SOURCE WATER DELINEATION AND ASSESSMENT REPORT

Camp Tuffit, LLC
Public Water Supply
PWSID # MT0001020

Date of Report: **27 January 2003**

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INTRODUCTION

This Delineation and Assessment Report was prepared by Jeffrey Frank Herrick, a hydrogeologist with the Source Water Protection Program of the Montana Department of Environmental Quality (DEQ). The Camp Tuffit public water supply (PWS) is located in Lake County, Montana. It is situated along the east shore of Lake Mary Ronan and northwest of Proctor and Dayton. The DEQ PWS identification number, operator name, and operator number for the Camp Tuffit PWS appear on the title page of this report.

Purpose

This report is intended to meet the technical requirements for the completion of a source water delineation and assessment for the Camp Tuffit PWS as required by the Montana Source Water Protection Program (DEQ, 1999) and the federal Safe Drinking Water Act (SDWA) Amendments of 1996 (P.L. 104-182). The Montana Source Water Protection Program is intended to be a practical and cost-effective approach to the protection of public drinking water supplies from contamination. The primary purpose of this source water delineation and assessment report is to provide information to assist the Camp Tuffit PWS operators and owners in the identification of potential contaminant sources near the PWS water intake and to assess the need for source water protection planning to protect the Camp Tuffit drinking water source.

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

Limitations

This report was prepared to assess threats to the Camp Tuffit public water supply, and is based on published data and information obtained from local residents familiar with the community. The terms “drinking water supply” and “drinking water source” refer specifically to the sources of the public water supplies, and not any other public or private water supply. Also, not all potential or existing sources of groundwater or surface-water contamination in the area of the Lake Mary Ronan are identified. Only potential sources of contamination in areas that contribute water to the identified drinking water sources are considered. A significant limitation exists in that some businesses/facilities in the area (that may be potential contaminant sources) may not have been identified. Additionally, little factual information is know about groundwater flow in the vicinity of Lake Mary Ronan, the extent of groundwater / surface water interactions in the area, and water circulation patterns in the lake itself.

Considerable background information and data specific to this PWS were compiled to form the basis of this source water delineation and assessment report. This information is typically in the form of data summaries, evaluations and reports, and regulatory correspondence. These have been included in the report as appendices. These appendices are maintained and are available at the DEQ Source Water Protection Program file library.

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

BACKGROUND

The Community

Camp Tuffit is a resort lodge and campground located on the east shore of Lake Mary Ronan. The lake is located north of the Flathead Indian Reservation and northwest of the small towns of Proctor and Dayton in Lake County. U.S. Highway 93 circles Flathead Lake's west shore and passes through Dayton. Dayton is 6.7 miles southeast of Lake Mary Ronan and Proctor is 4.5 miles southeast of Lake Mary Ronan (see Figure 1). The U.S. Census Bureau estimates the 2000 population of Lake County at 26,500 people, very few of these people reside in the area of Lake Mary Ronan. Although the 2000 census doesn't list Lake Mary Ronan, it is believed that somewhat fewer than 100 people live in the vicinity.

Over the last century timber harvesting has contributed significantly to the economy of the area around Lake Mary Ronan. In fact, a majority of the watershed was owned by a large timber company until recent years. Current ownership couldn't be determined. In recent years, the economic mainstay of tourism and more recently, residential development, have sustained the local economy. Within the area, residents obtain their drinking water from private wells or surface water intakes (in streams or local lakes). This is the case of Camp Tuffit, which withdraws water from Lake Mary Ronan for use by the facility. There is no central sewer system for the residents of a residential development located across the lake called the Lake Mary Ronan Highland Subdivision. Other than that development, all residents or businesses in area utilize on-site septic systems for waste disposal.

Geographic Setting

Lake Mary Ronan is located within the Salish Mountains of northwestern Montana. The elevation of Lake Mary Ronan itself is approximately 3,701 feet above mean sea level and the lake drains to the southeast via Ronan Creek. Ronan Creek drains into Flathead Lake, which drains south into the Flathead River. The glaciated topography in the vicinity of Lake Mary Ronan exhibits relatively varied relief typical a heavily glaciated U-shaped valley. Present are kettles and kame terraces, extensive glacial fluvial outwash materials, lateral moraines, and recessional and terminal moraines. All of these are seen from Lake Mary Ronan and through the Dayton Creek Valley to Flathead Lake.

Geology & Hydrology

The following is primarily this author's interpretation, which is supported by the more general discussions by Kendy and Tresch (1996), Alt and Hyndman (1986), and Johns (1970). The Lake Mary Ronan – Ronan Creek drainage is located in the Salish Mountains of northwestern Montana and is within a southeast trending intermontane stream valley. This area was heavily glaciated by local mountain glaciers that coalesced and flowed southeast toward the Flathead Lobe of the Cordilleran Ice Sheet. There is a small area of slightly higher ground at the east end of Lake Mary Ronan, just east of the lakeshore. This high ground is probably a glacial moraine or other glacially sculpted landform. Examination of a topographic map of the area suggests several things. Lake Mary Ronan collects behind a terminal or recessional moraine, which is present along the southeast shore of the lake. The lake drains through an outlet at Ronan Creek, which is along the uphill side of a lateral moraine that runs along the south side of the Dayton Creek valley, a glacially shaped valley running toward Flathead Lake. Ronan Creek eventually breaks out to the north and flows into the main valley about 3 miles after it exits the lake. It then flows parallel to the larger Dayton Creek before converging with it. Lateral moraines are noted on both sides of the Dayton Creek valley between Lake Mary Ronan and Flathead Lake. Grants Meadow is a swampy and sediment filled lake that has collected behind the lateral moraine on the north side of the Dayton Creek valley. In contrast to Ronan Creek, it drains westward behind the moraine and toward Lake Mary Ronan. Noteworthy are the large number of springs that emerge within the base of the Dayton Creek valley just southeast of Camp Tuffit and on the east side of what is thought to be a glacially formed terminal moraine. One source of the spring water is probably Lake Mary Ronan. The springs are probably emerging from within or from beneath the glacial till material and flow through and across the glacial outwash material draped across the bottom of the stream valley between Lake Mary Ronan and Flathead Lake. This outwash material is typically identified as alluvium, but is probably a result of sediment rich braided streams that drained the glacier(s) present within the Lake Mary Ronan drainage. It is unclear how much drainage out of Lake Mary Ronan is via groundwater versus surface water through Ronan Creek. Eventually, all surface water and groundwater draining from this area reach Flathead Lake.

Metasedimentary rocks of the Belt Supergroup surround the Lake Mary Ronan area, comprising a majority of the Salish Mountains. These rocks include argillite, siltite, quartzite, limestone, and dolomite that are Precambrian age. Argillite, limestone, and dolomite predominate in the rocks seen in the area. No Cretaceous and few Tertiary aged

sedimentary units are present in the area. Continental and local mountain glacial activity have heavily sculpted and influenced this region. Four major glacial advances occurred in Montana during the Pleistocene Epoch (10,000 – two million years ago) (Alden, 1953). Ice covered the northern third of the state during the maximum extent of each glacial advance. The Rocky Mountain Trench was a primary avenue for the repeated southward advance and retreat of the Flathead Lobe of the Cordilleran Ice Sheet. The Rocky Mountain Trench runs north-northwest from Saint Ignatius through Eureka and into Canada. It appears that several glacial episodes are recorded in the Lake Mary Ronan area and these episodes deposited Pleistocene age glacial till throughout the basin. This till is composed of heterogeneous, poorly sorted sand, gravel, pebbles, cobbles, and boulders in a sandy to clayey matrix. The glacial till of unknown thickness covers the upper reaches of the Dayton Creek valley floor with thicker material piled along the sides of the valley as lateral moraines. It should be noted that glacial activity in the area allowed significantly large volumes of glacial ice to flow into and east through the Dayton Creek valley and to shape it into the distinctive U-shaped glacial valley. As glacial ice melted or the glaciers retreated, streams and rivers carried large volumes of reworked glacial debris, which settled out of suspension as unconsolidated, moderately sorted, glacial-outwash deposits of sand, gravel, pebbles, and cobbles. Sediment clogged braided streams are typical of this reworking and transport process near the terminus of active glaciers. These deposits are collectively called Quaternary Alluvium. A geologic map for the area is presented on Figure 2.

Lake Mary Ronan occupies an area of approximately 1,492 Acres. The main streams that drain toward Lake Mary Ronan are Hilburn and Freeland Creeks from the west, Mary Ronan and Donaldson Creeks from the north, and a couple of unnamed streams (including one that drains from Grants Meadow) from the east. Grants Meadow is a small sediment filled lake located on a terrace/lateral moraine and its stream drains toward Lake Mary Ronan. The watershed that surrounds Lake Mary Ronan as depicted on Figure 3 encompasses approximately 19,809 Acres (~31 square miles). Lake Mary Ronan empties to the east into Ronan Creek. It is unclear to what extent Lake Mary Ronan drains into the U-shaped Dayton Creek valley by groundwater. Ronan Creek flows southeast and converges with Dayton Creek about 5.8 miles after it leaves Lake Mary Ronan. Water flow patterns within Lake Mary Ronan have never been characterized. With the lake draining via Ronan Creek at the east end, all contaminant sources surrounding the lake are considered to be upgradient of the lake's outlet. It can also be assumed that all contaminant sources located on the developed east shore of the lake are probably upgradient of the surface water intake for the Camp Tuffit.

Climate

The climate in the vicinity of Lake Mary Ronan is typical of mid-elevation intermountain basins of the Northern Rocky Mountains west of the Continental Divide. The nearest useful weather station is at the dam on Flathead Lake near Polson. Based on Western Regional Climatic Center data for the period of record, annual precipitation averages 15.03 inches. Monthly average precipitation ranges from 0.79 inches in March to 2.21 inches in June. The annual mean snowfall in Lake Mary Ronan is 30.4 inches. Early summer thunderstorms and winter snows provide a majority of the precipitation in the area. A summary of the available climatic data for the Lake Mary Ronan area is presented on Table 1 below.

Table 1. Climatic Data
Polson Kerr Dam, Montana (246640)
Period of Record Monthly Climate Summary – Period of Record : 3/22/1951 to 12/31/2001

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	32.4	38.5	46.6	57.2	65.6	72.6	82.3	82.2	70.9	57.5	41.6	33.8	56.8
Average Min. Temperature (F)	19.7	23.0	27.1	34.0	41.3	47.8	52.2	51.9	43.6	35.2	27.7	21.9	35.4
Average Total Precipitation (in.)	1.11	0.79	0.80	1.16	2.15	2.21	1.20	1.13	1.27	1.04	1.10	1.08	15.03
Average Total Snowfall (in.)	10.0	5.6	2.5	0.3	0.1	0.0	0.0	0.0	0.0	0.1	3.1	8.6	30.4
Average Snow Depth (in.)	5	4	1	0	0	0	0	0	0	0	1	3	1

Source: Western Regional Climate Center, wrcc@dri.edu

The Public Water Supply

The Camp Tuffit PWS is classified as a seasonal transient, non-community system under the Federal Safe Drinking Water Act (as administered by the Montana DEQ Public Water Supply Section) because the system serves less than 25

year-round residents through less than 15 service connections. The PWS services approximately 150 transients and 4 residents via 1 active service connection. The PWS appears to operate primarily between 15 May and 30 September each year. Camp Tuffit consists of 33 cabins, 24 RV hook-ups, and 2 year round residences. A majority of the cabins do not have water or sewer service. The Camp Tuffit source water is obtained through a surface water intake located in Lake Mary Ronan and withdraws water from the lake. The lake water intake is located about 200 feet off the east shore as depicted on Figures 1 and 3, and is approximately 3.5 feet off the bottom of the lake. Diagrams for the layout of the PWS are found in the 2000 Sanitary Survey, which is provided in Appendix C. Water withdrawn from the lake is pumped to the treatment plant. Water is filtered at the plant by passing it through 2 pressure sand filters followed by a bag filter. It is then chlorinated with sodium hypochlorite before entry into one of 2, 2,000 gallon baffled concrete water tanks (4,000 gallons total). These tanks are apparently set up in series and provide adequate chlorine contact time and water storage capacity for the Resort. Pressure is provided by 2 captive air tanks. Table 2 below lists the facilities of the Camp Tuffit PWS according to the DEQ PWS records.

Table 2. List of Sources & Facilities
Camp Tuffit PWS – MT0001020

Facility	PWS Facility ID per the DEQ PWS Section Database	Location	Description	Notes
Intake from Lake Mary Ronan	IN002	Surface Water Intake is located 200 feet off the east shore of the lake as seen on Figure 3. Approximate coordinates are: **Lat. 47.9177** **Long. –114.3839**	Surface Water Intake (Active) is within Lake Mary Ronan, along the east shore and adjacent to the Resort	Water is pumped from lake to the treatment plant, then into the 2 concrete storage tanks, which provide contact time.
Treatment Plant	TP002	Treatment plant is on shore as indicated on Figure 3. EP is before the clear well / storage tanks. Treatment plant is at: **Lat. 47.9167** **Long. –114.3823**	Treatment is by filtration followed by sodium hypochlorite treatment and contact time in tank series.	2 pressure sand filters followed by a bag filter provide filtration. Sodium hypochlorite is added after filtration and before water enters the first storage tank.
Storage Facility	ST001 w/ EP502	The 2, 2,000 gallon (4,000 gallons total) concrete tanks sit at the surface and are located just outside the treatment building.	Consists of 2, 2,000 gallon baffled concrete tanks that are at ground level. Tanks are arranged in series to provide contact time.	Receives water from treatment plant. It is then piped to distribution. Pressure is via 2 pressure tanks: a WX-203 and a Wellmate WM-9, both of which are located behind the treatment building.
Distribution System	DS001 w/ SP001	throughout the facility	Distribution of water via PVC water mains/pipes. These are seasonally drained.	Not all cabins are provided with water service or sewer.

Note: Please refer to the 2000 DEQ PWS Section Sanitary Survey for further details on the layout of this system.

The Camp Tuffit PWS obtains its drinking water from a surface water supply. As a result and from the perspective of hydrogeology, the source water is classified as highly sensitive to contamination. This is in accordance with Montana Source Water Protection Program aquifer/source water sensitivity criteria (1999). These criteria are discussed in more detail in the next chapter.

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. Transient, non-community PWSs are required to conduct routine monitoring for pathogens (including coliform bacteria), nitrate, and nitrite. All contaminant concentrations detected in required samples must comply with numeric maximum contaminant levels (MCLs) specified in the Federal Safe Drinking Water Act. The DEQ PWS Section's files and database maintain historic analytical data for this PWS.

Background Lake Mary Ronan Water Quality

Other than routine sampling by the Camp Tuffit PWS of the treated (finished) water, no other water quality data are known to have been collected to characterize the background water quality of Lake Mary Ronan or of its tributary streams. The background water quality data that are available from DEQ PWS Section's database are for bacteriological and inorganic sampling. These data are presented on Tables 3 and 4 respectively. Some water quality data have been collected by the DEQ TMDL program to determine classification of local major streams and the need for inclusion in the listing of impaired waterways. None of the local streams or lakes in the area are found on the TMDL listing. The State of Montana classifies the Thompson River and its tributaries, and the Little Bitterroot River and its tributaries as A-1 surface water in the Administrative Rules of Montana (ARM 17.30.601-.646). Surface waters designated as A-1 are to be maintained as suitable for drinking, culinary, and food processing purposes after conventional treatment for the removal of naturally present impurities. These waters must also be maintained as suitable for bathing, swimming, and recreation; growth and propagation of salmonoid fishes and associated aquatic life, waterfowl, and furbearers; and agricultural and industrial water supply.

Camp Tuffit PWS Water Quality

Within the past five years, there have been no positive coliform samples collected during routine contaminant monitoring. As such, there are no non-acute MCL violations in DEQ's records. It appears that sampling occurs monthly during facility operation. No MCL exceedences were noted for the other constituents monitored over the past five years (Nitrate & Nitrite). Concentrations for nitrite and nitrate range from 0 to 0.17 mg/L and no trend was noted where there was an increase in concentration over time. It appears that nitrate and nitrite samples are collected annually. The water quality data that are available from DEQ PWS Section's database are presented on Tables 3 and 4, and in Appendix B.

DELINEATION

The source water protection area, the land area that contributes water to the Camp Tuffit public water supply surface water intake, is delineated in this chapter. The purpose of delineation is to map the source of the PWS's drinking water and to define areas within which to prioritize source water protection efforts.

Source water protection areas for surface water sources are typically subdivided into Spill Response and Watershed Regions, each with separate management goals. The Spill Response Region encompasses an area upstream of the PWS's intake in which contaminants can be drawn into the intake with little lag time. The Watershed Region encompasses the entire area of the watershed upstream of the PWS.

Hydrologic Conditions

Lake Mary Ronan occupies an area of approximately 1,492 Acres. The main streams that drain toward Lake Mary Ronan are Hilburn and Freeland Creeks from the west, Mary Ronan and Donaldson Creeks from the north, and a couple of unnamed streams (including one that drains from Grants Meadow) from the east. Grants Meadow is a small sediment filled lake located on a terrace/lateral moraine and its stream drains toward Lake Mary Ronan. The watershed that surrounds Lake Mary Ronan as depicted on Figure 3 encompasses approximately 19,809 Acres (~31 square miles). Lake Mary Ronan empties to the east into Ronan Creek. It is unclear to what extent Lake Mary Ronan drains into the U-shaped Dayton Creek valley by groundwater. Ronan Creek flows southeast and converges with Dayton Creek about 5.8 miles after it leaves Lake Mary Ronan. Water flow patterns (circulation) within Lake Mary Ronan have never been characterized. With the lake draining via Ronan Creek at the east end, all contaminant sources surrounding the lake are considered to be upgradient of the lake's outlet. It can also be assumed that all contaminant sources located on the developed east shore of the lake are probably upgradient of the surface water intake for the Camp Tuffit.

Using DEQ Source Water Protection Program criteria for ranking aquifer/source water sensitivity (Table 5 below), the Camp Tuffit PWS source water is considered highly sensitive to contamination. The sensitivity ranking is a result of the surface water source for this PWS.

Table 5. Source Water Sensitivity, criteria to determine
(DEQ, 1999)

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

Conceptual Model and Assumptions

If contaminants were spilled or discharged directly into the local streams upstream of Lake Mary Ronan, or into Lake Mary Ronan itself, these substances could potentially reach the surface water intakes for this PWS before plant operators can close/isolate it. Contaminants derived from sources farther removed from the lake may be flushed into stream channels during spring snowmelt or storm events, or may infiltrate into the local aquifer (groundwater) that in turn discharges to the lake via hydraulic connections. Surface water flow and groundwater flow within most of the area of Lake Mary Ronan is believed to be toward the lake. An exception to this is may be in the area between Lake Mary Ronan State Park and the lake's outlet at Ronan Creek. This is an area where there might be a considerable amount of groundwater movement away from the lake as it drains through what is probably a glacial moraine and toward Dayton Creek valley. Evidence for this groundwater movement are the large number of springs emerging into that valley on both sides of Dayton Creek. Although groundwater movement beneath this particular area is in question, surface water drainage will typically always be down slope and toward the lake. As such, any contaminants that are released to the ground surface around the lake may be entrained by stormwater and discharged into the lake. Groundwater contamination from any source in the area will also probably flow toward and discharge into Lake Mary Ronan.

Delineation Results

Watershed Region

For PWSs with surface water intakes, a Spill Response Region and a Watershed Region are typically delineated and inventoried. A Spill Response Region is typically comprised of the area for 0.5 miles on either side of the main surface water bodies/channels and 10 miles upstream of the intake. A Watershed Region will encompass the entire watershed (or in the case of extremely large watershed, a local portion of a watershed), with the boundaries determined by topography and surface water flow direction. A PWS using groundwater would normally have an Inventory Region (based on a 3 year groundwater time-of-travel or a fixed 1-mile radius around the wellhead) and a Recharge Region (the watershed). For the purposes of the delineation in this SWDAR, the Spill Response Region and Watershed Region have been combined into a single Watershed Region.

The Watershed Region for the Camp Tuffit PWS intake encompasses the entire watershed upstream of Lake Mary Ronan and is bounded by the ridgeline east and uphill from Grants Meadow, the ridges associated with Blacktail and Wild Bill Mountains on the north, and the ridgeline of the Hog Heaven Range to the east. The Watershed Region extends a short distance south of the south shore of Lake Mary Ronan and includes a small portion of Ronan Creek after it exits Lake Mary Ronan (refer to Figure 3). This has been done to account for a lack of knowledge about surface water flow across and groundwater flow within the complex glacial till deposits of this area. It should be noted that the greatest threats to this water supply are from the facilities and homes located along the lakeshore, past or present logging activities, and from vehicular traffic on the roadways that saturate the watershed.

Limiting Factors

The delineation for the Camp Tuffit PWS Watershed Region is based on simple watershed mapping. Numerous assumptions are associated with the Source Water Protection Program (SWPP) criteria for delineations. Contaminant transport rates and concentrations will vary depending on stream/river flow conditions, ground water flux into the streams, contributions from overland flow, soil types, slope, characteristics of riparian vegetation, the extent of riparian vegetation buffer zones, the extent and duration of contamination, contaminant solution density, adsorption, mechanical dispersion, biological transformation, dilution, molecular diffusion, adsorption, precipitation, oxidation, complexation, and volatilization. As a result, some areas within the Watershed Region may be more conducive to contaminant transport than others, and should be designated as higher priority areas for source water protection efforts. It is also noteworthy that flow patterns within Lake Mary Ronan are not well understood. This has an impact on the understanding on whether contaminant sources around Lake Mary Ronan are located upgradient of the surface water intake or not. Groundwater movement through the terminal moraine from Lake Mary Ronan into the Dayton Creek valley probably occurs, but the magnitude and direction of groundwater movement are uncertain. There was little information available concerning the extent that logging had taken place in the watershed other than the evidence provided by the remnant logging roads apparent on the topographic sheet. It could not be determined which of these roads had been abandoned or maintained, and what roads may be newly installed within the watershed. It should also be noted that the author has plotted the locations of the Camp Tuffit intake and water treatment plant as accurately as possible.

INVENTORY

An inventory of potential sources of contamination was conducted to assess the susceptibility of the Camp Tuffit PWS to contamination, and to identify priorities for source water protection planning. Inventories were conducted within the delineated Watershed Region. The inventories focus on facilities that generate, use, store, transport, or dispose potential contaminants. Additionally, the inventories identify potential sources of all primary drinking water contaminants and Cryptosporidium. The inventory for the Camp Tuffit PWS also focuses on activities, general land uses, and large potential contaminant sources in the watershed. Only significant potential contaminant sources were selected for detailed inventory. The significant contaminants posing potential threats to the Camp Tuffit PWS include nitrate and pathogens.

Inventory Method

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

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

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

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

Step 4: A business phone directory was consulted to identify businesses that generate, use, or store chemicals in the inventory region. Equipment manufacturing and/or repair facilities, printing or photographic shops, dry cleaners, farm chemical suppliers, and wholesale fuel suppliers were targeted by Standard Industrial Codes. This is typically done by using SIC Codes (Standard Industrial Classification Codes) to identify businesses for inclusion in the inventory.

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

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

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

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

Inventory Results/Spill Response Region and Watershed Region

Figure 4 identifies land use and the locations of potential contaminant sources within the Watershed Region. It should be noted that because of the nature of the watershed, these sources are located in close proximity to Lake Mary Ronan itself. A listing of the types of potential contaminant sources is presented on Table 6 below. Spills of fertilizers or other compounds could occur along any of the roadways that run throughout the Watershed Region and all around the lake.

Table 6. Potential & Significant Potential Contaminant Sources
Camp Tuffit PWS

Potential Source	Potential Contaminants	Hazard
Roads	Pesticides, fertilizers, VOCs, SOCs, other	Spills, routine spraying, storm water runoff, infiltration into ground water
Watercraft traffic on the lake	Hydrocarbons (fuels), VOCs, MBTE(?)	Spills, releases from engines of watercraft during normal operation on any of the lakes or waterways
Septic Density (local higher concentrations of onsite residential septic systems around the lake)	Nitrate, pathogens	Leaks in septic tanks, leaks in collection lines, system failure, infiltration of untreated effluent into shallow ground water, which may in turn reach surface water
Large capacity septic systems (around the lake)	Nitrate, pathogens	Leaks in septic tanks, leaks in collection lines, system failure, infiltration of untreated effluent into shallow ground water, which may in turn reach surface water
UST at the Camp Tuffit facility	VOCs, petroleum hydrocarbons	Leakage of residual contents into aquifer, or transport of any current contamination into groundwater that can then reach the lake
Current and past logging activities	TDS, turbidity, nitrate	Erosion from logged areas transporting suspended sediments and solutes, and this mobilized contaminant reaching the local streams, the lake, and the surface water intake.
Stormwater transport to the lake	Pesticides, fertilizers, nitrate, pathogens, VOCs, SOCs, other	Improper disposal of assorted materials that get picked up by stormwater runoff and transported to the lake

The most significant potential contaminant sources within the Watershed Region are the residences, residential development(s), and facilities (lodges and campgrounds) along the east shore of Lake Mary Ronan. Any of the businesses or facilities along the east shore of the lake can probably be considered to operate large capacity septic systems. A large capacity septic system is one that services at least 20 persons per day for more than 6 months of the year. It isn't completely clear if these businesses operate longer than 6 months of the year. It should be noted that the Camp Tuffit public water supply is itself considered large capacity septic system. Large capacity septic systems can be major sources of contamination around a lake and can act as underground injection wells that allow water and water borne contaminants to recharge local groundwater. Groundwater surrounding any of the lakes in the Watershed Region generally flows toward and discharges into the lakes. This is especially important if there are large campgrounds or businesses in the area have poorly maintained or poorly constructed septic systems, or if they dispose of liquid waste contaminants improperly by flushing them into their onsite septic systems. It is noteworthy that the large capacity septic system for the Camp Tuffit is located upgradient of the surface water intake. Another significant potential contaminant source that showed up on the inventory is an underground storage tank (UST) associated with the Camp Tuffit facility itself. DEQ records indicate there is a single inactive UST for the facility, but it isn't known if this UST leaked or was ever properly abandoned. Although not being used, if this UST is still in-place, it may be a potential contaminant source.

It should be noted that petroleum hydrocarbons and VOCs are not regulated contaminants for transient PWSs. No active or abandoned mines, or other point sources were noted to be within the Watershed Region. Although the land use coverage as depicted on Figure 4 did not highlight the presence of extensive logged areas (usually transitional forest) within the Watershed Region, the watershed is saturated with a dense network of roadways. It is assumed that the road are associated with former logging operations. Recent logging activity is a very significant contaminant source in a watershed, as it allows sediment and solutes to be mobilized and transported into streams and possibly into Lake Mary Ronan. Additionally, it couldn't be determined if the roadways in the Watershed Region were abandoned or in current use. If they are in current use, this activity (vehicle use of the roads) is considered a contaminant source. During this inventory, it could not be determined who the current major landowners are within the watershed. If the watershed is currently owned by developers or other entities that plan on subdividing or logging the area, this activity will progressively degrade water quality in the lake.

Table 7. Septic Density and Land Use
Camp Tuffit PWS – Watershed Region

Watershed Region	**Land Use (see Figure 4)**				
	Evergreen Forest	Open Water	Shrubland	Transitional	Grassland / Herbaceous
	80.6%	7.8%	5.8%	4.2%	1.1%
	Septic Density				
	High Density	Medium Density	Low Density	Community Sewer	
	0%	<1%	>99%	None	

Note: Septic Density is the density of private onsite septic systems and is based upon the 2000 Census data.

The principal land covers in the Watershed Region are evergreen forest, open water, transitional vegetation, and grassland/herbaceous. All other uses combined are less than 1% (see Table 7 above and Figure 4). It should be noted that transitional vegetation typically will represent areas that have been logged off and are in the process of re-establishing an evergreen forest. The lack of transitional forest probably implies that the area was logged decades ago, although the roads associated with the logging still show up on topographic maps of the area. Areas of active or recent timber harvesting can strongly affect the water quality of PWSs with a surface water intake. Typically this is due to soil erosion with the transport of sediments and solutes to surface water channels and bodies. This suspended and dissolved load results in increased water turbidity and increased solutes in the water that reaches the PWS intake.

Low density of private septic systems occurs over all of the Watershed Region (essentially, just under 100% of the area is considered low density). Septic density is presented on Figure 5. Noteworthy is the presence of small areas of medium septic density in close proximity to and upgradient from the lake. It appears that these areas probably comprise less than 100 acres total. These are the very same areas where, if the local facilities use them, large capacity septic systems will be present. No community or centralized sewer system and wastewater treatment system are present around Lake Mary Ronan or within the watershed. The location, layout, and flow directions of storm sewers or drainage in and around Lake Mary Ronan are not known, but it is assumed that where present, these structures will direct flow toward the lake.

From the listing of potential contaminant sources, those considered significant are selected. This is based upon the volume of potential releases, the volume of hazardous materials typically handled, the potential of the released materials to impact nearby surface water or groundwater, and the proximity of the sources to the PWS surface water intake. It is noteworthy that this author considers all of the potential contaminant sources listed to be significant potential sources. This is primarily a product of the proximity of the potential contaminant sources to the lake.

Inventory Update

To make this SWDAR a useful document in the years to come, the owners, manager, or the certified water system operator(s) for the Camp Tuffit public water supply should update the inventory for their records every year. Changes in land uses or the presence of new potential contaminant sources should be noted and additions made as needed. The complete inventory should be submitted to DEQ at least every 5 years to ensure that this report/plan stays current in the public record.

Inventory Limitations

The extent of the potential contaminant source inventory is limited in several respects. The inventory is based on data that is readily available through state documents, published maps and reports, GIS data, and discussions with people that are familiar with the area. Documentation may not be readily available on some potential sources. As a result, all

potential contaminant sources may not have been identified or recognized as being significant potential contaminant sources. Little or no information is available concerning roadways in the watershed or the current status of a UST at Camp Tuffit. The author of this SWDAR is depending on local knowledge of the PWS owner and/or operator for site-specific knowledge. Additionally, it is not known to what degree watercraft are potential contaminant sources of petroleum hydrocarbons, VOCs, and possibly MTBE (a fuel additive) in Lake Mary Ronan.

SUSCEPTIBILITY ASSESSMENT

Susceptibility of the Camp Tuffit PWS's surface water intake and its source water is determined by two factors: the potential of a contaminant reaching the intake and the resulting health hazard. Susceptibility is assessed in order to prioritize potential pollutant sources and to guide management actions undertaken by local entities, in this case the managers of Camp Tuffit, local businesses, Lake County, and by local residents and stakeholders within the watershed.

The goal of source water management is to protect the source water, manage significant potential contaminant sources and ensure that land use activities in the Watershed Region pose minimal threats to the source water. Management priorities 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 Camp Tuffit PWS owners, operators, or other entities to reduce susceptibility are also included in this section of the report.

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 reach the PWS intake. The hazard presented by point sources of contaminants depends on whether contaminants can discharge directly to local streams or the lake. Hazard is also dependent on the health affects associated with potential contaminants. Hazard ratings for point and nonpoint sources are assigned based on criteria listed in Table 8. Barriers can be anything that decreases the likelihood that contaminated water will reach the surface water intake. Examples of barriers include: a vegetated riparian area, protective forest management practices, and dilution. It should be noted that the Camp Tuffit is a transient, non-community public water supply. As such, the only regulated contaminants are nitrates, nitrites, and pathogens. Sources of other contaminants will be discussed, but the susceptibility of the PWS to these contaminants will not be evaluated in this section.

Table 8. Hazard of Potential Contaminant Sources, Determination of
For Surface Water Sources

Potential Contaminant Sources	High Hazard Rating	Moderate Hazard Rating	Low Hazard Rating
Point Sources of Nitrates or Pathogens	Potential for direct discharge to surface water	Potential for discharge to groundwater hydraulically connected to surface water	potential contaminant sources in the watershed region
Septic Systems (density)	More than 300 per sq. mi.	50 – 300 per sq. mi.	Less than 50 per sq. mi.
Municipal Sanitary Sewer (percent land use)	More than 50 percent of region	20 to 50 percent of region	Less than 20 percent of region
Cropped Agricultural Land (percent land use)	More than 50 percent of region	20 to 50 percent of region	Less than 20 percent of region

Note: There is no community sewer or wastewater treatment system present within the Watershed Region described in this SWDAR. Septic density is known to be low overall, but it is highest in area around the Camp Tuffit PWS intake.

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

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

	High Hazard Rating	**Moderate Hazard Rating**	**Low Hazard Rating**
No Barriers	Very High Susceptibility	High Susceptibility	Moderate Susceptibility
One Barrier	High Susceptibility	Moderate Susceptibility	Low Susceptibility
Multiple Barriers	Moderate Susceptibility	Low Susceptibility	Very Low Susceptibility

Table 10, below, displays the susceptibility assessment results for the Camp Tuffit PWS surface water intake. The intake (in Lake Mary Ronan) is susceptible to a number of different contaminants, including pathogens, nitrates, and fertilizers. The susceptibility assessment results for the more significant potential contaminant sources identified are described below:

Large capacity septic systems – The potential hazard imposed by pathogens and nitrate originating from large capacity septic systems is moderate. The septic systems that are present in the Watershed Region in close proximity and upgradient from the PWS intake increases the overall threat. The susceptibility of the intake to nitrate and pathogens originating from this source is considered moderate, as there are few to no barriers identified between this contaminant source and the intake. Dilution within the lake thought to be a useful barrier, but there is no clear way to evaluate the extent this is an effective barrier. It should be noted that there are probably several of these large capacity systems near and/or directly upgradient from the intake that have not been inventoried (by name) in this report. It should be noted that over time and with increased residential or commercial development around the lake, the potential threat from sewage-contaminated groundwater would probably increase dramatically. The best solution to this current and future threat to water quality in the lake is the county and community promotion of advanced septic treatment systems for residential and commercial use. Additionally, the abandonment and closure of area roads will reduce or at least reduce development in the watershed. It isn't clear who owns the land in the watershed, so control of the roaded areas might be problematic.

Septic Density – Septic density in the Watershed Region is low, which signifies a low hazard. Dilution would be considered an effective barrier, which would result in the PWS intake having a low susceptibility to these contaminants. There are areas of increased septic density in the area surrounding Lake Mary Ronan and near the shoreline. The proximity of these areas of increased septic density are treated much like a point source (such as a high capacity septic system) and would pose a moderate hazard. The surface water intake would have a moderate susceptibility to contamination from this source. With increased commercial and/or residential development around the lake, the hazard from this source of contamination will increase dramatically and progressively.

Stormwater Discharges – The potential hazard of pathogens, nitrate, and other contaminants originating from stormwater discharges is considered moderate. These unregistered and unregulated discharges are difficult to evaluate, as the contamination is generally from a non-point source that isn't well characterized. Any and all significant stormwater runoff events that drain from the area around Lake Mary Ronan will eventually reach the lake. As such, contamination that is entrained and transported by this surface runoff will also reach the lake. This means that any improper disposal of chemicals to a stormwater sewer or stormwater channel has a potential to reach the surface water intake in the lake. Dilution would probably be a barrier to this source of contamination, although quantification of this has not been done. The susceptibility of the PWS intake to this potential source of contamination is believed to be moderate.

Table 10. Susceptibility Assessment Results

Significant Potential Contaminant Sources in the Watershed Region

Camp Tuffit PWS surface water intake

Potential Contaminant Source	Contaminant (regulated)	Hazard	Hazard Rating	Barriers	Susceptibility	Management Recommendations
Large capacity septic systems (around the lake)	Nitrate, nitrite, pathogens	Leaks in septic tanks, leaks in collection lines, system failure, infiltration of untreated effluent into shallow ground water, which may in turn reach surface water	**Moderate**	Dilution	**Moderate**	Education of system owners, ensure proper maintenance and operation of systems; monitor leaks in systems; promote use of advanced treatment systems
Septic Density (with local higher concentrations of septic systems)	Nitrate, pathogens	Leaks in septic tanks, leaks in collection lines, system failure, infiltration of untreated effluent into shallow ground water	**Moderate**	Dilution	**Moderate**	Educate public on proper maintenance and replacement of on-site systems; promote advanced treatment systems
Stormwater transport to the lake	Fertilizers, nitrate, pathogens, TDS, other	Improper disposal of assorted materials that get picked up by stormwater runoff and transported to the lake	**Moderate**	Dilution	**Moderate**	Public education to reduce improper disposal of chemicals, spill catchment, stormwater filtration/diversion, stormwater wetland development, public chemical collection and recycling day
Roads that are present throughout the watershed	Fertilizers, other	Spills, storm water runoff, infiltration into ground water, erosion and transport of sediments	**High**	Dilution; probable age and non-use of many of these roads that results in their being overgrown	**Moderate**	Maintain preparedness of local emergency personnel through active training; develop stormwater runoff diversion, systematically destroy or abandon almost all roads in the watershed and manage the rest. Access to remaining roads can be controlled by use of locked gates and limited key distribution.
Soil erosion from timber clear-cut areas	TDS, nitrate, nitrite	Erosion and transport of suspended sediments and solutes into the lake	**Moderate**	Dilution, probable age and re-vegetation of old clear-cut areas	**Low**	Erosion control and monitoring at local logging operations or construction sites.

Roads near the lakeshore within the watershed – The watershed is saturated with small roads that probably originated with logging operations. It is very unclear which of these roads are still in existence and if any are being maintained. Roads are a threat to the water supply in several ways. The potential hazard imposed by the release of fertilizers, nitrates or nitrites, or other compounds originating from large-scale releases along these roads is high. This is because there is potential for a spill originating on or near the roadways to discharge directly into Lake Mary Ronan near or upstream from the Camp Tuffit PWS's surface water intake. Any such release could involve considerable volumes of material. The probability of a release isn't accounted for in this particular evaluation. The presence of a road will allow for the presence of vehicles and human activities. These activities may allow for the release of an assortment of contaminants that potentially could reach the lake. Of greater significance is that roads tend to erode over time allowing suspended sediments and solutes to reach local streams and the lake. This will affect turbidity of the lake water and nitrates present. The susceptibility of the Camp Tuffit PWS to contaminants originating from this source is considered to be moderate. At least a couple of barriers were identified for this source. These would include dilution in the lake and the probability that many or most of the roads are abandoned and/or re-vegetated.

Soil Erosion from timber clear-cut areas – Soil erosion from fresh or poorly executed clear-cuts can be considerable. Erosion can transport large volumes of suspended sediment and solutes to the lake, which can in turn reach the PWS intake. Although not a frequent occurrence, this erosion does pose a moderate hazard to the PWS intake. Dilution is probably an effective barrier to this contaminant source. The probable age of these clear-cut areas and the fact that many or most have re-grown and currently erode little sediment into local streams is considered a barrier. As such, the PWS intake has a low susceptiblility to this type of contamination.

There are a number of sources of contamination that were not evaluated for this PWS. This is due to the fact that these facilities or activities are potential contaminant sources for chemicals that are not regulated for transient, non-community PWSs such as the Camp Tuffit. This doesn't mean that there is no hazard associated with these facilities or land uses. It should be noted that even small releases of some chemicals in close proximity to a surface water intake can have significant negative impact on water quality, and is therefore a significant threat to the public water supply. Additionally, some land uses or activities may have direct and long-term indirect affects on water quality in Lake Mary Ronan. The presence of accessible roads and housing or business development are examples to these. Steps can be taken to reduce the likelihood of releases into the source water for the PWS or in the vicinity of the lake. Some of these steps (considered management recommendations) are listed below.

Management Recommendations

Management recommendations are included in the susceptibility table for the Camp Tuffit PWS (Table 10). If these management recommendations are implemented, they may be considered additional barriers that will reduce the susceptibility of the PWS's intake to specific sources and contaminants.

Management recommendations fall into the following categories:

- Septic system maintenance, leak detection, promotion of advanced septic systems
- local management of activities or development in the watershed
- Silvicultural best management practices
- Road removal and control
- Stormwater management
- Public education

Septic system maintenance, leak detection, promotion of advanced septic systems – Education of local homeowners and business owners, and the promotion of advanced onsite septic treatment systems will reduce the susceptibility of the PWS intake to contamination from septic wastes.

Silvicultural best management practices (BMPs) – BMPs that address application and mixing of fertilizer and pesticides are a viable alternative to prohibition of their use. BMPs may also be utilized to minimize surface runoff and soil erosion on cultivated areas, landscaped properties, and road construction corridors. Erosion control, selective logging, and other silvicultural practices should be considered on a countywide or watershed basis. BMPs are generally voluntary but their implementation can be encouraged through education and technical assistance. County planning can help promote the implementation of BMP on lands that are outside the effective control of a rural community, but indirectly affect the community's PWSs.

Stormwater management – Stormwater planning should address source and drainage control. Source control can be accomplished through educational programs focusing on residential and commercial chemical use, disposal, and recycling. Drainage control and pollutant removal can be accomplished through the use of vegetated detention basins at outfall locations (essentially these are constructed wetlands). The construction of storm water runoff wetlands can go a long way to reducing the amount of non-point pollutants that could potentially reach the lake and the PWS.

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

Emergency Response Plan – Several counties have compiled Emergency Response Plans that were then adopted by the rural communities. The usefulness and effectiveness of a response plan are maximized if it contains a clear listing of all emergency contacts, emergency numbers, and resources available within the county to respond to an emergency situation, such as a hazardous material spill. Emergency plans are not difficult to develop or distribute, but have a significant benefit to the citizens and communities within the county. And they are actually effective in protecting public water supplies.

Assessment Summary

It appears that the Camp Tuffit PWS is vulnerable to several sources and types of contamination. These are primarily nitrates and pathogens associated with septic systems around Lake Mary Ronan. With further residential and commercial development around Lake Mary Ronan or within the watershed, these contaminant sources will increase in number and result in the contaminants of concern being present in ever increasing concentrations within the PWS's source water. Land use planning and management within the watershed will go a long way toward minimizing the threats that arise with development. An additional option that may have significant future value for the PWS is developing an alternate/supplemental source of water for Camp Tuffit. Ideally, this source of water would provide sufficient water to the facility until any given crisis is over. In the long run, a secondary source may provide water of sufficient quality and quantity to supply all of the facility's needs for an extended period of time. For example, an alternate source of water could be used during times of increased turbidity in the lake. The PWS operator, the resort's administration, and the Lake County administration should consider these management recommendations. Should contamination reach the PWS's intake, the Camp Tuffit and county managers will likely need to work cooperatively to address remediation or relocation of the PWS source. Editorial contributions from the Camp Tuffit PWS operator and administration have been solicited and incorporated into this report.

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GLOSSARY

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

Alkalinity. The capacity of water to neutralize acids.

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

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

CAFO. Confined animal feeding operation, which is typically registered by the State of Montana.

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

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

Delineation. A process of mapping source water management areas.

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

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

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

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

IOCs. Inorganic Chemicals

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

Large Capacity Septic Systems. As defined by the US EPA Underground Injection Control (UIC) Program, these are septic systems that serve more than 20 persons per day for a period greater than 6 months of the year.

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

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

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

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

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

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

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

POTW. Publicly Owned Treated Wastewater facility, typically a municipal sewer treatment plant with a wastewater discharge.

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

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

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

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

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

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

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

Transmissivity. The ability of an aquifer to transmit water.

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

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

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

Note: Definitions are taken from EPA's Glossary of Selected Terms and Abbreviations and other sources.

APPENDICES

APPENDIX A

DEQ PWS's Database Output

APPENDIX B

Sanitary Survey &
Other Correspondence

APPENDIX C

Concurrence Letter