
78.0	80.0	SAND GRAVEL

Montana Bureau of Mines and Geology
Ground-Water Information Center Site Report
CITY OF FAIRVIEW

Plot this site on a topographic map

Location Information

GWIC Id:	37408	Source of Data:	LOG
Location (TRS):	24N 60E 08	Latitude (dd):	47.8484
County (MT):	RICHLAND	Longitude (dd):	-104.0427
DNRC Water Right:		Geomethod:	TRS-TWN
PWS Id:		Datum:	NAD27
Block:		Certificate of Survey:	
Lot:		Type of Site:	WELL
Addition:			

Well Construction and Performance Data

Total Depth (ft):	48.00	How Drilled:	CABLE
Static Water Level (ft):	21.00	Driller's Name:	GENDRON
Pumping Water Level (ft):	30.00	Driller License:	WWC177
Yield (gpm):	15.00	Completion Date (m/d/y):	7/2/1974
Test Type:	BAILER	Special Conditions:	
Test Duration:	1.00	Is Well Flowing?:	
Drill Stem Setting (ft):		Shut-In Pressure:	
Recovery Water Level (ft):		Geology/Aquifer:	112TRRC
Recovery Time (hrs):		Well/Water Use:	UNUSED
Well Notes:			

Hole Diameter Information

No Hole Diameter Records currently in GWIC.

Casing Information[1]

No Casing Records currently in GWIC.

Annular Seal Information

No Seal Records currently in GWIC.

Completion Information[1]

No Completion Records currently in GWIC.

Lithology Information

From	To	Description
0.0	14.0	BROWN CLAY
14.0	28.0	GRAVEL- WATER
28.0	48.0	GRAY SHALE

Montana Bureau of Mines and Geology
Ground-Water Information Center Site Report
CITY OF FAIRVIEW

Plot this site on a topographic map

Location Information

GWIC Id:	37420	Source of Data:	GW4
Location (TRS):	24N 60E 08 AD	Latitude (dd):	47.8583
County (MT):	RICHLAND	Longitude (dd):	-104.0441
DNRC Water Right:		Geomethod:	UNKNOWN
PWS Id:		Datum:	NAD27
Block:		Certificate of Survey:	
Lot:		Type of Site:	WELL
Addition:			

Well Construction and Performance Data

Total Depth (ft):	129.00	How Drilled:	
Static Water Level (ft):	44.00	Driller's Name:	
Pumping Water Level (ft):		Driller License:	
Yield (gpm):	432.00	Completion Date (m/d/y):	8/29/1949
Test Type:		Special Conditions:	
Test Duration:		Is Well Flowing?:	
Drill Stem Setting (ft):		Shut-In Pressure:	
Recovery Water Level (ft):		Geology/Aquifer:	112TRRC
Recovery Time (hrs):		Well/Water Use:	PUBLIC WATER SUPPLY
Well Notes:			

Hole Diameter Information

No Hole Diameter Records currently in GWIC.

Casing Information[1]

No Casing Records currently in GWIC.

Annular Seal Information

No Seal Records currently in GWIC.

Completion Information[1]

No Completion Records currently in GWIC.

Lithology Information

From	To	Description
0.0	19.0	SURFACE CLAY
19.0	39.0	MIXED GRAVEL- WATER
39.0	50.0	DARK CLAY
50.0	85.0	QUICK SAND
85.0	129.0	GRAVEL- SAND AND SMALL KERNELS OF COAL- WATER

Montana Bureau of Mines and Geology
Ground-Water Information Center Site Report
CITY OF FAIRVIEW

Plot this site on a topographic map

Location Information

GWIC Id:	37426	Source of Data:	GW4
Location (TRS):	24N 60E 08 DB	Latitude (dd):	47.8544
County (MT):	RICHLAND	Longitude (dd):	-104.0488
DNRC Water Right:		Geomethod:	UNKNOWN
PWS Id:		Datum:	NAD27
Block:	14	Certificate of Survey:	
Lot:	20	Type of Site:	WELL
Addition:			

Well Construction and Performance Data

Total Depth (ft):	88.00	How Drilled:	
Static Water Level (ft):		Driller's Name:	HELMER
Pumping Water Level (ft):		Driller License:	
Yield (gpm):	250.00	Completion Date (m/d/y):	10/10/1934
Test Type:		Special Conditions:	
Test Duration:		Is Well Flowing?:	
Drill Stem Setting (ft):		Shut-In Pressure:	
Recovery Water Level (ft):		Geology/Aquifer:	112TRRC
Recovery Time (hrs):		Well/Water Use:	PUBLIC WATER SUPPLY
Well Notes:			

Hole Diameter Information

No Hole Diameter Records currently in GWIC.

Casing Information[1]

From	To	Dia	Description
0.0	70.0	0.0	

Annular Seal Information

No Seal Records currently in GWIC.

Completion Information[1]

No Completion Records currently in GWIC.

Lithology Information

From	To	Description
0.0	14.0	SURFACE SOIL AND YELLOW CLAY
14.0	32.0	SAND- GRAVEL AND SURFACE WATER
32.0	37.0	SANDY SHALE
37.0	43.0	BLUE CLAY
43.0	51.0	SANDY SHALE
51.0	60.0	FINE SAND AND WATER
60.0	74.0	FINE SAND AND WATER
74.0	78.0	FINE GRAVEL- SAND AND WATER
78.0	88.0	SAND WATER

Montana Bureau of Mines and Geology
Ground-Water Information Center Site Report
CITY OF FAIRVIEW

Plot this site on a topographic map

Location Information

GWIC Id:	37427	Source of Data:	LOG
Location (TRS):	24N 60E 08 DBC	Latitude (dd):	47.8572
County (MT):	RICHLAND	Longitude (dd):	-104.0491
DNRC Water Right:		Geomethod:	UNKNOWN
PWS Id:		Datum:	NAD27
Block:		Certificate of Survey:	
Lot:		Type of Site:	WELL
Addition:			

Well Construction and Performance Data

Total Depth (ft):	99.00	How Drilled:	CHURN
Static Water Level (ft):	20.00	Driller's Name:	SIMPSON
Pumping Water Level (ft):	68.00	Driller License:	WWC015
Yield (gpm):	475.00	Completion Date (m/d/y):	9/5/1964
Test Type:	PUMP	Special Conditions:	
Test Duration:	25.00	Is Well Flowing?:	
Drill Stem Setting (ft):		Shut-In Pressure:	
Recovery Water Level (ft):		Geology/Aquifer:	112TRRC
Recovery Time (hrs):		Well/Water Use:	PUBLIC WATER SUPPLY
Well Notes:			

Hole Diameter Information

No Hole Diameter Records currently in GWIC.

Casing Information[1]

From	To	Dia	Description
0.0	79.0	12.0	

Annular Seal Information

No Seal Records currently in GWIC.

Completion Information[1]

From	To	Dia	Description
79.0	99.0	0.0	STAINLESS SCREE

Lithology Information

From	To	Description
0.0	15.0	BROWN CLAY
15.0	28.0	SAND GRAVEL AND CLAY
28.0	40.0	GRAY CLAY
40.0	75.0	FINE GRAY CLAY
75.0	93.0	GRAY SAND GRAVEL AND COAL
93.0	99.0	GRAVEL- SOME SAND AND COAL

Montana Bureau of Mines and Geology
Ground-Water Information Center Site Report
CITY OF FAIRVIEW

Plot this site on a topographic map

Location Information

GWIC Id:	37358	Source of Data:	LOG
Location (TRS):	24N 60E 08 AC	Latitude (dd):	47.8502
County (MT):	RICHLAND	Longitude (dd):	-104.0405
DNRC Water Right:	28789	Geomethod:	TRS-TWN
PWS Id:		Datum:	NAD27
Block:	52	Certificate of Survey:	
Lot:	10 #12	Type of Site:	WELL
Addition:			

Well Construction and Performance Data

Total Depth (ft):	80.00	How Drilled:	FORWARD ROTARY
Static Water Level (ft):	20.00	Driller's Name:	SCHMID
Pumping Water Level (ft):	0.00	Driller License:	WWC296
Yield (gpm):		Completion Date (m/d/y):	9/27/1979
Test Type:		Special Conditions:	
Test Duration:	3.50	Is Well Flowing?:	
Drill Stem Setting (ft):		Shut-In Pressure:	
Recovery Water Level (ft):		Geology/Aquifer:	125TGRV
Recovery Time (hrs):		Well/Water Use:	MONITORING
Well Notes:	POSSIBLE UPDATE ON WELL DEPTH FROM 60' TO 148'. SEE QW 95Q0335		

Hole Diameter Information

No Hole Diameter Records currently in GWIC.

Casing Information[1]

From	To	Dia	Description
0.0	76.0	1.0	PVC

Annular Seal Information

No Seal Records currently in GWIC.

Completion Information[1]

From	To	Dia	Description
77.0	80.0	0.0	.01 SLOTS

Lithology Information

From	To	Description
0.0	1.0	TOPSOIL
1.0	10.0	SILT- MODERATE YELLOW BROWN CLAYEY OXIDIZED
10.0	30.0	GRAVEL- SANDY MEDIUM SAND THRU PEBBLES QUARTZ SAND SCORIA FRAGMENTS AND WELL ROUNDED SILICEOUS GRANULES AND PEBBLES W/ VERY SOFT LIGNITE THAT COLORS THE DRILLING FLUID
30.0	52.0	SILT- DARK OLIVE BROWN- VERY CLAYEY
52.0	70.0	SILT- OLIVE GRAY- VERY CLAYEY
70.0	72.0	SILT- OLIVE GRAY - VERY CLAYEY
72.0	80.0	GRAVEL- SANDY ABUNDANT LIGNITE QUARTZ SAND AND SILICEOUS PEBBLES

Montana Bureau of Mines and Geology
Ground-Water Information Center Site Report
CITY OF FAIRVIEW

Plot this site on a topographic map

Location Information

GWIC Id:	37359	Source of Data:	LOG
Location (TRS):	24N 60E 08 AC	Latitude (dd):	47.8502
County (MT):	RICHLAND	Longitude (dd):	-104.0405
DNRC Water Right:	28789	Geomethod:	TRS-TWN
PWS Id:		Datum:	NAD27
Block:	52	Certificate of Survey:	
Lot:	1 #11	Type of Site:	WELL
Addition:			

Well Construction and Performance Data

Total Depth (ft):	80.00	How Drilled:	FORWARD ROTARY
Static Water Level (ft):	24.00	Driller's Name:	SCHMID
Pumping Water Level (ft):		Driller License:	WWC296
Yield (gpm):		Completion Date (m/d/y):	9/27/1979
Test Type:		Special Conditions:	
Test Duration:	3.50	Is Well Flowing?:	
Drill Stem Setting (ft):		Shut-In Pressure:	
Recovery Water Level (ft):		Geology/Aquifer:	125TGRV
Recovery Time (hrs):		Well/Water Use:	MONITORING
Well Notes:			

Hole Diameter Information

No Hole Diameter Records currently in GWIC.

Casing Information[1]

From	To	Dia	Description
2.8	77.0	1.0	

Annular Seal Information

No Seal Records currently in GWIC.

Completion Information[1]

From	To	Dia	Description
70.0	77.0	0.0	SCREEN

Lithology Information

From	To	Description
0.0	1.0	TOPSOIL
1.0	22.0	SILT- MODERATE YELLOW BROWN CLAYEY COHESIVE OXIDIZ
22.0	37.0	GRAVEL- SANDY PREDOMINATELY COARSE SAND THRU PEBBL ES- SCORIA AND SILICEOUS ROCKS - SUB-ANGULAR TO WELL- ROUNDED W/LIGNITE- BLACK- SOFT-STAINS DRILL FLUID
37.0	54.0	SILT- OLIVE GRAY- CLAYEY- W/LIGNITE INCLUSIONS
54.0	80.0	SAND W/FINE TO MEDIUM- POOR SAMPLES- LIGNITE CHIPS

Montana Bureau of Mines and Geology
Ground-Water Information Center Site Report
CITY OF FAIRVIEW

Plot this site on a topographic map

Location Information

GWIC Id:	202434	Source of Data:	LOG
Location (TRS):	24N 60E 08 CCC	Latitude (dd):	47.8426
County (MT):	RICHLAND	Longitude (dd):	-104.0528
DNRC Water Right:		Geomethod:	TRS-TWN
PWS Id:		Datum:	NAD27
Block:		Certificate of Survey:	
Lot:		Type of Site:	WELL
Addition:			

Well Construction and Performance Data

Total Depth (ft):	40.00	How Drilled:	FORWARD ROTARY
Static Water Level (ft):	19.00	Driller's Name:	WATER SUPPLY
Pumping Water Level (ft):		Driller License:	WWC296
Yield (gpm):		Completion Date (m/d/y):	5/16/1979
Test Type:		Special Conditions:	ABANDONED
Test Duration:		Is Well Flowing?:	
Drill Stem Setting (ft):		Shut-In Pressure:	
Recovery Water Level (ft):		Geology/Aquifer:	Not Reported
Recovery Time (hrs):		Well/Water Use:	Not Reported
Well Notes:			

Hole Diameter Information

From	To	Diameter
0.0	40.0	4.0

Casing Information[1]

From	To	Dia	Description
-2.0	25.0	2.0	PVC

Annular Seal Information

No Seal Records currently in GWIC.

Completion Information[1]

From	To	Dia	Description
25.0	30.0	2.0	PERFORATED CASING

Lithology Information

From	To	Description
0.0	1.0	TOPSOIL SILTY AND BLACK
1.0	5.0	CLAY SILTY YELLOWISH AND BROWN
5.0	9.0	GRAVEL FINE MEDIUM TO COARSE
9.0	11.0	CLAY SILTY YELLOWISH BROWN
11.0	12.0	GRAVEL FINE MEDIUM TO COARSE
12.0	19.0	GRAVEL FINE MEDIUM TO COARSE WITH LOTS OF CLAY SILTY YELLOWISH BROWN MIXED MUD DIRT
19.0	26.0	SAND FINE
26.0	30.0	GRAVEL FINE MEDIUM TO COARSE
30.0	40.0	CLAY SILTY BLUISH GRAY BEDROCK

Montana Bureau of Mines and Geology
Ground-Water Information Center Site Report
CITY OF FAIRVIEW

Plot this site on a topographic map

Location Information

GWIC Id:	202436	Source of Data:	LOG
Location (TRS):	24N 60E 17 ABC	Latitude (dd):	47.8398
County (MT):	RICHLAND	Longitude (dd):	-104.0424
DNRC Water Right:		Geomethod:	TRS-TWN
PWS Id:		Datum:	NAD27
Block:	12	Certificate of Survey:	
Lot:	18	Type of Site:	WELL
Addition:			

Well Construction and Performance Data

Total Depth (ft):	40.00	How Drilled:	FORWARD ROTARY
Static Water Level (ft):	15.50	Driller's Name:	WATER SUPPLY
Pumping Water Level (ft):		Driller License:	WWC296
Yield (gpm):		Completion Date (m/d/y):	5/17/1979
Test Type:		Special Conditions:	ABANDONED
Test Duration:		Is Well Flowing?:	
Drill Stem Setting (ft):		Shut-In Pressure:	
Recovery Water Level (ft):		Geology/Aquifer:	Not Reported
Recovery Time (hrs):		Well/Water Use:	Not Reported
Well Notes:			

Hole Diameter Information

From	To	Diameter
0.0	40.0	4.0

Casing Information[1]

From	To	Dia	Description
-2.0	31.0	2.0	PVC

Annular Seal Information

No Seal Records currently in GWIC.

Completion Information[1]

From	To	Dia	Description
31.0	36.0	5.0	.016 SLOT SCREEN

Lithology Information

From	To	Description
0.0	1.0	TOPSOIL SILTY AND BLACK
1.0	17.0	CLAY SILTY YELLOWISH BROWN
17.0	19.0	GRAVEL FINE MEDIUM TO COARSE
19.0	24.0	SAND FINE TO MEDIUM
24.0	25.0	GRAVEL FINE MEDIUM TO COARSE
25.0	37.0	SAND FINE TO MEDIUM
37.0	40.0	CLAY SILTY MEDIUM GRAY

Montana Bureau of Mines and Geology
Ground-Water Information Center Site Report
CITY OF FAIRVIEW

Plot this site on a topographic map

Location Information

GWIC Id:	202439	Source of Data:	LOG
Location (TRS):	24N 60E 17 BAC	Latitude (dd):	47.8398
County (MT):	RICHLAND	Longitude (dd):	-104.0478
DNRC Water Right:		Geomethod:	TRS-TWN
PWS Id:		Datum:	NAD27
Block:	19	Certificate of Survey:	
Lot:	6	Type of Site:	WELL
Addition:			

Well Construction and Performance Data

Total Depth (ft):	40.00	How Drilled:	FORWARD ROTARY
Static Water Level (ft):	20.00	Driller's Name:	WATER SUPPLY
Pumping Water Level (ft):		Driller License:	WWC296
Yield (gpm):		Completion Date (m/d/y):	5/17/1979
Test Type:		Special Conditions:	ABANDONED
Test Duration:		Is Well Flowing?:	
Drill Stem Setting (ft):		Shut-In Pressure:	
Recovery Water Level (ft):		Geology/Aquifer:	Not Reported
Recovery Time (hrs):		Well/Water Use:	Not Reported
Well Notes:			

Hole Diameter Information

From	To	Diameter
0.0	40.0	4.0

Casing Information[1]

From	To	Dia	Description
-1.5	30.0	2.0	PVC

Annular Seal Information

No Seal Records currently in GWIC.

Completion Information[1]

From	To	Dia	Description
30.0	35.0	2.0	.016 SLOT SCREEN

Lithology Information

From	To	Description
0.0	1.0	TOP SOIL SILTY BLACK
1.0	19.0	CLAY SILTY YELLOWISH BROWN
19.0	22.0	GRAY FINE MEDIUM TO COARSE
22.0	24.0	CLAY SILTY YELLOWISH BROWN
24.0	35.0	GRAVEL FINE MEDIUM TO COARSE AND SAND FINE MEDIUM TO COARSE
35.0	40.0	CLAY SILTY MEDIUM GRAY

Montana Bureau of Mines and Geology
Ground-Water Information Center Site Report
CITY OF FAIRVIEW

Plot this site on a topographic map

Location Information

GWIC Id:	202442	Source of Data:	LOG
Location (TRS):	24N 60E 17 BAD	Latitude (dd):	47.8398
County (MT):	RICHLAND	Longitude (dd):	-104.0451
DNRC Water Right:		Geomethod:	TRS-TWN
PWS Id:		Datum:	NAD27
Block:	16	Certificate of Survey:	
Lot:	1	Type of Site:	WELL
Addition:			

Well Construction and Performance Data

Total Depth (ft):	40.00	How Drilled:	FORWARD ROTARY
Static Water Level (ft):		Driller's Name:	WATER SUPPLY
Pumping Water Level (ft):		Driller License:	WWC296
Yield (gpm):		Completion Date (m/d/y):	5/17/1979
Test Type:		Special Conditions:	ABANDONED
Test Duration:		Is Well Flowing?:	
Drill Stem Setting (ft):		Shut-In Pressure:	
Recovery Water Level (ft):		Geology/Aquifer:	Not Reported
Recovery Time (hrs):		Well/Water Use:	TEST WELL
Well Notes:			

Hole Diameter Information

No Hole Diameter Records currently in GWIC.

Casing Information[1]

No Casing Records currently in GWIC.

Annular Seal Information

No Seal Records currently in GWIC.

Completion Information[1]

No Completion Records currently in GWIC.

Lithology Information

From	To	Description
0.0	1.0	TOPSOIL
1.0	16.0	CLAY SILTY YELLOWISH BROWN
16.0	20.0	GRAVEL FINE MEDIUM TO COARSE
20.0	30.0	SAND FINE TO MEDIUM
30.0	40.0	CLAY SILTY MEDIUM GRAY

APPENDIX D - Sanitary Survey

APPENDIX E - Concurrence Letter & Other Correspondence