



Mammoth Community Water District  
Watershed Sanitary Survey 2006



Data Collected Between 1/1/2001 and 12/31/2006

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## EXECUTIVE SUMMARY

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The Mammoth Community Water District has prepared this 2006 Watershed Sanitary Survey (WSS) of the Lake Mary Watershed. This document meets the California Code of Regulations Requirements for Watershed Sanitary Surveys. The purpose of the survey is to identify actual or potential sources of contamination, which may adversely affect the quality of water used for domestic drinking water.

This WSS covers the Lake Mary Watershed, which is located within the Lakes Basin subunit of the Mammoth Basin Watershed. The Lake Mary Watershed includes Lake Mary, the source of surface water for the District, three main watercourses, and thirteen additional lakes. The U.S. Forest Service is the primary landowner of land in the watershed.

The District obtains surface water supplies from Lake Mary and treats the raw water at the Lake Mary Treatment Plant, located adjacent to the lake. Multiple modifications to the plant have taken place since the last WSS was prepared that have improved the operation of this facility. The District also owns and operates the wastewater collection system in the Lake Mary Watershed.

Potential sources of contamination in the watershed have been identified as the following: wastewater collection system, recreation, roads, and historic abandoned mines. The District conducts routine water quality testing of the raw water entering the Lake Mary Treatment Plant and the treated effluent to ensure that drinking water standards are met. The U.S. Forest Service and the District both work to ensure that risks to drinking water are minimized through a variety of control activities.

Overall, there are minimal threats to the Lake Mary Watershed due to its location near the top of a pristine watershed. The District has multiple plans for corrective action in the future to ensure that the quality of water present in Lake Mary remains high.

# CHAPTER 1

## Introduction

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### **Introduction**

This 2006 Watershed Sanitary Survey (WSS) covers the Lake Mary watershed from which the District obtains its surface water supplies. The initial WSS was completed in 1996 and this report is the second 5-year update of that survey.

### **Watershed Sanitary Survey Requirements**

The California Surface Water Treatment Rule, Title 22 of the State Code of Regulations, requires every public water system using surface water to conduct a comprehensive sanitary survey of its watersheds every five years. This section of the Code is located in CCR Title 22, Division 4, Chapter 17, Article 7, Section 64665, Watershed Sanitary Surveys. The purpose of the survey is to identify actual or potential sources of contamination, which may adversely affect the quality of water used for domestic drinking water.

### **Objectives**

The main objectives of this WSS update are to:

- Satisfy the regulatory requirements for a watershed sanitary survey
- Identify and assess existing and potential sources of contamination in the watershed
- Provide a general description of the existing watershed control and management practices
- Provide recommendations for improving watershed management practices in order to protect the quality of surface water

### **Conduct of the Study**

This update of the WSS for the Mammoth Lakes Basin Watershed was produced by the Mammoth Community Water District. This survey covers the entire surface water supply system for the District, which is located locally in the Lakes Basin. It was conducted by reviewing water quality data collected over the past five years since the previous survey was conducted, reviewing previous years reports, conducting a field review of the Lakes Basin on October 27, 2006, and consultation with District and US Forest Service staff.

## CHAPTER 2

# Lake Mary Watershed and Review of 2001 Watershed Sanitary Survey Recommendations

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### **Description of the Watershed**

The Mammoth Basin Watershed is located on the eastern side of the Sierra Nevada Mountain range. The Mammoth Basin is the watershed of Mammoth Creek and is located in the Long Valley Hydrologic subunit of the Owens hydrologic unit of the Lahontan drainage province. The Basin is bounded on the south by the drainage divide of Convict Creek; on the west, by the Mammoth Crest; on the north by the drainage divide of Dry Creek; and on the east extending along the watershed of Hot Creek. Surface elevations range from about 12,500 feet at Bloody Mountain in the southern part of the Basin to about 6,900 feet near the Cashbaugh Ranch at the far eastern extreme of the Basin.

The 71-square mile Mammoth Basin is divided into seven sub-units as shown in Figure 1. The Lake Mary Watershed is located within the southern portion of the sub-unit known as the Lakes Basin. This WSS reviewed the entire Lake Mary watershed, which encompasses approximately 8 square miles and includes three sub-units of the Lakes Basin; Mammoth Creek, Coldwater Creek, and George Creek. The Lake Mary watershed lies in the higher elevations of the Mammoth Basin at the Basin's southwest extreme, originating at the Mammoth Crest at elevations of 11,600 feet and extending to the outlet of Lake Mary at an elevation of 8875 feet.

### **Land Use**

The Lake Mary watershed includes thirteen lakes in addition to Lake Mary and three major drainage courses. The major stream drainages entering Lake Mary are upper Mammoth Creek, Coldwater Creek, Coldwater Diversion (manmade), and George Creek (Figure 2). The entire watershed is under the land ownership of the US Forest Service with a few exceptions.

There is one parcel of privately owned property, Pokonobe Lodge, on the north shore of Lake Mary. In addition, there are two additional individual parcels located on the ridge to the east of Lake Mary. One parcel contains the workings of the Old Mammoth Mine, which is no longer in use and is owned by the mine company. The other parcel is owned by a private individual.

A portion of higher elevation land the Lake Mary watershed is located in the John Muir Wilderness Area. Wilderness areas of the Lake Mary watershed contain no human developments and all camping and recreational activities are conducted under primitive conditions. Permits are required for overnight camping in the wilderness areas. Activities in the wilderness area include day hiking, fishing, and horseback riding.

At elevations below the wilderness area, camping is restricted to organized campgrounds administered by the US Forest Service. Drinking water is supplied to all campgrounds by the US Forest Service. Sewer service is provided by the District to all campgrounds in the Lakes Basin as well as all cabins and other facilities with the exception of ten cabins on the south side of Lake George where pit privies are used.

## **Review of 2001 Watershed Sanitary Survey Recommendations**

The 2001 Watershed Sanitary Survey included five recommendations for corrective action. This section describes the status of those recommendations

### ***Low filter effluent pressure***

The problem of low filter effluent pressure at the Lake Mary Treatment Plant has been resolved through the addition of seven new filters and flow control valves at the plant, and modifications to the control of flow being discharged from the Clearwell associated with Lake Mary Treatment Plant. Previously, the Clearwell valves were set manually which resulted in low filter effluent pressure at the plant. Prior to recent upgrades, the valves at the Clearwell were not automated. The automation of these valves ensures that the capacity of the filters at the plant is not exceeded and that positive pressure is maintained in the water line connecting the plant with the Clearwell.

### ***Maintaining proper storage of backwash water***

The Lake Mary Treatment Plant, by nature of its location in relation to the source water at Lake Mary, tends to have low-pressure head. In order to remedy this problem, the hydraulic head of the plant has been modified to improve the performance of the backwash valves.

### ***Corrosion control study***

A corrosion control study has not been required by the Department of Health Services. This is due to results of lead and copper testing in drinking water, which have not exceeded the action levels. While corrosivity of the raw water at Lake Mary is high, drinking water supplies tend to be mixed with groundwater resulting in reduced corrosivity. The District will continue to monitor the corrosivity of Lake Mary water and will evaluate the need for corrosion control.

### ***Disinfection contact time tracer study***

A tracer study was conducted in 2003 to determine chlorine contact time in the Clearwell using fluoride as a tracer. The results of this study showed that accurate contact time numbers are being used to meet disinfection contact time requirements for giardia and virus inactivation.

### ***MTBE monitoring***

The District monitors for MTBE in the raw water line to the Lake Mary Treatment Plant and in the treated effluent from the plant on an annual basis. This contaminant has not been detected in any samples since 2000. MTBE was phased out of gasoline in California by January 1, 2004, so it is unlikely that this possible carcinogen will be found in Lake Mary in the future.

## CHAPTER 3

# Water Supply System and Wastewater Facilities

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### **Source Water**

The District is currently entitled to divert a maximum of 2,760 acre-feet of water annually from Lake Mary at a maximum diversion rate of 5 cfs (cubic feet per second) from November 2 to April 30. From May 1 to November 1, a maximum diversion rate of 5.039 cfs is allowed. The State Water Resources Control Board has imposed several constraints and conditions on the water permit and licenses that have been issued to the District.

Surface water storage rights are limited to 660 acre-feet annually, of which 606 acre-feet may be collected between April 1 and June 30, and 54 acre-feet between September 1 and September 30 of each year. The District is also limited to a maximum drawdown in Lake Mary of 3.0 feet during the period between June 1 and September 15, and a total maximum annual drawdown of 5.7 feet.

The Mammoth Community Water District obtains about 40% to 60% of its annual water supplies from surface waters of the Lakes Basin, depending upon water year type and demands from the community during various months of the year. This supply is supplemented by groundwater extracted from eight production wells located within the developed portion of the community.

### **Facilities**

#### ***Lake Mary Treatment Plant***

The Mammoth Community Water District diverts surface water directly from Lake Mary through an intake structure and pipeline located near the northern shore of the lake. The intake structure is adjustable to obtain the highest quality water available and generally is located about 20 feet below the lake surface and 340 feet from the shore. Raw water flows by gravity through the intake structure through a valve vault on the shore and is then piped approximately 1,300 feet to the treatment plant.

The Lake Mary Treatment Plant uses filtration and chemical treatment to remove suspended solids and biological contaminants. In 2004, the District completed upgrades to the Lake Mary surface water treatment plant, which involved multiple modifications to the existing plant. The treatment system was expanded with the installation of seven new 10-foot diameter pressure filters and associated piping and controls. These new filters increased the treatment capacity of the plant to 3.2 million gallons per day while meeting the California Department of Health filtrations requirement of not exceeding three gallons per minute per square foot of filter area. Each of the new filters was designed with an air scour system during backwash to provide for

more efficient filter cleaning. As a result of these modifications, the production capacity of the plant is now rated at 5.7 cfs with one filter off line, which provides for the maximum 5.039 cfs diversion rate allowed for in the District's water rights permit. These improvements have the potential to enable the District to utilize the full 2,760 acre-feet of water available from the state water rights permits in normal and wet precipitation conditions.

Chemical system improvements included upgrades to the existing chlorine disinfection system and existing corrosion control system. The chlorine disinfection system was upgraded to allow for more efficient operation and control. Automatic shut-off valves were installed on the chlorine gas cylinders to automatically close whenever a chlorine leak is detected. Improvements to the corrosion control system included new automation to provide for future chemical addition if necessary.

Other plant upgrades included the installation of a new diesel fueled engine-generator to replace the existing system to provide for automatic emergency power during power outages. Existing treatment system controls were upgraded and new controls installed for the new filters. This allowed for more precise control over filtration rates, pump controls, chemical feed system controls, and improved monitoring of water quality parameters such as turbidity.

The Lake Mary Treatment Plant meets the CCR regulations for surface water treatment. Section 64652 of Title 22, Division 4, Chapter 17, Article 2 states that water supplies receiving permit approval from the California Department of Health Services must utilize treatment techniques that protect users from adverse health effects of microbiological contaminants.

### ***Wastewater Collection System***

The District operates the primary sewage collection system in the Lakes Basin watershed, which consists of about 9 miles of sewer main lines, 147 manholes, and 9 sewer lift stations. The collection system serves all campgrounds, cabins, lodges, and stores in the Lakes Basin, with the exception of 10 private cabins on the south end of Lake George.

The main lines in the Lakes Basin sewer collection system are owned and operated by the District. These main lines were installed by the US Forest Service and were taken over by the District upon completion of construction. The laterals to restrooms are still owned by the Forest Service.

### ***Lift Stations***

Within the Lake Mary watershed, the District operates three sewer lift stations: East Lake Mary, Coldwater, and West Lake Mary (Figure 3). Within the entire Lakes Basin area, which includes portions of land downstream from the source water of Lake Mary, the District operates nine sewer lift stations.

The East Lake Mary Lift Station is located on the south shore of Lake Mary about 170 feet from Lake Mary. This lift station receives wastewater from gravity collection pipelines serving about 40 cabins and the Crystal Crag Lodge. Wastewater is pumped from the East Mary Lift Station through approximately 150 feet of force main to an elevation of 8920, a lift of about 6 feet. From that point, sewer flow is fed by gravity to the Coldwater Lift Station.

The Coldwater Lift Station is located on the northeast shore of Lake Mary about 150 feet from the lake's shore. This lift station receives wastewater from the Coldwater Campground, the Lake Mary Store, several private cabins, and discharge from the East Mary Lift Station. Wastewater is pumped from the Coldwater Lift Station through approximately 1,875 feet of force main to an elevation of 8931, a lift of about 17 feet. It then flows by gravity to the District's wastewater treatment plant facility.

The West Lake Mary Lift Station is located on the northwest shore of Lake Mary about 190 feet from the lake and about 10 feet from Mammoth Creek as it flows from Lake Mary to Lake Mamie. This lift station receives wastewater from the Lake George Campground, Woods Lodge, and a portion of the Lake Mary Campground. Wastewater is pumped from the West Mary Lift Station through approximately 600 feet of force main and then flows by gravity to the District's wastewater treatment plant.



**Figure 1: Cold Water Lift Station with Lake Mary visible in the background**

## CHAPTER 4

# Potential Sources of Contamination in the Watershed

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Methods for surveying the watershed tributary to Lake Mary in this 2006 Watershed Sanitary Survey involved a field survey conducted on October 27, 2006, evaluating Watershed Sanitary Surveys prepared in 1996 and 2001, and consultation with MCWD and US Forest Service staff members.

### **Potential Contaminant Sources**

#### ***Wastewater Collection System***

The most significant potential source of contamination to the Lake Mary watershed is from human presence, particularly in the form of sewage and solid waste. With one exception, the developed area within the Lake Mary watershed is served by a wastewater collection system operated by the District. The collection system serves all campgrounds, cabins, lodges, and stores within the Lake Mary watershed. The only exception is ten cabins located on the southern side of Lake George that utilize septic systems.

The entire Lakes Basin watershed consists of about 9 miles of sewer transmission lines, 9 sewer lift stations, and 147 manholes. The wastewater collection system in the smaller Lake Mary watershed consists of about four miles of sewer transmission lines and three associated lift stations, and about 60 manholes. The wastewater collection system in the Lake Mary watershed serves 4 lodges with rental cabins, 4 campgrounds with 151 tent/RV sites, a store, and approximately 50 cabins.

The wastewater collection system is generally utilized from June through October by the cabins, campgrounds, and stores described above. Minimal flow in the collection system is experienced during the winter months, as the water systems for the recreations facilities are not operational during this time. The District has been experiencing high rates of infiltration and inflow to the sewer collection system during the spring runoff, generally in April and May. Infiltration is generally due to groundwater entering sewer collection pipelines through cracks and joints and inflow is generally due to surface flow entering manholes and other facilities. While this issue has resulted in unnecessary pumping and treatment of essentially clean water, it has not resulted in any overflow of the collection system. District staff has begun to address this problem through the sealing of manholes and lining of pipes in critical locations.

One of the most vulnerable portions of the wastewater collection system in the Lake Mary watershed is the lift stations. Failure of a pump, motor, or control instrumentation would eventually result in an overflow of wastewater from either the lift station itself or from a nearby manhole. Three lift stations are located adjacent to Lake Mary: Coldwater Lift Station, East

Mary Lift Station, and West Mary Lift Station. Both the Coldwater Lift Station and the East Mary Lift Station have the potential to contaminate source water in Lake Mary if they were to overflow. The West Mary Lift Station is located at a lower elevation than the lake and an overflow at this location would not compromise source water quality.

The District mechanical maintenance department conducts weekly inspections of sewer lift stations in the Lakes Basin. These inspections include visual inspections of the lift stations and test runs of equipment such as pumps, motors, and blowers. Quarterly alarm tests are also conducted to ensure that alarm signals are received through the District's supervisory control and data acquisition system (SCADA). Annual cleaning and maintenance is also conducted at these facilities to ensure that they remain in proper working order.

During the last five years, there has been only one failure of these facilities resulting in sewer discharge to surface water. On June 15, 2005, about 500 gallons of sewage and sewage water discharged to the inlet stream to Lake Mamie because of a broken force main. This break was discovered during the weekly lift station inspections. The discharge site was cleaned and the broken force main was repaired. This incident was reported to the Lahontan Regional Water Quality Control Board. While this discharge entered surface water, it was downstream of the District's diversion point at Lake Mary and, thus, had no impact on surface water supplies.

The sewer collection system itself has the potential to overflow from the many manholes located along the mains. In order to prevent such an overflow from occurring, the District's distribution and collection personnel of the operations department function under the California General Waste Discharge Requirements for Sanitary Sewer Systems (SWRCB Order 2006-0003-DWQ). These requirements include provisions for reporting any overflows to the Lahontan Regional Water Quality Control Board and the Mono County Health Department. In addition, the District is required to submit a sewer system management plan. The District is in the process of developing such a maintenance plan, which will describe the current program of cleaning and inspecting all sewer lines in the system in a five-year rotation schedule.

## ***Recreation***

Recreation is the next most significant potential sources of contamination to the Lake Mary Watershed. Common activities enjoyed by summer visitors to the Lake Mary Watershed include fishing, camping, biking, hiking, backpacking, and horseback riding. During the winter months, recreation declines significantly, as the access road to the area is closed due to snowfall. The Lake Mary Watershed still experiences visitors during the winter in the form of cross-country skiers, backcountry skiers, and later in the season, snowmobiles. The US Forest Service estimates that current visitor days experienced in the Lakes Basin totals about 500,000 people annually.

## **Campgrounds**

There are four campgrounds located in the Lake Mary Watershed: Coldwater, Lake Mary, Pine City, and Lake George. These campgrounds are located at elevations between 8,900 feet and

9,000 feet and total 151 campsites. The campgrounds are owned by the USFS and operated by a private company that operates and maintains campground facilities.

The Coldwater Campground is located several hundred feet from the south end of Lake Mary at an elevation of 8,900 feet. The campground is bordered by Mammoth Creek to the north and Coldwater Creek to the south. The campground includes 77 tent/RV campsites that are accessed by paved roadways. The average season for this campground is from mid-June to mid-September. At the upper end of the campground, a trailhead parking lot provides parking for anglers, hikers, backpackers, and people accessing the wilderness by horseback.

The Lake Mary Campground is located on the north end of Lake Mary near the Pokonobe Lodge at an elevation of 8,900 feet. It consists of 48 tent/RV sites that are accessed by paved roadways. The average season lasts from early June to mid-September.

The Pine City Campground is located on the east site of Lake Mary and consists of 10 tent/RV sites. There is no paving in the campground area. This campground is located at an elevation of 8,900 feet and has an average season of early June to mid-September.

The Lake George Campground is located on the north end of Lake George at an elevation of 9,000 feet. It contains 16 RV/tent sites that are accessed by paved roads and a picnic area. The average season lasts from early June to mid-September. Paved trailhead parking is located near the campground for anglers, hikers, backpackers, and horseback riders.

### Lodges, Cabins, and Stores

The Pokonobe Lodge is located at the north end of Lake Mary and offers a general store and marina. The marina rents paddleboats, pontoons, canoes, kayaks, rowboats, and motorized fishing boats.

The Lake Mary Marina and Store is located on the south end of Lake Mary and provides groceries. A boat ramp and dock provide the opportunity to rent pontoons, paddleboats, canoes, and motor boats.

Crystal Crag Lodge is also located that the south end of Lake Mary offers 21 rental cabins. It also has a boat launch with motorboats and rowboats for rent.

Woods Lodge at Lake George offers about rental 20 cabins, which are located on the north end of Lake George. The lodge also has a tackle and snack shop and a boat launch, which rents motorboats and rowboats.

Ten privately owned cabins are located at the south end of Lake George and are only accessible by foot or boat. These cabins are not connected to the District's sewer collection system. They are served by leach field septic systems, which are approved by the Mono County Environmental Health Department. Usage of these cabins is limited to intermittent use during the approximately five months of summer that they are accessible.

The Mono County Environmental Health Department records currently show that no businesses in the Lakes Basin are registered in the hazardous materials program. During the upcoming summer of 2007, the Lakes Basin will be inspected by the Mono County Environmental Health Department to ensure that all businesses and marinas comply with this program.

### Boating

While angling from shorelines, boats, and float tubes are popular activities in the Lakes Basin, the US Forest Service does not allow waterskiing and jet skiing on any lakes in the Lakes Basin. However, boats of all types are available for rent on Lake Mary at the Pokonobe Lodge, Lake Mary Store, and Crystal Crag Lodge and on Lake George at the Woods Lodge. Most of the marinas provide gasoline for motorboats through five-gallon gas cans.

### Winter Sports

During the winter months, the access road to the Lakes Basin is closed due to snowfall and a locked gate located near Twin Lakes. Cross-country skiing is the primary activity in the winter months with smaller amounts of visitors utilizing the area for access to backcountry skiing. The Tamarack Cross-Country Ski Center operates from November to April each year, depending upon snow conditions. Nineteen miles of trails are typically groomed for cross-country skiing. In addition, many visitors utilize the area for walking and snowshoeing.

Also during the winter, snowmobiles are allowed after April 17 to access non-wilderness areas. The US Forest Service currently has no further restrictions on where snowmobiles are allowed to travel.

All restrooms in the Lake Mary Watershed connected to the District's sewer collection system are locked and closed for the winter since the Forest Service's water system is turned off for the winter as well. However, the U.S. Forest Service has installed vault toilets in several locations for use by skiers.

### ***Roads***

There are approximately three miles of paved road surface in the area around Lake Mary that contributes to runoff into surface water supplies. Peak use of the roadways occurs during the summer tourist season from July through August.

Stormwater runoff is not collected in the Lakes Basin so it can be assumed that all runoff from roadways eventually discharges into one of the lakes in the area, either by direct runoff, by runoff to a stream channel, or by percolation through the soil. Those contaminants that are associated with automobile emissions would be expected to be present in the runoff. Due to the large amount of runoff in the form of precipitation and snowmelt, the impact would be small and would not have a measurable impact on surface water supplies. To date, automobile-related contaminants have not been detected in water quality sampling.

## *Historic Mines*

Within the Lakes Basin watershed, the remains of multiple historic gold mine sites exist that have been abandoned. These sites contain various amounts of remains from mining operations. Most of the mines operated in the late 1800s and were abandoned after just a few years due to lack of productivity.

The Old Mammoth Mine site is located downstream of Lake Mary near Mill City. Runoff from this site was evaluated by the US Forest Service in 2005 to determine if there could be any contamination coming from the mine. Nothing of significance was found in the drainage.

The Mammoth Consolidated Mine site is located near the Coldwater Creek Campground. The soil at the site was sampled by the US Forest Service in the fall of 2006 and high levels of lead were found in an old shaker table. There is no surface water adjacent to the site and the old shaker table only covers a 20 by 20 foot area, so contamination to Lake Mary would be unlikely. Lead has not been detected in any samples of raw water at the Lake Mary Treatment Plant. The US Forest Service is currently completing a study of the site and is expecting to conduct a clean-up operation in the summer of 2007.

## CHAPTER 5

### Water Quality Assessment

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Surface water entering Lake Mary is primarily derived from snowmelt due to the lake’s location high in the watershed. As a result, the water is of very low mineral content with excellent clarity. District staff performs regular monitoring in the raw water line of surface water that flows into the Lake Mary Treatment Plant, which is summarized below.

Table 1: Frequency of source water quality monitoring in the raw water line to the Lake Mary Treatment Plant

<b>Analysis</b>	<b>Frequency</b>
Inorganic Chemical	Every 3 years
Nitrate	Annual
General Mineral	Every 3 years
General Physical	Every 3 years
Gross Alpha	Every 4 years
MTBE	Annual
VOCs	Annual
Unregulated VOCs	Annual
SOCs	Every 3 years
Unregulated SOCs	Every 3 years
Corrosivity	Annual
Arsenic	Annual
Total and Fecal Coliform	Weekly
Color, Odor, Temperature, and PH	Weekly

While the District has been collecting water quality data for the past 23 years, this report summarizes the data collected over the past five years, since the WSS was last updated. The District tests for numerous constituents in the raw water line to Lake Mary, but only the constituents that were detected are noted in this report.

The District also tests the treated drinking water that is delivered to the distribution system to ensure that drinking water standards are being met. For example, total and fecal coliform tests are conducted in the treatment plant effluent on a weekly basis and testing for THMs and HAAs are conducted in the distribution system on an annual basis. The drinking water standards described in this section provide a comparison between California Health Department standards and the District’ source water, but are not enforceable standards in the source water since they only apply to drinking water supplied to customers.

The thirteen filters at the Lake Mary Treatment Plant are designed to reduce the number of giardia cysts by 99.9% and the number of viruses by 99.9% through filtration and disinfection. In addition, the District must meet primary drinking water standards as described by the California Department of Health Services.

### ***Inorganic Chemicals***

The only inorganic chemical detected during the last five years of water quality monitoring was arsenic. This constituent was detected during one sample collected on October 23, 2003 at 0.003 mg/L. The MCL for arsenic in drinking water was recently lowered from 0.05 mg/L to 0.01 mg/L. Arsenic is an odorless and tasteless element that generally enters the drinking water supply from natural deposits in the earth.

### ***Radioactivity***

Gross alpha radioactivity was found in every sample collected in the past five years. The highest sample was found on February 28, 2006 at 1.78 pCi/L. The lowest was found on December 2, 2003 at 0.128 pCi/L. The MCL for gross alpha radioactivity in drinking water is 15 pCi/L. Gross alpha radioactivity originates from the erosion of natural deposits of certain minerals.

### ***Volatile Organic Chemicals (VOC)***

Dichloromethane is the only VOC that has been detected in Lake Mary water over the past five years, with a single detection on February 28, 2006 at 1.7 ug/L. The MCL for this contaminant in drinking water is 5.0 ug/L. The US EPA states that this contaminant is most commonly used as a paint remover. Some people who drink water containing dichloromethane in excess of the MCL over many years may experience liver problems and may have increased risk of getting cancer. People with compromised immune systems, the aged, and the very young are the highest at risk. While the District's existing filtration system is not designed to remove contaminants such as this, such a small amount of this VOC results in a minor risk to public health.

### ***Corrosivity***

Corrosivity of Lake Mary water has remained relatively constant over the past 5 years ranging from 9.6 to 9.8, which are all highly aggressive. Corrosive water has the potential to remove iron and copper from water transmission pipes, may stain household fixtures, and may result in a metallic taste. The District conducts lead and copper monitoring in the community's drinking water twice a year. While individual samples have exceeded the 90<sup>th</sup> percentile requirements, the action levels for lead and copper have not been exceeded over the last 5 years.

### ***Turbidity***

Amounts of turbidity measured in raw water samples over the past several years have ranged from a minimum of 0.1 NTU in July 9, 2002 and a maximum of 1.3 NTU on July 20, 2005. Turbidity averages about 0.5 NTU and tends to fluctuate seasonally with the lowest measurements seen in the winter and early spring and the highest measurements seen in the summer and early fall. The secondary MCL for turbidity in drinking water is 5 NTU. Turbidity is a measure of the cloudiness of water and comes from soil runoff.

### ***Total Dissolved Solids (TDS)***

TDS have remained relatively constant over the last five years with a maximum of 30 mg/L measured three times and a minimum of 24 mg/L measured in December 23, 2002. The secondary MCL in drinking water for TDS ranges from 500 mg/L to 1000 mg/L. "Dissolved solids" refer to any minerals, salts, metals, cations or anions dissolved in water. Lake Mary water tends to be very low in TDS, which reflects the purity of this water source

### ***Sulfate***

Sulfate has remained relatively constant over the last five years with a maximum of 3.2 mg/L in October 29, 2003 and a minimum of 2 mg/L in July 25, 2006. The secondary MCL for sulfate in drinking water ranges from 250 mg/L to 500 mg/L. Sulfate is a naturally occurring substance in drinking water.

### ***Total Coliform***

The presence of coliform bacteria in source water is not a health threat itself, but is used to indicate whether potentially harmful bacteria may be present. Coliforms are naturally present in the environment, as well as feces. Fecal coliform and E.coli only come from human and animal fecal waste. The MCL for coliform in drinking water states that no more than 5% of samples may test coliform-positive in a month. For water systems like the District that collect fewer than 40 routine samples per month, no more than one sample can be total coliform-positive per month. The following table summarizes coliform data collected over the past 5 years from Lake Mary source water.

Table 2: Total coliform and fecal coliform summary in raw source water

Year	Maximum Total Coliform	Percent of Samples Containing Total Coliform	Percent of Positive Fecal Coliform
2002	40 MPN / 100 ml	67%	9%
2003	23 MPN / 100 ml	60%	8%
2004	17 MPN / 100 ml	64%	0
2005	16 MPN / 100 ml	40%	0
2006	13 MPN / 100 ml	43%	0

In addition to the routine samples summarized in the table above, during the field survey conducted on October 27, 2006, numerous grab samples of streams entering Lake Mary were taken to determine if coliform was present. Samples were taken from the four streams entering Lake Mary, which are Mammoth Creek, Coldwater Creek, Coldwater Diversion, and Lake George. In addition, a sample was taken at Lake George. There results of the fecal coliform analysis conducted on these samples showed that none of the samples contained fecal coliform.

## CHAPTER 6

# Watershed Control and Management Practices

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### **US Forest Service**

The Lake Mary Watershed is completely within the Inyo National Forest and, therefore, jurisdiction for management control rests almost entirely with the U.S. Forest Service. There is some limited authority granted to other agencies including the U.S. Fish and Wildlife Service and the Department of Fish and Game who share responsibility for hunting and fishing activities. Additional authority is granted to the Town of Mammoth Lakes for police protection and the clearing of snow from the roadways.

The US Forest Service administers the campgrounds, cabins and lodges in the Lakes Basin. Forest Service law enforcement officers patrol the Lakes Basin and would report any unauthorized activity with the potential to harm surface water. In addition, recreational personnel and other Forest Service personnel are active in the Lakes Basin on a regular basis and would report any spills or other unauthorized activity.

The watershed and reservoir management is under control of the U.S. Forest Service. The Forest Service must approve any new development in the watershed prior to construction of new facilities or occurrence of new activities. The Forest Service also controls reservoir operations through coordination with the District and the State Water Resources Control Board.

The Forest Service has several regulations that help protect water quality. First, 36 CFR 26.11 (c) prohibits placing any substance in a stream or lake that may pollute such a place. In wilderness areas, Forest Order 04-96-2 36 CFR 261.57 (g) prohibits washing, discharging soap, or depositing bodily waste within 100 feet of a lake or stream, 36 CFR 261.58 (aa) prohibits tying stock within 25 feet of a lake or stream, and 36 CFR 261.58 (e) prohibits camping within 25 feet of a lake or stream.

### **MCWD Control Activities**

In order to prevent contamination of surface water supplies from the District's sewer collection system in the Lakes Basin, the District operates under a strictly defined maintenance and inspection schedule. Sewer lift stations are inspected on a weekly basis to ensure that they are operating properly. In addition, all sewer lift stations are connected to the District's SCADA system through radio telemetry. District personnel are able to monitor lift station pump status and the flow levels on a daily basis. In addition, the SCADA system is designed to alert District personnel in the event that a pump fails, a communication failure occurs, or particularly high or low levels of flow exist at the lift station.

District Operations staff also conducts regular cleaning and TV inspections of the sewer collection lines to prevent blockages and to ensure that pipes are not leaking. The Operations Department conducts pipe cleaning and inspection on a five-year schedule throughout the entire collection system in the community.



Figure 2: SCADA communication system in East Mary Lift Station

### **Significant changes since the last watershed sanitary survey**

This section summarizes significant changes that have occurred since the last Watershed Sanitary Survey conducted in 2001. These changes cover facility upgrades, policy changes, and any other changes that could potentially influence water quality in the Lake Mary Watershed.

#### ***Lake Mary Treatment Plant Upgrades***

The District completed extensive upgrades of the Lake Mary Treatment Plant in 2004. These upgrades involved the installation of new turbidity meters, increasing the total number of filters to thirteen, and modifying the backwash system for filter cleaning.

In addition, the District also added automated valve control at the Clearwell, which stores treated surface water after leaving the Lake Mary Plant. This upgrade has improved the filter effluent pressure at the Lake Mary Treatment Plant.

### ***Radio Telemetry and Control Systems at Sewer Lift Stations***

Telemetry at sewer lift stations has been upgraded from telephone communication to radio telemetry. This change in the type of communication has resulted in multiple benefits to the District and the protection of water supplies.

First, this change has improved the type of information that is transmitted to District staff. The former telephone communication only provided two types of alarms: a common alarm and a power or phone failure alarm. This type of information made it difficult for staff to determine if an emergency existed or the type of emergency that may have existed. With the new radio telemetry connected to the District's SCADA system, staff is able to track a variety of functions at the lift stations such as pump status, flow, and communication status. In addition, staff can track histories of sewer flow and wet well levels at the lift stations.

The second benefit of radio telemetry is the reliability of this type of communication compared to telephone contact. Since telephone communication is through a physical line, it is susceptible to damage. When a telephone line is severed, the District is subject to the phone company's repair schedule. Alternatively, with radio telemetry, there is much less chance of losing communication.

In addition to adding improved telemetry, District staff has improved the actual control systems at the sewer lift stations. Instead of only one control system, a second, redundant system has been added to all sewer lift stations in the Lake Mary Watershed. These lift stations now have a primary control system for turning pumps on in the form of a pressure transducer and a backup system consisting of a float switch. This redundancy adds protection to ensure that sewer overflows do not occur.

All of these improvements to lift stations are part of an ongoing upgrade to these portions of the District's overall sewer collection system. Currently, two lift stations are upgraded per year and the primary focus has been on lift stations that have the potential to overflow to surface water, particularly those around Lake Mary.

### ***Lining of Sewers***

District Operations staff have begun slip-lining sewer main lines within the collection system throughout Town and in the Lakes Basin. This plastic pipe lining cuts down on leaks in sensitive areas and reduces infiltration and inflow in saturated soils. Three locations in the Lakes Basin sewer collection system have been slip lined in the last year. The locations of these pipes are near the West Lake Mary sewer lift station as it crosses Mammoth Creek, near the Lake Mary Treatment Plant that crosses the Bodle Ditch, and near the road bridge at the outflow of Twin

Lakes. These three sites are all close to surface water and tended to have high amounts of infiltration and inflow. Operations staff plans to continue this project throughout Town to target all critical locations in the sewer collection system.

### ***MTBE***

MTBE (methyl tertiary-butyl ether), a gasoline additive that was introduced to lower air pollution and has since been recognized as a threat to water quality and human health. The US Environmental Protection Agency has classified MTBE as a possible human carcinogen. MTBE has been used as a gasoline additive to reduce air pollution from tailpipe emissions primarily since the 1990s. On March 25, 1999, Governor Gray Davis released Executive Order D-5-99 that ordered the removal of the additive MTBE from California gasoline no later than December 31, 2002. This deadline was postponed until January 1, 2004, out of concerns for potential supply disruptions. In 2000, the California Department of Health Services established primary MCL of 13 micrograms per liter ( $\mu\text{g/L}$ ) in drinking water.

Currently, MTBE is not present in any gasoline sold in California, which significantly reduces the chances of this compound entering the District's surface water supplies. While it has not been banned in every state, it is unlikely that significant quantities of gasoline containing MTBE will enter Lake Mary or Lake George. The District continues to monitor for this compound on an annual basis. MTBE has not been detected in any of the raw water samples made at the Lake Mary Water Treatment Plant since 2000.

# CHAPTER 7

## Conclusions and Recommendations

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### **Recommendations for corrective action**

1. Monitor findings from US Forest Service clean up of Mammoth Consolidated Mine Site. Continue to communicate with the US Forest service to determine if cleanup at this site is effective and if other sites are in need of cleanup.
2. Obtain findings from Mono County Environmental Health inspection of possible fuel storage sites in the Lakes Basin. Communicate with them regarding the best ways to minimize risks to the watershed from these sites, if any are found.
3. Continue to discuss the possibility of banning two-stroke engines from motorboats on Lake Mary and Lake George. Possibly assist in the initiation of a pilot program at one of the marinas for electric motors that could possibly be charged through solar power.

### **Conclusions**

Overall, the Lake Mary Watershed is situated in a pristine location and has minimal threats to water quality. While there are certain threats to surface water supplies from the sewer collection system, recreational activities, roads, and historic mine sites, these are controlled by management activities to minimize the risks to surface water supplies. The U.S. Forest Service and the Mammoth Community Water District both actively manage the various risks to surface water supplies to ensure that these resources are protected and maintained at a high level of quality. The District plans to continue working with various agencies, landowners, and lessees in the Lake Mary Watershed to minimize threats to the watershed.

## REFERENCES

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