



**TAHOE WATER**  
SUPPLIERS ASSOCIATION  
PROTECT THE SOURCE

**Sanitary Survey  
and Watershed Control Program  
2009 Update**



**Save Natural Resources**

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# Sanitary Survey and Watershed Control Program 2009 Update

for Tahoe Water Suppliers Association Member Agencies  
Operating Surface Water Systems

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Purveyor Statistical Information is included in this 5 year update for:

North Tahoe Public Utility District (NTPUD) 2009

Lakeside Park Association (LPA) 2008

Tahoe City Public Utility District (TCPUD) 2008

Incline Village General Improvement District (IVGID) 2007

Kingsbury General Improvement District (KGID) 2007

Glenbrook Water Company (Glenbrook) 2007

Edgewood Water Company (Edgewood) 2007

Zephyr Water Utility (Cave Rock/Skyland = Zephyr) 2007

Round Hill General Improvement District (RHGID) 2007

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*NTPUD 2004 Watershed Sanitary Survey Update*  
Black and Veatch

*1992 Watershed and Sanitary Survey Control Plan*  
HDR Consultants

*1997 Watershed Sanitary Survey and Management Plan Update*  
Standish-Lee Consultants

*2002 Watershed Sanitary Survey and Management Plan Update*  
Nevada Tahoe Conservation District / Michelle Sweeney

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**TWSA members:**

**Lakeside Park Association  
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Round Hill General Improvement District  
Edgewood Water Company  
Zephyr Water Utility  
Glenbrook Water Company  
North Tahoe Public Utility District  
Tahoe City Public Utility District  
Skyland Water Company  
Cave Rock Water System  
South Tahoe Public Utility District (associate member)**

**Local, State and Federal Government:**

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North Lake Tahoe Fire Protection District (NV)  
North Tahoe Fire Protection District (CA)  
Placer County Environmental Health  
Placer County Office of Emergency Services  
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**Other Agencies:**

Desert Research Institute  
H2O Environmental  
Tahoe Environmental Research Center  
Tahoe Regional Planning Agency  
Tahoe Science Consortium  
Black and Veatch



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## **I: INTRODUCTION**

### **Purpose of the Sanitary Survey and Watershed Control Program Update**

*This Sanitary Survey and Watershed Control Program 2009 Update builds upon the original 1992 Watershed and Sanitary Survey Control Plan by HDR Consultants, the 1997 Watershed Sanitary Survey and Management Plan Update by Standish-Lee Consultants, the 2002 Watershed Sanitary Survey and Management Plan Update by Nevada Tahoe Conservation District and the NTPUD 2004 Watershed Sanitary Survey Update by Black and Veatch.*

The primary purpose of sanitary survey/watershed control plans and annual reports is to have the ability to “evaluate and document the capabilities of a water system’s sources, treatment, storage, distribution network, operation and maintenance, and overall management to continually provide safe drinking water and to identify deficiencies that may adversely impact a water system’s ability to provide a safe reliable water supply.” (EPA Guidance Manual)

Many of the Public Water Systems (PWS) participating in this survey supply their communities with drinking water directly out of Lake Tahoe, without source water filtration. These systems operate under “filtration exemption”. Safe drinking water is guaranteed through a multi-barrier treatment process which includes source water protection, monitoring, and disinfection.

Very few municipal water systems in the United States are able to operate under filtration exemption status, the requirements of which are described in Part 141 of the U.S. Environmental Protection Agency (EPA) National Primary Drinking Water Regulations. Four TWSA members operate using filtration treatment methods, but have chosen to participate in this report in support of the TWSA overall watershed control efforts.

In addition, Nevada water purveyors must meet the requirements of the Nevada Administrative Code (NAC) chapter 445A; the State of Nevada adopted Safe Drinking Water Act and subsequent updates in NAC 445 A. NAC 445 states that: the systems at Lake Tahoe “shall demonstrate that by location of the intake structure, a level of protection equivalent to watershed control is provided.” The water systems maintain filtration by the combined factors of Tahoe being an outstanding drinking water source, and because the water system managers have a notable record of working diligently and collaboratively to ensure Lake Tahoe’s water quality remains exceptional. California purveyors are additionally regulated by the California Department of Public Health’s Division of Drinking Water and Environmental Management (DDWEM).

Tahoe Water Supplier Association (TWSA) member agencies participated in 2007, 2008 and 2009 on the Watershed Sanitary Survey. These reports are conducted every 5 years. This process is now supplemented by TWSA Annual Reports, which have been produced each year since 2003. In 2009, The Nevada Division of Environmental Protection (NDEP) proposed amendments to the state drinking water regulatory code (NRS 445), to accept ongoing TWSA Annual Reports as fulfillment of the 5 year update requirement.

### **Safe Drinking Water Act**

The 1976 Safe Drinking Water Act regulates drinking water in the United States. Under the Act, the Environmental Protection Agency (EPA) has the authority to set standards for drinking water quality and oversee states, localities, and water suppliers. The 1986 Amendments to the Safe Drinking Water Act included the Surface Water Treatment Rule (SWTR) affecting surface water systems and set specific and measurable treatment standards for surface water purveyors. Federal and State regulation infer that protecting sources of drinking water, by implementing watershed control programs, can be an effective barrier in a multi-barrier potable water treatment process.

### **Clean Water Act**

Growing public awareness and concern for controlling water pollution led to enactment of the Federal Water Pollution Control Act Amendments of 1972. As amended in 1977, this law became commonly known as the Clean Water Act. The Act established the basic structure for regulating discharges of pollutants into the waters of the United States. It gave the EPA authority to implement pollution control programs such as setting wastewater standards for industry. The Clean Water Act also continued requirements to set water quality standards for contaminants in surface waters. The Act made it unlawful for any person to discharge any pollutant from a point source into navigable waters, unless a permit was obtained under its provisions. It also funded the construction of sewage treatment plants under the construction grants program and recognized the need for planning to address the critical problems posed by nonpoint source pollution.

The Clean Water Act (CWA) is the cornerstone of surface water quality protection in the United States. The Act does not deal directly with ground water nor with water quantity issues. The statute employs a variety of regulatory and non-regulatory tools to sharply reduce direct pollutant discharges into waterways, finance municipal wastewater treatment facilities and manage polluted runoff. These tools are employed to achieve the broader goal of restoring and maintaining the chemical, physical and biological integrity of the nation's waters so they can support "the protection and propagation of fish, shellfish, wildlife and recreation, in and on the water."

For many years following the passage of CWA in 1972, focus mainly was directed on the chemical aspects of the integrity goal. During the last decade, however, more attention has been given to physical and biological integrity. Also, in the early decades of the Act's implementation, efforts focused on regulating discharges from traditional point source facilities, such as municipal sewage plants and industrial facilities, with little attention paid to runoff from streets, construction sites, farms and other wet-weather sources.

Starting in the late 1980s, efforts to address polluted runoff have increased significantly. For non-point runoff, voluntary programs, including cost-sharing with landowners are the key tool. For wet weather point sources like urban storm sewer systems and construction sites, a regulatory approach is being employed.

Evolution of CWA programs over the last decade has also included something of a shift from a program-by-program, source-by-source, pollutant-by-pollutant approach to more holistic watershed-based strategies. Under the watershed approach equal emphasis is placed on protecting healthy waters and restoring impaired ones. A full array of issues are addressed, not just those subject to CWA regulatory authority. Involvement of stakeholder groups in the

development and implementation of strategies for achieving and maintaining state water quality and other environmental goals is another hallmark of this approach.

As stated, Nevada water purveyors must meet the requirements of the Nevada Administrative Code (NAC) chapter 445A. The regulating authority is Nevada Division of Environmental Protection Bureau of Safe Drinking Water. California purveyors are regulated by the California Department of Public Health's Division of Drinking Water and Environmental Management (CDPH-DDWEM).

Surface water systems operating under an exemption to filtration (a.k.a. "Non-filtration Permit"), must complete a Sanitary Survey and Watershed Control Plan (WCP) every 5 years with annual updates. The purpose of the WCP is to prevent contaminants which are potentially harmful to human health from entering sources of drinking water.

The EPA considers an effective WCP to include, at minimum, the following components:

- a) Description of the watershed;
- b) Identification and mechanisms to control potential contaminating sources; monitoring program to track existing and new detrimental activities;
- c) Program to gain ownership or control of the watershed;
- d) Annual reports (EPA 2003);
- e) Consideration of cryptosporidium in control requirements (Interim Enhanced Surface Water Treatment Rule 1998, Long Term Enhanced Surface Water Treatment Rule 2002).

### **Safe Drinking Water**

Lake Tahoe remains a pristine water supply. Lake Tahoe Public Water Systems (PWS) have no significant history of microbial contamination. Turbidity measurements from 2002-2009 remain primarily under the range of 5 nephelometric turbidity units (NTU). Turbidity readings at the intakes predominately stay well below 1.0 NTU. Instances of readings >1 NTU are associated with climactic events such as high winds, or unusually large volumes of stormwater runoff.

The Surface Water Treatment Rule (SWTR) of the Safe Drinking Water Act (SDWA) calls for strict control of all human activity within a watershed to maintain "protected watershed" status for those systems which do not filter source water. Due to the multiplicity of land use and ownership within the Tahoe Basin, strict control of human activity through landownership is not possible. However, pollution prevention, in the form of careful watershed management, is a viable and cost effective methodology used in Tahoe. The natural environment of the Basin and the Tahoe social community are favorable for maintaining a high quality water supply.

Lake Tahoe's water quality and water clarity receive attention from a large number of local, state and federal non-profits, research and regulatory agencies. According to the 2007 TRPA Lake Tahoe Environmental Improvement Program report (July 2007), as of 2006, \$1.2 billion has been invested by Congress, California and Nevada state legislatures, local governments and the private sector, on basin environmental management programs. Of this sum, approximately 50% of the funds are allocated for water quality improvement projects.

## **History of Filtration Exemption at Lake Tahoe**

In the early 1990's water systems at Lake Tahoe in Nevada and California sought filtration avoidance under the Surface Water Treatment Rule (SWTR) of the Safe Drinking Water Act (SDWA). The SWTR (amended, 1996) sets treatment requirement for surface water suppliers which emphasize control of microbial contaminants in the form of Maximum Contaminant Level Goals (MCLG) of zero (0) for Giardia Lamblia, viruses and Legionella. The SWTR requires filtration for all surface water systems unless source water quality can be assured through the adoption of watershed control, and utilizing effective watershed management. In this way watershed management is one mechanism applied, in lieu of filtration, as the first barrier to a multi- barrier approach. Multi-barrier treatment procedures are intended to provide inactivation of Giardia Lamblia, viruses and Legionella.

Watershed sanitary surveys are conducted to report on watershed characteristics, potential sources of pollution, water quality monitoring, and best management practices (BMPs). Based on earlier sanitary surveys including the 2002 report recommendations, several Nevada water systems decided to work together on a long-term partnership to maintain high levels of watershed protection. In 2002 this partnership was formalized with the formation of the Nevada Tahoe Water Supplier Association (NTWSA). In 2005 the first California member joined and the group changed its name to the Tahoe Water Suppliers Association (TWSA).

## **Regulatory Framework**

Lake Tahoe receives a large amount of attention from federal, bi-state, state and local governmental and regulatory agencies, as well as from non-governmental/non-profit agencies. A partial list of the collaborators engaged in watershed management include: USDA Forest Service, Fish and Wildlife Service, U.S. Army Corps of Engineers, the Tahoe Regional Planning Agency, U.S. Geologic Service, Nevada Divisions of Health Protection Services, State Lands, Forestry, and a host of California and local agencies. In total more than 100 involved agencies, organizations, and special interest groups are stakeholders in the Tahoe basin watershed management plans.

In regards to the drinking water suppliers ability to provide high quality potable water, the Surface Water Treatment Rule (SWTR) of the Safe Drinking Water Act (SDWA) calls for strict control of all human activity within a watershed to maintain "protected watershed" status. The SWTR (amended, 1996) sets treatment requirement for surface water suppliers which emphasize control of microbial contaminants in the form of Maximum Contaminant Level Goals (MCLG) of zero(0) for Giardia, Lamblia, viruses, and Legionella. The SWTR requires filtration for all surface water systems unless source water quality can be assured through the adoption of the watershed control and utilizing effective watershed management.

The Interim Enhanced Surface Water Treatment Rule (IESWTR) was last updated in January, 2001. The IESWTR focuses on control of Cryptosporidium. The Disinfection By-Product Rule (DBP) reduces consumer exposure to disinfections by-products, especially bromates. The Long Term Enhances Surface Water Treatment Rule (LT1 ESWTR) addresses controls for inactivation of Cryptosporidium. For smaller water providers, LT1 ESWTR serves as the counterpart to the IESWTR.

The Long Term 2 Enhanced Surface Water Treatment Rule (LT2 ESWTR) builds upon earlier rules to address higher risk public water systems for protection measures beyond those required for existing regulations. The U.S. Environmental Protection Agency (EPA) published LT2ESWTR on January 5, 2006. The LT2ESWTR improves control of microbial pathogens. LT2ESWTR requires source water monitoring at public water systems (PWS) that use surface

water or ground water under the direct influence of surface water (GWUDI). Based on system size and filtration type, systems need to monitor for Cryptosporidium, E. coli, and turbidity.

The Long Term 2 Enhanced Surface Water Treatment Rule and the Stage 2 Disinfection Byproduct Rule are the second phase of rules required by Congress. These rules strengthen protection against microbial contaminants, especially Cryptosporidium, and at the same time, reduce potential health risks of DBPs. The LT2ESWTR is being promulgated simultaneously with the Stage 2 Disinfection Byproduct Rule (Stage 2 DBR) to address concerns about risk tradeoffs between pathogens and disinfection by-products (DBPs).

The purpose of Long Term 2 Enhanced Surface Water Treatment Rule is to reduce illness linked with the contaminant Cryptosporidium and other pathogenic microorganisms in drinking water. The LT2ESWTR will supplement existing regulations by targeting additional Cryptosporidium treatment requirements to higher risk systems. This rule also contains provisions to reduce risks from uncovered finished water reservoirs and provisions to ensure that systems maintain microbial protection when they take steps to decrease the formation of disinfection byproducts that result from chemical water treatment. Current regulations require filtered water systems to reduce source water Cryptosporidium levels by 2-log (99 percent). Recent data on Cryptosporidium infectivity and occurrence indicate this treatment requirement is sufficient for most systems, but additional treatment is necessary for certain higher risk systems. These higher risk systems include filtered water systems with high levels of Cryptosporidium in their water sources and all unfiltered water systems, which do not treat for Cryptosporidium.

Systems serving less than 10,000 people have two options for compliance with the source water monitoring requirements: 1) Conduct E. coli monitoring first and based on those results, the system may or may not need to conduct Cryptosporidium monitoring, or 2) Systems may go directly to Cryptosporidium monitoring. TWSA members reporting in the TWSA annual reports/sanitary surveys all serve populations under 10,000.

### **Reference List for Filtration Avoidance Regulations**

*40 Codes of Federal Regulations (CFR)*

*Surface Water Treatment Rule (SWTR) / 141.70-141.75*

*Total Coliform Rule (TCR) / 141.21*

*Interim Enhanced Surface Water Treatment Rule (IESWTR) / 141.70-141.75; 141.170-141.175*

*Long Term Enhanced Surface Water Treatment Rule (LT1ESWTR) / 141.500-141.575*

*Long Term Rule 2 (LTR2)/(LT2ESWTR)*

*Disinfection By-Products 2 (DBP2R) / 40 CFR Parts 9, 141, and 142 National Primary Drinking Water Regulations: Stage 2 Disinfectants and Disinfection Byproducts Rule; Final Rule*

As noted, the level of development and human activity within the Tahoe Basin makes it impossible to control the watershed to the level required by the SWTR. To meet these requirements, multi-barrier controls are applied. The first step in multi-barrier control is strategic placement of the raw water intake structures. The systems at Lake Tahoe “*Demonstrate that by location of the intake structure, a level of protection equivalent to watershed control is provided*”.

Efforts to manage the watershed for optimal water quality are a top priority in basin management and policy. However it is by strategic intake placement, taking into account the depth and length of the intake, wind and lake currents, shore zone activity and other factors to minimize turbidity levels and associated microbial contaminants - that provide the level of

protection needed to maintain filtration avoidance. Being able to use the location of the intake as one of the methods of protection was determined during the adoption of the federal surface water treatment rules by the State of Nevada. One of the possible issues for the TWSA California members is the support of this interpretation by the California regulating agencies.

Reference	Constituent	Units	Regulation	Exception
NAC 141.71 (a)	Turbidity	NTU	The turbidity level cannot exceed 5 NTU in representative samples of the source water immediately prior to the first or only point of disinfection application.	Unless: The state determines that any such event was caused by circumstances that were unusual and unpredictable; and as a result of any such event, there have not been more than five events in the past 120 months that the system served water to the public, in which the turbidity exceeded 5 NTU.
40 CFR 141.71 NAC 445.266	Fecal Coliform/ Total Coliform	cysts/ml	Fecal Coliform must be less than or equal to 20/100 cysts/ml or Total Coliform must be less than or equal to 100/100 cysts/ml in at least 90% of the measurements made for the system served water to the public. Tests should be taken in representative samples of the source water immediately prior to the first or only point of disinfection application. The supplier must continue to be in compliance with the maximum contaminant level for total coliform to retain non-filtration avoidance permit.	
LT2	Enteric Viruses	Cysts/L	Goal is to find no enteric viruses. Existing regulations did not require unfiltered systems to provide any treatment for <i>Cryptosporidium</i> . Although unfiltered systems maintain watershed control programs to protect water quality, recent surveys have shown <i>Cryptosporidium</i> to be present in the sources of unfiltered systems. Without treatment, these <i>Cryptosporidium</i> will pass into the water distributed to consumers. Available data indicate that the average risk from <i>Cryptosporidium</i> in unfiltered systems is higher than in filtered systems, so that treatment by unfiltered systems is required to achieve comparable public health protection. Further, with available technologies like UV and ozone, treatment for <i>Cryptosporidium</i> is feasible for all unfiltered systems. Consequently, EPA is establishing requirements under the LT2ESWTR for all unfiltered systems to treat for <i>Cryptosporidium</i> , with the required degree of treatment depending on the source water contamination level.	

## **II. DESCRIPTION OF WATER SUPPLY**

The purpose of describing a watershed that affects a drinking water supply is to provide information that will help to evaluate the vulnerability of the source (EPA 1999). TWSA purveyor members are located on the eastern and southern shores of Lake Tahoe, Nevada and the northern and northwestern points of Lake Tahoe, California. Each of the full members draws water directly from the lake to service both a permanent and visitor population. Several have auxiliary groundwater sources. South Tahoe Public Utility District, a TWSA associate member, utilizes groundwater sources only. The watershed description briefly summarizes: general location and features of the basin and source water, water system, population and land ownership, and local agreements. The Lake's location, unique physical characteristics and national support for its protection and preservation create a distinctive political backdrop and regulatory system.

### **Location**

Lake Tahoe is a high alpine lake on the border of the Nevada/California state line. Approximately two-thirds of the land area is within California and one-third within Nevada. To the West, the Sierra Nevada Mountain range borders the basin across from the Carson Range on the east side of the lake. The basin is described as a high alpine and sub-alpine ecosystem. The primary soil type is granite (USGS 2003).

Lake Tahoe is the largest alpine lake on the North American continent. It is 22 miles long and 12 miles wide, with a surface area of 122,200 acres or 193 sq. miles. It exceeds 1,640 feet at its deepest location, making it the second deepest lake in the United States.

The source of water for Lake Tahoe is precipitation. A majority of the precipitation falls into the lake directly (USGS 2003). The Lake Tahoe Basin (USGS watershed #16050101) has 63 sub watersheds draining into the lake and one outlet, the Truckee River. Lake Tahoe contains an estimated 39.75 trillion gallons or 122 million acre feet of water. That's enough water to cover the entire state of California to a depth of 14.5 inches. The water that evaporates daily is 1.4 million tons, enough to supply the needs of 3.5 million people on a daily basis. The water in Lake Tahoe is 99.7 percent pure, about the same as distilled water.

The climate in the basin is characteristic of an alpine ecosystem. Between 1948 and 2005 the average maximum summer temperatures were between 94 and 95 degrees Fahrenheit. Summer average daily temperatures range between 57 and 65 F. Annual winter temperatures vary between 40 and 50 degrees with minimums ranging between 20 and 25 F. Snowfall occurs generally in October through March with most snow precipitation accruing in January through March (WRCC 2005).

With one outlet, it takes an average of 700 years for a particle to leave the lake (CTC 2003). Historically, a white plate called a Secchi disk could be seen in the lake at depths of 100 feet. A Secchi disk is an indirect measurement of clarity. The clarity has been reduced on average by 1 foot per year over the last thirty years. Current lake clarity is approximately 70 ft. (UC Davis 2009). The decrease in clarity has been attributed to storm water runoff, urban development, air quality and erosion (EPA 2005).

From the City of South Lake Tahoe, California north along the east side of Lake Tahoe to Tahoe City, California landmarks the north and south boundaries for the TWSA purveyors' combined service areas.



The purveyors' service areas are located in 23 sub-watersheds in the Lake Tahoe basin including: Bijou Park, Burke, Carnelian Bay, Carnelian Canyon, Cedar Flats, Dollar Creek, East Stateline Point, Edgewood, First, Glenbrook, Griff, Incline, Kings Beach, Logan House, McFaul, Mill, North Zephyr, Second, Slaughter House, Tahoe Vista, Third, Watson Creek and Zephyr creeks [Plate 1].

The western service and watershed boundaries of Tahoe City Public Utility District extend from north of Tahoma to Dollar Hill, and along the Truckee River to the Nevada County line. This service area is very large, encompassing almost 22 square miles. Other water suppliers located within the Tahoe Basin include the City of South Lake Tahoe (groundwater source) and small municipal and private homeowners.

### **Truckee River Operating Agreement (TROA)**

The Truckee River Operating Agreement was signed on Sept. 6 2008. This agreement among the 16 parties (United States, California, Nevada, Pyramid Lake Paiute Tribe, and Truckee Meadows Water Authority) was designed to improve the operational flexibility of Truckee River reservoirs, and has been in negotiation for more than 18 years. It is designed to formalize, regulate and monitor water rights and water use within the Tahoe Basin, the Truckee River Watershed and the final outflow areas of Pyramid Lake and the Carson River. Under TROA, Tahoe Basin water rights for water extractions (surface and groundwater) are capped at a total of 34,000 acre feet total, annually. This is divided at 11,000 acre feet per year (afy) for Nevada use and 23,000 (afy) for California use. Implementation of the plan is scheduled for no later than December 2014, unless the deadline is revised.

## Water System Description

As of 2009, the TWSA water suppliers have approximately a total number of 20,185 service hook ups and supply water to an estimated 37,700 residents [Table 1]. Lake Tahoe's year round population was estimated at 52,457 from the United States Census, 2000.

Average water flow for the suppliers ranges between 156,000 gallons per day (gpd) and 2,876,000 gpd. Annual peak water flow ranges between 437,000 gpd and 6,771,000 gpd. [Table 2].

**Table 1: Number of customers and service hook ups for TWSA partner agencies.**

Agency	County, State	Customer Number (2000 Census)	2009 - Number of Service Hook Ups
Kingsbury GID	Douglas, NV	3,937	2506
Round Hill GID	Douglas, NV	1,250	478
Zephyr Water Utility Company	Douglas, NV	1214	479
Cave Rock / Skyland	Douglas, NV	1,264	523
Incline Village GID	Washoe, NV	9,952	8,023
Glenbrook Water Company	Douglas, NV	1,000	250
Edgewood Water Company	Douglas, NV	3,000	11
North Tahoe PUD	Placer, CA	7,399	3,868
Tahoe City Public Utility District	Placer/EIDorado CA	900 (McKinney/Quail) 5700 (utility system total)	445 (McKinney/Quail system) 3,910 (utility system total)
Lakeside Park Association	EIDorado, CA	3000 avg; 5500 peak	137

**Table 2: Average annual flows and peak daily flow estimated from 2006 through 2009 (July 1 to June 30, annually) in gallons per day (gpd) for TWSA partner agencies.**

Agency	2006-2007		2007-2008		2008-2009	
	Average Daily Flow (gpd)	Peak Daily Flow (gpd)	Average Daily Flow (gpd)	Peak Daily Flow (gpd)	Average Daily Flow (gpd)	Peak Daily Flow (gpd)
Cave Rock/Skyland Water System	394,907	818,000	394,238	750,000	405,319	750,000
Edgewood Water Company	880,621	1,800,000	874,500	1,800,000	750,000	1,700,000
Glenbrook Water Company	140,085	600,000	213,000	650,000	215,000	650,000
Incline Village GID	3,163,000	6,250,000	3,025,000	7,435,000	2,876,000	6,771,000
Kingsbury GID	1,230,000	2,470,000	1,160,000	2,470,000	1,114,839	2,131,000
North Tahoe PUD (lake withdrawals /entire NTPUD system)	1,480,000	2,270,000	1,310,000 / 1,470,000	2,050,000 / 2,300,000	1,246,000/ 1,402,000	2,299,000/ 3,031,000
Round Hill GID	224,216	608,800	236,175	551,638	224,785	582,600

McKinney/Quail lake withdrawals /entire Tahoe City PUD	339,000 / 1,610,000	700,000 / 4,400,000	184,000 / 1,740,000	700,000 / 4,200,000	168,000/ 1,626,000	305,000/ 3,900,000
Zephyr Water Utility Company	220,704	400,000	222,855	400,000	235,553	400,000
Lakeside Park Association	242,000	515,000	217,000	656,000	156,000	437,000

### Intakes

The majority of TWSA purveyors pull water directly from Lake Tahoe to service their customers. Nevada State Law provides recommendations that drinking water intakes extend 1,000 feet (ft.) from the shore, set 15 ft. below the surface, and 4 ft. from the bottom of the basin (NAC 445A.6698, NRS 445A.860). The TWSA purveyors' intakes range from 670 ft. to 2,500 ft. long, 28 ft. to 63 ft. deep, and set 3 ft. to 6.5 ft. above the lake bottom [Table 3.0].

**Table 3: TWSA partner agencies' intake length (ft.), depth (ft.) and distance from Lake Bottom (ft.). Intake depth is dependent on the lake level. The depth is measured from Lake Rim.**

Agency	Length (ft.)	Depth (ft.)	Bottom (ft.)
Kingsbury GID	750	60	5
Round Hill GID	2450	52	4
Zephyr Water Utility Company	1100	63	6.5
Incline Village GID	670	30	4
Glenbrook Water Company	2000	60	6
Edgewood Water Company	2500	34	4
North Tahoe PUD	1800	28	4.75
Tahoe City Public Utility District (McKinney/Quail System)	800	26	3
Cave Rock / Skyland	1800	65	6
Lakeside Park Association	2300	37	4

### Population and Land Ownership

TWSA suppliers service the needs of both a permanent and visitor population. The basin is home to approximately 60,000 residents: 20,000 in Nevada and 40,000 in California. During a busy summer weekend 200,000 visitors are estimated to enter the basin. The area includes 14 ski resorts, 14 golf courses, 35 public beaches, 180.5 miles of bike paths, and 425 miles of official unpaved trails. [Plate 3-8] (TRPA 2002). The basin supports an estimated 23 million visitors, per year (US Census 2000).

Development within the basin occurs almost entirely on the low-lying gentle slopes near the lake shore. A majority of the land in the Tahoe Basin is either owned by the US Forest Service or is state land. Approximately 20-25% of the land in the Tahoe Basin is privately owned [Plate 2] (NTCD 2002, HDR 1992).

Land prices and housing costs in the Tahoe Basin are high. For example in Incline Village and Crystal Bay, Nevada, according to the US Census in 2000, the median value for ownership in Incline Village and Crystal Bay was \$514,000. In South Shore, CA the median value for homeowner occupied units was \$157,800. South shore ranked 3,255<sup>th</sup> of 25,117 us cities for

median home prices. Incline Village / Crystal Bay ranked 255<sup>th</sup> of 25,177 U.S. cities for median home prices (Dataplace 05). In 2004, Remax Tahoe Realty reported average and median house selling prices on the California side of south shore of Lake Tahoe as \$380,000 and \$471,000. On the Nevada side of the south shore of Lake Tahoe, prices were \$695,000 median and \$1,185,000 average.

### **Agreements-Regulatory Controls**

Lake Tahoe's famous clarity is a result of its unique physical environment and has gained world support for its protection and preservation. The Tahoe Basin, cradled between Nevada and California, presents a complex political backdrop for protecting Lake Tahoe as a water source. The local government includes: two states, six counties, one city, and multiple special districts. National attention for protection of Lake Tahoe has resulted in the designation of Lake Tahoe as an Outstanding Natural Resource Water and the creation of special agencies, including a large number of non-profits and special interest groups.

Lake Tahoe is designated as an Outstanding Natural Resource Water (ONRW) under the Clean Water Act (1972). Lake Tahoe has the highest level of protection as an ONRW water body and non-degradation rule applies. The effort to protect Lake Tahoe consists of the participation and development of numerous regulatory agencies and special interest groups including: the Tahoe Regional Planning Agency, Lake Tahoe Basin Management Unit, Lahontan Regional Water Quality Control Board (CA) and the Nevada Department of Environmental Protection. Historically, the focus has been on protecting its unique clarity.

Tahoe Regional Planning Agency (TRPA), a bi-state environmental regulatory agency, is responsible for balancing human development and environmental protection in the Lake Tahoe Basin. TRPA is responsible for meeting nine environmental thresholds. The thresholds include: water quality, air quality, soil conservation, vegetation, fisheries, wildlife, scenic resources/community design, recreation, and noise (Bi-Compact 1980). TRPA addresses source water protection issues in Ordinance 83 of the TRPA code of ordinances [Appendix E]. In addition, TRPA is charged with protecting the water quality, including drinking water, at the state of inception as indicated by the code.

The Lake Tahoe Basin Management Unit (LTBMU) manages 150,000 acres of National Forest Land in the Lake Tahoe Basin. It is the largest basin landholder. LTBMU's programs include: watershed management, urban lots, recreation, and wildlife. The Nevada Division of Environmental Protection and the Lahontan Regional Water Quality Control Board enforce state law and policies, respectively, to protect public health, water quality and sustain ecosystems. The Nevada Division of Environmental Protection Bureau of Safe Drinking Water is the regulating authority for Lake Tahoe water suppliers within Nevada; and the California Department of Health Protection Services regulates water suppliers within California.

The Tahoe Regional Planning Agency, USDA Forest Service, the Lahontan Regional Water Quality Control Board and the Nevada Division of Environmental Protection are working together to update their agencies' resource management plans for the Lake Tahoe Basin. The update process is called Pathway and includes three components: pathway steering committee, technical working groups and public comment. These regional plan updates will guide land management, resource management and environmental regulations over the next 20 years.

The Lake Tahoe Basin is a unique system that has gained global recognition. TWSA water suppliers provide water to an estimated 47% of the permanent population. The lake's location and international attention creates a complex political system of government, non-profit, special district, and concerned citizens. Lake Tahoe is seen as one of the most regulated basins in the country. Much of the attention of the regulatory authorities and scientific community has been directed towards Lake Tahoe's famous clarity and does not address the concerns of the drinking water suppliers. One goal of TWSA suppliers is to incorporate drinking water issues into current basin planning and community programs.

### **III: IDENTIFICATION AND MECHANISMS TO CONTROL POTENTIAL CONTAMINATING SOURCES**

A full description of TWSA activities to identify and describe mechanisms to control potential contaminating sources is consolidated in Table 4.0. The TWSA annual reports provide detailed information on yearly monitoring and action to control potential contaminating sources.

#### **2002-2009 TWSA Organizational Highlights**

There have been many improvements in the Tahoe Basin watershed since 2002, on both a physical level, such as through Environment Improvement Projects and policy changes in mechanical operation on roadways, as well as, on a legislative and public outreach level by bringing community awareness to water quality issues.

Since 2002, local water purveyors have played an increasingly important role in coordinated efforts towards source water protection. One major accomplishment to support a concerted effort in this arena has been the formalization of the Tahoe Water Suppliers Association. Over the past 5 years, TWSA has formalized its membership procedures, increased membership by incorporated new members from both the Nevada and the California sides of the lake, and has made excellent progress on addressing many of the recommendations from the 2002 Watershed Sanitary Survey and Management Plan Update.

#### **Formalization of Tahoe Water Suppliers Association**

##### **October 2009 TWSA Membership**

Lakeside Park Association  
 Incline Village General Improvement District  
 Kingsbury General Improvement District  
 Round Hill General Improvement District  
 Edgewood Water Company  
 Zephyr Water Utility  
 Glenbrook Water Company  
 North Tahoe Public Utility District  
 Tahoe City Public Utility District  
 Skyland Water Company  
 Cave Rock Water System  
 South Tahoe Public Utility District\*  
 (\*associate member – no reporting or data management)

The Tahoe Water Suppliers Association is comprised of individual water purveyors who use Lake Tahoe as their source for municipal drinking water. The TWSA has grown from an informal group of 6 Nevada purveyors in 2002, to a formalized group comprised of 12 member agencies. As of July 1, 2008, the TWSA is comprised of 8 water purveyors from the Nevada and 4 water purveyors from the California side.

The Association provides a roundtable for the exchange of strategic and operational information amongst the purveyors, and serves to provide a united effort in areas of watershed management and public education about water conservation and water quality issues.

The collective expertise of the participating members is one of the main strengths of the association. Many of the board members have between 10 to 30 years of experience in the

water and/or wastewater industry. They bring to the association an exceptionally high level of skills, certifications and expertise for dealing with daily and long-term strategic planning relative to protection of the watershed. The Association functions under the rules of the Nevada Revised Statutes 241 and the California Brown Act.

From the TWSA agreement signed July 2007: "Each of the Parties owns and operates a public water system within the Lake Tahoe Basin, which water systems rely all, or in part, upon surface water from Lake Tahoe as their source of water supply. The public water systems of each of the parties, other than Round Hill, Cave Rock/Skyland and Lakeside Park Association\*, are presently exempt from filtration requirements under the Safe Drinking Water Act (SDWA) and applicable regulations. In order to assure a safe water supply and avoid the significant capital and annual operating and maintenance costs associated with filtration treatment, water suppliers must conduct watershed sanitary surveys on a regular basis, participate in an active watershed protection program, and comply with additional requirements. The parties desire to create the Tahoe Water Suppliers Association whose purpose is to develop, implement and maintain an effective watershed control program in order to satisfy recommendations in watershed sanitary surveys, advocate for the protection of Lake Tahoe as a viable source of drinking water, and to satisfy additional state and federal requirements." (\*These systems utilize filtration.)

Nevada members of TWSA first started working together during the state adoption of the 1986 amendments to the Safe Drinking Water Act (SDWA) and the creation of the Surface Water Treatment Rule (SWTR). Together, the Nevada purveyors were successful in including the following language in the Nevada state code, "Alternatively, for the systems at Lake Tahoe, the suppliers of water shall demonstrate that by location of the intake structure, that a level of protection equivalent of watershed control is provided."

The partnership adopted the essential elements of an integrated water management approach for high-quality water source water not requiring filtration including: frequent monitoring, watershed controls, demonstrated history devoid of waterborne disease outbreaks, adequate storage in the event of higher turbidity excursions, and flexibility and redundancy in disinfection process (AWWA). The purveyors also completed the first of three sanitary surveys and control programs (1992) and pilot studies to determine trihalomethane formation potential and ozone disinfection design criteria. As a result, the Nevada State Board of Health granted five suppliers "filtration exemptions," while one supplier implemented filtration.

The 1992 plan, and subsequent updates, identified potential risks to source water quality including: sanitary sewer overflows, urban run-off and hygiene practices of summer boaters and visitors. The idea of forming an agency to deal with source water protection issues was presented in 1992; however, was not implemented until completion of the 2002 ten-year update plan.

In 2002, with encouragement from Nevada State Health officials, six purveyors from the original partnership formed an association under a multi-party agreement to address Federal and State source water protection regulations and fulfill recommendations of previous sanitary surveys. Appointed staff members from each agency comprise the TWSA board.

The Tahoe Water Suppliers Association (TWSA), formally Nevada Tahoe Water Suppliers Association, changed its name in December 2005 with the addition of its first California water purveyor, North Tahoe Public Utility District.

The largest partner, IVGID, offered its Resource Conservationist as the association Executive Director. The agreement stipulates cost sharing of expenses incurred by IVGID on behalf of the association. Members pay an annual fee, in part proportional to the size of their service areas and in part, in equal amounts representing common administrative costs. Recent budgets for TWSA were 2006-2007=\$60,391; 2007-2008=\$75,576; 2008-2009= \$66,644.

### **Legislative / Advocacy Actions 2002-2009**

After 20 years of negotiation, the TRPA Shorezone Ordinance was adopted in the fall of 2008. Since 2004, TWSA staff and members have provided comments to the Lake Tahoe Shorezone Ordinance Amendments Draft Environmental Impact Statement (Shorezone DEIS). The purpose of the DEIS was to review the environmental impacts of amendments to TRPA code 50-56, which regulates activities on the Tahoe basin shore. The amendments proposed regulations that would allow for 0 up to 3019 additional piers to be added to Lake Tahoe depending on the alternative adopted.

The DEIS requires that the parties responsible for public drinking water intakes assess the impact of any newly proposed pier or shore zone structure. The DEIS further requires that 'risk assessment' methodology be utilized to assess risk to drinking water supplies from these new structures proposed.

In addition, TWSA has submitted written and verbal comments to the TRPA on the Shorezone Ordinance advocating that proposed structures located within ¼ mile of a public drinking water intake complete a risk assessment prior to project approval by the Tahoe Regional Planning Agency.

On a practical, administrative level, the Tahoe Water Suppliers Association has been working closely with TRPA staff and in September, 2007 negotiated that a plan check notification be integrated into the TRPA project application process. Notification to the water supplier will be required for any projects within 600' of a ground or 1320' of a surface water source, which is in accordance with the current TRPA ordinance Chapter 83; Source Water Protection.

In addition, TWSA is now involved with monitoring and attending when necessary, the TRPA Interagency Shorezone Coordination Group Members meetings. This group reviews proposed projects along the shoreline, and TWSA presence will allow an early warning system for projects requiring possible risk assessment review.



## **TWSA Public Information and Outreach Highlights 2002-2009**

### **Drinking Water Forum 2005**

On May 5, 2005 the Lake Tahoe Drinking Water Forum was held. It was organized and sponsored by the Nevada Tahoe Water Suppliers Association, United States EPA, Tahoe Regional Planning Agency, Nevada Rural Water Association, Nevada Bureau of Health Protection Services, Incline Village GID, Resource Concepts, Inc., HDR Engineering Inc., and Black & Veatch Corporation. The forum theme was: “Lake Tahoe-It’s NOT just a clarity issue - Protect the Source!”

The purpose of the forum was to educate the public and local officials on the regulatory and health concerns for non-filtering water suppliers and provide a forum for discussion and next steps. A summary of the discussion and concerns was posted on [www.tahoeh2o.org](http://www.tahoeh2o.org). Over 130 participants on the the west coast attended the meeting. National, regional, and local representatives presented regulatory, environmental, and health information to the participants.

The forum was very successful. Media hits were reported from as far away as Las Vegas and Los Angeles. The response supported TWSA’s efforts to bring drinking water protection to the forefront of Lake Tahoe preservation efforts. Following the meeting, purveyors’ concerns about intake protection were incorporated into the Shorezone Ordinance and funding for a TRPA staff member focused on source water protection was allocated.

In January of 2006, the TWSA Executive Director met with representatives of the Nevada Rural Water Association, Environmental Protection Agency—Region 9, Nevada Division of Environmental Protection, and the Tahoe Regional Planning Agency to assess the need and potential for a second Lake Tahoe Drinking Water Forum. It was agreed that another forum in the same format would not be effective; however, the group supported a day-long meeting to organize and educate a Tahoe Basin Source Water Protection working group.

### **TWSA “Protect the Source” Campaign 2003-2009**

Since 2003, TWSA has developed an ongoing public information outreach campaign which included the creation of the Nevada Tahoe Water Suppliers Association (NTWSA), and later, the TWSA logo and website [www.tahoeh2o.org](http://www.tahoeh2o.org). Outreach materials are themed around the slogans “Protect the Source”. Educational materials include a “Keep Tahoe Clean” brochure, “Tahoe Top 10 Water Conservation” factsheet, “Drink Tahoe Tap” stickers and “Don’t Move a Mussel” outreach materials. In 2009, 45 large format aluminum signs were produced. These “Lake Tahoe is your Drinking Water/Protect the Source” signs were posted at area wide beaches and boat ramps. Promotional materials of a TRPA approved wildflower seed blend has been handed out, as well as, bio-degradable dog waste collection bags. TWSA members provide these in their offices for customer education, and the materials are used at all outreach events.

The “Drink Tahoe Tap” campaign, is in ongoing development, and parallels the national campaign of “Think Outside the Bottle”. This campaign addresses increasing customer confidence in municipal drinking water systems’ quality product, over bottled water options. Campaign launch began in the fall of 2007. Currently, there are several videos posted on You Tube about Lake Tahoe Drinking Water:

<http://www.youtube.com/watch?v=cRml3a4qq0M>

[http://www.youtube.com/watch?v=cO0HZ8mSG\\_8](http://www.youtube.com/watch?v=cO0HZ8mSG_8)

These videos are only a few of hundreds of other videos on bottled water / local tap water issues.

TWSA staff maintains an active, annual outreach program including hosting a blind 'drinking water taste test' at local Earth Day Festivals, Children's Science Day, Lake of the Sky Festival, Living Green at Tahoe, and multiple events at the Tahoe Center for Environmental Sciences. Outreach emphasis is on connecting residents and visitors with self-directed action to protect the lake, focused on the "Protect the Source" and "Drink Tahoe Tap" campaigns.

In addition, TWSA maintains a program of placing paid advertisements and submitting articles on water conservation and watershed protection in local papers. TWSA staff provides water conservation materials to all members.

In 2009, staff plans to re-initiate development of a larger scale campaign addressing the need for dog owners to clean up feces. A small number of dog waste stations have been installed in several purveyor areas.

### **Awards and Recognition for Source Water Protection Campaigns**

As a result of TWSA's "Protect the Source" campaign, the group has received several awards:

In October 2009, the Tahoe Water Suppliers Association was honored to receive the CA/NV American Water Works Association (AWWA) and United States Environmental Protection Agency (US EPA) Region 9 - "2009 Exemplary Source Water Protection Award for Medium Systems".

In December 2009, TWSA Executive Director (Madonna Dunbar) received the Parasol Community Collaboration's "2009 Living Green Award" for the member agency or individual that has demonstrated green living in the community through stewardship and collaboration.

In 2008, IVGID's Waste Not Programs were awarded the "Best Environmental Programs Award" by the Parasol Community Foundation, which includes the department's outreach and reporting work for TWSA.

In spring 2007, The Nevada Division of Environmental Protection, Bureau of Safe Drinking Water recognized the collaborative work of the TWSA with the awarding of the "2006 Wendell P. McCurry Excellence in Water Quality Award".

Tahoe Water Suppliers Association won the California-Nevada Section American Water Works Association (AWWA) "Exemplary Source Water Protection Award" in the fall of 2005 and the "National AWWA Exemplary Source Water Protection Award" for a medium size system in spring 2006.

### **TWSA Milestones**

In each of the previous sanitary surveys issues and suggestions for improvement were authored. Over the past years, the TWSA members have worked individually and collaboratively to address many of these recommendations. The milestone accomplishments are listed in the following table in the areas of public education and outreach, data management, watershed controls of detrimental activities and other areas of concern, which have been addressed since 2002.

**Comparison of General Regulation to Mechanism for Fulfillment of Mandates Watershed Control Program 2003-2009**

<b>Required Components of Watershed Control Program</b>	<b>Mechanisms implemented for fulfilling the required components of the watershed control program for all non-filtering water suppliers</b>
<p><u>Description of watershed:</u> A description of the watershed is a necessary component of an effective sanitary survey and watershed control program. As stated in federal and state guidelines and reiterated in previous sanitary surveys the description must consist of: a general review using the parameters location, topography, soil evaluation, and water rights; climatological data using the parameters snow depth, water content, temperature, flow, stream, location and analysis, and an estimate of run-off into the lake by each stream within the watershed; Landownership using the parameters zoning, percent developed (categorized by private, residential, and national forest, and service area); and intake description using the parameters location, capacity, pipe size, length, depth, year installed, and screen condition.</p>	<p>The description of each watershed was completed within previous sanitary surveys and is updated in this report.</p> <p>All water suppliers are expected to update changes annually within the watershed using the parameters associated with a general review, climatological data, land ownership, and intake description.</p> <p>Since 2003, the TWSA annual reports provided detailed descriptions of changes within each purveyors watershed, related map, and a general overview of changes within the Tahoe Basin.</p>
<p><u>Identification of detrimental activities within the watershed:</u> Identifying detrimental activities within the watershed is a necessary component of an effective sanitary survey and watershed control program. As stated in federal and state guidelines and reiterated in previous sanitary survey, when identifying potential hazards one must consider: natural hazards including precipitation, terrain, soil, land cover, erosion, fires, wildlife; man-made point sources including wastewater treatment including accidental releases and sewer line breaks; and, man-made non-point sources including roads, pesticides, logging, grazing/feedlots, recreation, unauthorized potential activity, storm run-off, vessel wastes, and transportation.</p>	<p>The identification of detrimental activities within Nevada Tahoe basin watershed was identified in the initial sanitary survey (HDR 1992) and supported by proceeding sanitary surveys.</p> <p>The preparation for the sanitary surveys included identification of potential new detrimental activities within their watersheds. All purveyors are expected to participate in basin wide efforts and develop communication with other agencies and stakeholders.</p> <p>Purveyors implement aerial photography, obtain early warning of spills, observe construction projects adjacent to normal maintenance/inspection routes and critical locations in effort to note changes within the watershed detrimental activities and identify new sources of pollutants.</p>
<p><u>Control of Detrimental Activities</u></p>	<p>Distribution of public education information through utility bill stuffers, newspaper /radio ads to the public and patrons (4 -12 annually).</p>
	<p>Creation of brochure describing Lake Tahoe as "source water" and includes protection techniques (BMP's, etc.).</p>
	<p>Printing of newspaper articles (1 spring, 1 fall) related to watershed management annually.</p>

	Participation and support for Lake Tahoe Environmental Education Coalition (LTEEC) media campaign
	Active participant in the Parasol Community Foundation and Parasol Community Foundation Environmental Team.
	Developed the <a href="http://www.tahoeh2o.org">www.tahoeh2o.org</a> website that includes public information on source water protection.
	Posted signs at beaches, marinas, boat launching facilities ("Protect the Source", dog waste collection, quagga mussel information, etc.).
	Participated in no dumping stenciling activities
	<p>Developed and implemented school programs and participation on outreach events such as Adopt-A-Watershed, World Water Monitoring Day, Earth Day, etc.</p> <p>Developed the Clean Water Team volunteer monitoring program. Initially grant funded by NDEP, this program is maintained and funded by TWSA.</p> <p>Instituted IVGID weekly beach sampling monitoring program.</p>
	Develop flyers to be displayed at forest service offices, visitor centers, local groups, stores, etc.
	Actively participate in basin wide interagency discussion forums under the Sierra Watershed Program developed by the Nevada Tahoe Conservation District or similar program (2-4 sessions annually).
	<p>Voiced water service concerns at public planning events. Involvement has been extensive in TRPA Shorezone Ordinance language and notification process.</p> <p>Check mechanism put into place on TRPA project application process to ensure purveyors have notification of possible projects near intakes.</p>
	TWSA has funded, through cooperative agreement with the Army Corps of Engineers the development of a working Risk Assessment Model. The model allows purveyors to work together with project developers to assess potential development risks to water supply.
	Obtains proposal information from Tahoe Regional Planning Agency and other stakeholders.
	Participated in legislative discussions/revisions where necessary.
	Formation of Lake Tahoe Waste Water Treatment Infrastructure Partnership (LTWIP) with member agencies representing key waste water treatment and conveyance sewer providers for the Tahoe Basin.
	Advised the state and federal agencies when their presence would be useful.

	Supported policies that limit the size and locations of grazing areas corrals, etc; suggest that microbiological contaminants be added to sampling procedures; ensure wastewater point-source discharges control efforts and policies do not change to substantially effect non-filtering water purveyors; encourage the establishment of buffer areas between livestock and surface waters.
	Seeking cooperation of landowners, Tahoe Regional Planning Agency, Nevada Department of Forestry and California Department of Forestry to ensure BMP's are implemented.  Provided customers with information regarding NTCD and TRPA free BMP evaluation services.  Coordinated with Nevada Tahoe Conservation District on BMP and Backyard Conservation program outreach.  Hosted BMP class for residents August and October 2007 through Nevada Tahoe Conservation District.
	Secured funding for watershed management programs, through formalization of TWSA agreement.
	Hosted the 2005 Tahoe Drinking Water Forum, which provided a roundtable forum for federal, state and local government, non-profits and interested parties in source water protection.
	Established an on-going program of watershed management that includes: data management, watershed partnerships, tracking feedback system, GIS mapping and emergency action plan.
	Created a position of watershed coordinator to work with water purveyors to initiate watershed management recommendations. Coordinated with other agencies involved with the basin. Preparation of TWSA annual reports has been on schedule since 2002.
	Negotiated with the TRPA and other appropriate agencies to create a 1/4 mile risk assessment required buffer protection zone around the intakes – restrictions adopted in the Shorezone Ordinance Oct. 2008.
	Implemented BMP's on utility controlled land.
	Extended intakes to minimum of thirty feet.
	Implemented education programs as discussed.
	Continuing routine maintenance on export lines; IVGID major upgrades to export line 2004-2009.
	Optimized treatment facilities and investigating intertie opportunities for emergency supply and fireflow needs.
	When possible, created a buffer zone around the intake.
	Maintained or created emergency storage to allow water service of storage during extremely high turbidity water quality episodes.

	Continued practices to prevent overflows and leaks from pipelines and pump stations.
	Evaluated intake locations with respect to existing recreational activities. TWSA has initiated the process of monitoring for invasive species (quagga/zebra mussels), with an inspection/monitoring program.
<u>Monitor activities that may potentially be detrimental to the watershed</u>	
Routine: note when, where, and how minimum specifications for raw water quality parameters were met.	Continues to monitor raw water for turbidity, total coliform, and or fecal coliform. Monitor for Giardia, Cryptosporidium and viruses. Turbidity; Coliform 1-17 samples per month, fecal 1-17 samples monthly, Giardia, Crypto, and viruses quarterly. Monitor turbidity and chlorine residual continuously by all purveyors.  Responded to new regulations in a timely manner.
	Improve lab and monitoring QA/QC techniques
Specifics: Monitor key threats to microbiological integrity including: recreation, storm water runoff, wastewater facilities, and forest fires	Established locations of tributaries and begin quarterly monitoring for microbiological data.  Incline Beach sampling continues weekly. Expanding to new location is limited by funding.
	Contact is ongoing with local agencies to gather tributary data collaboratively.
	Works with TRPA and other agencies to assess and mitigate impacts of boating and shorezone development on water quality.
	Coordinates with other agencies to assess the effectiveness of BMP's in reducing microbiological contaminants, or assess the impact of specific activities on drinking water quality.
	Tracking of weather events is in process, and relate to turbidity spiking.
	Collaborate with other agencies to gather data from existing programs.
	Created a watershed file that includes information on potential threats to microbiological integrity including: documents on spills, collection system breaks, erosion control projects, recreation and weather events.
<u>Develop a program to gain ownership or control of the watershed:</u> 1) Describe efforts to obtain ownership, special programs (include budget) 2) When ownership is not, efforts should be taken to gain ownership of critical elements including highly erodible land, access areas etc. 3) Describe how utility ensures that the land owner complies with these agreements 4) Written agreements should be obtained recognizing the watershed as part of public water supply. Utility should have flexibility to control land uses which	Monitor/Track: Routine and special task data; spills; equipment and failure, etc.; storm water run-off, activities of basin stakeholders, etc.

have an adverse effect on water quality.	
	<p>Created a collaborative data management system for routine data. Used in annual reports.</p> <p>Obtain when possible, written agreements with public landowners in buffer zones of a watershed related to specific watershed controls.</p> <p>Participates in regional programs such as Sierra Watershed Partnership, Nevada Tahoe Conservation District, in effort to jointly manage watersheds.</p> <p>Participates in regional planning efforts.</p> <p>Ongoing involvement in legislative and public education tasks.</p> <p>770 acres purchased in 2008 at Incline Lake by U.S. Forest Service and IVGID. The majority of the land be retired from development. IVGID has collected \$ 1 million combined District and Q1 funds committed towards the purchase of a 5 acre portion of the total purchase of lands at Incline Lake.</p>
<p><u>Annual Report</u> Includes: 1) Summary of data collected, identification of special concerns identified in the watershed and how they were handled, 2) descriptions of other activities in the watershed which could or did affect water quality in the past year, 3) anticipated activities that are expected to have an adverse impact on water quality in the future, 4) a description of how the water agencies intend to address them.</p>	<p>Completed Annual Reports 2003-2009. Copies available by contacting TWSA.</p>

## **IV: MONITORING AND DATA MANAGEMENT**

### **TWSA Member Agency Data Collection**

Since 2003, a central database has been established which serves to manage raw water data for temperature, coliform and turbidity information for all TWSA members. Daily data records are collected each month from all TWSA water purveyors. TWSA Annual Reports provide detailed raw water quality information for the purveyors.

The EPA defines monitoring as a method to identify new potentially contaminating activities and control existing activities. Water suppliers are required to monitor raw water for constituents that may affect human health. The suppliers established a central drinking water quality database to: improve accessibility, evaluate long term health of their water supply, distinguish water quality trends, and identify potential treatment methods.

In 2003, Incline Village GID expanded their volunteer surface water monitoring program to include additional analyses and monitoring sites. During the same period, staff also combined existing climatic databases in the basin for future causal studies. These are initial steps in expanding our water quality monitoring program.

From 2006 to 2009, the Tahoe Water Suppliers Association (TWSA) collaborated with the Army Corps of Engineers, the University of California-Davis, and Black & Veatch Consulting to complete a risk assessment study and improve current monitoring programs.

### **TWSA Mapping Program**

Using the 2002 Sanitary Survey updates and corresponding watershed maps as a template, the Tahoe Water Suppliers Association created a watershed mapping program in 2003. For the past several years, TWSA staff has developed extensive reference maps, defined by watershed, on the Lake Tahoe Basin as a method to: describe the watersheds, identify land ownership and land use changes, ascertain potential sources of drinking water contamination, and locate potential areas of future monitoring. Maps have been created for the water purveyors that describe: land ownership, land use, general description and location, service boundaries, potential contaminating sources, and recreation. The maps have been useful in describing the watershed features, identifying inconsistencies and areas of improvement for basin-wide mapping programs, locating potential sources of contamination, and structuring education and monitoring programs. The maps also serve as a historical tracking mechanism for land use changes within the Tahoe Basin. A sample of most relevant maps to date, are located in the map section of this report. [Appendix C]

Using data collected from TWSA purveyors and inter-agency partners such as the TRPA, U.S. Geologic Service and the U.S Forest Service; the TWSA staff plan to continue to maintain ongoing mapping projects relative to watershed management.

### **TWSA / Army Corps of Engineers Risk Assessment Model Project 2006-2009**

The entire Risk Assessment Report is provided in [Appendix D].

The 1996 amendments to the Safe Drinking Water Act resulted in a fundamental change from treating contaminated sources of drinking water to preventing contamination. The amendments require the states to establish and implement a Source Water Assessment Program (SWAP) and non-filtering water suppliers to implement source water protection programs specific to preventing microbial contamination. A source water assessment is intended to provide a strong



basis for developing, implementing and improving to a source water protection plan. SWAP can be used to focus environmental public health programs developed by federal, state and local governments, as well as efforts of public water utilities and citizens, into geographic areas defined by hydrology.

Potential Contaminating Sources (PCS) are generally identified within a source water assessment based on EPA guidelines. A PCS is defined as “Any facility or activity that stores, uses, or produces as a product or by-product, the contaminants of concern and has a sufficient likelihood of releasing such contaminants to the environment at levels that could contribute significantly to the concentration of these contaminants in the source waters of the public water supply” (EPA, 1997). The SWAP previously prepared for the Tahoe Basin was based on National MCL identified in regulations and are not specific to the region or watershed. Considering the Lake Tahoe Basin is a source of drinking water for multiple water purveyors and a unique environment, additional information on potential sources of contamination was needed.

The Risk Assessment model builds upon the SWAP to further quantify the risk of contamination from PCS for the Lake Tahoe Basin water supplier drinking water intakes. The risk assessment also identifies potential mitigation for high risk activities and/or emergencies. Importantly, the assessment helps identify response time necessary to protect human health during an emergency.

### **Purpose**

The development of the model provides water purveyors with a hands-on system to quantify immediate potential threats to the raw water used in the municipal water delivery systems, from proposed projects. It will also help to identify potential mitigations for a proposed activity, and it will provide water suppliers with information to react to emergency spills and/or leaks of potential contaminants within their watersheds.

- It is a tool for decision making.
- Address potentially contaminating activity within ¼ mile of intakes.
- Help determine level of risk of human disease, transmission, and infection.
- A detailed report on the model is provided in [Appendix D].

### **Watershed-Intake Modeling Tool**

A cooperative agreement with the Army Corps of Engineers secured a total of \$387,500 to fund design costs for the development of the Risk Assessment model project. The model is now completed for Phase 1. Perri Standish-Lee with Black & Veatch, served as the Project Manager. The development of the model provides water purveyors with a hands-on system to quantify immediate potential threats to the raw water used in the municipal water delivery systems from proposed projects. It will also help to identify potential mitigations for a proposed activity and it will provide water suppliers with information to react to emergency spills and/or leaks of potential contaminants within their watersheds.

### **Time of Travel Model**

The time of travel information inputs into the Watershed-Intake Modeling Tool to predict the travel times to intakes. This model identifies water intakes and streams that flow into the lake nearest the intakes; estimate stream velocities in contributing watersheds for low, median, and high flow conditions; constructs time of travel contour maps for each watershed; identifies high-risk areas with major road and sewer crossings; uses the USACE 2004 study to support risk assessment of sewer systems; calculates travel times for each sub-watershed for each flow

condition (distance/velocity); constructs GIS maps of travel time contours for each flow condition; overlays roads and sewers on maps; assesses relative risks of land-based sources of contamination at shoreline.

#### **July 4, 2006 Beach Monitoring Study**

The first step to creating the model occurred over the July 4 holiday weekend in 2006. Project team recorded recreation use numbers on all beaches located within a 1/4 mile of all TWSA water purveyor intakes. Staff recorded the number of beach-goers, swimmers, dogs, and boats using the beach facilities. Black & Veatch Consulting, retained by TWSA as the project leader, began initial data analysis.

#### **NTPUD 2004 Intake Risk Study**

In 2004, NTPUD commissioned a study by Black and Veatch, to evaluate the effects of high summer human recreation use, as potential source of contamination on the Agate Bay drinking water intake. Results of the study were presented at the AWWA CA/NV Fall 2004 Conference. Study supported that the strategic placement of drinking water intakes is a primary tool in a multi-barrier approach to protect the water quality at intake. [Appendix D]

Reference	Constituent	Units	Regulation	Exception
NAC 141.71 (a)	Turbidity	NTU	The turbidity level cannot exceed 5 NTU in representative samples of the source water immediately prior to the first or only point of disinfection application.	Unless: The state determines that any such event was caused by circumstances that were unusual and unpredictable; and as a result of any such event, there have not been more than five events in the past 120 months that the system served water to the public, in which the turbidity exceeded 5 NTU.
40 CFR 141.71 NAC 445.266	Fecal Coliform/ Total Coliform	cysts/ml	Fecal Coliform must be less than or equal to 20/100 cysts/ml or Total Coliform must be less than or equal to 100/100 cysts/ml in at least 90% of the measurements made for the system served water to the public. Tests should be taken in representative samples of the source water immediately prior to the first or only point of disinfection application. The supplier must continue to be in compliance with the maximum contaminant level for total coliform to retain non-filtration avoidance permit.	
LT2	Enteric Viruses	Cysts/L	Goal is to find no enteric viruses. Existing regulations did not require unfiltered systems to provide any treatment for <i>Cryptosporidium</i> . Although unfiltered systems maintain watershed control programs to protect water quality, recent surveys have shown <i>Cryptosporidium</i> to be present in the sources of unfiltered systems. Without treatment, these <i>Cryptosporidium</i> will pass into the water distributed to consumers. Available data indicate that the average risk from <i>Cryptosporidium</i> in unfiltered systems is higher than in filtered systems, so that treatment by unfiltered systems is required to achieve comparable public health protection. Further, with available technologies like UV and ozone, treatment for <i>Cryptosporidium</i> is feasible for all unfiltered systems. Consequently, EPA is establishing requirements under the LT2ESWTR for all unfiltered systems to treat for <i>Cryptosporidium</i> , with the required degree of treatment depending on the source water contamination level.	

### **TWSA OPERATORS UNDER FILTRATION EXEMPTION**

Incline Village General Improvement District (IVGID)  
 Kingsbury General Improvement District (KGID)  
 Edgewood Water Company (Edgewood)  
 Zephyr Water Utility (Zephyr)  
 Glenbrook Water Company (Glenbrook)  
 Ozone and chlorine residual for delivery

North Tahoe Public Utility District (NTPUD)  
 Ultra-violet (UV) disinfection and chlorine residual for delivery

### **TWSA OPERATORS USING FILTRATION TREATMENT**

Tahoe City Public Utility District (TCPUD); McKinney Quail system  
 Skyland Water Company (Skyland)  
 Cave Rock Water System (Cave Rock)  
 Round Hill General Improvement District (RGID)  
 Lakeside Park Association (LPA)  
 Filtration and chlorine residual for delivery

The EPA defines water quality monitoring as a method to identify new potentially contaminating activities and control existing activities. Water suppliers are required to monitor raw water for constituents that may affect human health. In 2002, the Tahoe Water Suppliers Association established a central drinking water quality database to improve accessibility, evaluate long-term health of their water supply, distinguish water quality trends, and identify potential treatment methods. Between 2003 and 2004, Incline Village GID expanded their volunteer surface water monitoring program to include additional analyses and monitoring sites. During the same period, staff also combined existing climatic databases in the basin for future causal studies. The Tahoe Water Suppliers Association (TWSA) worked with the Army Corps of Engineers, the University of California-Riverside, and Black & Veatch Consulting to complete a risk assessment study and improve current monitoring programs. These were initial steps in expanding the water quality monitoring program.

#### **Raw Water Monitoring**

Under the Surface Water Treatment Rule, TWSA non-filtering water suppliers are required to complete turbidity (NTU) and total or fecal coliform analyses on raw drinking water, 40 CFR §141.71(a). Samples are taken from the first pump station out of the drinking water intake pipe prior to treatment. Sample time is dependent on the flow of raw water relative to community demand. For example, Glenbrook Water Company serves a seasonal community and often does not pump or sample raw water daily during the winter months. The non-filtering water suppliers currently test raw water for total and E. coli coliform. State standards are met based on total coliform results. The filtering water suppliers are not required to test for total or fecal coliform on raw water.

All water suppliers are required to submit the daily maximum and daily average of the required constituents to the Nevada Department of Environmental Protection Bureau of Safe Drinking Water and the California Department of Health Services on a monthly basis. Any violations of the monitoring or constituent levels must be reported immediately. Violations may require

additional monitoring, reporting, customer alerts including boil orders, or ongoing treatment dependent on the violation type and duration.

To help suppliers identify potential problems and future treatment processes, TWSA developed a combined database which includes:

- Maximum turbidity
- Total coliform
- E. coli coliform

Each year TWSA members water quality data is published. The TWSA Annual Report summarizes for each purveyor raw water data for the July 1 to June 30 reporting years. Included in the annual reports are long-term yearly data ranging between 4 and 11 years depending on data submission. The data analysis includes the following:

- Monthly Mean and Maximum turbidity
- Annual Mean and Maximum turbidity
- Monthly Mean and Maximum Total coliform
- Annual Mean and Maximum Total coliform
- Annual Mean and Maximum E. coli coliform

The goal of the analysis is to identify trends and potential methods of improving supply and treatment processes. Following is a brief overview of the purveyors combined raw water sample results during the 2008-2009 reporting year and between 1997 and 2008 reporting years. Individual reports are located in the agency sections within this document.

## **TWSA Purveyor Raw Water Monitoring Multi-Year Summary**

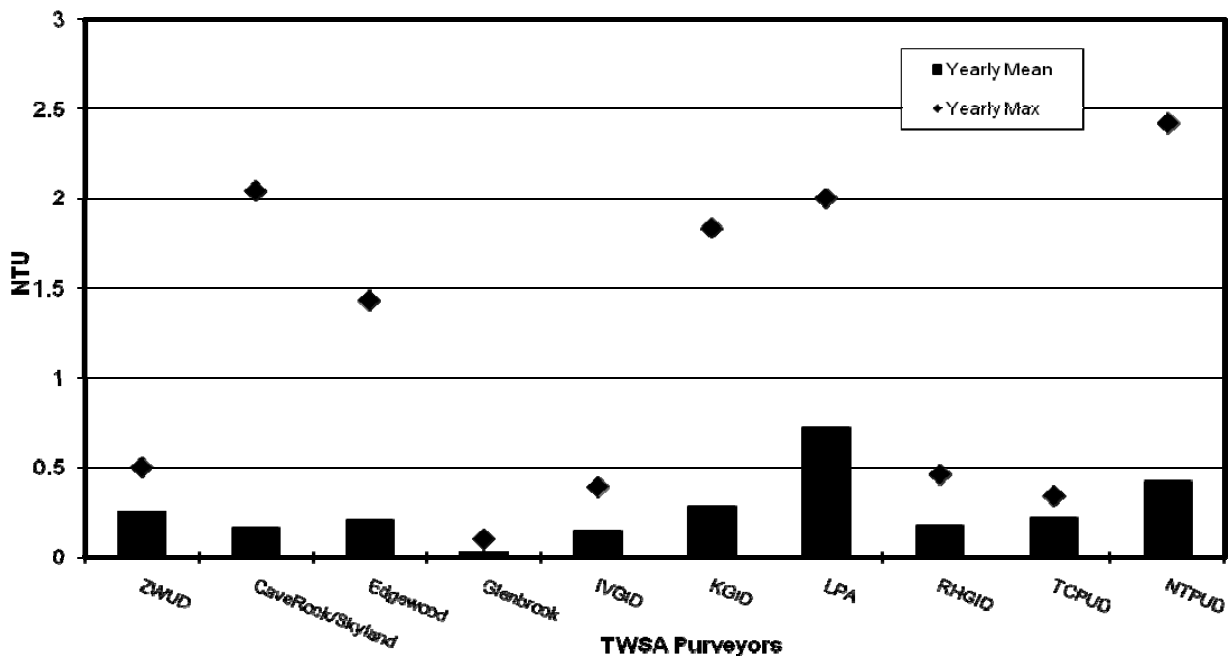
### **Turbidity 2008-2009**

During the 2008-2009 reporting year, the maximum turbidity readings for the purveyors was between 0.01 NTU and 2.42 NTU. The purveyors' maximum turbidity readings occurred at different times of the year but tended to occur during the spring and fall due to weather events. The highest monthly mean turbidities ranged between 0.06 and .09 NTU and occurred mostly during July and October 2008. The highest maximum turbidity reading for all TWSA water purveyors, 2.42 NTU was taken from the NTPUD intake on July 29, 2009 and was related to high winds. The highest yearly mean turbidity reading for the TWSA Purveyors was 0.9 NTU and was taken from the Lakeside Park Association's intake that filters raw water prior to distribution.

**Summary of TWSA raw water turbidity between 2008 and 2009.**

2008-2009 (NTU)	Cave Rock/Skyland	Edgewood	Glenbrook	LPA	IVGID	KGID	TCPUD	NT PUD	RH GID	ZWUD
Maximum	2.04	1.43	0.1	2	0.39	1.83	0.34	2.42	0.46	0.5
Date Maximum	4/20/09	12/14/08	9/7/08	6/14/09	10/31/08	5/4/09	7/9/08 10/13/08	7/29/08	9/1/08	8/19/08 5/4/09
Highest Monthly Mean	0.26	0.35	0.06	0.9	0.17	0.37	0.24	0.74	0.28	0.33
Date Mean	Jun-09	Aug-08	Aug-08	Oct-08 Jun-09	May-09	Aug-08	Oct-08	Jul-08	Jun-09	Aug-08

**Figure 1.0: Comparison of Annual Mean and Maximum Turbidity Results for TWSA Purveyors for the 2008-2009 Reporting Year.**



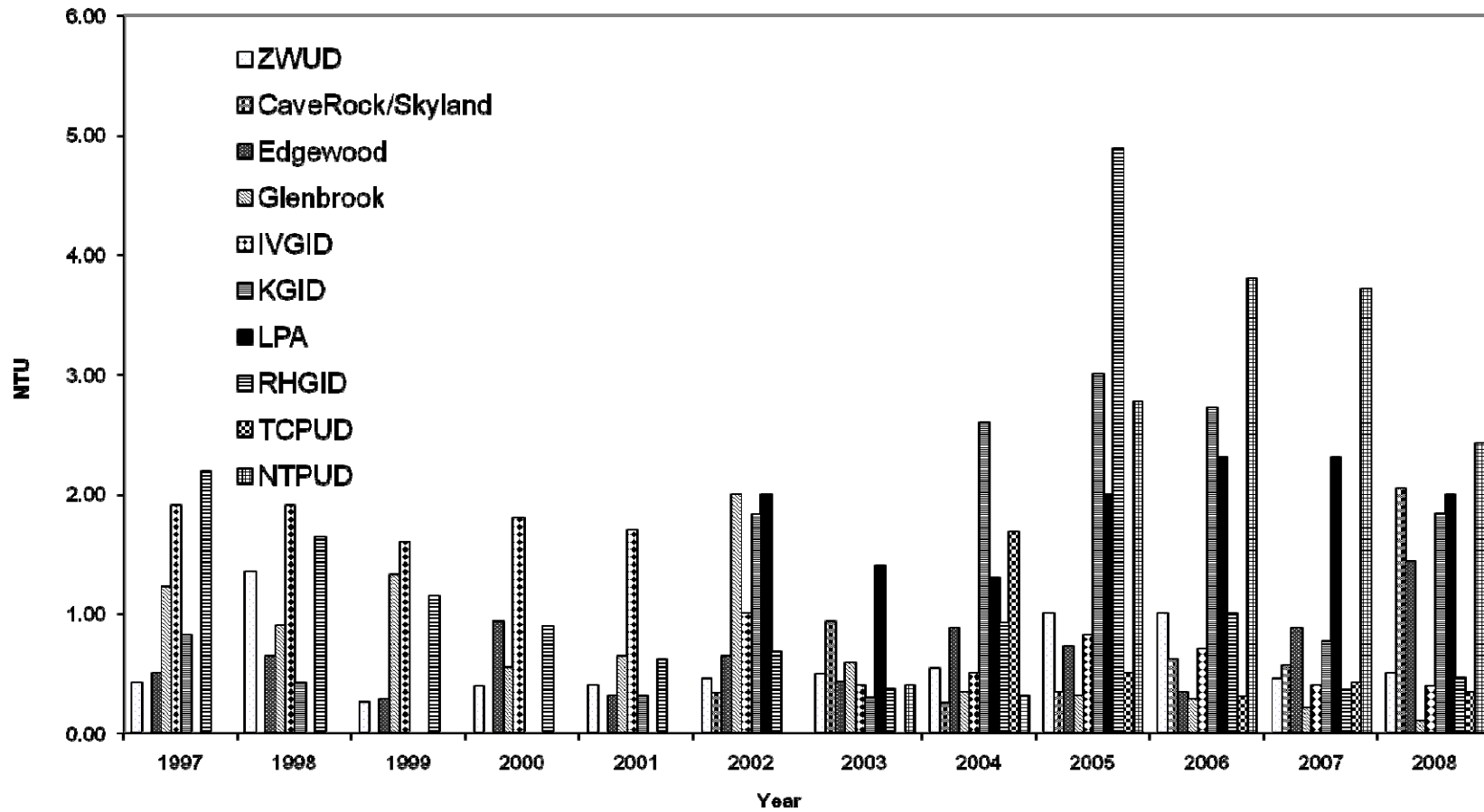
### Long Term Data on Turbidity

For the past eleven reporting years, maximum turbidity for each of the purveyors has varied. Although no trends visually appear, many of the maximum turbidity values have been larger the last five years (2004-2008) than during years 1997-2003.

Historical mean annual turbidity is the most consistent for each of the purveyors  
The annual range throughout all the reporting years and purveyors is 0.11 NTU to 0.57 NTU. .

<b>Comparison of TWSA Purveyors Annual Mean Turbidity for the July 1, 1997-June 30, 2009 Reporting Years.</b>												
(units NTU)	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Cave Rock/Skyland	No Data Submission					0.11	0.15	0.12	0.2	0.13	0.14	0.16
Edgewood	0.15	0.15	0.14	0.14	0.14	0.14	0.13	0.22	0.15	0.13	0.15	0.20
Glenbrook	0.3	0.27	0.27	0.22	0.32	0.27	0.21	0.15	0.11	0.09	0.07	0.28
IVGID	0.31	0.28	0.26	0.17	0.22	0.22	0.17	0.17	0.18	0.14	0.12	0.14
KGID	0.13	0.13	0.15	0.07	0.12	0.19	0.18	0.22	0.29	0.29	0.23	0.28
TCPUD	No Data Submission							0.22	0.21	0.21	0.2	0.22
NTPUD	No Data Submission						0.20	0.15	0.47	0.46	0.43	0.42
RHGID	0.57	0.42	0.17	0.15	0.15	0.19	0.13	0.14	0.22	0.21	0.43	0.17
ZWUD	0.17	0.17	0.18	0.21	0.21	0.17	0.18	0.21	0.26	0.24	0.24	0.26

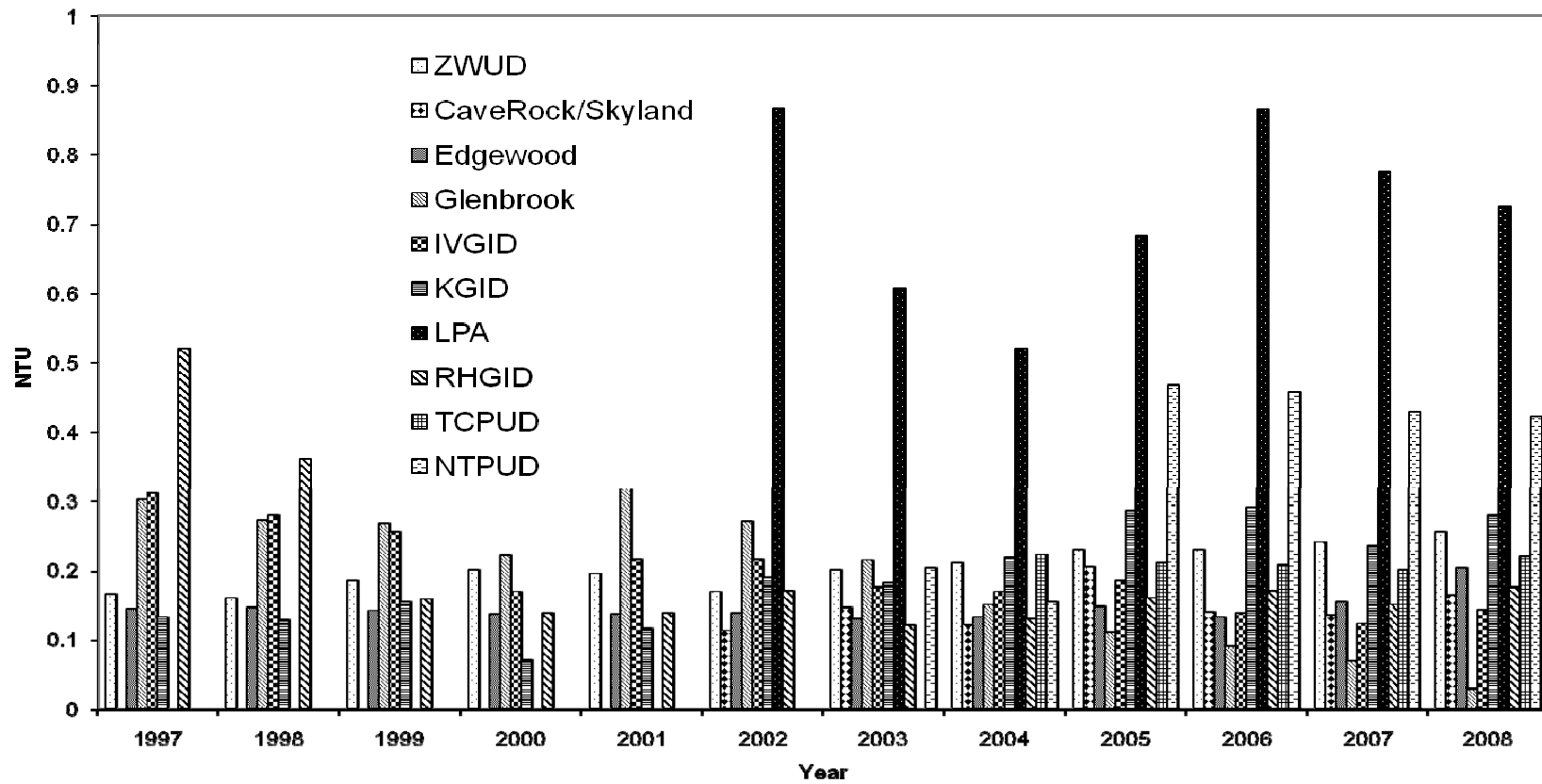
Figure 1.2: Comparison TWSA Purveyors Maximum Turbidity Results from 1997 to 2008.



Note: Purveyors bar graphs are in same order on axis as the legend list.



**Figure 1.3: Comparison of TWSA Purveyors Annual Mean Turbidity for the 1997-2008 Reporting Years.**



Note: Purveyors bar graphs are in same order on axis as the legend list

### Coliform Data

Short and long term coliform data are presented below:

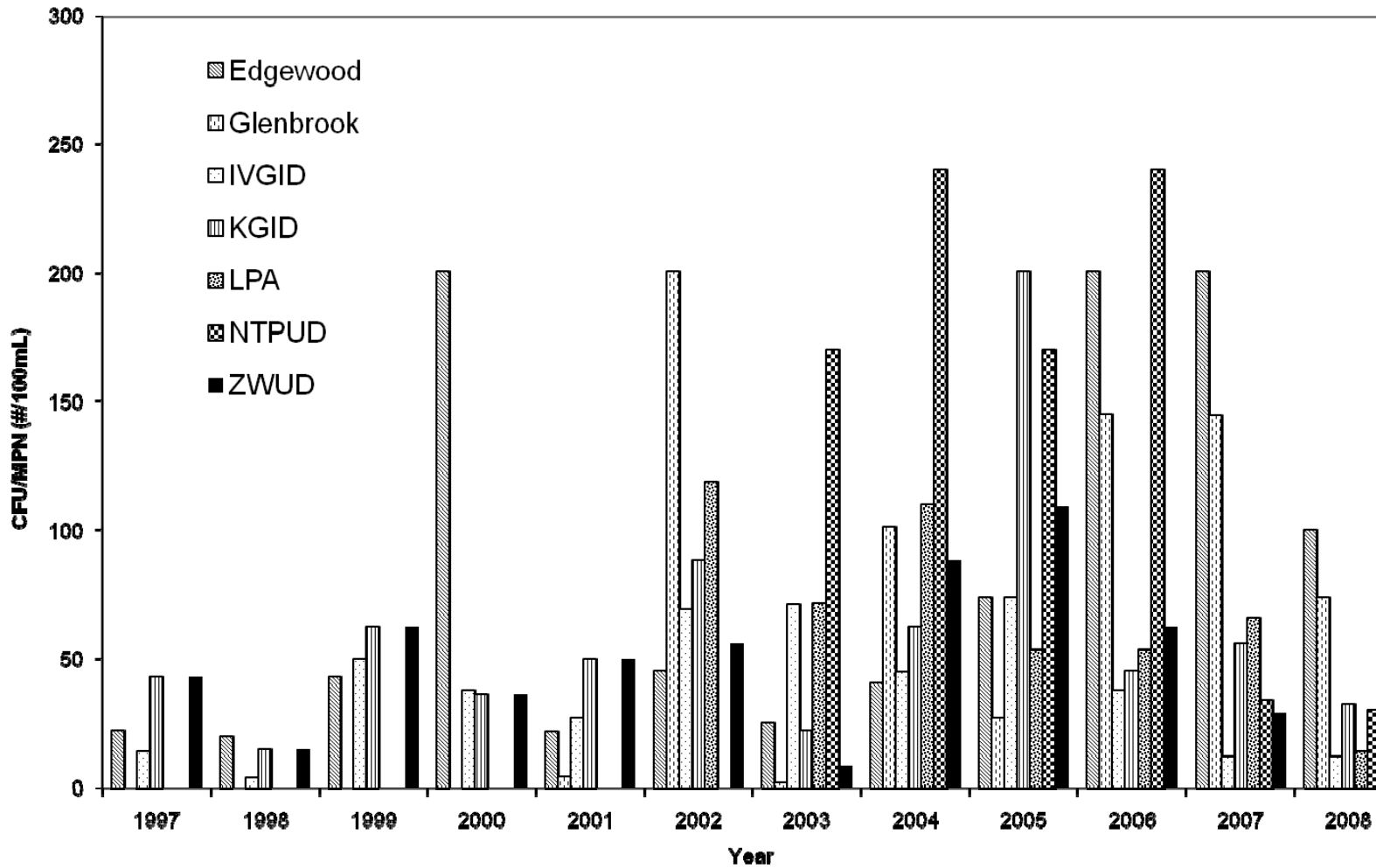
The maximum total coliform is the highest number of colony forming units per 100 mL, CFU, or most probable number of colony forming units per 100 mL, MPN, counted from a single raw water sample during a reporting year. The mean total coliform count is the average number of colonies counted per individual sample during the reporting year or month. Historical raw water data suggests that the maximum and mean total coliform count is highly variable between years.

During the 2008-2009 reporting year, the maximum total coliform readings for the purveyors was between 7 and 100 CFU/MPN. The annual mean total coliform results for the purveyors were between 0.2 and 5.1 CFU/MPN. The highest annual total coliform reading 100 CFU, and was taken from the Edgewood Water District intake on May 12, 2009.

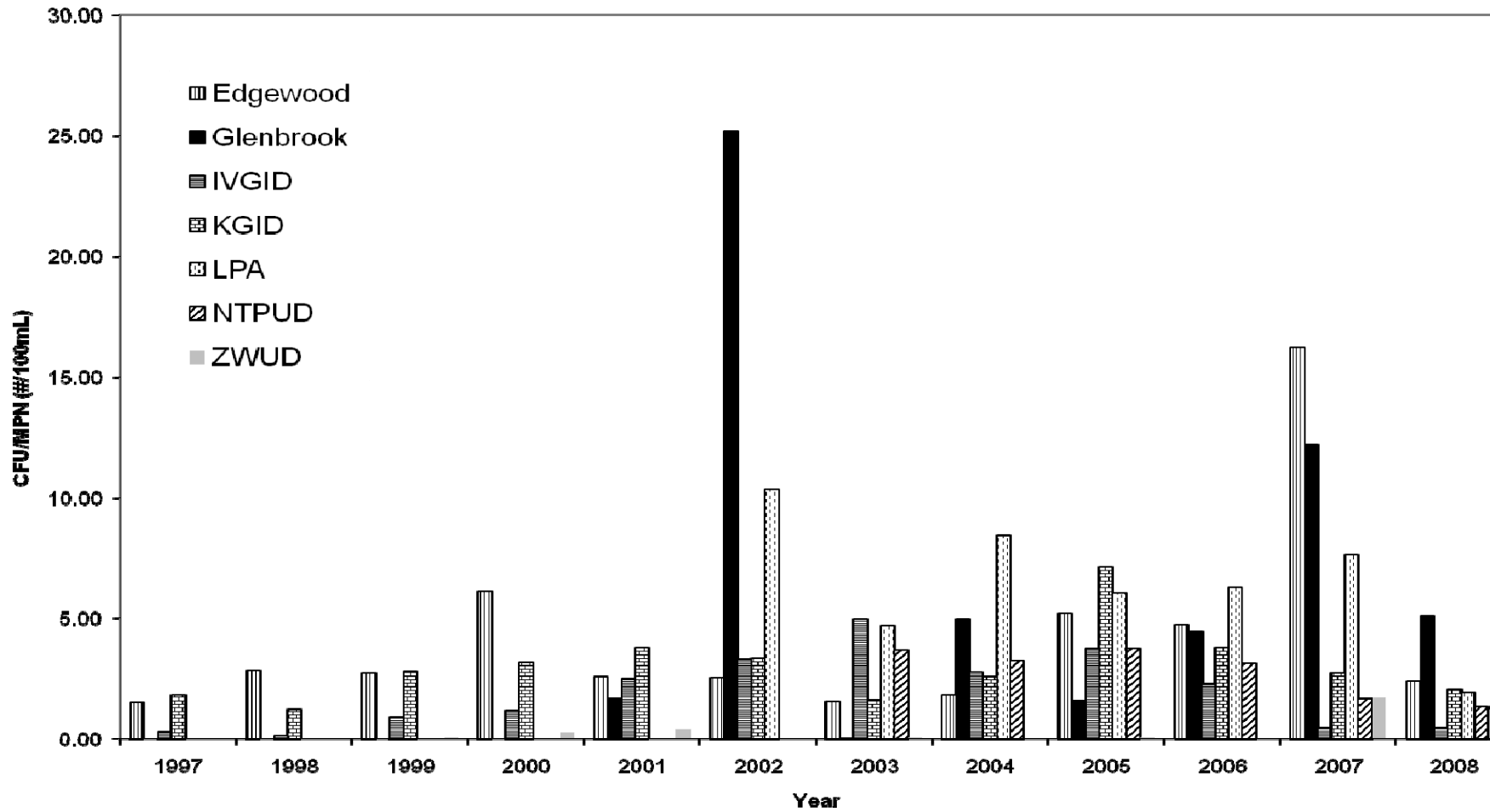
The TWSA water purveyors all remained well under regulatory limits.

For the 2008-2009 reporting year, a comparison of annual maximum total coliform (CFU or MPN/100mL) and annual mean of total coliform (CFU or MPN/100mL) by date for TWSA water suppliers.							
Annual Total Coliform CFU (#/100mL)	LPA	Edgewood	Glenbrook	IVGID	KGID	NTPUD	Zephyr
Maximum	14	100	74	7	32	30	13
Date Maximum	Jul-24-08	May-12-08	Sep-16-08	Jul-30-08	Jul-15-08	Aug26-08	Jul-30-08
Mean	1.9	2.4	5.1	0.2	2.1	1.3	1.2

**Figure 1.5: Comparison of TWSA Purveyors Maximum Total Coliform for the 1997 to 2008 reporting years.**



**Figure 1.6: Comparison of TWSA Purveyors Mean Total Coliform Results for 1997 to 2008 Reporting years.**



### **Surface Water Monitoring**

Since 1999, Incline Village General Improvement District has partnered with Nevada Division of Environmental Protection to provide a volunteer surface water monitoring program on the north shore of Lake Tahoe. Monthly or bi-monthly (seasonal adjustment), volunteers collect surface water samples, test physical and chemical characteristics of the water, and make visual observations from between nine and eleven sites in the Incline Village area. IVGID staff also manages a weekly stream and beach monitoring program.

The Incline Village Clean Water Team is a volunteer water monitoring program in the Incline Village/Crystal Bay area. The team has focused on surface water monitoring at eleven locations [Plate 11]. At each site volunteers monitor dissolved oxygen, electrical conductivity, gage height, pH, and stream flow and collect two grab samples. The grab samples are analyzed in the lab for total coliform, fecal coliform, and turbidity. Results from surface water streams has led IVGID staff to broken water pipes and identified social recreation areas (dog walking areas). The information was valuable in providing advice on the future location of a new dog park that would combine areas of high dog use into a managed site.

In 2003, IVGID added a beach monitoring program. Once a week, staff collects samples from four beach sites and the mouths of two streams [Plate 10]. The samples are analyzed in the lab for turbidity, total coliform, and E. coli coliform. The results of the tests are used to determine if additional studies are needed to assess the effect of recreation activity on source water quality. Initial results indicate an increase in the total coliform at beach and creek sites during the summer months. In the summer of 2005, IVGID staff consulted with professors at the University of Nevada, Reno and Desert Research Institute to improve sampling procedures and complete additional analyses. The object is to improve the program and mimic the study on the Nevada shore of the Lake Tahoe basin. The goal is to identify and remove or reduce potential contaminating sources.

### **Climatic Database**

In 2004, IVGID staff developed an internal climatic database using information gathered from Lake Tahoe Basin weather station sites located within the TWSA water purveyor watersheds. The purpose of the database is to provide accessible weather data for causal correlation analyses. The weather stations collect: wind speed (maximum and average), wind direction, precipitation, humidity, temperature (maximum and minimum), and snow depth.

During the time frames November 11-15, 2006, December 23-28, 2006, February 20-26, 2007 and March 25-31, 2007, high turbidity and/or total coliform events were reported by multiple water suppliers [Table 5.0 & Table 5.2]. By comparing the above listed high turbidity and coliform time frames with climatic data recorded by the Incline Creek Nevada weather station, managed by the Desert Research Institute, for those specific times, the climatic data shows wind gusts and precipitation events.

For the month of May 2007, a majority of TWSA water purveyors' monthly maximum turbidity reading occurred during the time frame May 12-20, 2007. The high turbidity readings can be explained by higher daily air temperatures, a lack of freezing nighttime air temperatures, and snowmelt runoff in local streams.

Most maximum turbidity and coliform events correlate to weather events and can be seen in the individual purveyor data sections in each year's TWSA Annual Report.

The location of the weather station and variability in available and dependable data has limited the statistical comparison of intake information to weather. Potential improvements may include adding weather stations to each of the purveyors first pump station at the intake. Other possible studies may include completing a bathometric study near the intakes to determine the potential affect of current on the water quality.

### **Safe Drinking Water Information System (SDWIS)**

*<http://www.epa.gov/safewater/databases/sdwis/index.html>*

The Environmental Protection Agency maintains a Safe Drinking Water Information System to track and inform people if a water purveyor has been in violation of the Safe Drinking Water Act. These violations can relate to health, reporting, or monitoring requirements that were not met.

EPA's Safe Drinking Water Information System (SDWIS) databases store information about drinking water. The federal version (SDWIS/FED) stores the information EPA needs to monitor approximately 156,000 public water systems. The state version (SDWIS/STATE) is a database designed to help states run their drinking water programs.

TWSA purveyors who had violations in the 2008-2009 reporting year include, Edgewood Water Company, Glenbrook Water Company, Kingsbury General Improvement District, Lakeside Park Water Association, and Skyland Water District. For details refer to the table below.

**2008-2009 Violations by TWSA Purveyors of the Health, Reporting, or Monitoring Requirements of the Environmental Protection Agency's Safe Drinking Water Act (SDWIS 2008-2009)**

Edgewood Water Company  
Monitoring/Reporting & Violations

System failed to complete all samples or sample in a timely manner, or had another non-health-based violation. A significant monitoring violation means the system failed to take a large percentage of the required samples. Non-significant monitoring violations indicate that the water system failed to take some of the required samples, but did do some of the required sampling.

Type of Violation	Sampling Period Begin Date	Sampling Period End Date	Contaminant
Monitoring, Routine Major (TCR)	Feb-01-2009	Feb-28-2009	Coliform (TCR)
Follow Up Action	Date of Response	Violation ID	
St Public Notif requested	Mar-19-2009	41709	
St Violation/Reminder Notice	Mar-19-2009	41709	

Glenbrook Water Company  
Monitoring/Reporting & Violations

System failed to complete all samples or sample in a timely manner, or had another non-health-based violation. A significant monitoring violation means the system failed to take a large percentage of the required samples. Non-significant monitoring violations indicate that the water system failed to take some of the required samples, but did do some of the required sampling.

Type of Violation	Sampling Period Begin Date	Sampling Period End Date	Contaminant
Monitoring, Routine Major (TCR)	Jan-01-2009	Jan-31-2009	Coliform (TCR)
Follow Up Action	Date of Response	Violation ID	
St Public Notif requested	Fe-28-2009	52709	
St Violation/Reminder Notice	Fe-28-2009	52709	

Table 5.3 Continued

Kingsbury General Improvement District

Monitoring/Reporting & Violations

System failed to complete all samples or sample in a timely manner, or had another non-health-based violation. A significant monitoring violation means the system failed to take a large percentage of the required samples. Non-significant monitoring violations indicate that the water system failed to take some of the required samples, but did do some of the required sampling.

Type of Violation	Sampling Period Begin Date	Sampling Period End Date	Contaminant
Monitoring and Reporting (DBP)	Apr-01-2008	Jun-30-2008	Bromate
Follow Up Action	Date of Response	Violation ID	
St Public Notif requested	Dec-12-2008	62108	
St Violation/Reminder Notice	Dec-12-2008	62108	

Round Hill General Improvement District

Monitoring/Reporting & Violations

System failed to complete all samples or sample in a timely manner, or had another non-health-based violation. A significant monitoring violation means the system failed to take a large percentage of the required samples. Non-significant monitoring violations indicate that the water system failed to take some of the required samples, but did do some of the required sampling.

Type of Violation	Sampling Period Begin	Sampling Period End Date	Contaminant
-------------------	-----------------------	--------------------------	-------------

CCR Complete Failure to Report	Date	Jul-01-2008	Dec-31-2025	Consumer Confidence Rule
Follow Up Action	Date of Response	Oct-02-2008	Violation ID	
St Public Notif requested	Oct-02-2008	64409		
St Violation/Reminder Notice	Oct-02-2008			
Type of Violation	Sampling Period Begin Date		Sampling Period End Date	Contaminant
Follow-up and Routine LCR Tap Sampling	Oct-01-2000		Oct-31-2025	Lead and Copper Rule
Violation ID 53601				
<p>Incline Village General Improvement District  Monitoring/Reporting &amp; Violations  System failed to complete all samples or sample in a timely manner, or had another non-health-based violation. A significant monitoring violation means the system failed to take a large percentage of the required samples. Non-significant monitoring violations indicate that the water system failed to take some of the required samples, but did do some of the required sampling.</p>				
Type of Violation	Sampling Period Begin Date		Sampling Period End Date	Contaminant
Monitoring of Treatment (SWTR-Unfit/GWR)	Nov-1-2008		Nov-30-2008	SWTR
Follow Up Action	Date of Response		Violation ID	
St Public Notif requested	Mar-19-2009		8309	
St Violation/Reminder Notice	Mar-19-2009			



## **TAHOE BASIN SURFACE WATER MONITORING PROGRAMS**

Lake Tahoe is a renowned area for scientific study. In 1999, three Tahoe research groups, the University of California--Davis, University of Nevada Reno, and the Desert Research Institute, signed the Tahoe Environmental Science System (TESS), a plan for scientific cooperation in the basin. During the same year the Lake Tahoe Science Advisory Group was established. Other local projects include volunteer-based monitoring programs and studies on the affects of recreation on water quality.

The Tahoe Science Consortium (TSC) includes representatives from the Desert Research Institute, University of Nevada Reno, University of California, Davis, Tahoe Regional Planning Agency, the U.S. Geological Survey, and the U.S. Forest Service. In 2001, the Lake Tahoe Science Advisory Group identified key research and monitoring needs for the Lake Tahoe Basin. In coordination with local non-profits, the Tahoe Regional Planning Agency and Lahontan Regional Water Quality Board host collaborative monthly meetings and an annual forum to disseminate scientific information. The Tahoe Regional Planning Agency is also completing an online database, the Tahoe Integrated Information Management System (TIMIS), to organize basin research projects.

### **Tahoe Environmental Research Center (TERC) Deploys Autonomous Underwater Vehicle**

TERC began a lake-wide experiment in August, 2009 with the deployment of an autonomous underwater vehicle (AUV) in Lake Tahoe. The AUV, known as Gavia, resembles a torpedo but is equipped with a broad suite of scientific instruments. These include high resolution cameras, side scan sonar, fluorometers for detecting algal chlorophyll and dissolved organic material, water temperature and conductivity, and water current velocity. The Gavia is programmed ahead of time to tell it what course to follow, what depth to dive to and how far off the bottom to cruise.

The Gavia will be used as part of TERC's study of aquatic invasive species in the lake. The Gavia will perform a complete circumnavigation of the lake at a depth of about 18 feet. This is the depth at which the heaviest concentrations of Asian clams have been found to date. Along the way it will take high resolution images of the lake bottom twice every second, as well as measuring other water quality parameters. The images will be analyzed the same day, and help rapidly guide researchers to find new areas of the lake that are impacted by invasive clams. To date clams have only been detected in the south-east corner of Lake Tahoe.

The Gavia will also help map areas of the lake that are being impacted by new filamentous green algae. The Gavia project is being conducted in collaboration with the University of British Columbia. It is funded by both California and Nevada state agencies, and is part of a concerted effort by researchers from both UC Davis and UNR to meet the challenges being posed to Lake Tahoe by invasive species.

## **Near-Shore Water Quality Monitoring Buoy at Lake Tahoe Linking On-Shore and Near-Shore Processes**

*<http://www.dri.edu/reports/1869>*

Prepared by Desert Research Institute, Reno, NV for Nevada Division of State Lands, April, 2009. Contract Award LTLP 06-11

Snapshot surveys have historically been used at Lake Tahoe to assess near-shore water clarity. Although they can provide data along the entire lake perimeter, snapshot surveys are not well suited for quantifying longer-term trends because of the lack of data between individual surveys. The objective of this project was to address several practical questions pertaining to the construction, operation, and maintenance of an autonomously deployed near-shore buoy capable of providing continuous water clarity measurements.

The buoy was deployed 40 meters off of Third Creek (Incline Village, NV) between April and October of 2008. Sensors included two turbidimeters, a light transmissometer, a water temperature sensor, a wind speed and direction sensor, and associated supporting electronics. Biofouling of the sensor's optics was the greatest concern in limiting the length of autonomous deployment. For turbidity, the integrated wiper system was successful at eliminating biofouling concerns. For light transmission, simple anti-biofouling techniques were moderately successful at inhibiting biofouling, requiring routine cleaning approximately twice a month.

Additional approaches that could be used to increase this cleaning interval were discussed. The degradation of near-shore water clarity generally reflected elevated sediment loads of the adjacent creeks, however, wind and lake currents were capable of pushing turbid plumes away from the buoy. Turbidity measured within the adjacent creeks was diluted by a factor of three-to one, or more, compared to that measured at the buoy. The Third Creek watershed exceeded current near-shore thresholds (3 NTU) during four percent of the 3451 hours that the buoy was deployed. Near-shore water temperatures were also influenced by the input of creek water during some occasions, but prevailing air temperatures and wind-driven mixing with colder waters were also controlling factors.

Relative to light transmission, turbidity was not as responsive to the degradation of water near optically clear background conditions. Based on their poor performance at ultra-low turbidity levels, it was concluded that turbidimeters should only be used to assess obvious clarity degrading events (e.g. >1 NTU), such as for compliance monitoring. The light transmissometer was more suitable for long-term monitoring of near-shore conditions as it measured both scattering and absorption processes and was sensitive to small clarity changes under background conditions.

These results were used to assess where current Lake Tahoe near-shore water quality standards are deficient, providing basin managers with six points to consider when discussing future threshold updates. A cost-effective near-shore monitoring plan was suggested comprised of shorter-term compliance monitoring using turbidimeter-based systems and longer-term threshold monitoring using transmissometer-based systems. This binary approach takes advantage of the strengths of each sensor technology to address the different objectives of short- and long-term monitoring programs. Continuous measurements from buoy-based systems will provide a new level of detail that previous near-shore snapshot surveys were not capable of, including the definition of long-term trends and a mechanism to support compliance and the implementation of more realistic thresholds that permit threshold exceedance during unusual or infrequent events.

### **Lake Tahoe to Pyramid Lake Snapshot Day event**

Snapshot Day is an event which has grown over the past years, between local partners within the Tahoe Basin, Truckee River and Pyramid Lake watersheds. The Snapshot Day event provides a picture of regional watershed water quality during a specific 3 hour time frame, on a single day during the months of May or June. Annually, over 300 volunteers collect water quality data from 105 locations within the watersheds. Reports and Data from the event through 2007, is available at: <http://www.tiims.org/Citizens-Gateway/Citizens-Monitoring/Reports.aspx>.

In spring 2008, TWSA staff accepted a leadership role in this event, serving as the North Lake Tahoe Coordinator. In 2009, TWSA continued to provide staff support, and event funding; as well as continue to provide a leadership role in this event in the future.

Fecal coliform sampling on Snapshot Day attempts to locate 'hot spots' or areas of potential microbial sources. Over the years Snapshot Day leaders have changed the locations where fecal coliform sampling occurs, which has helped them determine which sites will continue to be monitored annually and which sites do not pose a microbial threat (Whitney *pers. comm.* 2006).

### **Incline Village Clean Water Team (Volunteer Monitoring)**

Incline Village Clean Water Team volunteers monitor water quality in the Incline Village area. The streams in Incline Village discharge directly into Lake Tahoe. To protect their drinking water source, the Incline Village Clean Water Team (IVCWT) monitoring helps identify existing problems and helps prevent future water quality issues.

Bi-monthly, volunteers monitor 11 different sites in Incline Village, on Deer, Incline, Third, and Rosewood Creeks and on an unnamed tributary on Diamond Peak. Volunteers collect: habitat information, physical and chemical characteristics of the water quality, and water samples for lab analysis. The data collected is organized and available to state and local agencies as well as anyone who may have an interest in a specific area.

The Incline Village Clean Water Team goals are to:

- Promote water quality awareness
- Make the connection that Lake Tahoe is your drinking water
- Promote at home water conservation and pollution prevention
- Provide supplemental data to state and local agencies
- The group participates in Snapshot Day and World Water Monitoring Day, annually.

A summary of the Clean Water Team volunteer monitoring sampling results for coliform and turbidity from 2004 to spring 2007 are available in the TWSA 2008 Annual report.

In the past, results from surface water streams led IVGID staff to broken water pipes and identified social recreation areas (dog walking areas).

### **Incline Village Beach Monitoring Program**

IVGID staff also manages a weekly beach monitoring program. In 2003, IVGID began this beach monitoring program. Once a week, staff collects samples from four beach sites and the mouths of two streams [Plate 10]. The samples are analyzed in the lab for turbidity, total coliform, and E. coli coliform. The results of the tests are used to determine if additional studies are needed to assess the affect of recreation activity on source water quality. Initial results indicate an increase in the total coliform at beach and creek sites during the summer months.

In the summer of 2005, IVGID staff consulted with professors at the University of Nevada, Reno and Desert Research Institute to improve sampling procedures and complete additional analyses. In 2008 TWSA staff redesigned the databases to be more searchable and to improve use of the database for analysis. The ongoing goal is to identify and remove or reduce potential contaminating sources.

### **Other Basin Monitoring Programs**

Lake Tahoe is a renowned area for scientific study. In 1999, three Tahoe research groups: the University of California-Davis, University of Nevada Reno and the Desert Research Institute signed the Tahoe Environmental Science System (TESS), a plan for scientific cooperation in the basin. During the same year the Lake Tahoe Science Advisory Group was established. Other local projects include a South Lake Tahoe volunteer based monitoring programs and studies on the affects of recreation on water quality.

The Lake Tahoe Science Advisory Group includes representatives from the Desert Research Institute, University of Nevada Reno, University of California, Davis, Tahoe Regional Planning Agency, the U.S. Geological Survey, and the U.S. Forest Service. In 2001, the Lake Tahoe Science Advisory Group identified key research and monitoring needs for the Lake Tahoe Basin. In coordination with local non-profits, the Tahoe Regional Planning Agency and Lahontan Regional Water Quality Board host collaborative monthly meetings and an annual forum to disseminate scientific information.

### **Climatic Database**

IVGID staff uses information gathered from Lake Tahoe Basin weather station sites located within the TWSA water purveyor watersheds. The purpose of the database is to provide accessible weather data for causal analyses. The weather stations collect: wind speed (maximum and average), wind direction, precipitation, humidity, temperature (maximum and minimum), and snow depth.

By comparing the above listed high turbidity and coliform time frames with climatic data recorded by the Incline Creek weather station (managed by the Desert Research Institute) for those specific times, the climatic data shows wind gusts and precipitation events.

A majority of TWSA water purveyors' monthly maximum turbidity reading occurred during the spring runoff, intense rain events, or high wind events. In the spring, high turbidity readings can be attributed to higher daily air temperatures, a lack of freezing nighttime air temperatures, which increases snowmelt runoff in local streams.

The location of the weather station, and variability in available and dependable data, has limited the statistical comparison of intake information to weather. Potential improvements may include adding weather stations to each of the purveyors first pump stations at the intake. Other possible studies may include completing a bathometric study near intakes to determine the potential affect of current on the water quality.

## **LAND AND WATER RECREATION**

The Lake Tahoe Basin is world renowned for its recreation opportunities. In 2008, Lake Tahoe ranked first in the nation in choice vacation destinations newly ranked by the major travel Web site, TripAdvisor.com. This independent worldwide travel source put Lake Tahoe atop the list of its first Choice Destinations Awards, based on the opinions of millions of travelers; Tahoe ranked 10th worldwide. The Lake Tahoe Visitor Center reports that the basin supports over 23 million visitor days per year. The Lake Tahoe Basin supports ski resorts, beaches, forest access, hiking, biking, parks, and golf courses [Appendix C]. The recreation facilities located within the TWSA purveyors' area estimated 1,702,578 visits per year in 2008. [Table 4.0].

## Recreation Visitation Numbers

**Table 4.0: Number of reported visitors to recreation facilities in the TWSA purveyors' watershed during the 2002-2009 reporting years.** Methods of estimating visitors are variable and dependent on agency. Numbers should not be interpreted as exact.  
(Blank spaces = No data provided or available)

WATERSHED	SITE	2002	2003	2004	2005	2006	2007	2008
Burke Creek	Nevada Beach	82,000	82,000	84,200	119,020	90000	100,000	125,000
Logan House Creek	Glenbrook Beach						750	500
Burke Creek	Round Hill Pines Beach	30,000	35,000	40,000	25,000	35,300	37,000	40,000
McFaul Creek	Zephyr Cove Resort/Marina	500,000	500,000	391,804	450,000	430,000		
Edgewood Creek	Edgewood Golf Course	20,430	21,000	20,000	20,000	20,000	19,000	18,500
Edgewood Creek	Edgewood Restaurant	47,830	39,300	45,954	25,000		20,000	22,000
Glenbrook Creek	Camp Galilee		363	2,237	3,560	2,677	2,900	3,052
McFaul Creek	Zephyr Point Presbyterian Conference Ground	5,980	5,866	18,429	15,315		22,804	
Logan House Creek	Cave Rock Marina		97000	150732	145791	196,783	147,711	148,460
Glenbrook Creek	Glenbrook Golf Course	7,400	7,400		13000	7,500		7,000
Incline	Incline Recreation Center	34,965	99,800	93,832	103,715	109,951	121,064	133,153
Incline	Burnt Cedar Beach			58,252	59,656	38,246	72,571	66,647
Incline	Incline Beach			56,615	57,202	34,672	63,616	62,684
Incline	Ski Beach			25,772	26,272	18,041	29,732	30,496
Incline	Preston Field							17,000
Incline	Aspen Grove			6,545	10,598			
Incline	Incline Park							21,000
Incline	Incline Tennis			12,183	14,038	13,239	10,381	14,494
Incline	Diamond Peak Ski Resort			121,481	105,000	115,000	127,668	100,709
Incline	Incline Championship Golf Course			3,232	27,000	27,536	25,990	24,933
Edgewood Creek	Lakeside Beach							
NTPUD	Kings Beach Recreation Center						30,644	32,199

NTPUD	Tahoe Vista Recreation Area							474
NTPUD	North Tahoe Regional Park							4,460
NTPUD	Brockway Golf Course						27,000	22,000
NTPUD	Tahoe Vista Beaches							4,236
Edgewood	Tahoe Shores Private Beach				400	450	2762	1,600
Edgewood	4-H Camp (UNR manages)				5,270	5,270	4,700	4,250
NV State Parks	Spooner Lake				104,857		107,280	102,304
NV State Parks	Sand Harbor	437,717	491,336	454,341	426,314	1,003,878	848,701	695,427
TOTALS		1,166,322	1,379,065	1,608,443	1,781,512	2,168,256	1,840,425	1,702,578

## Inter-Agency Programs

As previously stated, the Tahoe Basin Watershed is managed by a complex synthesis of federal, state, local and private ownership. The following paragraphs highlight some of the major investments in watershed and source water protection management in place since 2002.

### US Army Corp of Engineering Studies

Extensive studies, including the current TWSA/US Army Corps Drinking Water Intake Risk Assessment Model, have been conducted on water quality protection topics between 2002-2009. Several of the studies address potential sources of pollution (sewer systems and storm runoff) relative to drinking water protection. The following table summarizes US Army Corp of Engineering Studies in this area. As of October 2009, the following detailed studies are available at: <http://www.spk.usace.army.mil/projects/civil/tahoe/documents/WaterQuality.html>.

#### Lake Tahoe Water Quality Studies

##### 1. Hydrologic Design Criteria Study

- Hydrologic Design Criteria Workshop Video - April 11, 2007 featuring David Goldman
- Final Summary Report (Hydrologic Design Criteria), Sep. 2007
  - Attachment 1: Task 1 Assessment Report (183 KB)
  - Attachment 2: Depth-Duration-Frequency Curves (2.2 MB)
  - Attachment 3: Regional Regression Equations (2.3 MB)
  - Attachment 4: Watershed Modeling Techniques (1.9 MB)
  - Attachment 5: Precipitation Depth-Duration-Frequency (1.9 MB)
  - Cold Regions Research and Engineering Laboratory (379 KB)
  - Comparison of MM5 Precip to Gage Precipitation (83 KB)
- Lake Tahoe Basin Hydrology Study - Compilation and Evaluation of Available Hydrologic Information - OCT 2002
- Lake Tahoe Basin Hydrology Collected Data (ZIP Files):
  - Lake Data (ZIP File / 697 KBytes)
  - Precipitation:
    - City of South Lake Tahoe (ZIP File / 1.9 MBytes)
    - El Dorado (ZIP File / 215 KBytes)
    - Meyers Fire Station (ZIP File / 3 KBytes)
    - NCDC (ZIP File / 20 MBytes)
    - State Parks (ZIP File / 692 KBytes)
    - Tahoe Research Group (ZIP File / 93 KBytes)
    - Western Regional Climate Center (ZIP File / 590 KBytes)
  - SNOTEL (ZIP File / 3.8 MBytes)
  - Snow Course (ZIP File / 388 KBytes)
  - Stream Flow (ZIP File / 1.1 MBytes)
  - DSS:
    - Tahoe (ZIP File / 2.8 MBytes)
    - City of South Lake Tahoe (ZIP File / 2.5 MBytes)



- [El Dorado](#) (ZIP File / 61 KBytes)
- [Lakes](#) (ZIP File / 362 KBytes)
- [NRCS](#) (ZIP File / 3.4 MBytes)
- [Precipitation](#) (ZIP File / 28 MBytes)
- [State Parks](#) (ZIP File / 1.1 KBytes)
- [Stream Flow](#) (ZIP File / 1.1 KBytes)

## 2. Groundwater Nutrient / TMDL Evaluation

This study analyzes, maps, and quantifies nutrient loading impacts caused by groundwater on overall lake clarity. This study also develops possible remedial measures to reduce this nutrient loading.

- [Lake Tahoe Basin Framework Study Groundwater Evaluation, October 2003 \(Final\)](#)
- [Interim Study Update \(MAY 2002\)](#)
- [Technical Project Management Plan \(Final\)](#)
- [Scope of Work \(Final\)](#)
- [South Lake Tahoe Modeling Statement of Work \(Draft\)](#)

## 3. Shorezone Sanitary Sewer Evaluation 2003

This study identifies and prioritizes remedial measures that can be deployed to reduce the risks of release of nutrients and other pollutants from wastewater collection facilities in the shorezone around Lake Tahoe.

- [Lake Tahoe Basin Framework Study Wastewater Collection System Overflow/Release Reduction Evaluation \(Final Report - April 2003\)](#) or download as [one Pdf file](#) (11 Mbytes)

## 4. Stream Erosion TMDL Evaluation

This study analyses sediment and nutrient loads and temporal trends to Lake Tahoe from stream channel erosion to produce a bulk number of nutrient contribution for the Basin, with breakdown by watershed types. Product will also explore quantification of lake clarity impacts due to stream erosion.

- [Draft Final Lake Tahoe Basin Framework Implementation Study: Sediment Loadings and Channel Erosion](#) or download as [one Pdf File](#) (24 Mbytes)

## 5. Incline Village Hydrology Study - 2000

This hydrology study is to estimate the 10-, 50-, 100-, and 500-year flows in the eight Incline Village area creeks along the north shore of Lake Tahoe, Nevada.

- [Incline Village Hydrology Study, Washoe County, Nevada](#)

January 2000 or download as one Pdf File (10 Mbytes)

#### 6. Methodology to Estimate Pollutant Load Reduction - 2006

- Executive Summary 21 April 2006 (1 Mbytes)
- Final Report 21 April 2006 (1.4 Mbytes)
- Final Report Appendices 21 April 2006.pdf (2.6 Mbytes)

#### 7. Urban Stormwater Management Plan

Develops a Work Plan or Project Management Plan (PMP) to explore alternatives for urban storm water management.

- Technical Project Management Plan Data (Final Report - April 2003)

#### 8. Advanced Stormwater Treatment Feasibility Analysis (Phase II)

- Advanced Stormwater Treatment Feasibility Analysis (Phase II)

### **Lake Tahoe Wastewater Infrastructure Partnership (LTWIP)**

2007 saw the formation of a parallel organization to the TWSA, the Lake Tahoe Wastewater Infrastructure Partnership (LTWIP). The groups' purpose is to develop, implement and maintain effective operation, maintenance and capital replacement programs to meet state-of-the-art industry standards, satisfy State and Federal requirements, and advocate for the protection of Lake Tahoe as an outstanding national water body.

Each of the Parties owns and operates a public sewer collection and/or treatment system within the Lake Tahoe Basin. These sewer systems could negatively impact the surface waters of Lake Tahoe upon failure or spillage. The Parties recognize the environmental sensitivity of the Lake Tahoe Basin, and the extraordinary responsibilities placed on their organizations as a result of their operation and maintenance of these sewage systems. Common standards and practices, and project prioritization are key steps to meeting those responsibilities. Members include Douglas County Sewer Improvement District No. 1 (DCSID), Incline Village General Improvement District (IVGID), Kingsbury General Improvement District (KGID), North Tahoe Public Utility District (NTPUD), Round Hill General Improvement District (RHGID), South Tahoe Public Utility District (STPUD), Tahoe Douglas District (TDD), and Tahoe City Public Utility District (TCPUD).

To assure reliable sewer operations and avoid significant economic and environmental costs associated with inadequate operation and maintenance of these systems, the Parties desire to improve their practices and standards, implement state of the art asset management concepts, and comply with additional requirements.

The US Army Corp of Engineers (USACE) has executed a Project Management Plan for Technical Assistance – Lake Tahoe Watershed Restoration which includes technical assistance related to the identification of faults, project identification, project prioritization, and application of consistent engineering standards for the execution of a wastewater capital replacement program within the Lake Tahoe Basin.

USACE has been working with the eight wastewater infrastructure districts to better integrate infrastructure capital replacement and rehabilitation into the EIP. This work continued in 2009 with unified project identification, project prioritization, and common technical standards, and a GIS system for asset location and to speed repair and lessen the probability of overflows.

The following is a summary of LTWIP activities during the period of July 1, 2008 through June 30, 2009:

### **TRPA Draft Regional Plan Policy Relating to Wastewater Infrastructure**

A discussion was held between the Partnership agencies, TRPA, Lahontan Regional Water Quality Control Board and the Nevada Division of Environmental Protection regarding proposed TRPA policy that would be included in the Regional Plan Update relating to sewer facilities in shorezones and stream environment zones (SEZs); and maintenance of export lines.

The Partnership recommended the following language for the proposed TRPA wastewater policy:

#### Proposed Policy:

All public wastewater agencies shall be required to develop and implement a risk based Sewer System Management Plan, consistent with federal and state mandated plans, to prevent sanitary sewer overflows within the Lake Tahoe Basin.

#### Proposed Implementation:

Add language to the Code requiring wastewater agencies to prepare risk-based wastewater asset management plans consistent with federal and state mandated plans that includes inspection methodology and frequency, asset management, capital rehabilitation and replacement programs, customer outreach, and cost/benefit analysis programs. The plans shall address gravity collection mains, trunk sewer mains, pump stations, sewer pressure pipes, and appurtenances critical to the collection and transport of raw and treated wastewater within the Lake Tahoe Basin. Capital replacement and rehabilitation prioritization shall include weighting for environmental and/or public health impacts of failure based on asset condition and location in relation to SEZ's, the lakezone, or other environmentally sensitive locations. Each wastewater agency's adopted plan shall be provided to TRPA between 2 to 5 years following Regional Plan adoption.

### **Update to the TRPA Draft Policy and Implementation related to Sanitary Sewer Operations and Management Programs:**

- TRPA is considering using the California adopted Sewer System Management Plan (SSMP) as the standard for the Risk-based plans for both states under their Updated Regional Plan.
- A formal letter with the comments from the Lake Tahoe Wastewater Infrastructure Partnership (LTWIP) was sent to TRPA in August 2008.
- Follow-up indicated that the TRPA Board Report will have four different policy alternatives.
- The Regional Plan is expected to begin the environmental impact review (EIR) process by the fall 2009. If the updated Regional Plan is adopted in 2010, California districts would need to submit their Sewer System Management Plan to TRPA by 2012, and Nevada districts would need to submit their Sewer System Management Plan to TRPA by 2015.

- LTWIP drafted a letter to TRPA from LTWIP regarding Shorezone policy as it relates to maintenance dredging.

### **GIS Steering Committee**

HDR Consultants has been working with the individual members to develop one GIS system basin-wide.

### **Member Agencies Develop Sewer System Management Plans (SSMPs)**

The Partnership is in support of using a consultant to assist in developing their risk-based Sewer System Management Plans. HDR Consultants have developed SSMP templates for the LTWIP members, which were being finalized in fall 2009.

The basic goals include:

- The goals of the SSMP is to provide a plan and schedule to properly manage, operate and maintain all parts to the sanitary sewer system.
- Development of a standard plan format that can be expanded /contracted to suit the various partners' scale, budget, and style.
- California and Nevada should use consistent risk factors in their approach.

### **Sewer Inspection Database Tool**

The final database analysis tool that reads and interprets sewer pipeline closed circuit television (CCTV) inspection results was completed in November 2009. This database tool reads the defects from the CCTV report and produces an initial recommendation on the replacement or repair of each pipe segment analyzed. All agencies in the partnership now have this tool and can prioritize repair and rehabilitation needs for their sewer mains that have CCTV data.

### **U.S. EPA's Lake Tahoe Geographic Response Plan (LTGRP) 2007**

The Lake Tahoe Geographic Response Plan (LTGRP) establishes the policies, responsibilities, and procedures required to protect life, environment, and property from the effects of hazardous materials incidents. This plan establishes the emergency response organization for hazardous materials incidents occurring within the Lake Tahoe watershed. The plan is generally intended to be used for oil spills or chemical releases that impact or could potentially impact drainages entering Lake Tahoe, Lake Tahoe itself, and its outflow at the Truckee River. Plan coverage is for El Dorado and Placer counties (California), as well as, Douglas and Washoe counties (Nevada) plus the Carson City rural area (Nevada). The final report was issued September, 2007 by Lake Tahoe Response Plan Area Committee (LTRPAC) and is available online at the U.S. EPA website: [www.epaosc.net](http://www.epaosc.net).

The LTGRP is the principal guide for agencies within the Lake Tahoe watershed, its incorporated cities, and other local government entities in mitigating hazardous materials emergencies. This plan is consistent with federal, state, and local laws and is intended to facilitate multi-agency and multi-jurisdictional coordination, particularly among local, state and federal agencies, in hazardous materials emergencies.

This plan is an operational plan as well as a reference document. It may be used for pre-emergency planning and emergency response. Agencies having roles and responsibilities established by this plan are encouraged to develop standard operating procedures (SOPs) and emergency response checklists based on the provisions of this plan. This plan provides a description of various response strategies for use during oil spills or chemical releases in the Lake Tahoe Basin.

### **LTGRP Plan Objectives**

1. Describe the overall emergency response organization for hazardous materials incidents occurring within the Lake Tahoe response area.
2. Establish a prompt and efficient notification system that ensures that the appropriate local, state and federal response agencies are informed of oil spills and chemical releases impacting the lake.
3. Identify lake and river response strategies in advance, so that response personnel can more effectively deploy personnel and equipment.
4. Delineate the responsibilities of local, state, and federal agencies in the event of a hazardous materials incident within the Lake Tahoe response areas.
5. Establish lines of authority, coordination and notification for hazardous materials incidents.
6. Facilitate mutual aid to supplement local resources.
7. Describe procedures for accessing outside funding (e.g., state and federal funding) for the mitigation of, and recovery from, hazardous materials incidents.

### **LTGRP Plan Incident Objectives**

For emergency response personnel to evaluate hazardous materials and take appropriate emergency actions in order to save lives, reduce injuries and prevent or minimize damage to the environment and property, the following actions should be taken:

1. Secure the affected area, isolate the hazard, deny the entry of unauthorized persons into the area, and ensure appropriate notifications.
2. Identify the hazardous material.
3. Provide rapid and effective warning, information, and instructions to threatened populations.
4. Provide means to access technical resources to stabilize the affected area and return to normal conditions as quickly as possible.
5. Train and equip emergency response personnel (hazmat team members as well as first responders) to mitigate hazardous materials incidents efficiently and effectively.

### **Tahoe Regional Planning Agency Activities**

#### **Regulatory: Participating in Regional Planning Efforts**

Tahoe Regional Planning Agency (TRPA) and the Lake Tahoe Basin Management Unit (LTBMU) have developed regulations on land use related to water quality standards. While many of the standards support drinking water efforts, they do not directly address drinking water pathogens. The Tahoe Water Suppliers Association is supporting funding of local source water protection projects and planning efforts by participating in the Tahoe Regional Planning Agency Shorezone Ordinance amendment process and Pathway.

#### **TRPA Shorezone Ordinance Activity**

The Shorezone Ordinance was adopted by the TRPA Governing Board (Preferred Alternative 6A) in October 2008.

Shorezone Ordinance documents are available at:

<http://www.trpa.org/default.aspx?tabindex=3&tabid=350>.

Applicable sections to water quality are provided in [Appendix D].

TWSA members' ongoing participation in the Shorezone Ordinance amendments process has included:

- Submitted written and verbal comments on multiple occasions in 2006, 2007 and 2008, to the "Lake Tahoe Shorezone Ordinance Amendments / Environmental Impact

Statement (EIS)". The TWSA recommendation of a ¼ mile 'buffer' around intakes was incorporated into Alt. 6A. Any proposed project within the buffer will need to go through a risk assessment evaluation by the applicable water purveyor, and the results will be provided to TRPA, with suggested mitigation measures.

- In addition to participating in the development process of the TRPA Shorezone Ordinance, TWSA has achieved a working relationship with the Tahoe Regional Planning Agency Planning Department to develop a method for identifying potentially contaminating activities near drinking water intakes early in the TRPA permitting process. In August 2007, TRPA staff agreed to add a check notification process into the project proposal application process, for any project to occur within 600' (groundwater) or ¼ mile or 1320' (surface water) of a source. The applicant will be required to notify applicable water purveyor, and attach documentation of purveyor notice to the TRPA application.
- Flagging of all water sources within the TRPA mapping system was negotiated in August 2007. The maps help identify intakes and activities of concern to drinking water suppliers, relative to proposed development.
- TWSA staff began monitoring the agendas for the TRPA/Interagency Shorezone Coordination Group (reviews all shorezone project proposals) and attending relevant sessions.
- TWSA/USACE Risk Assessment Model Project, Phase 1 was completed in mid-October 2008. Included in this project is a spreadsheet based tool that is to be utilized by the purveyors to analyze potential risk from shorezone development.

### **Pathway Process**

PATHWAY partner agencies include the Tahoe Regional Planning Agency, USDA Forest Service, the Lahontan Regional Water Quality Control Board and the Nevada Division of Environmental Protection. The agencies are working together to update important resource management plans for the Lake Tahoe Basin. These regional plan updates will guide land management, resource management and environmental regulations over the next 20 years. The plans will address many areas, including the following:

- How much additional development will take place at Lake Tahoe by the year 2027? What kind of growth is on the horizon?
- What will be the state of lake clarity, forest health, water quality and recreation by 2027?
- How will regional plans address the threat of catastrophic wildfires in the Lake Tahoe Basin?
- How will Lake Tahoe agencies revise their long-range plans to create a unified vision for Tahoe's future?
- How will Lake Tahoe's startling beauty be preserved while maintaining quality of life for those who live and visit here?

PATHWAY is an effort to ensure coordination between different public agencies and to share resources and expertise while inviting public participation. Working together, the goal for 2007 is to have each agency's regional plans completed and to be consistent with one another, and to develop the Total Maximum Daily Load (TMDL) for the Lake Tahoe Basin.

PATHWAY includes a process to solicit and incorporate public vision and opinion into the development of these plans, including: 5 Public Visioning Workshops that were held around Lake Tahoe and greater California and Nevada in 2005, and 2006; A body of citizens

representing a wide array of interest groups was included in the Pathway 2007 Forum process. Each of the Forum members solicit input from their particular constituency. Public comment periods allowed for the review of draft documents, and public hearings were hosted for opportunities to comment before the various decision-making bodies.

TWSA staff served on the Pathway Technical Working Groups (TWGs), which are another venue where the primary agencies are integrating new ideas and identifying solutions that will benefit the Tahoe Region. The product of these groups will be a Desired Condition & Threshold Evaluation Report that will be used by all four agencies to update their respective planning documents. This report was previously referred to as the "Threshold Update". The report will include a review and update to the TRPA Environmental Threshold Carrying Capacities (ETCC), as well as incorporation of USFS-LTBMU, LRWQCB, and NDEP goals and standards into a single comprehensive framework. The Desired Condition & Threshold Evaluation Report will function as the common point of reference for each agency when updating their respective plans.

One accomplishment of TWSA was to incorporate the difference between "water quality" from "water clarity" in the Water Management Technical Working Group proposals during PATHWAY. One of the initial goals of the group was to create a basin-wide source water protection plan. This group's observations and concerns was a turning point for gathering support for TWSA efforts.

TWSA was active over the last several years in participation on PATHWAY maintaining presence on the following committees:

- Member of the water quality technical committee for PATHWAY.
- Member of the socio-economic PATHWAY 2007 technical committee.
- Member of the PATHWAY 2007 steering committee.
- Member for Lake Tahoe Federal Advisory Committee.

There are nine (9) Environmental Threshold Carrying Capacities recognized by TRPA and, by association, the USFS-LTBMU: Air Quality, Fisheries, Noise, Recreation, Scenic, Soils Conservation / Stream Environment Zones, Vegetation, Water Quality and Wildlife. In addition, goals and indicators for Socio-Economics and Transportation will also be investigated as part of the report. An Adaptive Management System will be outlined to guide future monitoring and the integration of new information into standards, programs, policies and regulations. Each of these resource areas have an agency or private contractor Administrator, who manages a Core Group of three to five agency staff and Pathway 2007 Public Involvement contractors who are involved in writing the section of the Desired Condition & Threshold Evaluation Report related to their resource area.

These Core Groups solicit expert input from professionals in the various resource areas through TWGs. 12 TWGs have been assembled involving over 100 volunteers. The TWGs are intended to operate like "think tanks." There is significant opportunity for broad, open and freethinking technical discourse to ensure complete exploration of technical issues and to provide suggestions to the Core Groups related to desired conditions, standards and indicators that will best benefit the Tahoe Basin.

A list of Forum members, their areas of interest, and contact information is available at the following web address: [www.pathway2007.org/assets/Contact%20Cards\\_FNL.pdf](http://www.pathway2007.org/assets/Contact%20Cards_FNL.pdf)

Questions can be addressed to Jeremy Sokulsky (jsokulsky@trpa.org), the technical lead for the Pathway Desired Condition & Threshold Evaluation Report.

**PATHWAY - Total Maximum Daily Load Study (TMDL)  
Lake Tahoe Nutrient and Sediment Total Maximum Daily Load Project**

*Nevada Division of Environmental Protection & Lahontan Regional Water Quality Control Board*

As part of the joint effort to use the best science in establishing a policy to restore Lake Tahoe's famed clarity, the Lahontan Water Board and the Nevada Division of Environmental Protection announced the availability of three documents. The first two are lengthy technical reports providing the results of significant science and research efforts. The Lake Tahoe Total Maximum Daily Load Technical Report analyzes the pollutant sources and introduces the Lake Clarity Model, which is the tool that will be used in crafting water clarity restoration strategies. The Pollutant Reduction Opportunity Report evaluates, on a basin-wide scale, general strategies for reducing pollutant input to Lake Tahoe. The technical reports will be used to draft the Final Lake Tahoe TMDL, expected in 2009. The third is a short, less technical summary of these efforts along with a description of next steps, "Charting a Course to Clarity" will help you consider what strategies make sense. It synthesizes the two, large technical documents above, and summarizes what scientists have learned so far to answer four questions:

1. What pollutants are causing Lake Tahoe's clarity loss?
2. How much of each pollutant is reaching Lake Tahoe?
3. How much of each pollutant can Lake Tahoe accept and still reach the clarity goal?
4. What are the options for reducing pollutant inputs to Lake Tahoe?

Between September 2007 and February 2008, the Lahontan Water Board and the Nevada Division of Environmental Protection conducted a series of public workshops for stakeholders and held discussions with local governments about approaches for improving Lake Tahoe's clarity, approaches that ideally are both technically feasible and politically acceptable. This information will be the basis of the TMDL Implementation Plan and will be used by the Tahoe Regional Planning Agency to update its 20-year Regional Plan.

Document available at:

[http://www.waterboards.ca.gov/lahontan/TMDL/Tahoe/Tahoe\\_Index.htm](http://www.waterboards.ca.gov/lahontan/TMDL/Tahoe/Tahoe_Index.htm).

After four years of research, the Lake Tahoe Total Maximum Daily Load (TMDL) project has reached a watershed event, the development of a comprehensive, basin-wide budget of pollutant loads that are responsible for the loss of the Lake's famed clarity, and have applied those values to estimating the total load reductions necessary to restore clarity to its approximately 100-foot Secchi depth standard. Although results should still be considered preliminary and subject to revision, the report includes TMDL source categories and estimates of fine sediment loads reaching the lake.

**TMDL Research Produces Updated Pollutant Budget**

When Lake Tahoe TMDL research was initiated in 2002, an initial budget was available for two of the three pollutants of concern for lake clarity: total nitrogen and total phosphorus. The budget had been most recently updated in the 2000 USFS publication "Lake Tahoe Watershed Assessment," which was issued at about the same time as critical new research revealed that fine sediment constitutes an equal, if not greater, threat to clarity. It became a top priority for



TMDL research to verify and update the nutrient budget and to develop the first budget for sediment loading to the lake.

Following years of research, Lahontan Water Board TMDL researchers and staff have developed an update of the nutrient budget along with a preliminary fine sediment budget, and are currently presenting it to interested constituencies within the basin.

It is critical to emphasize that the loading estimates presented here are the result of source specific studies that were commissioned by Lahontan to provide input to TMDL models, most importantly the Lake Tahoe Clarity Model.

### **Using the Lake Clarity Model**

The Lake Clarity Model is a tool to show how lake clarity may respond to different options for reducing pollutant input. The Model suggests the 97.4 feet of clarity can be achieved if the pollutant input is reduced enough. It also shows there are many different ways to meet the clarity goal because there are three pollutants from five types of sources. In any case, the pollutant input will need to be reduced significantly to meet the clarity goal. The Lake Clarity Model suggests that reducing all the pollutant input by at least 25 percent is needed for the overall clarity trend to show signs of improvement. Or, by cutting all the urban pollutant sources by 75 percent could achieve 97.4 feet of clarity. These examples do not represent an endorsement of either scenario; rather, the examples serve to illustrate how the Lake Clarity Model can be used to help inform management decisions.

The Water Board and NDEP will also use the Lake Clarity Model to run simulations as part of developing attainable interim pollutant reduction targets. These interim targets, or milestones, will be scheduled for regular intervals to help guide pollutant control actions. The first interim targets could be step-wise clarity improvements to reverse the clarity decline within a specific time period of implementation. As the understanding of current pollutant input and pollutant reduction improves, the Lake Clarity Model will serve as a critical link between implementation plan effectiveness and the Secchi depth standard.

The Water Board and NDEP are working with other agency stakeholders to develop an Integrated Water Quality Management Strategy to evaluate potential pollutant reduction options. Through a process involving a number of local and regional experts with feedback and direction from agency and Pathway representatives, the TMDL project team identified a number of potential pollutant reduction practices for each source category. The pollutant reduction analysis includes estimated nutrient and fine sediment input reductions and cost estimates on a basin-wide scale. These pollutant reduction opportunities and cost estimates will help resource managers and stakeholders evaluate which activities are most efficient and cost effective for improving Lake Tahoe's clarity.

This information is described in the Pollutant Reduction Opportunity Report, available at the Water Board and NDEP offices, and downloadable at [http://www.waterboards.ca.gov/lahontan/TMDL/Tahoe/Tahoe\\_Index.htm](http://www.waterboards.ca.gov/lahontan/TMDL/Tahoe/Tahoe_Index.htm).

### **TRPA Environmental Improvement Program (EIP)**

The EIP Accomplishment Report located in [Appendix D] is a summary of EIP accomplishments from 1997 through 2009.

The 1997 Lake Tahoe Presidential Forum was a turning point in Tahoe history. The event inspired renewed commitment to the Tahoe environment and spurred the creation of the EIP. The EIP outlined a 10-year program of investment in the Tahoe Basin totaling \$908 million. Adjusted for inflation, the target is equivalent to \$1.2 billion in today's dollars. As of 2006, \$1.1 billion has been invested by Congress, the California and Nevada state legislatures, local governments and the private sector to implement the EIP. Responsibility for stewardship of the Tahoe Basin through the EIP is shared by the federal government, state governments, local governments and the private sector.

### **TRPA EIP Water Quality / Watershed Improvements**

The pristine clarity of the Tahoe Basin's lakes and streams are a national treasure. Fifty percent of the EIP has been invested in projects with the focus of preserving this water clarity legacy for future generations. This investment takes the form of area of treatment through erosion control and source runoff improvements as well as the implementation of Best Management Practices on developed properties. Nearly 3,000 acres of sensitive land have entered the public domain in the name of watershed protection. More than 367 acres of sensitive stream zones have been restored. Approximately 286 miles of unnecessary dirt roads have been treated or restored to keep soils in place. Significant investment has resulted in the construction of structures that mitigate the contribution that roads make to storm water runoff.

### **TRPA EIP Public Access and Recreation**

Public access and recreation opportunities are high priorities of Americans and many who visit Tahoe from around the globe. The Basin is prized for the hiking, biking and water recreation opportunities it provides. Under the EIP more than 76 miles of new trails have been constructed. The creation of viable access points and public facilities reduces improper use of sensitive areas, contributing to the preservation of the Tahoe basin and enhancement of people's enjoyment of it. Seventy-five public facilities have been constructed or rehabilitated with the EIP. Nine percent of EIP funding, has been invested in recreation projects.

### **TRPA Environmental Improvement (EIP) Projects**

The primary goal of the TRPA Environmental Improvement Program is to "lead the cooperative effort to preserve, protect and enhance the unique natural and human environment of the Lake Tahoe Region," (TRPA 2004). The Environmental Improvement Project (EIP) is administered by the Tahoe Regional Planning Agency. The EIP program identifies restoration and improvement projects needed to meet nine environmental thresholds in the basin. TWSA members act as managers and/or resources on EIP water quality improvement projects identified within their watersheds.

The program identified projects and programs needed to fulfill nine environmental thresholds in the Tahoe Basin. The thresholds include: water quality, air quality, soil conservation, vegetation, fisheries, wildlife, scenic resources/community design, recreation, and noise. TRPA, Nevada Tahoe Conservation District, and Lake Tahoe Basin Management Unit have completed the first stage of a tracking program to evaluate the progress of EIP project installations.

### **TRPA EIP Investment by Environmental Threshold**

Water Quality 50%/ Other Projects 50%; (Fisheries 0.4%/ Wildlife 4%/Vegetation 6%/Recreation 9%/Air Quality/Transportation 10%/Scenic Resources 10%/Soils/Stream Zones 11%)

### **TRPA EIP Accomplishments / Watershed Improvements**

- Acquired more than 2,968 acres of sensitive land.
- Improved over 27,450 acres for wildlife habitat.
- Restored more than 367 acres of sensitive stream zones.
- Treated more than 1,000 acres of storm water runoff.
- Treated or removed 286 miles of dirt road in forests.

### **Public Access and Recreation**

- Constructed more than 76 miles of new trails.
- Constructed or rehabilitated 75 public facilities.

### **Vegetation and Fire Fuels Management**

- Reduced fuels and fire hazards on approximately 19,000 acres.
- Streamlined Forest Practice Rules to facilitate “fire safe” projects while protecting water quality.
- Completed Community Wildfire Protection Plans throughout the Tahoe Basin.

### **Air Quality Improvements**

- Constructed eight facilities to increase transit ridership.
- Reduced over 3.4 million pounds of emissions via alternative-fueled vehicles and transit system investments.

### **Research/Monitoring and Technical Assistance**

- Funded over \$47 million in research and monitoring projects.
- Established the Tahoe Science Consortium to better inform agency decision-making.
- Federal agencies have provided \$8.7 million in technical assistance to EIP partners.

### **Program Support and Technical Assistance**

Program Support and Technical Assistance are provided and managed primarily through federal and state government entities. The table below accounts for contributions through federal sources including the United States Army Corps of Engineers (USACE), the United States Environmental Protection Agency (USEPA) and the Department of Agriculture’s Natural Resource Conservation Service (NRCS), and at the state level the Resource Conservation Districts, through 2006.

### **Operations and Maintenance**

The contribution the EIP makes to improve the Tahoe Basin environment is in the form of constructed projects. The long-term success of these projects in enhancing the Tahoe environment depends first, upon each project’s ability to function for a reasonable life span and second, upon EIP managers’ ability to anticipate when a project’s infrastructure will need to be replaced. Operations and maintenance estimates are integral to EIP success. Operations and maintenance costs were not accounted for in the 1997 EIP target amount. In planning for the next era of the EIP, EIP managers are designing a programmatic approach to estimating long-term Operations and maintenance needs. These needs will be accounted for in the articulation of EIP projections and targets.

Of the \$1.1 billion committed, \$512 million has gone toward the construction of 269 Environmental Improvement Projects and more than 9,100 private parcel water quality improvements throughout the Tahoe Basin.

As of 2008:

Projects Constructed in Nevada:

Large scale private projects (14) = \$7.9 million  
 Public projects (80) = \$80.1 million  
 Private parcel water quality improvements (5,110) = \$28.2 million  
 Total: 5,204 projects = \$116.2 million

Projects Constructed in California:  
 Large scale private projects (59) = \$117.7 million  
 Public projects (64) = \$163.2 million  
 Private parcel water quality improvements (3,996) = \$23.3 million  
 Total: 4,119 projects = \$304.2 million

Projects Constructed on Federal lands throughout the Lake Tahoe Basin  
 Public Projects Total: 52 projects = \$91.8 million

### **TIIMS**

The Tahoe Regional Planning Agency is also completing an online database, the Tahoe Integrated Information Management System (TIIMS), to organize basin research projects. The website: [www.tiims.org](http://www.tiims.org) provides extensive information on Lake Tahoe Basin restoration and planning efforts. TIIMS is designed to serve residents, visitors, teachers, students, government agency or non-profit organization, research scientist or private consultant. TIIMS is more than an information repository, it is an interactive website that provides tools for users to share and manage information and data efficiently. With TIIMS, you can access monitoring data, maps, and reports and also learn how to get involved in environmental education and restoration projects in the Basin.

TIIMS provides access to data and information across a wide spectrum reflected as an information pyramid. TIIMS includes the ability for agencies and organizations to collaborate and coordinate their planning and restoration efforts in the Lake Tahoe Basin through the TIIMS workspace.

### **LTEEC**

The University of Nevada Cooperative Extension and University of California Cooperative Extension have joined forces with agencies and organizations throughout the Tahoe Basin to improve environmental education at Lake Tahoe. Between 2002 -2007, local partners in the Lake Tahoe Environmental Education Coalition (LTEEC) provided extensive education and outreach on water quality issues through the broadcasting of the "Lake Tahoe Report" on local public access television, coupled with extensive print media articles. Information can be found at: [www.lteec.org](http://www.lteec.org)

### **Nevada Tahoe Conservation District (NTCD) Programs**

The Nevada Tahoe Conservation District's Water Quality and Erosion Control Program partners with the Nevada Division of State Lands, Natural Resources Conservation Service, US Bureau of Reclamation, US Forest Service, Tahoe Regional Planning Agency, Nevada Division of Environmental Protection, Washoe County, General Improvement Districts, Homeowner's Associations, private landowners, and other groups that have specific projects to improve water quality and reduce erosion. Nevada Tahoe Conservation District staff provides assistance to

project proponents by facilitating funding sources, permit acquisition, environmental compliance, design review, and general project oversight from planning through construction inspections.

### **NTCD Stormwater Utility Feasibility Report 2007**

[http://www.ntcd.org/documents/DIMS\\_2007.pdf](http://www.ntcd.org/documents/DIMS_2007.pdf)

The Nevada Tahoe Conservation District (NTCD), a nonregulatory agency whose mission is to assist private and public landowners through technical assistance, leadership and education, responded to a need identified through various studies and stakeholder interactions regarding improved management of stormwater in Nevada Lake Tahoe communities.

Many Nevada Tahoe local jurisdictions have stormwater authority and thus are the primary implementers of public works water quality improvement projects as part of the Tahoe Regional Planning Agency's (TRPA) Environmental Improvement Program (EIP). The intent of this report is to address the concerns of local jurisdictions over the complexity and cost of operations and maintenance, as well as the implementation of pending new watershed management policies.

Additionally, within the Nevada Tahoe Basin, there has been concern expressed regarding the high cost of residential parcel Best Management Practice (BMP) Retrofit Program (EIP #16), possible failures due to improper or lack of maintenance, and relatively low compliance rates regarding installations of the systems. Also in the Basin, there is a growing awareness among the agencies implementing and planning water quality improvement projects that stormwater management can be managed as a utility district similar to wastewater or drinking water utilities. In response to these concerns and ideas, NTCD, with local and State support and funding, initiated a Stormwater Initiative to determine if the jurisdictions should pool their resources into a stormwater management cooperative or district.

This study is unique as it addresses the regulatory framework, history and political complexity in relation to water quality and the study suggests that merging of jurisdictions and programs relating to stormwater may be an effective tool to meet management challenges. Water quality improvement projects in the Nevada Tahoe Basin are guided by TRPA, Nevada state regulations and rules pertaining to operations and maintenance as determined by the funding agencies. Beyond this, in Douglas County, NV, multiple General Improvement Districts (GIDs) and Homeowner Associations (HOAs) all with varying authorities relating to stormwater create a complex jurisdictional make-up. Finally, the BMP retrofit program requires homeowners with developed parcels to retrofit their properties to reduce erosion and retain stormwater from impervious surfaces from a rainstorm that historically occurs every 20 years on average. The

### **NTCD Water Quality Monitoring**

To understand project effectiveness at reducing sediment and nutrient loading to the Lake, NTCD monitoring staff collaborate with the local organizations in implementing monitoring studies. Some projects are implemented by contracting various consulting firms and academic institutions while other projects are designed and measured in house by NTCD monitoring staff. By understanding the hydrologic aspects of a project and analyzing sediment and nutrient concentrations in the water, we are able to calculate the volume of sediment and nutrients generated by a project area. We can then design a BMP or series of BMPs to reduce the volume of sediment and nutrients downstream and ultimately the lake.

Monitoring studies are critical to designing effective solutions and assessing the success of restored areas. However, to assess a mature solution, monitoring may be required for up to ten

years. As a result, monitoring can be a costly and time-consuming aspect of a project, and therefore is often neglected. NTCD strives to improve our knowledge of what systems work over the long term and we request sufficient funding to measure pre-project and post-project loads. A project is considered “successful” if design goals are met and post-project measurements are lower than pre-project measurements. For example, vegetative growth in a riparian area will stabilize banks and assimilate nutrients but may take several years to become established and be completely effective in the high-altitude climate of Lake Tahoe.

### **NTCD BMP/Water Quality Project Inventory Program**

The Water Quality Project Inventory (Inventory) consists of a computer based tool that includes a database of all public water quality best management practices (BMPs) implemented within the Lake Tahoe Basin and an electronic map (GIS) that shows the locations of all public water quality projects containing the BMPs.

The Inventory is the first comprehensive system that accounts for BMPs implemented in the Tahoe region and it has several uses. The TMDL (Total Maximum Daily Load) program may use information in the Inventory to account for BMPs implemented. Resource managers can use the Inventory map to browse water quality projects and determine which BMPs have been implemented and how they are distributed around the Basin. Implementers can use the database to facilitate BMP maintenance. The Inventory can also be used to report implementation of the Environmental Improvement Program (EIP).

The Inventory database contains quantities of 21 BMPs commonly implemented at Lake Tahoe. This information was collected directly from implementer project files that were stored in many formats and locations by the seven major urban stormwater project implementers at Lake Tahoe. The information was collected by a small, unbiased group of personnel from several agencies known in this report as the Inventory team. This information was extensively quality checked by the Inventory team, project funders, and implementing agencies. The Inventory team used the GIS to calculate the percentage of the watershed, percentage of urbanized area and percentage of road length treated by water quality projects. These values are calculated by summing the portion of each area or length covered by project area polygons in the GIS. Due to the variability in project area defined on plan sheets, these figures should be considered estimates. Basin-wide results include: Road Length Treated- 46% / Watershed Area Treated- 5% / Urban Area Treated- 42%. The Inventory can provide many other forms of useful analysis which are more completely explained within this report. Highlights of these features include treatment proportions for each TRPA priority watershed, trend analysis of BMP selection and analysis of BMP regional distributions. This report also describes the potential to enhance the Inventory to assist implementers with BMP maintenance tracking. The Inventory is available for download at the Nevada Tahoe Conservation District website ([www.ntcd.org](http://www.ntcd.org)) in the documents section.

### **Nevada Department of Transportation (NDOT) Stormwater Management Program**

NDOT amended the Stormwater Quality Manual, Planning and Design Guide January 2006. The Water Quality Erosion and Sediment Control Implementation Team managed the revision. The revised sheets were sent to NDEP. The Project Categorization Scoresheet revision was the most substantive amendment. Roadway Design staff utilizes this sheet for rating a project's impact relative to water quality. The result determines how to proceed with temporary erosion control planning as well as determining if permanent BMPs are necessary.

### **NDOT Permanent BMPs**

During 2004 and 2005, an erosion control water quality project was constructed along a 3-mile section of SR 28 through Incline Village. This project addressed erosion and water quality issues within the NDOT right of way focusing on source and treatment control. The project included riprap slope protection, reseeded slopes, sand oil interceptors, sediment trapping drop inlets, lined channels, energy dissipation at culvert outlets, curb and gutter, as well as, an enhanced Third Creek fish passage under SR 28. Construction cost for the environmental improvements is estimated at \$3.9 million.

In fall 2005, the Lake Tahoe Phase III Environmental Improvement Program Master Plan kicked off. This two-year effort focuses on master planning the remaining environmental improvements along the remaining 15 miles of NDOT's maintained roadways in the Tahoe Basin that have not been retrofitted with erosion control and water quality BMP's. Once completed, the Master Plan will include a preliminary design for those roadway sections, preliminary construction estimates and construction schedules.

In 2006, 3 erosion control projects were constructed along Highway 50. The first project, located approximately 0.5 miles north of Cave Rock retrofitted approximately 2 miles of roadway with erosion control and water quality BMP's. The project included riprap slope protection, roadway shoulder stabilization, reseeded slopes, infiltration basins, a sand oil interceptor, sediment trapping drainage inlets, energy dissipation at culvert outlets, lined channels, and curb and gutter. Construction cost for the environmental improvements is estimated at \$2.8 million.

The second project along Highway 50 was constructed approximately 1 mile south of Cave Rock, involving a 1.5-mile stretch of the roadway. The project included riprap slope protection, a sand oil interceptor, reseeded slopes, sediment trapping drainage inlets, energy dissipation at culvert outlets, lined channels and curb and gutter. Construction cost for the environmental improvements is estimated at \$0.6 million.

The third project along Highway 50 was constructed approximately 2 miles north of the California/Nevada Stateline, involving a 1.5-mile stretch of the roadway. The project included the installation of riprap slope protection, a sediment basin, reseeded barren slopes, sediment trapping drainage inlets, energy dissipation at culvert outlets, lined channels, curb and gutter. Construction cost for the environmental improvements is estimated at \$1.3 million.

### **NDOT Erosion Control**

NDOT amended the Stormwater Quality Manual, Construction Site Best Management Practices January 2006. The Water Quality Erosion and Sediment Control Implementation Team managed the revision. The revised sheets were sent to NDEP. The most substantive amendments occurred to the soil stabilizer, river diversion, silt fence, storm drain inlet protection, and the concrete waste management fact sheets. In 2006, NDOT purchased three new PM-10 compliant sweepers for District II.

### NDOT Lake Tahoe Basin Stormwater Drainage Structure Maintenance Activity

Task	Accomplishment	Man hours
Data is compiled from the following highways: US50; SR28; SR207, SR431; and SR760 (Elks Point Rd)		
Clean Culvert Openings	69 each	72
Clean Culverts	14,019 linear feet	1,602
Clean Cuts & Ditches	5 yd <sup>3</sup>	16
Clean Drop Inlets	785 each	1,030
Clean Retention/Detention Basins	1 yd <sup>3</sup>	16
Clean Slotted Drains	4,629 linear feet	815
Urban and Rural Sweeping	898 yd <sup>3</sup>	1,002
Sweep/Clean Debris from Structures	Not available	-
Remove Storm Debris	30 yd <sup>3</sup>	15
Clean Sand/Oil Interceptors	25 yd <sup>3</sup>	97

#### NDOT BMPs including Snow Removal and Ice Control

The Snow and Ice Program requires the use of abrasives and/or deicing agents across the state where low winter temperatures occur. NDOT continues to work hard determining the threshold to maximize the motoring public's safety while considering the potential adverse effects to the environment. One tool to accomplish this is the use of the Road Weather Information Systems (RWIS). RWIS is a series of meteorological stations strategically located alongside the highway that gives NDOT opportunities to utilize alternative de-icing/anti-icing chemicals/application rates, and make optimal use of equipment and staff. RWIS is an integral part of NDOT's annual maintenance operations in the Lake Tahoe Basin. Over \$6.8 million dollars has been spent for roadway maintenance since 1998 in the Basin.

During the past seven years, NDOT has reduced the total amount of sand and salt applied by an average of 82% and 61% respectively as compared to the average of the previous nine years in the Lake Tahoe Basin. This quantitative analysis does not correlate variables such as worker efficiency and climatic functions. Evaluating the total amount of material recovered from sweeping operations, cleaning of ditches, sediment basins, drop inlets, culverts, and sand oil interceptors versus the amount of sand applied, NDOT speculates that source control measures, constructed under the Environmental Improvement Program (EIP) since 1998-1999, has reduced erosion of cut slopes by 73%. This reduction is calculated by comparing the 2000-2006 period to 1990-1999. From an economic standpoint, less material applied to NDOT roads equates to less capital expenditure and subsequently, reduced maintenance hours to recover. Only Lake Tahoe data is being reported here due to the relative environmental sensitivity of the region.



### Lake Tahoe Basin Ice Control Materials Applied/Removed

Fiscal Year	Salt and Sand Applied (yd)	Straight Salt Applied (yd)	Salt Brine Applied (Gallons/Yards**)	Total Material Applied* (yd)	Total Material Removed* (yd)
Data is compiled from the following highways: US50; SR28; SR207, SR431; and SR760 (Elks Point Rd)					
1990-1991	5151	317	Not Available	5077	15394
1991-1992	4417	106	Not Available	6092	18808
1992-1993	8645	157.5	Not Available	8339	9687
1993-1994	6690	305.5	Not Available	5614	1219
1994-1995	9877	267	Not Available	8296	2368
1995-1996	7922	3	Not Available	9047	6259
1996-1997	5469	312	Not Available	6214	4016
1997-1998	6274	395	Not Available	5809	5427
1998-1999	3778	1124	50,550; 58.13	3435	6941
1999-2000	1678	363	43,879; 50.46	1616	1260
2000-2001	1543	451	51,799; 59.57	1873	2620
2001-2002	1033	459	110,026; 126.53	1248	3244
2002-2003	975	208	28,263; 32.50	1326	1728
2003-2004	842	213	16,742; 19.25	1268	2469
2004-2005	911	281	26,145; 30.07	1332	2098
2005-2006	1000	294	29,144; 33.52	1560	1397
*Excludes salt; **Conversion from pounds to salt in yds					

NDOT has committed to develop a sampling program for abrasives and de-icing materials as required by the MS4 Permit.

#### NDOT Illicit Discharge and Detention Program

NDOT maintains a routine sand oil interceptor monitoring program.

#### NDOT Public Outreach and Education

NDOT has committed to the Water Wise program. The Water Wise project is a public/private partnership geared to educate the broad public about non-point source (NPS) pollution in western Nevada through collaboration with a local broadcast meteorologist and creation of an interactive website. It provides a distribution and communications mechanism to get environmental science information to the public effectively and efficiently. The project enhances citizen awareness about local individual efforts needed to reduce NPS pollution, and broad-scale societal, community, institutional, and political actions needed to achieve long term improvements in water quality protection. The broadcast meteorologist and interactive website provide water quality data in a format that the general public can easily understand and identify with. The project has an evaluation component where pre-, mid-, and post-surveys will be conducted to assess impact to the public's awareness, learning, and behavior. Program effectiveness can also be measured by the Truckee Meadows Stormwater Committee's water quality monitoring with the goal being reduced concentrations of key constituents identified.

This is the first program of its kind in Nevada with approximately 50 cities nationally that participate. Water Wise is funded by NDEP, the Regional Water Planning Commission and the Truckee Meadows Stormwater Permit Coordinating Committee (Washoe County, Reno and Sparks). Stories are archived on the Water Wise home page: [www.krnv.iewatershed.com](http://www.krnv.iewatershed.com).

### **NDOT Monitoring Program**

As of fall 2005, NDOT monitoring of roadway runoff began in the Tahoe basin as part of the Tahoe Phase III Master Plan project. The monitoring consists of collecting data from 7 locations along NDOT's highways with the purpose of assessing both the performance of BMPs in terms of sediment and other pollutant removal, and the characterization of roadway runoff from non-BMP retrofitted roadway locations. The year-round monitoring efforts continued through September 2007.

During the week of June 26, 2006, the Environmental Services Division conducted the annual Lake Tahoe Basin sand oil interceptor (SOI) monitoring. Of the 23 SOIs this characterization study encompasses, 21 units were sampled. The pre-treatment vaults located at Spooner and Incline Maintenance Facilities are not included in this sampling program as the waste stream differs (non-stormwater versus stormwater). In 2007, the strategy changed as NDOT sampled and recommended that all the units get cleaned. The high bacteria levels observed in every sample last year prompted this change. The units were cleaned before the onset of the wet season (October – May).

No deleterious odors or substances were observed at the time of sampling. The analytical data did not show any significant differences in concentrations from last year. The SOIs contain high levels of bacteria in the water fraction, specifically total coliform and E. coli. Once again the total petroleum hydrocarbon-extractable (TPH-E) concentrations (EPA Method SW8015B) generally exceed the 100ppm threshold for both the diesel and oil ranges. The NDEP allows NDOT to contain the sediment in a lined facility at a maintenance yard located in an abandoned borrow pit located outside the Tahoe Basin (Oasis pit). Laboratory interpretation of these high levels of TPH-E concludes that the source is asphalt detritus as opposed to freed product (crankcase oil). This can be supported by the fact that not once has an SOI contained free product in the settling chamber upon time of sampling. The lab runs a silica gel wash clean-up of the samples before analyzing. This procedure removes most of the plant material (carbon) sources to get a representative sample. This data will be synthesized into a comprehensive file for ease of tracking to identify trends for proper management.

### **Cal-Trans Lake Tahoe Program**

The Statewide Stormwater Management Plan (SWMP) California Department of Transportation, Division of Environmental Analysis is available at:

[www.dot.ca.gov/hq/env/stormwater/annual\\_report/2008/index.htm](http://www.dot.ca.gov/hq/env/stormwater/annual_report/2008/index.htm)

This section provides information about how individual districts are to conduct specific activities or operations for fulfilling issues of concern to a Regional Water Quality Control Board (RWQCB). These issues have been developed because of agreed upon conditions or previous permit conditions. These activities are meant to be consistent with other municipal activities within the defined region.

### 13.1 TMDL Requirements

Total Maximum Daily Load (TMDL) requirements are developed by RWQCBs or USEPA pursuant to state and federal requirements to attain the water quality standards for a specific water body. Water Quality Control Plans, also known as Basin Plans, set standards for surface and ground water in the regions. These standards are comprised of designated beneficial uses for surface and ground water, plus numeric and narrative objectives necessary to support beneficial uses and the state's anti-degradation policy. A TMDL specifies the maximum amount of a pollutant that a water body can receive and still meet water quality standards, and allocates pollutant loadings to point and non-point sources. The Department will participate in implementation plans of adopted TMDLs with waste load allocations assigned to the Department (B.1). Districts are responsible for development and implementation of plans for stakeholder participation to meet the TMDL requirements for a given water body or watershed. Specific implementation plans and documents will be contained in the District Work Plans (DWP) prepared for a RWQCB (see Section 16).

### 13.2 Lahontan Region

Portions of Districts 2, 3, 9, and 10 implement specific stormwater management practices within the jurisdiction of the Lahontan RWQCB as follows: Prohibit non-stormwater discharges as follows: a) water line flushing; b) potable water resources; c) uncontaminated pumped groundwater; and d) air-conditioning condensate (not applicable to vehicles) that would violate numerical effluent limitations within the Lake Tahoe Hydrologic Unit (B.2) or receiving water objectives throughout the Lahontan Region. These prohibitions do not apply to pollutants present due to natural conditions.

1. A stormwater runoff collection, treatment and/or infiltration disposal facility is to be installed and maintained for discharge of stormwater runoff from impervious surfaces to storm drains or drainages. Treatment shall be provided for the 20-year, one-hour design storm as follows:
  - a. Within the Lake Tahoe Hydrologic Unit: 2.54 cm (one inch) of rain;
  - b. Within the Truckee River Hydrologic Unit: 1.9 cm (3/4 inch) of rain;
  - c. Within the East Fork Carson River and West Fork Carson River Hydrologic Units: 2.54 cm (one inch) of rain; and
  - d. Within the Mammoth Creek Hydrologic Unit above the 2,134 m (7,000-foot) elevation: 2.54 cm (one inch) of rain.

When site conditions do not allow for site runoff to be treated under the conditions above or runoff cannot meet applicable effluent limits and/or receiving water limitations specified in the basin plan, then traction sand trap devices shall be implemented prior to discharge to a storm drain or surface drainage.

2. The Department participates in an Environmental Improvement Program (EIP). The EIP supersedes the Capital Improvement Program (CIP) plans for erosion and runoff control in the Tahoe Basin. The EIP is a comprehensive program that addresses nine (9) environmental thresholds including water quality.
3. Districts shall not remove vegetation nor disturb the existing ground surface conditions between October 15 of any year and May 1 of the following year unless granted a variance by the Executive Officer within the following areas; a) The Lake Tahoe, Truckee River, East Fork Carson River, and West Fork Carson River Hydrologic Units.
4. For projects within the Lake Tahoe Hydrologic Unit that disturb one acre or

more of soil, District 3 submits the Storm Water Pollution Prevention Plan (SWPPP) to the RWQCB at least 30 days prior to beginning construction activities. The RWQCB is to notify the District within 15 days of construction of its intent to submit comments and will submit these comments within 10 days of construction; otherwise the District assumes that the RWQCB has no comments or proposed modifications. The RWQCB's proposed modifications shall be addressed within the SWPPP prior to beginning construction activities.

5. Where abrasives and/or de-icing agents are used on highways within the Lahontan Region, the following shall be recorded:
  - a. Location of the source of abrasives materials.
  - b. Volume of abrasives and de-icing agents used on individual highway segments.

#### **Lake Tahoe Basin Multi-Jurisdictional Fuel Reduction/Wildfire Prevention - 10 Year Plan**

The USDA Forest Service Lake Tahoe Basin Management Unit (LTBMU) is the lead agency. This strategic Comprehensive Fuels Plan for the Lake Tahoe Basin incorporates approximately 208,800 acres. The plan was developed to comply with the White Pine County Conservation, Recreation and Development Act Of 2006; Public Law 109-432 (H.R. 6111).

The plan facilitates the strategic decisions that must be made by land management, fire, and regulatory agencies to reduce the probability of a catastrophic fire in the Basin. It comprehensively combines all existing fuel treatment plans that have been developed within the basin and provides a communication framework for participating agencies to identify priority areas and to work collaboratively on accomplishing those priorities. In addition, it builds upon current and past fuel reduction projects that have already occurred on nearly 13,000 acres and the efforts of community based fire departments and fire safe councils that are actively treating fuels around residences. More information is available at: [www.fs.fed.us/r5/publications](http://www.fs.fed.us/r5/publications).

According to the Lake Tahoe Basin Management Unit of the U.S. Forest Service, at time of publication, 36,000 acres of forested land have been treated to remove dead and fallen trees and other fuels within the Lake Tahoe Basin Management Unit. Another 40,000 acres remain to be treated.

#### **Tahoe Basin Major Capital Improvement Projects related to Water Quality** **The following lists major water quality improvements/projects from 2002-2009.**

Details on individual projects are available in TWSA annual reports.

- Oliver Park/Kahle Drive Water Quality Improvement Project completed.
- Lincoln Park Water Quality Improvement Project completed.
- Round Hill Water Quality Improvement Project was completed.
- Logan Creek Water Quality Improvement Project completed.
- Hidden Woods Homeowners Association water quality improvement project completed.
- Lake Village Drive water quality environmental improvement project completed.
- Highway 207/Kingsbury Grade environmental improvement project completed.
- NDOT water quality improvements along Highway 50 completed.
- Incline Village Fairway Phase III/Country Club water quality improvement project.
- IVGID effluent export pipeline replacement Phases 1, 2 completed. IVGID replaced a total of 17,800 ft of pipeline from Lakeshore Blvd. to Sand Harbor / Highway 50 at Spooner Lake. Three additional phases were slated.
- Integration of Sand Harbor sewage treatment into IVGID system.

- Mill Creek Restoration project completed. Mill Creek was diverted around the IVGID Treatment Plant overflow pond back into its historic stream channel; thus, restoring Mill Creek to its naturally functioning hydrologic regime.
- Sierra Nevada College completed construction of the Tahoe Environmental Research Center Science building.
- Crystal Bay water quality improvement project completed.
- Rosewood Creek restoration projects completed.
- Third Creek Stream Bank Restoration Project involves restoring Third Creek stream banks between Lakeshore and Incline Way (in process).
- Tahoe Vista Recreation Area park and boat launch facility construction (2.5 acres) completed.
- North Tahoe Public Utility District (NTPUD) replaced 1,500 feet of six inch sewer main.
- Tahoe Vista erosion control project to control and treat storm water runoff in the Tahoe Marina, Tahoe Estates and Tahoe Vista area west of National Avenue completed.
- Brockway erosion control project to control and treat storm water runoff in the Stateline and Brockway area completed.
- Highway 28 environmental control project to control and treat runoff and create bike lanes along Highway 28 from Dollar Hill to Stateline completed.
- NTPUD Beaver Street sewer and water main replacement project replaced 1,900 feet of sewer and installed 2,660 feet of water main.
- Highway 267 erosion control and environmental improvement projects to control and treat runoff in the Kingswood area of Kings Beach.
- Park Cattle Company has completed restoration projects on Edgewood Golf Course including: installing sedimentation ponds to filter urban run-off, installing recirculation stream system and wetland off of Edgewood creek, creating wetlands, installing a pipeline from Lakeside Casino for future urban run-off projects.
- Stateline casinos have installed pre-treatment vaults on casino property. A central storm water pretreatment system has also been installed before the natural sedimentation filters. After vault treatments, storm water passes through six natural treatments (sedimentation ponds and wetlands) before reaching Lake Tahoe. Water leaving the sedimentation ponds into Lake Tahoe is being monitored by Resource Concepts in Carson City, Nevada.
- Upper and Lower Kingsbury Environmental Improvement Projects in the Burke Creek watershed completed.
- Glenbrook Environmental Improvement Projects, Highway 50 from Elks Point to Spooner and in the Cave Rock area completed.

## Major Basin Detrimental Events 2002-2009

Watershed Control Programs (WCP) provide information on the potential sources of pollution in order to identify and control activities that may lead to the deterioration of the quality of a drinking water source (EPA 2003). General threats to source water quality have been identified in Federal and State regulations. Previous sanitary surveys have identified threats specific to the watersheds contributing to the purveyor's source water. New sources of pollution are identified through source water quality monitoring and routine and monitoring of land use activities.

This chapter is a brief summary of activities in the Lake Tahoe Basin which has been characterized, in general, as potential sources of pollution by the U.S. Environmental Protection Agency or previous sanitary surveys.

The Environmental Protection Agency defines general watershed characteristics and activities that are detrimental to drinking water quality as:

<ul style="list-style-type: none"> <li>Point sources of contamination such as wastewater (sewage) treatment plants, industrial discharges, barnyard feedlots, or private septic systems</li> </ul>	<ul style="list-style-type: none"> <li>Animal populations specific to the discussion of Giardia contamination</li> </ul>
<ul style="list-style-type: none"> <li>Effect of precipitation, terrain, soil types, and land cover</li> </ul>	<ul style="list-style-type: none"> <li>Discharge to ground water which recharges the surface source</li> </ul>
<ul style="list-style-type: none"> <li>Road construction</li> </ul>	<ul style="list-style-type: none"> <li>Logging</li> </ul>
<ul style="list-style-type: none"> <li>Pesticide usage</li> </ul>	<ul style="list-style-type: none"> <li>Grazing animals</li> </ul>
<ul style="list-style-type: none"> <li>Recreation activities</li> </ul>	<ul style="list-style-type: none"> <li>Unauthorized activity in the watershed</li> </ul>

Potential pollution sources in purveyors' watersheds have been identified in previous sanitary surveys including:

- Sewer system breaks/spills
- Trash disposal
- Changes in landownership, zoning or land activities that affect water clarity
- Recreation
- Fire
- Erosion, stream pollution, storm run-off, and urban run-off which contributes to the pathogenic contamination of source water
- Wildlife / Grazing Animals

The TWSA Annual Reports provide detailed information on major incidents for each reporting year. Please contact TWSA for further information.

The following highlights several of the major events since 2002:

### Angora Fire 2007

The Angora Fire began on June 24, 2007 in the North Upper Truckee area in South Lake Tahoe, California and was fully contained on July 2, 2007. The fire burned a total of 3,100 acres and destroyed 254 homes. Scientists said the Angora fire was the worst wildfire here in a

century. It also burned in a particularly sensitive area: a watershed that provides a quarter of the water that runs into the lake. About 10 percent of the watershed some 3,100 acres was destroyed.

In some areas, scientists say, the fire burned so intensely it "mineralized" the soil, destroying the nutrients necessary to sustain plant life. It also may have created a layer of soil about 5 centimeters deep that is impervious to water, which could keep moisture from soaking in. That means workers have to amend the soil before anything can grow back, and to prevent erosion, lay down mesh mats, mulch and logs. If soil and ash flow into the lake from streams and creeks in the newly burned area, algae could harm plants growing beneath the surface where trout spawn.

The USDA Forest Service used aerial hydro-mulch operations to stabilize hillsides burned in the Angora Wildfire, near South Lake Tahoe. Planes treated 636 acres with a mixture of wood mulch, recycled paper, water and a guar gum based tackifier that binds the ingredients together. The treatment minimized soil movement until spring, when sprouting vegetation could take over its role as a natural soil stabilizer. The aerial hydro-mulching of Angora Fire Area started on September 12, 2007.

Unlike the east and north shores, the majority of South Lake Tahoe water supplies are fed from groundwater sources, which are less affected by erosion problems than the lake source intakes. At this time, TWSA water purveyors have indicated no changes in raw water intake turbidity readings due to the Angora fire.

#### **Formation of the California-Nevada Tahoe Basin Fire Commission**

In late summer, 2007, Governor Schwarzenegger (CA) joined with Governor Gibbons (NV) to announce the California-Nevada Tahoe Basin Fire Commission. The two governors signed a Memorandum of Understanding to create a panel of 17 voting members that represent each State's stake in the responsible management of lands and fire fuels within the Tahoe Basin, including representatives from affected state agencies, fire agencies and the public. They also requested the Secretary of the U.S. Department of Agriculture to designate one person from the United States Forest Service to serve on the commission.

The Commission performed a comprehensive review of the laws, policies and practices that affect the vulnerability of the Tahoe Basin to wildfires. It also studied various user-friendly approaches to reducing the threat of wildfires while protecting the environment and submitted a report and recommendations to the two governors in March, 2008.

"It is crucial that we all work together to prevent something like the Angora Fire from happening again and also make sure people have the right fire protection tools to protect their property," said Governor Schwarzenegger. "With this action we are taking today I know California and Nevada will rise to the occasion and make sure the Lake Tahoe Basin remains as safe as it is beautiful."

#### **Gondola Fire 2002**

No water quality problems have been reported by the TWSA purveyors in association with the fire. Extensive restoration projects have been undertaken and the area now serves as a model restoration / revegetation management demonstration area.

The wildfire that destroyed 673 acres of forest under Heavenly's gondola is helping researchers understand how a fire's intensity affects the amount of algae-feeding nutrients flowing into Lake Tahoe. High-intensity wildfires produce the most nutrients in runoff, scientists believe, while low-intensity prescribed burns actually decrease the nutrients washed away from the land.

Nutrients such as phosphorous and nitrogen account for about half the lake's loss of clarity by encouraging algae growth. Some of these nutrients come from fertilizers golf courses and home owners use on their lawns. Since algae needs both nutrients to grow, the Tahoe Regional Planning Agency is encouraging companies and residents to choose "zero phosphorous" fertilizers, creating a phosphorous-limited system in the lake.

But nitrogen and phosphorous exist naturally in Tahoe's soils as well. As fires have been suppressed over decades, those nutrients have been building to high levels. But when an intense wildfire comes through an area, it releases nutrients in even higher numbers than in an unburned area, said Wally Miller, a soil scientist with the University of Nevada, Reno. Miller had set up runoff collectors in the area of the Gondola fire before it happened, intending to study nutrients in runoff before and after prescribed burns. But when an actual wildfire raged through the area, he ended up with three sets of data: for unburned areas, wildfire burned areas, and prescribed fire burned areas. Results are starting to indicate the most nutrients are released after a high-intensity wildfire. Prescribed fires release the least amount of nutrients, even less than an unburned area, Miller contends. "It's looking like the best way to decrease the nutrient load in the runoff is prescribed fires or mechanical treatment," he said. Prescribed fires are intentionally set by land management agencies like the U.S. Forest Service. While initially unpopular, public support for intentional fires has grown in the past few years.

The U.S. Forest Service studies have also found a connection between nutrients and fire. "We've found the intensity of the fire has a great deal to do with the type of algae-feeding nutrients that get released," (Forest Service spokesman Rex Norman).

Low-intensity fire was the biggest architect of the Sierra Nevada's ecosystem, experts believe, and some trees depend on fire to open sunny areas for their seeds to germinate. After decades of fire suppression, Western forests are now unhealthy, with too many trees competing for limited water, thereby becoming susceptible to beetle infestation and intense wildfires.

<http://www.tahodailytribune.com/article/20050818/NEWS/108180037>

### **Incident Tracking**

Both the Lahontan Regional Water Quality Control Board (LRWQCB) and the Nevada Division of Environmental Protection (NDEP) maintain extensive records on land and water based pollutant spills within the Tahoe Basin.

Incidents ranging as low as 1 gallon of petroleum product releases are recorded through a combination of voluntary and mandatory reporting protocols. Since 2002, The Nevada Division of Environmental Protection (Superfund & Abandoned Mine Lands Programs; Bureau of Corrective Actions) has reported spill incidents involving sewage, solvent and other pollutants which occurred within the Nevada side of the Tahoe Basin. LRWQCB files indicate hundreds of primarily small incidents between 2002 and 2009. Most of these were of no threat to Lake Tahoe water quality. Several large scale incidents which had possible impact are listed in detail below.



Since 2002, improvements have been made between incident responders (US Coast Guard, marina operators) in reporting protocol to regulators and communications to individual water purveyors on incidents which may impact drinking water quality.

In addition, water purveyors are taking increased responsibility for dealing with sewer related spills relative to the locations where private laterals link to main public utility systems. LTWIP member utilities including IVGID, TCPUD and NTPUD maintain increased and improved policies for video inspection of lines and are working to educate customers on the problems with line damage due to grease blockages and improper digging near lines.

### **Sewer Treatment**

Wastewater treatment is a major area of concern for water quality. In 1966, a significant control action took place to protect the pristine quality of Lake Tahoe when Nevada and California acted to prohibit the discharge of treated wastewater effluent into the lake. Treatment plants were retrofitted with export pipelines and pump stations to transport the effluent out of the basin. Sewage systems were expanded to export untreated wastewater to the Town of Truckee, California, for treatment and disposal. In 1971, both states prohibited septic tanks and required that all sewage generators be connected to an existing sewage system. These programs are administered by the Lahontan Regional Water Quality Control Board (LRWQCB) in California, and the Nevada Department of Environmental Protection (NDEP).

Sewage collection and treatment on the Nevada side of the Lake Tahoe Basin is provided by Douglas County Sewer District #1 (DCSD), Round Hill General Improvement District, and Incline Village General Improvement District. Round Hill GID and Kingsbury GID operate a collection system and discharge into DCSD. All wastewater is discharged outside the Tahoe Basin.

North Tahoe PUD and Tahoe City PUD, located in California, provide sewage collection for its customers and convey raw wastewater to the Truckee Tahoe Sanitation Agency (TTSA) for treatment and disposal at the Truckee Water Reclamation Plant. TTSA was built in response to the passage of the Porter-Cologne Act that disallowed septic systems or any treatment of sewage in the Tahoe basin. TTSA treats and disposes of the waste that is transported to its facility in Truckee from the communities on the north shore of the Tahoe Basin as well as Squaw Valley, Alpine Meadows and Truckee. All treatment and collection facilities participate in local and county spill notification programs.

The Lake Tahoe Wastewater Treatment Infrastructure Partnership (LTWIP) was formed in 2007, as an association of local agencies providing wastewater services. Group activities are referenced in greater detail in this report.

### **Spills and Incidents: 2002-2009**

TWSA annual reports chronicle spill incidents annually. Greater detail about individual spills and incidents can be obtained in these reports. Reported incidents have had no recorded impact on drinking water quality. However minimizing spills, incidents and accidents are a major source of concern for the water purveyors.

### **Rupture of IVGID Export Line causes closure of Highway 28**

Third party damage to the IVGID export line occurred during stormwater improvements along Highway 28 prior in the summer. On Aug 1, 2009 – IVGID wastewater treatment operators investigated the export line in response to a pressure alarm. They discovered roadbed weakening. Approximately 40,000 gallons of treated wastewater had eroded the roadbed and

was released to the adjacent forest area. Emergency response was instituted and the section was repaired. No effluent was released to Lake Tahoe or any other waterbody in the area.

### **Seaplane Sinking in Incline Village**

On Sept. 11, 2008, at approximately, 11 a.m., a private seaplane, conducting routine landing and takeoff procedures, flipped and sank several feet at Burnt Cedar Beach, in Incline Village, within ½ mile proximity to the drinking water intake. Emergency staff responded immediately with containment booms and tow vehicle. Working in close coordination with the IVGID Public Works Director, the plane was towed away from the intake. The intake was closed for 5 hours during the initial emergency. Raw water samples and operator monitoring was conducted. Raw water samples were analyzed for hydrocarbons. No detectible contaminants entered the drinking water supply. One gallon of fuel was estimated to have been released, according to US Coast Guard and NLTFPD staff.

### **Sanitary Sewer Spill in Carnelian Bay September 2009**

SSO Event ID: 745253

SSO Event Type: Category 2

Spill Start Date/Time: 09/30/2009 11:15

Spill End Date/Time: 09/30/2009 11:49

Agency: NORTH TAHOE PUD

Incident occurred near Sierra Boat Company at State Highway 28 at 5146 North Lake Boulevard in Carnelian Bay; approximately 100 gallons of effluent was released. The spill did not reach surface water or storm drains. The spill was fully contained; effluent was Vactor removed from location. For more information on this incident, log into the CIWQS system using the following URL: <http://ciwqs.waterboards.ca.gov/ciwqs>.

### 2008 - 2009 Spill Incidents

The following information is compiled from the Nevada Division of Environmental Protection; Spill Reporting Program and the Lahontan Regional Water Quality Control Board records. The list includes incidents occurring on the Nevada and California sides of the lake. *The list is not comprehensive to include all incidents.*

081009-02	09-Oct-08	1420	USFS - LTBMU	Diesel fuel	Spooner summit USFS fire station, east of US50.		Douglas
080724-02	24-Jul-08	1426	BLM	Transformers	Dirt trail on BLM3.0 miles uphill, need 4WD to get there.		Douglas
090706-01	06-Jul-09	0920		Unknown oil	Lake Tahoe off of Sky Land Shore	Skyland	Douglas
090429-04	29-Apr-09	1305	DCSID	Secondary Treated effluent	West of North Benjamin Forest Service Property	State Line	Douglas
090513-01	13-May-09	1610	F&B Inc.	Diesel fuel	Manchester Corp. Yard on Logging Road	Stateline	Douglas
080718-02	18-Jul-08	1056	Robertson	Sewage	Approx 200' West of Terrace View Dr in eastbound lane of SR 207	Stateline	Douglas
090602-01	02-Jun-09	1120	Coeur Rochester	Heating Oil	2031 Pray Meadows, Glenbrook NV	Stateline	Douglas
081106-01	06-Nov-08	0937	Park Cattle Co.	TPH	Friday Station at Lake Tahoe, Edgewood Golf Course, at dam US 50 and Kingbury Grade, across from golf course	Stateline	Douglas
080811-02	11-Aug-08	1640	Kingsbury GID	Sewer overflow	Behind 432 Quaking Aspen	Stateline	Douglas
080822-03	22-Aug-08	0930	Heavenly Ski Resort	Diesel fuel	Near East Peak Lodge	Stateline	Douglas
090716-02	16-Jul-09	1520		Unknown, assume oil	1/4 Mile South of Zephyr Cove	Zephyr Cove	Douglas
080723-01	23-Jul-08	0945	South Lake Tahoe PUD	Raw sewage	3411 Lake Tahoe Boulevard from sewage manhole	South Lake Tahoe	El Dorado
080930-01	30-Sep-08	1015	State of Nevada - Buildings and Grounds	TPH	Marlette Lake, North side at lake level.		Washoe

090331-01	31-Mar-09	1500	Sheela Roberts-Montoya	Fuel oil	314 Wassou	Crystal Bay	Washoe
090604-04	04-Jun-09	1640	Incline Middle School	Heating Oil	Northwest corner of school parking lot.	Incline Village	Washoe
081113-04	13-Nov-08	1641	United States Forest Service	Explosive Residues	Incline Lake, Washoe Co	Incline Village	Washoe
080826-01	26-Aug-08	1150	Boat Reg # NV 0945KP	Gasoline	In the lake near Incline Village	Incline Village	Washoe
090427-01	27-Apr-09	0847	IVGID	Raw sewage	In front of Sand Harbor State Park entrance on Highway 28.	Incline Village	Washoe
090429-02	29-Apr-09	0850	Same	Raw sewage	180 Village Blvd.	Incline Village	Washoe
080912-01	12-Sep-08	1035	USFS	Explosive devices	Incline Lake off SR 431.	Incline Village	Washoe
080911-03	11-Sep-08	1215	Private seaplane owner	Aviation fuel	Lake Tahoe, in the lake about 1/2 mile off Burnt Cedar Beach, Incline Village.	Incline Village	Washoe
080727-01	27-Jul-08	1322	Unknown	Black patchy film floating 1/4 mile to 1/2 mile long	North Lake Tahoe off shore of 501 Lake Shore, Incline Village Perhaps an aquatic invasive algae or weed.	Incline Village	Washoe

### **Historical Larger Incidents**

North Tahoe Public Utility District reports a major sewer spill on July 19, 2005. Officials estimate 120,000 gallons of raw sewage spilled on Lake Tahoe's shore when a contractor punctured a 14 inch sewer main line (State of California County of Placer Public Service Announcement, July 27, 2005).

Jan. 2007, a pipe fitting broke at water production pump station at Tahoe Vista, CA. Approximately 5,200 gallons of chlorinated drinking water was released into Lake Tahoe.

Incline Village General Improvement District reported a sewer spill on May 10, 2006 in conjunction with the export pipeline rehabilitation project. Most of the spill was contained within the pipeline trench and approximately 3,000 gallons was spilled into Lake Tahoe. IVGID is pursuing a SEP (supplemental environmental project) with NDEP to mitigate any harm caused by the event. (Johnson pers. comm. 2006)

North Tahoe Public Utility District reported that stormwater and raw sewage water was released to Lake Tahoe, January 2006. During heavy rains, crews were responding to a number of pump failures in the system. At this pump station, a generator overheated and shut down. By the time crews could respond, 1,000 gallons had been released to a dry creek emptying into Lake Tahoe.

On Feb. 2004, a treated effluent line was compromised by a guard rail post. IVGID was currently working under an order to replace this stretch of pipe. It has since been replaced. 10 gpm for 2 hours released from line. Some materials released to Lake Tahoe near Sand Harbor.

### **Trash or Hazardous Waste Spills**

No trash or hazardous waste spills from solid waste collection or transportation companies have been reported to the EPA during the past years. (EPA 2009).

The trash disposal on the eastern and southern areas of the Lake Tahoe basin is managed by South Tahoe Refuse Company Inc. and Waste Management. Trash disposal for North Tahoe PUD and Tahoe City PUD is managed by Tahoe Truckee Sierra Disposal. All solid waste is collected and transferred out of the basin. There are no landfill sites within TWSA member boundaries.

Household Hazardous Waste (HHW) collection sites and collection days are located throughout the basin, in order to provide an easy way for homeowners to drop off small quantities of home-generated wastes, potentially harmful to water quality if disposed on improperly. HHW Sites are maintained at Incline Village GID (NV), Tahoe Douglas Fire Protection District (NV) and the Cabin Creek Transfer Station (CA). These programs offer a valuable service to water quality protection, by offering services for proper disposal of toxic substances. The IVGID site handles approximately 8 to 10 ton of materials annually.

### **Shorezone Development and Projects**

TWSA staff regularly attends monthly Interagency Shorezone Coordination Group meetings, in order to keep TWSA purveyors informed of development with possible impacts to the drinking water intakes. Projects most recently under review focus primarily on compliance to the newly adopted TRPA Shorezone Ordinance related to existing buoy field locations; policy and mitigation measures on dredging activities.

Since 2008, TWSA staff has been receiving copies of re-issued and newly permitted boat buoy permits from Nevada State Lands. Many of these structures are located outside the ¼ mile intake buffer, and as a result, the water providers do not provide comment.

In 2008, two projects came under review for potential impacts, the Glenbrook Buoy Field Expansion and the proposed Beach Club on Lake Tahoe.

#### **Glenbrook Buoy Field Expansion (DO-2814-07)**

Expansion to the buoy field adjacent to the Glenbrook Water Company intake was determined by NDEP, to be a potential source of contamination; due to potential source water contamination events from increased boating activity. Mitigation measures agreed upon by NDEP staff include the yearly signing of a notice of awareness for proper boating practices by the buoy users. A copy of this notice was required to be included in TWSA annual reports starting in 2009, along with information on any incidents and follow up procedures taken. In 2008, the Glenbrook Homeowners Association began the required annual notices; and reported no incidents as of Sept 1, 2009. The Nevada Bureau of Safe Drinking Water has stated in association with this project that if increased microbial contamination is seen, the agency will re-evaluate the purveyor's filtration avoidance status.

#### **Beach Club on Lake Tahoe, Stateline, Douglas County, NV Draft Environmental Impact Statement (DEIS)**

This project is still in the planning stages. A revised DEIS has not been submitted for review as of the time of publication of this report.

On February 29, 2008 NDEP submitted comments that the DEIS did not fully address potential impacts to the Kingsbury GID water system. The DEIS noted that water lines would need to be re-routed, and that buildings will be adjacent to the existing surface water treatment plant. The proposed pier is adjacent to the drinking water intake. Disruption to service at this site would impact the entire KGID service area.

These items were deemed of particular concern:

1. Potential short and long term impacts to turbidity and microbial contamination due to construction, drainage and recreation.
2. Space for expansion of the treatment plant to address LTSESWR.
3. Access for KGID staff to treatment plant during and after construction.
4. Impacts to other utilities linked to the treatment plant.
5. Construction timing to minimize water treatment operation interruptions.
6. Integrity of the intake for pier expansion.
7. Security of the treatment plant building.
8. Ozone proximity for residents.

### **Possible Future Detrimental Activities: Shorezone Activities**

The TWSA/Army Corps Risk Assessment model project was developed to provide a scientifically based, operational tool for water purveyors to use in cooperation with project developers to model possible impacts to drinking water intakes from such developments.

- NTPUD is participating and commenting on possible drinking water quality impacts due to the expansion of the North Tahoe Marina.
- Glenbrook Water Company is providing comments and is active in monitoring the development process of a proposed Glenbrook buoy field expansion.
- Tahoe Shores Mobile Home Park closure/Tahoe Beach Club redevelopment.
- Changing requirements by TRPA on defensible space.
- Catastrophic wildfire.
- Pier and buoy field expansion.
- Hazardous materials spills.

### **Chemical and Pesticide Usage**

#### **Lahontan Regional Water Board Water Quality Control Plan (Basin Plan):**

Proposed changes to the Water Quality Objective for Pesticide Application to Water

*[http://www.swrcb.ca.gov/rwqcb6/water\\_issues/programs/basin\\_plan/docs/pest\\_bpaprojectdescription.pdf](http://www.swrcb.ca.gov/rwqcb6/water_issues/programs/basin_plan/docs/pest_bpaprojectdescription.pdf)*

In July 2009, the Lahontan Region Water Quality Control Board began the scoping process for revisions to regulator language regarding aquatic herbicides, pesticides and other chemical controls.

#### **Description of the Proposed Activity**

The proposed activity is the adoption of an amendment to the Lahontan Regional Water Board's (Water Board) Water Quality Control Plan (Basin Plan) to change the water quality objective for pesticides. The current pesticide water quality objective essentially prohibits pesticide application to water by requiring the pesticide concentration to not exceed the lowest detectable levels (Basin Plan pg. 3-5). Detectable limits decrease with the advancement of laboratory techniques and other detection technology. The proposed Basin Plan Amendment (BPA) would amend the water quality objective so that proposals for aquatic pesticide use could be brought to the Water Board for discretionary board level consideration and approval. The Basin Plan defines pesticides to include insecticides, herbicides, rodenticides, fungicides, molluscicides, piscicides and all other economic poisons. An economic poison is any substance intended to prevent, repel, destroy or mitigate the damage from insects, rodents, predatory animals, bacteria, fungi or weeds capable of infesting or harming vegetation, humans, or animals (Food and Agriculture Code 12753).

Currently, addition of pesticides to water for any purpose is in conflict with the water quality objective. There may be situations where the use of pesticides could be considered appropriate. These uses include the protection of public health (e.g. vector control, protection of municipal supply waters) and the preservation of ecological integrity and associated protection of water quality (e.g. invasive species control, endangered species recovery). The proposed BPA would amend the water quality objective to provide the Water Board with the discretion to approve specific aquatic pesticide applications and regulate the project under the National Pollution

Discharge Elimination System program. The proposed Basin Plan Amendment ( BPA) will not by itself require specific project implementation. Adoption of the proposed BPA could indirectly result in the application of pesticides to surface waters. The Water Board is required by the California Environmental Quality Act to analyze impacts and mitigation measures that are a reasonably foreseeable consequence of adopting the BPA.

The project, under the California Environmental Quality Act, is the amending of a water quality objective. The proposed BPA is a region wide amendment. The project area is the Lahontan Region. The Lahontan Region is defined in terms of drainage basins by Section 13200(h) of the Porter-Cologne Act. For planning purposes, the Lahontan Region has historically been divided into North and South Lahontan Basins at the boundary between the Mono Lake and East Walker River watersheds. The entire Lahontan Region is about 570 miles long and has a total area of 33,131 square miles.

### **Perchlorate**

Several communities around the lake, including Incline Village, Kings Beach, Glenbrook and the City of South Lake Tahoe, provide community fireworks shows annually at the 4th of July holiday and at other large events. These shows are conducted by professional fireworks providers and are staged from barges anchored several hundred yards off shore. Event organizers require the next day cleanup of any firework debris, several include underwater dive cleanup. Perchlorate as a potential drinking water contaminant has entered the discussion surrounding these events. TWSA staff has conducted research which was shared with TWSA board members, on the perchlorate issue. Personal use of fireworks is banned in the Tahoe Basin.

### **Wildlife**

The Tahoe Basin is home to many species of native, introduced, adapted and domestic animals. The significance to drinking water includes the potential of bacterial contamination from animal defecation/feces. Due to large population sizes, the main threats include: 1) domestic dogs and 2) colonies of Canadian Geese which inhabit local beaches and defecate at the shoreline. TWSA staff ongoing beach and stream monitoring sampling indicates no significant impact on drinking water quality from wildlife. Dr. Marc Walker, University of Nevada Reno faculty, conducted extensive studies on dog feces and water quality, between 2004 and 2007 at Burke Creek. His study revealed that once feces have desiccated, there is no ongoing bacteriological impact on water quality. This report is referenced in the TWSA 2008 Annual Report.

IVGID uses a Goose Patrol team of approximately 12 dogs to haze and chase geese from District property.

### **Grazing Animals: Baldwin Grazing Allotment**

[http://www.fs.fed.us/r5/ltbmu/documents/projects/BGAMP/FINAL\\_Baldwin\\_Allotment\\_EA\\_20090723.pdf](http://www.fs.fed.us/r5/ltbmu/documents/projects/BGAMP/FINAL_Baldwin_Allotment_EA_20090723.pdf)

The Lake Tahoe Basin Management Unit (LTTBMU) proposes to discontinue authorized livestock grazing on the Baldwin Allotment in order to meet state and federal resource standards and achieve desired conditions. The proposal includes an amendment to the 1988 LTBMU Land and Resource Management Plan to close the Baldwin Grazing Allotment to eliminate grazing in the future. The Baldwin Grazing Allotment is located in El Dorado County on the south shore of Lake Tahoe in the Fallen Leaf Management Area. The 200 acre allotment is adjacent to Baldwin Beach (T13N R17E Section 26 and 35) in the Tallac Creek drainage. The U. S. Forest Service Lake Tahoe Basin Management Unit (LTBMU) manages the Baldwin Grazing Allotment in the



Tallac Creek watershed. The allotment is approximately 200 acres and the only allotment on the lakeshore of Lake Tahoe. Because the grazing permit expired on December 31, 2006, and no NEPA decision had been made on the allotment, a temporary grazing permit was issued for 2007 and 2008. Permitted use was modified from 45 horses from July 1 until October 15 to 30 horses for 3 days (or until standards were met) on the C Pasture only. All resource standards were met in the 2007 and 2008.

### **State of the Lake Report**

[www.terc.ucdavis.edu](http://www.terc.ucdavis.edu)

Annually in August, the University of California-Davis, issues the *Tahoe: State of the Lake Report*. This report summarizes how natural variability and human activity have affected the lake's clarity, physics, chemistry and biology. Data is presented to reveal a unique record of trends and patterns – the result of natural forces and human actions that operate over time scales ranging from days to decades. These patterns tell us that Lake Tahoe is a complex ecosystem, and it behaves in ways we don't always expect.

The long-term data set collected on the Lake Tahoe ecosystem by the University of California, Davis, and its research collaborators, is a valuable tool for understanding ecosystem function and change.

*Tahoe: State of the Lake Report* presents ongoing data in the context of the long-term record. While the focus is on data collected as part of ongoing, long-term measurement programs, the 2009 report included data related to the discovery of a major invasion of *Corbicula fluminea*, or Asian clam, in Lake Tahoe. If any single factor had to be identified as the most important change in the state of Lake Tahoe in 2008, it would be the dramatic increase of Asian clam. The report also includes data about changes in the algae composition and concentration, lake clarity and the effects of climate change on snowmelt timing, lake water temperature and density stratification.

The UC Davis Tahoe Environmental Research Center has developed sophisticated computer models that help scientists more accurately predict how Lake Tahoe's ecosystem behaves. Long-term data sets are essential to refine the accuracy of those models. In these times of rapid change, reliable predictive models are indispensable tools for Lake Tahoe Basin resource managers.

Some of the highlights:

#### Asian Clams:

- In parts of the southeast of Lake Tahoe, Asian clams now comprise almost 50% of the benthic (sediment-dwelling) organisms and are present in concentrations greater than 1500 per sq. meter.
- The green filamentous algae *Zygnema* is co-located with the beds of Asian clam and is present at concentrations sufficient to be considered a nuisance. High concentrations of nutrients that are excreted by the clams are believed to be driving the growth and accumulation of the large *Zygnema* biomass.
- Calcium deposition occurs from dead clam shell beds.

#### Meteorology:

The Lake Tahoe ecosystem is highly influenced by meteorology. In the short term, meteorological conditions are expressed as daily variations in weather. In the long term, they

are expressed as normal cyclical variations such as wet and dry cycles, and long-term trends related to global climate change.

#### Historical record:

- The nightly minimum temperatures recorded at Tahoe City have increased by more than 4 degrees F since 1910.
- Days when air temperatures averaged below freezing have generally decreased by 30 days per year since 1910, although 2008 was a cold year with the greatest number of freezing days in the last 16 years.
- Since 1910, the percent of precipitation that fell in the form of snow decreased from 52 percent to 34 percent.
- Peak snow melt averages 2 ½ weeks earlier than in the early 1960s.

#### Previous year:

- Solar radiation in the Tahoe basin was reduced by up to 20% during one week in July on account of smoke from the California wildfires.
- Precipitation during both 2007 and 2008 was low, with 2008 being the 12th driest year on record in 98 years.

#### Physical Properties:

Lake Tahoe's physical properties are largely a response to external factors, especially meteorology. Physical properties, in turn, determine the environment for all the lake's chemical and biological processes.

#### Historical record:

- Water temperature (volume averaged) rose by more than 1 degree F in the past 38 years.
- Winter surface water temperatures were the coldest measured in the last 10 years, with the lowest maximum surface water temperature of 41.02 degrees F.
- Density stratification of Lake Tahoe has increased over the last 38 years as surface water warmed due to climate change.

#### Previous year:

- In 2008, lake level fell to a low of 6223.07 feet in December, within 1 inch of the natural rim.
- Lake Tahoe mixed all the way to the bottom in 2008, repeating the deep mixing event of the previous year.

#### Nutrients and Particles:

Lake Tahoe's clarity is determined especially by fine sediment particles, and also by nutrients. Tahoe's urban areas contribute 72% of fine particles (<16 micrometers in size), despite representing only 10% of the land base. Nutrients affect lake clarity by promoting algae growth. Offshore, algae make the water greenish and less clear. Along the shoreline, algae are a problem because it coats rocks with green slime and provides nutrients for bacteriological growth. . The two nutrients that most affect algal growth are nitrogen and phosphorus. These nutrients are measured at various depths at TERC's mid-lake and western lake stations. One form of nitrogen that is readily available to algae (nitrate) enters the lake through stream and urban runoff, groundwater and atmospheric deposition. Phosphorus occurs naturally in Tahoe Basin soils and enters the lake from soil disturbance and erosion, as well as atmospheric deposition.

#### Historical record:

- Stream inputs of particles, nitrogen and phosphorus are directly linked to the annual amount of precipitation to the annual amount of precipitation via runoff and stream flow.
- Atmospheric deposition of nutrients, both in concentration and total loads, are also linked to precipitation.
- Nitrogen concentrations in the lake have remained generally constant for many years.
- Phosphorus concentrations have been generally declining.

#### Previous year:

- The watersheds that contributed the most particles and nutrients to Lake Tahoe were the Upper Truckee River, Blackwood Creek, Trout Creek, Ward Creek and Incline Creek.
- In 2008, the volume-weighted, annual average concentration of phosphorus was just under 2.0 micrograms per liter (parts per billion); the lowest value since monitoring began in 1980.

#### Biology:

The longest data sets for lake biology come from the base of the food web—the free-floating algae (or phytoplankton). This algae influences the lake's food web, clarity and aesthetics.

#### Historical record:

- Primary productivity, the rate at which algae produce biomass through photosynthesis, has been increasing since 1959.
- Since 1984, the annual average depth of the deep chlorophyll maximum has declined.
- Diatoms remain the dominant algal species and provide high quality food for aquatic species.

#### Previous year:

- Primary productivity in 2008 was the highest on record.
- The depth of the maximum chlorophyll concentration decreased in 2008 to a mean of 115 feet.
- Periphyton (attached algae) concentrations were similar to values recorded in 2007, with the exception of Zephyr Point, which experienced a 2-3 fold increase to the highest values ever recorded at that site.

#### Clarity:

Clarity remains the indicator of greatest interest for Lake Tahoe because it tracks both degradation and the community's efforts to restore clarity to historic levels. Secchi depth (the point below the lake surface at which a 10-inch white disk disappears from view) has been measured continuously since 1968, and is the longest continuous measure of Lake Tahoe's water clarity.

- In 2008, the annual average Secchi depth was 69.6 feet, virtually identical to the value recorded in 2007.
- In the last eight years, Secchi depth measurements have been better than predicted by the long-term linear trend.
- There is statistical support that Lake Tahoe's clarity decline has slowed significantly, and is now best represented by a curve.

#### Education and Outreach:

The public can learn about the science behind Lake Tahoe restoration at TERC's Incline Village education center (the Thomas J. Long Foundation Education Center).

- In 2008, over 9,200 people participated in education and outreach activities.

## RECREATION ACTIVITIES

### **Boating: Aquatic Invasive Species - Potential Importation of Quagga/Zebra Mussels**

*[http://www.trpa.org/documents/docdownloads/AIS/Quagga\\_Survival\\_Risk\\_LT\\_3\\_09.pdf](http://www.trpa.org/documents/docdownloads/AIS/Quagga_Survival_Risk_LT_3_09.pdf)*

The Tahoe Regional Planning Agency (TRPA) and Tahoe Resource Conservation District (TRCD) have taken the lead roles in a region-wide management plan for the prevention of the introduction of Aquatic Invasive Species (AIS). These agencies began a large-scale, lake-wide campaign to educate boaters on the AIS threat to Lake Tahoe, and provided inspection of boats by trained inspectors at public and private ramps, in the summer of 2008.

The discovery of Quagga Mussel contamination in Lake Havasu, Lake Mead, and the Colorado River Basin has created an emergency need in our area to address prevention. Recent studies indicate the survivability potential is real for these species if introduced to Lake Tahoe. If established at Tahoe, quagga mussels or their cousin, zebra mussels, could cause profound changes to the alpine lake's sensitive ecosystem. The mussels could clog water intakes, cover boats and piers, and litter pristine beaches with sharp and reeking shells.

The potential threat to water quality from the introduction of aquatic invasive species became a leading topic in basin management plans. In 2008-2009 the emphasis continued on creating an effective boat inspection and boater education program. For the water purveyors, these species are of special concern due to their tendency to colonize and plug drinking water intakes. The potential for biofouling and bacteriological contamination are also concerns.

A recent study by the U.S. Army Corps of Engineers estimates a mussel invasion could cost Tahoe's tourism economy more than \$22 million per year.

The Lake Tahoe Aquatic Invasive Species Working Group (LTAISWG) is a diverse group of agencies, community members and scientists dedicated to early detection and rapid response, prevention and control of aquatic invasive species in the Tahoe Basin. TWSA staff became actively involved in working with TRPA and TRCD as a member of the working group, focusing on the AIS inspection program protocols, public education and outreach. TWSA staff provides education and outreach to the public at local events on the threat these species pose to drinking water quality.

In 2009, 45 large format aluminum signs with source water protection and AIS/quagga mussel information were sponsored by TWSA for installation at public access points.

Incline Village General Improvement District (IVGID), as the sole water purveyor operating its own boat ramp, responded with additional inspector staffing of the Ski Beach boat ramp, providing coverage 7 days a week, from mid-July 2008 to October 2008.

## TRPA Ordinances

In October 2008, the TRPA Governing Board revised the TRPA Code of Ordinances to prohibit the transportation of invasive species: TRPA Code of Ordinances, Chapter 79.3 now contains regulations relating to the prevention of invasion by aquatic invasive species.

Invasive species are defined in the TRPA Code as:

*...species, both aquatic and terrestrial, that establish and reproduce rapidly outside of their native range and may threaten the diversity or abundance of native species through competition for resources, predation, parasitism, hybridization with native populations, introduction of pathogens, or physical or chemical alteration of the invaded habitat. Through their impacts on natural ecosystems, agricultural and other developed lands, water delivery and flood protection systems, invasive species may also negatively affect human health and/or the economy. Aquatic invasive species shall include but not be limited to: zebra mussel (*Dreissena polymorpha*), quagga mussel (*Dreissena bugensis*), Eurasian water milfoil (*Myriophyllum spicatum* L.), curlyleaf pond weed (*Potamogeton crispus* L.), and large mouth bass (*Micropterus salmoides*).*

TRPA Code of Ordinances, Chapter 79.3. A relates to the transport, introduction and launching of watercraft that is contaminated with aquatic invasive species: *Prohibition: The transport or introduction of aquatic Invasive Species into the Lake Tahoe Region is prohibited. Further, the launching of any watercraft contaminated with Aquatic Invasive Species into the waters of the Tahoe Region is prohibited*

TRPA Code of Ordinances, Chapter 79.3. B makes it mandatory to submit to the inspection of watercraft prior to launching when an inspector is present, makes decontamination mandatory when the watercraft is judged by an inspector to be contaminated, and closes boat launching facilities when an AIS inspector is not present.

*(1) An owner operator of a Boat Ramp or other Boat Launch Facility (exclusive of single family residences) shall close the ramp or facility to launching of watercraft at all times when the provisions of subsection (2) have not been or cannot otherwise be provided or met.*

*(2) All watercraft, motorized and non-motorized, including but not limited to boats, personal watercraft, kayaks, canoes and rafts, shall be subject to an inspection prior to launching into the waters of the Lake Tahoe Region to detect the presence, and prevent the introduction, of Aquatic Invasive Species. An inspection under this section is valid only if performed by a trained inspector pursuant to Tahoe Regional Planning Agency standards and requirements for Aquatic Invasive Species inspections.*

*(3) All watercraft inspected in subsection (2) shall be subject to decontamination if determined necessary by an inspection under 79.3 B (2). A watercraft shall launch only if the required decontamination is performed and completed by a trained individual pursuant to TRPA standards and requirements for Aquatic Invasive Species decontamination and launch is authorized by a trained inspector pursuant to TRPA's standards and requirements for Aquatic Invasive Species Inspections.*

*(4) All watercraft inspected in compliance with subsection (2) and decontaminated in compliance with subsection (3) are subject to a fee to pay for the inspection and/or decontamination and other program costs.*

The TRPA Governing Board approved an inspection fee amount and program structure which became effective on June 1, 2009:

AIS INSPECTION FEES	
Fee	Vessel Category
No Fee	Non-Motorized
No Fee	With Inspection Seal
\$10*	Up to 16'
\$30*	Over 16' to 25'
\$40*	Over 25' to 39'
\$60*	Over 39'
Additional \$10 for vessels containing ballast tanks/bladders/live wells. * A 25% discount card will be available this summer for frequent launches.	

## Lake Tahoe Region – Aquatic Invasive Species Management Plan

<http://www.trpa.org/default.aspx?tabindex=0&tabid=378>

*United States Army Corps of Engineers (USACE) 2009; Lake Tahoe Region Aquatic Invasive Species Management Plan, California - Nevada.*

This plan was officially adopted August 2009 at the Tahoe Forum.

The Aquatic Invasive Species Management Plan is part of a multi-stakeholder collaborative effort to minimize the deleterious effects of nuisance and invasive aquatic species in the Lake Tahoe Region. This specific product is authorized pursuant to Section 108 of Division C of the Consolidated Appropriations Act of 2005, Public Law 108-447 and an interagency agreement between the U.S. Army Corps of Engineers and the California Tahoe Conservancy. This report was prepared by the firm, Tetratech.

Substantial changes to the Lake Tahoe Region's economy, pristine water quality, aesthetic value, and recreational pursuits are occurring, partly due to the harmful impacts of aquatic, non-native plants, fish, invertebrates, and other invaders. These non-native aquatic organisms are considered 'invasive' when they threaten the diversity or abundance of native species or the ecological stability of infested waters, or commercial, agricultural, aquacultural or recreational activities dependent upon such waters (NANPCA 1990), or aquatic invasive species (AIS) when they occur in water. AIS are commonly spread by activities such as boating, fishing, hatchery releases, and aquarium dumping. The Lake Tahoe Region is not only threatened by new introductions to Lake Tahoe from other waterbodies, but the expansion of existing populations within the lake and even as a source of AIS to nearby waterbodies.

At least 20 non-native species are established in the Lake Tahoe Region, including aquatic plants, fishes, invertebrates, and an amphibian. As examples, Eurasian watermilfoil (*Myriophyllum spicatum*; an aquatic plant) has been spreading around Lake Tahoe over the last 15-20 years, and curlyleaf pondweed (*Potamogeton crispus*; another aquatic plant) has begun to expand dramatically over the last three years. Beds of Asian clams (*Corbicula fluminea*) are larger and more common than previously known, and populations of warm water fishes such as largemouth bass (*Micropterus salmoides*) and bluegill (*Lepomis macrochirus*) are expanding. Moreover, global climate change has resulted in warmer water temperature, likely facilitating the establishment of non-native plants in the nearshore environment and providing increased spawning areas for warm water fishes that compete with desirable species.

The potential economic impact to the Lake Tahoe Region caused by new AIS introductions such as quagga or zebra mussels (*Dreissena bugensis* and *D. polymorpha*, respectively) or expanding aquatic plant populations would be substantial. The combined economic impacts to recreation value, tourism spending, property values, and increased boat/pier maintenance, when evaluated over a 50 year period, is estimated at \$417.5 million (present value), with an average annual equivalent value of \$22.4 million per year. The largest estimated impacts would be to property values and lost tourism spending, each accounting for 38% of the total estimated AIS damages. Spending on prevention and early eradication produces a higher benefit to cost ratio than post-infestation control programs such that maximum benefits are realized through early and preemptive action.

The 2007 discovery of quagga mussels in Lake Havasu, Lake Mead, and the Colorado River Basin have prompted rapid cooperation and action by regional, bi-state, and federal agencies and non-governmental organizations in the Lake Tahoe Region. These new threats, coupled with recent studies showing high incidence of boat traffic to Lake Tahoe from these areas, have prompted a tremendous ramping up of education and outreach campaigns, new regulations to

prevent accidental introduction, and increased control efforts and research on the biology and distribution of existing AIS populations.

Examples of these activities include:

- Formation of the Lake Tahoe AIS Working Group (LTAISWG)
- Formation of the Lake Tahoe AIS Coordination Committee (LTAISCC)
- Yearly workshops organized by the LTAISWG to prioritize AIS prevention, monitoring, control, education, and research efforts
- Development and implementation of a Vessel Inspection Program at Lake Tahoe
- Deployment of portable boat washing stations
- Full-time AIS Coordinator hired by U.S. Fish and Wildlife Service (USFWS)
- Increased monitoring for invasive aquatic plants, invertebrates, and warm water fishes
- Use of diver-operated suction and benthic barriers to control invasive aquatic plants
- Evaluation of diver-operated suction and bottom barriers to control Asian clams
- Measurements of warm water fish behavior and diets in and around the Tahoe Keys
- Increased education and outreach activities
- Quagga mussel survivability studies

Despite these efforts, the Lake Tahoe Region lacked a cohesive guiding document to prioritize objectives and identifies lead organizations, specific actions for each organization, and funding sources to combat existing and potential AIS. Further guidance was needed to delineate appropriate, science-based regulation and monitoring that expressly deals with prevention and management of AIS. The purpose of the *Lake Tahoe Region AIS Management Plan* (the Plan) is to facilitate coordination of regional, bi-state, state, and federal programs and to guide implementation of AIS prevention, monitoring, control, education, and research in the Lake Tahoe Region.

The goals of the Plan are to:

- Prevent new introductions of AIS to the Lake Tahoe Region
- Limit the spread of existing AIS populations in the Lake Tahoe Region, by employing strategies that minimize threats to native species, and extirpate existing AIS populations when possible
- Abate harmful ecological, economic, social and public health impacts resulting from AIS

The implementation of the Plan is structured around seven objectives associated with:

- A. Management plan implementation and updates
- B. Coordination and collaboration
- C. Prevention
- D. Early detection, rapid response and monitoring
- E. Long-term control and management
- F. Research and information transfer
- G. Laws and regulations

To meet these objectives, 23 strategies are identified with respective action items detailing how that objective will be met. The priority of each of the 95 actions included are ranked as low, medium, or high and the lead and cooperating entities are identified. Where applicable, short-term (present through 2010) priorities for action and funding source are indicated as are the long-term actions over the five year period from 2010 to 2015. In many cases, the LTAISWG or



LTAISCC are named as the lead or cooperating entities. Currently, the two committees share a common chair.

The intent of the Plan is to provide more localized guidance for preventing and managing AIS in the Lake Tahoe Region and will not be in conflict with the California AIS Management Plan (CAISMP), administered by the California Department and Fish and Game (CDFG) or the anticipated plan from the state of Nevada.

At a minimum, the Plan will be reviewed once a year and revised every five years by a LTAISCC sub-committee to ensure Plan objectives, strategies and actions continue to identify and address relevant AIS issues in a timely manner. Individual components of the Plan (e.g., rapid response plans, monitoring plans, and vessel inspection protocols) may be updated more frequently to fully address changing needs in the Lake Tahoe Region.

Summarized in the Plan is the background of non-native species introductions to the Lake Tahoe Region, the pathways for existing and potential AIS introductions, the types of existing and potential AIS in the Lake Tahoe Region, and short- and long-term priorities for action. Also included (as appendices) is an overview of regulations and programs, the Vessel Inspection Plan, the Small Watercraft Screening Process, an estimate of potential economic impacts from a mussel infestation at Lake Tahoe, and an overview of existing and potential AIS life histories, environmental requirements, distributions, and control methods.

## **V: PROGRAM TO GAIN OWNERSHIP OR CONTROL OF THE WATERSHED**

As noted, the level of development and human activity within the Tahoe Basin makes it impossible to control the watershed to the level required by the SWT. However, through strict regulatory control of land use, and due to the extensive areas of federal, state and public lands, portions of the watershed are being retired from development potential through ongoing land acquisition in the form of public land purchases.

### **Forest Service Land Acquisition Program in Lake Tahoe Basin**

The USDA Forest Service, Lake Tahoe Basin Management Unit announced the Fiscal Year (FY) 2007 acquisition program of environmentally sensitive lands in the Lake Tahoe Basin, authorized by the Santini/Burton Act (P.L. 96-586). The Forest Service is also planning the Fiscal Year 2008 program. This notice serves as the annual notification required by the Santini/Burton Act for both years programs.

All of the proposed purchases are properties where the owners have expressed a definite interest in selling to the Forest Service. The purchase prices will be based on fair market value appraisals prepared by qualified private appraisers and approved by Forest Service Review Appraisers.

### **A summary of the 2007 and 2008 Santini/Burton programs follows:**

<u>California</u>	<u># Parcels</u>	<u>Acres</u>
El Dorado County	1	2.5 acres
	1	40 acres
	5	1.71 acres
Placer County	1	1.87 acres
	4	268.73 acres
Total	<u>12</u>	<u>314.81 acres</u>

The properties proposed for acquisition include the Quail Lake property at Homewood, a 40 acre in-holding above Luther Pass, a five lot in-holding near upper Ski Run Blvd., a small lot in Christmas Valley and a small lot in Ward Canyon.

### **Incline Lake Purchase**

In summer 2008, the finalization of the purchase of Incline Lake was achieved. This was the largest private land holding on the Nevada side of Lake Tahoe. As a privately owned parcel, the diversity of resources at Incline Lake has been essentially inaccessible to the general public for more than 70 years. The \$75-million purchase of privately owned Incline Lake was funded from the sale of public land in the Las Vegas area. The 777-acre property is located between Incline Village and Mount Rose summit and is within the Incline's drainage watershed to Lake Tahoe. Purchase of this property would provide major watershed protection, as it is slated for removal from development and returned to low-impact public recreational use.

### **U.S. Environmental Protection Agency Activities**

EPA Region 9 has provided more than \$31 million since 1997, to promote water quality efforts in and around the lake. Several years ago, the EPA placed a full-time staff person in Tahoe to work with the community and local agencies to coordinate ongoing watershed projects in the area. The EPA supports a variety of watershed projects in an effort to reduce sediment and pollutants from flowing into the lake.

Recently funded projects include the following:

- Complete Lake Tahoe's water pollution control plan;
- Evaluate trends and patterns in water quality;
- Evaluate nutrients and sediment loading into Lake Tahoe from urban runoff;
- Monitor and model air pollution sources, including mobile emissions;
- Tahoe Integrated Information Management System.

### **Water Pollution Control Plan (TMDL)**

*[http://ndep.nv.gov/bwqp/file/lccp\\_handbook\\_v099.pdf](http://ndep.nv.gov/bwqp/file/lccp_handbook_v099.pdf)*

The United States Environmental Protection Agency (US EPA) Lahontan Regional Water Quality Control Board (LRWQB) and Nevada Division of Environmental Protection (NDEP) have been working together collaborating with numerous other federal, state and local entities to develop a water quality plan (known as the Lake Tahoe Total Maximum Daily Load (TMDL). The plan will identify the sources of pollution and specify reductions in sediment and nutrients that are necessary to restore the lake's clarity.

The State of Nevada has designated Lake Tahoe as a Water of Extraordinary Aesthetic or Ecologic Value. However, NDEP was forced to list the waterbody on its 303(d) List of Impaired Waterbodies due to exceedances in the clarity standard. In addition, monitoring conducted over the last 40 years has indicated a steady trend of loss in the Lake's transparency.

The Lake Tahoe TMDL is a scientific effort at the forefront of the campaign to return Lake Tahoe water clarity to historic levels. The scale of the TMDL effort signifies the importance of this national treasure; to date the TMDL Program has involved research by nearly 200 scientists and engineers and more than a \$10 million investment by the federal government and the states of Nevada and California as well as eight years of cooperation and participation by Tahoe resource management agencies, local governments and the public. In order to better manage the enormous undertaking of the Lake Tahoe TMDL, it was necessary to break the effort into three distinct phases, for which key questions were posed.

Phase 1 involved the establishment of a comprehensive research program to answer the following questions:

- What pollutants are causing Lake Tahoe's clarity loss?
- What are the sources and quantities of each of these pollutants?
- How much of each pollutant can Lake Tahoe accept and still reach the clarity goal?

The analysis indicates that the primary pollutants controlling clarity are fine sediment particles and the nutrients phosphorous and nitrogen. Fine sediment particles (FSP) cloud the water while nutrients fuel algal growth. Although each affects the distance that light is able to penetrate into the water column, the analysis indicates FSP, particularly those less than 16 micrometers, appear to be more important than nutrients due to their light scattering effect. The

vast majority of FSP entering the Lake are derived from the urban area. Modeling results suggest that a 65% reduction in FSP, accompanied by reductions in nitrogen and phosphorous are necessary to restore historic clarity within Lake Tahoe.

Annual TMDL loading estimates into Lake Tahoe include: 392 metric tons of Nitrogen, 50 metric tons of Phosphorous; 14,800 metric tons of fine particles (S. Patterson, 2009). Detailed information can be found in the *Lake Tahoe Total Maximum Daily Load Technical (Tech) Report* at <http://ndep.nv.gov/bwqp/tahoe.htm>

Phase 2 of the TMDL attempts to answer these questions:

- What are the options for reducing pollutant inputs to Lake Tahoe?
- What strategy should be implemented to achieve the clarity goal?

The *Pollutant Reduction Opportunity (PRO) Report* (<http://ndep.nv.gov/bwqp/tahoe.htm>) was a basin-wide analysis which quantified load reductions achievable from implementing various levels of pollutant control efforts. Together the Tech and PRO Reports provide the scientific and technical basis for the development of a recommended implementation strategy capable of achieving the Clarity Challenge. This interim target of 80 feet annual average Secchi disk depth to be achieved within 20 years is important because scientists may then state with confidence that we have actually reversed the trend in clarity loss and are now moving in the path of restoring Lake Tahoe to its historic clarity. Approximately a 32% load reduction in FSP with accompanying reductions in nitrogen and phosphorous are needed to achieve the Clarity Challenge.

The recommended strategy to achieve the *Clarity Challenge* was born from a public/ stakeholder input process carried out between the fall of 2007 through the spring of 2008. The process was designed to evaluate the political and social acceptability of the strategy alternatives, with the goal of crafting a preferred strategy that received broad stakeholder support. While the recommended strategy calls for load reductions from the atmosphere, stream channels and the forested areas, it emphasizes FSP reductions through the control, treatment and prevention of urban stormwater. This stems from the conclusions that urban stormwater represents both the greatest source of these pollutants as well as the greatest opportunity to achieve needed load reductions.

The analysis suggests that while broader application of conventional pollution controls will be beneficial, more innovative and advanced controls are required in order to meet the Clarity Challenge. Examples of such controls include, but are not limited to, alternatives to roadway abrasives applications, advanced roadway sweeping practices using the latest technology and equipment, and conveying stormwater to local or regional facilities featuring enhanced treatment through biological or chemical processes.

Phase 3 of the TMDL addresses the following questions:

- How will the strategy be implemented?
- How will progress be assessed?

Phase 3, the current phase, represents the transition from the science-based policy formation phases to the implementation and performance evaluation phase. In this phase the recommended strategy will be implemented by local government agencies, as well as state,

regional and federal regulatory and land management agencies through their respective programs. Load reduction requirements will be established based on allocations contained in the TMDL document.

It is expected that future stormwater discharge permits or Memoranda of Agreement MOU codes will include pollutant load reduction requirements. However, it should be noted that our agencies are committed to cooperating with their respective constituencies in an attempt to ensure that milestones schedules are considered workable.

Progress toward meeting the Clarity Challenge will be assessed through the TMDL Management System, a program intended to define the process and protocols by which consistent methods and tools are used to quantitatively estimate and track the amount of load reductions achieved through specific actions on the ground. In addition, monitoring programs are a key part of evaluating progress. A Regional Stormwater Monitoring Program (RSWMP) is currently being developed for the purpose of verifying the effectiveness of load reduction actions. Lake clarity status and trend monitoring will continue in order to assess the Lake's response to these actions.

### **Lake Clarity Crediting Program**

[www.waterboards.ca.gov/lahontan/water\\_issues/programs/tmdl/lake\\_tahoe/index.shtml](http://www.waterboards.ca.gov/lahontan/water_issues/programs/tmdl/lake_tahoe/index.shtml) (or)  
<http://ndep.nv.gov/BWQP/tahoe.htm>

Because urban stormwater is the main source and represents the greatest opportunity to resolve the Lake Clarity problem, NDEP and the Lahontan Water Board sought to develop a program that would drive accountability and motivate effective action to improve Lake Tahoe clarity. An Environmental Protection Agency (EPA) Targeted Watershed Initiative Grant was used to create the Lake Clarity Crediting Program (Crediting Program).

The Crediting Program is the framework that connects on-the-ground actions taken by local governments and state transportation agencies to the goal of restoring Lake Tahoe clarity. It defines a comprehensive and consistent system to quantify, track and report load reduction actions. In order to maximize review efficiency and consistency and comparability of results Crediting Program specifies the use of standardized protocols for this purpose. Although the Handbook lays out the requirements necessary to consider the utilization of other methods and tools, the Crediting Program encourages the use of the following approved tools:

- The Pollutant Load Reduction Model is the standard load reduction estimation tool, which integrates load reductions achieved through combinations of source control practices and treatment BMPs in a catchment. The beta-version of the PLRM is due to be released October 2009. A public meeting was held to release the model.
- The Best Management Practice Maintenance Rapid Assessment Methodology (BMP RAM) and Road RAM are the standard condition assessment methods used to inspect and report actual conditions in comparison to the expected conditions used in load reduction estimations. THE BMP RAM is now available for download! The Road RAM is scheduled to be completed by end of March 2010.
- The TMDL Accounting and Tracking Tool (A&T Tool) is the central credit accounting system. It stores information related to catchment schedules and inspection results and generates reports showing the credits awarded each year for specific catchments and urban jurisdictions. The A&T Tool also tracks and reports load reductions at all scales

from specific catchments to the overall basin. The A&T Tool is scheduled to become available in the near future.

Through the fall of 2010, NDEP and the Lahontan Water Board will work with local governments and transportation agencies on a non-regulatory basis to test and implement the protocols, tools and methods described in the Handbook. Through the beta-testing we expect to improve the Crediting Program and Handbook to make them more efficient, functional and better able to support targeted efforts to reduce pollutant loading. Funding is being sought to support testing and training for jurisdictions to implement the Handbook. The Handbook will be updated in the fall of 2010 based on lessons learned and comments received during the beta-test period. At that time, we expect to incorporate the Crediting Program into policies, permits, MOA and codes. Comments or questions on the Crediting Program and Handbook during the beta-test period may be submitted to NDEP.

## Clarity Crediting Program - Translation of Lake Tahoe TMDL into Policy

From a public information memo issued by Jason Kuchniski, NDEP Lake Tahoe Watershed Program Manager Sept. 2009

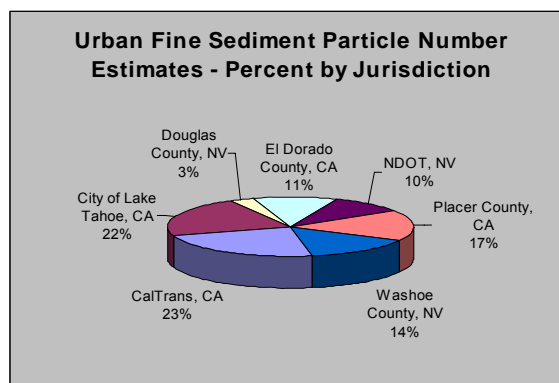
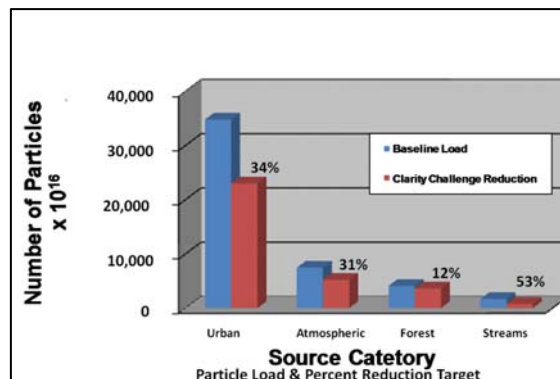
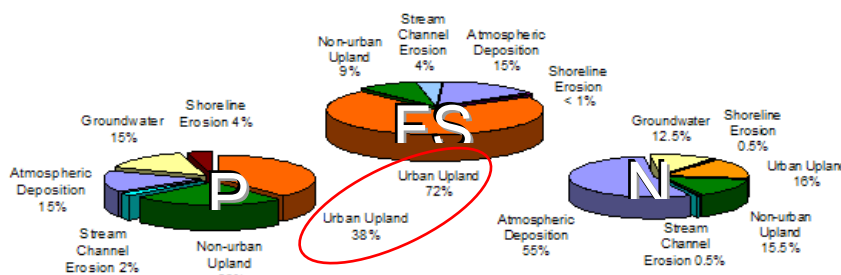
Undertaken collaboratively between the Lahontan Water Board and NDEP, the Lake Tahoe TMDL is an extensive scientific effort to understand the causes of clarity loss within Lake Tahoe. Results of the Source Analysis indicated that urban stormwater is the primary source of fine sediment particles [(FSP) <math> < 16 \mu\text{m}</math>] and phosphorous pollutants that control clarity.

The Lake Clarity Model was developed specifically to predict the lake response to pollutant inputs. Model results completed for the Linkage Analysis indicate reductions in pollutant loads will reverse the current trend of clarity loss. However, after looking at the magnitude of load reductions necessary to meet Lahontan's transparency standard (annual average Secchi disk depth of 29.7 meter, or approximately 100 feet), the TMDL agencies and TRPA desired to establish a realistically achievable numeric target. The agencies agreed upon the Clarity Challenge, which entails achieving a numeric target of 77-80 feet within a 20 year timeframe.

Model results also indicated that the lake is more responsive to FSP than nutrients. Due to this finding, we are concentrating on this pollutant for the Clarity Challenge; a reduction of approximately 32% in FSP is needed from all sources.

The TMDL is furthermore a planning tool intended to develop a logical implementation approach to mitigate the problem. Results from the Pollutant Reduction Opportunities (PRO) analysis reveal that the urban environment represents the greatest opportunity to reduce FSP and P loads. Consequently, the TMDL Implementation Plan focuses on FSP reductions from urban stormwater. Pollutant allocations will require urban and roadway jurisdictions to reduce stormwater loads by 34% from 2004 baseline levels. Innovative and advanced stormwater treatment and pollutant source controls will need to be implemented in order to accomplish this goal.

Because Lake Tahoe is a bi-state waterbody, the TMDL must comply with the requirements of both California and Nevada. To meet State of California TMDL requirements, the TMDL Implementation Plan must specify how the Lahontan Water Board and NDEP will translate the scientific findings into policy. Our agencies have agreed that stormwater load reductions shall



be incorporated into existing stormwater permits as wasteload allocations. Stormwater from the Nevada municipalities will be treated as a load allocation, and will be dealt with through the establishment of a singular Memoranda of Agreement (MOA) with Washoe and Douglas Counties and the Nevada Department of Transportation (NDOT). A singular MOA is advantageous because it will save time and effort, provides transparency between jurisdictions and promotes collaboration among the entities in terms of project planning, implementation and O&M.

The regulatory approach taken by NDEP must provide reasonable assurance that entities will participate in and accomplish actions to achieve TMDL load reductions. While NDEP staff have identified a preliminary list of elements that the MOA should contain, the MOA shall identify three key actions to be accomplished by each signatory:

1. Participate in the Lake Clarity Crediting Program
2. Develop jurisdictional Pollutant Load Reduction Plans
3. Participate in the Regional Stormwater Monitoring Program

The Lake Clarity Crediting Program establishes credit requirements for urban and roadway jurisdictions based on TMDL allocations. Furthermore, it defines the process and roles to consistently estimate and track load reduction actions implemented by the jurisdictions. As such, it provides a mechanism by which progress toward achieving load reduction milestones (ie., load reduction target to be accomplished within a specific timeframe) can be evaluated. In addition to enabling regulators and staff to assess implementer's performance, it also provides implementers assurance that they will receive a set amount of credit for their actions. A milestone schedule will be incorporated into the MOA that will set load reduction targets to be achieved within specified timeframes. As a side note, TRPA plans on using the Crediting Program to inform the distribution of residential building and commercial floor space allocations. Basing the allocation system on the number of credits received will act as an incentive for municipalities to implement and maintain load reduction actions. It is important to note that this incentive does not exist for the roadway jurisdictions.

Required by NPDES stormwater permits, Stormwater Management Plans are intended to inspire the development of comprehensive programs to control stormwater. These tools are advantageous in that they ensure the permittee is diligent in addressing stormwater control. However, NDEP believes they are more onerous than what is needed to address TMDL implementation. Staff believe streamlined versions of the stormwater management plans that specifically address TMDL pollutants of concern (primarily fine sediment) are needed on a jurisdictional basis. Staff have identified a preliminary list of items to include in these Pollutant Load Reduction Plans (PLRPs). One item of particular importance is prioritization of catchments where load reduction actions shall be implemented. This task is equally important for project implementers and funders as accomplishing this task will provide an idea of where the most bang-for-the-buck can be achieved in terms of load reductions. Therefore, it is essential that the methodology for prioritization be consistent between jurisdictions. As a side note, TRPA will be requiring the submittal of SWMP or Nevada equivalent as terms for crediting according to their allocation distribution system.

The Crediting Program relies heavily on models to estimate load reductions from implementation actions. Therefore, monitoring is essential to assess if estimated load reductions are actually occurring as predicted by the models. Because it serves to verify and validate pollutant reduction estimates, implementing agencies have the responsibility to monitor and report if and how effective their actions have been. To fulfill this need, a Lake Tahoe Regional Stormwater Monitoring Program (RSWMP) is currently being developed. The concept for this



program is that rather than monitoring every project or BMP, cost savings can be achieved by monitoring a select number of representative sites and BMP types. This information can then be used to inform the project design process, adjust load reduction estimation methods, and reevaluate the TMDL implementation strategy.

### **Nevada Division of Environmental Protection (NDEP)**

#### **Best Management Practice Maintenance Rapid Assessment Methodology (BMP RAM)**

<http://ndep.nv.gov/bwqp/tahoe.htm> The BMP RAM is a simple, repeatable field observation and data management tool that can assist Lake Tahoe natural resource managers in determining the relative condition of urban stormwater treatment BMPs. The primary purpose of the BMP RAM is to inform the user of the relative urgency of water quality maintenance for Treatment BMPs. The BMP RAM evaluations, therefore, do not specifically address or consider the quality of the design of a particular Treatment BMP relative to others. Rather, the BMP RAM provides a practical, consistent and reliable tool to track the condition of a particular Treatment BMP relative to its observed condition at the time of installation or immediately following complete maintenance.

Three items are available for download on the website. The Technical Document contains background information describing how the tool works and the rationale for tool development choices. The User Manual describes the specific protocols to create a Treatment BMP Inventory, conduct field observations, and interact with the database. The Database is the tool used to house and manage data and calculate RAM scores. Microsoft Access 2007 and familiarity with the Technical Document and User Manual are required to operate the database.

## **VI: ANNUAL REPORTS**

Comprehensive annual reports are available for TWSA members for 2003-2009. These reports provide great detail to yearly watershed activities and provide supplemental documentation for this 5 year update. To obtain a copy of any report, contact the TWSA Executive Director at 775-832-1212, or by email: [madonna\\_dunbar@ivgid.org](mailto:madonna_dunbar@ivgid.org).

TWSA Annual Reports (2007 and later) are posted online at: [www.tahoeh2o.org](http://www.tahoeh2o.org).  
CD and hardcopies of the earlier reports are available for viewing by contacting the TWSA Executive Director.

## **VII: FUTURE CONSIDERATIONS**

The following are individual agency responses to several questions posed in the process of completing the sanitary survey.

### **1) Address: Cryptosporidium in control requirements (LT2):**

IVGID: has planned with a 5 year capital improvement program to install UV at Burnt Cedar Disinfection facility, and if needed, the extension of the intake to additional protection zone. In April 2008, IVGID began testing for Cryptosporidium, using Method #1622 as primary choice for additional controls.

KGID: is in the process of gathering information from the State of Nevada to ensure that we remain in compliance with the requirements of LT2 and the D/DBP rules. In addition, we are attending applicable training courses to maintain the appropriate level of preparedness for these rule requirements. It is anticipated that the District will hire a consulting engineer at the proper time to evaluate the alternatives available to the District. We will then select and implement the best available option. Given the current schedule to maintain compliance, the District is progressing in a timely fashion.

RHGID: began raw water E-Coli sampling in January 2008

Glenbrook: began Cryptosporidium monitoring in January 2008.

Edgewood: is working with the Health Division to determine what is needed to comply with the rules.

Douglas County (ZWUD: Sampling for E. Coli began October 2008 and Cryptosporidium in 2010.

NTPUD: A sampling plan was submitted to California DPH in June 2008.

TCPUD performed 24 raw water bacteriological samples on a bi-weekly basis. The results of these 24 samples were to be used to satisfy the monitoring requirements and no plant modifications are anticipated at this time.

TCPUD: was in preliminary design phase for a permanent micro-filtration plant to meet LT2 requirements when put into service.

LPA: N/A

Additional details included in individual sections, where applicable.

### **2) Address: Major changes in utility operations since 2002:**

IVGID: The major change is the increased sewer line inspections to determine pipe integrity. Completion of the export pipeline provided increased sewer system integrity.

KGID: The following changes have been made to utility operations since 2002. The well that was used to supply 2% of the District's water has been shut down, and Lake Tahoe currently supplies 100% of the needs of the District. It is our intent to analyze the feasibility of reutilization of the well supply. An electronic surveillance camera has been installed at the Lake Station and tied into an updated SCADA security monitoring system. Along with the existing

generator at the lake station, an emergency generator has been installed at one of the District's booster pump stations.

RHGID: extended the raw water intake to 2500 feet.

Glenbrook: reported no changes.

Edgewood has installed a generator at the Lake Pump station for emergency backup power. The generator has the capacity to run the pump station at normal capacity during power outages.

NTPUD: has initiated a 5 year capital project to replace deteriorating water distribution infrastructure.

Douglas County (ZWUD): N/A

TCPUD: installed the Upper Highlands Booster Station and a 1.2 MG storage tank for reserve.

**3) Address: Policies in place to maintain operational knowledge due to staffing losses or transitions:**

One of the main advantages for members within the Tahoe Water Suppliers Association has been access to the extensive knowledge and experience of other purveyor agency staff. Rather than working in a void, members now have the ability to call on other TWSA partners for problem solving strategies in areas of technical, administrative and operational policies and procedures.

IVGID: We adopted an employee succession strategy to develop personnel as to the direction they need to aspire to fill vacancies as needed.

KGID: continually provides for the retention of operational knowledge due to staffing losses or transitions. District employees are cross-trained in a broad range of activities, across departmental lines to ensure there is a working knowledge of the system, and to pass that knowledge on from person to person. We encourage and fund training efforts for employees to maintain existing professional licenses and to obtain new licensing. As a corporate philosophy, employees are promoted from within, even across departmental lines, to maintain a broad based knowledge of all employees within the District.

RHGID and Glenbrook: hire new people and train them in the field. One primary tool for training is the use of daily log books to allow new hires to learn how particular situations are handled.

Edgewood: Management is establishing policy to address this issue.

Douglas County (ZWUD): N/A

NTPUD: - In 2009, NTPUD several key organizational and operation positions were vacated in rapid succession. Maintenance of institutional knowledge is being maintained by using operational record keeping such as: GIS work order tracking, comprehensive master plans, improved data management systems and asset management software.

LPA: N/A

TCPUD: All TCPUD employees are considered part of a pool. Although most are specialized for day to day operation, all are cross trained in different disciplines.

#### 4) Address: TWSA future priorities?

The ongoing work of the TWSA is detailed in the following 2007-2012 Action Plan.

#### TWSA ACTION PLAN

TWSA members use the following 'Action Plan' to accomplish the goals of the Watershed Control Program.

PROGRAM	ACTION	RESPONSIBLE PARTY AND PARTNERS	TIMELINE
<b>Education</b>			
1.0	Continue to improve the TWSA education program by redefining the theme and message.	TWSA, LTEEC, NTCD, HOAs, Forest Service	2003-ongoing
1.1	Provide current information, education material, and reports on TWSA website ( <a href="http://www.tahoeh2o.org">www.tahoeh2o.org</a> ).	TWSA	Updated quarterly, 2004-ongoing
1.2	Create and distribute posters, flyers, brochures, inserts, web media, reminder stickers, booth materials, and print and radio media.	TWSA, LTEEC, NTCD, HOA's, Forest Service, Local and State officials/agencies and PIO's	2003-ongoing
1.3	Include source water protection information in current customer information mailings, CCRs, new customer mailings and BMP/Water Audit.	TWSA	2003-ongoing  new resident web packet launched spring 2008 <a href="http://www.tahoewelcom e.org">www.tahoewelcom e.org</a>
1.4	Distribute information at community events for example: Earth Day, chamber mixers, community meetings, etc.	TWSA, HOA's, community partners and environmental groups	2004-ongoing
1.5	Participate in industry level source water protection efforts (American Water Works Association, WEFTEC, others).  Provide professional development opportunities for TWSA members.	TWSA	2004-ongoing
1.6	Track customer responses, outreach efforts, web visits, and summarize activities.	TWSA	2005-ongoing
1.7	Participate in 2nd Drinking Water Forum, dependent on funding.	TWSA, EPA—Region 9, TRPA, NRWA, NTCD	Pending revival of event
1.8	Incorporate parameters of concern to TWSA partners into surface water monitoring programs in the Lake Tahoe Basin.	TWSA, UNR, LTEEC, NTCD, TRPA, NDEP	2004-ongoing
1.9	Incorporate Aquatics Invasive Species (Quagga Mussel / NZ mudsnail / plants) information in TWSA outreach.	TWSA, TRCD, TRPA	2008-ongoing

<b>Monitoring</b>			
2.0	Improve current surface water monitoring programs by improving the sampling programs, refining analyses, and reporting success.	TWSA, UNR, LTEEC, NTCD, TRPA, NDEP, TCS	Fall 2005-ongoing
2.1	Incorporate potential parameters of concern into surface water monitoring programs in the Lake Tahoe Basin.	TWSA: UNR, LTEEC, NTCD, TRPA, NDEP	Fall 2005-ongoing
2.2	Prepare a project proposal with the University of Nevada Reno to study climatic affects on source water quality and potential sources of pollution.	TWSA, UNR, DRI	Fall 2005-ongoing, pending funding
2.3	Research potential grant funding for monitoring programs.	TWSA, UNR, USACE	Fall 2005, Spring 2006 <sup>1</sup> ongoing
2.4	Define the elements of a surface water risk assessment. Provide information to local planning agencies.	TWSA, AWWA Source Water Protection, USACE, Black and Veatch	2006 – 2008 Model and final report issued Oct. 2008 / Ongoing: use of model and modeling for filtration method purveyors 2009-2010: grant funding for Phase 2 and 3
<b>Data Management</b>			
3.0	Improve reporting process for intake samples; annual submission of Watershed Control Plan in October.	TWSA board and staff	2003-ongoing
3.1	Gather, track, and report regularly on TWSA partners' operations, management, project, planning or other changes that may affect water quality.	Planning agencies, local water districts, environmental education programs, recreation facilities.	2003-ongoing
<b>Regulatory</b>			
4.0	Participate in regional planning efforts, including PATHWAY 2007 general and technical committees, and TRPA Shorezone Ordinance Amendment process.	TWSA staff and board, partners, regulating authorities	2004-ongoing
4.1	Promote TWSA objectives and goals by attending stakeholder meetings and offering presentations or testimony.	Planning agencies, local water districts, environmental education programs, recreation facilities	2004-ongoing
4.2	Set trigger for water supplier notification during a plan review that includes activities that may affect drinking water quality.	TRPA, TWSA	2007-ongoing
4.3	Promote TWSA objectives and goals by attending stakeholder meetings and offering presentations or testimony.	Planning agencies, local water districts, environmental education programs, recreation facilities.	2005-ongoing

<b>Mapping</b>			
5.0	Mapping of potential contaminating sources.	TRPA/Counties/ TWSA staff	2003-ongoing
<b>Administration</b>			
6.0	Develop a plan to incorporate new members into TWSA.	TWSA	2003-ongoing New contract and financial system established July 2007.
6.1	Review other agencies to improve the annual reporting process	TWSA	2006-ongoing
6.2	Submit annual report to NDEP –Bureau of Safe Drinking Water and CDPH-DDWEM	TWSA	2003- ongoing Annual, October
<b>Water Conservation</b>			
7.0	Incorporate water conservation and source water protection information into packets and education programs.	TWSA, NTP, NTCD	2005-ongoing
7.1	Research current water use and water conservation programs in the Lake Tahoe Basin.	TWSA	2005-ongoing
7.2	Develop collaborative water conservation program/plan.	TWSA, NTCD, other partners	2005-ongoing
7.3	Research potential grant funding.	TWSA, NTCD, other partners	2004-ongoing
<b>Water Rights</b>			
8.0	Review Tahoe annual diversions report prepared by the Nevada State Engineers office.	TWSA	ongoing

### Acronyms

*TCS: Tahoe Science Consortium*  
*TRPA: Tahoe Regional Planning Agency*  
*BMP: Best Management Practices*  
*LTEEC: Lake Tahoe Environmental Education Program*  
*CCR: Consumer Confidence Report*  
*CDPH-DDWEM: California Department of Public Health*  
*Division of Drinking Water and Environmental Management*  
*NTCD: Nevada Tahoe Conservation District*  
*HOA: Homeowners' Association*  
*EPA: Environmental Protection Agency*  
*NRWA: Nevada Rural Water Association*  
*NDEP: Nevada Department of Environmental Protection*  
*UNR: University of Nevada, Reno*  
*AWWA: American Water Works Association*  
*USACE: US Army Corps of Engineers*  
*DRI: Desert Research Institute*

## **VIII: Facilities Descriptions**

### **Description and Review of Water System Supply Facilities**

Information in this section pertains to the participating Public Water Systems' (PWS) compliance with drinking water regulations regarding system facilities, and the ability to consistently deliver an adequate quantity of safe drinking water to the consumer.

Primary information was gathered from the 2002 Sanitary Survey, with updated information provided by written response and verbal interview from facility managers. This information was compiled from: previous sanitary survey reports, operations and maintenance manuals, water system plans/schematics and project reports.

### **Regulatory Context**

The Surface Water Treatment Rule (SWTR) requires all unfiltered systems, as one criteria to remain unfiltered, have an annual on site inspection to assess the systems' watershed control program and disinfection process. The onsite survey must be conducted by the state, or a party approved by the state. In addition, under 40 CRF 142.10(b)(2), as a condition of state primacy, states are required to have a systematic program for conducting sanitary surveys of public water systems in that state. The regional authorities are Nevada Department of Environmental Protection Bureau of Safe Drinking Water (NDEP; BSDW) and California Department of Public Health's Division of Drinking Water and Environmental Management (CDPM:DDWEM).

In addition the Total Coliform Rule (TRC) requires a water system periodically undergo a sanitary survey for all systems that collect less than 5 routine total coliform samples a month. The Interim Enhanced Surface Water Treatment Rule (IESWTR) elaborates on sanitary survey requirements for all surface and Groundwater Under Direct Influence of Surface Water (GWUDI). (EPA SSGM; pgs. 1-3)

### **Determination of Outstanding Performance**

Each state is required to develop a means to determine whether a system has outstanding performance. A state should have defined outstanding performance and established certain specifications for determination of this status.

The states of Nevada and California maintain system information on the Safe Drinking Water Information System (SDWIS) at: [www.epa.gov/safewater/sdwisfed/sdwis.htm](http://www.epa.gov/safewater/sdwisfed/sdwis.htm).

### **Potential Detrimental Factors Influencing Source Water Quality**

Maintaining healthy watersheds near sources of drinking water is one method used to insure clean water is being delivered to water consumers. The TWSA purveyors maintain stringent water quality standards to provide an exceptional product to their customers. During the 2002-2009 reporting years, all purveyors met federal and state requirements, as applicable, for turbidity, total and fecal coliform.

Land ownership and land values in Lake Tahoe do not allow for TWSA members to gain ownership of all lands within its watershed as recommended by the Safe Drinking Water Act and the Source Water Protection Treatment Rule. A majority of the land in the Tahoe Basin is either owned by the US Forest Service or is state land. Non-filtering water purveyors depend partially on the natural filtering process of the watershed to protect the water source, Lake Tahoe.

Potential threats to source water quality include point source pollution (sources from a discernable location) and, non-point source pollution (pollution from many diffused points). Current Tahoe Regional Planning Agency (TRPA) and Lake Tahoe Basin Management Unit (LTBMU) policies have reduced point source pollution sources by outlawing or limiting related activities in the Lake Tahoe Basin including: sewer discharge into streams or lakes, septic



tanks, solid waste disposal, agriculture, mining exploration, and hazardous waste disposal (Kiel 2000). Potentially significant remaining point sources of pollution include: sewer, trash and hazardous waste spills. Non point source pollution is attributed to land use activities such as: recreation, forest management and construction (EPA 1994). Potential pollution sources in the watersheds have been identified in previous sanitary surveys and annual reports.

## Water System Description

As of 2009, the TWSA water suppliers have approximately a total number of 20,185 service hook ups and supply water to an estimated 37,700 residents [Table 1]. The Lake Tahoe's year round population was estimated at 52,457 from the United States Census, 2000.

Average water flow for the suppliers ranges between 156,000 gallons per day (gpd) and 2,876,000 gpd. Annual peak water flow ranges between 437,000 gpd and 6,771,000 gpd. [Table 2].

**Table 1: Number of customers and service hook ups for TWSA partner agencies.**

Agency	County, State	Customer Number (2000 Census)	2009 - Number of Service Hook Ups
Kingsbury GID	Douglas, NV	3,937	2506
Round Hill GID	Douglas, NV	1,250	478
Zephyr Water Utility Company	Douglas, NV	1214	479
Cave Rock / Skyland	Douglas, NV	1,264	523
Incline Village GID	Washoe, NV	9,952	8,023
Glenbrook Water Company	Douglas, NV	1,000	250
Edgewood Water Company	Douglas, NV	3,000	11
North Tahoe PUD	Placer, CA	7,399	3,868
Tahoe City Public Utility District	Placer/EIDorado CA	900 (McKinney/Quail) 5700 (utility system total)	445 (McKinney/Quail system) 3,910 (utility system total)
Lakeside Park Association	EIDorado, CA	3000 avg; 5500 peak	137

**Table 2: Average annual flows and peak daily flow estimated from 2006 through 2009, in gallons per day (gpd) for TWSA partner agencies.**

Agency	2006-2007		2007-2008		2008-2009	
	Average Daily Flow (gpd)	Peak Daily Flow (gpd)	Average Daily Flow (gpd)	Peak Daily Flow (gpd)	Average Daily Flow (gpd)	Peak Daily Flow (gpd)
Cave Rock/Skyland Water System	394,907	818,000	394,238	750,000	405,319	750,000
Edgewood Water Company	880,621	1,800,000	874,500	1,800,000	750,000	1,700,000
Glenbrook Water Company	140,085	600,000	213,000	650,000	215,000	650,000
Incline Village GID	3,163,000	6,250,000	3,025,000	7,435,000	2,876,000	6,771,000
Kingsbury GID	1,230,000	2,470,000	1,160,000	2,470,000	1,114,839	2,131,000
North Tahoe PUD (lake withdrawals /entire NTPUD system)	1,480,000	2,270,000	1,310,000 / 1,470,000	2,050,000 / 2,300,000	1,246,000/ 1,402,000	2,299,000/ 3,031,000
Round Hill GID	224,216	608,800	236,175	551,638	224,785	582,600

McKinney/Quail lake withdrawals /entire Tahoe City PUD	339,000 / 1,610,000	700,000 / 4,400,000	184,000 / 1,740,000	700,000 / 4,200,000	168,000/ 1,626,000	305,000/ 3,900,000
Zephyr Water Utility Company	220,704	400,000	222,855	400,000	235,553	400,000
Lakeside Park Association	242,000	515,000	217,000	656,000	156,000	437,000

### Intakes

The majority of TWSA purveyors pull water directly from Lake Tahoe to service their customers. Nevada State Law provides recommendations that drinking water intakes extend 1,000 feet (ft.) from the shore, set 15 ft. below the surface, and 4 ft. from the bottom of the basin (NAC 445A.6698, NRS 445A.860). The TWSA purveyors' intakes range from 670 ft. to 2,500 ft. long, 28 ft. to 63 ft. deep, and set 3 ft. to 6.5 ft. above the lake bottom [Table 3.0].

**Table 3: TWSA partner agencies' intake length (ft.), depth (ft.) and distance from Lake Bottom (ft.). Intake depth is dependent on the lake level. The depth is measured from Lake Rim.**

Agency	Length (ft.)	Depth (ft.)	Bottom (ft.)
Kingsbury GID	750	60	5
Round Hill GID	2450	52	4
Zephyr Water Utility Company	1100	63	6.5
Incline Village GID	670	30	4
Glenbrook Water Company	2000	60	6
Edgewood Water Company	2500	34	4
North Tahoe PUD	1800	28	4.75
Tahoe City Public Utility District (McKinney/Quail System)	800	26	3
Cave Rock / Skyland	1800	65	6
Lakeside Park Association	2300	37	4

## INDIVIDUAL WATERSHED AND FACILITY DESCRIPTIONS

### Glenbrook Water Company

#### Watershed description

Glenbrook Homeowner Association is located on the east shore of Lake Tahoe, Nevada. The Glenbrook Water Company serves the homeowner association. The total area within the District jurisdiction is 1.4 square miles.

The Glenbrook Water Company and the water intake is located in the Glenbrook Creek and Slaughterhouse sub-watersheds in the Lake Tahoe Basin. The water intake is located directly south of Slaughterhouse Creek and north of Glenbrook Creek. The watersheds are within Douglas County, Nevada jurisdiction.

Most of the land in Slaughterhouse and Glenbrook Creek watersheds is managed by the US Forest Service, Lake Tahoe Basin Management Unit. Forest Service property supports relatively few hiking, biking and running trails. The private land in the watersheds is owned by the Glenbrook Homeowners Association. In addition to the water company, the homeowner association manages a golf course, horse property and a small beach.

#### Glenbrook Water Cooperative Ozonation Plant Overview

The following information concerning the Glenbrook Water Cooperative Ozonation Plant and all information concerning the Glenbrook system was initially gathered during the course of two in-person interviews conducted by Nevada Tahoe Conservation District staff and review of the Glenbrook Operations Manual in 2002. This 2007 update documents operational changes. Information was gathered by written correspondence with operations management. The Glenbrook system map and operations manual are on file with BHPS.

#### Glenbrook Operations Staff

Operations Staff	Position	Current Certification Level
Cameron McKay	Operator	Treatment III

#### Glenbrook Ozonation Plant Report

The Glenbrook Water Cooperative plant was designed by HDR, Folsom. It was constructed in 1996 – 1997 and officially came on line in December 1997. The plant utilizes ozone as the primary disinfectant treatment for meeting the requirements of the SWTR for 3 and 4-log removal of Giardia and viruses. Chlorine is applied as a secondary disinfectant and in order to maintain a residual throughout the distribution system. The Glenbrook Ozone Disinfection Facility includes five major systems: 1) the liquid oxygen (LOX) storage system, 2) the ozone production and destruction system, 3) the chemical feed system, 4) the lake intake and high service pumps, 5) and the utility and support systems.

#### Glenbrook System Capacity

Average daily production	(winter) 180,000 gpd (summer) 600,000 gpd (06/07)
Total design capacity	1,000,000 gpd
Total emergency capacity	500,000 gallons
Total storage capacity	500,000 gallons

### Glenbrook Connections and Meters

Connection Type	Connections
Residential - Houses	250
Commercial	none

### Glenbrook Facility Components and Activity Status

Activity Status	Facility Name
Active	Distribution System
Active	Lake Tahoe Intake
Active	Ozone Treatment Plant
Active	Lake Pump Station

Ozone Generators: Two 20 lb per day ozone generators manufacture ozone from pure oxygen gas. One generator is capable of meeting the dose requirements; the second generator serves as a back-up unit.

Lake Intake Pumps: The intake pumps consist of two 20 hp submersible pumps each delivering approximately 1,000 gpm. One pump is used to supply the treatment process and the other pump serves as backup. This pump station is used concurrently with the high service pumps.

High Service Pump Station: The two 100 hp high service pumps are each capable of delivering 1,000 gpm. Once the reservoir falls below a set point, the system is called to start. The controller then starts the ozone feed system, the off gas system and the pumps. The system continues to pump and treat water until the reservoir level meets a high level set-point.

Backup Engine Generator: The backup generator is designed to handle the load for the entire plant, The standby generator will automatically start on loss of power.

### Glenbrook Plant Specifications

Operational Intake	
Depth	60 ft
Length	1,600 ft
Capacity	1,800 gpm
Pipe Size (inside diameter)	12 in.
Year Installed	1997
Screened intake	yes
Backup Intake (old)	
Length	800 ft
Capacity	----
Pipe Size	12 in.
Plant Flow Rate	
Minimum	1,000 gpm
Average	1,000 gpm
Maximum	1,800 gpm
Ozone System	
Ozone Demand	
Average	0.3 mg/L

Maximum	0.42 mg/L
Ozone Production	
Average	3.5 lb/day
Maximum	20 lb/day
Ozone Generators	
Number	2
Capacity/Unit	20 lb/day
Ozone Contractor	
	There are two of them
Length	22 ft.
Diameter	10 ft.
Volume	12,917 gallons
Contact Time	Varies per flow
Ozone Dosage	
Required disinfection CT (raw water, 5°C & pH 8)	1.9 mg/L
Ozone dosage (@890 gpm)	20 lb/day
Ozone Destruction System	
Sodium Bisulfite (ozone quenching)	
Pumps (#)	2
Capacity per pump	3.4 gph
Dose Rate	2.2 mg/O <sup>3</sup>
Feed Concentration	12 – 25%
Storage volume (total)	100 gallons
Sodium Hypochlorite (residual secondary disinfectant)	
Pumps	2
Capacity per pump	3.4 gph
Feed rate	0.2 – 1.0 mg/L
Feed concentration	1.25 %
Storage volume (total)	100 gallons

### Glenbrook Distribution Infrastructure Status

Infrastructure Type	Total Number	Condition	
		% Good	% Fair
Water Lines	< 10 miles	100	
Pump Stations	1	100	
Zone Valves	8	100	
Reservoirs	1	100	

Estimates of infrastructure condition are estimates, not specifically quantified, provided by PWS managers. They are intended only to give the reader a general estimate of facility improvements that may need to be addressed in the next few years.

### Emergency Power and Security Systems

The monitoring and control system is a combination of pneumatic, electronic, and electric process instruments and controls. The majority of the system is controlled from the Ozone System Control Panel (OSCP). The panel contains a Programmable Logic Controller (PLC) that is responsible for the automation of the system equipment and instrumentation. The operation of the backup electrical generator is controlled by an automatic transfer switch.

The current alarm system is supported by Sierra Controls. Secured fences and gates are in place to prevent vandalism of facilities. At all times the ambient air ozone leak detector located in the ozone generator room is energized to monitor room air quality with respect to detectable

ozone concentrations. It is set to initiate an alarm system if the room ambient ozone concentration exceeds a preset threshold. The ambient ozone concentration monitor will activate the building ventilation system when the ambient ozone level reaches the WARNING threshold. An ozone leak alarm condition automatically initiates a series of shutdown and alarm actions including autodial contact with the assigned supervisor.

Glenbrook's storage capacity of 0.5 mgd can provide up to two days of emergency storage during the winter months and up to one day of emergency storage during the summer months.

**Public Notification Announcements**

No public notification announcements have been issued since 1997. Glenbrook Water Cooperative issues a Consumer Confidence Report prior to July 1 each year. See the Glenbrook Association website for more information: [www.glenbrookoa.org](http://www.glenbrookoa.org)

**Cryptosporidium in control requirements (Interim Enhanced Surface Water Treatment Rule 1998, Long Term 2 Enhanced Surface Water Treatment Rule):**

Glenbrook began Cryptosporidium monitoring in January 2008.

## Kingsbury General Improvement District

### Watershed Description

Kingsbury GID is located between the Edgewood Water Company and Round Hill GID service areas, on the east shore of Lake Tahoe, Nevada. The Edgewood Creek watershed lies slightly south of the primary watershed area of the Burke Creek watershed area, which is 5 square miles. A large percentage of the Burke Creek watershed is owned by the US Forest Service, Lake Tahoe Basin Management Unit. Forest Service property includes extensive hiking, biking, running trails, and beach access/camping at Nevada and Round Hill Pines beaches. Private land includes residential and small commercial lots. Social and county services include small parks. Kahle Park and Recreation fire department, post office, health services, and schools are also available. The watersheds are within Douglas County, Nevada jurisdiction.

### KGID Disinfection Plant Review

The following information concerning the Kingsbury General Improvement District (KGID) was gathered during the course of in-person interviews conducted by Nevada Tahoe Conservation District staff in 2002. Data and information from the State Bureau of Health Protection Service was also compiled and incorporated into select tables found in the following pages. This 2007 update documents operational changes, gathered by written correspondence with operations management.

Previously, 98% of the KGID water supply came from Lake Tahoe with Well No. 4 supplying the remaining 2%. Since 2002, this well has been shut down, and Lake Tahoe currently supplies 100% of the needs of the District. KGID intends to analyze the feasibility of reutilization of the well supply.

The KGID service area ranges in elevation from 6,230 feet to 7,980 feet resulting in a static differential of approximately 760 PSI across the water system. As a result, the water system is segregated into six primary pressure zones to convey water from the surface water supply to customers.

### KGID Key Operations Staff and Certifications

Operations Management Staff	Position	Current Certification Level
Cameron McKay	Operator	III

There are four full-time operators with a minimum of Grade 1 Distribution and Treatment Certificates on Staff at KGID.

### KGID Ozonation Plant Report

The KGID Water treatment Plant was designed by HDR of El Dorado Hills. It was constructed in 1994–1995 and officially came on line in April 1995. The treatments applied include ozone disinfection and chlorination. Ozone is the primary disinfectant, in place to meet CT requirements. Chlorine is the secondary disinfectant and is applied in order to maintain a residual throughout the distribution system.



**KGID System Capacity**

Average daily production	1.23 mgd
Total design capacity	2.9 mgd
Total emergency capacity	2.9 mg
Total storage capacity	4.4 mgs

**KGID Connections and Meters**

Connection Type	Connections	
Commercial – Resorts	Metered	100
Residential - Houses	No meter, flat rate	2,362

**Water Storage:** The water storage facilities are interconnected to the supplement storage tanks located at lower, adjacent pressure zones. Therefore, only the storage facilities located within the pressure zones at the highest elevations must be self-sufficient to meet storage demands.

**Pump Stations:** There are six pump stations within the KGID water system. These serve to supply water to their respective pressure zones and to lift water to the pumps stations adjacent, higher-pressure zone. Multiple pumps are available to meet variations in water demand and to provide back-up pumping capacity.

**KGID Facility Components and Activity Status**

Activity Status	Facility Name	Note	Capacity
Active	Distribution System	40 miles of pipe	---
Active	Lake Tahoe Intake	---	---
Active	Ozone Treatment Plant	---	---
Active	Well 4 Station 4	25 gpm	200,000 gallons (Accumulated Capacity)
	Storage Tanks		
Active	2A and 2B	New in 1996 and 1998	900,000 gallons (combined)
Active	3	Rehab Scheduled 2003	1.2 MG
Active	4	Rehab in 2000	100,000 gallons
Active	5	New in 1995	120,000 gallons
Active	6	Rehab in 2000	800,000 gallons
Active	10	Recent Rehab	1.2 MG
	Water Pump Stations	(Total Pumps)	
Active	1	3	2050 gpm
Active	2	3	900 gpm
Active	3	3	840 gpm
Active	4	2	500 gpm
Active	5	2	500 gpm
Active	7	3	500 gpm

### KGID Plant Specifications

Operational Intake (new)	
Depth (lake level at 6,229 ft. above sea level)	65 ft.
Length	750 ft.
Capacity	4,000 gpm
Pipe Size (inside diameter)	24 in.
Year Installed	1990
Screened Intake	Yes
Dive inspection and cleaning	annual
Plant Flow Rate / Raw Water Pumps	
Minimum	0.55 MGD / 1000 GPM
Average	1.0 MGD / 900 GPM
Maximum	2.7 MGD / 2,000 GPM
Ozone System	
Air Prep Systems	2
Ozone Demand	
Average	0.2 ppm
Ozone Production	
Minimum	7 lb/day
Maximum	14 lb/day
Ozone Generators	
Number	2
Capacity/Unit	50 lb/day (by design)
Ozone Contractor	
Diameter	9 ft.
Volume	@25 ft. / 6,174 gallons
Detention Time	6.1 minutes
Ozone Dosage	
Required disinfection CT (raw water, 5°C & pH 8)	1.9 mg/L
Ozone Destruction System Sodium Bisulfite (ozone quenching)	
Pumps (#)	2

### Distribution System

The KGID water distribution system consists of approximately 40 miles of 1.5, 2, 4, 6, 8, 10, 12, and 16 inch pipes. Most of the older pipe consists of steel pipe and asbestos cement (AC) pipe. The transmission mains consist of large diameter, high pressure pipes to convey water to the various pressure zones. Due to the rugged terrain, many of the distribution system's secondary transmission water mains are constructed as a "branch" pipeline network. Small pipe sizes are a limitation on capacity within the system. There are 49 control valves located throughout the water system that are associated with water conveyance. A significant portion of the distribution system has been in operation for approximately 40 to 60 years. Repair of leaks is a primary concern. Administrative staff is cognizant of and attentive to the system's needs. Replacement priorities are balanced with available capital replacement funding.

The District completed construction projects denoted as Phase 1-A, 1-B, 1-C, 1-D, and 1-E. These projects consisted of removing existing piping and installing 8,200 feet of 16 inch transmission main and 12,200 feet of 8 inch distribution main. We replaced four motors at our

pump stations and recoated the outside of both tanks at Station #2 and the interior and exterior of Tank #3.

### KGID Distribution Infrastructure Status

Infrastructure Type	Total Number	Condition		
		% Good	% Fair	% Poor
Water Lines	211,000 ft	34	33	33
Pump Stations	6		100	
Zone Valves	N/A			
Reservoirs (new)	7	72	14	14

### Corrosion Control

Much of the KGID infrastructure was installed in the 1960s. Leaks and system corrosion are a concern that is being actively addressed at the time of this report. Corrosion control chemicals were added to the water beginning in 1998. The chemical currently in use for this purpose is Zinc Ortho Phosphate. This applies a thin coat of the interior protection to prevent further deterioration of the existing, older water lines. The dose is minute and is monitored on a regular basis. Corrosion control coupons are installed and are analyzed every six months. Review and rehabilitation or replacement of current infrastructure is currently underway. Comprehensive project maps and information pertaining to recent and upcoming upgrades have been provided to BHPS.

### Emergency Power and Security Systems

Since 2002, an electronic surveillance camera has been installed at the Lake Station and tied into an updated SCADA security monitoring system. Along with the existing generator at the lake station, an emergency generator has been installed at one of the District's booster pump stations. Security systems for KGID were installed in March 2002. A SCADA system monitors the entire technical system. The intrusion alarm system has recently been linked to the SCADA system. Operators are notified of emergencies via the SCADA and alarm systems. All initial components of the treatment facilities have redundant backup units. These include backup units for the following facilities: ozone generators, air preparation and compressors, off gas destruct, quench chemical feed pumps and residual chlorine feed pumps. The Lake Station (pump house) has one standby diesel generator as a backup to the main electric supply. Emergency power generators are currently projected to be installed at the six other pump stations pending availability of funding. Portable Natural gas/propane engines are the current backup for pumping at the six pump stations. The system's 4.4 million gallons of storage can provide up to four days of emergency storage during the winter months and up to one day of emergency storage during the summer.

### Public Notification Announcements

KGID has distributed a Consumer Confidence Report to customers prior to July 1, each year since 1997. The TWSA annual reports document all violations and announcements.

### Cryptosporidium in control requirements (Interim Enhanced Surface Water Treatment Rule 1998, Long Term 2 Enhanced Surface Water Treatment Rule):

KGID is in the process of gathering information from the State of Nevada to ensure compliance with the requirements of LT2 and the D/DBP rules. In addition, staff is attending applicable training courses to maintain the appropriate level of preparedness for these rule requirements. It is anticipated that the District will hire a consulting engineer at the proper time to evaluate the alternatives available to the District. We will then select and implement the best available

option. Given the current schedule to maintain compliance, the District is progressing in a timely fashion.

## Incline Village General Improvement District (IVGID)

### Watershed Description

Incline Village General Improvement District is located on the north east shore of Lake Tahoe, Nevada. The water company primarily serves residential, commercial, and recreation customers. The total area within the service zone is 11.5 square miles.

The Incline Village watershed is fed by Incline Creek, Third Creek, First Creek and Second Creek sub-watersheds in the Lake Tahoe basin. The total watershed area is approximately 15.65 square miles. In comparison, First and Second Creek are relatively small watersheds and thus will not be individually addressed in this report. Third and Incline Creek drain into Lake Tahoe 1 land mile south east of the IVGID Burnt Cedar Treatment Station. The Second Creek mouth is located 1/2 land mile west of the water treatment plant. The watersheds are within Washoe County, Nevada jurisdiction.

Incline Village General Improvement District owns a significant portion of the private land in the Third and Incline watersheds. In addition to water and services, IVGID operates a ski area, a recreation facility, two golf courses, and related administration departments.

### Burnt Cedar Disinfection Plant Review

The following information concerning the Burnt Cedar Disinfection Plant and the Incline Village General Improvement District (IVGID) water purveyance system was initially gathered during the course of two in-person interviews conducted by Nevada Tahoe Conservation District staff in 2002. This 2007 update documents operational changes. This information was gathered by written correspondence with operations management. The Burnt Cedar System map and operations manual are on file with BHPS.

### IVGID Burnt Cedar Operations Staff

Operations Staff	Position	Current Certification Level
Joe Pomroy	Director of Public Works	P.E.
Brad Johnson	District Engineer	P.E.
Harvey Johnson	Utilities Superintendent	Grade T-3 Water and IV Wastewater

No changes to organizational structure or operational method are anticipated in the next five years.

### Burnt Cedar Disinfection Plant Report

The Burnt Cedar Disinfection Plant was designed by Kennedy/Jenks Consultants, San Francisco. The facility was constructed in 1994-1995. Official start-up was accomplished in August 1995, after some initial deficiencies in the system had been addressed. The plant applies ozonation as the primary disinfectant treatment for meeting the requirements of the SWTR for 3 and 4-log inactivation of *Giardia* and viruses. Chlorine is applied as a secondary disinfectant and in order to maintain a residual throughout the distribution system. In order to meet TRPA scenic guidelines, most of the compact treatment facility is underground.

**IVGID Burnt Cedar System Capacity (Millions of Gallons)**

Average daily production	3.16 MG/DAY ( 2006/2007)
Total design capacity	8.5 MG/DAY
Total emergency capacity	8.5 MG
Total storage capacity	5.7 MG

**IVGID, Burnt Cedar Connections and Meters (Gallons per day)**

Connection type	Annual (gpd) 05/06	Number of connections
Commercial	121,379,798	207
Construction*	1,633,674	43
Irrigation	41,242,883	56
IV Domestic	7,589,092	34
IV Irrigation	107,880,899	23
IV Snowmaking	23,849,488	1
Multi Family	245,720,313	4,033
Single Family	471,386,775	3,549
<b>Total</b>	<b>1,020,682,922</b>	<b>3,132</b>

Source "Total" is taken from the document IVGID Water Management Plan Update Water Year 2006 update. Numbers reported are annual totals in gallons for the 2005/06 water year.

\*Includes construction accounts and fire flow testing.

**IVGID, Burnt Cedar Facility Components and Activity Status**

Activity Status	Facility Name	
Active	Treatment Plant, Burnt Cedar	
Active	Distribution System (valves and pressure reducing stations)	
	Water Pump Stations (WPS)	Emergency Power
Active	WPSI-A, Lake Tahoe Burnt Cedar Intake	Yes
Active	WPS-1	Yes
Active	WPS-2	Yes
Active	WPS3-1	Yes
Active	WPS3A-1	No
Active	WPS4-1	No
Active	WPS4-2	Yes
Active	WPS5-1	Yes
Active	WPS5A-1	Yes
Active	WPS5-2	Yes
Active	WPS6-1	Yes
Active	WPS6C-1	Yes
Active	WPS8B-1	Yes
	Reservoirs (R)	Capacity (millions of gallons)
Active	R1F-1	0.75
Active	R2-1	1.00
Active	R2-2	1.00
Active	R3-1	0.70

Active	R3A-1	0.17
Active	R4-1	0.25
Active	R5-1	0.50
Active	R5A-1A	0.25
Active	R5A-1B	0.25
Active	R5-2	1.00
Active	R6-1	0.30
Active	R6C-1	0.35
Active	R8B-1	0.35

### IVGID, Burnt Cedar Plant Specifications

Operational Intake	
Depth	28 ft.
Length	650 ft.
Capacity	8.5 million
Pipe Size	18 in.
Plant Flow Rate	
Minimum	1.6 MGD / 1,100 gpm
Average	3.6 MGD / 2,400 gpm
Maximum	8.5 MGD / 6,000 gpm
Oxygen System	
LOX Tanks	2
Capacity/Tank	3,000 g
Ozone System	
Ozone Dosage	
Average	0.5 mg/L
Maximum	1.2 mg/L
Ozone Production	
Average	14 lb/day
Maximum	85 lb/day
Ozone Generators	
Number	2
Capacity/Unit	100 lb/day
Ozone Concentration	6%
Ozone Eductors	
Primary	3 Units
Recirculation	1 Unit
Capacity/Unit	7 SCFM
Eductor Booster Pumps	2 Units
Capacity/Pump	110 gpm @60 psi TDH
Ozone Contractor	
Length	250 ft.
Diameter	5 ft.
Volume	4900 ft. <sup>3</sup>
Detention Time (@ Q <sub>max</sub> )	6.1 minutes
Disinfection CT (5°C & pH 8)	1.9 mg/L-minute
Ozone Destruction System Calcium Thiosulfate (ozone quenching)	
Units	2

Mass	10 lb O <sub>3</sub> /day
Gas Flow	20 SCFM
Sodium Hypochlorite (residual secondary disinfectant)	
Pumps	2
Feed rate	2.7 lbs/day or 5.7 ml/min
Storage volume	1000 gallons

### Burnt Cedar Distribution Infrastructure Status

Infrastructure Type	Total Number	Condition	
		% Good	% Fair
Water Lines	90 miles	90	10
Pump Stations	14	100	
Zone Valves	28	100	
Reservoirs	14	80	20

Estimates of infrastructure condition are estimates, not specifically quantified, provided by PWS managers. They are intended only to give the reader a general estimate of facility improvements that may need to be addressed in the next few years.

### Emergency Power and Security Systems

Policy is to respond to emergencies 24 hours per day, 365 days per year within 30 minutes. An upgraded SCADA system providing radio telemetry is in place. The system provides operating status information and sound system alarms. Automatic shutdown will occur in the event of an emergency or when vital operational parameters fall out of acceptable range. Facilities are secured with fences and locking gates. Improvements have included upgrading the emergency power generators, increased sewer line inspections to determine pipe integrity, plus and on call emergency operators available 24/7, year round.

### Public Notification Announcements

The TWSA annual reports document all violations and announcements. IVGID has distributed an annual Consumer Confidence Report to customers prior to July 1, each year since 1997.

### Cryptosporidium in control requirements (Interim Enhanced Surface Water Treatment Rule 1998, Long Term 2 Enhanced Surface Water Treatment Rule):

IVGID: has planned with a 5 year capital improvement program to install UV at Burnt Cedar Disinfection facility, and if needed, the extension of the intake to additional protection zone. In April 2008, IVGID began testing for Cryptosporidium, using method #1622 as primary choice for additional controls. (Johnson/Murphy, pers. com. 2007)



## Zephyr Water Utility District (ZWUD)

### Watershed Description

ZWUD is owned and operated by Douglas County, Nevada. It is located on the east shore of Lake Tahoe, in the McFaul sub-watershed. The District serves four communities: Zephyr Knoll, Zephyr Heights, Marla Bay, and Zephyr Cove. The County provides contract water service to Presbyterian Conference Center. The total area within the District jurisdiction is .4 square miles.

The McFaul watershed area is approximately 3.9 square miles and includes two secondary streams. McFaul creek drains into Lake Tahoe at Marla Bay, Lake Tahoe approximately  $\frac{3}{4}$  of a mile south of the county water intake. Approximately 6,000 feet of shoreline are located in the district area. The Tahoe Regional Planning Agency notes over 80% of the McFaul watershed is owned by the Lake Tahoe Basin Management Unit. Land use in the remainder of the watershed includes: public service (schools, fire department), commercial land, residential, and recreation (public and private beaches).

### Zephyr Water Utility District Plant Overview

The following information concerning the Zephyr Water Utility District (ZWUD) Plant and all information concerning the ZWUD system was gathered during the course of in-person interviews conducted by Nevada Tahoe Conservation District staff in 2002. Supplementary information was provided by Douglas County staff during phone interviews and by review of the ZWUD Facility Operations Plan. Data and information from the State Bureau of Health Protection Service was also compiled and incorporated into select tables found in the following pages. This 2007 update documents changes, gathered by written correspondence with operations management.

### ZWUD Operations Staff and Certifications

Operations Staff	Position	Current Certification Level
Jerry Walker	Utilities Supervisor	N/A

No changes to organizational structure or operational method are anticipated in the next five years.

### ZWUD Plant Report

The ZWUD Ozone Disinfection Facility was designed by Kennedy/Jenks Consultants. It was constructed in 1997 and initially came on line in summer 1997. The plant was shut down for several months in 1998 due system dysfunction and re-opened in 1999 after several changes were made. The treatments applied include ozone disinfection and chlorination. Ozone is the primary disinfectant, in place to meet CT requirements. Chlorine is the secondary disinfectant and is applied in order to maintain a residual throughout the distribution system.

### ZWUD System Capacity

Average daily production	.22 mg/day (06/07)	450 gpm
Total design capacity	680 gpm	
Total emergency capacity	680 gpm	
Total Storage capacity	625,000 gallons	

Note: There is AC pipe containing asbestos in the system. Monitoring has never shown this to have negative impacts on water supply, however it is worth noting and keeping track of the percentage of pipe replacement that is removing the pipe containing asbestos (Nevada State Bureau of Health Protection Services database).

**ZWUD Connections and Meters**

Connection Type	Number of Connections
Residential - Houses	465

Community irrigation is the only component of the system that is metered.

**ZWUD Connections and Meters**

Activity Status	Facility Name
Active	Distribution System
Active	Lake Tahoe Intake
Active	Storage Tank 625 K
Active	Intake Pump 1
Standby (alternating as main/backup)	Intake Pump 2
Active	Treatment Plant Lake Tahoe Intake

**ZWUD Plant Specifications**

Operational Intake	
Depth (lake level at 6,229 ft. above sea level)	69 ft.
Length	1,083 ft.*
Pipe Size (inside diameter)	10 in.
Year Installed	1992
Plant Flow Rate / Raw Water Pumps	
Minimum	400 gpm (1 pump), 640 (2 pumps)
Average	450 gpm (1 pump) – normal operating
Maximum	400 gpm (1 pump), 700 (2 pumps)
Ozone System	
Ozone Demand	
Average	5 lbs/day for 11 hours/day
Maximum	13 lbs/day for 24 hours/day
Ozone Production	
Average	5 lbs/day for 11 hours/day
Maximum	4 lbs/day for 16 hours/day
Ozone Generators	
Number	2
Capacity/Unit	20 lb/day
Ozone Contractor	
Length	138 ft.
Diameter	30.5 ft.
Volume	700 ft <sup>3</sup>
Contact Time	11.6 minutes (@Q=450 gpm)
Ozone Dosage	
Required disinfection CT (raw water, 5°C & pH 8)	1.9 mg/L
Required ozone concentration	0.164 mg/L
Ozone dosage (@890 gpm)	0.35 mg/L
Ozone production rate	1.89 – 20 lbs O <sub>3</sub> /day
Ozone gas flow rate	0.3 SCFM – 1.7 SCFM

Ozone Destruction System	
Sodium Bisulfite (ozone quenching)	
Pumps (#)	2
Dosage	.15 mg/L
Feed Rate	0.81 lbs/day or 0.86 ml/min
Storage volume (total)	110 gallons
Sodium Hypochlorite (residual secondary disinfectant)	
Pumps	2
Feed rate	2.7 lbs/day or 5.7 ml/min
Storage volume (total)	200 gallons

\* In 1996 – 1997 the first 400 feet (nearest shore) of lake intake, 10-inch Polyethylene pipe was replaced with 10-inch Ductile Iron pipe.

### ZWUD Distribution Infrastructure Status

Infrastructure Type	Total Number	Condition	
		% Good	% Fair
Water Lines		85	
Pump Stations	1	100	
Zone Valves		85	
Reservoirs (new)	1	100	

Estimates of infrastructure condition are estimates, not specifically quantified, provided by PWS managers. They are intended only to give the reader a general estimate of facility improvements that may need to be addressed in the next few years.

### Emergency Power and Security Systems

An automatic system shutdown will occur in the event of an emergency or when vital operational parameter fall out of acceptable ranges. When a facility system shutdown occurs the facility will not restart automatically. A system shutdown requires a manual reset by the operators before the plant can be restarted. The facility operators receive a callout through the autodialer of the facility PLC and must visit the plant to investigate the cause of shutdown prior to restarting the facility.

### Cryptosporidium in control requirements (Interim Enhanced Surface Water Treatment Rule 1998, Long Term 2 Enhanced Surface Water Treatment Rule):

Sampling for E. Coli to begin October, 2008 and Cryptosporidium in 2010.

## Edgewood Water Company

### **Watershed Description**

Edgewood Water Company is located on the east shore of Lake Tahoe, Nevada. The total area within the service area is 6.7 square miles.

The utility company and intake is located in the Edgewood sub-watershed and adjacent to the Burke Creek sub-watershed in the Lake Tahoe basin. Edgewood Creek drains into Lake Tahoe approximately  $\frac{3}{4}$  of a mile south of Burke Creek. The watersheds are within Douglas County, Nevada jurisdiction.

The Edgewood Creek watershed is composed of state, federal, and private land. The watershed area is approximately 7 square miles. The state and federal lands support an extensive network of hiking and biking trails. Of the Douglas County, Lake Tahoe Watersheds, the Edgewood watershed has the highest percentage of privately owned lands. Park Cattle Company is the largest land owner. Its holdings include the Edgewood Golf Course and land south-west of the golf course. Park Cattle Company leases a portion of their land to casinos in Stateline, Nevada.

The Burke Creek watershed area is 5 square miles. A large percentage of the Burke Creek watershed is owned by the US Forest Service, Lake Tahoe Basin Management Unit. Forest Service property includes extensive hiking, biking, running trails, and beach access/camping at Nevada and Round Hill Pines Beaches. Private land includes residential and small commercial lots. Social and county services include small parks. Kahle Park and Recreation fire department, post office, health services, and schools are also available.

### **Edgewood Water Company Treatment Plant Review**

The following information concerning the Edgewood Ozonation Plant and information concerning the Edgewood system was gathered during the course of in-person interviews conducted by Nevada Tahoe Conservation District staff in 2002. This 2007 update documents operational changes, gathered by written correspondence with operations management. The Edgewood system map and operations manual are on file with BHPS.

### **Edgewood Operations Staff and Certifications**

Operations Staff	Position	Current Certification Level
Cameron McKay	Manager/Operator	Treatment III
Jim Summers	Operator	Treatment III

Edgewood Water Company provides drinking water to 11 hookups serving visiting populations at the following sites:

- Stateline Hotels including Caesar's, Harvey's, Horizon, Harrah's
- Wells Fargo Bank
- Edgewood Clubhouse
- Golf course and maintenance facility
- Park Estate House
- 2 Beach houses on Park estate

The Edgewood Water Company Ozonation Plant was designed by HDR. It was constructed in the 1996 – 1997 and officially come online in September 1997. The plant utilizes ozonation as the primary disinfectant treatment for meeting the requirement of the SWTR for 3 and 4-log inactivation of *Giardia* and viruses. Chlorine is applied as a secondary disinfectant and in order to maintain a residual throughout the system.

### Edgewood System Capacity

Average daily production	.88 mg/day ( 06/07)
Total design capacity	3.4 mg/day
Total emergency capacity	1.97 mg
Total storage capacity	2.3 mg

Note: There is AC pipe containing asbestos in the system. Monitoring has never shown this to have negative impacts on water supply, however it is worth noting and keeping track of the percentage of pipe replacement that is removing the pipe containing asbestos (Nevada State Bureau of Health Protection Services database (SDWIS)).

### Edgewood Connections and Meters

Connection Type	Connections
Commercial – Hotels/Resorts	8
Residential - Houses	3

### Edgewood Facility Components and Activity Status

Activity Status	Facility Name
Active	Distribution System
Active	Lake Tahoe Intake
Active	Old Storage Tank (1M150K)
Active	Pump Facility 1 Lake Pump Station
Active	Pump Facility 2
Active	Pump Facility 3
Active	Storage Tank 2 (1M150K)
Active	Ozone Treatment Plant

### Edgewood Plant Specifications

Operational Intake (new)	
Depth (lake level at 6,229 ft. above sea level)	35 ft.
Length	2,500 ft.
Capacity	4,000 gpm
Pipe Size (inside diameter)	18 in.
Year Installed	1990
Screened Intake	Yes
Backup Intake (old)*	
Depth (Lake level at 6,223 ft/m)	13 ft.
Length	700 ft.
Capacity	2,400 gpm
Pipe Size (inside diameter)	16 in
Plant Flow Rate / Raw Water Pumps	
Minimum	1.0 MGD / 700 GPM
Average	0.79 MGD / 700 GPM

Maximum	3.4 MGD / 2400 GPM
Ozone System	
Ozone Demand	
Average	0.35 ppm
Maximum	0.42 mg/L
Ozone Production	
Minimum	3.5 lb/day
Maximum	4.4 lb/day
Ozone Generators	
Number	2
Capacity/Unit	30 lb/day
Ozone Contractor	
Length	32 ft.
Diameter	17.4 ft.
Total Volume	12,340 gallons
Contact Time	2.37 mg/minute
Ozone Dosage	
Required disinfection CT (raw water, 5°C & pH 8)	1.9 mg/L
Ozone dosage (@890 gpm)	20 lb/day
Ozone Destruction System Sodium Bisulfite (ozone quenching)	
Pumps (#)	2
Capacity per pump	3.4 gph
Dose rate	2.2 mg/mg O <sub>3</sub>
Feed concentration	12-25%
Storage volume (total)	110 gallons
Sodium Hypochlorite	
Pumps	2
Capacity per pump	1.66 gph
Feed rate	0.2 – 1.0 mg/L
Feed concentration	12.5 %
Storage volume (total)	110 gallons

\*The new intake line was installed in 1992. The old intake line has been retained for backup.

### Edgewood Distribution Infrastructure Status

Infrastructure Type	Total Number	Condition	
		% Good	% Fair
Water Lines	>10 miles	100	
Pump Stations	1	90	10
Zone Valves	10	100	
Reservoirs	2	100	

Estimates of infrastructure condition are estimates, not specifically quantified, provided by PWS managers. They are intended only to give the reader a general estimate of facility improvements that may need to be addressed in the next few years.

### Emergency Power and Security Systems

The current alarm system is supported by ADT. Secured fences and gates have been installed to prevent vandalism of facilities. Recently, Edgewood installed a generator at the Lake Pump station for emergency backup power. The generator has the capacity to run the pump station at normal capacity during power outages. Edgewood's storage capacity of 2.3 mgd can provide up

to two days of emergency storage during the winter months and up to one day of emergency power during the summer months.

**Public Notification Announcements**

The TWSA annual reports document all violations and announcements.

**Cryptosporidium in control requirements (Interim Enhanced Surface Water Treatment Rule 1998, Long Term 2 Enhanced Surface Water Treatment Rule):**

Edgewood is working with the Health Division to determine what is needed to comply with the rules.

## Round Hill General Improvement District (RHGID)

### Watershed Description

As a filtering water supplier, RHGID has volunteered to implement watershed control programs, submit data and report on progress annually.

Round Hill General Improvement District (RHGID) is located on the east shore of Lake Tahoe, Nevada. The district serves residential and small commercial communities. The total area within the District jurisdiction is 1.2 square miles.

The water utility is located in the McFaul Creek sub-watershed in the Lake Tahoe Basin. The watershed area is approximately 4 square miles. The district intake is located south of McFaul Creek. Burke Creek drains into Lake Tahoe approximately 1 mile south of the district intake. The watersheds are within Douglas County, Nevada jurisdiction.

A large percentage of the McFaul watershed is owned by the US Forest Service, Lake Tahoe Basin Management Unit. Private land includes lots dedicated to horse stables, beach access, a marina, small commercial, and camping. Social services including parks, fire department, post office, and schools are also available. A large percentage of the Burke Creek watershed is also owned by US Forest Service, Lake Tahoe Basin Management Unit. Forest Service property includes extensive hiking, biking, and running trails. Private land includes: residential, beach access/camping at Nevada Beach, Roundhill Pines Beach, Kahle Park and Recreation, and small commercial lots.

As a filtering water supplier Round Hill General Improvement District is not required to meet non-filtering water quality standards. However, water quality data suggests RHGID does continuously meet non-filtering water quality standards.

### System Operations Information

As a supplier using surface water, but not under Lake Tahoe filtration exemption specifications, the Round Hill system is required to provide multi-barrier treatment including filtration and disinfection. RHGID operates a 2 stage filtration pack system chemical coagulation and disinfection facilities. Round Hill General Improvement District extended intake was upgraded in 2006 to increase to 2450 ft. (McKay pers. comm. 2006).

### RHGID Operations Staff and Certifications

Operations Staff	Position	Current Certification Level
Greg Reed	General Manager/Operator	Grade IV Treatment and Grade IV Distribution

### Round Hill General Improvement District Facility Overview

The Round Hill General Improvement District does not operate under filtration exemption. This system does apply filtration to source water from Lake Tahoe. Round Hill was a participant in the initial study (1990-1992) for filtration exemption qualifications. Subsequently, system managers chose to construct a filtration system rather than to operate under filtration exemption.

As a filtration system, the system specifications and monitoring requirements at Rounds Hill differ from those of the other filtration exempt (ozonation) facilities in this report.



The water treatment facility includes two-stage filtration package treatment units, chemical coagulation and disinfection facilities. As a supplier using surface water, and not under Lake Tahoe filtration exemption specifications, the Round Hill system is required to provide multi-barrier treatment including filtration and disinfection in order to protect the customer from adverse health effects of microbiological contaminants. These are provisions for treatment and performance requirements, monitoring, design standards, operating requirements, reporting to Nevada, public notification and requirements for a watershed sanitary survey.

### **Emergency Power and Security Systems**

Protocol is to shut down treatment if there are any spills or pollution threats near intake. Round Hill utilizes a SCADA control and automatic alarm system in its operations. Should a plant alarm condition occur, it is transmitted to the SCADA control panel for retransmission to the District office for the following conditions:

Fire Alarm	Raw Water Turbidity
Clarification Tank Level High	Unit No. 1 High Effluent Turbidity
Clearwell Tank Level High	Unit No. 2 High Effluent Turbidity
Unit No. 1 High Clarifier Pressure	Power Failure
Unit No. 2 High Clarifier Pressure	Chlorine Residual Low
Backwash Cycle Fail	Air Scour Blower Fail
Flush Cycle Fail	

### **Water Supply**

Average flow rates for the Round Hill system typically range from a low of .14 mgd to a high of .6 mgd. The lowest flow rates typically occur during the months of November through March due to winter conditions and no landscape irrigation. The highest monthly flow rates typically occur in August.

### **Public Notification**

There is a public notification plan in place. This involves emergency notification through local news media and, when necessary, door-to-door emergency notification by the District's two full-time field employees.

### **Cryptosporidium in control requirements (Interim Enhanced Surface Water Treatment Rule 1998, Long Term 2 Enhanced Surface Water Treatment Rule):**

RHGID: began raw water E-Coli sampling in January 2008.

## Lakeside Park Association (LPA)

### Watershed Description

As a filtering water supplier, LPA has volunteered to implement watershed control programs, submit data and report on progress annually. LPA is not required to meet non-filtering water quality standards. However, water quality data suggests LPA continuously meets non-filtering water quality standards.

Lakeside Park Association (LPA) is located on the south shore of Lake Tahoe, Nevada. The total area within the service area is 0.15 square miles. The utility company and intake is located in the Bijou Park sub-watershed. It is adjacent to the Edgewood Creek sub-watershed in the Lake Tahoe basin. Edgewood Creek drains into Lake Tahoe approximately 2/10 of a mile south of the CA/NV state line. These watersheds are within both CA and NV jurisdiction.

This watershed area is composed of state, federal, and private land. The watershed area is approximately 3 square miles. The state and federal lands support an extensive network of hiking and biking trails. Within the service boundaries of the Bijou Park watershed, 80 percent is privately owned land, comprised of residential and commercial lots.

### Lakeside Park Association (LPA) Water Treatment Plant Review

The following information concerns the LPA Raw Water Intake Filtration Water Treatment Plant.

Information concerning the LPA system was gathered during the course of in-person interviews and written surveys conducted in 2008, by TWSA staff. This 2008 update documents operational changes, gathered by written correspondence with operations management. The LPA system map and operations manual are on file with CADPH.

### LPA Operations Staff and Certifications

Operations Staff	Position	Current Certification Level
Bob Loding	Manager/Operator	CA T-1 & D-1; NV T-3 & D-2
Tim Whitt	Operator	CA D-1

LPA Water Company provides drinking water to 137 total number of services hookups. Connections are not metered.

### LPA Filtration Plant Report

The LPA Water Filtration Plant was designed by SPH Associates. It was constructed in 1996-97 and officially came online in July 1997. The plant utilizes contact clarification, mixed media filtration and chlorination for meeting the requirement of the SWTR for 3 and 4-log inactivation of *Giardia* and viruses and all other safe drinking water requirements.

### LPA System Capacity

Average daily production	0.25 mg/day
Total design capacity	0.61 mg/day
Total emergency capacity	1 MGD
Total storage capacity	0.21 mg

**LPA Connections**

Connection Type	Connections
Commercial – Hotels/Resorts	49
Residential - Houses	88

**LPA Facility Components and Activity Status**

Activity Status	Facility Name
Active	Raw Water Intake
Active	Raw Water Pump Station

**LPA Plant Specifications**

Raw Water Intake	
Depth (lake level at 6,229 ft. above sea level)	33 ft.
Length	2300ft.
Capacity	1500 gpm
Pipe Size (inside diameter)	14 in.
Year Installed	1995
Screened Intake	Yes
Back-up Water Supply	
Well #3	
Output	350 gpm
Length	ft.
Capacity	0 gpm
Pipe Size (inside diameter)	
Plant Flow Rate / Raw Water Pumps	
Minimum	375 GPM
Average	375 GPM
Maximum	700 GPM
Filtration System	
Filters	2
Treatment Capacity	420 GPM
Treatment Removal	Down to 2 Microns
Flow rates	100 to 420 GPM
Pre Chlorination System	
Pumps	2
Coagulant Feed System	
Pumps	2
Post Chlorination System	
Pumps	2

**LPA Distribution Infrastructure Status**

Infrastructure Type	Total Number	Condition	
		% Good	% Fair
Water Lines	3 miles	20	80
Pump Stations	1	100	
Zone Valves	0		
Reservoirs	1	100	

Estimates of infrastructure condition are estimates, not specifically quantified, provided by PWS managers. They are intended only to give the reader a general estimate of facility improvements that may need to be addressed in the next few years.

**Emergency Power and Security Systems**

LPA has Emergency standby power provided by two diesel generators. These generators can provide full power to all facilities for 2 days of continuous operation (without refueling). Switch-over to stand-by power is automatic.

Water treatment and pump stations are protected by a hard-wired dialer alarm system.

**Public Notification Announcements**

For the past 5 years, this plant has had zero (0) violations.

**Cryptosporidium in control requirements (Interim Enhanced Surface Water Treatment Rule 1998, Long Term 2 Enhanced Surface Water Treatment Rule ):**

LPA has and continues to monitor its raw water source (Lake Tahoe) for Total Coliform and E-Coli twice per month.

Well #3, the stand-by water source, is monitored for Total Coliform and E-Coli every 3 months.

Tahoe City Public Utility District (TCPUD)  
 Quail Lake/McKinney Shores Water System Only  
 CA Public Water System No. 3110011

**Watershed description**

The Tahoe City Public Utility District-Quail Lake/McKinney Shores Water System is located on the West shore of Lake Tahoe, Nevada. The total area within the service area is 3 square miles. The District primarily serves residential, commercial, and recreation customers. The total area within the service zone is approximately 22 square miles.

The District operates and maintains four separately licensed water systems within this service zone. All sources are groundwater, with the exception of the Quail Lake/McKinney Shores Water System. This system is served by both groundwater and surface water. System operations information

The Quail Lake/McKinney Shores System watershed is fed by McKinney Creek and Quail Creek. The Tahoe City Public Utility District owns approximately 100 acres of the undeveloped land in the watersheds. The rest of the property is owned by both private and public agencies and does include a privately owned ski resort. The water system and intake are located in the McKinney Creek sub-watershed. It is adjacent to the Quail Lake Creek and General Creek sub-watershed(s) in the Lake Tahoe basin.

McKinney Creek drains into Lake Tahoe, adjacent to Placer County Parcel No. 098-330-015. These watersheds are within CA jurisdiction.

The McKinney Creek watershed is composed of state, federal and private land. The watershed area is approximately 2 square miles. The state and federal lands support a network of hiking and biking trails. Within service boundaries the McKinney Creek watershed has a relatively low percentage of privately owned lands. Private land includes residential and small commercial lots.

**McKinney Quail/Interim Water Treatment Plant Review**

Information concerning the Tahoe City Public Utility District-Quail Lake/McKinney Shores Water System was gathered by Tahoe City Public Utility District personnel. This 2008 update documents operational changes, gathered by written correspondence with operations management. The Quail Lake/McKinney Shores system map and operations manual are on file with CDPH.

The Tahoe City Public Utility District McKinney Quail Interim Water Treatment Plant has been in operation since 2004. The water treatment facility utilizes direct filtration and chlorine contact to achieve all surface water treatment standards. The facility is located outside and is operated seasonally from May through October, and is permitted to produce approximately 300 gallons per minute.

### Operations Staff and Certifications

Operations Staff	Position	Current Certification Level
Tony Laliotis	Director of Utilities	Grade T2
Doug Olsen	Utilities Superintendent	Grade T2
Rich Lehman	Field Supervisor	Grade T3
Francisco Gonzalez	Operations Specialist II	Grade T2

The Tahoe City Public Utility District-Quail Lake/McKinney Shores Water System provides drinking water to 400 services hookups.

Connections: Metered beginning April 2009, unmetered previously.

### McKinney Quail Interim Water Treatment Plant

The McKinney Quail Interim Water Treatment Plant was designed by Gilmore Engineering and the TCPUD. It was constructed in 2004 and officially came online in August 2004. The plant utilizes Direct Filtration the primary treatment for meeting the requirement of the SWTR for 2 and 1-log inactivation of *Giardia* and viruses, respectively. Sodium Hypochlorite 12.5% is applied as a secondary disinfectant and provides the additional log removal for *Giardia* and viruses as well as maintains a residual throughout the system.

### McKinney Quail Interim Water Treatment Plant System Capacity

Average daily production	0.28 mg/day
Total design capacity	0.42 mg/day
Total emergency capacity	0.14 mg
Total storage capacity	0.35 mg

### Quail Lake/McKinney Shores Connections and Meters

Connection Type	Connections
Commercial – Hotels/Resorts	6
Residential - Houses	385

### Quail Lake/McKinney Shores Facility Components and Activity Status

Activity Status	Facility Name
Active	Distribution System
Active	Lake Tahoe Intake
Active	Crystal Way Well
Active	McKinney Quail Interim Treatment Plant
Active	Quail Tank
Inactive	McKinney Shores Intake
Inactive	McKinney Well No. 1

### McKinney Quail Interim Treatment Plant Specifications

Operational Intake (new)	
Depth (lake level at 6,229 ft. above sea level)	6203 ft.
Length	800 ft.
Capacity	300 gpm
Pipe Size (inside diameter)	8 in.
Year Installed	1983
Screened Intake	Yes

<b>Backup Intake (old)*</b>	
Depth (Lake level at 6,223 ft/m)	NA
Length	NA
Capacity	NA
Pipe Size (inside diameter)	NA
<b>Plant Flow Rate / Raw Water Pumps</b>	
Minimum	50 GPM
Average	200 GPM
Maximum	300 GPM
<b>Coagulant System</b>	
Coagulant Used	NTU Technology Pro Pac 9890
Dosage	6-8 mL/Min of a 24% Solution
Storage	35 Gallons
<b>Filtration System</b>	
<b>Filters</b>	
2 Pressure Filters	50 sq. ft surface area each
Media Depth (Anthracite/Sand)	12/18 inches
<b>Disinfection System</b>	
Type	Sodium Hypochlorite 12.5%
Dosage	1.5-2.0 mg/L
Storage	60 Gallons
Contact Time	65 mg*minute/L
Required disinfection CT (raw water, 10°C & pH 8.25)	62 mg*minute/L
Pumps	1 Primary (Spare on Shelf)
Capacity per pump	14 gpd
Feed rate	1.5-2.0 mg/L
Feed concentration	12.5 %

#### **Quail Lake/McKinney Shores Distribution Infrastructure Status**

Infrastructure Type	Total Number	Condition	
		% Good	% Fair
Water Lines	8 miles	75	25
Pump Stations	2	100	0
Zone Valves	75	50	50
Reservoirs	1	100	0

#### **Emergency Power and Security Systems**

All pumping facilities are provided with fenced and locked access points. Backup power is installed at both the Well and Water Treatment Plant. Instantaneous events are monitored by telemetry. Events which cause possible non-compliance initiate plant shutdown and immediate operator notification. Events which do not cause non-compliance issues are logged and operators notified to monitor and adjust if necessary.

A SCADA system providing radio telemetry is in place. The system provides operating status information and sound system alarms. Automatic shutdown will occur in the event of an emergency or when vital operational parameters fall out of acceptable range. Facilities are secured with fences and locking gates.

**Public Notification Announcements**

For the past 5 years this plant has had no violations.

**Cryptosporidium in control requirements (Interim Enhanced Surface Water Treatment Rule 1998, Long Term 2 Enhanced Surface Water Treatment Rule ):**

A sampling plan has been submitted to California DPH in June 2008. TCPUD will be performing 24 Raw Water Bacteriological samples on a bi-weekly basis. The results of these 24 samples will be used to satisfy the monitoring requirements and no plant modifications are anticipated at this time.



**North Tahoe Public Utility District (NTPUD)  
Tahoe Main - National Avenue Intake Water System  
CA Public Water System No. 3110001**

**Watershed Description**

The North Tahoe Public Utility District (NTPUD) is located on the north shore of Lake Tahoe, in Placer County, California. The Districts' service areas include the communities of Brockway, Kings Beach, Tahoe Vista and Carnelian Bay. California State Highway 267 and CA State Highway 28 bisect the service area.

The total water service area is 3.4 square miles. The District primarily serves residential, commercial, and recreation customers. The total watershed area within the District is 13,891 acres. The majority of land consists of Tahoe and Toiyabe National Forest mixed with developed areas. The watershed is entirely within California jurisdiction.

The NTPUD watershed is fed by several streams which originate in the upper watershed and eventually empty into Lake Tahoe. One water body (Watson Lake) lies on the western extent of the service area. The Dollar Reservoir was decommissioned (drained and re-vegetated) after 2004. The intake for NTPUD is located off National Avenue in Tahoe Vista, going from the shoreline at National Avenue extending 1,800 feet straight out into Agate Bay.

The NTPUD owns approximately 327 acres of the undeveloped land in the watersheds: The North Tahoe Regional Park, Firestone Property, the Gentry Property, and multiple smaller parcels. The rest of the lands in the service area are owned by both private and public agencies and includes two marinas, several public beaches, boat ramps and public parks. State, Federal and PUD lands support a network of hiking and biking trails. Private land includes residential and small commercial lots. Development-wise, the area is built out.

The National Avenue water system and intake are located in the Snow Creek and Griff Creek sub-watersheds. It is adjacent to the Brockway and Carnelian Canyon Creek sub-watersheds in the Lake Tahoe Basin.

**Water facilities**

North Tahoe Public Utility District services 3,868 water connections (2009) with approximately 2,600 serviced by the main system. These connections range from single family dwellings to large business establishments, as well as separate irrigation and fire systems. The District operates three separate and independent water systems. They are Dollar Cove, Carnelian Bay, and the Tahoe Main system.

The Main system is comprised of Tahoe Vista, Kings Beach, and Brockway up to the Nevada State Line. The main water system draws water from Lake Tahoe through an intake at the end of National Avenue in Tahoe Vista, as well as a single well (groundwater source) located in the North Tahoe Regional Park at the top of Donner Road. From there the water is treated at the District's state of the art National Avenue UV Treatment facility. The main system has five water tanks; Park Tank (500,000 gallons), Kingswood West (500,000 gallons), Kingwood 500 (500,000 gallons), Kings Beach (500,000 gallons) and the Kingswood 120 (120,000 gallons). *(Note: Kingwood 120 is scheduled for replacement with a new 500,000 gallon tank in 2010.)*

Water for the Dollar Cove system is currently being supplied through the Tahoe City Public Utility District's Tahoe City system. This system was developed when the two Districts made an agreement to begin a joint well drilling project that is comprised of six separate wells

(groundwater source). Carnelian Bay draws its water from a single well (groundwater source) rated at 200 gallons per minute. The Carnelian Bay System (CBS) has two (2) 500,000 gallon tanks for storage. CBS's finished water is non-chlorinated.

Between July 1, 2008 and June30, 2009: the main system provided nearly 1,246,000 gallons and all sources provided 1,402,000 gallons daily to customers in 2009. The National Avenue Water Treatment Plant provides drinking water to 3,868 services hookups. Connections are fully metered, billing is consumption based on multiple tiers (varies by account type). Standard residential (SFR) base rate included 6,000 gallon/month before tier consumption begins.

### **National Avenue Water Treatment Plant Review**

Information concerning the NTPUD National Avenue Water System was gathered by NTPUD Public Utility District personnel and compiled by TWSA staff. This 2009 update documents operational changes, gathered by written and verbal correspondence with operations management. The NTPUD system map and operations manual are on file with CDPH.

The water treatment facility utilizes ultra-violet disinfection and chlorine contact to achieve all surface water treatment standards.

### **Operations Staff and Certifications**

Operations Staff	Position	Current Certification Level
Curtis Aaron	General Manager / CEO	NA
Norm Moore	Lead Technician	Operator Grade 2
Mike Thornton	Maintenance Tech. II	Operator Grade 2

### **NTPUD National Avenue Water Treatment System**

The NTPUD National Avenue Water Treatment Plant consist of a lake water intake structure with raw water screens and three intake booster pumps, water chlorination/disinfection equipment, a 25 micron screen facility, a CT disinfection chamber , four UV disinfection units, UV Process monitoring equipment, two UV booster systems and a mercury containment vessel.

The National Avenue Intake is the primary supply source for the entire main system with a reliable capacity of 800 gpm (achievable even with the largest of any units out of service). The intake was last updated in 1995; the old intake was decommissioned at that time.

Raw water entering the system in chlorinated, then the plant utilizes Ultra-Violet Disinfection for inactivation of *Giardia* and viruses. Sodium Hypochlorite 12.5% is applied as a secondary disinfectant and provides the additional log removal for Giardia and viruses as well as maintains a residual throughout the system.

### **Water Treatment Plant System Capacity**

Average daily production	1.3 million gallons per day (MGD)
Total design capacity	2.3 MGD
Total emergency capacity (includes all well and tank capacity)	3500 MG
Total storage capacity	2.12 MG

### Connections and Meters

Connection Type	Connections
Commercial – Hotels/Resorts	225
Residential - Houses	3,477
Fire	99
Irrigation	70

### Facility Components and Activity Status

Activity Status	National Avenue Water Treatment System
Active	Distribution System
Active	Lake Tahoe Intake
Active	Intake Lake Pumps (3) & Booster Pumps (2). Note: a 3rd booster pump is scheduled for addition in 2010.
Active	Storage tanks (5) : The main system has five water tanks; Park Tank (500,000 gallons), Kingswood West (500,000 gallons), Kingwood 500 (500,000 gallons), Kings Beach (500,000 gallons) and the Kingswood 120 (120,000 gallons). (Note: Kingwood 120 is scheduled for replacement with a new 500,000 gallon tank in 2010.)
Active	Wells: The Park Well produces 850 gpm and supplies 3-5% of need annually, mainly used during irrigation season.
Active	Intertie with IVGID in the Crystal Bay area for emergency needs.
Inactive	Backup Intake

### Treatment Plant Specifications

Operational Intake (new)	
Depth (lake level at 6,229 ft. above sea level)	33 ft.
Length	1,800 ft.
Intake height	3.5 ft.
Capacity	1,600 gallons per minute (GPM)
Pipe Size (inside diameter)	18 in. - HDPE
Year Installed	1995
Screened Intake	Yes – screen opening is 2 mm.
Backup Intake (old)* - decommissioned	
Plant Flow Rate / Raw Water Pumps	
Minimum	600 GPM
Average	800 GPM
Maximum	1600 GPM

Screens (8) (Note: In 2008 number of screens was increased from 6 to 8)	25 microns
Chlorine Injector System	Details: 2 Jesco MAGDOS LT Chemical Metering Pumps.0.03 to 4.49 gph each
Chlorine Contactor downstream of the 25 micron screens	812 ft. of 60 inch diameter pipeline Provides .05 log inactivation of <i>Giardia</i> at all times. Chlorine contactor is sized to provide 3 log inactivation of <i>Giardia</i> at reduced capacity during emergency operations.
Ultraviolet Disinfection Facilities	
	Two parallel trains: each train consists of two (2) 4 lamp Trojan Swift 4L12 UV reactor units, each train designed for flow rate of 1,600 gpm.
Mercury Containment System	60 in. diameter pipe and automatic valve that will capture and isolate the distribution system form mercury in the unlikely event of a UV lamp breakage.
<b>Disinfection System</b>	
Type	Sodium Hypochlorite 12.5%
Dosage	1.5-2.0 mg/L ; finished water = 1.2 -1.4 mg/L)
Storage	Upgraded to 5,000 Gallons
Contact Time	65 mg*minute/L (3.2 to 4.4 hrs)
Required disinfection CT (raw water, 10°C & pH 8.25)	62 mg*minute/L
Chlorine injector pumps	1 Primary (1 Spare)
Capacity per pump	4 gallons per hour (14 gpd annual average)
Feed rate	Variable by flow
Feed concentration	12.5 %

### North Tahoe Public Utility District - Distribution Infrastructure Status

Total System capacity of 2,400 gpm is based on NAWTP capacity of 1,600 gpm plus 800 gpm from District's Park Well.

The NAWTP operates under SWTR Filtration Avoidance Criteria: pathogens may be present in the water but are not physically filtered from raw water. Inactivation is achieved using multiple disinfection barriers. Two barriers are provided at NAWTP The first is chlorine which provides 4 log virus inactivation and 0.5 *Giardia* inactivation. The second barrier is UV disinfection which provides 0.5 log virus inactivation, 3 log *Giardia* inactivation and 2 log *Cryptosporidium* inactivation. It is expected that North Tahoe Public Utility District will achieve compliance with all existing , pending and future regulations.

Infrastructure Type	Total Number	Condition	
		% Good	% Fair
Water Lines	6.15 miles (main system only)	20 %	80 %
Booster Pump Stations	2 in main system	100 %	
Pressure Reducing Zone Valves	8 in main system	100 %	
Isolation Valves (Curb, gate, and Main-line Valves	431	100 %	
Reservoirs – Dollar	Decommissioned and revegetated	NA	
Storage tanks: Park Tank (500,000 gallons; Kingswood West (500,000 gallons); Kingwood 500 (500,000 gallons); Kings Beach (500,000 gallons) and the Kingswood 120 (120,000 gallons) . (Note: Kingwood 120 is scheduled for replacement with a new 500,000 gallon tank in 2010.)	Total storage capacity is 2.12 million gallons	100%	

### **Emergency Power and Security Systems**

All pumping facilities are provided with fenced and locked access points. Backup power is installed at both the Wells and Water Treatment Plant. Instantaneous events are monitored by telemetry. Events which cause possible non-compliance initiate plant shutdown and immediate operator notification. Events which do not cause non-compliance issues are logged and operators notified to monitor and adjust if necessary.

A Supervisory Control and Data Acquisition System (SCADA) system provides radio telemetry, operating status information and sound system alarms. Automatic shutdown will occur in the event of an emergency or when vital operational parameters fall out of acceptable range. Facilities are secured with fences and locking gates. Annual upgrading of the status and alarm system reporting service – recent upgrades include the addition of remote control of pump stations to alert District personnel. The District's SCADA system was fenced in 2009.

### **Other programs supporting local watershed management:**

- TRPA Shorezone ordinance language (passed Oct. 2008) provides a 1,320 foot buffer zone around the intake. Any proposed development needs to undergo a risk assessment evaluation by the water purveyor.
- A Water Main Replacement study for the Kings Beach Grid area of the NTPUD was conducted in 2007.
- Regional Plant feasibility study: a multi-agency study is being conducted on the feasibility of a regional supply plant based out of Dollar Cove. Study to be released in 2010.
- 2008 Water Main Replacement Project – This project consisted of installing approximately 2,800 linear feet of water main in a four block area, reconnecting existing water services, installing new water services, replacing existing fire hydrants, and installing new, mid-block fire hydrants.
- 2009 Lincoln Green Waterline Replacement – 850 linear feet of 4" water main upgraded to 8" water main line, hydrant and blowoff valve replacements.
- District's FOG program: Extensive education and outreach of the damage caused by fat, oil and grease (FOG) blockages has been distributed to all customers.
- Sewer system force main bypass valve – in the event of damage or failure, this bypass valve system would stop the flow of sewage into Lake Tahoe. In 2009, 3 of 4 Main Pump Stations have been outfitted with bypass valve galleries to date. Construction of the final bypass valve gallery at Carnelian Main Station is scheduled to be completed in 2010.
- In addition, in response to the 2005 sewer spill, the District has invested in a bypass hose reel system capable of long term transport between wet wells in the incident of a major break.
- UST Clean up and remediation; continued removal of underground fuel storage tanks and bioremediation of contaminated soils at the corporation yard and main pump stations decreases the possibility of leaking underground tanks and well as cleanup for contaminated soils.
- Addition of generators at C-2 sewer lift station and Dollar addition will reduce likelihood of overflow due to power outage, by providing secondary power. The District is currently seeking bid for a redundant generator at Dollar Hill, and anticipates purchase in 2010.

North Tahoe Public Utility District and Placer County Capital Improvement Projects 2008-09:

- (EIP #10063) Lake Forest Area A (Dollar) Water Quality Improvement Project, for the Dollar Point area, includes improvement of culvert outfalls to the lake.
- Snow Creek Wetlands Restoration, Tahoe Vista; removal of industrial gravel processing facility and wetlands restoration.

Recent NTPUD CIP Projects:

The District's activities and CIP projects during the 2008-2009 reporting year are:

- Tahoe Estates Erosion Control Project (in coordination with Placer County) – This was an erosion control project in a major subdivision to prevent or treat storm water runoff into Lake Tahoe. The District teamed with Placer County, through a 2/3 reimbursable US Forest Service grant to relocate and install new water mains, and install additional fire hydrants.
- Laurel Drive Water Main Relocation (part of the above project) – Installed 860 lineal feet of 6" water main, water services, and fire hydrants required by Placer County to accommodate new road base thickness for permeable pavement.
- Carnelian Water Tank Rehabilitation – This consisted of the internal and external recoating of the District's Carnelian Woods 2 (CW2) water storage tank.
- Dollar Cove Water Treatment Study – The purpose of the study was to evaluate various alternatives for reactivation of the District's Dollar Cove Lake Intake. The study was funded by a grant from the Placer County Water Agency.

As of October 2009, NTPUD is in the planning stage for the following CIP projects:

- Adding a new 1.3 MG water storage tank for Zone 1 of the upper main system.
- Replacement of the 0.12 MG water storage tank with a 0.5 MG water storage tank in Zone 2. (Kingswood 120)
- Install an additional pump at the National Avenue Water Treatment Plant in 2010.
- Install security fence around the perimeter of the Kingswood West Water Storage Tank.
- Carnelian Bay and Kingswood water main replacement design completed, construction expected in 2010.

The District is also in the planning stage for the following non-CIP projects:

- Purchase and implement a GIS system.
- Update the District's Water Master Plan.
- Survey the force main system; install locating wires database logger, expected completion spring 2010.

### **Public Notification Announcements**

TWSA Annual Reports provide reference to any violations. For the past 5 years this plant has had no violations.

### **Cryptosporidium in control requirements (Interim Enhanced Surface Water Treatment Rule 1998, Long Term 2 Enhanced Surface Water Treatment Rule):**

NTPUD is in compliance with the LT2 rules and schedule.

**Appendix A, B, D and E – are located on the enclosed CD.**



## **TWSA Sanitary Survey 2009 Update Map List**

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- Plate 27 a: Eldorado County Source Water Assessment
- Plate 28: Placer County Source Water Assessment
- Plate 29: Washoe County Source Water Assessment
- Plate 30: Tahoe City PUD service area details

## TWSA Sanitary Survey 2009 Update

### References

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*Most information and reports are referenced directly in the applicable section of the main report.*

*Below are additional websites and publications referenced.*

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