

WYOMING WATER ASSESSMENT AND PROTECTION PROGRAM (SWAP)



SOURCE WATER ASSESSMENT PROGRAM EXECUTIVE SUMMARY

Source Water Assessment Prepared For:
Greybull

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SOURCE WATER ASSESSMENT SUMMARY FOR Greybull

PWS Source Water Assessment Summary

The Town of Greybull maintains a community water system that serves a population of 3,250 through approximately 1,300 connections. Facilities include three flowing artesian Madison Aquifer wells, three storage tanks, three gas chlorine injection stations, and an infiltration gallery that obtains water from Shell Creek. In 1993, EPA Region 8 found the infiltration gallery to be under the direct influence of surface water. Since that time, Greybull has been searching for water sources to supplement its supply and is currently working with the Wyoming Water Development Commission on a project to rehabilitate its Shell #3, and Greybull #1 wells.

The susceptibility of Greybull's groundwater and surface water sources was generally rated high. The Town's groundwater sources received high susceptibility ratings for land use, transportation corridor, and point source contaminants due to the presence of forested and irrigated cropland use, a state highway, and an underground injection point. These sources do not present an immediate threat to the Town's Madison Aquifer wells due to their completion depths in a confined aquifer. Greybull's infiltration gallery on Shell Creek generally received high susceptibility ratings for land use, transportation corridor, and point source contaminants due to the presence of forested land use, a few wastewater discharge and underground injection points, and a state highway. The following report contains the source water delineation and susceptibility assessment for the Town of Greybull, Wyoming, PWS #5600022.

Delineation Methods

Because the Town of Greybull uses groundwater sources for its community water supply, but maintains a connection to a surface water source, Lidstone conducted a conjunctive delineation that included surface and groundwater delineation methodologies. Hydrogeologic mapping techniques were used to delineate the source water area for Greybull's three wells. Surface water mapping techniques were used to delineate the source water area for the Town's infiltration gallery on Shell Creek. The source water area delineation map for each of Greybull's sources is attached to this report.

Hydrogeologic mapping techniques use surface observations in combination with subsurface geologic and hydrogeologic data to identify aquifer boundaries and areas that contribute water to the aquifer. These techniques were used because the Town of Greybull's water source is derived from a limestone and dolomite aquifer. Conduit flow aquifers have extremely variable flow patterns and rates, making the calculation of time of travel difficult. Because of this issue, aquifer vulnerability mapping techniques were also used as part of the hydrogeologic mapping effort to identify and delineate vulnerable areas. These areas (faults, fractures, exposed bedrock, perennial streams, etc.) are anticipated to be more susceptible to the rapid infiltration of contaminants released at the ground surface.

Groundwater Sources

Greybull owns and operates three, flowing artesian Madison Aquifer wells that are located in

excess of 14 miles from Town along U.S. Highway 14 near Shell, Wyoming. In an attempt to supplement its then surface water supply, the Town contracted the drilling of a fourth well, Greybull #1, in 1982. This well is located approximately nine miles from Town, near the Whaley Cemetery. To date, it has not been connected to Greybull's water system because the well yielded an insufficient quantity of water. In addition water from this well is of poor quality. These two factors appear to be related primarily to improper well completion and borehole collapse. The Town hopes to place this well online following rehabilitation efforts to be completed during the summer of 2004.

Each of these wells lies along the homoclinal western flank of the Bighorn Mountains, a broad, asymmetrical structural uplift. As a result of this uplift, exposures of the Madison Limestone and Bighorn Dolomite within the Trapper and Shell Creek drainages offer excellent recharge areas for the Madison Aquifer through the direct infiltration of precipitation, and snowmelt runoff. The Madison Aquifer consists of sufficiently saturated portions of the Madison Limestone and Bighorn Dolomite. Groundwater in this aquifer generally flows westward from the recharge area into the Bighorn Basin through open fractures or cavern systems. While Shell Well No. 1 is completed in the Madison Limestone to a depth of 2,440 feet, Shell Well Nos. 2-3 are completed in both the Madison Limestone and Bighorn Dolomite to depths of 3,379 and 2,051 feet, respectively. While each of these wells yields water under artesian pressure, Shell Well Nos. 1 and 3 only yield up to 300 gpm, but Shell Well No. 2 yields up to 1,200 gpm. Additional information on each of these wells is included on the attached Well Information Sheets.

As shown on the enclosed source water area delineation maps, contaminant inventory zones were developed to encompass that portion of the recharge area in the Bighorn Mountains that could ultimately deliver groundwater to the Town's wells. Zone 2 extends from the western edge of the Madison Limestone outcrop to the drainage divide across the top of the Bighorn Mountains. This zone extends to the drainage divide because of the potential for point source contaminants to be introduced to the recharge area along U.S. Highway 14. Zone 3 extends beyond Zone 2 on the north and south to groundwater divides in the Madison Aquifer that have been documented through potentiometric mapping in University of Wyoming graduate theses.

Surface Water Sources

The Town of Greybull also has the potential to obtain surface water from an infiltration gallery that is located on Shell Creek approximately three miles east of Shell, Wyoming. Constructed as a replacement for a previous infiltration gallery, this facility consists of 750 feet of 15-inch diameter perforated asbestos cement pipe which underlies Shell Creek and diverts water toward the Town's main transmission line. Due to U.S. EPA's determination in 1993 that the Town was violating the Surface Water Treatment Rule, Greybull no longer relies on surface water from Shell Creek to meet its municipal demands. Additional information on this surface water source is included on the enclosed Surface Water Information Sheet.

As shown on the attached source water area delineation maps, contaminant inventory zones for the Shell Creek infiltration gallery were completed to encompass all the drainages that are tributary to Shell Creek above the intake. Upstream from the infiltration gallery, Zone 2 includes a 1,000 foot buffer along both banks of Shell Creek and all perennial tributaries for a distance of 15 river miles. Within that distance, Zone 2 terminates wherever a watershed boundary is

encountered or where the stream or tributary becomes intermittent. Zone 3 includes the remaining Shell Creek watershed upstream from the intake.

Integrity Summary

The Town of Greybull supplies its municipal system with groundwater obtained from three Madison Aquifer wells located east of Town at the base of the Bighorn Mountains. Greybull also maintains an infiltration gallery on Shell Creek, but does not currently use it for municipal supply. The integrity of the wells and intake associated with these sources is described below according to the source type and location.

Greybull currently obtains its supply water from three wells, and intends to put an older forth well online sometime in the near future. While Shell #3 was completed after 1993 when stringent construction standards were required by the State of Wyoming, Shell #1, Shell #2, and Greybull #1 were completed between 1983 and 1993 when less stringent construction standards were required. Available records indicated that each of the three wells that are currently in use was completed with both surface and annular seals. Each of these three wells is also enclosed in a building to restrict access and reduce the wellheads' susceptibility to flooding. As shown on the Integrity Summary Table, the Shell #1 and Shell #2 wells received integrity scores of 2, while Shell #3 received a score of 1. These scores solely reflected the well completion dates.

At the base of the Bighorn Mountains, the Town maintains a surface water diversion on Shell Creek. The infiltration gallery was constructed before 1983, when less stringent construction standards were required by the State of Wyoming. The intake is inspected regularly, screened, and is not easily accessible to the general public. As shown on the Integrity Summary Table, this intake received an integrity score 3 due to its construction date.

Water Source Sensitivity Summary

Greybull obtains water for its municipal system from the confined Madison Aquifer through three wells, and maintains a surface water intake on Shell Creek as a backup source. As shown on the Source Sensitivity Summary Table, both the groundwater and surface water sources received sensitivity scores of 10.

The wells and intake received the maximum sensitivity score for two reasons. While confined, the Madison Aquifer is known to be susceptible to contamination due to the fact that its permeability is attributed to interconnected fracture and cavern networks. This matrix typically results in high and variable groundwater transmission rates. Similarly, surface water obtained from Shell Creek is known to be vulnerable to contamination because it is a surface water source. The additional reason is that laboratory analysis of water samples within the last five years detected several contaminants that are listed on EPA's primary and secondary drinking water standards. These included nitrate, xylenes, and sulfate among others. Despite detection, these contaminants were generally detected at concentrations below the EPA's maximum contaminant levels.

Water System Susceptibility Rating

Susceptibility is defined as the potential for a public water supply to draw water contaminated at concentrations that would pose a threat or concern to human health. The susceptibility of Greybull's groundwater and surface water sources is detailed in the following sections.

The Town's groundwater sources received high susceptibility ratings for land use, transportation corridor, and point source contaminants. Land use susceptibility ratings were high due to the presence of forested lands in Zone 3 and irrigated croplands in Zone 1 of the source water areas. The wells also rated high with respect to transportation corridor and point source contaminants due to the presence of a state highway and an underground injection point in Zone 2. These contaminant sources do not present an immediate threat to the Town's Madison Aquifer wells due to their completion depths in a confined aquifer. Susceptibility ratings for each type of potential contaminant source are summarized on the attached susceptibility tables.

Greybull's surface water source, the infiltration gallery on Shell Creek, generally received high susceptibility ratings for land use, transportation corridor and point source contaminants. The high land use susceptibility ratings reflect the high percentage of forested land within Zones 1 and 2 of the source water area. While forested land is not considered an immediate threat, it can be problematic following forest fires when hard rains wash the resulting ash and debris into surface water intakes and reservoirs. The high point source susceptibility ratings resulted from the fact that there are a few wastewater discharge and underground injection points upstream from the intake within Zone 2. The intake was also assigned a high susceptibility for transportation corridor contaminants due to the presence of a state highway in Zone 2.

A review of your PWS's routine water analysis results revealed that one or more chemicals that are considered contaminants in drinking water were detected at some time within the last five years. Chemical detections have a large impact on your PWS's sensitivity score because it may indicate that there is a pathway for contaminants to reach the water supply. However, it is likely that these chemicals are present only in small amounts and are not a danger to your health. Some of these chemicals may also occur naturally in water.

For more information about which chemicals were detected, please contact the PWS for a copy of the most recent Consumer Confidence Report or water analysis results. Chemical detections at levels that are a concern to human health are reported on the EPA's website: http://www.epa.gov/enviro/html/sdwis/sdwis_query.html. To see if your PWS has exceeded the federal primary or secondary drinking water standards, just click on the State of Wyoming and then type in the name of your PWS. Consumer Confidence Reports are prepared by the PWS on a yearly basis. The reports should include information about any chemicals found in the water, even those found at very low levels. Please contact Kim Parker at DEQ, 307-777-7781, or WARWS for assistance. You may also contact EPA to find out what contaminants were detected. You may have to fill out a Freedom of Information Act request to obtain the water test results for your PWS. Please call EPA's Safe Drinking Water Hotline at 1-800-426-4791.

**POINT SUSCEPTIBILITY SUMMARY TABLE
FOR Greybull
Point Source Susceptibility Summary**

It may appear from the results of this point source susceptibility summary table that your system has too many PSOCs influencing the final ratings. In some cases, a specific PSOC falls within a specific contaminant inventory zone shared by multiple wells or intakes. When this is the case, that PSOC will be scored for each intake. For example, an underground storage tank may appear within a contaminant inventory zone shared by four different wells. This would cause that single storage tank to be entered into the table four times, or once for each well or intake.

Point Source Type	Low	Medium	High
Wastewater Discharge	N/A	N/A	2
Underground Injection	N/A	N/A	5

- * Illustrates the number of PSOCs in a particular rating class for all water sources
- * N/A - Not Applicable