# East & West Decker Coal Mines

# Source Water Delineation and Assessment Report

**PWSID MT0000953 (East Decker)**

**PWSID MT0003951 (West Decker)**

**Report Date: April 10, 2002**


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# INTRODUCTION

This Source Water Delineation and Assessment Report (SWDAR) was completed by Jim Stimson, Hydrogeologist with Montana Department of Environmental Quality (DEQ).

## Purpose

This report is intended to meet the technical requirements for completion of the delineation and assessment report 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 areas that contribute water used for drinking. Assessment involves identifying locations in the delineated 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 the town of Decker Coal Mine protect their drinking water source. Some of the information on the well and the public water supply comes from a sanitary survey completed in August 3, 2000 by Joe Steiner of HDR Engineering Inc. (available from DEQ upon request).

## Limitations

This report was prepared to assess threats to the Decker Coal Mine public water system and is based on published information and information obtained from local residents familiar with the community water supply. The terms "drinking water supply" or "drinking water source" refer specifically to the source of the Decker Coal Mine public water system and not any other public or private water system. Also, not all of the potential or existing sources of groundwater or surface water contamination in the Decker Coal Mine area are identified. Only potential sources of contamination in areas that contribute water to Decker Coal Mine public water system wells are considered.

The term "contaminant" is used in this report to refer to constituents for which maximum Contaminant 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

Two public water supplies serve the Decker mine. The East Decker unit operates year-round with approximately 225 employees and the West Decker unit is a year-round operation and serves about 80 employees. The mine is located near Decker, Montana about 20 miles north of Sheridan, Wyoming (Figure 1).

## Geographic Setting

The Decker Coal Mine is located within the Powder River Basin just north of the town of Decker with a location of 45.0273-north latitude and -106.8189-east longitude. Decker is about 3,460 feet above sea level and is within the Upper Tongue River Watershed (HUC 10090101). The Powder River Basin which extends into Wyoming is a geologic or structural basin located between the Bighorn Mountains to the west and the Black Hills to the east. The Miles City Arch separates the Powder River Basin from the Williston Basin. This area is dominantly rolling hills and badlands topography with local relief between 100 and 500 feet. Land elevations range from 4,800 feet in the Wolf - Little Wolf Mountains to the southwest to 2,200 feet at the Powder River's confluence with the Yellowstone River. Within the Upper Tongue River Waters, elevations of the uplands reach about 4,300 feet near the state line.

The average daily high and low temperatures at Decker are not available but are probably similar to Broadus with 86.8° F and 55.5° F in July and 31.4° F and 5.5° F in January. Precipitation at Decker averages 12.15 inches annually, and is heaviest in May and June.

## General Aquifer Setting

The East Decker public water supply obtains water from 2 wells located at the east facility (Figure 1). The wells are completed in shallow alluvium of the Tongue River. Based on the well logs included in the latest sanitary survey, this aquifer is interpreted to be unconfined. The West Decker public water supply uses 3 wells located at the west facility. One of the wells (Well # 4) is a back up well and is apparently not routinely used. The wells are relatively deep, completed at 980, 326, and 282 feet below ground surface (bgs). This depth range suggests the water supply is obtained from aquifers within the Tongue River and possibly the Fox Hills - Hell Creek formations. The Fort Union Formation can be up to 1,600 ft thick and consists of beds of sandstone, siltstone, silty shale, coal and clincker. The Fox Hills-Hell Creek Formation can be up to 1,300 ft thick and consists of beds of shale, mudstone, sandstone, and coal. Multiple thick layers of shale and mudstone present in both formations act as confining layers.

## Water Quality

Water quality for the Tongue River Formation and the deeper regional aquifer are summarized in Table 1. The information comes from a report by Slagle and others (1983). In general, the water is dominant in sodium and sulfate with smaller amounts of magnesium, calcium, and bicarbonate. Dissolved solids are generally between 400 to 6,000 milligrams per liter (mg/L) and average about 2,000 mg/L. Coal aquifers tend to be dominated by sodium and bicarbonate water.

**Table 1.** Chemical analyses of water from the Tongue River Formation

(Slagle et al, 1983).

| Number of Samples | Ca mg/L | Mg mg/L | Na mg/L | K mg/L | $HCO_3$ mg/L | Cl mg/L | $SO_4$ mg/L | Dissolved Solids |
|---|---|---|---|---|---|---|---|---|
| Maximum | 460 | 680 | 1,900 | 48 | 2,000 | 120 | 4,400 | 6,300 |
| Average | 120 | 120 | 410 | 8 | 650 | 13 | 1,100 | 2,100 |
| Minimum | 1.7 | 0.3 | 3.2 | 1 | 20 | 0.4 | 0 | 110 |
| Chemical analyses of water from wells deeper hydrologic unit. | | | | | | | | |
| Number of Samples | Ca mg/L | Mg mg/L | Na mg/L | K Mg/L | $HCO_3$ mg/L | Cl mg/L | $SO_4$ Mg/L | Dissolved Solids |
| Maximum | 350 | 330 | 1,100 | 14 | 2,000 | 770 | 3,300 | 5,720 |
| Average | 32 | 27 | 450 | 4 | 850 | 36 | 390 | 1,400 |
| Minimum | 1.0 | 0.1 | 13 | 1 | 230 | 3.0 | 0.1 | 390 |

## Monitoring and Enforcement Actions

The East and West Decker public water supply wells are routinely monitored for compliance with drinking water standards. Bacteriological monitoring occurs monthly. Compliance with other drinking water standards is based on additional sampling on a variety of schedules depending on system classification and population served. There

were no detects of other regulated contaminants in either of the public water supply wells during the past five years with the exception of nitrate. Nitrate can come from human or animal wastes but also occurs naturally. The highest level detected in the East Decker system during the past five years was 0.75 mg/l, and in the West Decker system the highest level detected was 0.14 mg/l. Both systems are considerably below the maximum Contaminant level for nitrate of 10 mg/l set by the U.S. Environmental Protection Agency (EPA).

# CHAPTER 2 - DELINEATION

The source water protection areas for the Decker Mine public water systems are delineated in this chapter. The purpose of delineation is to map the source of the water supply's drinking water and to define areas within which to prioritize source water protection efforts. Three types of management regions are mapped; they are the control zone, inventory region, and recharge region.

The goal of management in the control zone is to avoid introducing contaminants directly into the water supply's well or immediate surrounding areas. The inventory region should be managed to prevent contaminants from reaching the well before natural processes reduce their concentrations. The goal of management in the recharge region is to maintain and improve water quality over long periods of time or increased usage.

## Hydrogeologic Conditions

This section provides an overview of the geology and ground-water hydrology of the Powder River Basin. This is an important section because it identifies and describes the geologic formations or groups of formations that are used as aquifers in this region. It also helps in understanding why some of the aquifers are more sensitive to potential contamination from the land surface and why others are less sensitive. Descriptions of hydrogeologic conditions in the Powder River Basin come from reports by Cannon (1985), Lee, Slagle, and Stimson (1977), Rankl and Lowry (1985), Slagle et al. (1983), Slagle, Lewis, and Lee (1985), and Smith et al. (2000). Note: An accurate geologic map of the area is not available at this time and is not included with the figures.

Quaternary alluvial deposits and terrace deposits are present within most stream valleys in the region. These deposits consist of lenses and beds of gravel, sand, silt and clay ranging in thickness between 0 to 100 feet. Bedrock is also exposed at the land surface in the region and is almost exclusively the Fort Union Formation (Paleocene age). The Wasatch Formation (Eocene age) crops out in several areas in the southern portion of the Powder River Basin within Montana. The Fort Union Formation consists of beds of fine grained sandstone, siltsone, shale, and coal. Clinker beds are also present where outcrops of coal have burned and fused rock material together. The Fort Union can be up to1,600 feet thick and can be divided into three members in descending order: the Tullock, Lebo Shale, and Tongue River. The Hell Creek Formation (Upper Cretaceous) is below the Fort Union, ranges between 200 and 900 feet thick, and contains beds of silty shale, mudstone, sandstone, and coal. 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 lies below the Hell Creek and is marked by a light-colored sandstone bed ranging in thickness from 30 to 150 feet. The sandstone is known as the Colgate Member and is present over large areas in this region. The lower part of the Fox Hills is made up of sandstone, sandy shale, silty shale, and carbonaceous shale. Thickness of the entire Fox Hills ranges between 60 and 400 feet in this region and further east. The Pierre Shale (Upper Cretaceous) occurs below the Fox Hills and is between 1,300 and 3,000 feet thick. Geologic formations

below the Pierre Shale are generally not considered as potential aquifers due to either limited yield or poor water quality.

Published reports on ground-water resources in the Powder River Basin identify four primary aquifers that include the alluvial and terrace deposits within stream valleys, the upper 200 feet of the Fort Union Formation, sandstone beds within the lower Fort Union Formation, and the lower Hell Creek - upper Fox Hills Formation (Colgate Member). Water from formations below the Pierre Shale tend to have high total dissolved solids and are too saline for domestic and stock water use.

Several studies in this region divide the aquifers into a shallow group, referred to as a shallow hydrologic unit, that represents aquifers within 200 feet of the land surface (Slagle et al. 1983, Smith et al. 2000). In most places this correlates to the upper part of the Fort Union Formation. Ground-water flow within this shallow hydrologic unit is generally from upland areas toward stream tributaries and their major streams. Below 200 feet down to the pervasive claystone and shale beds in the upper Hell Creek Formation represents a deeper group of aquifers or a deeper hydrologic unit. Ground-water flow within the deeper hydrologic unit is generally from upland areas toward major streams. Below the deeper unit, the lower Hell Creek - upper Fox Hills can be treated as a distinct hydrologic unit. Ground-water flow in the lower Hell Creek - upper Fox Hills is generally north toward the Yellowstone River valley and represents a deeper regional flow system. Studies also indicate the regional flow system contributes water to segments of the Tongue River and Powder River.

Although identifying and mapping the multiple groups of aquifers or hydrologic units can seem confusing and maybe unnecessary, it is actually a very important concept. In many places in eastern Montana potable water is very hard to come by. Many shallow wells either encounter no water or water of poor quality. Knowing that the lower Hell Creek - upper Fox Hills hydrologic unit is present over large areas in eastern Montana provides drillers with an alternative target for a source of potable water. The down-side to having to use the deeper hydrologic unit is that drilling costs are increased, in some cases substantially.

The East Decker wells tap Tongue River alluvium and ground-water flow to the wells is interpreted to be from the south parallel to the Tongue River and from upland areas to the southeast. This is a shallow unconfined aquifer that is very likely in hydraulic connection with the Tongue River. The West Decker wells tap sandstone beds within the deeper hydrologic unit, specifically within the Tongue River Formation, and possibly the Hell Creek Formation. These beds can be considered confined aquifers. Ground-water flow is generally from the south toward the Yellowstone River Valley, although studies indicate there is some leakage from the deeper hydrologic unit to the shallow hydrologic unit and some of this water discharges to larger rivers in the region such as the Tongue and Powder (Rankl and Lowry, 1985).

## Conceptual Model

The aquifers in this region receive water from infiltration of precipitation, loss of water from streams and irrigation canals, and, in some locations, from leakage from adjacent aquifers. The shallow alluvial aquifer tapped by the East Decker wells receives recharge from upland areas to the south of the well. The aquifer is very likely in hydraulic connection with the Tongue River. No confining layers are present and therefore, the alluvial aquifer is more sensitive to potential contamination sources in and around the East Decker facility and upstream within the Tongue River valleys (Figure 3).

Water enters (recharges) the deeper hydrologic unit of the Fort Union and Fox Hills - Hell Creek formations from upland areas. Multiple claystone and shale beds above the sandstone beds utilized by the Decker public water supply wells act as confining beds and impede flow from potential contaminants present at the land surface in the vicinity of the mine. Water from the deeper hydrologic unit mixes with water from the shallow hydrologic unit at discharge areas along larger stream drainages like the Tongue River and Powder River (Figure 3).

## Source Well

Water treatment for the East Decker wells consists of iron permanganate removal filters, softening, cartridge sediment filters, a reverse osmosis system, caustic soda pH adjustment, chlorination and an air tower de-carbonation unit. The water is pumped either to a 750,000-gallon storage tank or the water treatment building that houses Well 1. Water from the West Decker wells is pumped to a 150,000-gallon storage tank and treated with chlorine and softened before entering the distribution system. Table 2 summarizes the well information for Decker Mine.

**Table 2.** Information from drillers logs from wells near the Decker Mine water supply.

| **MBMG #**<br>**DNRC WR#** | **East Decker Wells** | | **West Decker Wells** | | |
|---|---|---|---|---|---|
| Location | **Well 1 09S 40E 12** | **Well 2 09S 40E 12** | **Well 3** | **Well 4** | **Well 5** |
| Date Completed | April 08, 1977 | April 04, 1977 | 1975 | December 1990 | December 1991 |
| Depth | 89 ft bgs* | 90 ft bgs* | 980 ft bgs* | 282 ft bgs* | 326 ft bgs* |
| Screened Interval | 69 - 89 ft bgs* | 70 - 90 ft bgs* | - | - | 143 - 158 ft bgs* 284 - 305 ft bgs* |
| SWL Depth | - | - | - | - | 113 |
| PWL Depth | - | - | - | - | - |
| Drawdown | - | - | - | - | - |

| | | | | | |
|---|---|---|---|---|---|
| Test Pumping Rate | - | - | - | - | 55 gpm** |
| Specific Capacity | - | - | - | - | - |
| - | - | - | - | - | - |

**ft bgs = feet below ground surface, ** gpm = gallons per minute

**Delineation**

Methods and criteria for delineating source water protection areas are specified in the Montana Source Water Protection Program Document (DEQ, 1999). For wells completed in unconfined alluvial aquifers, the inventory region can be delineated using a 3-year Time-Of-Travel, 1-mile fixed radius, or by using hydrogeologic mapping. Information from the East Decker wells is sparse and the fixed radius method is used for the inventory region. A surface water buffer region was also delineated and used to analyze land use but the surface water buffer region is not depicted on the map in Figure 5.

Wells completed in a confined aquifer can have inventory regions delineated as 1,000-foot fixed radius circles. When multiple inventory regions overlap they can be combined into a single region. The fixed radius method is used for the source water protection regions for the West Decker wells. A recharge region is also delineated. Each source water protection region is described below and they are shown in figures 4 and 5.

*Control Zones* - 100-foot radius control zones are delineated for the public water supply wells at the East and West Decker facilities; all sources of potential contaminants should be excluded in this region.

*Inventory Region* – The inventory region is a 1,000-foot fixed radius circle measured from the wellhead for the West Decker wells and a 1-mile fixed radius circle measured from the well head of the East Decker wells. The inventory region for the East Decker wells is

modified so that one boundary coincides with the bank of the Tongue River and a section of the reservoir shoreline. All potential sources of contamination are inventoried within this region.

*Recharge Region* - Topographic divides that represent the boundaries of the 8-digit watershed HUC 10090101, are used as the recharge region for all of the Decker Mine wells. All aquifers used by the Decker Mine wells receive recharge from the infiltration of precipitation, lose of water from streams and irrigation canals, and from leakage from adjacent and overlying aquifers. The goal of management in the recharge region is to maintain and improve the long-term quality of groundwater in the bedrock and alluvial aquifers.

*Surface water buffer zone* - this buffer zone extends one half mile from each bank of the Tongue River. The buffer zone extends one half mile below the well field and ten miles upstream from the well field. Potential sources of nitrate and pathogens are inventoried within this buffer zone.

# CHAPTER 3 - INVENTORY

An inventory of potential contaminant sources was conducted to assess the susceptibility of the Decker Mine public water supply wells to contamination and to provide a basis for source water protection planning. The inventory for the wells focuses on facilities that generate, use, transport, or store potential contaminants and certain land uses in the inventory region delineated in the previous section. Sources of all primary drinking water contaminants and cryptosporidium are identified, although only potential sources of contaminants that are the greatest threat to human health were selected for detailed inventory. The contaminants of greatest concern to Decker Mine public water supply wells are nitrate, microbial contaminants, fuels, solvents, and pesticides.

**Inventory Method**

Databases were searched to identify businesses and land uses that are potential sources of regulated contaminants. 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 (USGS, 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 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, sources of nitrate and microbial contaminants were identified in the surface water buffer, 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 runoff
12. Floor drains, sumps, or dry well

**Inventory Results/Control Zones**

Land within the control zones for the East Decker wells are undeveloped but there are several nearby utility roads. The control zones around the West Decker wells 3 and 5 are also undeveloped.

**Inventory Results/Inventory Regions**

Land use in the inventory region for the East Decker wells is entirely grassland or shrubland, and the active coal mine pit. These land uses are not considered to be potential contaminant sources for the East Decker wells. It is not clear from information within the sanitary survey where the septic drainfield or sewage lagoon is located. The mines septic system is considered potential source of nitrates and pathogens. Use of pesticides and other chemical treatments on or along roads and around parking areas is also potential contaminant sources. Maintenance shops and equipment wash-down facilities, as well as re-fueling sites are potential contaminant sources if they are within the inventory region (Figure 4). The occasional detection of VOCs in the treated water was noted in one of the sanitary surveys on file at the DEQ. If Class V injection wells, or floor drains, are present at any of the maintenance shops or other facilities in the inventory region, they would represent significant potential sources of contamination.

Land use for the West Decker inventory region also consists of grassland or shrubland, and the active coal mine pit. These land uses are not considered to be potential contaminant sources. The issues mentioned above related to maintenance shops, fuel storage facilities, sewer lines, septic drainfields, and Class V injection wells also apply to this facility. Significant potential contaminant sources that may be of concern for West Decker are listed in Table 3.

**Table 3.** Significant potential contaminant sources in the inventory region.

| Source | Contaminants of Concern |
|---|---|
| Fuel Storage Tanks | VOCs (petroleum and fuel products) |
| Maintenance Shops and Wash-down Sites | A variety of hazardous materials including VOCs (petroleum and fuel products) |
| Septic drainfield and Sewer lines | Pathogens / Nitrate |
| Class V Injection Wells | A variety of hazardous materials |

### Inventory Result/Recharge Region and Surface Water Buffer Region

Land use in the recharge region is dominated by grassland or shrubland, with some agricultural land present along the Tongue River valley (Figure 5). The exact percentage of land uses cannot be generated at this time because the watershed extends into Wyoming, and the Wyoming land use information is not available. As mentioned above, grassland and shrubland are not considered to be potential contaminant sources. Pesticides and nitrate use within the watershed could be a concern but is probably not a threat to the water supply because the percent of agricultural land within the watershed is small.

### Inventory Update

The Montana Source Water Protection Program recommends that the certified water system operator update the inventory every year. Changes in land uses or potential contaminant sources will be noted and additions made as needed. The complete inventory should be submitted to DEQ every five years.

### Inventory Limitations

The potential sources of contaminants described above are identified from readily available information. 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 source water for Decker Mine public water supply wells have been identified.

## CHAPTER 4 - SUSCEPTIBILITY ASSESSMENT

The susceptibility of the Decker Mine public water supply wells to contamination is assessed in this chapter. The proximity of a potential contaminant source to a well or the density of non-point potential contaminant sources determines the threat of contamination, referred to here as hazard (Table 4A and 4B). Hazard and the existence of barriers to contamination determine susceptibility (Table 5).

Barriers can be anything that decreases the likelihood that contaminants will reach a 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 can also be 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 4A.** Hazard of potential contaminant sources for the East Decker alluvial wells.

| - | | High | Moderate | Low |
|---|---|---|---|---|
| **GW and SW** | **Septic Systems** | More than 300 per sq. mi. | 50 – 300 per sq. mi. | Less than 50 per sq. mi. |
| **GW and SW** | **Municipal Sanitary Sewer** (percent land use) | More than 50 percent of region | 20 to 50 percent of region | Less than 20 percent of region |
| **GW and SW** | **Cropped Agricultural Land** (percent land use) | More than 50 percent of region | 20 to 50 percent of region | Less than 20 percent of region |

**Table 4B.** Hazard of potential contaminant sources for the West Decker bedrock 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**<br>(# per square mile) | High: > 300<br>Moderate: 50 to 300<br>Low: < 50 | Moderate: > 300<br>Low: < 300 | Low |
| **Sanitary Sewer**<br>(% land use) | High: > 50<br>Moderate: 20 to 50<br>Low: < 20 | Moderate: > 50<br>Low: < 50 | Low |
| **Cropland**<br>(% land use) | High: > 50<br>Moderate: 20 to 50<br>Low: < 20 | Moderate: > 50<br>Low: < 50 | Low |

**Table 5.** Susceptibility to potential contaminant sources based on hazard and the presence of barriers.

| - | High Hazard | Moderate Hazard | Low Hazard |
|---|---|---|---|
| **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 Discussion**

The East Decker water supply wells are completed in an alluvial aquifer that is interpreted as unconfined. A large portion of the inventory region consists of the mine support facilities which in this case is predominantly undeveloped land and no significant potential contaminant sources are identified. A moderate rating is assigned to the fuel storage facilities because they are assumed to be in compliance with state and federal regulations. The presence of Class V injection wells in the vicinity of the supply wells could pose a threat to the alluvial wells and are assigned a moderate susceptibility rating. Class V wells should be located and abandoned if found which would reduce or eliminate the hazard they represent.

The East Decker water supply wells are completed in a deep confined bedrock aquifer. From the available well information, it appears there are several other deep wells within the inventory region. The supply well logs in the sanitary survey indicate these wells are properly sealed with bentonite. However, information on the seal for the other wells within the inventory region is lacking. It is assumed the other wells within the inventory zone tap the same aquifer as the West Decker supply wells. As a result, the hazard assigned to all significant potential contaminant sources within the inventory region is moderate (see middle column of Table 4A). Because the mine site is in a remote setting and potential contaminant sources are largely absent, the susceptibility rating for the West Decker wells is low to moderate. Fuel storage facilities would be assigned a low susceptibility rating if they are in compliance with state and federal regulations. Table 6 summarizes the susceptibility ratings.

*Fuel Storage Tanks (UST)* – Hazard from the UST sites is rated low to moderate for the reasons stated in the paragraphs above. Susceptibility is rated moderate because the UST

sites are in compliance with current state and federal regulation to provide leak detection and monitoring which is considered a barrier.

*Sewer Lines* – For East and West Decker the hazard is rated low. Susceptibility is rated low because of the low density of the lines in the inventory region.

*Class V injection wells* – The presence of Class V wells has not been verified in the area and will not be done until EPA completes a nation-wide inventory of the Class V wells. However, Class V wells are listed as potential contaminant sources because they have been widely used in many communities throughout the nation in the past. Hazard of the Class V wells within the inventory region would be low and susceptibility would be rated low to moderate.

**Table 6.** Susceptibility assessment for the East and West Decker wells.

| Source | Contaminant | Hazard Rating | Barriers | Susceptibility | Management |
|---|---|---|---|---|---|
| Fuel Storage, equipment repair, and wash down Sites | Petroleum Products Fuels | Low | Compliance with state and federal regulations | Low to Moderate | Continue inspections, leak detection and monitoring |
| Municipal Sewer Lines | Pathogens / Nitrate | Low | None | Low to Moderate | Maintenance and inspection (when practical) to detect leaks. |
| Class V Injection Wells (including floor drains) | Hazardous Materials | Low | None | Moderate | Inventory and permitting or closure of Class V injection wells. |

## Management Recommendations

Continue the routine water quality monitoring for the water supply. Continue to keep significant potential contaminant sources (see step 6 under Susceptibility above) away from the water supply wells.

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# Figures

Figure 5 - Landcover and Surface Water Buffer Region

## GLOSSARY*

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

**Alkalinity.** The capacity of water to neutralize acids.

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

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

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

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

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

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

**Delineation.** A process of mapping source water management areas.

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

**Maximum Contaminant Level (MCL).** Maximum concentration of a substance in water that is permitted to be delivered to the users of a public water system. 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 sources that are diffuse and do not have a single point of origin.

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

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

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

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

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

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

**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 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 system.

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

**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. herbicides and pesticides).

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

**Transmissivity.** The ability of an aquifer to transmit water.

**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.

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

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