Final - February 19, 2002

Ackley Lake State Recreation Area Westside No. 2
Source Water Delineation and Assessment Report

Public Water Supply: **Ackley Lake State Recreation Area Westside No. 2 (PWSID #MT0043177)**
Report Date: **August 16, 2000**
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Introduction

This delineation and assessment report is intended to meet the technical requirements of the Montana Source Water Protection Program (DEQ, 1999) and the federal Safe Drinking Water Act (SDWA) Amendments of 1996 (P.L. 104-182). Jim Stimson, Hydrogeologist with the Montana Department of Environmental Quality (DEQ) prepared the final report with assistance from intern Briana Roach. Information on land use and potential contaminant sources comes from a variety of sources including the Montana Gap Analysis Land Cover Database (Redmond R.L. et. al., 1998), the DEQ Public Water Supply files (including Sanitary Surveys), and other public sources of information. A web-based GIS application is also used to query and generate maps to support writing this report. This application is called the Source Water Protection Program Query System and is available at the following web address or URL**:** http://nris.mt.gov/wis/swap/swapquery.asp. The application was developed by the DEQ Source Water Protection Program (SWPP) and provides access to data from the U. S. EPA, DEQ, Montana Bureau of Mines and Geology (MBMG) and other sources.

Details on this water supply were obtained from a review of the Public Water Supply files and the most recent sanitary survey completed in September 1993 by the Central Montana Health District Sanitarian's Office (available from DEQ upon request).

Purpose

The purpose of this delineation and assessment report is to assess threats to the Ackley Lake State Recreation Area (SRA) No. 2 water supply using information obtained from FWP personnel managing the site and from published reports. Delineation is a process whereby areas that contribute water to aquifers or surface waters used for drinking water are identified on a map. These areas are referred to as source water protection areas. Assessment involves identifying locations or regions in source water protection areas where contaminants may be generated, stored, or transported and then determining the potential for contamination of drinking water by these sources.

Public Water Supply Information

Ackley Lake SRA No. 2 is a campground and recreation area located on the west side of Ackley Lake, six miles southeast of Hobson, Montana (Figure 1). The Department of Fish, Wildlife and Parks (FWP) operates the site. The site is served by a well (PWS Source ID 002)

also located on the west side of the lake. Use of a second well on the east side of the lake was discontinued in 1995 due to elevated nitrate concentrations of 16.4 milligrams per liter (mg/l).

DEQ public water supply records indicate the current water system serves 25 or more non-residents campers per day through one active service connection. Because the water supply does not regularly the same persons for at least six months a year, it is classified as a transient, non-community public water supply. Water demand is estimated at approximately 125 gallons per day assuming 5 gallons per day per visitor (EPA, 1991). The well (PWS Source ID 002) is located near the boat ramp. Sewage at the facility is collected in vault toilets located more than one hundred feet from the well.

According to the most recent sanitary survey (September 1993) and well log data from the Montana Bureau of Mines and Geology (MBMG), the Ackley Lake SRA No. 2 well is 43 feet deep and was drilled in 1981. The well is constructed with 6-inch casing, perforated between the depths of 26 and 31 feet, and yields 18 gallons per minute (gpm). The static water level is 15 feet below land surface and the pumping water level is 17 feet (Figure 2A). The well appears to be completed in a terrace gravel aquifer, interpreted as the equivalent to the Flaxville gravel (Tertiary age) in central and northeastern Montana. Streams in the area have dissected the terrace gravel deposits exposing the Colorado shale in some places. A geologic map for the area shows Ackley Lake occupying a depression between two terrace deposits floored in part by the Colorado shale. Surface- and ground-water flow in this region is generally northeast from the Little Belt Mountains toward the Judith River. Locally, ground water flows from upland areas toward local stream valleys and then northeast toward the Judith River.

The No. 2 well has a hand-pump with a cylinder pump located inside the well casing and a water reservoir that fills when the pump is used. No treatment is applied to the water system. According to the sanitary survey, the pump appears to be in good working order, but the survey states “There would be a chance of the well becoming contaminated where the well rod enters the pump housing.” This observation most likely refers to a deterioration of packing material between the hand-pump rod and pump housing that results in open spaces that act as pathways into the pump housing and well casing. The pump housing can also come loose from its support base creating direct access for potential contaminants into the well casing. Routine inspection and maintenance of the hand-pump can address these concerns. At the time of writing this report, it is not clear whether this pump currently needs maintenance based on the 1993 sanitary survey or other information available in the DEQ PWS files.

FWP is required to monitor for nitrate and coliform bacteria at Ackley Lake (PWS Source ID 002). DEQ records for the last five years indicate no detection of bacteria. Nitrate was detected but the highest level of detected was 1.28 mg/l, considerably below the maximum concentration level of 10 mg/l set by the U.S. Environmental Protection Agency (EPA). Nitrate can come from human or animal wastes but also occurs naturally. Nitrate and microbiological monitoring results are kept on file at the DEQ.

Delineation

A 100-foot radius control zone, a one-mile radius inventory zone, and a surface water buffer zone were delineated for Ackley Lake SRA No. 2 (PWS Source ID 002), as is required for transient, non-community (TNC) public water supplies under the Montana Source Water Protection Program (Figure 1B). The control zone is the most critical area from which direct introduction of contaminants into the well or immediate area can occur. The inventory region encompasses the area from which water or contaminants can flow into the public water supply well at Ackley Lake SRA No. 2 over a period of months to years. A surface water buffer zone is also delineated for the Ackley Lake well for the following reasons: 1) The well is shallow, less than 50 feet deep; 2) The aquifer is relatively thin and lacks a confining layer that slows down or impedes flow from potential contaminant sources at the surface; and 3) The well is in close proximity to Ackley Lake (approx. 100 feet). These three factors increase the likelihood that the aquifer, the lake and "feeder canal" are hydraulically connected. As a result, under certain conditions, the lake and the feeder canal could contribute water to the aquifer and consequently, to the well. The surface water buffer extends one half mile around the lake, and contributing streams and canals up-stream a distance corresponding to 4-hour time of travel (TOT) but not to exceed ten miles or beyond the limit of the watershed. The Inventory and surface water buffers zones are combined on the map in Figure 1 because contaminant inventory requirements are the same for both zones, for TNC public water supplies.

Inventory

The Montana Source Water Protection Program (DEQ, 1999) requires that land uses and all potential sources of nitrate and microbial pathogens within the control zone and inventory region of transient, non-community public water supplies be identified. These potential sources of contamination are also identified for sites requiring a surface water buffer zone.

Agriculture is the dominant land use around Ackley Lake, representing about 84% of the land use within the inventory and surface water buffer zones (Figure 1C). This includes irrigated and dryland crops. According to the SWPP guidelines, cultivated cropland represents a significant potential contaminant source. In addition, the agricultural land is considered to represent a high hazard for potential contamination of source water, if it represents more than 50% of the land use within the Inventory Region or Zone. Use of agri-chemicals is the primary concern because under certain conditions they can be sources of nitrate, from fertilizers, and synthetic organic chemicals (SOC), from herbicides and pesticides. However, it is also worth noting that water from wells completed in or near shale formations can have elevated nitrate concentrations. In such cases, the nitrate is naturally occurring and does not come from human activities. Regardless of the source, elevated nitrate levels represent an acute health hazard. In the case of Ackley Lake, the public water supply is vulnerable to elevated nitrate due to the large percentage of agricultural land and the close proximity of the Colorado Shale.

Other potential sources of contamination that are not classified as significant but are present at this site include recreational activities, site maintenance (waste removal from vaulted toilets), domestic animals, and wildlife. For example, leaks or accidental fuel spills from boats and vehicles could occur within the 100-foot control zone. Defecation of domestic animals (pets) and wildlife near or at the well could also pose a threat to water quality. Birds and small rodents often perch or climb on hand-pumps. These threats are reduced if the pump and pump

housing are maintained. Other measures such as restricting parking and pets to areas outside the 100 foot control zone and down-gradient from the well would also help reduce risk to the source water quality.

Susceptibility Assessment

Susceptibility to potential contaminant sources is assessed both for the aquifer and the public water supply well. According to the Montana Source Water Protection Program criteria, a terrace and pediment gravel aquifer is rated as highly sensitive to potential sources of contamination (Table 2, Source Water Protection Program Document). The large percentage of agricultural land use in this area represents a high hazard to this public water supply, primarily for nitrate and SOCs. While modern well construction can be counted as a barrier to potential contamination sources within the control zone, the terrace gravel has no impermeable soil or rock unit above the water producing unit, so the aquifer as a whole is unconfined. Based on this information, the susceptibility of Ackley Lake SRA No. 2 is high for pathogens and very high for nitrate.

References:

Ackley Lake Water Users' Association, May 1981, Ackley Lake Dam, Hobson, Montana, Judith Basin County, MT10.

Feltis, R. D., 1977, Geology and water resources of the northern part of the Judith Basin, Montana; Montana Bureau of Mines and Geology (MBMG) Bulletin 101.

Montana DEQ, 1999. Montana Source Water Protection Program Approved by EPA in November 1999.

Montana State Water Projects Bureau, Department of Natural Resources and Conservation, May 1995, Ackley Lake Dam Emergency Plan: a guide to emergency procedures at Ackley Lake Dam.

U.S. EPA, Office of Water, 1991. Manual of Small Public Water Supply Systems, EPA 570/9-91-003, 211 p.

U.S. Geological Survey, 2000. National Landcover Dataset, Montana. 30-meter electronic digital landcover dataset interpreted from satellite imagery.

Zimmerman, E. A., 1966, Geology and Ground-Water Resources of Western and Southern Parts of Judith Basin, Montana; MBMG Bulletin 50-A.

Figure 2A. Well log for water supply well.

Error! Bookmark not defined.GWIC Well Log Report - Source Well (West Side of Lake)

Montana Bureau of Mines and Geology
Ground-Water Information Center

Owner and Location Information

Site Name:MT DEPT FISH GAME

GWIC Id:	25718	Source of Data:	Not Reported
Location (TRS):	14N 14E 22 CC	Latitude (dd):	46.9564
County (MT):	JUDITH BASIN	Longitude (dd):	-109.9401
DNRC Water Right:	Not Reported	Geomethod:	TRS-TWN
Certificate of Survey:	Not Reported	Datum:	1927
Block:	Not Reported	Addition:	Not Reported
Lot:	Not Reported	Subdivision:	Not Reported

Well Construction and Performance Data (measurements are reported below land surface)

Total Depth (ft):	43.00	How Drilled:	Not Reported
Static Water Level (ft):	15.00	Driller's Name:	Not Reported
Pumping Water Level (ft):	17.00	Driller License:	346
Yield (gpm):	18.00	Completion Date:	Jan 01,1982
Test Type:	Not Reported	Special Conditions:	None Reported
Test Duration:		Is Well Flowing?:	No
Drill Stem Setting (ft):		Shut-In Pressure:	
Recovery Water Level (ft):		Well/Water Use:	PUBLIC WATER SUPPLY
Recovery Time (hrs):		Geology/Aquifer:	Not Reported

Casing Information

From	To	Diameter	Type
0	0	6.0	

Perforation/Screen Information

From	To	Diameter	Description
26.0	31.0	0	

Lithology Information

No lithology information reported.

Site Notes

No notes available for this record.

Well Notes

No notes available for this record.

Figure 2B. Well log for abandoned well.

GWIC Well Log Report - Use discontinued due to nitrate.

Montana Bureau of Mines and Geology
Ground-Water Information Center

Owner and Location Information

Site Name:MT DEPT FISH GAME

GWIC Id:	25719	Source of Data:	Not Reported
Location (TRS):	14N 14E 22 DC	Latitude (dd):	46.9564
County (MT):	JUDITH BASIN	Longitude (dd):	-109.9293
DNRC Water Right:	Not Reported	Geomethod:	TRS-TWN
Certificate of Survey:	Not Reported	Datum:	1927
Block:	Not Reported	Addition:	Not Reported
Lot:	Not Reported	Subdivision:	Not Reported

Well Construction and Performance Data (measurements are reported below land surface)

Total Depth (ft):	42.00	How Drilled:	Not Reported
Static Water Level (ft):	14.00	Driller's Name:	Not Reported
Pumping Water Level (ft):	16.00	Driller License:	346
Yield (gpm):	18.00	Completion Date:	Jan 01,1982
Test Type:	Not Reported	Special Conditions:	None Reported
Test Duration:		Is Well Flowing?:	No
Drill Stem Setting (ft):		Shut-In Pressure:	
Recovery Water Level (ft):		Well/Water Use:	PUBLIC WATER SUPPLY
Recovery Time (hrs):		Geology/Aquifer:	Not Reported

Casing Information

From	To	Diameter	Type
0	0	6.0	

Perforation/Screen Information

From	To	Diameter	Description
27.0	32.0	0	

Lithology Information

No lithology information reported.

Site Notes

No notes available for this record.

Well Notes

No notes available for this record.