

Whitefish, City of

***SOURCE WATER DELINEATION AND  
ASSESSMENT REPORT***

**City of Whitefish  
Public Water Supply  
PWSID # MT0000357**

**Date of Report: 24 October 2002**

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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 City of Whitefish public water supply (PWS) is located in Flathead County, Montana, and 15 miles north of Kalispell. The DEQ PWS identification number, operator name, and operator number for the Whitefish PWS appear on the title page of this report.

### **Purpose**

This report is intended to meet the technical requirements for the completion of the source water delineation and assessment report for the City of Whitefish 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 City of Whitefish PWS operator in the identification of potential contaminant sources near the City of Whitefish wells and the need for a source water protection plan to protect the City of Whitefish drinking water sources.

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 City of Whitefish 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 City of Whitefish are identified. Only potential sources of contamination in areas that contribute water to the identified drinking water sources are considered.

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.

## CHAPTER 1 BACKGROUND

### The Community

The City of Whitefish is located approximately 7 miles northwest of Columbia Falls in central Flathead County ([Figure 1](#)). The town is situated on the south end of Whitefish Lake and straddles the Whitefish River that drains the lake to the south. The U.S. Census Bureau estimates the 2000 population of Flathead County at 74,471 people, 5,023 of whom reside in Whitefish. The Whitefish population has increased 15% over the last 10 years. The main line of the Burlington Northern Railroad runs east-west through town. U.S. Highway 40 connects Whitefish with Columbia Falls to the southeast and U. S. Highway 93 connects Whitefish with Kalispell to the south and Eureka to the north.

Over the last century timber harvesting has contributed significantly to the economy of Whitefish. It was actually called Stump Town in the 1890s to reflect the already harvested forest in and around town. In recent years, the economic mainstays of small grain, pasturing, retail development, and tourism have augmented the local economy.

Within Whitefish city limits, residents obtain their drinking water from the municipal PWS. The Whitefish municipal sewer district also services all residents within city limits. Municipal wastewater discharges to multi-cell infiltration ponds located south of town. Residents in areas outlying city limits utilize private wells for water and on-site septic systems for waste disposal.

### Climate

The climate in the vicinity of Whitefish is typical of low-elevation intermountain basins of the Northern Rocky Mountains west of the Continental Divide. Based on Western Regional Climatic Center data for the period of record, annual precipitation averages 22.42 inches. Monthly average precipitation ranges from 1.34 inches in March to 3.13 inches in June. Summer thunderstorms and winter snows provide a majority of the precipitation in the area. The annual mean snowfall in Whitefish is 74.0 inches. Periodic drought cycles (as defined by moving annual precipitation averages less than 10 inches) occur in the region at approximately 10 to 20 year intervals. A summary of the available climatic data for the Whitefish area is presented on Table 1 below.

**Table 1. Climatic Summary**

City of Whitefish, Montana (248902)  
Period of Record Monthly Climate Summary  
Period of Record : 7/ 1/1948 to 12/31/2001

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	30.1	35.3	44.4	55.9	64.7	71.3	79.6	79.8	70.4	55.0	38.4	29.9	54.6
Average Min. Temperature (F)	15.1	15.9	22.9	30.3	38.5	44.8	49.4	48.0	39.1	30.4	24.4	16.8	31.3
Average Total Precipitation (in.)	2.20	1.65	1.34	1.51	2.42	3.13	1.68	1.55	1.34	1.33	1.99	2.28	22.42
Average Total Snow Fall (in.)	22.2	12.2	6.7	2.1	0.4	0.1	0.0	0.0	0.0	0.6	8.7	20.9	74.0
Average Snow Depth (in.)	12	13	8	1	0	0	0	0	0	0	1	5	3

Percent of possible observations for period of record.

Max. Temp.: 25.7% Min. Temp.: 25.7% Precipitation: 92.2% Snowfall: 90.6% Snow Depth: 90.7%

Source: Western Regional Climate Center, [wrcc@dri.edu](mailto:wrcc@dri.edu)

### **Geographic Setting**

Whitefish is located in a north-northwest trending intermontane basin in northwestern Montana. The Flathead area basin is bounded by the Flathead Lake to the south, the Salish Mountains to the west, and the Whitefish and Swan Ranges on the north and east. Whitefish Lake is bounded on the east by the Whitefish Range on the east and the Stryker Ridge to the north. The elevation of Whitefish is approximately 900 feet above mean sea level. The glaciated topography in the vicinity of the town exhibits relatively varied relief typical of kettles and kame terraces, drumlins, glacial fluvial outwash materials, and recessional moraines.

Whitefish is located in the Stillwater watershed. The U.S. Geological Survey hydrologic unit code for this watershed is 17010210050. The Whitefish River flows to the southeast near the City of Whitefish paralleling the range front of the Whitefish Mountain Range. The Whitefish River eventually drains into the Flathead River near Kalispell, which in turn drains into the north end of Flathead Lake. The City of Whitefish PWS facilities are depicted on [Figure 2](#) relative to town, Whitefish Lake, and the local topography.

### **Geology & Hydrogeology**

This section provides an overview of the geology and hydrology of the area in the vicinity of Whitefish. The geology of the area can be used to determine the locations, boundaries, and hydraulic properties of local aquifers. An understanding of hydrogeologic conditions also provides an explanation for the sensitivity of local aquifers to potential contamination sources.

The following is primarily drawn from Kendy and Tresch (1996) and Alt and Hyndman (1986). The Kalispell Valley (inclusive of the Whitefish Lake area) is located in the southern part of the Rocky Mountain Trench. It is bounded by normal faults on the east and west sides, and it is cross-cut by other faults with uneven displacement. It has been suggested that many of the fault bounded blocks of the area are typical horst and grabben structures as seen further south in the Basin and Range Provinces.

Metasedimentary rocks of the Belt Supergroup surround the Kalispell basin. These include limestone, dolomite, siltite, quartzite, and argillite. No Tertiary sediments are present as outcrops along the edges of the basin, but are present, buried beneath younger Quaternary glacial and alluvial materials. These younger materials are up to 1,000 feet thick in places. The region has been heavily glaciated by continental and local mountain glacial activity. Four major glacial advances occurred in Montana during the Pleistocene Epoch (10,000 – two million years ago) (Alden, 1932; Simon et al., 1999). Ice covered the northern third of the state during the maximum extent of the 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 glacial tills left behind are extremely varied, with little correlation between the stratigraphy present in different parts of the basin. In the Whitefish area, there is obvious kame and kettle topography (from in-place stagnant melting of large segments of glacial materials and the entrained sediment load), glacially sculpted drumlin ridges, coarse fluvial terraces, and moraine-like deposits. Some other features of the extensive and repeated glaciation of the area are the aligned ridges and scoured out lake basins, polished bedrock outcrops, isolated cirques, and aretes in the higher mountains. A geologic map for the area is presented on [Figure 3](#).

The modern stream and river valleys in the area are made up of interbeds of alluvium, lacustrine, and glaciofluvial silt, sand, clay, and gravel sediments (Kendy and Tresch, 1996). These modern streams have incised, eroded, transported, and reworked tremendous volumes of glacial till materials and have filled many of the modern valley basins with sediment. Abundant lakes are present in areas behind major terminal or recessional moraines and/or scoured-out valley floors. The Whitefish, Stillwater, Flathead, and Swan Rivers drain the Kalispell Valley into Flathead Lake. Swift Creek flows into Whitefish Lake from the north, then the Whitefish River flows southward draining the lake toward a confluence with the Stillwater River then the Flathead River, prior to their draining into Flathead Lake. The watershed that surrounds and drains into Whitefish Lake comprises approximately 151 square miles (97,000 Acres) of mostly U.S. Forest Service, U.S. Bureau of Land Management, and privately owned forestland. Whitefish Lake itself covers approximately 5 square miles (3,299 Acres).

### **The Public Water Supply**

The Whitefish PWS is classified as a community system under the Federal Safe Drinking Water Act, because the system serves at least 25 year-round residents through at least 15 service connections. The PWS services 5,878 residents via 2,761 active service connections.

The City of Whitefish source water is obtained through several surface water intakes. One intake is located in the middle of Whitefish Lake and withdraws water from the lake. There are 3 intakes located on perennial streams within Haskill Basin (north of the City of Whitefish). One of the intakes in the Haskill Basin is located on Haskill Creek, but is not currently active. The other intakes are located on 2 unnamed creeks in that basin that are designated as 2<sup>nd</sup> and 3<sup>rd</sup> Creeks (collectively depicted

on [Figure 2](#)). Water pumped from the lake and draining by gravity from the intakes in Haskill Basin are collected in a surface water holding reservoir located north of town. The water is treated there and placed into one of several holding tanks for distribution. The sources and other facilities associated with the City of Whitefish PWS are depicted on [Figure 2](#). Note that intakes in Haskill Basin, also depicted on [Figure 2](#), are in a drainage that does not naturally drain into Whitefish Lake. Table 2 below lists the facilities of the City of Whitefish PWS. The Whitefish Lake surface water intake is located in the middle of Whitefish Lake, approximately 2,100 feet from shore in Monks Bay and is in line with the promontory south of Dog Bay.

The city of Whitefish obtains its drinking water from a surface water supply. As a result, the source water is classified as highly sensitive to contamination, in accordance with Montana Source Water Protection Program aquifer/source water sensitivity criteria (1999). These criteria are discussed 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.

#### Background Whitefish Water Quality

Other than routine sampling by the City of Whitefish PWS of the treated (finished) water, no water quality data are known to have been collected to characterize background water quality of Whitefish Lake or of the streams in Haskill basin. The background water quality data that are available from DEQ PWS Section's database for inorganic, organic, and bacteriological sampling is presented in Appendix B. Some limited water quality data have been collected by the USGS on the lower reaches of the Whitefish River. Patricia Ladd of the USGS office in Helena provided these data which are summarized on Table 3. The data for sampling of the City of Whitefish PWS finished water are in Appendix B.

The State of Montana classifies Whitefish Lake and its tributaries as A-1 surface water. A-1 surface waters 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. The Whitefish River from the outlet of Whitefish Lake to the confluence with the Stillwater River is considered B-2 surface water. B-2 surface water is to be maintained suitable for drinking, culinary and food processing purposes, and after conventional treatment; bathing, swimming, and recreation; growth and marginal propagation of salmonoid fishes and associated aquatic life, waterfowl, and furbearers; and agricultural and industrial water supply. These surface water classifications are pursuant to the Administrative Rules of Montana 17.30.600-.625. The segment of the Whitefish River from outlet from Whitefish Lake appears on the Montana 2000 303(d) list as only partially supporting a cold water fishery and aquatic life uses, with inadequate data on primary contact recreational uses.

#### City of Whitefish PWS Water Quality

Within the past five years, no positive fecal coliform samples were collected during routine contaminant monitoring. No MCL exceedences were noted for any other constituents monitored over the past five years. The water quality data that are available from DEQ PWS Section's database for inorganic, organic, and bacteriological sampling is presented in Appendix B.

Table 2. List of Sources & Facilities  
City of Whitefish PWS

Facility	PWS Facility ID per the DEQ PWS Section Database	Location	Description	Notes
Intake from 1 <sup>st</sup> Creek (Haskill Creek)	IN002	Haskill Basin	Surface Water Intake (Inactive)	Drains via pipeline to surface water storage reservoir (raw water)
Intake from 2 <sup>nd</sup> Creek			Surface Water Intake (Active)	
Intake from 3 <sup>rd</sup> Creek			Surface Water Intake (Active)	
Intake from Whitefish Lake	IN005		Surface Water Intake (Active)	Pumped from lake to surface (raw) water storage reservoir
Raw water storage reservoir		below Haskill drainage	8.8 million gallons storage	Receives water from pipeline draining intakes in Haskill basin
Water Treatment Plant	TP001	just south of reservoir	Contact Absorption Clarifier Treatment Plant for IN002 and IN005	
Clear Well	CW001	under water treatment plant	Finished water is pumped into Storage Tank 1	water is transferred to Storage Tank 1
Storage Tank 1	ST001	West of raw water reservoir	1 million gallon baffled reservoir/tank for finished water	Flows by gravity to distribution
Storage Tank 2	ST002	Lower part of Grouse Mountain	0.75 million gallon reservoir/tank for finished water	Receives water from distribution and is pumped up to this tank. It then flows by gravity to distribution
Storage Tank 3	ST003	Upper part of Grouse Mountain	0.30 million gallon reservoir/tank for finished water	Receives water from distribution and is pumped up to this tank. It then flows by gravity to distribution
Pressure Control Assemblies	PC001 PC002 PC003 co-located w/ ST002 PC004 co-located w/ ST003	PC001 w/ Suncrest area PC002 w/Mountain Park area PC003 w/ ST002 PC004 w/ST003		
Distribution System	DS001	throughout city limits	Distribution of water via water mains	
Treatment Plant	TP002	lower Grouse Mountain	Treatment at PF001 (lower Grouse Mountain pumping facility) before lifting water to storage)	Considered auxiliary treatment and used as needed. Treatment methodology (beyond chlorination) is not clear
Pumping Facility	PF001	lower Grouse Mountain	Lifts water up to the Grouse Mountain storage tanks	

## CHAPTER 2 DELINEATION

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

Source water protection areas for surface water sources are subdivided into Spill Response and Watershed Regions, each with separate management goals. The Spill Response Region encompasses an area upstream of the Whitefish PWS 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 Whitefish PWS.

### Hydrologic Conditions

The watershed north-northwest of Whitefish Lake drains primarily into Swift Creek which enters the lake at the north end. Whitefish Lake drains out of the south end into the Whitefish River. Snowmelt, direct precipitation, surface runoff, and lateral inflow from alluvial and bedrock aquifers contribute to flow in Swift Creek and the Whitefish River. It does not appear that Swift Creek or the Whitefish River have been extensively dammed or diverted along their courses. The local streams in the Haskill basin drain into Haskill Creek which flows south-southeast until it reaches a confluence with the Whitefish River about 1 mile south of town.

Using DEQ Source Water Protection Program criteria for ranking aquifer/source water sensitivity (Table 4 below), the City of Whitefish PWS source water is considered highly sensitive to contamination. The sensitivity ranking is a result of the surface water source for the Whitefish PWS.

**Table 4. Source Water Sensitivity, criteria to determine**  
(DEQ, 1999)

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

### Conceptual Model and Assumptions

If contaminants were spilled or discharged directly into Swift Creek, Whitefish Lake, or the immediate surrounding tributaries to these surface water bodies upstream of the Whitefish PWS source intakes, these substances could potentially reach the surface water intakes before plant operators can close/isolate them. Contaminants derived from sources farther removed from the river throughout the watershed may be flushed into tributaries and the main stream channels during spring snowmelt or storm events, or may infiltrate aquifers which discharge to the lake via hydraulic connections.

### Delineation Results

#### Spill Response Region

The Spill Response Region for the City of Whitefish PWS extends 1/2 mile downstream and approximately 10 miles upstream of the City of Whitefish surface water intake (see [Figure 4](#)). It encloses the shoreline of Whitefish Lake. The width of the region extends 1/2 mile surrounding the lake and on either side of Swift Creek. The small Haskill basin watershed surrounding

the water intakes on Haskill Creek, 2<sup>nd</sup> Creek, and 3<sup>rd</sup> Creek is also included in the Spill Response Region. The Haskill basin watershed was included due to the identification of potential contaminant sources within the drainage (see [Figure 5](#) for a closer look at the Haskill basin).

#### Watershed Region

The Watershed Region for the City of Whitefish PWS intakes encompasses the entire Swift Creek watershed upstream of Whitefish Lake and is bounded by Stryker Ridge to the southwest, the top of the Whitefish Range to the northeast and extending northwest to the ridgeline between Herrig and Link Mountains. The region extends a couple of miles southeast of the City of Whitefish (refer to [Figure 6](#)).

#### **Limiting Factors**

The delineations for the Whitefish PWS Spill Response Region and Watershed Region are based on fixed-distance and watershed mapping. The Spill Response Region represents an approximation of the distance required for contaminants released upstream to reach the surface water intake with little lag time. Numerous assumptions are associated with these Source Water Protection Program (SWPP) criteria for Spill Response Region delineations. Contaminant transport rates and concentrations will vary depending on stream/river flow conditions, ground water flux into the river, 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 Spill Response Region may be more conducive to contaminant transport than others, and should be designated as higher priority areas for source water protection efforts.

## CHAPTER 3 INVENTORY

An inventory of potential sources of contamination was conducted to assess the susceptibility of the City of Whitefish PWS to contamination, and to identify priorities for source water protection planning. Inventories were conducted within the delineated Spill Response and Watershed Regions. The inventory focuses on facilities that generate, use, store, transport, or dispose potential contaminants, as well as areas where potential contaminants are generated, used, stored, transported, or disposed. Additionally, the inventory identifies potential sources of all primary drinking water contaminants and *Cryptosporidium*. Only significant potential contaminant sources were selected for detailed inventory. The significant contaminants posing potential threats to the City of Whitefish PWS include nitrate, pathogens, herbicides, and pesticides. The inventory for the Whitefish PWS also focuses on all activities in the Spill Response Region, as well as general land uses and large potential contaminant sources in the Watershed Region.

### Inventory Method

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

Step 1: Land cover is identified from the 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: 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.

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

[Figure 7](#) identifies the locations of potential contaminant sources (point sources) in the Spill Response Region. It should be noted that most of these are located on the south end of Whitefish Lake and south of the intake for the lake water. Spills of fertilizers, pesticides, volatile organic compounds (VOCs), and synthetic organic compounds (SOCs) could occur along the highways and the BNSF railroad tracks within the Spill Response Region or directly into the lake ([Figure 7](#)). The Big Mountain Ski Resort may have activities and/or contaminant sources that could reach and negatively impact Haskill Creek, which flows

out of the basin directly below the resort. USTs are known to be present at the resort. The Micho Mine is present in the watershed above the 2<sup>nd</sup> Creek intake within the Haskill basin. Little or nothing was discovered about the status, size, or character of this mine. A full listing of businesses in and around the City of Whitefish (based on SIC codes and their potential to be contaminant sources) and other types of facilities was compiled and is present in Appendix A.

The principal land covers in the Spill Response Region are evergreen forest (61%), open water (19%), grassland/herbaceous (8%), shrubland (4%), low intensity residential areas (2%), pasture and hay (2%), with little deciduous forest and commercial or transportation uses (roads and railroad) (see [Figure 8](#)). Activities on agricultural land poses a small potential threat to the City of Whitefish PWS because cultivated cropland occupies only ~1.7 percent of the Spill Response Region.

Low density of private septic systems occurs over most of the Spill Response Region (92.9% of the area is considered low density). Noteworthy is the presence of areas of high and medium septic density in close proximity to the lake and the PWS's lake water intake. Big Mountain Ski Resort is located in Haskill basin and operates a large capacity septic system. This system is located directly uphill from the Haskill Creek intake. The City of Whitefish PWS has inactivated this particular surface water intake and now relies on the Haskill basin intakes on 2<sup>nd</sup> and 3<sup>rd</sup> Creeks. A large portion of the Whitefish municipal sewer system is located inside of the Spill Response Region and comprises approximately 3.7% of the total area. This area is small, but due to its location, sewer main breaks or leaking connections in the system could pose a threat to the PWS. No registered or unregistered concentrated animal feeding operations (CAFOs) are known to be located in the Spill Response Region. Septic Density within the Spill Response Region is presented on [Figure 9](#).

**Table 5. Potential contaminant sources in the Spill Response Region**  
City of Whitefish PWS

Potential Source	Potential Contaminants	Hazard
Cultivated Cropland (% of area)	Fertilizers, pesticides, pathogens, nitrate	Spills, over application, surface runoff
Burlington Northern Santa Fe Railway	Pesticides, fertilizers, VOCs, other	Spills, storm water runoff, infiltration into ground water
BN Fueling Facility & Wastewater Discharge	Pesticides, hydrocarbons, VOCs, other	Storm water runoff, incomplete treatment of wastewater
Highways and Roads	Pesticides, fertilizers, VOCs, other	Spills, 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-site residential septic systems (% of area)	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	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
Municipal sewer system (% of area)	Nitrate, pathogens	Leaks in mains/lines, system failure, infiltration of untreated effluent into shallow ground water, which may in turn reach surface water
USTs/LUSTs	VOCs, petroleum hydrocarbons	Spills, leaks impacting groundwater and or reaching surface water
Mining operations	Metals	Erosion and mobilization of metals in sediment and/or leached into surface water and groundwater
Assorted businesses in town	VOCs, SOCs, petroleum hydrocarbons, metals, pathogens, nitrate	Releases or spills, mishandling of chemicals, improper disposal of chemicals anywhere near the lake
Class V Injection Wells where storm and/or waste water is concentrated and recharges groundwater.	VOCs, SOCs, petroleum hydrocarbons, metals, pathogens, nitrate	Leaks, spills, improper handling and disposal/discharge of chemicals used by various businesses and are released to systems that allow infiltration of contaminants to the subsurface or to the storm water system

From the above list of potential contaminant sources, some are considered significant 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 intakes.

**Table 6. Significant potential contaminant sources in the Spill Response Region**  
City of Whitefish PWS.

Source	Potential Contaminants	Hazard
Burlington Northern Santa Fe Railway	Pesticides, fertilizers, hydrocarbons (fuels), VOCs, other	Spills, storm water runoff, infiltration into ground water
BN Fueling Facility & Wastewater Discharge	Pesticides, hydrocarbons (fuels), VOCs, other	Storm water runoff, incomplete treatment of wastewater, groundwater contamination migrating offsite
Highways and Roads	Pesticides, fertilizers, hydrocarbons (fuels), VOCs, other	Spills, storm water runoff, infiltration into ground water
On-site residential septic systems (local concentrations of)	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 (although individual systems were not identified)	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
Municipal Sewer	Nitrate, pathogens	Leaks in mains/lines, system failure, infiltration of untreated effluent into shallow ground water, which may in turn reach surface water
USTs/LUSTs	VOCs, petroleum hydrocarbons	Spills, leaks impacting groundwater and or reaching surface water

**Inventory Results/Watershed Region**

The Watershed Region for the City of Whitefish PWSs is comprised of Swift Creek, its tributaries, and several other smaller streams that drain toward and into Whitefish Lake. It also includes the area of Haskill Basin that contributes water to the Haskill Basin intakes. The Watershed Region surrounds and extends primarily to the northwest of Whitefish Lake (Figure 6). As with the Spill Response Region, most of the potential contaminant point sources are located on the south end of Whitefish Lake and south of the PWS’s intake for the lake water. Most of the inventoried significant potential contaminant sources are displayed on Figure 10. Spills of fertilizers, pesticides, volatile organic compounds (VOCs), and synthetic organic compounds (SOCs) could occur along the highways and the BNSF railroad tracks within the Watershed Region. The Big Mountain Ski Resort may have activities and/or contaminant sources that could reach and negatively impact Haskill Creek, which flows out of the basin directly below the resort. USTs are known to be present at the resort. The Watershed Region encompasses a large portion of the City of Whitefish and the businesses located there. As such, it also encompasses a number of significant potential contaminant sources, such as storm water discharges, the BN Refueling Facility, UST/LUST locations in and around town, and a few mine prospects. A full listing of businesses in the City of Whitefish (based on SIC codes) was compiled and is present in Appendix A. Predominant land covers in the Watershed Region include evergreen forest (79%), grasslands/ herbaceous (6%), shrubland (5%), open water (4%), and transitional areas (2%) (see Figure 11). Activities on agricultural land poses a small potential threat to the City of Whitefish PWS because cultivated cropland occupies only ~1.3 percent of the Watershed Region.

As with the Spill Response Region, low septic densities occur over the entire Watershed Region (91.7% overall). There are areas of both high and medium septic density in close proximity to the lake and the PWS’s lake water intake. Big Mountain Ski Resort is located in Haskill basin and operates a large capacity septic system. This system is located directly uphill from the Haskill Creek intake (currently inactive). The Whitefish municipal sewer system is located primarily inside of the Watershed Region and comprises approximately ~4.2% of the total area. This area is small, but sewer main breaks or leaking connections in the system could pose a threat to the PWS. No concentrated animal feeding operations are located in the Watershed Region (Figure 12).

Figure 13 is a tabular and graphical summary of all land use within the Spill Response Region and within the Watershed Region. Table 7 on the following page summarizes septic density in the Spill Response Region and within the Watershed Region. Table 8 below lists the potential contaminant sources identified in the Watershed Region.

**Table 8. Potential contaminant sources in the Watershed Region**  
City of Whitefish PWS

Potential Source	Potential Contaminants	Hazard
Cultivated Cropland (% of area)	Fertilizers, pesticides, pathogens, nitrate	Spills, over application, surface runoff
Land clearing (primarily from construction, logging, or fires)	Sediments, organic and inorganic solutes	Dramatically increased runoff with the associated erosion and transport of sediments, increased solution and transport of solutes and organics
Burlington Northern Santa Fe Railway	Pesticides, fertilizers, VOCs, other	Spills, storm water runoff, infiltration into ground water
Highways and Roads	Pesticides, fertilizers, VOCs, other	Spills, 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-site residential septic systems (% of area)	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	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
Municipal Sewer (% of area)	Nitrate, pathogens	Leaks in mains/lines, system failure, infiltration of untreated effluent into shallow ground water, which may in turn reach surface water
BN Fueling Facility & Wastewater Discharge	Pesticides, hydrocarbons, VOCs, other	Storm water runoff, incomplete treatment of wastewater, groundwater contamination migrating offsite
USTs/LUSTs	VOCs, petroleum hydrocarbons	Spills, leaks impacting groundwater and or reaching surface water
Mining operations	Metals	Erosion and mobilization of metals in sediment and/or leached into surface water and groundwater
Assorted businesses in town	VOCs, SOCs, petroleum hydrocarbons, metals, pathogens, nitrate	Releases or spills, mishandling of chemicals, improper disposal of chemicals anywhere near the lake
Class V Injection Wells where storm and/or waste water is concentrated and recharges groundwater.	VOCs, SOCs, petroleum hydrocarbons, metals, pathogens, nitrate	Leaks, spills, improper handling and disposal/discharge of chemicals used by various businesses and are released to systems that allow infiltration of contaminants to the subsurface or to the storm water system
Storm Water / Wastewater Discharges	VOCs, SOCs, pathogens, nitrate, TDS	Leaks, spills, improper handling and disposal/discharge of chemicals used by various businesses and are released to systems that allow discharge of contaminants with wastewater to surface water

From the above list of potential contaminant sources, some are considered significant 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 intakes.

**Table 9. Significant potential contaminant sources in the Watershed Region**  
City of Whitefish PWS

Source	Potential Contaminants	Hazard
Burlington Northern Santa Fe Railway	Pesticides, fertilizers, VOCs, other	Spills, storm water runoff, infiltration into ground water
Municipal Sewer	Nitrate, pathogens	Leaks in mains/lines, system failure, infiltration of untreated effluent into shallow ground water, which may in turn reach surface water
Storm Water / Wastewater Discharges	VOCs, SOCs, pathogens, nitrate, TDS	Leaks, spills, improper handling and disposal/discharge of chemicals used by various businesses and are released to systems that allow discharge of contaminants with wastewater to surface water
BN Fueling Facility & Wastewater Discharge	Pesticides, hydrocarbons (fuels), VOCs, other	Storm water runoff, incomplete treatment of wastewater, groundwater contamination migrating offsite
Highways and Roads	Pesticides, fertilizers, hydrocarbons (fuels), VOCs, other	Spills, storm water runoff, infiltration into ground water
On-site residential septic systems (local concentrations of)	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 (although individual systems were not identified)	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
USTs/LUSTs	VOCs, petroleum hydrocarbons	Spills, leaks impacting groundwater and or reaching surface water

### 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 public water supply for the City of Whitefish should update the inventory for their records every year. Changes in land uses or potential contaminant sources should be noted and additions made as needed. The complete inventory should be submitted to DEQ 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 reports, and GIS data. 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. In some instances, inadequate location information precluded the inclusion of potential sources in the inventory. In the case of the Micho Mine, little or not data was available for the production of this report to determine if it was in fact a significant potential contaminant source for the intake. Additionally, it is not known to what degree watercraft are potential contaminant sources of petroleum hydrocarbons, VOCs, and possibly MTBE (a fuel additive) into Whitefish Lake.

## CHAPTER 4 SUSCEPTIBILITY ASSESSMENT

Susceptibility of the City of Whitefish PWS's 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 in the Spill Response Region in order to guide management actions undertaken by local entities, in this case the City of Whitefish and Flathead County.

The goal of source water management is to protect the source water, manage significant potential contaminant sources in the Spill Response Region, and ensure that land use activities in the Watershed Region pose minimal threats to the source water. Management priorities in the Spill Response Region are determined by ranking the significant potential contaminant sources identified in the previous chapter according to susceptibility. Alternative management approaches that could be pursued by City of Whitefish PWS owners and operators 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 in Whitefish's Spill Response Region depends on whether contaminants can discharge directly to the segments Swift Creek and the Whitefish Lake drainage, which is both the Spill Response and Watershed Region. Point source 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 10. Barriers can be anything that decreases the likelihood that contaminated water will reach Whitefish's surface water intake. Examples of barriers include: a vegetated riparian area, protective forest management practices, and dilution.

**Table 10. 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
Point Sources of VOCs, SOCs, or Metals	Potential for direct discharge of large quantities from roads, rails, or pipelines	Potential for direct discharge of small quantities to surface water	Potential for discharge to groundwater hydraulically connected to surface water
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 little municipal sewer system present within the Spill Response Region and the Watershed Region described in this SWDAR, but it is concentrated in the are surrounding the Whitefish Lake intake.

Barriers to contamination can be anything that decreases the likelihood that contaminants will reach a spring or well. Barriers can be engineered structures, management actions, or natural conditions. Examples of engineered barriers are spill catchment structures for industrial facilities and leak detection for underground storage tanks. Emergency planning and best management practices 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 11. Susceptibility of Source Water based on Hazard rating and the presence of Barriers**

	<b>High Hazard Rating</b>	<b>Moderate Hazard Rating</b>	<b>Low Hazard Rating</b>
<b>No Barriers</b>	Very High Susceptibility	High Susceptibility	Moderate Susceptibility
<b>One Barrier</b>	High Susceptibility	Moderate Susceptibility	Low Susceptibility
<b>Multiple Barriers</b>	Moderate Susceptibility	Low Susceptibility	Very Low Susceptibility

Susceptibility ratings are presented individually for each significant potential contaminant source and each associated contaminant in Table 12.

**Table 12. Susceptibility Assessment Results**  
**Significant Potential Contaminant Sources** in the Spill Response Region & Watershed Region  
City of Whitefish PWS surface water intakes

<b>Source</b>	<b>Contaminant</b>	<b>Hazard</b>	<b>Hazard Rating</b>	<b>Barriers</b>	<b>Susceptibility</b>	<b>Management Recommendations</b>
<b>BNSF Railway</b>	Pesticides, fertilizers, VOCs	Spills, storm water runoff, infiltration into ground water	<b>High</b>	Dilution; County Emergency Response Plan, training and preparation of local response personnel, continued remediation of current contamination	<b>Moderate</b>	Maintain preparedness of local emergency personnel through active training; develop storm water runoff diversion; continuation of remediation at former release sites
<b>Highways and Roads</b>	Pesticides, fertilizers, VOCs	Spills, storm water runoff, infiltration into ground water	<b>High</b>	Dilution; County Emergency Response Plan, training and preparation of local response personnel	<b>Moderate</b>	Maintain preparedness of local emergency personnel through active training; develop storm water runoff diversion
<b>Large Capacity Septic Systems</b>	Pathogens, nitrate	System failure, system overload, infiltration of untreated effluent into ground water	<b>Moderate</b>	Dilution	<b>Moderate</b>	Ensure proper maintenance and operation of systems; monitor leaks in systems; develop an alternative treatment plan in the event of system failures, promote use of advanced treatment systems; incorporation into municipal sewer system
<b>Stormwater Discharges</b>	VOCs, SOCs, pathogens, nitrate, TDS	Storm events that may wash contaminants into surface water near the intake	<b>Moderate</b>	Dilution, downgradient locations	<b>Low</b>	Public education to reduce improper disposal, spill catchment, stormwater filtration/diversion, wetland development
<b>On-site residential septic systems (septic density)</b>	Pathogens, nitrate	Leaks in septic tanks, leaks in collection lines, system failure, infiltration of untreated effluent into shallow ground water	<b>Low</b>	Dilution	<b>Low</b>	Educate public on proper maintenance and replacement of on-site systems; promote advanced treatment systems; annex into City sewer district
<b>Municipal Sewer System</b>	Pathogens, nitrate	Leaks in sewer mains to groundwater, which may reach surface water	<b>Low</b>	Dilution	<b>Low</b>	Ongoing testing and maintenance of lines and system, replacement of old lines, compliance with current regulations for discharges
<b>USTs/LUSTs</b>	VOCs, petroleum hydrocarbons	leaks, spills that reach groundwater, which may reach surface water	<b>Low</b>	Spill prevention, dilution, ongoing monitoring of groundwater, monitoring for spills, ongoing remediation of spill sites	<b>Very Low</b>	Spill response planning, tank and groundwater monitoring, spill catchment, active and ongoing remediation of spill sites

Table 12, above, displays the susceptibility assessment results for the City of Whitefish PWS surface water intakes. The town's intake (primarily that in Whitefish Lake) is susceptible to a number of different contaminants, including pathogens, nitrates, fertilizers, pesticides, VOCs, petroleum hydrocarbons, and total dissolved solids. The above assessment addresses both the Spill Response Region and the Watershed Region for the City of Whitefish PWS.

The susceptibility assessment results for each significant potential contaminant source identified are described below:

***Burlington Northern Santa Fe railway*** – The potential hazard imposed by pesticides, fertilizers, VOCs, and SOCs originating from the Burlington Northern Santa Fe railway is high. The railway and former spills along the railway pose a high hazard. This is because there is potential for a spill originating on or near the tracks to directly discharge into Whitefish Lake upstream from the City of Whitefish's surface water intake. Contamination from former spills could reach surface water indirectly. The susceptibility of the Whitefish PWS to contaminants originating from this source is considered to be moderate. Multiple barriers identified for this source include dilution in the lake and the ongoing remediation taking place on previous spill sites.

***Highway 93 and other roads along the lakeshore*** – The potential hazard imposed by pesticides, fertilizers, VOCs, and SOCs originating from releases along these roads is high. This is because there is potential for a spill originating on or near the roadways to directly discharge into Whitefish Lake near or upstream from the City of Whitefish's surface water intake. The susceptibility of the Whitefish PWS to contaminants originating from this source is considered to be moderate. A barrier identified for this source would include dilution in the lake and the county/city's emergency response planning and preparedness.

***Large capacity septic systems*** – The potential hazard imposed by pathogens and nitrate originating from large capacity septic systems (outside of the city limits) is moderate. The few number of these septic systems that are present in the Spill Response and Watershed Regions reduce the overall threat. The susceptibility of the intakes to nitrate and pathogens originating from this source is also moderate, as the only barrier identified between this source and the town's intake would be dilution in the lake. It should be noted that the intake in Haskill Creek (now considered to be inactive) is directly below the large capacity septic system of the Big Mountain Ski Resort. This large capacity septic system would be considered a high hazard to his intake. The intake would have a very high susceptibility to nitrates and pathogens from this contaminant source, as there are no barriers between the source and the intake.

***Stormwater Discharges*** – The potential hazard imposed by pathogens, nitrate, and other contaminants originating from the stormwater discharges is considered moderate. These unregistered and unregulated discharges are difficult to evaluate, as the contamination is a non-point source that isn't well characterized. Any and all significant storm or runoff events that drain from outside and inside city limits will eventually reach the lake. As such, contamination that is entrained and transported by this surface runoff will also reach the lake. Thus any improper disposal of chemicals to a storm sewer or storm water channel has a potential to reach the surface water intake in the lake. Dilution and locations that are downgradient from the intake would be the only known barriers to this source of contamination. The susceptibility of the PWS intake is believed to be low.

The City of Whitefish PWS has a low to very low susceptibility to the remaining significant sources listed in Table 12 above. The hazard they pose is thought to be low and there appear to be some barriers that reduce the susceptibility. 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. Steps can be taken to reduce the likelihood of releases into the source water for the PWS or in the vicinity of the sources. Some of these steps (considered management recommendations) are listed below.

### **Management Recommendations**

Management recommendations are included in the susceptibility table for the Whitefish PWS (Table 12). If these management recommendations are implemented, they may be considered additional barriers that will reduce the susceptibility of Whitefish's intake to specific sources and contaminants.

Management recommendations fall into the following categories:

- Sewer maintenance and leak detection
- Municipal sewer extension
- Agricultural best management practices
- Stormwater management

- Proper disposal and monitoring of oil and gas production wastewater
- Education
- Emergency Response Planning

***Sewer Maintenance and leak detection*** – Early warning of leaks and scheduled replacement of aging sewer lines will reduce the susceptibility of Whitefish’s intake to contamination from municipal septic wastes.

***Sewer Extension*** – Installation of advanced septic treatment systems such as sand filters can limit contamination from new rural residential development, however, annexation and extension of sewers is the only way to reduce contamination from existing unsewered developments. Although for the purposes of source water protection private onsite septic systems are evaluated much the same as municipal sewer areas, it is believed that municipal sewers are easier to manage, maintain, and/or monitor by the city government.

***Agricultural and 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 fields. Erosion control, selective logging, and other silvicultural practices (essentially BMPs) should be considered on a countywide 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 city limits but indirectly affect the city PWS.

***Stormwater management*** – Stormwater planning should address source and drainage control. Source control can be accomplished through educational programs focussing 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. The construction of storm runoff wetlands can go a long way to reducing the amount of non-point pollutants that could potentially reach the lake.

***Education*** - Educational workshops provided to the general public by the city, county, or state promote safe handling and proper storage, transport, use, and disposal of hazardous materials. Ongoing training provided to designated emergency personnel 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.

***Hazardous Materials Collection Days*** – Several counties in the state that have vulnerable water supplies have implemented scheduled days for the collection of hazardous wastes from the public. These vary in the inclusiveness of what materials are collected, how the materials are handled, and how they are disposed of, but they all act to reduce the amount of unauthorized or improper disposal of these wastes. Used motor oil collection stations could be established and available to the public on a regular basis.

***Emergency Response Plan*** – Several counties have compiled Emergency Response Plans that were then adopted by the local 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 municipalities within the county.

These management recommendations should be considered by the City of Whitefish PWS operator, the city administration, and the Flathead County administration. Should contamination reach the town's intake, the City and County will likely need to work cooperatively to address remediation or relocation of the Whitefish PWS source. Editorial contributions from the Whitefish PWS operator and the City of Whitefish administration have been solicited and incorporated into this report.

## **Monitoring Waivers**

### Monitoring Waiver Requirements

The 1986 Amendments to the Safe Drinking Water Act require that community and non-community PWSs sample drinking water sources for the presence of volatile organic chemicals (VOCs) and synthetic organic chemicals (SOCs). The US EPA has authorized states to issue monitoring waivers for the organic chemicals to systems that have completed an approved waiver application and review process. All PWSs in the State of Montana are eligible for consideration of monitoring waivers for

several organic chemicals. The chemicals diquat, endothall, glyphosate, dioxins, ethylene dibromide (EDB), dibromochloropropane (DBCP), and polychlorinated biphenyls are excluded from monitoring requirements by statewide waivers.

#### *Use Waivers*

A Use Waiver can be allowed if through a vulnerability assessment, it is determined that specific organic chemicals were not used, manufactured, or stored in the area of a water source (or source area). If certain organic chemicals have been used, or if the use is unknown, the system would be determined to be vulnerable to organic chemical contamination and ineligible for a Use Waiver for those particular contaminants.

#### *Susceptibility Waivers*

If a Use Waiver is not granted, a system may still be eligible for a Susceptibility Waiver, if through a vulnerability assessment it is demonstrated that the water source would not be susceptible to contamination. Susceptibility is based on prior analytical or vulnerability assessment results, environmental persistence, and transport of the contaminants, natural protection of the source, wellhead protection program efforts, and the level of susceptibility indicators (such as nitrate and coliform bacteria). The vulnerability assessment of a surface water source must consider the watershed area above the source, or a minimum fixed radius of 1.5 miles upgradient of the surface water intake. PWSs developed in unconfined aquifers should use a minimum fixed radius of 1.0 miles as an area of investigation for the use of organic chemicals. Vulnerability assessment of spring water sources should use a minimum fixed radius of 1.0 miles as an area of investigation for the use of organic chemicals. Shallow groundwater sources under the direct influence of surface water (GWUDISW) should use the same area of investigation as surface water systems; that is, the watershed area above the source, or a minimum fixed radius of 1.5 miles upgradient of the point of diversion. The purpose of the vulnerability assessment procedures outlined in this section is to determine which of the organic chemical contaminants are in the area of investigation.

Given the wide range of landforms, land uses, and the diversity of groundwater and surface water sources across the state, additional information is often required during the review of a waiver application. Additional information may include well logs, pump test data, or water quality monitoring data from surrounding public water systems; delineation of zones of influence and contribution to a well; Time-of-Travel or attenuation studies; vulnerability mapping; and the use of computerized groundwater flow and transport models. Review of an organic chemical monitoring waiver application will be conducted by DEQ's PWS Section and DEQ's Source Water Protection Program. Other state agencies may be asked for assistance.

#### Susceptibility Waiver for Confined Aquifers

Confined groundwater is isolated from overlying material by relatively impermeable geologic formations. A confined aquifer is subject to pressures higher than atmospheric pressure that would exist at the top of the aquifer if the aquifer were not geologically confined. A well that is drilled through the impervious layer into a confined aquifer will enable the water to rise in the borehole to a level that is proportional to the water pressure (hydrostatic head) that exists at the top of a confined aquifer.

The susceptibility of a confined aquifer relates to the probability of an introduced contaminant to travel from the source of contamination to the aquifer. Susceptibility of an aquifer to contamination will be influenced by the hydrogeologic characteristics of the soil, vadose zone (the unsaturated geologic materials between the ground surface and the aquifer), and confining layers. Important hydrogeologic controls include the thickness of the soil, the depth of the aquifer, the permeability of the soil and vadose zones, the thickness and uniformity of low permeability and confining layers between the surface and the aquifer, and hydrostatic head of the aquifer. These factors will control how readily a contaminant will infiltrate and percolate toward the groundwater.

The Susceptibility waiver has the objective of assessing the potential of contaminants reaching the groundwater used by the PWS. A groundwater source that appears to be confined from surface infiltration in the immediate area of the wellhead may eventually be affected by contaminated groundwater flow from elsewhere in the recharge area. Contaminants could also enter the confined aquifer through improper well construction or abandonment where the well provides a hydraulic connection from the surface to the confined aquifer. The extent of confinement of an aquifer is critical to limiting susceptibility to organic chemical contamination. Regional conditions that define the confinement of a groundwater source must be demonstrated by the PWS in order to be considered for a confined aquifer susceptibility waiver. Confinement of an aquifer can be demonstrated by pump test data (storage coefficient), geologic mapping, and well logs. Site specific information is required to sufficiently represent the recharge area of the aquifer and the zone of contribution to the PWS well. The following information should be provided:

- Abandoned wells in the region (zone of contribution to the well),

- Other wells in the region (zone of contribution to the well),
- Nitrate/Coliform bacteria analytical history of the PWS well,
- Organic chemical analytical history of the PWS well,

#### Susceptibility Waiver for Unconfined Aquifers

Unconfined aquifers are the most common source of usable groundwater. Unconfined aquifers differ from confined aquifers in that the groundwater is not regionally contained within relatively impervious geologic strata. As a result, the upper groundwater surface or water table in an unconfined aquifer is not under pressure that produces hydrostatic head common to confined aquifers.

Unconfined aquifers are usually locally recharged from surface water or precipitation. In general, groundwater flow gradients in unconfined aquifers reflect surface topography, and the residence time of water in the aquifer is comparatively shorter than for water in confined aquifers. Similar water chemistry often exists between unconfined groundwater and an area surface water, and physical parameters and dissolved constituents can be an indicator of the hydraulic connection between groundwater and surface water. Consequently, unconfined aquifers can be susceptible to contamination by organic chemicals migrating from the ground surface to groundwater.

The objective of the susceptibility waiver application is to assess the potential of organic chemical migration from the surface to the unconfined aquifer. The general procedures make use of a combination of site specific information pertaining to the location and construction of the source development, monitoring history of the source, geologic characteristics of the unsaturated soil and vadose zones, and chemical characteristics of the organic chemicals pertaining to their mobility and persistence in the environment. The zone of contribution of the unconfined groundwater source must be defined and plotted. This should describe the groundwater flow directions, gradients, and a 3-year time-of-travel. All surface bodies within a 1,000 feet of the PWS well(s) must be plotted. Analytical monitoring history of the PWS well and those nearby should be provided as well.

#### Susceptibility Waiver for Surface Water

Many surface water bodies are locally recharged by local precipitation. In general, residence time in local surface water bodies such as streams and narrow lakes is considered small, as the water moves through the system rather quickly. Water contained in large lakes and reservoirs may have variable residence times based on seasonal turnover, temperature inversions, stagnant depths or isolated reaches of the lake water, and throughput of water in the water body. Similar water chemistry often exists between shallow unconfined groundwater and surface water, and physical parameters and dissolved constituents can be indicators of the hydraulic connection between groundwater and surface water. Consequently, unconfined aquifers can be susceptible to contamination by organic chemicals migrating from the ground surface to groundwater. Alternately, surface water bodies directly or indirectly receive a considerable percentage of their water from groundwater. Therefore, surface water can be susceptible to contamination by organic chemicals migrating from groundwater into the surface water.

The objective of the susceptibility waiver application is to assess the potential of organic chemical migration of contaminants into surface water that is used as a source. The general procedures make use of a combination of site-specific information pertaining to the location and construction of the water source development, monitoring history of the source, geologic / hydrologic characteristics of the source water, and chemical characteristics of the organic chemicals pertaining to their mobility and persistence in the environment. The area of contribution to the surface water body at the PWS intake must be defined and plotted. This should describe the water flow directions, stream discharge and velocity, and residence time of water in the stream, lake, or reservoir (if the information is available). All surface bodies within 1,000 feet of the PWS intake(s) must be plotted. The Montana DEQ Source Water Protection Program typically will delineate and assess a larger (more conservative) area called a Spill Response Region or a Watershed Region that extends at least 0.5 miles downstream and approximately 10 miles upstream of the PWS surface water intake. It encloses the shoreline of any lakes along the length of the region. The width of the region extends 1/2 mile surrounding any lakes and on either side of the primary stream tributaries. In the case of Haskill Basin as a source water of the City of Whitefish PWS, the entire watershed surrounding the intakes was delineated as the part of the Spill Response and Watershed Regions. Analytical monitoring history of the PWS intake should also be provided as part of the susceptibility waiver application.

#### Waiver Recommendation

Based on past monitoring results and the susceptibility assessment of the Whitefish PWS intakes, the City of Whitefish PWS appears to be eligible for monitoring waivers. See Table 13 for the affect of identified potential contaminant sources on monitoring waiver eligibility for the City of Whitefish PWS. The PWS may be eligible for a volatile organic (VOC), synthetic organic (SOC), and some inorganic chemical (IOC) waivers for their Haskill drainage intake. It is not clear if the Whitefish

Lake intake would be eligible for a monitoring waiver for one or more of these contaminant analytes. For monitoring waiver consideration, the City of Whitefish PWS should submit a letter to DEQ requesting specific monitoring waivers. The PWS may also need to provide additional information to DEQ regarding chemical use within the Spill Response Region.

**Table 13. Susceptibility Assessment & Waiver Eligibility**  
for significant potential contaminant sources in the Spill Response Region  
City of Whitefish PWS surface water intakes

Source	Contaminant	Susceptibility	Waiver Eligibility
<b>Highway and Roads</b>	Petroleum hydrocarbons, VOCs, SOCs, metals, pathogens, nitrate	Moderate	No probable affect on eligibility for Haskill basin intakes Chemical use may preclude waivers for some chemicals for the Whitefish Lake intake
<b>BNSF Railway</b>	Pesticides, fertilizers, VOCs	Moderate	No probable affect on eligibility for Haskill basin intakes Chemical use may preclude waivers for some chemicals for the Whitefish Lake intake
<b>Stormwater Discharges</b>	Pathogens, nitrate, VOCs, SOCs	Moderate	No probable affect on eligibility for Haskill basin intakes No probable affect on eligibility for the Whitefish Lake intake or
<b>Municipal Sewer System</b>	Nitrate, pathogens	Low	No probable affect on eligibility for Haskill basin intakes No probable affect on eligibility for the Whitefish Lake intake
<b>Silvicultural Activities</b>	Inorganics, some SOCs, pathogens, nitrate, TDS	Low to Very Low	Unknown affect on the Haskill basin intakes (the basin is partially owned by private lumbering interests) No probable affect on eligibility for the Whitefish Lake intake
<b>Large Capacity Septic Systems</b>	Nitrate, pathogens	Moderate	May affect the Haskill basin intakes (if the Haskill Creek intake is used) Clearly diminishes the probability of waivers for the Whitefish Lake intake
<b>Mines and/or Mine Prospects</b>	Metals	Unknown	May affect the Haskill basin intakes (mine is present in 2 <sup>nd</sup> Creek) May not affect the Whitefish Lake intake

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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.

**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**

**Listing of Potential Contaminant Sources  
by SIC Code  
and Other Sources**

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**APPENDIX B**

**DEQ PWS's Database Output**

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**APPENDIX C**

**Sanitary Survey &  
Other Correspondence**



**APPENDIX D**

**Concurrence Letter**

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