Hangman's Tree WUA
Public Water System

PWSID # MT0000128

SOURCE WATER DELINEATION AND ASSESSMENT REPORT

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EXECUTIVE SUMMARY

Hangman's Tree subdivision is located between the towns of Montana City and Clancy in Jefferson County in southwestern Montana. Montana City is located approximately 7 miles north of Clancy. Drinking water for the Hangman's Tree Water Users Association (WUA) Public Water System (PWS) is supplied by two wells located approximately two miles south of Montana City in southwestern Montana. Wells #3 and #4 and emergency/ backup well #5 are located in Section 26, Township 9 North, Range 3 West. This Source Water Delineation and Assessment Report was prepared under the requirements and guidance of the Federal Safe Drinking Water Act and the US Environmental Protection Agency, as well as a detailed Source Water Assessment Plan developed by a statewide citizen's advisory committee here in Montana. The Department of Environmental Quality (DEQ) is conducting these assessments for all public water systems in Montana. The purpose is to provide information so that the public water system operator, consumers, and community citizens can begin developing strategies to protect your source of drinking water. The information that is provided includes the identification of the area most critical to maintaining safe drinking water, i.e., the Inventory Region, an inventory of potential sources of contamination within this area, and an assessment of the relative threat that these potential sources pose to the water system.

Based on the well logs it appears that alluvium or older Tertiary sediments overlying the Boulder Batholith are the source of groundwater to Hangman's Tree WUA PWS Wells #3 and #4. The emergency well appears to be installed in granitic bedrock of the Boulder Batholith. In accordance with the Montana Source Water Protection Program criteria (1999), groundwater within these types of aquifers is considered to have a high sensitivity to potential contaminant sources. Sensitivity is defined as the relative ease that contaminants can migrate to source water through the natural materials.

Four types of source water protection management regions for the Hangman's Tree WUA PWS were identified as part of this assessment. They are the control zone, inventory region, surface water buffer, and the recharge region. Potential contaminant sources were identified, where present, within each of these three regions and the results are as follows:

- The goal of management in the control zone is to avoid introducing contaminants directly into the water supply's well or immediate surrounding areas. The control zone is delineated as a 100-foot radius around the wells and all sources of potential contaminants should be excluded in this region. No significant potential contaminant sources were identified within the control zone.

- The inventory region should be managed to prevent contaminants from reaching the well before natural processes reduce their concentrations. The inventory region includes the area of land overlying the aquifer(s) that supplies drinking water to the wells. Due to the complexity of this hydrogeologic setting, groundwater in the alluvium and groundwater in shallow fractured bedrock interacting with surface from Prickly Pear Creek, the inventory region for Wells 3, 4, and emergency well 5 are based on the use of a one-mile radius inventory region that has been modified using the west bank of Prickly Pear Creek as a hydrogeological boundary. Significant potential contaminant sources identified within the inventory region for Hangman's Tree WUA PWS Wells #3 and #4 include: moderate septic density surrounding the wells and Interstate 15. The most significant potential contaminant source to the emergency well is the high septic density within the subdivision.

- The management goal of the surface water buffer is to protect against the introduction of pathogens and nitrates into the wells through surface water-groundwater interaction. A surface water buffer zone has been delineated around Lump Gulch and Prickly Pear Creek to account for the interaction of surface water and groundwater. The surface water buffer includes ½-mile buffers around associated surface waters for 10 miles upstream of the groundwater zone of contributions or to watershed limits, whichever distance is shorter. Potential contaminant sources identified in the surface water buffer include: areas of moderate to high septic density, abandoned mine sites, USTs, LUSTs, a DEQ remediation site, and a treated wastewater discharge into Prickly Pear Creek.

- The goal of management in the recharge region is to maintain and improve water quality over long periods of time or increased usage. Hydrogeologic mapping was used to delineate the recharge region for the Hangman's Tree WUA PWS wells. Groundwater flow direction is most likely paralleling Prickly Pear Creek. Recharge to the wells is most likely from infiltration of precipitation and snowmelt entering directly into Prickly Pear Creek, leakage from Prickly Pear Creek, and leakage from the underlying fractured bedrock of the Boulder Batholith into overlying alluvium or older sediments. In addition to the potential contaminant sources previously identified in the inventory region and surface water buffer, there are DEQ remediation sites, treated wastewater discharge points, leaking underground storage tanks (LUSTs), additional USTs, additional mine sites, and recycling centers.

Susceptibility is the potential for a public water supply to draw water contaminated by inventoried sources at concentrations that would pose concern. 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 public water supply well. The Hangman's Tree WUA PWS has a moderate susceptibility to the on-site sewer system, Interstate 15, and abandoned mine sites. Low risk potential contaminant sources and potential sources located outside the Inventory Region, but within the Recharge Region may still pose a threat over time, but are not discussed in detail in this assessment. This provides a quick look at the existing potential sources of contamination that could, if improperly managed or released, impact the source water for the Hangman's Tree WUA PWS. The susceptibility analysis provides the Hangman's Tree WUA PWS operator and homeowners with information concerning where the greatest risk occurs and where to focus resources for protection of their valuable drinking water resource.

The costs associated with contaminated drinking water are high. Developing and approach to protect that resource will reduce the risks of a contamination event occurring. The local geology and well construction issues have been summarized in this report as they pertain to the quality of your drinking water source. The area that is believed to be most critical to preserving your water quality (the Inventory Region) has been identified and within that area the potential contaminant sources have also been identified. In addition, recommendations are provided, i.e., Best Management Practices, regarding the proper use and practices associated with the potential contaminant source. The information provided in this report will help increase awareness about the relationship between land use activities and drinking water quality.

INTRODUCTION

Carolyn DeMartino, a Montana Department of Environmental Quality (DEQ) Water Quality Specialist and DEQ intern Aubrey Smartt, completed the Hangman's Tree WUA (PWSID# 00128) Source Water Delineation and Assessment Report (SWDAR). Glen Rasmussen (Certification #4947), and Philip Meis are the operators for the Hangman's Tree WUA Public Water System (PWS).

Purpose

This Source Water Delineation and Assessment Report is intended to meet the technical requirements for the completion of the delineation and assessment for the Hangman's Tree WUA Public Water System (PWS) as required by the Montana Source Water Protection Program (DEQ, 1999) and the federal Safe Drinking Water Act (SDWA) Amendments of 1996 (P.L. 104-182).

The Montana Source Water Protection Program is intended to be a practical and cost-effective approach to protect public drinking water supplies from contamination. A major component of the Montana Source Water Protection Program is "delineation and assessment". Delineation is a process of mapping source water protection areas, which contribute water used for drinking. Assessment involves identifying locations or regions in source water protection areas where contaminants may be generated, stored, or transported, and then determining the relative potential for contamination of drinking water by these sources. The primary purpose of this source water delineation and assessment report is to provide information that helps Hangman's Tree WUA to protect its drinking water source.

Limitations

This report was prepared to assess the susceptibility of the Hangman's Tree WUA PWS to significant potential contaminant sources, and is based on published information and information obtained from individuals familiar with the community. The terms "drinking water supply" or "drinking water source" refer specifically to the source of the Hangman's Tree WUA public water supply and not any other public or private water supply. Also, not every potential or existing source of groundwater or surface water contamination in the Hangman's Tree WUA area have been identified. Only potential sources of contamination in areas that contribute water to its drinking water source are considered.

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

CHAPTER 1
BACKGROUND

The Community

Hangman's Tree subdivision is located approximately two miles south of Montana City (Figure 1). According to the Census Bureau the population of Jefferson County in 2000 was 10,049 with the population of Montana City at 2,094. Approximately 154 non-transient individuals utilize the Hangman's Tree WUA public water supply year-round.

The major transportation route in the Hangman's Tree WUA area is Interstate 15. There is no railway transportation in the Hangman's Tree WUA area.

Hangman's Tree WUA utilizes individual on-site septic systems to treat and dispose of sanitary waste. Other residences in the area are also served by individual septic systems.

Geographic Setting

This section provides an overview of the geographic setting in the vicinity of the Hangman's Tree WUA.
Hangman's Tree WUA is located approximately 7 miles south of the city of Helena and two miles south of Montana City in west central Montana, just east of Prickly Pear Creek in Section 26, Township 9 North, and Range 3 West (Figure 2). See Figure 3 for an aerial photograph of the Hangman's Tree WUA vicinity. Prickly Pear Creek flows north and empties into Lake Helena. Montana City is located on the southern edge of an intermontane basin in west central Montana just east of the Continental Divide. The Helena valley slopes gently from the south and west towards an area of lower elevation near Lake Helena.

The elevation at Hangman's Tree WUA ranges between 4,200 and 4,600 feet. The Elkhorn Mountains are to the southeast and the South Hills are north of Clancy.

Climate

The climate of the Montana City area is typical of mid-elevation intermontane basins of the Northern Rocky Mountains east of the Continental Divide. Based on climate data from the closest weather station located in Helena (244055), the average maximum and minimum temperatures in this area are 82.7° F and 53.4° in July and 29.6 F° and 11.2° F in January. Annual precipitation in this area averages 11.94 inches. Monthly average precipitation ranges from 0.47 inches in February to 2.10 inches in June. Summer thunderstorms and winter snows provide a majority of the precipitation in the area. May and June are the wettest months. An annual average of is 51.2 inches of snow is received in this area (Western Regional Climate Center, Monthly Climate Summary 1/1/1893to 9/30/2004). Table 1 summarizes the available climatic data for this area.

Table 1. Helena WSO, Montana (244055)

Period of Record Monthly Climate Summary
Period of Record : 1/ 1/1893 to 9/30/2004

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	29.6	34.8	43.2	55.2	64.3	72.6	82.7	81.1	69.2	57.3	41.9	32.6	55.4
Average Min. Temperature (F)	11.2	15.3	22.3	31.8	40.3	47.7	53.4	51.8	42.5	33.4	22.4	14.7	32.2
Average Total Precipitation (in.)	0.61	0.47	0.71	0.98	1.91	2.10	1.13	1.01	1.11	0.73	0.60	0.59	11.94
Average Total SnowFall (in.)	8.9	7.2	8.6	5.3	1.7	0.1	0.0	0.1	1.2	3.1	6.8	8.2	51.2
Average Snow Depth (in.)	13	12	5	1	0	0	0	0	0	1	5	10	4

Percent of possible observations for period of record.
Max. Temp.: 99.9% Min. Temp.: 99.9% Precipitation: 99.5% Snowfall: 95.1% Snow Depth: 95.3%
Check Station Metadata or Metadata graphics for more detail about data completeness.

Western Regional Climate Center, wrcc@dri.edu

The Public Water Supply

The Hangman's Tree WUA PWS is classified as a community system under the Federal Safe Drinking Water Act, because the system regularly serves at least 25 year-round residents through at least 15 service connections. The Hangman's Tree WUA PWS serves 154 non-transient persons via 65 active service connections.

The most recent sanitary survey (J. O'Mara, November 2002) indicates that the Hangman's Tree WUA water system consists of two wells, a 40,000-gallon storage tank, five hydrants, and a distribution system. Well #3 (WL003) is a 8-inch steel well located approximately 50 feet from Prickly Pear Creek on the west side of Interstate 15. West Well #3 was drilled in 1986 to a depth of 85 feet. At the time it was drilled, the well had a yield of 188 gallons per minute. Well #4 (WL004) is a 8-inch steel well located 20 feet from Well #3. East Well #4 was drilled in 1997 to a depth of 97 feet. At the time it was drilled, the well had a yield of 180 gallons per minute. East Well #4 replaced East Well #1 in 1997.

Well #5 is used as an emergency well and was drilled in 2000 to a depth of 505 feet. This well is constructed of 8-inch casing to 40 feet and then 4-inch diameter perforated PVC casing in an 8-inch drill hole to 505 feet. Emergency well #5 is located approximately three-quarters of a mile east of Wells #3 and #4 and higher up on the hillside (personal communication with G. Rasmussen, February 2005).

Water from wells #3 and #4 is pumped under the interstate through the distribution system to the 40,000-gallon storage tank. There is no treatment system used on the water. A copy of the well logs for Hangman's Tree WUA with information on well lithology and construction data, are included in Appendix A. The sanitary survey is available upon request from the DEQ.

Water Quality

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

Hangman's Tree WUA Water Quality

The Hangman's Tree WUA's water quality is routinely monitored for compliance with drinking water standards. Bacteriological monitoring is conducted monthly. Compliance with other drinking water standards is based on additional sampling on a variety of schedules. Within the past five years there have been three detections of coliform bacteria in the Hangman's Tree WUA PWS, but there have been no detections of fecal coliform. Coliform bacteria were last detected in the water supply on November 20, 2000. There have been no detections of coliform bacteria since this date. Nitrate plus nitrite as nitrogen ranging from 0.28 milligrams per liter (mg/L) to 1.11 mg/L has been detected in Hangman's Tree WUA PWS water within the past five years but remains below the MCL of 10 mg/L (DEQ SDWIS database).

CHAPTER 2
DELINEATION

The source water protection area, the land area that contributes water to Hangman's Tree WUA PWS wells, is identified in this chapter. The management areas identified within the source water protection area included the control zone, inventory region, surface water buffer, 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 well or in the immediate area surrounding each well.

The inventory region represents the zone of contribution of the wells. Due to the complexity of the Hangman's Tree WUA PWS hydrogeologic setting, groundwater in the alluvium and groundwater in shallow fractured bedrock interacting with surface from Prickly Pear Creek, a modified 1-mile fixed radius inventory region was delineated around Wells #3, #4 and #5. The inventory region was modified using the west bank of Prickly Pear Creek as a hydrogeological boundary. 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.

A surface water buffer zone has been delineated around Lump Gulch, Clancy Creek, and Prickly Pear Creek to account for the possible interaction of surface water and groundwater. The surface water buffer includes ½-mile buffers around associated surface waters for 10 miles upstream of the groundwater zone of contributions or to watershed limits, whichever distance is shorter. The management goal of the surface water buffer is to protect against the introduction of pathogens and nitrates into the wells through surface water-groundwater interaction.

The recharge region represents the entire portion of the aquifer that contributes water to the Hangman's Tree WUA PWS. The topographic divide that represents the watershed boundary (based on the 11-digit USGS hydrologic unit) is used as the recharge region for the PWS wells. Management in the recharge region should focus on maintaining and improving the quality of groundwater that could reach each well over longer timeframes or with increased water usage.

Hydrogeologic Conditions

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.

Based on the well logs for the Hangman's Tree WUA PWS, Wells #3 and #4 are completed into unconfined alluvium or older Tertiary Sediments overlying the Boulder Batholith. The emergency well appears to be completed in the granitic Boulder Batholith (Figure 4). These aquifers are classified as having a high sensitivity to potential contaminant sources in accordance with SWPP source water sensitivity criteria (DEQ, 1999).

Table 2. Source Water Sensitivity Criteria

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

Conceptual Model

Quaternary Alluvium or older Tertiary sediments overlying the Boulder Batholith appear to be the source of groundwater for the Hangman's Tree WUA PWS Wells #3 and #4. Emergency well #5 appears to be completed in the granitic Boulder Batholith. Groundwater flow is towards and then paralleling Prickly Pear Creek. Recharge to the aquifer is most likely from infiltration of precipitation, losses from area streams, and from groundwater in the bedrock seeping into the overlying sediments.

Well Information

Well information for the Hangman's Tree WUA PWS wells is presented in Table 3.

Table 3. Source well information for the Hangman's Tree WUA PWS

Information	West Well #3	East Well #4	Emergency Well #5
PWS Source Code	003	004	----
Well Location (Township, Range, Section)	T. 9 N., R. 3 W., Sec. 26 SW¼ NE¼SW¼ SW¼ (CCAC)	T. 9 N., R. 3 W., Sec. 26 SW¼ NE¼SW¼ SW¼ (CCAC)	T. 9 N., R. 3 W., Sec. 26 NW¼SE¼SE¼ (DDB)
Latitude/ Longitude	46.5039 / 111.9521	46.5039 / 111.9521	46.5027/-111.9386
MBMG #	58808	165643	186730
Water Right #	G032673-00	G032673-00	C113698-00
Date Well was Completed	11/13/1986	12/01/1997	07/28/2000
Total Depth (feet)	85	97	505
Perforated Intervals (feet)	45-60, 77-79, 79-80	54-68, 80-86	40-500
Static Water Level (feet)	10	4	26
Pumping Water Level (feet)	51	26	120

Table 3. Source well information for the Hangman's Tree WUA PWS

Information	West Well #3	East Well #4	Emergency Well #5
Drawdown (feet)	41	22	94
Test Pumping Rate (gpm)	188	180	35

Methods and Criteria

DEQ's Source Water Protection Program specifies methods and criteria used to delineate subregions of the source water protection area for the Hangman's Tree WUA PWS wells. Control zones were delineated around each PWS well. An inventory region, surface water buffer, and recharge region were also delineated around the wells.

Delineation Results

One hundred-foot radius control zones were delineated around each well (Figure 5). A modified one-mile fixed radius inventory region has been delineated around Wells #3, #4 and emergency well #5 (Figure 6). A separate surface water buffer for Lump Gulch and Prickly Pear Creek has also been delineated (Figure 7) as well as a recharge region (Figure 8).

Limiting Factors

Delineation of the modified 1-mile fixed radius inventory region for the Hangman's Tree WUA PWS wells assumes that the aquifer is homogeneous and of infinite aerial extent. Aquifer materials are seldom homogeneous. Also, groundwater flow within a fractured bedrock aquifer is not uniform or strictly two-dimensional. The total amount of recharge to the aquifer system from precipitation, area streams, and seepage from the underlying bedrock is unknown and can vary seasonally.

CHAPTER 3
INVENTORY

An inventory of potential contaminant sources was conducted within the Hangman's Tree WUA PWS well control zones, and inventory region, surface water buffer, and recharge region. Potential sources of all primary drinking water contaminants and Cryptosporidium were identified, however, only significant potential contaminant sources were selected for the detailed inventory. Significant potential contaminants in the Hangman's Tree WUA inventory regions include nitrate, pathogens, fuels, solvents, agricultural chemicals, and metals.

The significant potential contaminant source inventory for Hangman's Tree WUA focuses on all activities in the control zone, certain sites or land use activities in the inventory region, and general land uses and large facilities in the surface water buffer and recharge region.

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 most recent version of the National Land Cover Dataset compiled by the U.S. Geological Survey and U.S. Environmental Protection Agency (1992). Land cover types in this dataset were mapped from satellite imagery at 30-meter resolution using a variety of supporting information. Current land cover may not be reflected by this dataset in some areas where major growth has occurred. For example, land cover designated in the past, as agricultural land may now be commercial or residential land.

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 SIC code.

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, or use 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 Zone

Land cover within the control zones for both Hangman's Tree WUA PWS wells #3 and #4 consists of a portion of the frontage road and Prickly Pear Creek. There are no significant potential contaminant sources within the control zones for these wells. Land cover within the control zone for the emergency well consists mainly of a subdivision road and a portion of an adjacent residential home.

Inventory Results/Inventory Region

Land cover within the inventory region consists predominantly of evergreen forest at 71% (Figure 9). Other types of land cover and their percentages are also identified on Figure 9. Overall, septic system density within the inventory region is low (Figure 10). However, an area of moderate septic density surrounds both Hangman's Tree WUA PWS wells #3 and #4. An area of high septic density within the subdivision itself covers approximately 2 percent of the inventory region but does not appear to be a significant potential contaminant source to any of the Hangman's Tree WUA PWS wells. The most significant potential contaminant sources in the Hangman's Tree WUA PWS inventory region are listed in Table 4 and described in the text following the table. Significant potential contaminant sources are also identified on Figure 11.

Table 4. Significant Potential Contaminant Sources In The Hangman's Tree WUA Inventory Region			
Significant Potential Contaminants	**Map Figure ID Number**	**Contaminant**	**Hazard**
Area Septic System Density	Figure 10	Nitrates and pathogens	Improperly functioning systems could allow untreated effluent go leach into area drinking water
Interstate 15	Figure 11	VOCs, SOCs, and other hazardous materials	Vehicle usage increases the risks for leaks or spills of fuels and other hazardous materials that may impact area groundwater
Priority Abandoned Mine Sites	Figure 11	VOCs, SOC, metals, and possible acid rock mine drainage	Historic spills, leaks, or improper handling of chemicals and wastes generated in mining operations may impact area groundwater

Area Septic System Density – An area of moderate septic density surrounds Wells #3 and #4. Improperly functioning septic systems could allow untreated effluent containing nitrates and pathogens to leach into area groundwater and impact drinking water.

Interstate 15 – Vehicle usage increases the risks for leaks or spills of fuels and other hazardous materials in the vicinity of Wells #3 and #4 that may leach into area groundwater and impact drinking water.

Priority Abandoned Mine Sites – Historic spills, leaks, or improper handling of chemicals and wastes generated in mining operations at these sites may impact area groundwater.

Inventory Results/ Surface Water Buffer

Land cover in the surface water buffer for Hangman's Tree WUA PWS wells consists primarily of forest and grassland (Figure 12). Additional land cover types and their percentages are identified on Figure 12. In addition to the septic density identified in the inventory region, there are areas of high and moderate septic density south of Hangman's Tree WUA and along Prickly Pear Creek. Overall, septic density in the surface water buffer is low (Figure 13). In addition to the potential contaminant sources previously identified in the inventory region, there are additional abandoned mines, two recycling centers, a treated industrial wastewater discharge location, and underground storage tanks within the surface water buffer (Figure 14).

Inventory Results/ Recharge Region

Land cover in the recharge region for the Hangman's Tree WUA PWS wells also consists primarily of grassland and evergreen forest (Figure 15). Additional land cover types and their percentages are identified on Figure 15. Overall, septic density in the recharge region is also low (Figure 16). In addition

to the potential contaminant sources previously identified in the inventory region and surface water buffer, there are numerous inactive mines, treated wastewater discharge points, storm water discharge points, DEQ Remediation Sites, and USTs/LUSTs (Figure17).

Inventory Update

The certified operator(s) should update the inventory every year. Changes in land uses or potential contaminant sources should be noted and additions made as needed. The complete inventory should be submitted to DEQ every five years to ensure the source water delineation and assessment report remains current.

Inventory Limitations

The potential contaminant inventory was conducted using various databases to acquire readily available information. Information was also obtained where possible, from individuals familiar with Hangman's Tree WUA. Consequently, unregulated activities or unreported contaminant releases may have been overlooked. The use of multiple sources of information, however, should ensure that the major threats to the Hangman's Tree WUA wells have been identified.

CHAPTER 4
SUSCEPTIBILITY ASSESSMENT

Susceptibility is the potential for a public water supply to draw water contaminated by inventoried sources at concentrations that would pose concern. Susceptibility is assessed in order to prioritize potential pollutant sources for management actions by local entities, in this case Hangman's Tree WUA.

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 Surface Water Buffer and Recharge Region pose minimal threat to the source water. Management priorities in the Inventory Region are determined by ranking the significant potential contaminant sources identified in the previous chapter according to susceptibility. Alternative management approaches that could be pursued by the Hangman's Tree WUA 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 Hangman's Tree WUA wells (Table 5).

Table 5. Relative Susceptibility to Specific Contaminant Sources as Determined by Hazard 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

Proximity or density of significant potential contaminant sources and the type of contaminants determines the hazard (Table 6).

Table 6. Hazard of potential contaminant sources associated with proximity to a PWS well or intake or density within a PWS inventory or spill response region.

Type of Contaminant Source		High Hazard	Moderate Hazard	Low Hazard
SURFACE WATER	Point Sources of Nitrate or Microbes	Potential for direct discharge to source water	Potential for discharge to groundwater hydraulically connected to source water	Potential contaminant sources in the watershed region
	Point Sources of VOCs, SOCs, or Metals	Potential for direct discharge of large quantities from roads, rails, or pipelines	Potential for direct discharge of small quantities to source water	Potential for discharge to groundwater hydraulically connected to source water
WELLS	Point Sources of All Contaminants (Unconfined)	Within 1-year TOT	1 to 3 years TOT	Over 3 years TOT
	Point Sources of All Contaminants (Confined)	PWS well is not sealed through the confining layer	Well(s) in the inventory region other than the PWS well are not sealed through the confining layer	All wells in the inventory region are sealed through the confining layer
ALL	Septic Systems	More than 300 per sq. mi.	50 – 300 per sq. mi.	Less than 50 per sq. mi.
	Municipal Sanitary Sewer (% land use)	More than 50 percent of region	20 to 50 percent of region	Less than 20 percent of region
	Cropped Agricultural Land (% land use)	More than 50 percent of region	20 to 50 percent of region	Less than 20 percent of region

Susceptibility rankings are presented individually for each significant potential contaminant source and each associated contaminant in Table 7 and in text following the table. Management recommendations that indicate how significant potential contaminant sources could be better managed to prevent impacts to the Hangman's Tree WUA wells are also provided in Table 7.

Table 7. Susceptibility assessment for significant potential contaminant sources in the Hangman's Tree WUA PWS Inventory Region							
Potential Contaminant Sources	**Figure ID Number**	**Potential Contaminants**	**Hazard**	**Hazard Rating**	**Barriers**	**Susceptibility**	**Management Recommendations**
Septic System Density	Figure 10	Nitrates and pathogens	System failure could allow untreated effluent to enter into area groundwater	Moderate for Wells 3 and 4	None	High	Encourage other area septic system owners to properly maintain their septic systems
Interstate 15	Figure 11	VOCs, SOCs, other hazardous materials	Vehicle usage increases the risks for leaks or spills of fuels and other hazardous materials	High for Wells 3 and 4	Local emergency spill responders in Jefferson and Lewis and Clark County and emergency responders nearby	High	Implement an emergency spill response plan that clearly identifies who to contact in the event there is a major spill on the interstate that threatens Wells 2 and 3.
Priority Abandoned Mine Sites	Figure 11		Historic spills, leaks, or improper handling of chemicals and wastes generated in mining operations may impact area groundwater	Low for wells 3 and 4	Distance from wells	Low	Contact DEQ's Abandoned Mine Program to determine the status of remediation efforts at these mines

Susceptibility Assessment Results

Septic System Density - Hazard is ranked moderate, as an area of moderate septic density within the inventory region surrounds wells 3 and 4. Overall, susceptibility of the wells is ranked high as no barriers to contamination were identified.

Interstate 15 – Hazard is ranked high, as the interstate is located in the inventory region upgradient of wells 3 and 4. Overall, susceptibility of the wells is ranked high as only one barrier to contamination was identified.

Priority Abandoned Mines Sites – Hazard is ranked low as two mine sites are located in the inventory region but not in close proximity to any of the Hangman's Tree WUA PWS wells. Overall, susceptibility of the wells is ranked low as only one barrier to contamination was identified.

Management Recommendations

The Hangman's Tree WUA Source Water Delineation and Assessment Report was prepared to assist the Hangman's Tree WUA PWS operator and customers to protect the wells. The report provides information concerning the aquifer that supplies water to the Hangman's Tree WUA well, identifies the control zone and inventory region, and within each of these protection areas identifies the significant potential contaminants that may impact the PWS well. If the management recommendations included in Table 8 are implemented by the Hangman's Tree WUA PWS, they may be considered additional barriers that will reduce the susceptibility of Hangman's Tree WUA's well to specific potential contaminant sources and their associated contaminants.

Management recommendations fall into the following categories:

- Education
- Sewage disposal system maintenance and leak detection
- Advanced Septic System Treatment
- Stormwater management
- Emergency Response Plan

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 such as the Hangman's Tree WUA PWS operator will promote the efficiency and effectiveness of emergency responses to hazardous material spills that may occur in the vicinity of the wells. 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.

Sewage Disposal System Maintenance and Leak Detection – Proper operation and maintenance of all area septic systems will reduce Hangman's Tree WUA wells susceptibility to contamination from this potential contaminant source.

Advanced Septic System Treatment – Installation of advanced septic treatment systems such as sand filters for future rural residences can limit contamination from septic systems.

Stormwater Management – Stormwater planning should address potential contaminant sources and drainage control. Source control can be accomplished through educational programs focusing on residential chemical use, disposal, and recycling. Drainage control and pollutant removal can be accomplished through the use of vegetated detention basins at outfall locations. The construction of storm runoff wetlands can go a long way to reducing the amount of non-point pollutants.

Emergency Response Plan – An emergency response plan would be of significant benefit to the Hangman's Tree WUA water operators and homeowners. The usefulness and effectiveness of an emergency response plan are maximized if the plan contains a clear listing of all emergency contacts, emergency numbers, and resources available within Jefferson County and Lewis and Clark County to respond to an emergency situation, such as a hazardous material spill, in the vicinity of the Hangman's Tree WUA PWS wells.

CHAPTER 5
MONITORING WAIVERS

Monitoring Waiver Requirements

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

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.

Waiver Recommendation

Currently, Hangman's Tree WUA has a waiver for Phase II inorganics. For additional waiver consideration, based on monitoring history or a demonstration that certain chemicals were/ are not used in the inventory region, the Hangman's Tree WUA PWS will need to send a letter to the DEQ Public Water Supply Section requesting monitoring waivers. Additional information regarding chemical use on adjacent properties in the inventory region must accompany the waiver request letter.

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GLOSSARY*

Acute Health Effect. A negative health effect in which symptoms develop rapidly.

Alkalinity. The capacity of water to neutralize acids.

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

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

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

Biennial Reporting System (BRS). An EPA database that contains information on hazardous waste sites. The data can be accessed through the EPA Envirofacts website.

Chronic Health Effect. A negative health effect in which symptoms develop over an extended period of time.

Class V Injection Well. Any pit or conduit into the subsurface for disposal of waste waters. The receiving unit for an injection well typically represents the aquifer, or water-bearing interval.

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

Community. A town, neighborhood or area where people live and prosper.

Comprehensive Environmental Cleanup and Responsibility Act (CECRA). Passed in 1989 by the Montana State Legislature, CECRA provides the mechanism and responsibility to clean up hazardous waste sites in Montana.

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

Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS). A database that provides information about specific sites through the EPA Envirofacts website.

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

Confined Aquifer. A fully saturated aquifer overlain by a confining unit such as a clay layer. The static

water level in a well in a confined aquifer is at an elevation that is equal to or higher than the base of the overlying confining unit.

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

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

Glacial. Of or relating to the presence and activities of ice or glaciers. Also, pertaining to distinctive features and materials produced by or derived from glaciers.

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

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

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

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

Hydrology. The study of water and how it flows in the ground and on the surface.

Hydrogeology. The study of geologic formations and how they effect ground water flow systems**.**

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

Lacustrine. Pertaining to, produced by, or formed in a lake or lakes.

Leaking Underground Storage Tank (LUST). A release from a UST and/or associated piping into the subsurface.

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

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

Montana Pollutant Discharge Elimination System (MPDES). A permitting system that utilizes a

database to track entities that discharge wastewater of any type into waters of the State of Montana.

National Pollutant Discharge Elimination System (NPDES). A national permitting system that utilizes a database to track entities that discharge wastewater into waters of the United States.

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

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

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

Permit Compliance System (PCS). An EPA database that provides information on the status of required permits for specific activities for specific facilities. The data can be accessed through the EPA Envirofacts website.

Phase II (and IIb) Rules. EPA updated or created legal limits on 38 contaminants. The rules became effective July 30, 1992 and January 1, 1993. Some of these contaminants are frequently-applied agricultural chemicals such as nitrate and others are industrial solvents.

Phase V Rule. EPA set standards for 23 contaminants in addition to those addressed by the Phase II Rules. The Phase V Rule became effective January 17, 1994. Some of these contaminants include inorganic chemicals such as cyanide and other Phase V contaminants are pesticides that enter water supplies through run-off from fields where farmers have applied them or by leaching through the soil into ground water. Six are probable cancer-causing agents. Others can cause liver and kidney damage, or problems of the nervous system and brain.

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

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

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

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

Recharge Region. A source water management region that is generally the entire area that could contribute water to an aquifer used by a public water supply. Includes areas that could contribute water

over long time periods or under different water usage patterns.

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

Resource Conservation and Recovery Information System (RCRIS). Is a database that provides information about specific sites through the EPA Envirofacts website.

Secondary Maximum Contaminant Levels (SMCL). The maximum concentration of a substance in water that is recommended to be delivered to users of a public water supply based on aesthetic qualities. SMCLs are non-enforceable guidelines for public water supplies, set by EPA under authority of the Safe Drinking Water Act. Compounds with SMCLs may occur naturally in certain areas, limiting the ability of the public water supply to treat for them.

Section Seven Tracking System (SSTS). SSTS is an automated system EPA uses to track pesticide producing establishments and the amount of pesticides they produce.

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

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

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

Spill Response Region. A source water management area for surface water systems that encompasses the area expected to contribute water to a public water supply within a fixed distance or a specified four-hour water travel time in a stream or river.

Standard Industrial Classification (SIC) Code. A method of grouping industries with similar products or services and assigning codes to these groups.

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

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

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

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

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

Toxicity. The quality or degree of being poisonous or harmful to plants, animals, or humans.

Toxicity Characteristic Leachate Procedure. A test designed to determine whether a waste is hazardous or requires treatment to become less hazardous.

Toxic Release Inventory (TRI). An EPA database that compiles information about permitted industrial releases of chemicals to air and water. Information about specific sites can be obtained through the EPA Envirofacts website.

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

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

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

Underground Storage Tanks (UST). A tank located at least partially underground and designed to hold gasoline or other petroleum products or chemicals, and the associated plumbing system.

Volatile Organic Compounds (VOC). Chemicals such as petroleum hydrocarbons and solvents or other organic chemicals which evaporate readily to the atmosphere.

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.

* With the exception of the definitions for Lacustrine, Phase II and Phase V Rules, and Standard Industrial Classification Code, definitions were adapted from EPA's Term References System (formerly known as Glossary of Selected Terms and Abbreviations) which can be found at: http://www.epa.gov/trs/index.htm

The definitions of glacial and lacustrine were taken from the Glossary of Geology by Robert L. Bates and Julia A. Jackson.

The definitions for Phase II and Phase V Rules were adapted from:
http://www.epa.gov/OGWDW/source/therule.html#PhaseII
http://www.epa.gov/OGWDW/source/therule.html#PhaseV

The definition for Standard Industrial Classification Code was adapted from:
EPA/Office of Enforcement and Compliance Assurance: Guide to Environmental Issues: Glossary of Terms & Acronyms *Term Detail*)

APPENDICES

APPENDIX A: WELL LOGS

Montana Bureau of Mines and Geology
Ground-Water Information Center Site Report
HANGMANS TREE WUA **(Well #3)**

Plot this site on a topographic map

Location Information

GWIC Id:	58808	Source of Data:	COMBO
Location (TRS):	09N 03W 26 CCAC	Latitude (dd):	46.5039
County (MT):	JEFFERSON	Longitude (dd):	-111.9521
DNRC Water Right:	G032673-00	Geomethod:	MAP
PWS Id:	00128003	Datum:	NAD27
Block:		Altitude (feet):	
Lot:		Certificate of Survey:	
Addition:		Type of Site:	WELL

Well Construction and Performance Data

Total Depth (ft):	85.00	How Drilled:	FORWARD ROTARY
Static Water Level (ft):	10.00	Driller's Name:	H & L
Pumping Water Level (ft):	51.00	Driller License:	WWC334
Yield (gpm):	188.00	Completion Date (m/d/y):	11/13/1986
Test Type:	PUMP	Special Conditions:	
Test Duration:	10.00	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:			

Hole Diameter Information

From	To	Diameter
0.0	85.0	8.0

Casing Information[1]

From	To	Dia	Wall Thickness	Pressure Rating	Joint	Type
0.0	44.0	8.0				
44.0	85.0	7.0				

Annular Seal Information

From	To	Description
0.0	20.0	CEMENT

Completion Information[1]

From	To	Dia	# of Openings	Size of Openings	Description
45.0	60.0	7.0			JOHNSON 0.15
77.0	79.0	7.0			30 SLOT
79.0	80.0	7.0			80 SLOT

Lithology Information

From	To	Description
0.0	4.5	SAND AND GRAVEL
4.5	5.0	SAND
5.0	24.0	SAND AND GRAVEL
24.0	28.0	SAND GRAVEL AND CLAY
28.0	34.0	CLAY AND SAND
34.0	40.0	CLAY AND SAND
40.0	60.0	SAND
60.0	79.0	SAND
79.0	80.0	GRAVEL AND SAND
80.0	81.0	BEDROCK
81.0	85.0	BEDROCK QUARTZ

[1] - All diameters reported are inside diameter of the casing.

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

Montana Bureau of Mines and Geology
Ground-Water Information Center Site Report
HANGMANS TREE WUA **(Well #4)**

Plot this site on a topographic map

Location Information

GWIC Id:	165643	Source of Data:	LOG\DEQ
Location (TRS):	09N 03W 26 CCAC	Latitude (dd):	46.5039
County (MT):	JEFFERSON	Longitude (dd):	-111.9521
DNRC Water Right:	G032673-00	Geomethod:	MAP
PWS Id:	00128004	Datum:	NAD27
Block:		Altitude (feet):	
Lot:		Certificate of Survey:	
Addition:	HANGMANS TREE	Type of Site:	WELL

Well Construction and Performance Data

Total Depth (ft):	97.00	How Drilled:	ROTARY
Static Water Level (ft):	4.00	Driller's Name:	LINDSAY
Pumping Water Level (ft):	26.00	Driller License:	WWC253
Yield (gpm):	180.00	Completion Date (m/d/y):	12/1/1997
Test Type:	PUMP	Special Conditions:	
Test Duration:	24.00	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:			

Hole Diameter Information

From	To	Diameter
0.0	97.0	8.0

Casing Information[1]

From	To	Dia	Wall Thickness	Pressure Rating	Joint	Type
-4.0	55.0	8.0				STEEL
49.0	97.0	7.0				STEEL

Annular Seal Information

From	To	Description
0.0	20.0	CEMENT

Completion Information[1]

From	To	Dia	# of Openings	Size of Openings	Description
54.0	68.0	7.0			100 SLOT SCREEN
80.0	86.0	7.0			100 SLOT SCREEN

Lithology Information

From	To	Description
0.0	3.0	TOPSOIL AND FILL
3.0	10.0	BROWN SAND AND ROCKS
10.0	18.0	BLACK CLAY AND GRAVEL
18.0	52.0	GRAVEL SAND AND SILT
52.0	70.0	GRAVEL SAND
70.0	78.0	DECOMPOSED GRANITE BROWN
78.0	86.0	GRAY BROKEN GRANITE
86.0	97.0	GRAY GRANITE

[1] - All diameters reported are inside diameter of the casing.

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

Montana Bureau of Mines and Geology
Ground-Water Information Center Site Report
HANGMAN'S TREE WATER ASSOC. **(Well #5)**

Plot this site on a topographic map

Location Information

GWIC Id:	186730	Source of Data:	LOG
Location (TRS):	09N 03W 26 DDB	Latitude (dd):	46.5027
County (MT):	JEFFERSON	Longitude (dd):	-111.9386
DNRC Water Right:	C113698-00	Geomethod:	TRS-TWN
PWS Id:		Datum:	NAD27
Block:		Altitude (feet):	
Lot:		Certificate of Survey:	
Addition:	GRUBER ESTATES FIRST ADD	Type of Site:	WELL

Well Construction and Performance Data

Total Depth (ft):	505.00	How Drilled:	AIR ROTARY
Static Water Level (ft):	26.00	Driller's Name:	LINDSAY
Pumping Water Level (ft):	120.00	Driller License:	WWC253
Yield (gpm):	35.00	Completion Date (m/d/y):	7/28/2000
Test Type:	AIR	Special Conditions:	
Test Duration:	1.00	Is Well Flowing?:	
Drill Stem Setting (ft):		Shut-In Pressure:	
Recovery Water Level (ft):	26.00	Geology/Aquifer:	Not Reported
Recovery Time (hrs):	1.00	Well/Water Use:	DOMESTIC
Well Notes:			

Hole Diameter Information

From	To	Diameter
0.0	505.0	8.0

Casing Information[1]

From	To	Dia	Wall Thickness	Pressure Rating	Joint	Type
-1.5	39.4	8.0				8 5/8 #23
20.0	505.0	4.0				CERTA LOCK PVC

Annular Seal Information

From	To	Description
0.0	25.0	BENTONITE

Completion Information[1]

From	To	Dia	# of Openings	Size of Openings	Description
40.0	500.0	4.0			PERFORATED CASING

Lithology Information

From	To	Description
0.0	2.0	TOPSOIL
2.0	37.0	CLAY AND SAND
37.0	105.0	BROKEN ROCK AND CLAY
105.0	505.0	GRANITE BEDROCK

[1] - All diameters reported are inside diameter of the casing.