POGGEMEYER
DESIGN GROUP

# South Tahoe Public Utility District
# Recycled Water Facilities Master Plan

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Prepared By: Poggemeyer Design Group
10651 Professional Circle, Suite A
Reno, Nevada 89521
(775) 857-3330

Prepared For: South Tahoe Public Utility District
1275 Meadow Crest Drive
South Lake Tahoe, California 96150-7401
(530) 544-6474

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# Abstract

The South Tahoe Public Utility District (District), the wastewater service provider for California residents in the South Lake Tahoe area has prepared this *Recycled Water Facilities Master Plan* (Master Plan) for recycled water and freshwater operations in Alpine County, California. The District has also prepared an associated Environmental Impact Report (EIR) in accordance with the requirements of the California Environmental Quality Act (CEQA) for the Master Plan. The Master Plan was prepared in 2008 and adopted in October 2009 with a 20 year planning horizon.

The District treats sewage generated in the Lake Tahoe basin and exports the treated wastewater (recycled water) to the eastern portion of Alpine County where it has been utilized to irrigate ranch lands since the 1960's. The District also operates a freshwater system in support of Indian Creek Reservoir, a recreational amenity in Alpine County. The Master Plan and EIR were prepared to assure continued successful operation of the District's recycled water and freshwater systems.

Issues prompting the preparation of the Master Plan and EIR include; the need to improve or replace the emergency disposal facility for recycled water, to improve operational control of recycled water and freshwater systems, to plan for potential loss of lands currently irrigated with recycled water, to ensure recycled water is used in conformance with applicable regulations and does not harm the environment, and to meet obligations regarding water quality and water surface elevation in the Indian Creek Reservoir. The Master Plan identifies 26 distinct projects which include infrastructure and management projects for both recycled water and freshwater operations in Alpine County. Of the 26 projects, eight are recommended for implementation in the near future, the implementation of twelve other projects is contingent on various factors, and the remaining six are future projects, which will require additional CEQA documentation.

# Executive Summary

## Introduction, Purpose and Objectives

The South Tahoe Public Utility District (District) has prepared this *Recycled Water Facilities Master Plan* (Master Plan) for their recycled water and freshwater operations in Alpine County, California. The District also prepared an associated Environmental Impact Report (EIR) in accordance with the requirements of the California Environmental Quality Act (CEQA).

The purpose of the Master Plan is to identify infrastructure and management projects to assure continued successful operation of the District's recycled water and freshwater systems in Alpine County.

The District treats wastewater generated in the Lake Tahoe basin and exports the treated wastewater (recycled water) to Alpine County where it has been used to irrigate ranch lands since the 1960's. The District also operates a freshwater system in support of Indian Creek Reservoir, a recreational amenity in Alpine County that was formerly used for recycled water and which has since been converted to a freshwater reservoir.

The objectives of the Master Plan include the following.

1) Establishing a plan for recycled water and freshwater management for operation through the year 2028.

2) Assuring regulatory compliance of the District's recycled water and freshwater operations.

3) Protecting and enhancing the environment in Alpine County.

4) Continuing cooperation with Alpine County stakeholders.

## Background

In 1967 the South Tahoe Public Utility District (District) entered into an agreement with the Alpine County Water Agency for importation, storage and direct land application of recycled water in response to the Porter Cologne Act which, among other things prohibited the use of recycled water within the Tahoe Basin.

Infrastructure was constructed to convey recycled water from the District's wastewater treatment plant out of the Lake Tahoe basin along Highway 89 over Luther Pass to Highway 88 in Hope Valley, then along the West Fork of the Carson River and eventually to the Indian Creek Reservoir, which was originally built for recycled water storage. The District entered into agreements with ranch owners in Alpine County to receive the recycled water for their use in irrigating their ranch lands.

In response to treatment changes at the District's wastewater treatment facility in Lake Tahoe and regulatory requirements, the District completed in 1989 the construction of Harvey Place Reservoir, replacing Indian Creek Reservoir as the storage facility for recycled water. Indian Creek Reservoir was converted to a freshwater reservoir and the District has continued involvement with the Indian Creek Reservoir as part of their freshwater operations in Alpine County.

**Issues**

Issues prompting the preparation of this Master Plan and its associated EIR include the following.

1) The existing On-Farm emergency disposal site for recycled water does not adequately serve its intended purpose prompting the need to plan a replacement emergency temporary storage facility.

2) The District wanted to identify improvements needed in its recycled water and freshwater operations in Alpine County

3) The District was concerned about the potential loss of existing lands irrigating with its recycled water due to subdivision of the land or other causes.

4) The District wanted continued management its recycled water in conformance with applicable regulations and reduce potential effects on the environment.

5) The District desired to improve operational control of their recycled water and freshwater systems in Alpine County.

6) The District needed planning to assure conformance with their obligations regarding water quality and minimum water surface elevations in the Indian Creek Reservoir.

**Master Plan Preparation and Development**

In December 2000 the District hired a consultant to prepare a Master Plan for the District's recycled and freshwater facilities within Alpine County. During the initial Master Plan development it became evident that the District needed to obtain additional property in Alpine County in order to provide increased operational flexibility and long term reliability for its recycled water system. Acquisition of the Diamond Valley Ranch was completed by the District in 2006. The property totaled approximately 1,400 acres with more than 900 acres of water righted land. The land acquisition has allowed the District to pursue several options to implement needed improvements to its recycled water operations. Development of the Master Plan was suspended while acquisition of the Diamond Valley Ranch property was underway.

Upon completion of the property acquisition, the District hired a consultant in 2007 to complete the Master Plan and to include in it new opportunities provided by the District's ownership of the Diamond Valley Ranch. Hauge Brueck Associates, working as a subconsultant, was tasked with preparing an Environmental Impact Report (EIR) related to the Master Plan as part of California Environmental Quality Act (CEQA) requirements. The EIR evaluates alternatives to the projects identified in the Master Plan, and identifies mitigation measures to avoid or lessen the environmental impacts of the master plan projects.

**Results and Recommendations**

Through a process of public participation and comment, along with comparison to the District's guiding principles (as discussed in Section 7, page 7-49), twenty-six distinct Master Plan projects were identified which reflect the most desirable aspects of all alternatives considered. The twenty-six projects include infrastructure and management projects for both recycled water and freshwater operations in Alpine County. Of the twenty-six projects, eight are recommended for implementation in the near future (five to eight years), the implementation of twelve other projects is contingent on various factors discussed in the Master Plan, the remaining six are future projects that will require additional CEQA documentation if they are to be implemented.

The Master Plan projects, including a description, the project type, the recommendation status, the conceptual cost, and the Master Plan page number of the description of the project, are presented in Table ES-1. Costs for management projects and future projects were not developed.

## Table ES -1 Recycled Water Facilities Master Planned Projects

| Project Number | Project Description | Project Type | Recommendation Status | Conceptual Cost ($MIL) | Page No. |
|---|---|---|---|---|---|
| 1 | Recycled Water Irrigation Fields on Diamond Valley Ranch | Recycled Water Infrastructure Projects | Recommended | 3.5 | 9-61 |
| 2 | Harvey Place Reservoir Bypass System Pipelines | | Recommended | 6.9 | 9-63 |
| 3 | Diamond Valley Ranch Irrigation Fields Pump Back Station | | Recommended | 0.6 | 9-65 |
| 4 | Diamond Valley Freshwater/Recycled Water Irrigation System | | Recommended | 1.9* | 9-66 |
| 5 | Diamond Ditch Conveyance Improvements | | Recommended | 1.2 | 9-68 |
| 6 | Waterfall Pipeline Forebay and Pipeline | | Recommended | 2.0 | 9-70 |
| 7 | District Pasture Subsurface Irrigation Pilot Project | | Contingent | 0.4 | 9-71 |
| 8 | West Fork Pipeline | | Contingent | 4.6 | 9-72 |
| 9 | On-Farm Pipeline | | Contingent | 2.8 | 9-74 |
| 10 | Wade Valley Pipeline | | Contingent | 3.1 | 9-75 |
| 11 | Prepare Nutrient Management Plans | Recycled Water Management Projects | Recommended | Not Applicable | 10-77 |
| 12 | Permitting for Recycled Water Use in Diamond Valley | | Recommended | Not Applicable | 10-77 |
| 13 | Make Recycled Water Available to Irrigators in Nevada | | Contingent | Not Applicable | 10-78 |
| 14 | Snowshoe Thompson No. 1 Conveyance Capacity Improvements | Freshwater Infrastructure Projects | Contingent | 3.0 | 11-81 |
| 15 | Upper Dressler Ditch Conveyance Improvements | | Contingent | 2.5 | 11-82 |
| 16 | Indian Creek Treatment Wetlands | | Contingent | 0.9 | 11-83 |
| 17 | Diversion Ditch for Stormwater Flow Away from Harvey Place Reservoir and to Indian Creek Reservoir | | Contingent | 0.4 | 11-84 |
| 18 | Indian Creek Reservoir Spillway Channel | | Contingent | 0.9 | 11-85 |
| 19 | Use Mud Lake Winter Diversion for Indian Creek Reservoir Flushing Flow | Freshwater Management Projects | Contingent | Not Applicable | 12-87 |
| 20 | Storage of Water for Downstream Users | | Contingent | Not Applicable | 12-87 |
| 21 | Develop Recycled Water Wholesale Program | Future Projects Project | Future | Not Applicable | 13-95 |
| 22 | Biosolids Composting | | Future | Not Applicable | 13-96 |
| 23 | Become a Water Rights Buyer/Broker | | Future | Not Applicable | 13-96 |
| 24 | Power Generation | | Future | Not Applicable | 13-96 |
| 26 | Extend the C-Line to the State Line | | Future | Not Applicable | 13-97 |
| 26 | Injection Well Program | | Future | Not Applicable | 13-97 |

*Does not include Phase 3, Irrigation of the Jungle.

Table ES-2 presents vital numbers relative to the District's recycled water management, namely the annual volume of recycled water the District must manage and the required acreage for direct land application of the recycled water.

**Table ES -2 Recycled Water Volumes and Application Acreage Requirements**

| Item | 2007 | 2028 |
|---|---|---|
| Harvey Place Reservoir Inflow (acre-feet annually) | 4,873 | 6,498 |
| Harvey Place Reservoir Outflow (acre-feet annually) | 4,738 | 5,848 |
| Application Acreage Required (acres) | 1,458 | 1,799 |
| Application Acreage Deficiency Based on Unblended Water (acres) | 3 | 344 |
| Application Acreage Deficiency Based on Blended Water (acres) | 816 | 1,157 |

Table ES-2 Notes:

(1) The numbers presented are based on an assumed planning value recycled water application rate of 3.25 acre-feet per acre per year.
(2) The numbers presented are based on actual irrigated acreage which is less then Lahontan Regional Water Quality Control Board permitted acreage.
(3) The numbers presented do not include irrigation with recycled water on Diamond Valley Ranch.
(4) The Harvey Place Reservoir outflow for the year 2028 is based on 10% reduction of outflow with respect to inflow which is a 10 year average reduction factor.
(5) Values for blended water are based on the California week of the Nevada/California rotation.

Table ES-2 is based on a year 2028 average daily flow of 5.8 MGD which is a result of flow projection calculations presented in Section 5 (page 5-27). The estimated 2028 recycled water volumes are conservative and are based upon increasing population. Compared to the 2007 value of 4.4 MGD this is roughly a 32% increase. While the District has seen a downward trend in the amount of sewage treated at its wastewater treatment plant in the last three years there are still over 2,300 parcels available for development based on TRPA's Individual Parcel Evaluation Score (IPES) which may result in a population increase in the District's service territory.

Analysis of Table ES-2 shows a current deficiency of 3 acres for direct land application of recycled water based on unblended water volumes and 816 acres based on blended water (Reference Table 13.1 through 13.3 for additional information). Blending of recycled water and freshwater occurs on three contract irrigator ranches located on the west side of the West Fork of the Carson River, and one ranch located on the east side. The combined, blended volume is considered to be all recycled water and there may be issues with blended water flowing from California into Nevada. Currently the contract irrigators have tailwater agreements with the Nevada Division of Environmental Protection for recycled water entering Nevada. However the situation could change and therefore the Master Plan includes projects which could help alleviate the issue of blended water.

Further analysis of Table ES-2 indicates that the District should take action to address direct land application acreage deficiencies. The application of recycled water on the Diamond Valley Ranch presents the best opportunity for the District to establish additional application lands while meeting a guiding principle of first using recycled water in Alpine County. Improvements on the Diamond Valley Ranch will also address the regulatory concern of emergency temporary storage of recycled water. The Master Plan presents the projects necessary to address these and other issues.

A summary list of recommendations is provided in Section 13.9 (page 13-102). The recommendations include general recommendations, the recommendation for projects to be implemented in the near future, groundwater monitoring recommendations, land and easement recommendations and recommendations for projects with contingent implementation.

**Master Plan Content**

The Master Plan is divided into 13 sections and includes 14 appendices. The following briefly describes the content of each section.

Section 1 - Introduction
This section provides background information regarding the District's operations in Alpine County. It includes the history of District operations in Alpine County, details regarding the recycled water application sites, a description of the agreements and permits associated with recycled water management in Alpine County and the issues and concerns pertaining to the current agreements and permits associated with recycled water management.

Section 2 - Study Area
This section provides a description of the study area in Alpine County that is part of the District's freshwater and recycled water operations. The study area description includes the limits of the District's Alpine County operations area, current and future land uses, population trends and ranching practices.

Section 3 - Existing Freshwater System
This section describes the existing freshwater facilities in Alpine County including those owned and operated by the District and other facilities that are part of the District's freshwater operations in Alpine County. These include facilities such as the Snowshoe Thompson Ditch No. 1 and No. 2, the Millich Ditch, the Upper Dressler Ditch, the Upper and Lower Harvey Channels, and the Indian Creek Reservoir.

Section 4 - Existing Recycled Water System
This section describes the existing recycled water facilities in the Master Plan area including the C-Line, Harvey Place Reservoir, and the Diamond Ditch. Section 4 also includes additional information pertaining to the contract irrigation ranchers, and potential future users of the District's recycled water.

Section 5 - Flow Projections
This section presents the methodology used to estimate the future volume of the District's recycled water to be managed. The planning year is 2028, the year the existing contract irrigator agreements expire. Section 5 also includes an evaluation of the recycled water quality. A trend analysis is provided for both recycled water quality and quantity to establish baseline numbers for master planning.

Section 6 - Recycled Water Quality Regulations
This section provides an overview of federal, state and local regulations pertaining to use of recycled water. Section 6 also discusses the potential state-wide Recycled Water Policy which is currently being developed, the ultimate goal of which is to promote the use of recycled water in California and includes the potential requirements for preparation of Nutrient Management Plans of recycled water. In general, Nutrient Management Plans may be required for irrigation projects when the recycled water exceeds three milligrams per liter (mg/l) of total nitrogen (the District's recycled water averages about 20 mg/l total nitrogen).

Section 7 - Master Plan Development
This section includes statements of the purpose and need for the Master Plan including the issues the Master Plan intends to resolve. The section also includes the objectives of the Master Plan, the guiding principles for development for the Master Plan and an overview of the planning process.

Section 8 - Development of Projects
This section describes the development of Master Plan projects to meet the purpose and need and the objectives of the Master Plan.

Section 9 - Recycled Water Infrastructure Projects
This section describes ten recycled water infrastructure projects including six projects recommended for implementation in the near future and four projects whose implementation is contingent upon various factors. For the contingent projects, the trigger mechanism for project implementation is discussed.

Section 10 - Recycled Water Management Projects
This section describes three recycled water management projects two of which are recommended for implementation in the near future while the third project's implementation is contingent.

Section 11 - Freshwater Infrastructure Projects
This section presents five freshwater infrastructure projects all of which are subject to contingent implementation.

Section 12 - Freshwater Management Projects
This section presents two freshwater management projects both of which have contingent implementation.

Section 13 - Master Plan Implementation
This section presents strategies for implementation of the projects identified in the Master Plan. The section describes various triggers which could cause the implementation of contingent projects. These triggers include loss of land currently irrigated with recycled water, regulatory changes, and changes to the total volume of recycled water to be managed. Section 13 also includes an overview of the potential future projects that may require reconsideration when the Master Plan is updated.

Section 13 includes a list of recommendations (page 13-102) of actions the District should take to address recycled water and freshwater management in Alpine County. Also included is a capital improvement plan for non-contingent projects (page 13-101). The capital improvement plan provides a schedule for implementation of projects to be constructed on the Diamond Valley Ranch.

**Master Plan Implementation**

The Master Plan intends to provide guidance to the District for recycled water operations and its direct land application as an irrigation resource, and management of freshwater by implementation of each project identified. Various project triggers such as development of existing ranchland, resulting in loss of recycled water application sites, coupled with higher recycled water flow rates and volumes entering Alpine County will determine the need for, and priority of, implementation of the contingent projects of the Master Plan.

Implementation of the Master Plan projects will improve the District's security, reliability and the economy of its freshwater and recycled water activities in Alpine County.

# Section 1: Introduction

The purpose of this document is to present a Master Plan of projects for the South Tahoe Public Utility District's recycled water and fresh water programs into the year 2028 and beyond.

## 1.1 Background

This section provides background information relevant to the South Tahoe Public Utility District's Alpine County operations and facilities. The District's interest in Alpine County is to preserve the practice of storage and application of recycled water in a manner which will benefit the local agricultural community, protect the environment, comply with regulations, and support the obligations of the District Board to its ratepayers. This section provides an introduction to the history, agreements, and practices that have shaped the existing recycled water operations in Alpine County.

### 1.1.1 Porter-Cologne Water Quality Act

California's primary statute governing water quality and water pollution issues is the Porter-Cologne Water Quality Control Act of 1970 (Porter-Cologne Act) which falls under the State Water Code, Division 7. The Porter-Cologne Act grants the State Water Resources Control Board (SWRCB) and Regional Water Quality Control Boards (RWQCB) broad powers to protect water quality and is the primary vehicle for implementation of California's responsibilities under the federal Clean Water Act. The Porter-Cologne Act grants the SWRCB and the RWQCBs authority and responsibility to adopt plans and policies, to regulate discharges to surface and groundwater, to regulate waste disposal sites and to require cleanup of discharges of hazardous materials and other pollutants. The Porter-Cologne Act also establishes reporting requirements for unintended discharges of any hazardous substance, sewage, or oil or petroleum product.

In 1964 the California State Legislature started discussions regarding the development of the Porter-Cologne Water Quality Act provisions for the protection of Lake Tahoe. In anticipation of the implementation of the act in 1969 the District embarked on what would become a long-term partnership with Alpine County and Alpine County ranching interests. The catalyst of the export pipeline project that conveys recycled water from the Tahoe Basin into Alpine County was the text developed in Section 13951:

> "Notwithstanding any other provision of law, on or after January 1, 1972, waste from within the Lake Tahoe watershed shall be placed only into a sewer system and treatment facilities sufficient to handle and treat any such waste and transportation facilities sufficient to transport any resultant effluent outside the Lake Tahoe watershed, except that such waste may be placed in a holding tank which is pumped and transported to such treatment and transportation facilities."

The Porter-Cologne Act also provides for the use of recycled water according to a uniform statewide reclamation criterion that specifies that the use of recycled water "does not cause, constitute, or contribute to, any form of contamination." This act allows Regional Boards to issue permits to individual contract irrigators for proper use, application and management of recycled water.

### 1.1.2 1967 Agreement – Alpine County and the District

On April 3, 1967 the District entered into an agreement with Alpine County and the Alpine County Water Agency to import tertiary-treated recycled water into Alpine County. The County and Agency stipulated provisions designed to secure a "place at the recycled water table" for themselves and protect the interests of the residents of the County. This agreement was subsequently amended to reflect operational changes and to address the use of new facilities constructed by the District. The first amendment, signed on August 21, 1972, provided for the use of the Indian Creek Reservoir facilities and restricted the volume of storage available for Agency and County use as well as the use of the Diamond Ditch infrastructure. The second modification to the agreement was entered on June 8, 1983, and the third amendment of March 15, 1984 set the criteria for use of Harvey Place Reservoir and reflected the termination of recycled water application along Indian Creek as directed by the Lahontan Regional Water Quality Control Board. The fifth modification to the agreement occurred on July 16, 1991 and since that time the District, County, and Agency have operated under this modified agreement.

In 2002 the District, County and Agency compiled all of the pertinent and applicable provisions of the original 1967 agreement and the subsequent amendments into a single agreement titled *Agreement Between South Tahoe Public Utility District And The County Of Alpine And The Alpine County Water Agency (*contract nos.: WA2002-01/CC2002-69), entered on November 5, 2002. This new agreement reflects all of the provisions mutually agreeable from earlier agreements and modifications. This agreement is the current operating guideline used in Alpine County. This agreement is provided in Appendix N.

### 1.1.3 Indian Creek Reservoir Construction and Modification

Indian Creek Reservoir construction commenced in 1967 and the reservoir started storing recycled water on April 1, 1968. This reservoir was intentionally sited in a watershed with very little natural surface water. The purpose of Indian Creek Reservoir was to store recycled water for spring and summer irrigation; therefore, additional water from precipitation and runoff was not desired. Indian Creek Reservoir was designed to hold the seasonal production of recycled water from South Lake Tahoe and can contain a maximum storage volume of 2,800 acre-feet. The C-Line Export pipeline was completed to the reservoir, conveying the annual storage volume at a maximum storage pool elevation of 5,600 feet.

Upon completion of construction, the District applied for Davis-Grunsky Act funding of the project. This project qualified and received funding in large part because of the related stream flow enhancements, fishery and wildlife, and recreation benefits. In 1972 the District and California Department of Fish and Game started a fish stocking program. The District supplied the financial resources to plant 15,000 pounds of catchable size trout. At this same time, Bureau of Land Management campgrounds were constructed, and have since been maintained under agreement with the Bureau of Land Management, County and District. The Davis-Grunsky funding source tied the District operation of Indian Creek Reservoir to the continued support of the Indian Creek Reservoir fishery and recreation facilities until the contract term expiration in 2022.

Currently the District is party to an agreement with the Bureau of Land Management for the continued operation of the recreational facilities located at Indian Creek Reservoir. This agreement is in effect until November 11, 2024; at such time the assignments of that contract can be accepted by Alpine County. A copy of the District- Bureau of Land Management contract is in Appendix M, and references to this agreement are also contained in Section 10 of the

agreement between South Lake Tahoe Public Utility District and the County Alpine and The Alpine County Water Agency (Appendix N).

Upon completion of construction of Harvey Place Reservoir, the District drained Indian Creek Reservoir in 1989 and started to fill it with freshwater from Indian Creek and the West Fork of the Carson River.

### 1.1.4 Diamond Ditch Agreement 1972

A contract was entered into between the District and the Diamond Ditch Mutual Water Association (DDMWA) in 1972. Four ranches comprise the DDMWA including: Gansberg, Ace Hereford, Neddenriep and Bruns. This contract allowed for the use of recycled water stored in Indian Creek Reservoir in the amount of up to 3,000 acre-feet per year (AF/Yr). When construction of Harvey Place Reservoir began in 1983, the District entered into a new agreement with DDMWA, effective for 40 years after completion of the direct land application system (November 3, 1988). This new agreement specified that from April to October, the District must provide a minimum of 2,000 AF/Yr and a maximum of 3,600 AF/Yr to be divided equally among the ranchers. The agreement allows for the District to lease the Diamond Ditch system, and the District assumes the loan payments on the system, which allows the District the right of access for maintenance and operations of the system.

This agreement states several provisions regarding delivery volumes and timing that are physically and operationally impossible for the District to meet. Future modifications of this agreement will reflect operations that are possible and a delivery volume that is determined by state-mandated regulations, and potentially by the crop type and soil characteristics at the application site as developed in Nutrient Management Plans (see section 1.2.4, page 1-5).

### 1.1.5 Harvey Place Reservoir Agreement 1983

A 1983 amendment to the 1967 Alpine County contract provided for the construction of Harvey Place Reservoir. The District currently uses the 3,800 acre-feet Harvey Place Reservoir to store recycled water during the winter months; during the growing season that water is available for agricultural irrigation. The 1983 agreement started a series of environmental reviews, geotechnical studies, reservoir and transmission pipeline modification design, and public outreach programs.

The need for a new reservoir was twofold: increased treatment plant outflow deemed Indian Creek Reservoir too small for seasonal storage needs, and the District decided to revert to secondary treatment at the South Lake Tahoe wastewater treatment facility. Together these issues made storage of recycled water in Indian Creek Reservoir infeasible. The water quality of the inflow to Indian Creek Reservoir could not be degraded by the addition of secondary treated waste water because Indian Creek Reservoir had a developing freshwater fishery.

### 1.1.6 Harvey Place Reservoir Construction 1988

Harvey Place Reservoir is a clay core, earthen dam constructed of local materials in 1988. The clay was extracted from the center of the Diamond Valley property approximately 0.7 miles to the north of the dam site. The C-Line was modified to convey recycled water to Harvey Place Reservoir rather than Indian Creek Reservoir.

### 1.1.7 Indian Creek Reservoir TMDL 2003

The Lahontan Regional Water Quality Control Board has listed Indian Creek Reservoir and Indian Creek on the list of State Impaired Water Bodies (303d list). This listing prioritizes the development of Total Maximum Daily Loads (TMDL) to control and mitigate the pollutant(s) of concern. Indian Creek Reservoir is designated a cold water fishery; this entails water quality parameters consistent with low production lakes (see Appendix E for additional information). Because of the ambient nutrient load in the reservoir's sediments and water column, the reservoir is highly productive, or eutrophic. The management strategy to improve water quality by decreasing algal production is focused around the management of phosphorus. The following table, Table 1.1, is a summary of the numeric targets and indicators for Indian Creek Reservoir, based on the Total Maximum Daily Load and Implementation Plan for Indian Creek Reservoir, by the California Regional Water Quality Control Board, Lahontan Region, July 2002.

**Table 1.1: Indian Creek Reservoir Water Quality Targets**.

| Indicator* | Target Value | Reference |
|---|---|---|
| Total P concentration | (Interim**) No greater than 0.04 mg/L, annual mean | Current water quality objective (mean of monthly means) |
| Total P concentration | (Long term**) No greater than 0.02 mg/L, annual mean | USEPA, 1988, 1999 |
| Dissolved oxygen concentration | (Interim**) 30 Day Mean 6.5 mg/L; 7 Day Mean Minimum 5.0 mg/L; 1 Day Minimum 4.0 mg/L | Region-wide water quality objective for waters designated for COLD use |
| Dissolved oxygen concentration | (Long term**) Shall not be depressed by more than 10 percent, below 80 percent saturation, or below 7.0 mg/L at any time, whichever is more restrictive | Water quality objective for surface waters of Indian Creek watershed |
| Secchi depth | Summer mean no less than 2 meters | USEPA, 1988, 1999 |
| Chlorophyll A | Summer mean no greater than 10 ug/l | USEPA, 1988, 1999 |
| Carlson Trophic Status Index | Composite index no greater than 45 units | USEPA, 1988, 1999 |

*These indicators will be measured for at least one depth profile sampling station in Indian Creek Reservoir. The Carlson Trophic Status Index will be computed from other parameters as explained in the TMDL implementation plan technical staff report.

**Interim targets are expected to be attained by 2013. Long term targets are expected to be attained by 2024.

## 1.2 Recycled Water Irrigators and Application Sites

The parties to the many agreements for recycled water use have changed since the first agreement to provide recycled water to ranches in Diamond Valley and along Indian Creek. This section is a brief summary of the location, time frame and irrigators who have used the recycled water resource since District operations commenced in 1968.

### 1.2.1 1968-1972

Recycled water was distributed through existing freshwater conveyance infrastructure from 1968 through 1972. Indian Creek was used to convey recycled water to the Smith and Springmeyer ranches downstream of Harvey Place Reservoir in Dutch (Long) Valley, and lesser

irrigation ditches were used to irrigate portions of the Heise Ranch and Schwake land in Diamond Valley. The original parties to the 1967 Alpine County Water Agency agreement for the importation and storage of recycled water in Alpine County used “as much or as little” recycled water as needed for irrigation practices.

### 1.2.2 1972-1983

The original Diamond Ditch Agreement was developed in 1972. This agreement allocated the recycled water resources imported into Alpine County from South Lake Tahoe to several ranches in the West Fork of the Carson River watershed. The completion of the Diamond Ditch in 1972 made it possible to convey recycled water from Indian Creek Reservoir to lands in Wade Valley and along the West Fork of the Carson River.

Historically the recycled water irrigated lands were located in Diamond Valley along Indian Creek and further down Dutch (Long) Valley. Waters were stored in Indian Creek Reservoir and released into Indian Creek for irrigation of the Smith and Springmeyer ranches downstream. Additionally, irrigation water was delivered to land in Diamond Valley directly from the C-Line Export Pipeline. However, in the early 1970’s the Lahontan Regional Water Quality Control Board objected to recycled water entering the Carson River and terminated the use of Indian Creek as a recycled water irrigation conveyance. This was the primary driver for the construction of the Diamond Ditch in 1972 to access lands along the West Fork of the Carson River. During the period from 1972 to 1983, recycled water was applied to lands on the Gansberg, Neddenriep, Bruns, and Hall (Ace Hereford) ranches.

### 1.2.3 1983-1988

In 1983 several changes were made to the Diamond Ditch Agreement. Most of the changes focused on the volume of water to be delivered and how that was divided among the ranching interests. Planning work done in the early 1980’s along with operational changes at the District’s treatment facility in South Lake Tahoe necessitated the construction of Harvey Place Reservoir to replace Indian Creek Reservoir as the recycled water storage facility. During this period several agreements were made regarding the construction of Harvey Place Reservoir, which was completed in 1989. To accompany the new storage reservoir the District also constructed the 380 acre Dressler On-Farm emergency disposal site located six ditch miles below Harvey Place Reservoir on the south portion of the Dressler property. Because water could be delivered to this land, the Diamond Ditch Agreement and the ranchers’ delivery contracts had to be modified to include the Dressler (currently Brooke) and Celio ranches.

### 1.2.4 1988-present

The District has supplied recycled water to six contract irrigators in Alpine County since 1988. These irrigators include the Gansberg, Neddenriep and Bruns ranches and the Bently (Ace Hereford Ranch), Celio and Brooke ranches located in Wade Valley. The Brooke ranch (also known as the West Fork Ranch) permitted acreage includes the District’s On-Farm recycled water emergency disposal site on a dry section of Wade Valley. The total permitted recycled water application area for the six ranches is 1,883 acres.

Beginning in 2003, the contract irrigators were required to provide 5 years notice if they wanted to terminate their agreement with the District to irrigate with recycled water. The District also has the ability to discontinue service to the irrigators with a 5-year notice. Since 2003, the agreements run for five year terms, but unless either party options out of the agreement, the contract irrigators are obligated recycled water from the District until 2028 when the current

agreements expire. Delivery volumes are not set by a measured or scientific determination, but rather by agreement dividing up water deliveries. An immediate action of the District should be to amend these agreements to reflect a volume of recycled water delivered based on the irrigated acreage, crop type, and soil conditions. It is recommended that Nutrient Management Plans be prepared, in accordance with the guidance provided by the State of California, for each of the contractor irrigators' ranch lands. Greater detail about the recycled water application rate can be found in Section 2.3.2 (page 2-13).

### 1.2.5 Issues Pertaining to Permits, Agreements and Regulations

The District should review existing permits and agreements to ensure successful management of its fresh and recycled water resources.

Under the Diamond Ditch Modification Agreement, the District guarantees to deliver on-demand a certain flow rate to the ranchers currently applying recycled water. An analysis of the Ditch capacity and integrity was conducted, with results presented in Appendix C.

Tentative wastewater reclamation requirement agreements between the Lahontan Regional Water Quality Control Board and contract irrigators require recycled water provided by the District to remain in California. However, the contract irrigators have an understanding with the Nevada Division of Environmental Protection allowing tailwater to cross the state line.

A summary of District permits, agreements and regulations can be found in Table 1.2 (Page 1-7). The District should take the following actions to resolve the aforementioned issues:

- Ensure that recycled water delivery volumes permitted by Lahontan Regional Water Quality Control Board-rancher agreements and by the Diamond Ditch Agreement and Modification Agreement can continue to be met.
- Work with the ranchers to maintain and/or establish optimized recycled water application on existing and future recycled water irrigated lands, as well as compliance with potential state regulations such as the Recycled Water Policy.
- Strive to meet interim and long-term targets of the Indian Creek Reservoir TMDL plan.
- Renegotiate rancher agreements and the Diamond Ditch Agreement which expire in the year 2028.

**Table 1.2: Recycled Water and Fresh Water Permits and Agreements**

| Agreement Name | Agreement Parties | Agreement Effective Dates | Agreement Summary Description | District Considerations or Issues |
|---|---|---|---|---|
| 1967 Agreement | Alpine County and District | 1967 to current (amended in 1972, 1983, 1984 and 1991) | District may import recycled water to Alpine County. | Last updated in 2002 and titled *Agreement Between South Tahoe Public Utility District and the County of Alpine and the Alpine County Water Agency.* |
| Harvey Place Reservoir Agreement (1983) | Alpine County and District | 1983 to 1 Oct 2022 | Construct Harvey Place Reservoir to store recycled water and preserve Indian Creek Reservoir for recreational use. | Amended the 1967 Agreement. The District is required to provide 15,000 pounds of fish annually to the Indian Creek Reservoir trout fishery. |
| Diamond Ditch Agreement (Superseded) | Alpine County Water Agency and Diamond Ditch Mutual Water Association | 7 Aug 1972 to 9 Aug 1989 | The agreement allocated up to 3,000 AF/Yr of recycled water resources stored in Indian Creek Reservoir to several ranches within the West Fork of the Carson River watershed. The agreement allowed the District to lease the Diamond Ditch System, which in turn allowed access for maintenance and operations of the system. | See Modification Agreement below. |
| Diamond Ditch Modification Agreement | Alpine County Water Agency, Diamond Ditch Mutual Water Association (DDA), Hall (now Ace Hereford), Bruns, Neddenriep and Gansberg | 1 Nov 1988 to 1 Nov 2028 | When Harvey Place Reservoir was constructed, the 1983 amendment was created to provide a min. 2,000 AF/Yr and max. 3,600 AF/Yr of recycled water to be divided equally among the ranchers. The DDA leases the system to the District, while the District has the right to install turnouts to irrigate lands of others not party to the agreement, provided each rancher still receives 25 cfs during the irrigation season. Ranchers can be released from the agreement, provided the remaining lands are sufficient for recycled water disposal under the agreement. If ranchers pull out of the agreement before 40 years is up, the District retains the right to maintain and operate structures on ranchers' lands to transmit recycled water to other lands not in the agreement. | The District guarantees to deliver on demand a certain flow rate to the ranchers currently applying recycled water. An analysis of the Ditch capacity and integrity was conducted, with results presented in Appendix C. |

| Agreement Name | Agreement Parties | Agreement Effective Dates | Agreement Summary Description | District Considerations or Issues |
|---|---|---|---|---|
| Davis-Grunsky Act Contract | District and California Department of Water Resources | 3 May 1972 to 1 Oct 2022 | State provided funds for constructing Indian Creek Reservoir with the agreement the District would construct, maintain and operate recreational facilities on the reservoir. | Contract calls for a minimum pool elevation of 5583 feet and maintenance of the trout fishery. District should implement the Hypolimnetic Oxygenation System. |
| Cooperative Agreement for Indian Creek Reservoir Recreational Facilities | United States Bureau of Land Management (BLM) and District | 13 Jun 1973 to 11 Nov 2024 | The BLM agreed to meet the District's obligations of the Davis-Grunsky Act Contract. The District agrees to maintain the Indian Creek Reservoir trout fishery. | |
| Alpine Decree Surface Water Rights to Support Indian Creek Reservoir | District and Nevada District Court | Most recent Order approved 16 Nov 1990 | Transfer surface water rights into storage in Indian Creek Reservoir to support the minimum pool elevation and enhance the cold water fishery. | November 1990 Order allows District to provide up to 555 AF/Yr for recreational use at Indian Creek Reservoir or water to be used for irrigation of appurtenant lands (such as the Schwake Ranch). |
| Indian Creek Reservoir TMDL | LRWQCB and District and other parties | 2003-Current | Established Total Maximum Daily Loads for pollutants of concern (such as Phosphorus) to improve water quality in Indian Creek Reservoir and Indian Creek. | Interim and long-term targets must be met by 2013 and 2024, respectively, as outlined in Table 1.1 (page 1-4). |
| Gansberg Agreement (Harvey pasture cattle grazing agreement) | District and Gansberg | 1986 to 1 Nov 2028 | Gansberg agrees to graze his cattle on a portion of Harvey Place lands. The District constructed a 75' pipeline from its export pipeline to the Harvey Place irrigation ditch; Gansberg agrees to maintain the ditch and use it to irrigate the land agreed upon for grazing. | Gansberg Agreement is tied to the Diamond Ditch Agreement, so both will need to be renegotiated with the Diamond Ditch Agreement term is up. |
| Dressler Agreement<br>i. Abdoo Modification<br>ii. Brooke Modification | District and Dressler Co. (and subsequently Abdoo, Aqueduct and Brooke) | 19 Jan 1984 to 1 Nov 2028 | Guarantees delivery of water from Harvey Place Reservoir to the lands of Dressler and delivery of flushing flows for Indian Creek Reservoir. The District constructed Upper Dressler Ditch to divert Indian Creek water to Indian Creek Reservoir to maintain its water quality. The District constructed an On-Farm irrigation system on Dressler land and committed a min. 800 AF/Yr, and max. 2,000 AF/Yr. This depends on transmitting recycled water through the lands of Hall, Celio, and perhaps Bruns. Dressler grants the District access for monitoring and construction, for monitoring wells and other infrastructure, and grants emergency discharge from Harvey Place Reservoir onto his lands. If the District terminates the agreement before its term is up, it must give Dressler access to all structures that affect his water rights. Dressler has the right to be released from the agreement for a portion of the lands if the remaining lands are sufficient for the committed application. | Scott Brooke acquired a portion of Dressler lands and constructed a connection from the District's lateral to his Far East Ditch to irrigate lands with recycled water rights (800-2,000 AF/Yr) he acquired as Dressler's successor. The recycled water contract will need to be renegotiated with Brooke in 2028.<br><br>Fresh water flushing flows for Indian Creek Reservoir will need to be renegotiated with the owners of Mud Lake. |

| Agreement Name | Agreement Parties | Agreement Effective Dates | Agreement Summary Description | District Considerations or Issues |
|---|---|---|---|---|
| Celio Agreement | District and Celio | 30 Aug 1983 to 2028 | The District agrees to provide a minimum 100 AF/Yr and max. 200 AF/Yr to Celio, in addition to any tailwater the ranch receives from Ace Hereford. Celio grants the District an easement for recycled water operations through the lands. | District should negotiate an extension of the easement for the Celio Agreement. |
| Tentative Wastewater Reclamation Requirements for Bruns Ranch Irrigation Site | Bruns and LRWQCB | 13 April 1989 to 2028* | Permits the ranch an annual average of 650 AF recycled water on 170 acres. Bruns actually receives ¼ of the recycled water remaining after the Celio and Dressler obligations are met. This is a function of how much recycled water the District's plant produces and could be less than 650 AF. | Freshwater supplied from West Fork of Carson River (Fredericksburg diversion). Tailwater extends to Gansberg and Neddenriep ranches. |
| Tentative Wastewater Reclamation Requirements for Gansberg Ranch Irrigation Site | Gansberg and LRWQCB | 13 April 1989 to 2028* | Permits the ranch an annual average of 650 AF recycled water on 505 acres. Gansberg actually receives ¼ of the recycled water remaining after the Celio and Dressler obligations are met. This is a function of how much recycled water the District's plant produces and could be less than 650 AF. | Freshwater supplied from West Fork of Carson River. Tailwater extends to Neddenriep ranch |
| Tentative Wastewater Reclamation Requirements for Neddenriep Ranch Irrigation Site | Neddenriep Partnership and LRWQCB | 13 April 1989 to 2028* | Permits the ranch an annual average of 650 AF recycled water on 458 acres. Neddenriep actually receives ¼ of the recycled water remaining after the Celio and Dressler obligations are met. This is a function of how much recycled water the District's plant produces and could be less than 650 AF. | Freshwater supplied from West Fork of Carson River. Tailwater extends to Gansberg Ranch and Nevada. |
| Tentative Wastewater Reclamation Requirements for Ace Hereford Ranch Irrigation Site | Bush (trustee for Hall) and LRWQCB | 13 April 1989 to 2028* | Permits the ranch an annual average of 650 AF recycled water on 250 acres. Hall actually receives ¼ of the recycled water remaining after the Celio and Dressler obligations are met. This is a function of how much recycled water the District's plant produces and could be less than 650 AF. | Tailwater extends to Celio and Brooke ranches. |
| Tentative Wastewater Reclamation Requirements for Celio Ranch Irrigation Site | Celio and LRWQCB | 13 April 1989 to 2028* | Permits the ranch an annual average of 200 AF recycled water on 100 acres. | Tailwater extends to Brooke ranch. Celio is actually irrigating 47 acres. |
| Tentative Wastewater Reclamation Requirements for Dressler On-Farm Irrigation System | Dressler and LRWQCB | 13 April 1989 to 2028* | Permits the ranch an annual average of 2,000 AF recycled water on 400 acres (800 AF plus a potential 1,200 AF for the On-Farm emergency disposal land). | Tailwater extends to On-Farm system. Current permitting exceeds the planning value 3.25 AF/Acre recycled water application rate. |

*This agreement can be modified/terminated by either party, given a 5-year notice.

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# Section 2: Study Area

## 2.1 Description and Boundaries

The District's fresh water and recycled water facilities are located in northeastern Alpine County on the eastern slope of the Sierra Nevada. Although all operations are within Alpine County, California, the closest urban areas are the towns Minden and Gardnerville located 20 miles north of Alpine County in Douglas County, Nevada. The South Tahoe Public Utility District service area is 25 miles away in El Dorado County, California.

The recycled water system begins at the District's wastewater treatment plant in South Lake Tahoe, where filtered secondary treated wastewater (recycled water) is pumped out of the Lake Tahoe basin along Hwy 89 over Luther Pass to Hwy 88 in Hope Valley then along the West Fork of the Carson River to Harvey Place Reservoir southeast of Woodfords, California. A map of the District's service area boundaries is presented in Figure 2.1 (at the end of Section 2). Recycled water from the reservoir is conveyed in the Diamond Ditch for the irrigation of ranchlands in Wade Valley and to the north along Hwy 88 to the Nevada border.

## 2.2 Land Use

The general land use patterns in Alpine County reflect the rural agricultural values of the people that first homesteaded much of the area. The County consists of largely government-owned lands, leaving a small portion of the County along the West Fork of the Carson River and Indian Creek and Diamond Valley as privately-owned agricultural lands. Due to elevation and climate, the majority of agriculture is limited to pasture grasses and some alfalfa crops. Few if any crops are grown for human consumption.

Even though there is a long-standing history of family ranching maintaining the rural community lifestyle, there is the possibility of land use change resulting from semi-rural development. A trend of large ranches subdividing into 5- to 20-acre parcels for home sites has been witnessed in the nearby Carson Valley and along the West Fork of the Carson River in Alpine County, California.

### 2.2.1 Existing Land Use

The existing land use patterns in the study area in Alpine County consist of a mix of low density rural residential and agricultural (open space and mixed rural residential zoning allowing 5 and 10 acre home sites). The area known as River Ranch Estates along the West Fork of the Carson River was once a working ranch but was subdivided and is no longer feasible to flood irrigate with recycled water due to the density of domestic wells and houses. Once the irrigation setbacks specified under Title 22 are applied, too little land is available for irrigation to warrant recycled water irrigation using conventional flood irrigation methods

Fortunately, the largest contiguous tracts of land available for recycled water application are supporting land uses that are consistent with the historic use and supportive of recycled water application. The lands adjacent to District owned lands in Diamond Valley include a mix of Forest Service (USFS), Bureau of Land Management (BLM), Bureau of Indian Affairs (BIA), and some Alpine County owned land. Lands permitted to receive recycled water and lands that may receive recycled water in the future are adjacent to several privately owned parcels, as well as USFS, BLM, BIA and Alpine County-owned land. These lands that irrigate, or have the potential to irrigate, with recycled water are subject to potential change of land use designation in the

future; however, this will not affect District operation as buffer zones compliant with regulatory requirements have been incorporated into the planning of application areas. It is the recycled water user, and not the District, that is ultimately responsible for the proper application of recycled water with respect to buffer zones and recycled water use warning signage.

To date several hundred acres of land have been removed from recycled water irrigation either because of proximity to a surface water of the State or because of rural development, similar to the River Ranch Estates area. The pattern of agricultural lands being converted to residential developments is a common trend in the neighboring Carson Valley, and is also occurring in northern Alpine County.

### 2.2.2 Areas of Current Development

New development in the south end of Carson Valley and northern end of Alpine County, close to the Nevada-California state line, is changing the land use patterns in areas that receive recycled water from Harvey Place Reservoir. Population density is increasing and awareness of recycled water issues and regulations is sometimes lacking with the new landowners. Presently, most of the change has occurred in the areas supplied by the Upper and Lower Fredericksburg ditches.

The recycled water application areas east of the Carson River are not as greatly impacted by development at this time. This area differs from the west side of the river because fields are much smaller and the irrigation systems are not as complex. This area includes the only recycled water sprinkler application in use in the District's operations area. This type of application practice has limited potential due to topographic constraints, but provides a better system of recycled water tailwater control and improved application efficiency.

### 2.2.3 Land Use Projections in 2028

Development of rural lands adjacent to or within recycled water application areas are likely to continue on a limited scale in Alpine County along Hwy 88. The ranchettes on Chambers Lane may fill in as homes are built on existing parcels. The population growth in Nevada will likely cause the subdivision of large ranches along the state line, complicating tailwater control and irrigation conveyance issues. Although the growth anticipated in Alpine County does not greatly impact the District's contracted application areas at this time, there is no mechanism currently employed for the protection of irrigated lands and the ensured continuance of application areas. Several of the existing application areas are transitioning from large contiguous ranches owned by one person into several smaller ranches owned by descendants of the original owner. This type of land division through inheritance threatens the continuity of application areas and complicates the management of the lands.

The District-acquired Diamond Valley Ranch land may also experience some land use changes over the next 20 years. Agricultural practices will most likely be maintained but livestock grazing may be reduced. The application of recycled water on the Diamond Valley Ranch may be necessary as the volume of recycled water increases and as application areas elsewhere in Alpine County are lost to development and urban encroachment.

## 2.3 Population

The population growth in Alpine County and South Lake Tahoe is an important trend to analyze in order to prepare an effective Master Plan. The South Lake Tahoe population will determine the rate of recycled water production change, thereby setting the annual volume of water available for irrigation. The Alpine County population change will require proper planning of

recycled water facilities and public education on the benefits of recycled water irrigation as well as the regulatory obligations and requirements relating to recycled water use. Growth in Alpine County and the potential for agricultural lands to be developed in response to this growth may impact the lands available for recycled water application.

### 2.3.1 Alpine County Population Trends

Alpine County has expended great effort in planning for, and maintaining, a rural lifestyle for its residents. The aesthetics, zoning, and value systems of the residents promote low density rural development. Lands available for development are zoned differently from the agricultural and District land holdings. The population of Alpine County is anticipated to increase in the next 20 years; however, the population densities on lands associated with District operations may be less than those in areas zoned as rural residential because of County-planned growth and zoning and the County's dedication to the preservation of open space.

### 2.3.2 Recycled Water Application Rates and Blending

Several factors influence the rate of applied irrigation water. Soils and crop type have the greatest influence on nutrient assimilation ability and groundwater protection assurance. Although these can be modified by the irrigator to some extent, the range of acceptable application rates is approximately 3.25 acre-feet per acre throughout the agricultural lands in Alpine County. The application rate of 3.25 acre-feet per acre was selected to best approximate the mean application rate in the region. This rate has been demonstrated to not impact groundwater quality at current recycled water strength (see Appendix J). The 3.25 acre-feet per acre recycled water application rate is an assumed value used for planning purposes in this Master Plan. The appropriate, site specific, recycled water application rate could be estimated in Nutrient Management Plans that may be required by the Recycled Water Policy currently being developed by the State of California.

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# Section 3: Existing Freshwater System

The District operates a freshwater system in addition to its recycled water system in Alpine County. The freshwater system is comprised of the remnants of the District's operation prior to the construction of Harvey Place Reservoir in 1988. The District supports the recreational and habitat quality of Indian Creek Reservoir. In order to sustain these objectives, the District operates and maintains freshwater conveyances for water from the West Fork of the Carson River and Indian Creek, as well as the Indian Creek Reservoir storage facility. The location of the freshwater infrastructure facilities are shown on Figure 3.1 (at the end of Section 3).

Facility descriptions, hydraulic capacities and pertinent hydrologic data can be found in Appendix C – Hydrology and Hydraulics Review.

## 3.1 Snowshoe Thompson No. 1 Ditch

Snowshoe Thompson No. 1 Ditch was constructed in the 1860's. This earthen ditch conveys Alpine Decree water rights from the West Fork of the Carson River to water righted lands in Diamond Valley. The upstream portion of the ditch is above and parallel to the Millich Ditch, with which the Snowshoe Thompson No. 1 Ditch shares a common diversion structure from the West Fork. This parallel upper reach has been prone to failure due to the unstable soils and steep hillsides. The capacity of this reach varies greatly and is a limiting factor in diverting the full water right entitlement to irrigated lands and to Indian Creek Reservoir. Projects proposed in this Master Plan address the stability and capacity of this approximately 2,000 foot long section of ditch. Future projects would allow the District to utilize existing alternate infrastructure to support the conveyance of freshwater to Indian Creek Reservoir. These projects are presented in Section 8 and discussed in Sections 9 through 12.

The Snowshoe Thompson No. 1 Ditch intercepts minor flows from Scott Creek to a junction box in which the District can direct the flows through a pipeline under Harvey Channel to a Parshall flume, prior to emptying into the Upper Dressler Ditch. The District can also direct flows to Harvey Channel or other irrigation ditches.

## 3.2 Indian Creek Diversion

Indian Creek was re-routed around the Harvey Pasture drainage during the construction of Harvey Place Reservoir. This was done to direct flood flow away from the recycled water storage facility. Winter flows in Indian Creek are used as flushing flows to improve the water quality of Indian Creek Reservoir, as water is diverted from Indian Creek into the Upper Dressler Ditch and is passed through the reservoir back to Indian Creek. This diversion has a capacity limitation at the diversion structure; however, little water exists in Indian Creek in a normal water year so capacity limitation of this diversion is not an operational obstacle. Diversions of water from Indian Creek to Indian Creek Reservoir can be measured with a flow recorder and a Parshall flume located in the Upper Dressler Ditch.

Winter flows obtained from Fred Dressler's Indian Creek water rights are used as flushing flows through Indian Creek Reservoir. Dressler's water rights apply to Indian Creek flows received between 1 October through 31 March when Indian Creek is predominantly dry. Indian Creek flows received between 1 April and 30 September, up to 555 acre-feet, are available for storage as part of the District's water rights acquired with the purchase of land for Harvey Place Reservoir (see Section 4, page 4-19).

## 3.3 Upper Dressler Ditch

The purpose of the Upper Dressler Ditch is to divert runoff water from the local Harvey Place watershed into Indian Creek Reservoir. The Ditch also serves as a means of delivering Indian Creek flushing water and makeup water from Indian Creek and the West Fork of the Carson River to Indian Creek Reservoir. The ditch runs as a contour canal along the 5,640-5,620 foot contour lines with a bed slope of 0.00150 ft/ft. The length of the open portion is 5,170 feet (a mixture of trapezoidal concrete sections and irregular earthen ditch sections). The earthen sections have very high transmission losses, making the conveyance efficiency of the ditch very poor. Actions to improve the conveyance efficiency and reduce the extensive annual maintenance requirements have been outlined in this Master Plan, as presented in Section 11 (page 11-81).

## 3.4 Indian Creek Reservoir

Indian Creek Reservoir is a 2,800 acre-foot freshwater storage reservoir constructed in 1967 for the storage of tertiary treated recycled water from the District's Wastewater Treatment Plant (WWTP). The reservoir was converted to freshwater in 1989, upon the completion of Harvey Place Reservoir. Indian Creek Reservoir operations mandate that the maximum storage pool is at 5,600 feet above sea level or 56 feet on the reservoir stage height gauge. The minimum pool is approximately 1,515 acre-feet at a gauge height of 45 feet. The District contract with Alpine County lists 45 feet as the minimum level the reservoir may reach in a normal year and 40 feet in dry years. In addition, the U.S. District Court Water Master requires the reservoir to be lowered to the 45 foot level by November 1$^{st}$ of each year. The District must pass through any water accumulated in Indian Creek Reservoir in excess of that necessary to maintain an elevation of 45 feet on the staff gauge corresponding to the storage of 1,515 acre-feet. This elevation ensures the Water Master that no seasonal carryover of water has occurred. Figure 3.2 (page 3-17) is the reservoir area and capacity curve for Indian Creek Reservoir. The reservoir volume is the bottom axis and the surface area in acres is the top axis.

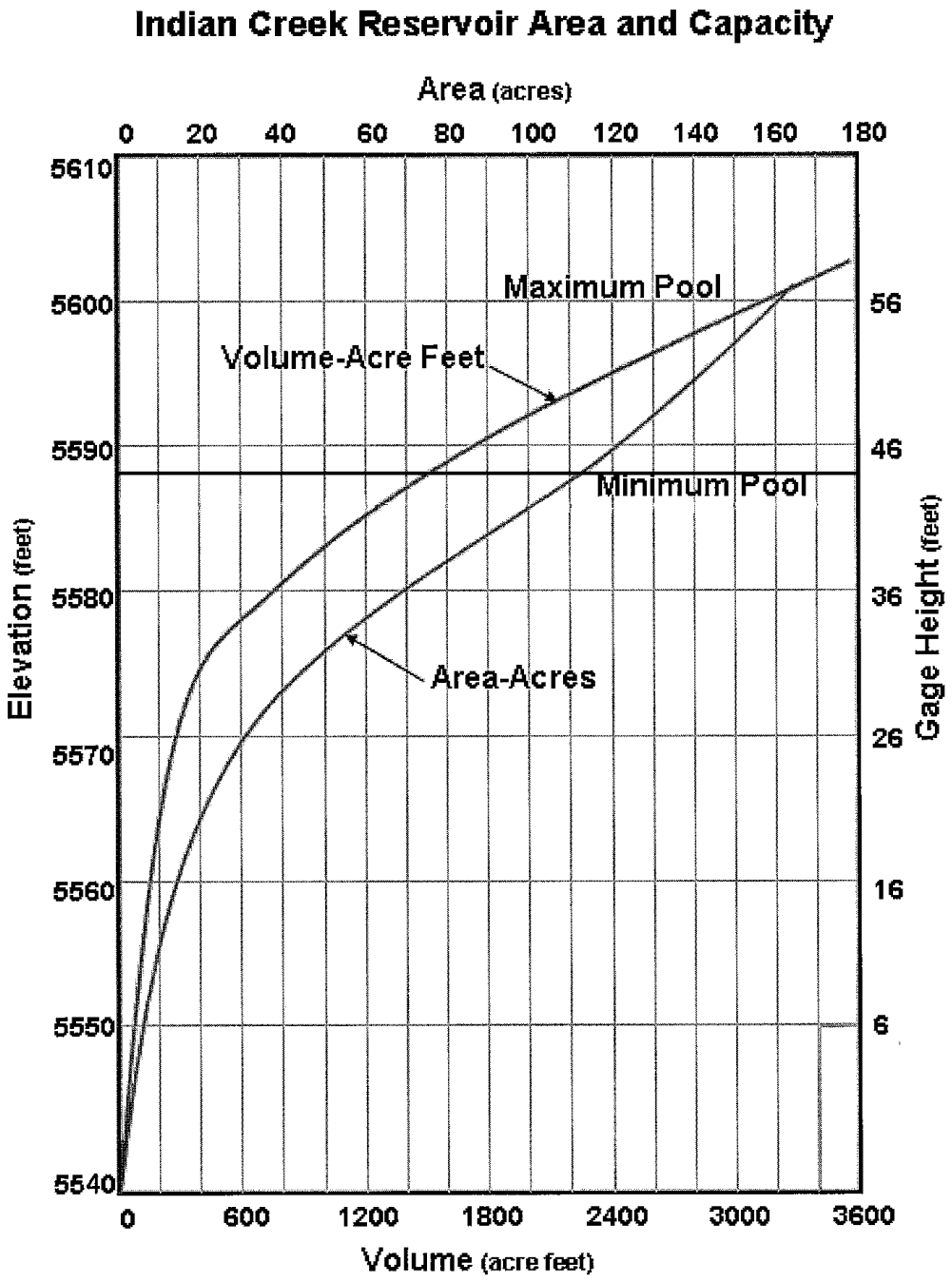


**Figure 3.2: Indian Creek Reservoir Storage Capacity Curve**

## 3.5 Alpine Decree Surface Water Rights to Support Indian Creek Reservoir

The District has transferred surface water rights from lands adjudicated under the Alpine Decree into storage in Indian Creek Reservoir to support the minimum pool elevation and enhance the cold water fishery habitat. Currently up to 555 acre-feet per year could be transferred to storage in the reservoir, although the actual number is somewhat less due to operational and capacity limitations in the Snowshoe Thompson No. 1 / Upper Dressler conveyance system. This volume offsets the water lost to evaporation and seepage. The use of the reservoir to seasonally store and convey freshwater rights to irrigated lands may increase in the future as water rights are made available for habitat support. The direct transfer of water to storage reduces the amount of water that can be diverted from the West Fork of the Carson River to the consumptive use of the water right. As land is needed for recycled water application on the water-righted portions of the Diamond Valley Ranch, the existing surface water right may be placed in storage in Indian Creek Reservoir. Appendix G – Water Rights, details the specifics of water-righted lands, volumes and uses.

## 3.6 Easements and Encroachment Permits for District Fresh Water Facilities

The District has either blanket or individual easements for its freshwater facilities, or has acquired, through condemnation or grant deed, the property upon which the facilities are constructed. In 1998, the District obtained from Garth McCormack permanent pipeline easements and an overflow easement for Snowshoe Thompson No. 1 Ditch. Pursuant to the Harvey Pasture Cattle Grazing Agreement (Gansberg Agreement), in which the District and Fred Gansberg entered an agreement concerning cattle grazing on District lands, Gansberg granted the District an easement for a diversion structure on Indian Creek. Technical Memorandum No. 8A discusses District easements and encroachment permits in greater detail.

It is recommended that the District conduct a full evaluation of easements to verify those the District has and those the District needs for all properties that are associated with either freshwater or recycled water. Any gaps that are identified should be addressed by securing an easement. Similarly, it is recommended the District identify the metes and bounds of Alpine County properties, associated with District operations, with GIS mapping to make sure the limits of ownership are properly defined.

# Section 4: Existing Recycled Water System

## 4.1 Recycled Water Facilities

The existing recycled water facilities for the District's operations include the South Lake Tahoe Wastewater Treatment Plant (WWTP), A, B and C-Line Export Pipelines, the Harvey Place Reservoir, the Diamond Ditch, contract irrigator application sites, and the On Farm emergency disposal site.

Each of these facilities is essential for the operation of the recycled water distribution system. The recycled water facilities capacity and condition assessment is provided in Appendix C - Hydrology and Hydraulics Review.

### 4.1.1 General System Description

The A-Line and B-Line export pipelines convey recycled water from the South Lake Tahoe WWTP to the top of Luther Pass. The C-Line extends from the top of Luther Pass to Harvey Place Reservoir located to the south of Diamond Valley in Alpine County (See Figure 4.1 at the end of Section 4). The Diamond Ditch carries recycled water from Harvey Place Reservoir to irrigated lands in Wade Valley and along Hwy 88 west of the West Fork of the Carson River. Several irrigation laterals distribute the recycled water throughout the application areas. Although the recycled water conveyance and application areas extend to the Nevada state line, the District responsibilities and facilities end at the two junction boxes across Chambers Lane on the west side of the river at the Paynesville Bridge. From the Paynesville Bridge all recycled water is the responsibility of the various land applicators.

#### 4.1.1.1 Harvey Place Reservoir

Harvey Place Reservoir, constructed in 1989, has an active storage capacity of approximately 3,800 acre-feet. The actual storage capacity of Harvey Place Reservoir is approximately 4,000 acre-feet, but 200 acre-feet lies below the outlet of the reservoir (CWC-HDR, 1988). The elevation of the primary spillway on Harvey Place Dam is approximately 5,563 feet above sea level, which corresponds to the maximum elevation water should rise to during normal operation. The District's normal operation is to fill the reservoir with recycled water from October 15 to April 1, without any discharge. After April 1, the District may begin drawing the reservoir to minimum pool before October 15 to allow for it to be filled again during the winter (CWC-HDR, 1988).

#### 4.1.1.2 Diamond Ditch System

The Diamond Ditch system begins at the outlet works of Harvey Place Reservoir. The Ditch runs parallel to the Harvey Place Reservoir access road then crosses under Diamond Valley Road and Indian Creek in a double-barrel inverted siphon. The inverted siphon is located in Diamond Valley just upstream of a short narrow canyon that connects Diamond Valley to Dutch Valley. The capacity of the Diamond Ditch and inverted siphon under Indian Creek, as reported in the District's Operation and Maintenance Manual, is 40 cfs (CWC-HDR, 1988); however, two choke points limit the capacity of the Diamond Ditch to approximately 20 cfs. One choke point is located at Bar Screen No. 3 near where Snowshoe Thompson No. 2 Ditch terminates at the Diamond Ditch, and the other choke point is located at Bar Screen No. 5 at the box where flow transitions from open channel to pipeline flow for the existing pipeline that leads to the

Paynesville Bridge. These choke points are addressed by a recommended project of the Master Plan, discussed in Section 9 (page 9-68).

From the inverted siphon under Indian Creek, a concrete lined trapezoidal channel continues approximately 1,800 feet from the outlet of the siphon southwest towards Wade Valley. As the channel crosses a saddle and enters Wade Valley it flows in a short rip-rap lined channel section and then into a steep unlined section for a total of approximately 1,170 feet. At the base of the steep unlined channel, the gradient flattens and recycled water is routed to a 36-inch HDPE pipeline approximately 1,080 feet long. The pipeline discharges to another concrete lined trapezoidal channel in Wade Valley that is approximately 5,313 feet long. From the end of the concrete lined channel, flow is routed in an unlined channel for a total length of approximately 8,000 feet. From the Snowshoe Thompson No. 2 Ditch diversion structure, the gradient increases and the ditch winds downhill to the Upper Celio/On-Farm Ditch diversion structure. At this diversion structure flow can either be routed northward toward Diamond Valley Road in the unlined Diamond Ditch North, or into a 30-inch reinforced concrete pipe that conveys flows into the unlined Celio/On-Farm Ditch system. Numerous irrigation turnout structures and side channel spillways exist along the bank of the north section of the Diamond Ditch in Wade Valley.

The Diamond Ditch system continues from Wade Valley in a northerly direction, paralleling the West Fork of the Carson River to the Paynesville Bridge, where it crosses the river through a 20-inch diameter steel pipe. The contract irrigators combine the Diamond Ditch flows (recycled water) with the Fredericksburg Ditch flows (freshwater), which continue in a northwesterly direction for approximately 5 miles irrigating the Bruns, Neddenriep, and Gansberg fields. Blending of recycled water and freshwater is performed by the contract irrigators in an effort to increase irrigation flows across their ranches. Blending increases the volume of recycled water from a regulatory perspective.

On the west side of the West Fork of the Carson River the District's control of the recycled water ends at the two concrete flow-control structures in the field across from Chambers Lane. On the east side of the West Fork, the District's control of the recycled water ends at the pipe inlet box for the pipeline leading down to Scott Brooke's ranch (see figure 4.1, at the end of Section 4).

#### 4.1.1.3 Dressler On-Farm System

In conjunction with the construction of Harvey Place Reservoir in 1988, the District built the On-Farm emergency disposal facility on lands north of Wade Valley. This 380-acre facility was designed to dispose of recycled water through miles of shallow infiltration ditches following the general contours of the land, each separated by a distance of approximately 200 feet. Several control structures with turnouts are used to control the placement of water. The On-Farm system is comprised of approximately 11.5 miles of unlined ditch, 2.6 miles of concrete-lined ditch, and 37 concrete turnout structures.

This system has been problematic since its development for a number of reasons. The most significant reason for the facility's inefficiency is the poor soil conditions present at the site. The entire area is underlain by a deep caliche hardpan that prohibits infiltration and promotes sheet flow runoff. The second reason the usefulness of the facility is limited is the extensive annual maintenance required to preserve the capacity of the infiltration ditches. The loose surface soils in the area are easily eroded into the infiltration ditches rendering them ineffective in an emergency event.

Both of these operational issues are compounded by the facility location being six ditch-miles below Harvey Place Reservoir. This means that all six miles of the Diamond Ditch and the On-

Farm lateral must be intact to utilize the facility. An investigation of the integrity, functionality and feasibility of the On-Farm facility was conducted. Based on location, soils characteristics, regulatory compliance, required maintenance and ease of use it was recommended that the District relocate their primary emergency disposal facility to the Diamond Valley Ranch in the form of a temporary storage facility.

### 4.1.2 Ditch System Condition Assessment

The recycled water distribution system has its limitations, including conveyance capacity restrictions along sections of the Diamond Ditch. Of particular importance is the erosion of sections of the Diamond Ditch in Wade Valley, as this poses a reliability and water quality concern. The annual maintenance associated with open ditches is costly and time consuming. Currently the District operates its Alpine County Facilities with three full time employees and several seasonal staff as work load demands.

Harvey Place Dam and Reservoir require little annual maintenance; however, the limited ability of the District to by-pass the reservoir limits the maintenance that can be performed on the pipeline under Harvey Place Reservoir that carries flow from Indian Creek Reservoir to Indian Creek. Maintenance requiring the draining of Harvey Place Reservoir is limited under existing operational practices.

The On-Farm emergency disposal site is a continued source of maintenance and reliability problems. The site is susceptible to localized erosion and “filling in” of infiltration ditches. This continual maintenance issue deems this area undesirable due to time and cost associated with maintenance on a facility that is marginally effective at best.

Maintenance is compounded by the rigid filling and release schedules of Harvey Place Reservoir, and the limited growing season at these elevations. A system of conveyance redundancy could provide for greater flexibility and management alternatives.

## 4.2 Recycled Water Irrigators

Alpine County ranchers and the District have benefited from the recycled water resource provided by the South Lake Tahoe Public Utility District. This section describes the current contract irrigators and future potential irrigators. A detailed assessment of the contract irrigators’ lands and their associated ranching practices can be found in Appendix D – Ranching Practices. The parties receiving recycled water have changed since recycled water was first provided to users in Alpine County in 1968. The data and ranch profiles provided in Appendix D are only applicable to current recycled water irrigators.

### 4.2.1 Current Users

The ability to use recycled water in Alpine County as a source of irrigation and nutrients for crops is a valuable commodity to local ranchers. The recycled water application system is located in a watershed that has very limited freshwater storage capacity. The lack of freshwater storage and the short seasonal runoff period makes the value of recycled water stored in Harvey Place Reservoir higher than in most areas because it can be used later in the irrigation season.

The South Tahoe Public Utility District currently has contracts with several local landowners for direct land application of recycled water from Harvey Place Reservoir. As per the modified August 29, 1972 Diamond Ditch Agreement between the District and the Diamond Ditch Mutual

Water Association, a minimum of 1,800 acre-feet and a maximum of 2,600 acre-feet annually must be delivered for irrigation between April and the end of October. The December 4, 1983 Diamond Ditch Modification Agreement changed the allocation to a minimum of 2,000 acre-feet and a maximum of 3,600 acre-feet delivered annually. Under the Diamond Ditch Agreement this flow must be divided equally among the partners of the agreement. Figure 4.2 (at the end of Section 4) depicts the current lands receiving recycled water.

Recycled water is applied directly to pasture crops in Wade Valley located to the east of the West Fork of the Carson River. The irrigation methods used are controlled flood irrigation, and center pivot sprinkler irrigation. West of the river, recycled water is blended by the contract irrigators with fresh water in the Fredericksburg system prior to application on permitted lands. The diversion of fresh water is through the Upper and Lower Fredericksburg Ditch off the West Fork of the Carson River.

Agriculture practices are confined to meadow and hay pastures with some alfalfa crops being grown. Cattle are pastured for at least part of the year on recycled water application areas. Portions of the pasturelands and alfalfa crops are cut for hay two or three times during the irrigation season. This requires the rotation of irrigation water to allow for the drying and bailing of the hay. Horses, sheep, and other domestic livestock grazing make up the balance of the agriculture uses. Each of the contract irrigator ranches has slightly different practices but all generally conform to this use pattern. The following descriptions of the contract ranches illustrate the similarities and diversity of the lands receiving recycled water.

Ranch ownership is expected to change as time goes on. A list of current ranch owners, provided by the District, is included at the end of Appendix D. This list should be updated with future Master Plan updates.

#### 4.2.1.1 Bruns Ranch

The Bruns ranch is flood irrigated by recycled water on 140 acres. This ranch has a total of 170 acres permitted for recycled water. The total amount of recycled water permitted to be supplied to the ranch under the Lahontan Regional Water Quality Control Board permit is 650 acre-feet. This volume of recycled water is substantially higher than the recommended application rate. Irrigation of this land also occurs as blended water, when freshwater from the Fredericksburg diversion on the West Fork is combined with recycled water from the Diamond Ditch. This practice produces tailwater that contains some recycled water. The permitted land is used for grazing by the owner's livestock.

Recycled water application areas on the Bruns ranch are served by the Upper and Lower Fredericksburg Ditches. The tailwater runoff from this area is collected and used on the Neddenriep and Gansberg ranches.

#### 4.2.1.2 Gansberg Ranch

The Gansberg ranch uses recycled water on 505 acres of permitted land. The total amount of recycled water permitted by Lahontan to be supplied to the ranch is 650 acre-feet. The cropland supports hay and alfalfa production. The owner's livestock also uses all pastures seasonally. The 505 acres of flood-irrigated crop land is served from the Upper Fredericksburg Ditch. Fresh water from the West Fork of the Carson River is mixed with the recycled water during a portion of the irrigation season.

#### 4.2.1.3 Neddenriep Ranch Partnership

The Neddenriep Ranch Partnership irrigates all of its land using recycled water, a total of 454 acres, although its Lahontan permit is written for 458 acres. This land is used for hay production and livestock grazing.

The Upper and Lower Fredericksburg Ditches serve the 458 acres of flood-irrigated property and fresh water is supplied from the West Fork of the Carson River.

#### 4.2.1.4 Bently (Ace Hereford Ranch)

This ranch is permitted under the Lahontan permit to use 650 acre-feet of recycled water on 250 acres of land. 130 acres is flood irrigated, while 60 acres uses a pivot irrigation system. The pastures are used primarily for livestock and some are leased to other parties.

Historically, this property was served by the Snowshoe Thompson No. 2 Ditch, which delivers water from the West Fork of the Carson River. This freshwater conveyance has been inoperable since the late 1990's and it is not expected to be put back in service. Without a freshwater conveyance of water rights this ranch and other lands in Wade Valley are entirely reliant on recycled water irrigation. The Ace Hereford Ranch receives recycled water directly from the Diamond Ditch. Tailwater runoff from the Ace Hereford ranch is permitted for use on the Celio Ranch.

#### 4.2.1.5 Celio Ranch

The Celio ranch is permitted under the Lahontan permit to use 200 acre-feet of recycled water on 100 acres. It only irrigates 47 acres. The irrigation is done primarily with flood irrigation, and uses primarily tailwater from the Ace Hereford ranch. The tail water from up gradient lands is adequate to irrigate all of the Celio land with primarily recycled water. The pastures are used mainly for grazing livestock. There are also 13 acres of irrigated wetlands on the property. Minimal freshwater irrigation application occurs as a normal irrigation practice. Currently the freshwater conveyance to Wade Valley is inoperable and is anticipated to remain so.

#### 4.2.1.6 Scott Brooke

The area is permitted under the Lahontan permit to use 800 to 2,000 acre-feet of recycled water on 400 acres. The total area that is flood irrigated with recycled water is 120 acres. The primary use of this land is for cattle grazing. Runoff from these fields can reach the Falke-Tillman Ditch and travel to property in Nevada. Brooke's permitted lands include the On-Farm, which is not irrigated as a regular practice. Lands irrigated on the Brooke Ranch have the potential to be irrigated by blending water from the Falke-Tillman Ditch.

The On-Farm Emergency Disposal site is located on this permitted land. Recycled water flows through the On-Farm Emergency Disposal site prior to its application on the Brookes' irrigated land.

Acreage and recycled water application data by ranch is presented in Section 13, (Page 13-89) Table 13.1 (Page 13-93).

## 4.3 Easements and Encroachment Permits for District Recycled Water Facilities

It appears that overall the District has either blanket or individual easements for most of its main facilities or has acquired, through condemnation or grant deed, the property upon which the facilities are constructed. However, there is some question about those documents that are unsigned and/or unrecorded included in the documents provided by the District as discussed in Technical Memorandum No. 8A. The District should have easements for all its facilities and any missing portions should be addressed.

It is recommended that the District take the following steps in order clarify the easement status and land status affecting its facilities.

1. Ask a title company to perform a search for all documents recorded with the District as either the Grantee or the Grantor and obtain copies of the recorded documents.

2. Obtain a preliminary title report on all acquired properties.

3. Research the Bureau of Land Management and Forest Service records for all rights of way granted to the District.

4. Determine what encroachment rights have been granted to the District within State highway rights of way.

5. Organize individual files for each facility easement or right of way and include a copy of the recorded document.

## 4.4 Future Potential Users

The District currently supplies all of its recycled water to the contact irrigator ranches. However, as the volume of recycled water increases over the next 20 years and the available irrigated lands potentially diminish due to possible development of lands currently irrigating with recycled water, additional users may be required to dispose of the annual production of the South Lake Tahoe WWTP. If currently irrigated lands are lost resulting in excess recycled water, the District should evaluate options not limited to keeping the water in Alpine County, but potentially using it elsewhere, including in Nevada. All lands receiving recycled water in Alpine County including potential future users should be based on the planning value application rate of 3.25 acre-feet per acre and it is recommended the District prohibit blending of fresh and recycled water. If water is to be blended the recycled water portion should be reduced so that the total application of recycled water does not exceed the assumed planning value 3.25 acre-feet per acre application rate or what is established through the preparation of Nutrient Management Plans.

### 4.4.1 Potential Alpine County Users

Currently 1,883 acres of land are permitted by the Lahontan Regional Water Quality Control Board to receive recycled water. Of the 1,883 permitted acres, roughly 77 percent (+/-1,455 acres) uses recycled water for irrigation purposes. Recycled water is not currently applied to the remaining 505 acres partially due to the lack of infrastructure to convey water to some areas, or because the permitted acreage is non-pasture/agricultural land. Portions of the permitted 505 acres on the Fredericksburg system, between the Fredericksburg Ditch and Fredericksburg Road and along the west side of the West Fork of the Carson River, have the potential to receive recycled water but additional infrastructure would need to be constructed.

Development in areas currently receiving recycled water may result in the loss of permitted land. Therefore, additional lands need to be permitted for the application of recycled water in Alpine County. There are approximately 1,100 acres west of Fredericksburg Road not currently in agricultural production that have the potential to receive recycled water with infrastructure modifications. However it is anticipated that some of this land could be earmarked for residential development due to location and property values.

### 4.4.2 Potential Nevada Users

Nevada irrigators downstream of Alpine County currently do not have access to sufficient volumes of water to divert to irrigation in an average or below average rain year. Because of this lack of reliable freshwater sources, Nevada irrigators perceive recycled water as a desirable commodity. Currently, the District's recycled water is not permitted for direct land application in Nevada. Permitting could be pursued through the Nevada Division of Environmental Protection for Nevada irrigators to receive recycled water from Harvey Place Reservoir. Currently only a secondary irrigator (tailwater) user agreement is in place to administer waters from the District's system entering Nevada. The irrigators in California and Nevada recognize the inherent value of the recycled water resource as a desirable commodity and are striving to maximize the usage and efficiency in applying this resource.

In order to provide users in Nevada with recycled water, improvements and modifications to the existing conveyance systems also need to be performed. New conveyance systems would also need to be constructed.

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# Section 5: Flow Projections - Recycled Water Quantity and Quality

## 5.1 Recycled Water Quantity

The District's Wastewater Treatment Plant (WWTP) treats wastewater from the South Lake Tahoe area of El Dorado County that is located south and east of Emerald Bay, including the City of South Lake Tahoe (reference Figure 2.1 at the end of Section 2).

The District treats wastewater from commercial properties, single-family residences, and multi-family residential dwellings for the purpose of this Master Plan. Only flow quantities since 1997 were deemed accurate because of errors in flow data before this time.

Figure 5.1 shows the daily average recycled water flows from May 1997 to January 2001. Data through 2006 are available as annual averages only and are not shown in the figure below, though these data were used in projecting future recycled water flows as discussed in the following sections.

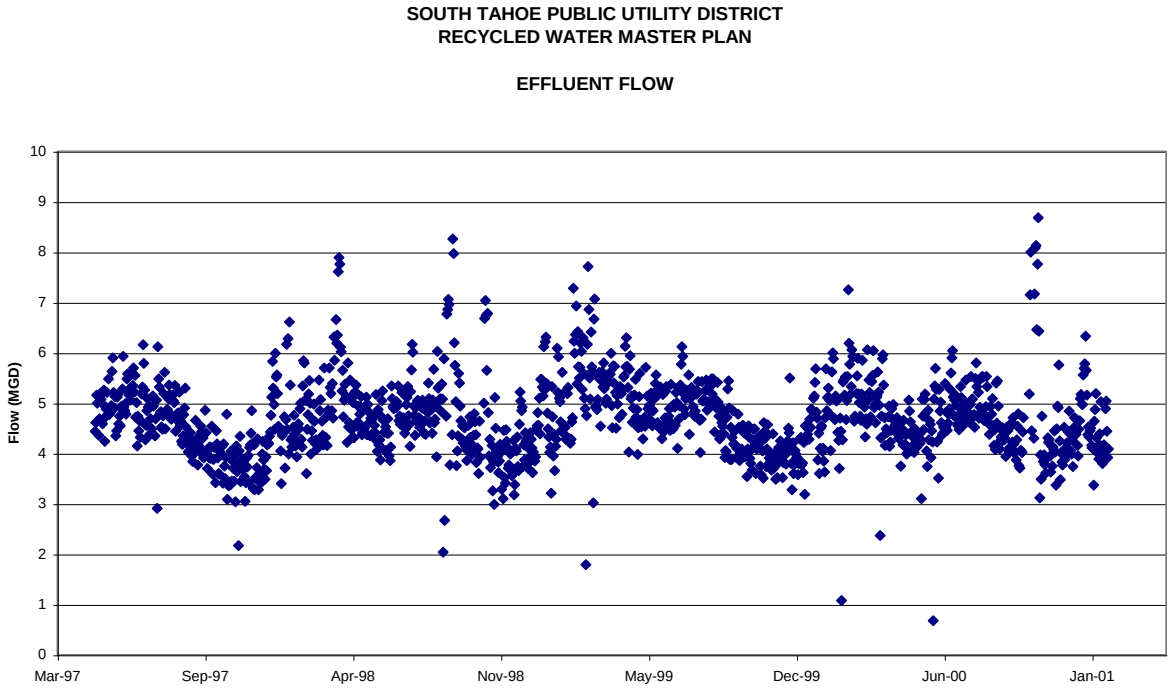


**Figure 5.1: Recycled Water Flow versus Time 1997-2001**

Natural variations in flow occur throughout the year. An analysis of the variation is necessary to determine a peaking factor, which is useful when determining recycled water direct land application needs. The 1998 and 1999 peak month occurred in early spring resulting from spring runoff and the associated inflow and infiltration. A second peak also occurs in the summer of

each year reflecting a large volume of visitors and tourists in the area at that time. The monthly peaking factor for both of these years was 1.17. The year 2000 showed a peak occurring in February with a second peak occurring in October. The peaking factor for this year is 1.2. For planning purposes, this factor will be used for estimating daily flow in the maximum month.

### 5.1.1 Recycled Water Quantity - Projected Flow

Three methods were used to estimate the volume and annual average daily flow rate of recycled water leaving the District's WWTP. The design flow for 2028 was determined to be 5.8 million gallons per day (MGD) by using the third method, based on a combination of current flow data and an increasing population trend.

#### 5.1.1.1 Recycled Water Flow Estimate Method 1

The first method of estimating recycled water flow quantity for the year 2028 uses recycled water flow data provided by the District WWTP, reference Table 5.0 (page 5-29) and Figure 5.1.1 (page 5-30). The WWTP data indicate a decreasing trend in total yearly recycled water volume from 1997 to the beginning of 2007. Applying a trendline to the data results in a projected 2028 daily flow of 2.04 MGD (R-squared value=0.6957). An R-squared value, or coefficient of determination, is an indicator between 0 and 1 that reveals how closely the estimated value for a trendline corresponds with the actual data. A trendline is most reliable when its R-squared value is near 1; therefore, the 2028 projected daily flow for this first method is somewhat reliable. It is unknown why the data set indicates a yearly decrease in average daily wastewater flow. It has been speculated that the South Lake Tahoe area is experiencing an increase in second or seasonal homes with a corresponding decrease in use. It is unknown whether this trend will continue; in fact, from the years 2004 to 2007, the recycled water volume has increased by an average of 35 million gallons per year.

**Table 5.0: Recycled Water Flow and Quality, 1997-2007.**

| | <---FLOW---> | | | | | | | | | | | Total | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total | Daily | COD | BOD | SS | NH3-N | NO3-N | Total-P | Cl | TDS | Turbidity | $Cl_2$ | Coliform | | TKN |
| Year | MG | MGD | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | NTU | mg/L | Total | Fecal | mg/L |
| | | | | | | | | | | | | | | | |
| 97 | 1,872.3 | 5.12 | 37.0 | 6.9 | 3.7 | 19.3 | 0.25 | 2.59 | 50.0 | 226 | 2.80 | 6.12 | 2.1 | 2.0 | 20.73 |
| 98 | 1,693.4 | 4.64 | 35.6 | 6.9 | 4.0 | 18.6 | 0.28 | 2.56 | 47.6 | 227 | 2.55 | 4.57 | 2.1 | 2.0 | 21.05 |
| 99 | 1,742.2 | 4.78 | 34.8 | 6.5 | 3.1 | 19.3 | 0.16 | 2.65 | 48.8 | 220 | 2.42 | 4.19 | 2.8 | 2.0 | 19.77 |
| 00 | 1,685.9 | 4.74 | 42.4 | 7.9 | 3.9 | 20.7 | 0.04 | 2.55 | 53.1 | 226 | 2.83 | 4.53 | 2.1 | 2.0 | 20.89 |
| 01 | 1,565.4 | 4.29 | 46.9 | 8.7 | 5.1 | 19.1 | 0.54 | 2.87 | 58.3 | 241 | 4.49 | 5.20 | 2.0 | 2.0 | 21.60 |
| 02 | 1,581.8 | 4.33 | 41.2 | 6.8 | 3.0 | 19.8 | 0.64 | 2.79 | 54.8 | 231 | 3.70 | 5.49 | 2.0 | 2.0 | 21.57 |
| 03 | 1,537.5 | 4.21 | 45.9 | 7.8 | 3.3 | 22.2 | 0.10 | 2.83 | 57.2 | 240 | 4.08 | 5.69 | 2.1 | 2.0 | 24.20 |
| 04 | 1,483.3 | 4.05 | 47.4 | 7.9 | 3.8 | 23.1 | 0.04 | 3.19 | 55.7 | 242 | 4.79 | 6.00 | 2.1 | 2.0 | 26.33 |
| 05 | 1,496.7 | 4.21 | 44.9 | 7.4 | 3.5 | 21.1 | 0.74 | 3.06 | 50.6 | 250 | 4.30 | 6.19 | 2.0 | 2.0 | 21.67 |
| 06 | 1,588.1 | 4.35 | 47.8 | 6.6 | 2.7 | 21.2 | 0.07 | 3.09 | 48.1 | 242 | 4.35 | 5.95 | 2.0 | 2.0 | 21.66 |
| | | | | | | | | | | | | | | | |
| Permit Max Concentration | | | 300 | 45 | 60 | | | | | | 20 | | 240[1] | | |
| Permit Ave Concentration | | | 60 | 30 | 30 | | | | | | 10 | | 23[2] | | |
| | | | | | | | | | | | | | | | |
| Maximum | 1,872.3 | 5.12 | 47.8 | 8.7 | 5.1 | 23.1 | 0.74 | 3.19 | 58.3 | 250 | 4.79 | 6.19 | 2.8 | 2.0 | 26.33 |
| Minimum | 1,483.3 | 4.05 | 34.8 | 6.5 | 2.7 | 18.6 | 0.04 | 2.55 | 47.6 | 220 | 2.42 | 4.19 | 2.0 | 2.0 | 19.77 |
| Average | 1,624.7 | 4.47 | 42.4 | 7.3 | 3.6 | 20.4 | 0.29 | 2.82 | 52.4 | 235 | 3.63 | 5.39 | 2.1 | 2.0 | 21.95 |
| No. Years | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |

Key

COD = Chemical oxygen demand: an indirect measure of organic compounds in wastewater, and an indication of wastewater strength.

BOD = Biochemical oxygen demand. BOD is a measure of how fast biological organisms use up oxygen in a body of water. Similar to COD, BOD is a measure of wastewater strength.

SS = Suspended solids: small solid particles that remain in suspension in water. A low SS concentration is important because the particles can serve as carriers of pollutants and pathogens.

$NH^3$-N = Nitrogen as ammonia. Ammonia is toxic to aquatic life. In its various forms, nitrogen can also deplete dissolved oxygen in receiving waters, stimulate aquatic plant growth and present a public health hazard.

$NO^3$-N = Nitrogen as nitrate. Nitrate is a primary contaminant in drinking water and high concentrations can result in oxygen starvation of human cells, resulting in a condition known as methemoglobinemia (Blue Baby Syndrome).

P = Phosphorus. Wastewater containing nitrogen and phosphorus can cause eutrophication, excessive growth of plant and/or algae blooms in water bodies.

Cl = Chloride, a measure of wastewater salinity. Irrigation with recycled water high in chloride concentration can cause the buildup of salts in the soil, impairing the growth of salt-sensitive crops.

TDS = Total dissolved solids: a measure of all inorganic and organic substances in wastewater (generally less than two microns in size). TDS is an indicator of salinity as well as an array of chemical contaminants.

$Cl_2$ = Chlorine. Residual chlorine in wastewater can be toxic to a wide variety of fish and aquatic life.

TKN = Total Kjeldahl Nitrogen (sum of organically-bound nitrogen; ammonia and ammonium in biological wastewater treatment).

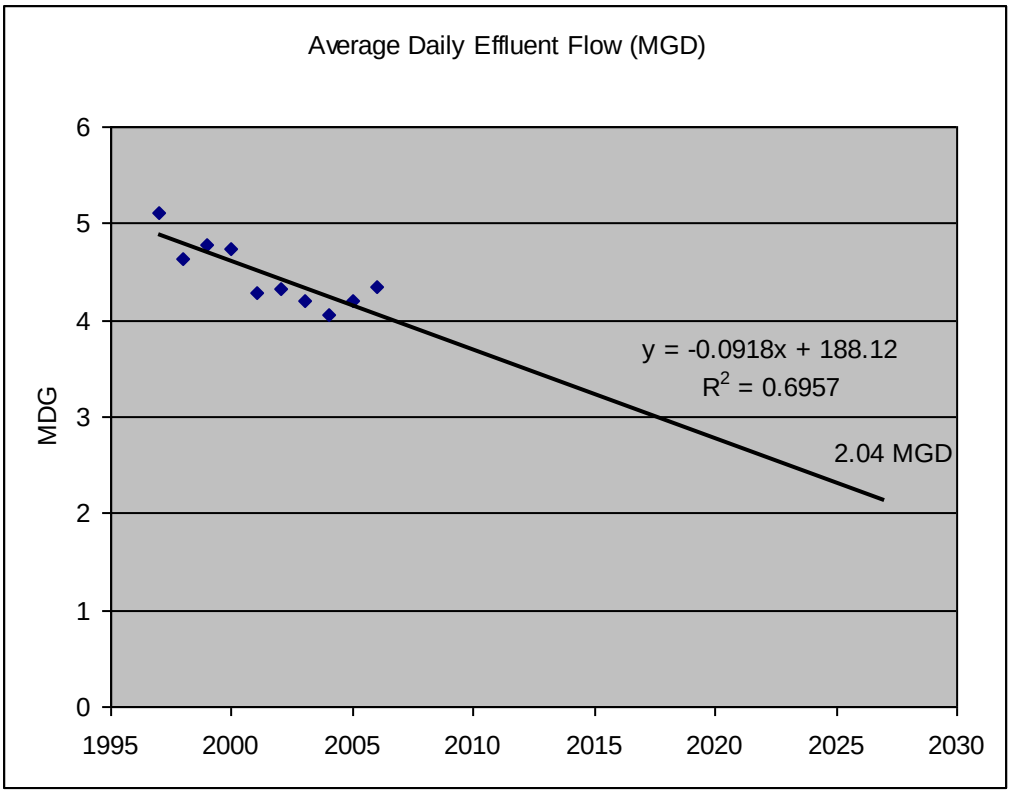


**Figure 5.1.1 Recycled Water Flow versus Time, 1997-2028**

#### 5.1.1.2 Recycled Water Flow Estimate Method 2

The second method for estimating the recycled water flow quantity for the year 2028 uses recycled water inflow and discharge from Harvey Place Reservoir data provided by the District; reference Table 5.1 (page 5-31) and Figure 5.1.2 (page 5-31). The District data indicate a decreasing trend in total yearly recycled water inflow and discharge from Harvey Place Reservoir from 1997 to the beginning of 2007. Applying a trendline to the data results in a projected 2028 inflow of 1838 acre-feet per year (AF/Yr) (R-squared value=0.7658) and a discharge of 1,668 AF/Yr (R-squared value=0.4162). The R-squared value for the trendlines was compared to determine which projected value was more reliable, with the projected inflow of 1,838 AF/Yr determined to be the more reliable value. It is believed that the value for amount of recycled water discharged from Harvey Place Reservoir is more variable than the inflow due to climatic fluctuations resulting in varying evapotranspiration rates as well as other geologic and environmental factors. The 2028 projected annual inflow of 1,838 AF/Yr equates to an average daily inflow of 1.64 MGD. Using the peaking factor previously determined of 1.2, the peak month in 2028 is projected to have a maximum flow of 1.97 MGD.

**Table 5.1: Harvey Place Reservoir Inflow and Discharge, 1997-2007.**

| Year | Amount of recycled water that entered Harvey Place Reservoir (AF/Yr) | Amount of recycled water that was discharged from Harvey Place Reservoir in (AF/Yr) |
|---|---|---|
| 1997 | 5721 | 5298 |
| 1998 | 5724 | 4660 |
| 1999 | 5290 | 4869 |
| 2000 | 5172 | 4367 |
| 2001 | 4803 | 4142 |
| 2002 | 4852 | 4127 |
| 2003 | 4718 | 4123 |
| 2004 | 4548 | 3716 |
| 2005 | 4590 | 3793 |
| 2006 | 4873 | 4738 |

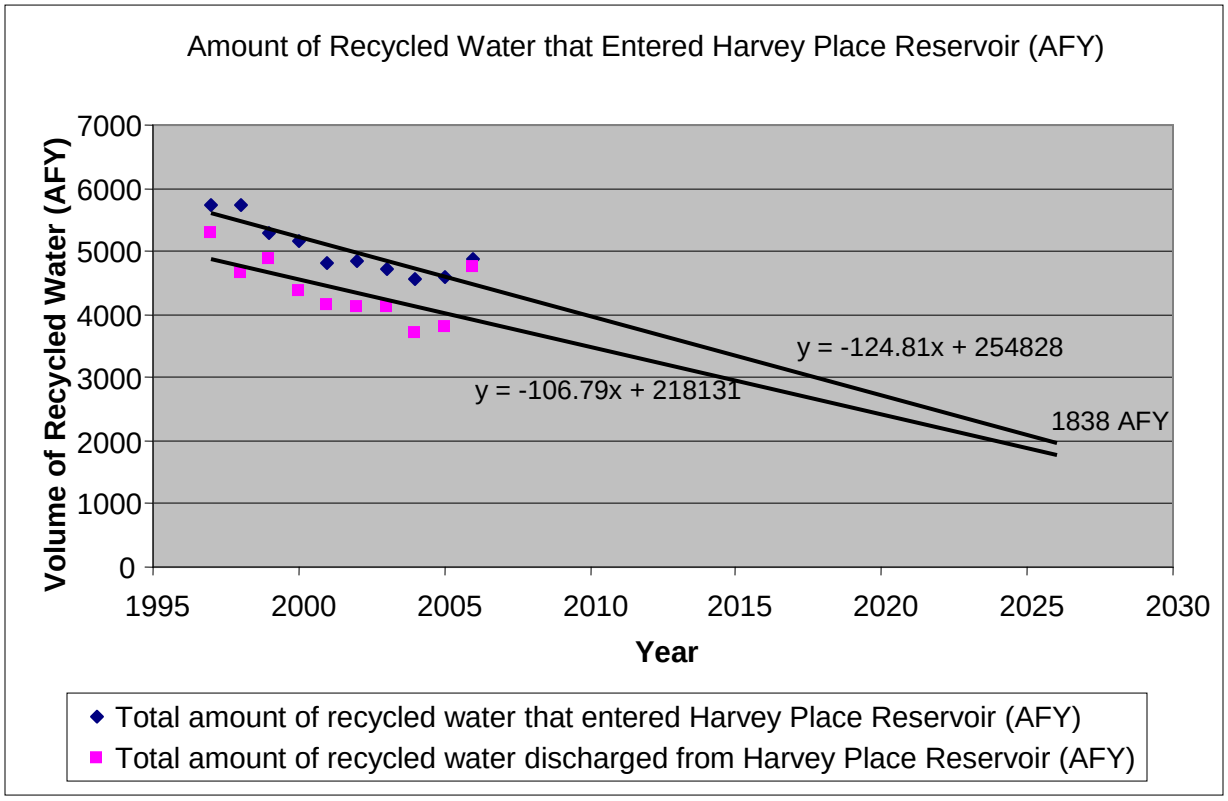


**Figure 5.1.2 Harvey Place Reservoir Inflow and Discharge versus Time, 1997-2028**

Based on the above District recorded data, it is assumed that future Harvey Place Reservoir outflow equals 90% of inflow.

The third method for estimating recycled water flow quantity for the year 2028 first estimates the population increase by the year 2007 and the year 2028 by utilizing residential unit allocation figures provided by the Tahoe Regional Planning Agency (TRPA). The population increase estimate is then adjusted for year-round residency and added to the year 2000 population as provided by the U.S. Census Bureau to estimate the year 2028 population. This method then

determines, using recycled water data provided by the WWTP, an average annual per capita flow in the year 2000. The assumption is made that the per capita flow for the year 2000 continues to the year 2028. The per capita recycled water flow is then multiplied by the estimated 2028 population to arrive at the 2028 estimated recycled water flow quantity.

The method of determining the population within District boundaries for the projection year 2028 uses the TRPA residential allocation limits along with the 2000 base population provided by the Census Bureau. The TRPA methodology used to determine a suitable parcel for building allows the criteria to change from year to year. The TRPA assigns an individual parcel evaluation system (IPES) score to each parcel (see Figure 2.1 at the end of Section 2). If the parcel has an IPES score above a certain threshold then a building permit can be obtained by the parcel owner. Currently the IPES score threshold is approximately 740; however, this number may vary. At the time of this writing (2008) the current number of parcels with a score above 740 is 2,363 of the total 3,450 undeveloped lots existing within the District service area boundary. The 2008 annual residential unit allocation limit for the District service area is 83 in El Dorado County and 35 in the City of South Lake Tahoe, totaling 118 residential units per year. This 118 unit limit is set to the year 2008, but for the purpose of this analysis, it is assumed to continue to the projection year 2028. This assumption was necessary due to the variability in available buildable lots from year to year. The TRPA unit allocation limit was 116 in the year 2003. Applying a typical value of 2.8 people/unit to the annual residential units results in a population growth projection of 325 people per year from 2000 to 2007 and 330 people per year from 2007 to 2028. These growth projections result in a population increase from the year 2000 of 2,275 by the year 2007 and a population increase of 8,885 by the year 2028. The 2028 population estimate increase of 8,885 is based upon year-round residency which is not true for all District users. An adjustment to the estimated population increase for the year 2028 is therefore necessary to account for only partial use by out-of-town users. The District database shows that in November 2005 only 45 percent of District customers had permanent addresses in South Lake Tahoe. A recent estimate by a local South Lake Tahoe marketing group estimated that only 35 percent of District customers were year-round residents. The more conservative 45 percent figure is used in this report for estimating purposes. It is assumed that out of town users would be present within the District for 3.5 months in the summer and 1.5 months in the winter for a total of 5 months of the year. The average full time residency population increase for use with estimating 2028 recycled water volume is 6,035 established as follows:

$$\frac{(8{,}885 \times 5) + (0.45 \times 8{,}885 \times 7)}{12} = 6{,}034.4 \text{ (say, } 6{,}035)$$

The average full time residency population increase is then added to the 2000 population of 27,868 to yield an estimated 2028 population of 33,900.

#### 5.1.1.3 Recycled Water Flow Estimate Method 3

The method used for estimating recycled water flow quantity in the year 2028 applies year 2000 recycled water flow per capita to the population estimation for the year 2028. The year 2000 was chosen because accurate flow data were obtained from the District WWTP and an accurate population value was supplied by the United States Census Bureau for this year. The year 2000 flow of 4.74 MGD from the South Tahoe WWTP and the 2000 Census population of 27,868 results in an average annual flow per capita of 170 gallons per capita per day (gal/cap/day). This high per capita flow reflects the tourist and commercial industry not accounted for in the population numbers. Assuming this per capita flow continues to the year 2028 and the

estimated 2028 population of 33,900 year round residents results in an estimated average annual 2028 flow of 5.8 MGD as follows:

170 gal/cap/day x 33,900 cap = 5.76 MGD (round to 5.8 MGD)

The 5.8 MGD estimated annual recycled water flow from the District's wastewater treatment facility equivalent to 6,498 AF/Yr is assumed to be the Harvey Place Reservoir daily inflow rate in the year 2028.

The population estimate and subsequent recycled water flow quantity developed above should be considered estimates only. Both the average annual flow per capita and the TRPA unit limit per year were assumed to remain constant from the present to the year 2028. Each of these factors can be expected to vary over time. The estimated recycled water flow quantity utilized in this Master Plan should therefore be assumed to be accurate within a 20 percent range of the value developed.

The recycled water flow for the year 2028 estimated by using Method 3 (based upon an increasing population trend) is larger than that developed using Method 1 or Method 2 (based on decreasing flow trends). It is believed that the decreasing flow data may be the result of a trend toward vacation homes and away from primary residences in the Lake Tahoe area. However, because population in the area is increasing, the more conservative value developed using method 3 with a 5.8 MGD average flow is utilized in this Master Plan.

**Table 5.2: WWTP Recycled Water Flow Method 3 Summary**

| Parameter | Year 2028 |
|---|---|
| Population | *33,900 |
| Annual Average Flow | 5.8 MGD |
| Maximum Month Flow | 7.0 MGD |

**Adjusted to account for year-round residents*

## 5.2 Recycled Water Quality

The District's WWTP is currently permitted for "secondary 23" recycled water. This means the water has been oxidized and disinfected so that the median concentration of total coliform bacteria does not exceed a Most Probable Number (MPN) of 23 per 100 milliliters (ml) and the single day maximum does not exceed a MPN of 240 per 100 ml in any 30 day period. This is explained further in the next section.

Secondary treated wastewater (recycled water) is pumped out of the Lake Tahoe basin into Alpine County. Recycled water is stored in Harvey Place Reservoir. Recycled water from the reservoir is used for agricultural reuse on several properties located between the reservoir and the State line.

### 5.2.1 WWTP Recycled Water Quality

Recycled water quality data from the South Tahoe WWTP from the past ten years was obtained. The following water quality parameters were examined for trends and used to project the recycled water quality for the year 2028.

- Biochemical Oxygen Demand (BOD)

- Total Kjeldahl Nitrogen (TKN)
- Nitrate as Nitrogen ($NO_3$-N)
- Suspended Solids (SS)
- Total Dissolved Solids (TDS)
- Chloride (Cl)
- Total Phosphorus (TP)

Figures 5.2.1(a-d) show the WWTP recycled water BOD, $NO_3$-N, TKN and TP concentrations, respectively, over the past ten years. Figures 5.2.1(e-g) show SS, TDS and Cl, respectively, over the past ten years.

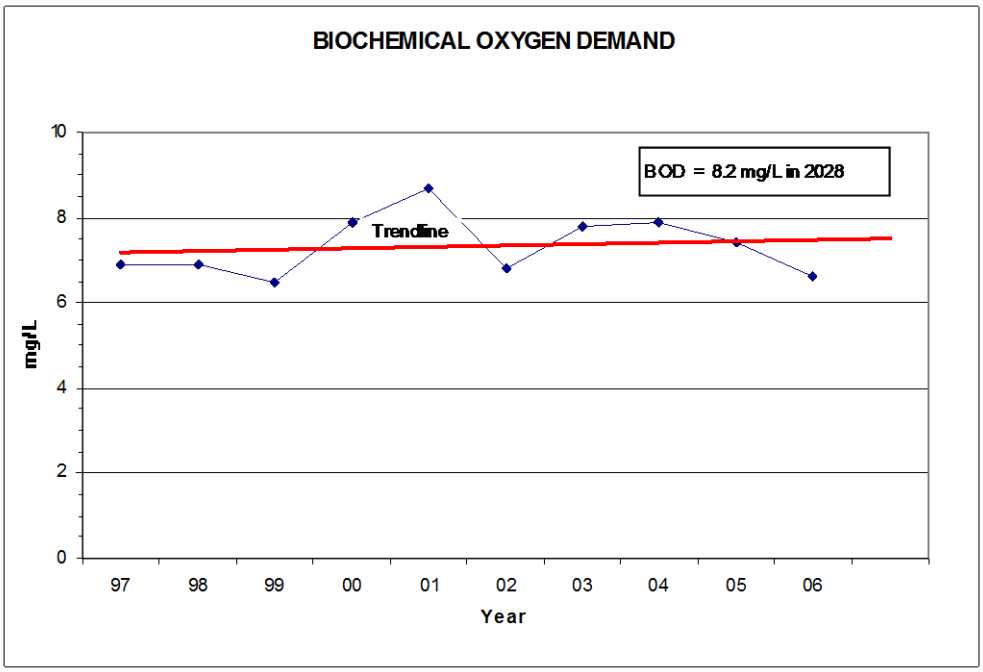


**Figure 5.2.1(a): BOD versus Time**

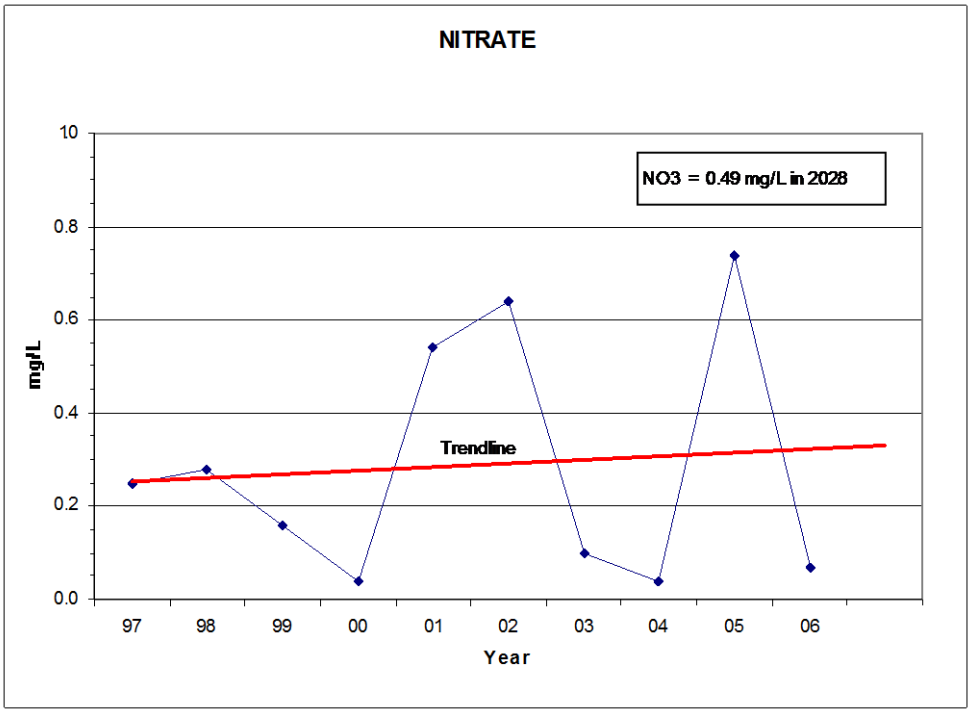


**Figure 5.2.1(b): $NO_3$-N versus Time**

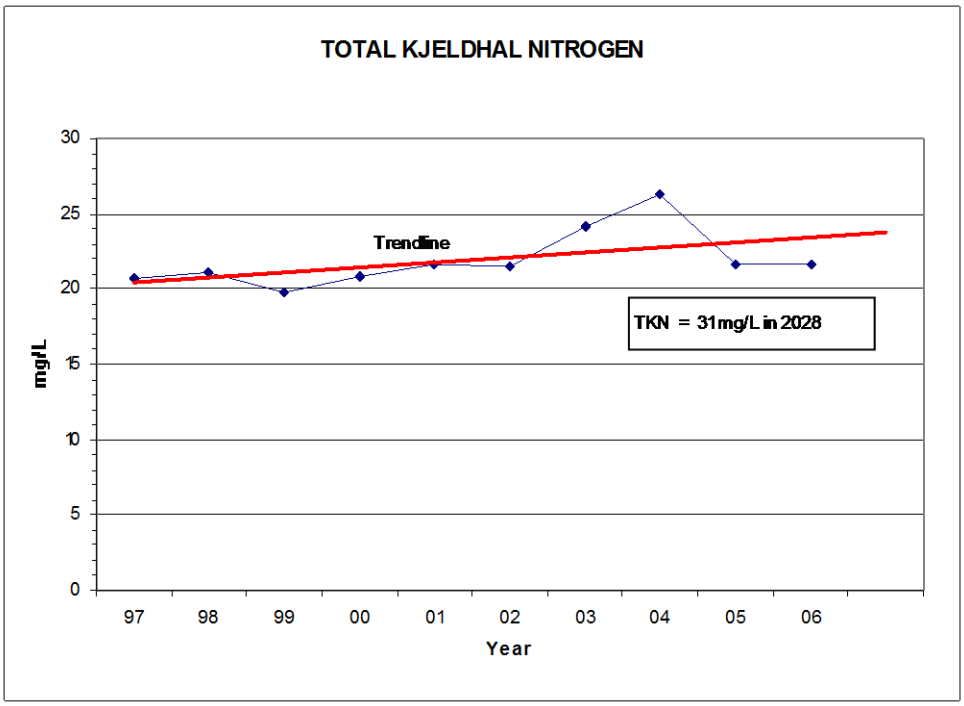


**Figure 5.2.1(c): Total Kjehldahl Nitrogen versus Time**

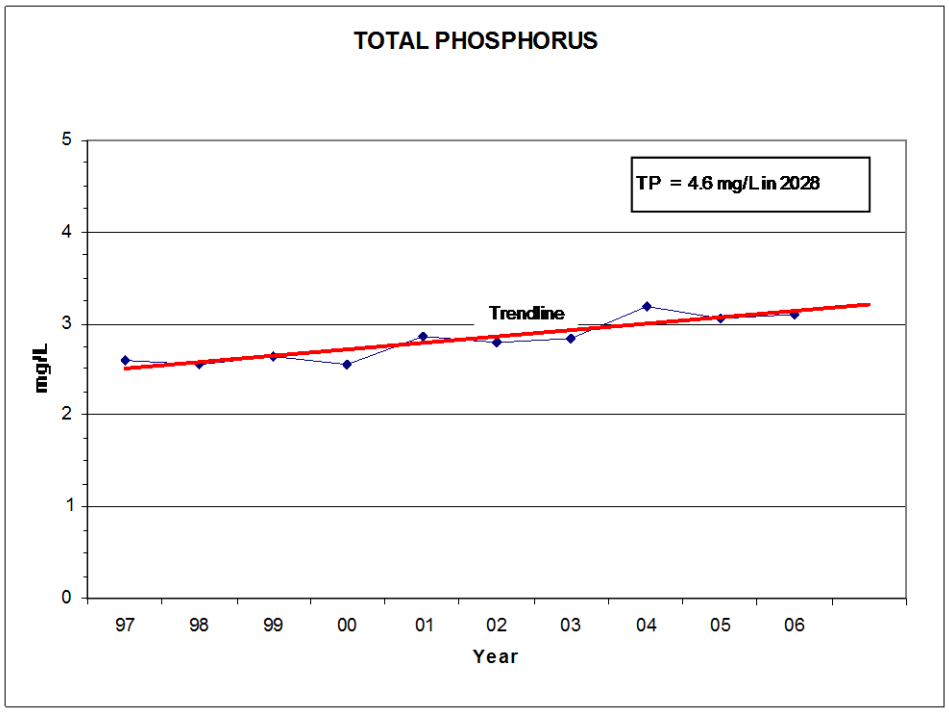


**Figure 5.2.1(d): Total Phosphorus versus Time**

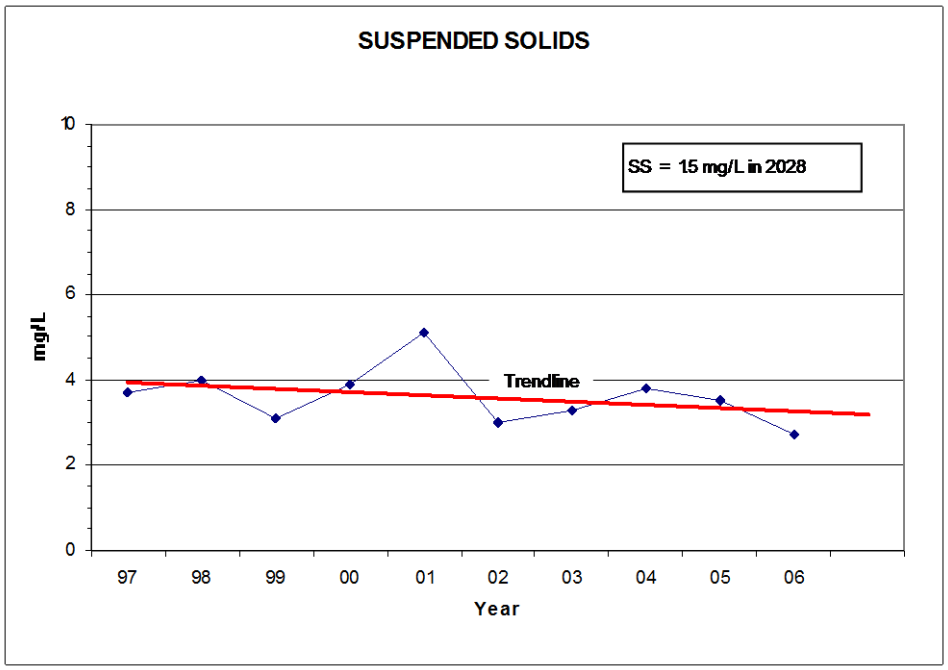


**Figure 5.2.1(e): Suspended Solids versus Time**

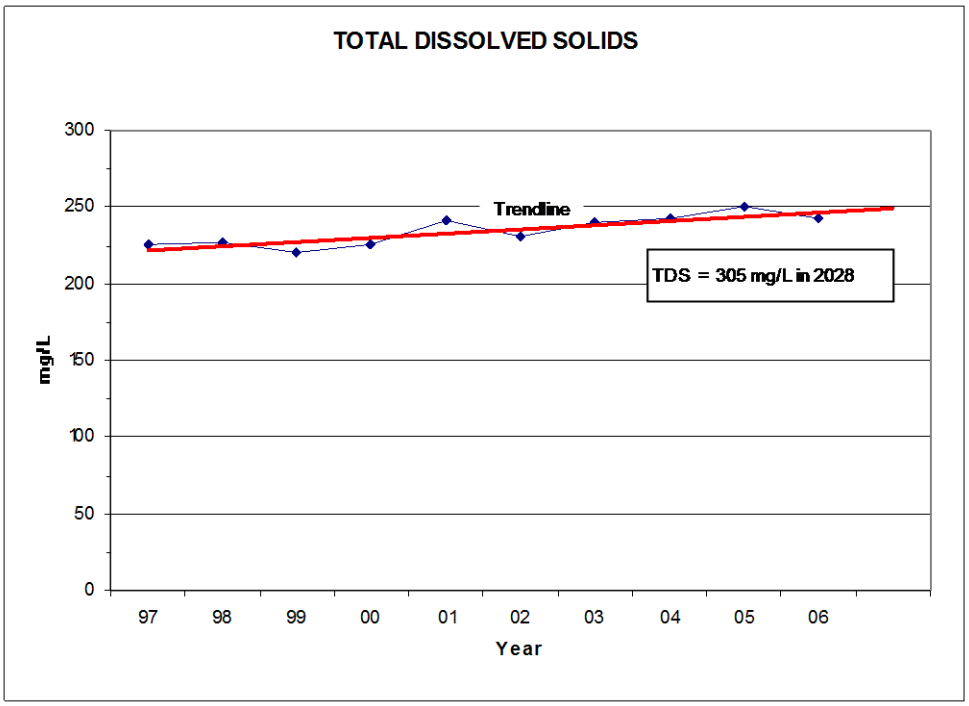


**Figure 5.2.1(f): Total Dissolved Solids versus Time**

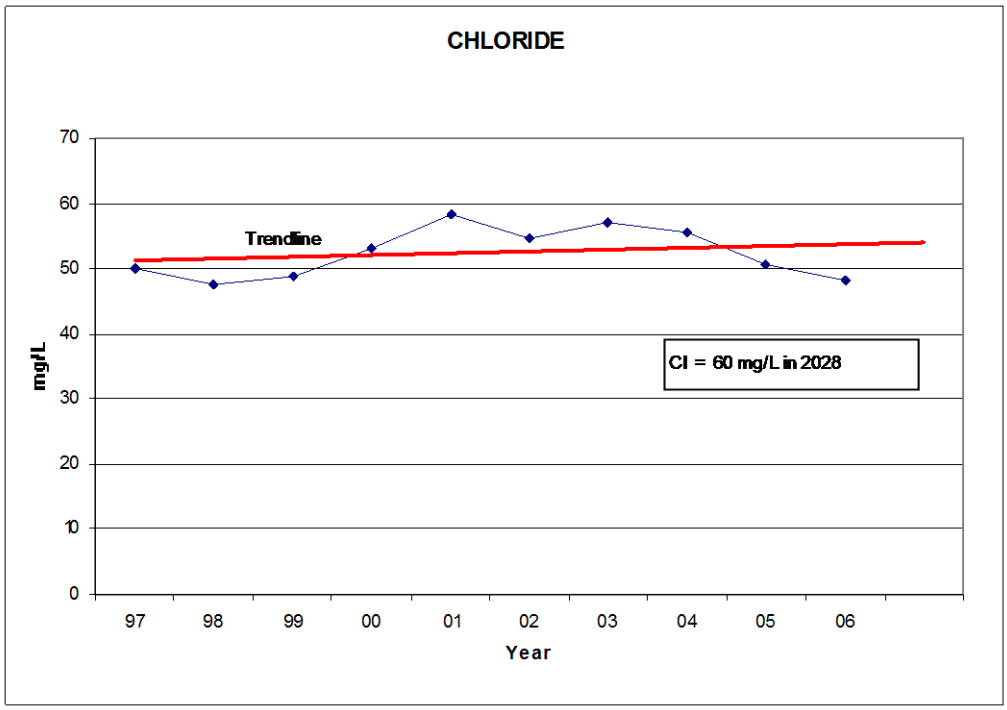


**Figure 5.2.1(g): Chloride versus Time**

### 5.2.2 Trend Analysis

The BOD, $NO_3$-N, TKN and TP concentrations show a slight increasing trend over the past ten years (Figures 5.2.1(a-d)). Using these trends to project future average recycled water concentrations gives a BOD concentration 8.2 mg/L, an $NO_3$-N concentration of 0.49 mg/L, a TKN concentration of 31 mg/L, and a TP concentration of 4.6 mg/L in the year 2028. At the projected 2028 flow of 5.8 MGD, these concentrations correspond with a BOD load of 397 lb/day, an $NO_3$-N load of 23.7 lb/day, a TKN load of 1,501 lb/day and a TP load of 223 lb/day. BOD, $NO_3$-N, TKN and TP are operationally controlled parameters and recycled water concentrations can be decreased when necessary by applying additional oxygen, bringing unused aeration basins on line, or modifying aeration basin operational parameters.

The SS concentration shows a slight decreasing trend over the last 10 years, while the TDS, and Cl concentrations show a slight increasing trend (Figure 5.2.1(e), 5.2.1(f), and 5.2.1(g)). Using these trends, an SS average recycled water concentration of 1.5 mg/L, a TDS average recycled water concentration of 305 mg/L, and a Cl average recycled water concentration of 60 mg/l in the year 2028 are projected. At the projected 2028 flow of 5.8 MGD, these concentrations correspond with a SS load of 73 lb/day, a TDS load of 14,764 lb/day, and a Cl load of 2,904 lb/day. These concentrations are not affected by additional biological treatment. Additionally, concentrations of TDS and Cl are expected to rise due to water conservation efforts.

Several data anomalies are evident in Figure 5.2.1 (b). No explanation is evident as to why the data anomalies exist. The trend line shown does include the anomaly data input.

### 5.2.3 Projected Water Quality

The projected water quality for the District's recycled water is summarized in Table 5.3. Appendix B contains the technical memorandum detailing these projections.

**Table 5.3: Existing and Projected Recycled Water Quantity and Quality**

| Parameter | Year 2028 | |
|---|---|---|
| Population | 33,900* | |
| Flow<br>Annual Average<br>Peak Month | <br>5.8 MGD<br>7.0 MGD | |
| BOD | 8.2 mg/L | 397 lb/day |
| TKN | 31 mg/L | 1,501 lb/day |
| NO3-N | 0.49 mg/L | 23.7 lb/day |
| SS | 1.5 mg/L | 73 lb/day |
| TDS | 305 mg/L | 14,764 lb/day |
| Chloride (Cl) | 60 mg/L | 2,904 lb/day |
| TP | 4.6 mg/L | 223 lb/day |

*Adjusted for year-round residents

Lands receiving recycled water may be either hydraulically limited rather or nutrient limited and preparation of Nutrient Management Plans should determine which is the case.

### 5.2.4 Groundwater Monitoring

The District has maintained a groundwater monitoring program in Alpine County with a total of 16 separate monitoring points including 9 groundwater monitoring wells installed in 1988 in response to a Lahontan Regional Water Quality Control Board order issued in 1984. The purpose of the groundwater monitoring program is to verify that the District's recycled water operations do not have a negative impact on the groundwater resources of Alpine County. The groundwater monitoring program is a requirement of the District's discharge permit issued by Lahontan Regional Water Quality Control Board. As of this writing the Alpine County Board of County Supervisors has contracted with the Alisto Engineering Group of Walnut Creek, California to conduct an evaluation of the District's groundwater monitoring program. The scope of work generally includes the following.

- Survey existing monitoring sites to establish consistent location and elevation data.
- Gather water table elevations on a quarterly basis to establish groundwater table contours.
- Evaluate the 16 existing groundwater monitoring sites to verify their suitability. Some of the locations are private wells that may not accurately measure shallow water table elevations while others may be negatively affected by private septic tank and leach field wastewater management and disposal systems.
- Evaluate groundwater table contours to develop recommendations for changes to the groundwater monitoring program to improve its effectiveness.

The evaluation intends to determine the effectiveness of the District's groundwater monitoring program and recommend additional groundwork monitoring well sites. A final report of the evaluation is scheduled for completion in November, 2008. The findings of the study may be used to modify the groundwater monitoring program of the District's discharge permit with the Lahontan Regional Water Quality Control Board.

The additional well sites will most likely include additional monitoring wells on the Diamond Valley Ranch property. It is anticipated the installation of the additional groundwater monitoring wells will occur in late 2008 and early 2009.

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# Section 6: Recycled Water Quality Regulation

## 6.1 Introduction

In order to comply with the EPA's Water Quality Criteria and Standards Plan (EPA Plan), the Recycled Water Master Plan strategies include improving and expanding the transport, storage, and use of recycled water, as well as improving the ability to transport fresh water to Indian Creek Reservoir. Appendix A (Technical Memorandum 1 – Environmental Regulations and Permitting) contains detailed information on the EPA plan and comprehensive regulatory and permitting information.

The following agencies have jurisdiction over the use of recycled water in the States of California and Nevada:

> ***The Alpine County Board of County Commissioners*** has the authority to review all actions for conformance with local laws, ordinances, and zoning regulations.
>
> ***The Lahontan Regional Water Quality Control Board )*** has regulatory authority to enforce the requirements of the Clean Water Act and the California Water Code. This includes the regulatory authority to enforce the implementation of TMDLs and the adoption of waste discharge requirements to ensure compliance with water quality standards. The Board has authority to implement the requirements of Title 22 of the California Code of Regulations governing the use of recycled water in California.
>
> ***The Nevada Division of Water Resources (NDWR)*** has the authority to permit the use of any water within the State including the use of wastewater recycled water. Any person who desires to appropriate public water in the State needs, prior to performing any work, to make application to the State Engineer to change the place of diversion or change in manner or place of use. NDWR also administers permits for the conservation of water resources and for the quantities and manner of use of the various water resources, including the use of recycled water. The role of the NDWR in regulating the reuse of recycled water is to set maximum quantities of recycled water which may be used for specific purposes as part of the State's water conservation efforts.
>
> ***The Nevada Division of Environmental Protection (NDEP)*** administers programs designed to protect and enhance the environment of the State including public health and enjoyment, the propagation and protection of terrestrial and aquatic life, the operation of existing industries, the operation of public water and wastewater systems, agricultural, recreational and other activities. The NDEP issues permits that limit the amount of pollutants that can be discharged to the waters of the State. In addition, NDEP assesses, monitors, and issues permits for the discharge and reuse of recycled water from wastewater treatment facilities.

Federal agencies with review and/or permitting authority for portions of the Master Plan that encroach on or impact Federal lands are:

> ***The U.S. Bureau of Land Management (BLM)*** manages some of the land where conveyance ditch improvements would occur. The BLM is responsible for reviewing any proposed construction activity that may involve lands under their jurisdiction.

***The U.S. Forest Service (USFS)*** manages the remaining Federal lands within the Master Plan area that are not under the control of the BLM. They are responsible for reviewing any proposed construction or planning activity for conformity with the Forest Plan.

There are recent changes in key Federal regulatory programs that have to be considered with any of the elements of the Master Plan.

In July 2000 the United States Environmental Protection Agency issued a final rule revising the current regulatory requirements for establishing TMDLs under the Clean Water Act. The final rule implements an enhanced approach to water quality planning, assessing and permitting TMDLs, and regulatory requirements. The new rules applied to the Lahontan Regional Water Quality Control Board's final TMDL for Indian Creek Reservoir and Indian Creek established in 2002, as outlined in Table 1.1 (Page 1-4). Any water reuse programs need to be evaluated under the new rule to ensure the ability to meet the regulatory requirements.

## 6.2 California Regulation

California requirements for production, discharge, distribution, and use of reclaimed (recycled) water are contained in the California Water Code, Division 7 – Water Quality, Sections 1300 through 14076 (Water Code); the California Administrative Code, Title 22 – Social Security, Division 4 – Environmental Health, Chapter 3 – Reclamation Criteria, Sections 60301 through 60475 (Title 22); and the California Administrative Code, Title 17 – Public Health, Chapter 5, Subchapter 1, Group 4 – Drinking Water Supplies, Sections 7583 through 7630 (Title 17). In addition, guidelines for production, distribution, and use of recycled water have been prepared or endorsed by State agencies administering the reclaimed (recycled) water regulations.

In an effort to consistently apply state statutes and regulations regarding water recycling and quality, The State Water Resources Control Board has developed a draft Recycled Water Policy to provide direction to the Regional Water Boards to ensure consistent interpretations of state regulations with respect to water recycling projects. The proposed Recycled Water Policy addresses requirements for implementation plans for recycled water irrigation projects, reduction of salts, groundwater recharge reuse projects, liability, and procedures for conflict resolution. The policy does not address recycled water impoundments, tailwater, or aquifer storage and recovery projects that do not use recycled water.

### 6.2.1 Water Code

The Water Code contains requirements for the production, discharge, and use of reclaimed, or recycled, water. The Porter-Cologne Water Quality Control Act is contained in Division 7 of the Water Code. It established the State Water Resources Control Board (SWRCB) as the State agency with primary responsibility for the coordination and control of water quality, water pollution, and water rights (Division 7, Chapter 1).

Nine Regional Water Quality Control Boards (RWQCB) were established to represent the SWRCB regionally and carry out the enforcement of water quality and pollution control measures (Division 7, Chapter 4). Also, each RWQCB was required to formulate and adopt water quality control plans and establish requirements for waste discharge to waters of the State.

Water reclamation (Division 7, Chapter 7) was included in the Porter-Cologne Water Quality Control Act in 1969. Subsequent amendments required the California Department of Health

Services (DHS) to establish water reclamation criteria, and gave the RWQCB the responsibility of prescribing specific water reclamation requirements for water which is used or proposed to be used as recycled water. It also provided for the regulation of injection of waste into the ground, and required the use of recycled water, if available, rather than potable water for irrigation of greenbelt areas.

In 1980, focus on the ownership of treated wastewater was addressed in the Water Code. Amendments required that the owner of a wastewater treatment plant obtain approval from the SWRCB prior to making any changes in the point of discharge, place of use, or purpose of use of treated wastewater.

### 6.2.2 Title 22

In 1975, Title 22 was prepared by the California Department of Health Services (DHS) in accordance with the requirements of Division 7, Chapter 7 of the Water Code. In 1978, Title 22 was revised to conform with the 1977 amendment to the Federal Clean Water Act. The requirements of Title 22, as revised in 1978 and again in 1990, regulate production and use of recycled water in California today.

Title 22 established four categories of wastewater treatment effluent (recycled water):

**Un-disinfected Secondary Water** – oxidized wastewater

**Disinfected Secondary 23** – Water that has been oxidized and disinfected so that the median concentration of total coliform bacteria does not exceed a Most Probable Number (MPN) of 23 per 100 milliliters (ml) and the single day maximum does not exceed a MPN of 240 per 100 ml in any 30 day period.

**Disinfected Secondary 2.2** – same as secondary 23 except the median MPN must be below 2.2 and the single day maximum below 23.

**Disinfected Tertiary Water** – Filtered and disinfected wastewater that has either been disinfected with a C x t [disinfection concentration (mg/l) multiplied by contact time (minutes)] value of at least 450 and a minimum contact time of 90 minutes or removal of 99.999 percent (5-log) of f-specific bacteriophage MS2, or polio, and median concentration of total coliform MPN of 2.2 or less and a maximum single day total coliform MPN less than 23.

The District's wastewater treatment plant is currently permitted as secondary 23 recycled water. The plant, however, has consistently met the secondary 2.2 criteria for the past several years.

Title 22 requires the following control measures when irrigating with Secondary 23 recycled water:

- Cross Connection Control – No physical connection may exist between pipes carrying recycled water and the potable water system. Where recycled water is piped to the reuse area a cross connection control plan is necessary to ensure the safety of the potable water system. No hose bibs may be used on pipes carrying recycled water except the quick-connect type to prevent contamination of normal garden hoses.

- Domestic Well Setback – No storage of, or irrigation with, disinfected secondary 23 recycled water shall occur within 100 ft of a domestic well. Repermitting to secondary 2.2 water does not change the setback requirement.

- Residence Setback – No spray irrigation is allowed within 100 ft of a residence or place where public exposure could be similar to that of a park or playground for secondary 23 and secondary 2.2 water.

- Runoff – Irrigation runoff shall be confined to the recycled water use area unless otherwise authorized by the regulatory agency.

- Drinking Water – Drinking water fountains must be protected against contact with recycled water spray, mist or runoff.

### 6.2.3 Title 17

Title 17 regulates one aspect of the distribution of recycled water. The focus of Title 17 is protection of drinking water supplies through control of cross-connections with potential contaminants. Examples of potential contaminants to potable water supplies are sewage; non-potable water supplies such as recycled water, irrigation water, and auxiliary water supplies; fire protection systems; and hazardous substances.

Table 1 of Title 17, Group 4, Article 2 – Protection of Water System, specifies the minimum backflow protection required on the potable water system for situations in which there is potential for contamination to the potable water supply. Recycled water is addressed as follows:

- An air-gap separation is required on "Premises where the public water system is used to supplement the reclaimed water supply."

- An air-gap separation is required on "Premises where reclaimed water is used and there is no interconnection with the potable water system. A reduced pressure principle backflow prevention device may be provided in lieu of an [air gap] if approved by the health agency and water supplier."

An air-gap separation is defined as "a physical break between the supply line and a receiving vessel." A reduced pressure principle backflow prevention device is defined as " a backflow preventer incorporating not less than two check valves, an automatically operated differential relief valve located between the two check valves, a tightly closing shut-off valve on each side of the check valve assembly, and equipped with necessary test cocks for testing."

## 6.3 Nevada Regulation

Due to the proximity of the recycled water use area in Alpine County to the California-Nevada state line, the potential exists for the District to transport water into Nevada for crop or pasture irrigation. Nevada's laws concerning recycled water use are substantially similar in intent to California's, but are more rigid in their structure and end-user requirements.

### 6.3.1 Nevada Division of Environmental Protection

The Nevada Division of Environmental Protection (NDEP), Bureau of Water Pollution Control, governs recycled water reuse in Nevada. The Nevada Revised Statutes, Chapter 445A, contains requirements for the use of reclaimed, or recycled, water. Chapter 445A.275 cites:

> "A person using treated effluent for irrigation by flooding or sprinklers shall use effluent that has received at least secondary treatment. As used in this subsection:

'Secondary treatment' means the biological oxidation of the sewage to a point where the sewage has a 5-day inhibited biochemical oxygen demand concentration of 30 mg/l or less.

'Five-day inhibited biochemical oxygen demand' means the amount of dissolved oxygen in mg/l required during stabilization of the carbonaceous decomposable organic matter by aerobic bacterial action at 20 degrees centigrade for 5 days."

The level of total coliform in the recycled water determines the purposes for which it can be used as well as the buffer zone around the use area. Also, the total amount of nitrogen and the amount of each species (ammonia, nitrate, organic) are considered when determining the suitability of recycled water for a given purpose.

The required coliform levels and buffer zones for the four classifications are shown in Table 6.1. In addition to compliance with these regulations, NDEP requires an Effluent Management Plan be submitted by the recycled water user and approved prior to the use of recycled water.

**Table 6.1: NDEP Recycled Water Quality Standards**

| | Fecal Coliform (colony-forming units per 100 mL) | | | |
|---|---|---|---|---|
| **Reuse Classification** | **A** | **A(1)** | **B** | **C** |
| 30 Day Geometric Mean | No Limit | 200 | 23 | 2.2 |
| Maximum Daily Number | No Limit | 400 | 240 | 23 |
| Minimum Buffer Zone (ft) | 800 | 400 | 100 | 0 |

- Category A – Pasture or other agricultural purposes except growing crops for human consumption, where public access to the site is prohibited.
- Category A (1) – Same as A. The higher quality allows for a smaller buffer zone.
- Category B – Golf courses, cemeteries, greenbelts where public access is controlled and human contact with the recycled water does not occur; an impoundment where human activity is prohibited and contact with the recycled water does not occur.
- Category C – Cemetery, park, playground where access is controlled and contact with the recycled water cannot reasonably be expected; impoundments where full body contact with the recycled water cannot reasonably be expected.

### 6.3.2 Tailwater Operating Agreement

The primary irrigators in California, with the exception of the Bruns, Celio and Ace Hereford ranches, and the secondary irrigators, tailwater users, in Nevada entered in to an agreement with the NDEP to continue the use of tailwater that originated as recycled water from Harvey Place Reservoir. This agreement makes it the responsibility of the water user to properly sign and notify the operational personnel with potential contact and the public of the presence of recycled water use.

Furthermore, the agreement mandates a water quality sampling program. The District is not a direct party to this agreement but is involved insofar as providing water quality sampling collection and analysis. Direct parties to this agreement are the primary California irrigators and

those land owners that have traditionally benefited from a mixed recycled water tailwater inflow from California.

This agreement was entered in June of 2003 and is administered and enforced by NDEP.

## 6.4 Anticipated Permitting Requirements

The following discussion provides an overview of some of the potential environmental permitting issues that apply to projects of the Master Plan. Additional issues may be identified as each option is further evaluated.

### 6.4.1 NEPA Documentation

The projects of the Master Plan may be at least partially located on lands under the jurisdiction of the Bureau of Land Management and the U.S. Forest Service. The National Environmental Policy Act (NEPA) requires federal agencies to conduct environmental review before undertaking any federal action that could affect the environment, including the use of federally managed lands.

Use of this property requires approval of federal agencies. Environmental requirements under NEPA may be met by completion of an Environmental Assessment or Environmental Impact Statement. Any project implemented is subject to NEPA requirements and evaluated with environmental documentation.

### 6.4.2 The California Environmental Quality Act (CEQA)

The proposed Master Plan projects are subject to the requirements of The California Environmental Quality Act (CEQA). CEQA defines a "project" as an activity where the whole of an action, which has the potential for resulting in either a direct physical change in the environment, or a reasonably foreseeable indirect change in the environment.

Title 14, Article 18, Statutory Exemptions, Section 15262, of CEQA states that "a project involving the feasibility of planning studies for possible future actions which the agency, board, or commission has not approved, adopted, or funded does not require the preparation of an EIR or Negative Declaration but does require consideration of environmental factors. This section does not apply to the adoption of a plan that will have a legally binding effect on later activities."

Once a strategy and/or alternative has been recommended, the strategy and/or alternative is subject to review to determine if the activity is ministerial, has no possible significant effect, is statutory exempt, or is eligible for a categorical exemption. If the activity is not exempt, then the activity is reviewed for any significant effects on the environment. If there are no significant effects on the environment, the activity may be eligible for a Negative Declaration. If significant effects are found, the activity is subject to an EIR under the CEQA regulations.

### 6.4.3 Endangered Species Act

The U.S. Fish and Wildlife Service (FWS) administers the Endangered Species Act (ESA). Plants and animals listed as threatened or endangered are protected, as is their habitat. The FWS must be contacted regarding potential impacts to habitat and protected species pursuant to Section 7 of the Endangered Species Act. A permit may be required if it is determined that the project could impact a protected species or it's habitat.

### 6.4.4 Section 401 of the Clean Water Act

The California Lahontan Regional Water Quality Control Board and the NDEP administer the 401 Water Quality certification program in their respective states. A 401 certification is required when a proposed activity requires a Corps 404 permit. The 401 Water Quality Certification is a standard permit requisite for all construction projects. The 401 certification generally requires best management practices to be implemented during construction to minimize water quality impacts.

### 6.4.5 Section 402 of the Clean Water Act

The Lahontan Regional Water Quality Control Board and the NDEP also administer Section 402 of the Clean Water Act in their respective states. Section 402 requires adherence to National Pollutant Discharge Elimination System (NPDES) regulations for storm water runoff as well as permanent surface water point discharges. Activities disturbing more than one acre of area require the filing of a Notice of Intent, the preparation of a Stormwater Pollution Prevention Plan and, upon completion of the project, the filing of a notice of termination.

### 6.4.6 National Historic Preservation Act

Cultural resources are objects, sites, structures, buildings, or areas of architectural, archaeological, cultural, or scientific significance. These resources receive federal protection under Section 106 of the National Historic Preservation Act (NHPA) (36 CFR 800). Traditional Cultural Properties, which are areas that have been used for medicinal, ceremonial, or religious purposes and which may or may not be associated with specific artifacts, are also covered under the NHPA.

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# Section 7: Master Plan Development

## 7.1.1 Introduction

The South Tahoe Public Utility District undertook the complex task of preparing a 20 year Master Plan for their Alpine County operations. This Master Plan was necessitated by several issues which currently are anticipated to impact the ability of the District to use recycled water, comply with regulatory obligations, reduce operational costs and assess potential operational issues.

The threat of the loss of application areas to residential development prompts direct land application availability concerns for future operations. The District required a minimum of 1,455 acres for annual irrigation application in the year 2007 to this area's 1,883 acres of land permitted to receive recycled water in Alpine County, California but infrastructure is not in place to deliver recycled water to all of this area. The District's acquisition of the Diamond Valley land has added a large portion of which is available for irrigation with recycled water. As time goes on, lands are being converted from agricultural uses to ranchettes that may be unable to apply recycled water for irrigation in a regulatory compliant manner. The District's Diamond Valley Ranch property helps to ensure that additional lands are available for irrigation with recycled water if the need arises.

The existing rancher agreements are on five year terms since 2003 and the overall agreement is up for renewal in 2028, which provides an opportunity to negotiate new agreements for recycled water delivery to irrigators that can encompass the security, regulatory compliance, and management flexibility the District desires.

A series of workshops and scoping meetings were held in the winter and spring of 2001 and 2007. Through these workshops a plan was developed to provide guidance and input to the Master Planning process. Section 7.3 (page 7-54) provides a chronology of the planning activities undertaken by the District Board, staff and consultants. Sections 7.1.2 (page 7-49) through 7.2.5 (page 7-52) discuss the principal issues facing the District and the management philosophy regarding those issues and stakeholders.

## 7.1.2 Purpose and Need

The South Tahoe Public Utility District has defined a mission statement to describe the objectives of the Master Plan. This mission statement reflects the management philosophy of the District Board and staff and is supported by the recommendations presented in this master plan. It is the District's mission to:

> "Furnish our customers with reliable water and wastewater services, and provide these services safely, efficiently, and cost effectively."

As the existing recycled water conveyance, distribution, emergency disposal, and application systems reach their planned capacity, the need for further planning to provide a roadmap for future operations is evident. The District is faced with several substantial operational constraints which this Master Plan focuses on resolving. A summary of the District's operational constraints is presented in the following purpose and need **(PN – No.)** statements:

**PN-1.** Inadequate land may be available to apply future recycled water flows.

**PN-2.** Residential development is encroaching on agricultural land, reducing land available for recycled water irrigation.

**PN-3.** Potential exists for nitrate accumulation in groundwater with unregulated recycled water irrigation application rates.

**PN-4.** Existing recycled water application contracts with contract irrigators will expire in 2028.

**PN-5.** Adequate emergency disposal facility and options are currently unavailable for recycled water.

**PN-6.** Agricultural tail water containing recycled water may not be confined to permitted lands.

**PN-7.** Operational control of the distribution system is insufficient.

**PN-8.** The Diamond Ditch conveyance capacity currently does not meet the on demand recycled water flow rate of 25 cfs of the agreement between the District and the Contractor Irrigators. Additionally, the District does not have control of the Diamond Ditch.

**PN-9.** Ability to meet Indian Creek Reservoir water quality requirements is impaired and the District needs to meet TMDL requirements for the Indian Creek Reservoir.

**PN-10.** Recycled water system improvements are needed to improve operational flexibility.

These issues are addressed by the recommendations of this Master Plan. Insofar as practical each of these issues is addressed by one or more Master Plan objectives and/or guiding principles. The projects presented in the Master Plan projects strive to address these system inadequacies to the greatest extent possible.

## *7.2 Master Plan Objectives*

Through discussion and debate at several meetings held with the District Board, staff, and the Alpine County Board a set of objectives to be addressed in the Master Plan were defined. These objectives focus on the following considerations.

1) Regulatory compliance

2) Operational reliability and flexibility

3) Environmental protection

4) Continuing the cooperative association with Alpine County stakeholders

The following is a list of Master Plan objectives that influence the operations of the District's recycled water program and formulate the design of the Master Plan projects:

- To reuse and/or apply recycled water from the District's wastewater treatment plant in South Lake Tahoe to accommodate the projected growth of the system as defined by the adopted plans within the South Tahoe Public Utility District service area.

- To operate the recycled water application system in a manner that protects public health and safety and promotes the wise use of water resources.

- To maximize reclamation, recycling and reuse of the available water resource to the greatest extent reasonably feasible.
- To optimize water resource conservation.
- To meet or exceed applicable responsible agency and institutional guidelines and requirements for reclamation, recycling and reuse.
- To minimize net operating costs and District expenditures.
- To work cooperatively with responsible agencies, jurisdictions and land owners/operators.

To further define these objectives and set criteria in which to measure the feasibility of Master Plan concepts, ideas and operational practices, a set of guiding principles were established. These guiding principles define the objectives set forth by the District Board in sections 7.2.1 through 7.2.5.

### 7.2.1 Regulatory/Permitting

The South Tahoe Public Utility District has undertaken the complex challenge of developing a long-range Master Plan in order to ensure existing and future regulatory compliance The permitting and regulatory obligations for operating both fresh water and recycled water systems must be upheld by the District to protect public health and ensure the protection of the environment.

The difficulty of obtaining various permits and regulatory approvals is reviewed for each project. This includes environmental assessments, discharge permits, special use permits, easements, encroachment permits, land transfer approvals and Corps of Engineers permits.

### 7.2.2 Reliability and Flexibility

In order to ensure successful, economical and responsible management of recycled water resources and to meet freshwater quality concerns, the District purchased the Diamond Valley Ranch in 2006 for potential future recycled water application. Each of the Master Plan projects were reviewed with respect to the District's requirements for management reliability and flexibility. The following criteria were used to assess the benefit of each proposed project:

- Ownership and Easements – Evaluate ownership and accessibility for long-term operation and maintenance.
- Regulatory Compliance – Evaluate the ability to comply with current and anticipated regulations and permits. Consider the probability of non-compliance.
- Longevity/Security – Look at the ability of a proposed project to provide long-term reliability and alleviate the effect of circumstances outside the District's control such as sale of an application site, development adjacent to a site, public opinion, extreme weather or natural occurrences.
- Emergency Response – Evaluate the reliability of those proposed projects that provide emergency disposal, conveyance or temporary storage.
- Reliance on Existing Agreements – Assess the ability to extract the District from undesirable contractual arrangements, or assess the benefit of being party to other agreements.

### 7.2.3 Environmental Issues

A paramount concern of the District is to achieve a system and management plan that secures the quality of the environment for the future. Each of the proposed projects will undergo an environmental assessment to evaluate associated or perceived impacts with respect to:

- Aesthetics – The perception a Master Plan project might have a detrimental impact on the quality of life and visual aesthetics of the area.
- Habitat – Destruction of habitat that may support sensitive species will be evaluated for each of the projects.
- Water Resources – Impact on surface water and groundwater resources.
- Air Quality – Impact of a project on air quality; either from dust, exhaust, odor, other contaminate.

### 7.2.4 Alpine County

The District and Alpine County have worked in agreement since the 1960's; it is the desire of the District to uphold this relationship and support the objectives sought by the County. Specific criteria that assess this objective are:

- Support Existing Land Uses and Culture – Substantial modifications of existing land use and cultural practices in Alpine County are not the intent of the District. Potential projects will be assessed with regard to impacts on this criterion.
- Demand Irrigation Supply – Assess how potential projects might benefit existing practices by providing more flexibility and functionality to the irrigation system by using various delivery modifications.
- Crop Production Improvements – Evaluate potential projects for benefits to the productivity to the agricultural community. This includes an increase in irrigated lands, better conveyance efficiency, and enhanced irrigation scheduling.
- Maintain Supply to Alpine County irrigators - Recycled water should be used in Alpine County first, subject to economic and other considerations.

### 7.2.5 Guiding Principles

In an effort to maintain focus on the objectives of the Master Plan, the District developed a set of "Guiding Principles". These values reflect the focus and priorities of the District pertaining to the recycled water management and operations in Alpine County. The Guiding Principles were reflected in public presentations and materials throughout the Master Plan and were subject to CEQA review and approval. A brief explanation of the Guiding Principles follows:

- All recycled water operations comply with regulations – This guiding principle speaks to the desire for all aspects of the District's operations to conform to federal, state, and local regulatory requirements. Much of the Federal jurisdiction has been remanded to the State and administered along with Title 22 by the Lahontan Regional Water Quality Control Board. Other local government regulations will be upheld in the planning design and operations of the recycled water program.

- District has a fully reliable system – Historically, the District has operated the recycled water irrigation distribution system in Alpine County without the reliability in operations to ensure the proper and adequate direct land application of all recycled water produced

annually. This inconsistency can be attributed to insufficient application control standards.

- Blending of recycled and freshwater – The practice of blending recycled water with freshwater from the West Fork of the Carson River has occurred since the early 1970's. This is done to provide sufficient irrigation head for effective water conveyance when the level of the West Fork of the Carson River is down. Recycled water regulation under Title 22 requires that fresh water blended with regulated recycled water be treated as if it were all recycled water. This practice therefore increases the volume of water that must meet recycled water regulations. If irrigators apply fresh water and recycled water on a rotational schedule then fewer tailwater control systems will be required and a calculated application rate can be monitored.

- Reliable emergency disposal site – The Lahontan Regional Water Quality Control Board requires an emergency disposal facility for recycled water. This requirement was initially met in 1988 by the construction of the On-Farm emergency disposal site, located approximately 6 miles northeast of the Harvey Place Reservoir. Subsequent evaluation of the capabilities of the On-Farm system indicates that its operational efficiency is low and it requires regular and costly maintenance. Operations of the District's recycled water program must meet emergency disposal regulations imposed by the Lahontan Regional Water Quality Control Board. The Diamond Valley Ranch has provided an area which can be utilized for emergency disposal in the form of temporary storage.

- Application rate reflects crop type and soil conditions – For the ensured protection of groundwater resources and the limitation of tailwater production, a planning value recycled water application rate of 3.25 acre-feet per acre was assumed for preparation of the master plan. This rate was developed to produce no percolation past the root zone to the groundwater and complete nutrient assimilation by the plant biomass. The methodology to calculate the nutrient budget for recycled water application was borrowed from the Nevada Division of Environmental Protection, Effluent Management Plan criteria. The State of California has released a draft policy on recycled water use that includes details on the preparation of Nutrient Management Plans. If adopted by the State of California, the application rate of recycled water could potentially be required to be established through preparation of a Nutrient Management Plan for the basin. However, it is in the best interest of the District to work with contract irrigators to help them to establish Nutrient Management Plans on an individual basis to help ensure the application of recycled water in an amount that would not adversely affect the land or groundwater.

- 5,848 acre-feet of recycled water application in year 2028 – Through analysis of growth projections in the Tahoe Basin and how that relates to recycled water production from the South Tahoe WWTP, a determination was made that the District needs the capacity and flexibility to manage 5,848 acre-feet per year (5.8 MGD) of recycled water application by the year 2028. The management of this volume of water could be accomplished through direct land application, infiltration or export. Currently the District provides approximately 4,738 acre-feet per year of recycled water to agricultural irrigation.

- Application area available for 20% additional capacity – Because changes can occur quickly and have an immediate effect on recycled water production and application areas, a safety margin of 20% additional capacity in the recycled water system was deemed prudent. This margin would be used to compensate for unanticipated growth in

the Tahoe Basin service area or development of existing application areas in Alpine County.

- Irrigators are responsible for regulatory compliance – In the past, the District was sometimes viewed as the de-facto responsible party for recycled water regulatory compliance. The problem with this regulatory responsibility was the limited influence the District has on the individual irrigators, their application methods and rate. For example District personnel cannot touch private water turn-out facilities, or anything along the Fredericksburg Ditch. Future District operations in Alpine County should clearly delineate the District as the recycled water purveyor, and the contract irrigators, the ranchers, as the responsible parties to recycled water application regulations. For the ensured protection of the environment and regulatory compliance the District reserves the right to cease recycled water delivery to irrigators that do not comply with the proper recommended application methods and regulations. The removal of a ranching property from recycled water irrigation should not affect the other irrigators for the duration of the Diamond Ditch Agreement, as the District retains the right under the Agreement to maintain and operate structures on ranchers' lands to transmit recycled water to other lands.

## 7.3 Planning Process

In December 2000 the District contracted a consultant to prepare a recycled water Master Plan for District operations in Alpine County. The scope of services also included the negotiation and planning associated with the Indian Creek Reservoir TMDL being imposed by the Lahontan Regional Water Quality Control Board.

The freshwater and recycled water systems are inherently intertwined due to the manner of use of the water resources in the area. Although it is recognized that the two systems, freshwater and recycled water are separate, the management of one should be "in sync" with the management objectives of the other.

The planning process started in earnest in January of 2001 when the consultants started on a literature review and data assemble for integration into a resource management geographic information system (GIS) to be used extensively for mapping and data management throughout the Master Planning process. See Appendix H for more information regarding mapping and GIS.

An initial project kickoff meeting was held with the District management. At this meeting the outline for data collection, evaluation, and Master Plan process development was presented and discussed. Resulting from this discussion a decision on data presentation in a technical memoranda format was decided on. The technical memoranda found in appendices A through K were completed by mid-June 2001 and updated accordingly in 2008. These memoranda are the basis of the planning data and project development. Each of the eleven technical memoranda was provided to the District for review and modified to reflect comments received from District staff and legal counsel.

District staff has held a series of workshops with the District Board and the Alpine County Contract Commission, made up by the Alpine County supervisors. These workshops discussed and identified how the District philosophy would be incorporated into the planning effort and how the values set by the District Board were prioritized. These values are further described in sections 7.2.1 through 7.2.5. Issues surrounding interaction with Alpine County, regulatory and permitting, environmental protection and impacts, and the need to develop management flexibility were deemed central to the objective of the Master Plan.

Each workshop conducted in 2001 was presented to the District for review and comment, and then presented to the Alpine County Board the following day. Comments were recorded in the meeting minutes and reflected in subsequent planning. Some of the suggestions and comments from ranching interests, District ratepayers, County officials, and other stakeholders such as Lahontan Regional Water Quality Control Board, the Washoe Tribe, and Alpine County School District were received and incorporated into an alternatives analysis.

In the initial Master Plan development effort, it became obvious that the District needed to secure additional lands for the application of recycled water. Development of the Master Plan document was halted in 2001 while the Diamond Valley Ranch property was being acquired to provide additional land for application of recycled water. In 2007, upon completion of the acquisition of the property (Diamond Valley Ranch), the District hired a consultant to continue completion of the Master Plan. An initial meeting was held with District board members and employees in 2006 followed by Master Plan project scoping meetings held at Turtle Rock Park on May 16, 2007 and at the South Tahoe Public Utility District boardroom in South Lake Tahoe on May 17, 2007.

In the project scoping meeting 28 Master Plan concepts were presented to the public. During Master Plan development each of the 28 concepts were analyzed. After consideration and evaluation two project concepts were deleted. These ideas were not pursued because they did not meet the criteria for the Master Plan objectives as set forth by the District or were objectionable to the County or the regulatory agencies. The remaining 26 concepts constitute the Master Plan. These concepts were developed into 26 District projects. Of the 26 projects, eight are recommended for implementation in the near future, while implementation of twelve other Master Plan projects is contingent on various factors and conditions. Six of the 26 Master Plan projects are deemed as potential future projects and are not formally part of the Master Plan. If the future projects are to be implemented, additional environmental assessment and documentation will be required.

Through a process of public presentation and comment/comparison to the District's guiding principles the Master Plan projects identified in 2008 reflect the most desirable aspects of all of the alternatives discussed. Upon implementation, the Master Plan projects intend to provide the District with security, reliability and economy for its recycled water and fresh water programs.

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# Section 8: Development of Projects

## 8.1 Introduction and Project Development

This Master Plan presents a list of projects planned to meet the District's needs with respect to recycled water and fresh water infrastructure and management in their Alpine County operations. The District has successfully managed its recycled water and a portion of the freshwater in Alpine County for many years and the Master Plan serves as a guidance manual for the District to continue it's successful management. In developing the projects of the Master Plan, particular attention was directed towards identifying the areas of the District's operations in Alpine County that could be improved. Project development was also based on the information detailed in Section 7 including meeting the objectives of the Master Plan, purpose and needs anticipated, and the District's guiding principles in Alpine County operations.

The projects of the Master Plan were developed with input from, and coordination with, District personnel familiar with the opportunities and constraints of the District's operations in Alpine County. Numerous meetings and site visits were held to develop project concepts, address limiting aspects and conditions, identify realistic project implementation strategies, and develop potential projects and variations.

The Master Plan projects presented herein are classified into the following four project types.

1) Recycled Water Infrastructure Projects

2) Recycled Water Management Projects

3) Fresh Water Infrastructure Projects

4) Fresh Water Management Projects

Generally infrastructure projects are those projects requiring capital investment and construction, while management projects are projects that make managerial or procedural changes. For these four projects types, the Master Plan projects are grouped in three different categories including projects recommended for implementation in the near future, projects whose implementation is contingent on various factors, and future projects that may or may not be implemented in the future

The projects intend to be publicly supportable, financially feasible, and effective in meeting the District's recycled water management needs. The Master Plan development process upheld the CEQA requirements through evaluation of multiple alternatives, including a "no action" alternative. Master plan alternatives are included in the Environmental Impact Report associated with the Master Plan. The Master Plan does not specifically omit any of the alternatives developed however recommended projects are identified. Implementation of alternatives other than the Master Plan projects could be affected by technological, regulatory, economical and other potential changes.

Each of the projects listed in Table 8.1 (page 8-59) were compiled to satisfy a specific management philosophy. Through a process of public presentation and comment/comparison to the District's guiding principles, the most desirable projects were defined.

There are some projects that were developed to address inadequacy of existing facilities, primarily the District's On-Farm emergency disposal system. Other projects were developed to

address potential operational concerns as well as the possibility of the loss of lands currently irrigated with recycled water due to subdivision or some other cause. Lastly, some projects have been developed in response to regulatory or environmental considerations. Projects were developed, as much as possible, to meet multiple needs.

## 8.2 Master Plan Project Listing

The Master Plan consists of 26 distinct projects classified in the four types mentioned previously. Of these 26 projects, eight are recommended for implementation in the near future, twelve projects are identified as projects that may or may not be implemented based on various contingencies and project triggers, and the remaining six projects are classified as potential future projects.

Table 8.1 (page 8-59) presents a summary of the Master Plan projects, including conceptual costs for recommended infrastructure projects. Each of the projects are detailed in the following sections with the recycled water infrastructure projects discussed in Section 9, the recycled water management projects discussed in Section 10, the freshwater infrastructure projects discussed in Section 11, the freshwater management projects discussed in Section 12, and the projects classified as potential future projects detailed in Section 13. All of the recommended and contingent projects are shown in Figure 8.1 (at the end of Section 8).

Some of the Master Plan projects include variations to provide the District with some flexibility while others stand alone. The Master Plan projects reflect the most desirable aspects of the project alternatives to provide the framework of a Master Plan that provides the District with the security, reliability, and economy required; provide the County and local residents with continued support of agricultural practices; and impart a minimal impact to aesthetics and land use practices in the area.

**Table 8.1 Recycled Water Facilities Master Plan Projects**

| Project Number | Project Description | Project Type | Recommendation Status | Conceptual Cost ($MIL) | Incorporates All or Portion of Component Number(s)** |
|---|---|---|---|---|---|
| 1 | Recycled Water Irrigation Fields on Diamond Valley Ranch | Recycled Water Infrastructure Projects | Recommended | 3.5 | 11, 19 |
| 2 | Harvey Place Reservoir Bypass System Pipelines and Ditches | | Recommended | 6.9 | 11 |
| 3 | Diamond Valley Ranch Irrigation Fields Pump Back Station | | Recommended | 0.6 | 11 |
| 4 | Diamond Valley Freshwater/Recycled Water Irrigation System | | Recommended | 1.9* | 29, 30 |
| 5 | Diamond Ditch Conveyance Improvements | | Recommended | 1.2 | 3 |
| 6 | Waterfall Pipeline Forebay and Pipeline | | Recommended | 2.0 | 3, 4, 6, 22 |
| 7 | District Pasture Subsurface Irrigation Pilot Project | | Contingent | 0.4 | 7, 14, 16 |
| 8 | West Fork Pipeline | | Contingent | 4.6 | 1, 2, 4, 7, 14 |
| 9 | On-Farm Pipeline | | Contingent | 2.8 | 1, 6, 7, 14 |
| 10 | Wade Valley Pipeline | | Contingent | 3.1 | 5, 14, 20, 22 |
| 11 | Prepare Nutrient Management Plans | Recycled Water Management Projects | Recommended | Not Developed | 18 |
| 12 | Permitting for Recycled Water Use in Diamond Valley | | Recommended | | 19 |
| 13 | Make Recycled Water Available to Irrigators in Nevada | | Contingent | | 2 |
| 14 | Snowshoe Thompson No. 1 Conveyance Capacity Improvements | Freshwater Infrastructure Projects | Contingent | 3.0 | 17, 23, 24 |
| 15 | Upper Dressler Ditch Conveyance Improvements | | Contingent | 2.5 | 23, 24 |
| 16 | Indian Creek Treatment Wetlands | | Contingent | 0.9 | 23, 24 |
| 17 | Diversion Ditch for Stormwater Flow Away from Harvey Place Reservoir and to Indian Creek Reservoir | | Contingent | 0.4 | 31 |
| 18 | Indian Creek Reservoir Spillway Channel | | Contingent | 0.9 | 32 |
| 19 | Use Mud Lake Winter Flows for Indian Creek Reservoir Flushing | Freshwater Management Projects | Contingent | Not Developed | 23 |
| 20 | Storage of Water for Downstream Users | | Contingent | | 24 |
| 21 | Develop Recycled Water Wholesale Program | Future Projects | Future | Not Developed | 25 |
| 22 | Biosolids Composting | | Future | | 26 |
| 23 | Become a Water Rights Buyer/Broker to Maintain the Value of Recycled Water | | Future | | 27 |
| 24 | Power Generation | | Future | | 28 |
| 25 | Extend the C-Line to the State Line | | Future | | 33 |
| 26 | Injection Well Program | | Future | | 8, 34 |

*Does not include Phase 3, Irrigation of the Jungle.
**See Appendix F – Technical Memorandum 6 for component listing.

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# Section 9: Recycled Water Infrastructure Projects

The following Master Plan projects reflect ideas and modifications to the existing recycled water system designed to enhance the utility of the recycled water distribution system, increase the reliability and regulatory compliance associated with the storage and distribution of recycled water resources, and to reduce or eliminate potential operational constraints. All projects discussed in this section pertain to recycled water infrastructure. The purpose and need statement(s) satisfied by the project, as well as the aspects of the project, are listed. There are 10 recycled water projects detailed in this section of which six are recommended for implementation in the near future while the other four are projects whose implementation is contingent on various factors described for each.

## 9.1 Project No. 1 - Recycled Water Irrigation Fields on Diamond Valley Ranch

This project addresses the purpose and need statements:

- PN-5. Adequate emergency disposal facility for recycled water and options are currently unavailable for recycled water.
- PN-10. Recycled water systems are needed to improve operational flexibility.

This project entails construction of irrigation fields on the District's Diamond Valley Ranch property. The project includes a total of seven irrigation fields. Five of the irrigation fields, totaling approximately 344 acres are planned to utilize an aerial irrigation system using center pivot irrigation equipment. Two of the irrigation fields totaling approximately 49 acres, will utilize gravity surface (flood) irrigation. The remaining 511 acres of water righted land will continue to be irrigated with freshwater. The irrigation fields utilizing surface irrigation methods will serve a dual purpose including service as an irrigation site for the majority of the time and service as an temporary storage facility for recycled water in the event of an emergency which generally would be a flood event. The combined temporary storage volume of the flood irrigated irrigation fields is approximately 294 acre feet.

An evaluation of the existing recycled water emergency disposal facility (On-Farm) illustrated a need for a new facility that would be utilized in a variety of scenarios and hydrologic conditions. The key requirement for determining the size and location of this new facility is its proximity to Harvey Place Reservoir. The proposed location on the Diamond Valley Ranch allows for the release of recycled water from Harvey Place Reservoir into the irrigation fields for temporary storage and return pumping back to Harvey Place Reservoir, or the delivery of the impounded water directly into the Diamond Ditch system.

The design concept is to allow surface and aerial irrigation, useable in all seasons. Initially the facility will be irrigated with existing freshwater rights diverted from the West Fork of the Carson River. As the potential need for recycled application area grows in response to potential development of existing application areas, recycled water would be used to irrigate the irrigation fields upon securing a permit for recycled water application (Project No. 12, page 10-77).

In practice the flood irrigated irrigation fields would temporarily hold recycled water in times of emergency. During normal operations the irrigation fields would provide alternative uses. To

move impounded water from the irrigation fields to the outlet of Harvey Place Reservoir for redistribution, a pump-back system would be necessary (See Project No. 3, page 9-65).

In order to maintain the aesthetics of Diamond Valley the flood irrigated irrigation fields would consist of irrigated pasture bounded by embankments. These embankments would serve to impound the emergency stored water on the irrigation field until it can be transferred back to Harvey Place Reservoir or to direct land application areas. The configuration of this facility reflects the natural topography of the area to the greatest extent possible. However, this configuration is conceptual and detailed facility planning will identify the best location, size and configuration on the Diamond Valley Ranch.

Project No. 1 pertains to the irrigation fields only. The pipe and ditch improvements are presented in Section 9.2, Project No. 2 (page 9-63) and the associated pump back facility for returning flow from the irrigation fields to Harvey Place Reservoir is presented in Section 9.3, Project No. 3 (page 9-65).

### 9.1.1 Project Description

The two irrigation fields utilizing surface irrigation methods and serving as emergency, temporary storage areas would have of gradual embankments of six foot height separating and surrounding the two fields the two fields. The location of the surface irrigated irrigation fields is on the western edge Diamond Valley Ranch as shown in Figure No. 9.1 at the end of Section 9. Field No.1 is approximately 24 acres in size and Field No. 2 is approximately 25 acres. An average water depth of 6 feet results in approximately 294 acre feet of temporary storage which at the current treatment plant flow rate of 4.1 MGD equates to approximately 23 days of temporary storage.

The embankments are planned to be low-sloping berms which allow crop harvesting with conventional equipment. The design principle guiding this project intends to preserve the aesthetics of the area by creating natural looking temporary storage boundaries and sloping embankments which would be used for pasture hay production or alfalfa. The outlet facility includes a collection system and pump base station (Project No. 3, page 9-65) to return impounded water to Harvey Place Reservoir or the Diamond Ditch.

The temporary storage area is planned to slope less than 2% to accommodate irrigation practices and have a common sump system to facilitate draining and water management within the facility. The drain system provides the collection infrastructure needed to evacuate the temporarily impounded water to Harvey Place Reservoir or the Diamond Ditch.

The five irrigation fields utilizing center pivot irrigation equipment range in size from 47 to 120 acres. These fields would not provide any temporary storage of water. Each center pivot irrigation field is comprised of a central hub where the pivot assembly is connected to the irrigation spans. The spans are composed of several segments of pipe joined together and supported by trusses, mounted on wheeled towers with sprinklers positioned along its length. The water source is connected to the central hub of the irrigation system thereby allowing the spans to rotate around the pivot point. Different nozzles are available for the controlled release of the water. Nozzle types vary from aerial spray, rotary sprinkler head to drip systems. Initially freshwater will be used to irrigate the existing native grasses present on the Diamond Valley Ranch. The center pivot equipment may ultimately use recycled water as its source for irrigation depending upon the need for additional land to apply recycled water. This will require securing a permit for use of recycled water on the Diamond Valley Ranch (Project No. 12, page 10-77).

Several options exist for efficient and flexible management of the facility. The facility needs to receive water directly from the C-Line as well as from the Harvey Place Reservoir outlet works. The facility should be able to be drained to Harvey Place Reservoir or the Diamond Ditch. Figure 9.1 (at the end of Section 9) depicts a conceptual configuration of the irrigation fields located on the northwest section of the irrigated lands in Diamond Valley. The pipeline facilities associated with the irrigation fields are presented in Section 9.3, Project No. 3 (page 9-65). The piping configuration shown on Figure 9.1 (at the end of Section 9) allows for the conveyance of recycled water to the irrigation fields from both the C-Line and Harvey Place Reservoir simultaneously, and the evacuation of the facility to either Harvey Place Reservoir or the Diamond Ditch using a combination of new and existing pipelines and the pump back station.

The conceptual cost for the irrigation fields project, including site preparation, excavation, and grading is approximately $3.5 million.

### 9.1.2 Project Considerations

Project phasing includes an initial phase of construction the irrigation fields using center pivot equipment. The source of freshwater supply would be via a portion of the pipeline system described in Project No. 2, page 9-63). The following phase would be the construction of the irrigation fields using surface irrigation methods.

The irrigation fields are planned to be adjacent to portions of Diamond Valley Road. These areas will require signage and public notification of the application of recycled water. The land proposed for use is currently not permitted to receive recycled water. Recycled water direct land application permits (Lahontan Regional Water Quality Control Board Reclamation Requirements) are required prior to construction of the impoundment. Restriction on the duration of temporary storage may be imposed by the Lahontan Regional Water Quality Control Board for groundwater protection purposes which would affect the required pumping capacity of the irrigation fields pump back station (Section 9.3, Project No. 3, Page 9-65).

Irrigation will be required for the areas outside of the irrigation fields (Project No. 4 - Diamond Valley Freshwater/Recycled Water Irrigation Systems, page 9-66). The irrigation source can be recycled water or freshwater from the West Fork of the Carson River or possibly from freshwater stored in the Indian Creek Reservoir. Irrigation would be accomplished via flood application.

The temporary storage facility would utilize recycled water for pasture irrigation. The total volume applied would be based on an appropriate irrigation application rate as determined by Nutrient Management Plan (Project No. 11, page 10-77). Initially the irrigation would be accomplished using freshwater rights, with occasional augmentation with recycled water. In the future the proportion of recycled water used for irrigation may increase as existing application areas are lost to development or recycled water production increases.

## 9.2 Project No. 2 - Harvey Place Reservoir Bypass System Pipelines

This project addresses the purpose and need statements:

- PN-5. Adequate emergency disposal facility for recycled water and options are currently unavailable for recycled water.

- PN-7. Operational control of the distribution system is insufficient.

One of the concerns of the existing recycled water C-line conveyance system is the inability to bypass recycled water flow around Harvey Place Reservoir for maintenance or emergency purposes. The Harvey Place Reservoir Bypass System Piping project coupled with the Recycled Water Irrigation Fields (Project No. 1, page 9-61) and the pump back system (Project No. 3, page 9-65) would allow the District to convey recycled water directly from the Importation Pipeline (C-line) to the new irrigation fields or the Diamond Ditch. This system allows for flexible management of the Harvey Place Reservoir water level, irrigation of the temporary storage facility with recycled water, and a means of conveying recycled water directly to the Diamond Ditch system.

### 9.2.1 Project Description

The Harvey Place Reservoir Bypass System includes the pipeline facilities necessary for conveyance of water to and from the irrigation fields and is shown in Figure 9.2 (located at the end of Section 9). The new pipelines for the Harvey Place Reservoir Bypass System include the following facilities.

1) Harvey Place Reservoir Bypass Pipeline

2) District Pasture Pipeline

3) Harvey Place Reservoir /Irrigation Field Connector Pipeline

The Harvey Place Reservoir Bypass Pipeline will connect to the C-line just south of the Millich Ditch crossing. This approximately 10,800 foot pipeline would be a pressurized, gravity flow 24-inch diameter pipeline capable of carrying the District's projected future recycled water flow of approximately 5.8 MGD. The increase in pipe diameter from the existing C-Line is required to minimize friction head losses. The District Pasture Pipeline is planned to terminate at the irrigation fields

The District Pasture Pipeline would begin with a valve station on the C-line above the District pasture. This approximately 5,800 foot pipeline would be a pressurized, gravity flow 24-inch diameter pipeline capable of carrying the District's projected future recycled water flow of approximately 5.8 MGD. The increase in pipe diameter from the existing C-Line is required to minimize friction head losses. The District Pasture Pipeline is planned to terminate at the Harvey Place Reservoir Bypass Pipeline just south of the irrigation fields. The Harvey Place Reservoir Bypass Pipeline will work in conjunction with the District Pasture Pipeline to allow freshwater Snowshoe Thompson No. 1 ditch flow to be relocated to the existing C-Line pipe between the connecting points of the two proposed pipelines to accommodate an increase in future flushing flows for Indian Creek Reservoir without having to repair the Snowshoe Thompson No. 1 ditch between those two points (approximately 5,000 feet).

The Harvey Place Reservoir /Irrigation Field Connector Pipeline is a pipeline connecting the Harvey Place Reservoir with the irrigation fields. The pipeline would be bidirectional. The pipeline would be sized to meet a desired flow rate from Harvey Place Reservoir to the irrigation fields or the pump back rate to the reservoir. The only capacity limiting factor is the existing 24-inch diameter pipeline connected to the Harvey Place Reservoir Outlet Facility and the pipeline within the facility.

The Harvey Place Reservoir /Irrigation Fields Connector pipeline length is approximately 2,100 feet and is master planned as 24-inch diameter. This pipeline is planned to connect to the existing Diamond Valley Ranch Pipeline. The Diamond Valley Ranch Pipeline is an existing 24-inch diameter steel pipeline and it provides a method of directing flow from the Harvey Place

Reservoir outlet facility to Diamond Valley. From the outlet facility recycled water and freshwater can be directed to the Diamond Ditch and to Indian Creek, respectively.

The Harvey Place Reservoir Bypass Pipeline working in conjunction with the Harvey Place Reservoir /Irrigation Fields Connector, the existing Diamond Valley Ranch Pipeline, and the Harvey Place Reservoir Outlet Facility would allow recycled water flow to completely bypass the reservoir and flow into the Diamond Ditch. Figure 9.2 illustrates the general alignment of the Harvey Place Reservoir Bypass Pipeline and a detail of the valve configuration required at the irrigation fields.

The alignment of the Harvey Place Reservoir Bypass System pipelines consists of two pipelines: The Harvey Place Reservoir Bypass pipelines and the Harvey Place Reservoir / Irrigation Fields Connector pipeline. The alignments are depicted on Figure 9.2. The conceptual cost for the pipeline project is $6.9 million.

### 9.2.2 Project Considerations

The Harvey Place Reservoir Bypass Pipeline and Harvey Place Reservoir /Irrigation Fields Connector pipeline has multiple uses that benefit District operations. The primary purpose of the Harvey Place Reservoir /Irrigation Fields Connector Pipeline is to convey recycled water to the Irrigation Fields from Harvey Place Reservoir. In addition to this purpose the pipeline can also provide recycled water for irrigation to irrigated areas of Diamond Valley. The efficiency of this configuration relies on the ability to utilize the available head differential to convey water through Diamond Valley and back up to Harvey Place Reservoir without pumping. This potential exists for the combination of the Harvey Place Reservoir Bypass and the Harvey Place Reservoir /Irrigation Fields Connector pipelines, thereby providing much greater management flexibility at little additional operational cost.

## 9.3 Project No. 3 - Diamond Valley Ranch Irrigation Fields Pump Back Station

This project addresses the purpose and need statement:

- PN-5. Adequate emergency disposal facility for recycled water and options are currently unavailable for recycled water.

The proposed Irrigation Fields are planned to drain to the southeast corner of the site. To move impounded water from the Irrigation Fields to the Harvey Place Reservoir Outlet Facility, collection pipes, pumps and discharge system should be established. A pump system utilizing existing trailer mounted pumps the District currently owns would be developed to pump from the Irrigation Fields. A collection system capable of draining the Irrigation Fields would serve as a suction pipeline header to a location where trailer mounted pumps would be configured to connect to the Harvey Place Reservoir /Irrigation Fields Connector pipeline.

Alternatively a larger capacity pump system of a more permanent nature would be utilized to reduce the total time required to empty the irrigation fields. This would allow for greater flexibility by completing the evacuation of the irrigation fields in a shorter time frame. This creates a system capable of multiple emergency disposal events in a single season as well as reducing the impounded water levels for crop growth and haying.

### 9.3.1 Project Description

A collection system of inlets and pipes with ability to gather from any one or more individual cells would be established to connect to a single pipeline leading to the pump station facility. This pipeline would serve as a suction header for the pump facility. The pump facility is planned to consist of a staging area for connection of the District's trailer mounted pipes. The pumps operating in parallel would connect to a discharge header to convey flow to the Harvey Place Reservoir /Irrigation Fields Connector Pipe. The existing pumps would deliver a total of 6,400 gallons per minute (9.2 MGD) at 165 feet of head which exceeds the head required to pump from the irrigation fields to the Harvey Place Reservoir via the existing Harvey Place Reservoir Outlet Facility. Facility planning would identify the optimum configuration and size of trailer mounted pumps to be utilized and rental agreements would be established to assure pump availability.

The conceptual cost of the pump back station project is $0.6 million. This does not include the cost of the two existing trailer mounted pumps the District currently owns.

It is possible to bypass both the emergency temporary storage facility and Harvey Place Reservoir with the C-Line inflow without pumping. Pressurized flow in the Harvey Place Reservoir Bypass Pipeline would flow to the Harvey Place Reservoir /Irrigation Fields Connector pipeline to the Harvey Place Reservoir Outlet Facility and then into the Diamond Ditch.

### 9.3.2 Project Considerations

Using the existing trailer mounted pumps requires a considerable amount of time to empty the irrigation fields. This is not an issue if emergency stored recycled water in the irrigation fields is discharged to the Diamond Ditch. If the emergency stored recycled water in the irrigation fields is discharged to Harvey Place Reservoir, it may be desirable to have a higher capacity pump station to reduce the total amount of time required to empty the irrigation fields.

Another consideration regarding the duration of time the recycled water is emergency stored in the irrigation fields lies in groundwater quality concerns. If the emergency stored recycled water is in the irrigation fields for an extended duration the irrigation fields would begin acting as a rapid infiltration basin discharging to groundwater. This may be a regulatory and environmental concern.

## 9.4 Project No. 4 - Diamond Valley Freshwater / Recycled Water Irrigation System

This project addresses the purpose and need statement:

- PN-1. Inadequate land may be available to apply future recycled water flows.

The Diamond Valley requires irrigation to support pasture hay and wet meadow habitats. The source water for irrigation may come from multiple sources. The irrigation fields may be irrigated with recycled water, while the remainder of the lands with water rights would receive fresh water. An irrigation water distribution system should meet the demands of both the irrigation fields and to other lands in the Diamond Valley.

### 9.4.1 Project Description

The design objective of this pipe network is to have one pipeline to convey recycled water or freshwater from the Harvey Place Reservoir outlet facility to the irrigation fields for irrigation of the irrigation fields and potentially other portions of the Diamond Valley Ranch. The Harvey Place Reservoir /Irrigation Field Connection Pipe Bypass Pipeline would convey recycled water from Harvey Place Reservoir to irrigate the irrigation fields and would provide recycled water to irrigate other lands in Diamond Valley. From this trunk system distribution pipelines branch and take irrigation water to the north and south corners of the irrigated lands in Diamond Valley. The trunk system provides flow and pressure to multiple smaller irrigation zones. The irrigation distribution system should be designed to maximize the use of gravity conveyance. Figure 9.2 (located at the end of Section 9) shows the preliminary configuration of the irrigation distribution network. This irrigation network provides water for both sprinkler and flood irrigation methods.

This project also includes irrigation of the area known as the "jungle" which is located southeast of the junction of Highways 88 and 89. The irrigation system planned includes spray irrigation of the jungle within District property by utilizing a header pipe running along the jungle ridge line which is connected to the Diamond Valley Ranch irrigation supply pipeline. The irrigation area is approximately 140 acres. It is not intended to grow crops in the jungle and implementation of this aspect of Diamond Valley Ranch irrigation would only be utilized if additional application lands are needed. If jungle irrigation is implemented the conceptual cost for the project is $2.9 million.

### 9.4.2 Project Considerations

Future phasing is a major consideration for the implementation/installation of the Diamond Valley irrigation distribution system. Initially the system is planned to distribute freshwater over the irrigation fields area, however some recycled water may be supplied for irrigation based on other factors once an application permit is secured from the Lahontan Regional Water Quality Control Board. The volume of recycled water used in Diamond Valley depends upon the amount of recycled water required for contractor irrigators. The amount of freshwater used in irrigating Diamond Valley can make up any shortfall in available recycled water needed.

Because the southeast edge of the Diamond Valley Ranch abuts to Indian Creek, an effective tailwater control system would have to be implemented.

Special operational considerations may need to be addressed when using pipelines for both freshwater and recycled water delivery; for example, the ability to completely drain the line when switching between the two uses. Although the majority of the land initially receives freshwater irrigation, the District should pursue Lahontan Regional Water Quality Control Board recycled water application permits for lands in the Diamond Valley. (See Project No. 12, page 10-77).

### 9.4.3 Phase 1 – Irrigation Fields Irrigation

The first phase of the Diamond Valley Irrigation distribution system construction may be to convey water to the irrigation fields for irrigation from the Harvey Place Reservoir outlet facility via the Diamond Valley Pipeline and the Harvey Place Reservoir /Irrigation Fields Connector pipeline. The initial purpose of this line is to provide freshwater irrigation to the irrigation fields. Costs associated with the construction of this section of pipe are contained in Section 9.2 - Harvey Place Reservoir Bypass System Pipelines.

Irrigation of the fields, utilized for times when temporary storage is not needed, assumes that pipe pressure is adequate to distribute irrigation flows to the entire area. It is estimated the cost

to initially irrigate the temporary storage facility is negligible because it can be accomplished with flood irrigation.

### 9.4.4 Phase 2 – Diamond Valley Irrigation Distribution Network for Fresh and Recycled Water

Phase 2 of the Diamond Valley irrigation distribution network would be triggered by the need for greater irrigation efficiency and/or the requirement to dispose of recycled water. The New Harvey Place Reservoir Feeder Main pipeline is planned to branch from the Harvey Place Reservoir bypass pipeline (terminating at the end of the existing C-Line) and distributes water to the southern perimeter of irrigated lands and to the southwest section of Diamond Valley. This trunk line is planned to feed smaller diameter irrigation pipes capable of supporting sprinkler, subsurface, and flood irrigation practices.

The cost of this system is dependent upon the irrigation method selected; however, the conceptual cost for the distribution piping is $1.9 million.

## 9.5 Project No. 5 - Diamond Ditch Conveyance Improvements

This project addresses the purpose and need statements:

- PN-7. Operational control of the distribution system is insufficient.
- PN-10. Recycled water systems are needed to improve operational flexibility.

This recommended project includes the following aspects.

(1) Providing capacity improvements at Bar Screen No. 5.
(2) Modifying Bar Screen No. 3.
(3) Installing a casing pipe for the existing recycled water pipeline crossing the Paynesville Bridge.
(4) Installing erosion control measures on the Diamond Ditch upstream and downstream of the Snowshoe Thompson No. 2 diversion structure.

The District faces an operational constraint at Bar Screen No. 5 due to potential clogging, which requires frequent maintenance and/or cleaning of the screen. This project intends to fix this and other problems with the existing conveyance system.

The total conceptual cost for The Diamond Ditch Conveyance Improvements is $1.2 million. The individual component conceptual costs are as follows.

(1) Improvements at Bar Screen No. 5 - $0.09 million
(2) Modifying Bar Screen No. 3 - $0.18 million
(3) Install casing pipe on existing pipeline crossing the Paynesville Bridge - $0.66 million
(4) Installing erosion control measures downstream of the Snowshoe Thompson No. 2 diversion structure - $0.27 million.

### 9.5.1 Project Description

Improvements to the Diamond Ditch System proposed in this project will result in increasing the capacity of the system to transport higher flow rates of recycled water and in stabilizing segments of the system that are subject to erosion and/or flooding. The increase in system capacity will allow the District to manage the potential increases in the volume of recycled water resulting from future flow from the Tahoe Basin. The improvements will permit the District to provide uninterrupted flows of recycled water while protecting the environment.

It is recommended that the control box overflow at Bar Screen No. 5 be modified if the District does not implement Project No. 6 (Page 9-70), and the Waterfall Forebay and Pipeline. If Project No. 6 is not implemented and Bar Screen No. 5 is blocked by debris, recycled water spillage can potentially overtop a small downstream containment berm and enter the nearby West Fork of the Carson River. To improve the Diamond Ditch flow rate and to reduce operational constraints, either of the following is recommended: (1) provide improvements at Bar Screen No. 5 area, or (2) construct a new bar screen at a location above the Diamond Ditch Waterfall with a flow-limiting weir and an overflow side outlet that discharges to Wade Valley. Neither of the recommendations would be necessary if Project No. 6 is constructed.

Modifying the Bar Screen No. 3 flow control structure will also result in increased system capacity and alleviate the flooding and erosion problems associated with this structure.

The existing recycled water 20-inch diameter steel pipeline crossing the Paynesville Bridge is not double contained. This project would install a 30-inch diameter casing pipe for the carrier pipe to reduce the possibility of spillage.

The Diamond Ditch crosses the West Fork of the Carson River a total of six times: there are four above-ground crossings (including the Paynesville Bridge), and two underground inverted-siphon type crossings. The District should evaluate all six crossings to determine the need for installing casing pipe or implementing other upgrades.

The existing Diamond Ditch has eroded downstream of Bar Screen No. 3. Erosion control in the form of channel riprap lining should be installed. The planning level cost (see Table 8.1, page 8-59) is based on approximately 450 feet for the eroded portion upstream of Bar Screen No. 3 and approximately 300 feet of the eroded section downstream from Bar Screen No. 3.

### 9.5.2 Project Considerations

The two choke points discussed in Section 4.1.1.2 generally limit the conveyance capacity of the Diamond Ditch to an estimated 20 cfs. These choke points are at Bar Screen No. 3 and at Bar Screen No. 5. The Diamond Ditch agreement requires the District to deliver an instantaneous recycled water flow rate of 25 cfs. This project intends to fix these choke points.

The aspect of providing improvements at Bar Screen No. 5 of this project is not needed with the implementation of Project No. 6 below. Implementation of Project No. 6 would alleviate potential operational constraints at the Bar Screen No. 5 area. Otherwise, if the District does not implement Project No. 6, the District could reduce potential operational restrictions by providing the improvements at Bar Screen No. 5.

This component is not anticipated to be affected by existing regulations and no additional permits are anticipated with the implementation of this project. Capacity and stability improvements would increase the system's overall reliability with regard to uninterrupted conveyance of recycled water and limit potential operational constraints.

While the Diamond Ditch is the primary conveyance mechanism of the District's recycled water system, the District must consider the issue of capital investment for improvements to the Diamond Ditch which is owned by others.

## 9.6 Project No. 6 - Waterfall Pipeline Forebay and Pipeline

This project addresses the purpose and need statements:

- PN-7. Operational control of the distribution system is insufficient.
- PN-8. The Diamond Ditch conveyance capacity currently does not meet the on demand recycled water flow rate of 25 cfs of the agreement between the District and the Contractor Irrigators. Additionally, the District does not have control of the Diamond Ditch.

If a recycled water piping system were constructed on the lands west of the West Fork of the Carson River (See Project No. 8, page 9-72), the system would require pressure flow conditions that would be generated by the hydraulic head differential of the Waterfall Pipeline and Forebay (see Figure 9.3, at the end of Section 9). The untapped benefit of the elevation differential is one of two principal concepts of the Waterfall Pipeline. Two of the District's objectives are satisfied by this project. Development of the Waterfall Pipeline allows for a more efficient and flexible system through the utilization of higher head as well as eliminating the operational constraints caused by Bar Screen No. 5.

A forebay is necessary for the operation of the Waterfall Pipeline as a pipeline entrance facility. The Waterfall Pipeline requires a sedimentation forebay and bar screen to minimize pipeline maintenance and lengthen the service life of the pipe. If the bar screen becomes blocked the water level will increase in the open ditch section of the Diamond Ditch and eventually spill. The purpose of a forebay is to allow for some flow attenuation and an alarm system will warn the District of a potential spill situation. The alarm is intended to notify District operations staff so they can reduce the release from Harvey Place Reservoir and/or service the forebay.

### 9.6.1 Project Description

The Waterfall pipeline is planned to run from the northwest corner of Wade Valley to the Bar Screen No. 5, a distance of approximately 1,900 linear feet. The alignment is planned to parallel the Diamond Ditch alignment for a distance, then along the Diamond Valley Road to avoid the existing waterfall section and finally to Bar Screen No. 5.

The forebay would be a cast in place concrete structure approximately 10 by 10 feet in plan dimension. The depth of the box would be sized to allow for sediment capture, a rising water service level to trip an alarm and a side outlet overflow weir that would direct spillage to the Upper Celio Dressler Ditch, as opposed to the West Fork of the Carson River in the present condition.

The total conceptual cost for the Waterfall pipeline and forebay project is $2.0 million. This cost includes a concrete junction box, site preparation, and piping. Additional costs associated with

monitoring and SCADA control systems could be incurred if that level of sophistication is desired.

### 9.6.2 Project Considerations

The pipeline alignment follows a portion of the Diamond Valley Road to avoid construction in the steep existing waterfall portion of the Diamond Ditch.

An alarm system would notify District personnel of a flow problem in the Waterfall Pipeline and shortly thereafter spillage would begin at the forebay. However a spill at this location would not have critical consequences from a regulatory view but it may pose operational problems.

While the Diamond Ditch is the primary conveyance mechanism of the District's recycled water system, the District must consider the issue of capital investment for improvements to the Diamond Ditch that is owned by others.

## 9.7 Project No. 7 - District Pasture Subsurface Irrigation Pilot Project

This project addresses the purpose and need statement:

- PN-1. Inadequate land may be available to apply future recycled water flows.

The implementation of this project is contingent upon the need for additional lands to be irrigated with recycled water that are subject to regulatory buffer constraints. It is a pilot project to determine the worthiness of this relatively new irrigation concept.

The District owned land in the southwest corner of Diamond Valley is 200+ acres of pasture with encroaching upland vegetation and is separated from Alpine County School District property on the west by a 17-acre buffer zone; thus, this is an ideal location to pilot a subsurface irrigation system (Figure 9.2, at the end of Section 9). This type of new technology is a sound way of demonstrating the benefits of recycled water application while allowing for precise control of the water budget and by eliminating surface water contact. These methods are being used in areas with high public contact potential. The area used for the pilot subsurface irrigation system would be very small; likely two to four acres.

### 9.7.1 Project Description

The subsurface irrigation system would require perforated plastic pipe to be installed approximately 8 to 12 inches below the land surface on four on-acre sites. The design of the subsurface pipe installation will depend upon slope, crop and soil conditions.

The conceptual cost of this system is $0.4 million. Annual maintenance is minimal; however, replacement of the system is recommended every 3 to 5 years. This requirement makes it attractive for pilot projects, research and education, but it is economically unfeasible in areas that do not have recycled water human contact concerns.

### 9.7.2 Project Considerations

The end use of the land should be a primary consideration. Subsurface irrigation systems may have a shorter functional lifespan in areas that are subject to livestock grazing. Lands that are

close to public access areas are ideal for this application due to the resulting reduction in the potential for public contact. These systems require periodic replacement to maintain efficiency, and application control. Land receiving recycled water application through the use of subsurface application systems requires a Lahontan Regional Water Quality Control Board recycled water application permit.

## 9.8 Project No. 8 - West Fork Pipeline

This project addresses the purpose and need statements:

- PN-6. Agricultural tail water containing recycled water may not be confined to permitted lands.
- PN-7. Operational control of the distribution system is insufficient.
- PN-8. The Diamond Ditch conveyance capacity currently does not meet the on demand recycled water flow rate of 25 cfs of the agreement between the District and the Contractor Irrigators. Additionally, the District does not have control of the Diamond Ditch.
- PN-10. Recycled water system improvements are needed to improve operational flexibility.

It is envisioned that this project would solve the key regulatory and operational issues potentially occurring within the existing recycled water system. Elements that promote the construction of a recycled water piping system on the lands west of the West Fork of the Carson River included the pipe location and service area, the flexibility that the delivery system provides, and the need to minimize recycled water tail water by separating recycled waters and fresh waters in the Fredericksburg system. Additionally, the loss of a contract irrigator between and adjacent to other contract irrigator lands would serve as a trigger for constructing a West Fork pipeline. Three alternative pipeline alignments (see Figure 9.3, at the end of Section 9) have been selected for review and comparison. Each requires an evaluation of the Paynesville Bridge pipeline and each have unique characteristics and a cost to benefit analysis should be completed with detailed facility planning.

Implementation of this project is primarily contingent upon regulatory aspects of the Contract Irrigators' practice of blending recycled water with fresh water in the Fredericksburg Ditch system. The District would reduce operational concerns by providing recycled water to the Contract Irrigators on the west side of the river at a location that eliminates blending in the Fredericksburg Ditch system. Implementation of this project would require coordination and cooperation with the Contract Irrigators. Additionally the District should investigate the current practice of irrigators' blending of water in the Falke/Tillman Ditch.

### 9.8.1 Project Description

The objective of the pipeline alignment alternatives is to deliver water to the closest property line of each of the three west side contract irrigators. The pipe alignments are planned to remain in road easements with a valve and meter teeing off the pipeline at each property. This pipeline system will have considerable head, although under standard water pipeline pressures limits, and would be sized to convey the demand needed.

Pressure required to allow full functionality of the pipeline at each outlet is a consideration in the design. The necessary pressure will be generated by the hydraulic head differential in the Waterfall Pipeline. Therefore, the projects will require facility planning including a determination of the demand locations, integrated design and construction schedules. A determination of the water pressure at delivery for each alignment should be made.

### 9.8.2 Project Requirements for Implementation

The three alignment alternatives have been developed, it is important to examine the properties that can be served from each alignment, and to determine the delivery water pressure that each alignment is capable of producing. Figure 9.3 (at the end of Section 9) shows the three possible alignment alternatives and the Waterfall pipeline used to pressurize the West Fork Pipeline.

### 9.8.3 Alignment 1 – Fredericksburg Road

The Fredericksburg Road alignment runs from the Paynesville Bridge on the North side of the Diamond Valley Road, across Highway 88 to Fredericksburg Road. To minimize road disturbance the alignment is planned to be located along the east edge of Fredericksburg Road, a distance of approximately 11,000 feet, to the southern corner of the Gansberg Property.

The capability of delivering 20-30 psi to each of the three contract irrigators on the up gradient side of their irrigated lands is a major advantage to the Fredericksburg Road alignment.

The conceptual cost for this alignment alternative is $4.6 million.

### 9.8.4 Alignment 2 – Highway 88

The starting point of the proposed Highway 88 alignment is also at the Paynesville Bridge. Starting on the north side of the bridge, the alignment would head west along Diamond Valley Road to Highway 88. The alignment would then follow north along the highway for approximately 11,800 linear feet. The end of this alignment lies at a lower elevation than the Fredericksburg Road alignment. Approximately 20-30 psi will be available to the California irrigators at the points of delivery. The pressure provided by the pipeline can be harnessed to move water through the irrigators' piped distribution system, thereby eliminating the need for pumps. Pressure relief valves should be installed at each irrigator's connection point.

The construction of this alignment would be less cumbersome, as the available right-of-way along Highway 88 is much wider and flatter than that of the proposed alignment along the Fredericksburg Road. The Highway 88 alignment also has the added advantage of delivering recycled water to permitted lands on both sides of the highway. This alignment benefits those irrigators with ranches split by the highway.

The conceptual cost for this alignment alternative is $5.0 million.

### 9.8.5 Alignment 3 – Chambers Lane

The Chambers Lane alignment alternative is similar to alignment 2 except the first leg of the alignment runs 4,000 feet north along Chambers Lane from the Paynesville Bridge before turning west to Highway 88. The alignment then runs north to the same terminus location as alignment 2. The total length of alignment 3 is approximately 13,000 linear feet and would also generate 20-30 psi flowing at 25 cfs.

An advantage to this alignment is the proximity of the pipeline to the ranchettes. Although the permitting and application of recycled water on small areas may take considerable negotiation, this alignment would provide the necessary infrastructure.

The conceptual cost for this alignment alternative is $5.5 million.

### 9.8.6 Project Considerations

While the Diamond Ditch is the primary conveyance mechanism of the District's recycled water system, the District must consider the issue of capital investment for improvements to the Diamond Ditch system that is owned by others.

## 9.9 Project No. 9 - On-Farm Pipeline

This project addresses the purpose and need statement:

- PN-8. The Diamond Ditch conveyance capacity currently does not meet the on demand recycled water flow rate of 25 cfs of the agreement between the District and the Contractor Irrigators. Additionally, the District does not have control of the Diamond Ditch.

The On-Farm pipeline is planned to provide recycled water to the Alpine County irrigators on the east side of the West Fork of the Carson River. This pipeline would allow for regulated application rates of recycled water and would provide the District with greater control over the recycled water delivery. In the future this pipeline alignment would be used to convey excess recycled water from Alpine County to Nevada recycled water applicators. The pipeline would service existing permitted and new lands in the future should the need arise.

The implementation of this project is contingent upon the need for additional land for irrigating with recycled water.

### 9.9.1 Project Description

The On-farm pipeline (see Figure 9.3, at the end of Section 9) would share the forebay with the waterfall pipeline. This design would allow for a single alarm. The alignment would follow the existing On-farm diversion ditch and access road. The 20-inch diameter, 6,700-foot pipeline would be capable of delivering a considerable amount of water at a higher pressure. This rate of delivery provides the Celio and Brooks ranches with more than adequate delivery volume in addition to providing a conveyance to Nevada from the Diamond Ditch system in the event that future excess recycled water is sold to Nevada irrigators.

The conceptual cost for the On-farm pipeline project is $2.8 million.

### 9.9.2 Project Considerations

This project allows for a controlled delivery of recycled water to the east side contract irrigators. A design consideration of the pipeline and alignment is the current conveyance demand and the potential future use of this system. As recycled water production increases in the future, markets for this excess water may exist in Nevada.

This project should be reviewed with respect to existing and future capacities. The additional costs associated with the construction of a 20-inch diameter pipeline rather than a smaller line is

relatively minor in comparison to operational difficulties compounded by inadequate pipeline capacities to convey the necessary flows.

## 9.10 Project No. 10 - Wade Valley Pipeline

This project addresses the purpose and need statement:

- PN-7. Operational control of the distribution system is insufficient.

The Wade Valley pipeline project (see Figure 9.3, at the end of Section 9) is a series of infrastructure improvements along the Diamond Ditch in Wade Valley. Currently portions of the ditch are lined or piped while other portions are not lined. Implementation of this project is contingent upon the severity of continued erosion in the Diamond Ditch.

### 9.10.1 Project Description

Erosion of the Diamond Ditch has occurred in areas of steep gradient and sections lacking energy dissipation structures. The solution to this problem may be a series of phased piping projects designed to target the problem sections first. The end result of the phased construction plan is a continuous pipeline from Diamond Valley to the Waterfall Pipeline forebay located in Wade Valley.

A conceptual piping configuration is required to determine the final configuration of this section to the Diamond Ditch. An alternative alignment across the irrigated pasture of the Ace Hereford would minimize the piped distance from Diamond Valley to the Waterfall Pipeline and the On-farm Pipeline. The 20-inch diameter pipeline would be approximately 7,500 feet in length. This optional alignment would also benefit sprinkler irrigation in Wade Valley by providing enough pressure to operate an efficient pivot irrigation system.

The initial phases of this project focus on addressing the existing stability and erosion problem in the Diamond Ditch, and future considerations should evaluate the feasibility of a parallel pipeline through Wade Valley.

The conceptual cost for the Wade Valley Diamond Ditch improvements is $3.1 million.

### 9.10.2 Project Considerations

While the Diamond Ditch is the primary conveyance mechanism of the District's recycled water system, the District must consider the issue of capital investment for improvements to the Diamond Ditch that is owned by others.

## 9.11 Project Variations

The recycled water infrastructure projects listed previously require capital investment and construction. Included among these projects are three potential revenue generating alternatives; however, the majority of the recycled water infrastructure projects intend to improve the District's Alpine County operations. The potential revenue generating recycled water infrastructure projects include the following:

(1) Grow Biomass Crops for Pulp Production Using Recycled Water
Under this variation recycled water would be used for growing biomass crops (such as poplar and willow) for use in pulp wood production. The crops would be harvested every

4 to 6 years depending upon the species and growth characteristics. The revenue generation is generally minimal; however, the option would be leased and require minimal involvement by the District. A portion of the Diamond Valley Ranch not used for the irrigation fields would be a suitable site for growing bio-mass crops.

(2) Wetland Sod and Seed Production

By implementing this variation, the District would generate revenue from the production and sale of wetland sod and seed. Recycled water would be used to grow wetland-species sod for transplantation to mitigation sites. Seeds would also be harvested from mature wetlands and sold for wetland habitat projects. The Master Plan recommended irrigation fields on the Diamond Valley Ranch or some other location within the Diamond Valley Ranch would be suitable for producing wetland sod.

(3) Mitigation Wetland Creation Using Freshwater

Mitigation is required when waters of the State or wetlands of the United States are impacted. Under this variation, the District would create a mitigation wetland that would be used to "bank credits" in anticipation of selling the credits to others when waters or wetlands are impacted. The creation of mitigation wetlands would require District support in perpetuity. Concern exists by regulators that wetlands supported by recycled water are subject to change and the perpetuity aspect comes into question. If a freshwater source is utilized this concern is eliminated. A portion of the Diamond Valley Ranch may be suitable to create mitigation wetlands.

The potential use of recycled water in Nevada may require capacity conveyance improvements in the Diamond Ditch delivery system. Some of the projects described in this section address this need.

# Section 10: Recycled Water Management Projects

The District should develop and adopt a series of revised management and operation techniques to meet the objectives of recycled water management. The recycled water management projects have been separated from the infrastructure projects for clarity in understanding of the scope of the projects and how they integrate with the infrastructure projects. Although some administrative and operational costs may be entailed by the implementation of some of these management projects, itemized cost estimates were not developed for these projects.

There are a total of three recycled water management projects. Two of these are recommended for implementation in the near future. The implementation of the third project is contingent on the need for additional recycled water irrigation land.

## 10.1 Project No. 11 - Prepare Nutrient Management Plans

This project addresses the purpose and need statement:

- PN-3. Potential exists for nitrate accumulation in groundwater with unregulated recycled water application rates.

The recycled water application rate is founded upon a database containing irrigated lands, soil types, crop type and topographical and environmental data. The ultimate goal of California's Recycled Water Policy, currently under development, is to provide an incentive for development of salt (including nutrient) management plans by recycled water dischargers in groundwater basins that are threatened by salts. The intent of the Water Board in developing salt management plans is to assist irrigators in developing the irrigation requirements to meet crop demand, understand nitrogen limits, and protect groundwater by not exceeding the permeability limits. Application rates are discussed in greater detail in Appendix K.

Project No. 11 of the Master Plan, Prepare Nutrient Management Plans, is recommended to be implemented because it will establish the appropriate recycled water application rate for each of the contract irrigator ranches. Although the Recycled Water Policy could potentially only require development of a single Nutrient Management Plan (NMP) for the basin, it is in the District's best interest to assist in preparation of the NMPs in coordination with each contract irrigator and educate the contract irrigators of the requirements of the NMP. The NMP recycled water irrigation application rate information can be used to modify the "effluent contract" for each contract irrigator and in turn, each contract irrigator's Lahontan Regional Water Quality Control Board permit for application of recycled water.

## 10.2 Project No. 12 - Permitting for Recycled Water Use in Diamond Valley

This project addresses the purpose and need statements:

- PN-1. Inadequate land may be available to apply future recycled water flows.
- PN-2. Residential development is encroaching on agricultural land, reducing land available for recycled water irrigation.

- PN-4. Existing recycled water application contracts with contract irrigators will expire in 2028.

The Diamond Valley has not been irrigated with recycled water for several decades. Currently no land in Diamond Valley is permitted to receive recycled water. In the future several portions of Diamond Valley need to be permitted to apply recycled water for irrigation or emergency temporary storage.

The irrigation fields should be permitted to receive recycled water both as irrigation application and as a recycled water emergency temporary impoundment. This may demand a more developed groundwater monitoring system to detect nitrogen in the shallow groundwater during episodes of impounded water.

A permit application must be made with the Lahontan Regional Water Quality Control Board for the irrigation of lands within Diamond Valley and for the emergency temporary storage of recycled water.

It is recommended the District commence securing a permit from the Lahontan Regional Water Quality Control Board for irrigating the Diamond Valley Ranch with recycled water. Project No. 12, Permitting for Recycled Water Use in Diamond Valley, should be implemented because it will allow the District to apply recycled water on the Diamond Valley Ranch if lands currently irrigated with recycled water are lost to subdivision or some other reason.

## 10.3 Project No. 13 - Make Recycled Water Available to Irrigators in Nevada

This project addresses the purpose and need statements:

- PN-1. Inadequate land may be available to apply future recycled water flows.
- PN-2. Residential development is encroaching on agricultural land, reducing land available for recycled water irrigation.
- PN-4. Existing recycled water application contracts with contract irrigators will expire in 2028.

The concept of making recycled water available to irrigators in Nevada is a contingent project. Implementation could be triggered by the District's need for additional lands for irrigation with recycled water in the event existing lands within Alpine County currently irrigated with recycled water are lost by subdivision or some other reason. Economics is another possible trigger for this project.

Nevada irrigators downstream of Alpine County currently do not have access to sufficient volumes of water to divert to irrigation in an average or below average precipitation year. Because of a lack of reliable freshwater sources, Nevada irrigators perceive recycled water as a desired commodity. Currently the District's recycled water is not permitted for direct land application in Nevada with the exception of tailwater agreements the three contract irrigators, with land adjacent to the state line, have with the Nevada Division of Environmental Protection (NDEP). This project would pursue the permitting of land in Nevada by NDEP to receive recycled water from Harvey Place Reservoir for the purpose of irrigating.

An initial step to implementation of this project could be the permitting of lands in Nevada currently owned by existing contract irrigators. This would result in additional lands for irrigating

with recycled water. This and other irrigation in Nevada with the District's recycled water would also have to be permitted by the Lahontan Regional Water Quality Control Board.

Existing ditch systems (Diamond Ditch and Fredericksburg Ditch) are in place to deliver recycled water to Nevada; however, the District does not own these ditches. Conveyance to Nevada irrigators using these existing ditch systems would require agreement with the Ditch owners for conveyance. Most likely new infrastructure would need to be constructed to deliver recycled water to Nevada irrigators. A potential future project discussed in Section 13 (page 13-97) includes an extension of the C-Line from Woodfords to the State Line. Implementation of this project would construct the infrastructure necessary for conveyance to Nevada. Conveyance and distribution systems would be constructed within Nevada by Nevada irrigators. The value of this water will depend on if it is delivered with sufficient pressure for spray irrigation or not.

One drawback of this pipeline project is that no method is provided for diverting recycled water flows to winter storage in Harvey Place Reservoir. Additional pipe connection infrastructure to the C-Line will be needed for this project alternative.

Permits and approval must be obtained from NDEP and Douglas County, Nevada. Irrigation with recycled water in Nevada will be subject to all recycled water requirements set forth by the Federal EPA and NDEP. Recycled water must be applied in Nevada at a rate that will not result in adverse impacts to groundwater and surface water resources. The state of Nevada requires preparation of an Effluent Management Plan for each use of recycled water in the state to ensure recycled water is used without degrading existing water quality in the state. It will be the responsibility of the Nevada irrigators to ensure compliance with applicable Nevada regulations and the requirements of the Effluent Management Plan.

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# Section 11: Fresh Water Infrastructure Projects

There are five freshwater infrastructure management projects described in this section. For all five of these projects their implementation is contingent primarily on the District meeting its requirements at the Indian Creek Reservoir.

The District is obligated to meet certain water quality goals (TMDLs) at the Indian Creek Reservoir as well as providing sufficient water to meet minimum water surface elevation requirements. Often there is insufficient fresh water in the West Fork of the Carson River for the District to convey a sufficient amount of water to meet it's minimum water surface elevation requirements. In these years the river is under "regulation" as discussed in Appendix G. However, even in years when the river is not under regulation, the existing freshwater conveyance infrastructure is often insufficient to convey existing and possible future Indian Creek Reservoir freshwater storage rights to the reservoir.

## 11.1 Project No. 14 - Snowshoe Thompson No. 1 Conveyance Capacity Improvements

This project addresses the purpose and need statement:

- PN-9. Ability to meet Indian Creek Reservoir water quality requirements is impaired and the District needs to meet TMDL requirements for the Indian Creek Reservoir.

The implementation of this project is contingent on two factors, one pertaining to water quality and the other pertaining to water quantity. The District is currently implementing a Hypolimnetic Oxygenation System project at the Indian Creek Reservoir. If this project is successful in meeting the District's TMDL requirements, the water quality aspect of project implementation is unnecessary. The other contingency factor is meeting the water surface elevation requirements in the Indian Creek Reservoir. If not meeting the water surface elevation requirement due to conveyance capacity limitations continues to be a problem, the freshwater conveyance improvements of this project are needed.

Snowshoe Thompson No. 1 Ditch is the first conveyance ditch for freshwater to Indian Creek Reservoir and for irrigation water to Diamond Valley pasturelands. Snowshoe Thompson No. 1 is an unlined ditch that has limited capacity for existing diversions. The limited capacity issues combined with structural integrity concerns illustrate the need for improvements to this conveyance.

### 11.1.1 Project Description

The Snowshoe Thompson Ditch No. 1 Ditch diverges from the south bank of the West Fork of the Carson River about a half-mile above Woodfords. The proposed project is planned to pipe portions of the ditch in its original alignment to improve capacity, integrity, and eliminate the annual maintenance that is currently required.

The piped section of Snowshoe Thompson No. 1 Ditch is planned to start at the Millich Ditch diversion structure. The Snowshoe Thompson No. 1 pipeline is planned to tie into the existing concrete head works and sluice gate and extend along the hillside to a location near Hwy 89. The need for a large conveyance volume to capture the full water right allocation necessitates a large diameter pipe, perhaps as large as 36 inches. This large diameter allows the diversion of approximately 40% of the allocated water right to be captured per month during the runoff

season when ample water is available for diversion. The Alpine Decree mandates that a water right can not be diverted from the river at a rate greater than 40% per month; this is known as the 40:40:20 diversion rate.

The conceptual cost of piping the distance from the West Fork of the Carson River to the Harvey Channel, approximately 10,500 feet, is $3.0 million.

Alternatively the existing ditch could be enlarged in place with short piped sections for areas where erosion and steep hillside locations. This would reduce the capital cost but operation and maintenance costs would continue and seepage in the ditch would persist.

Finally, if the C-Line extension to bypass Harvey Place Reservoir were constructed, the abandoned portion of the C-Line (see Figure 9.1 at the end of Section 9) could be utilized for Snowshoe Thompson No. 1 flows. Construction of two short connector pipelines between the Ditch and the aforementioned section of C-Line would be the only additional infrastructure required.

### 11.1.2 Project Considerations

Constructability of the pipeline in its existing alignment is a major hurdle to the completion of this project. The side hill that the alignment runs along is steep and unstable. Traditional open trench methods may need to be modified in order to use the existing alignment. There are several environmental concerns addressed in the Environmental Impact Report that may dictate the construction schedule.

### 11.1.3 Phase 1 – Diversion to Highway 89

Phase 1 of the Snowshoe Thompson No. 1 reconstruction is planned to commence at the head works of the split of Millich Ditch. The existing concrete structure will be modified to incorporate a debris screen and gate. Phase 1 reach totals 2,900 linear feet that is planned to be replaced with 36-inch diameter pipe. Periodically along the alignment sediment sumps should be constructed to aid in pipeline maintenance. Prioritizing construction of Phase 1 is important to minimize the District's operational constraints during high runoff events, and convey the maximum allocated volume of water to Indian Creek Reservoir.

### 11.1.4 Phase 2 – Highway 89 to Upper Dressler Ditch

Phase 2 improvements are less critical than the upstream Phase 1 reach. The existing capacity is less hindered throughout this reach; however transmission losses are quite high. Phase 2 improvements includes approximately 8,700 linear feet of ditch conversion to 36-inch diameter pipe. Alternatively, the abandoned portion of C-Line could be utilized for Snowshoe Thompson No. 1 flows, considerably reducing the Phase 2 improvements.

## 11.2 Project No. 15 - Upper Dressler Ditch Conveyance Improvements

This project addresses the purpose and need statement:

- PN-9. Ability to meet Indian Creek Reservoir water quality requirements is impaired and the District needs to meet TMDL requirements for the Indian Creek Reservoir.

Like Project No. 14 (page 11-81), project implementation for Project No. 15 is contingent upon water quality and quantity in the Indian Creek Reservoir.

The Upper Dressler Ditch carries freshwater from Snowshoe Thompson No. 1 Ditch at Indian Creek to Indian Creek Reservoir. Portions of the ditch are concrete lined, while other sections consist of loosely consolidated earth. These earthen areas are prone to a high rate of leakage and erosion. Lining or piping sections of this ditch can reduce sediment transport. This project should be phased on a priority reach basis. The District completed in 2007 the conversion of approximately 2,000 feet to piped conveyance. Problem sections are planned to be improved first and the concrete sections may require replacement as they deteriorate in the future.

### 11.2.1 Project Description

Unlined sections of the Upper Dressler Ditch are planned to be piped in a 48" diameter pipeline to promote conveyance and ditch stability. The general construction method for piping the Upper Dressler ditch will be to place the pipeline in the existing ditch alignment and backfill and compact.

Figure 11.1 (at the end of Section 11) depicts the reach of the Upper Dressler Ditch that has a high seepage rate and should be the priority reach when this project is implemented.

### 11.2.2 Project Considerations

The sections in most need of repair are entirely within District owned lands; access exists along the entire alignment. Other than the pipe material, suitable bedding and backfill material may be the greatest construction cost.

A detailed condition assessment for the portions of the C-Line to be converted to freshwater conveyance which is associated with Project No. 2 (page 9-63) is necessary before final decisions are made regarding the Upper Dressler Ditch Conveyance Improvements.

The conceptual cost of the Upper Dressler Ditch Conveyance Improvements project is $2.5 million.

## 11.3 Project No. 16 - Indian Creek Treatment Wetlands

This project addresses the purpose and need statement:

- PN-9. Ability to meet Indian Creek Reservoir water quality requirements is impaired and the District needs to meet TMDL requirements for the Indian Creek Reservoir.

Project No. 16 is contingent upon the success of the District's current Hypolimnetic Oxygenation System project. The TMDL on Indian Creek Reservoir sets a water quality standard for phosphorus. Concerns exist that flushing more water through the reservoir will transfer the elevated level of phosphorus to downstream systems, thereby impeding the water quality objectives of the receiving water bodies. If the Hypolimnetic Oxygenation System project meets TMDL goals the need for the Indian Creek Treatment Wetlands Project will be eliminated. If the Hypolimnetic Oxygenation System project does not meet TMDL goals, then the District may be faced with increasing flushing flows through the Indian Creek Reservoir. Project No. 16 could be constructed as shown in Figure 11.2 (at the end of Section 11) to address the impacts of increased flushing flows on downstream systems.

### 11.3.1 Project Description

The alignment of Indian Creek directly below Harvey Place Reservoir Dam is planned to be modified to provide for phosphorus sedimentation and biological nutrient assimilation in a 20-acre treatment wetland. The objective of this design is to provide hydraulic retention time of the high phosphorus water. A series of pools, emergent vegetation, and plug-flow wetlands provide wetland area for the separation of phosphorus from the source water. The wetland should be sized to pass the maximum released flow from Indian Creek Reservoir, yet function at optimum treatment potential near 5 cfs, the mean annual release rate. This provides enhanced treatment throughout most of the year and minor but beneficial treatment during high flow periods.

Treatment wetlands construction costs vary greatly throughout the region. The conceptual cost for the treatment wetlands project is $0.9 million.

### 11.3.2 Project Considerations

Wetland maintenance and success criteria are the key to a successful treatment wetland. Plant selection and substrate quality affect the rates of phosphorus absorption but the long-term maintenance of the wetland should ensure success. This maintenance involves annual grubbing and flow path work, burning, and periodic replanting.

## 11.4 Project No. 17 - Diversion Ditch for Stormwater Flow Away From Harvey Place Reservoir and to Indian Creek Reservoir

This project addresses the purpose and need statements:

- PN-7. Operational control of the distribution system is insufficient.
- PN-10. Recycled water system improvements are needed to improve operational flexibility.

The Indian Creek Reservoir and the Harvey Place Reservoir were both strategically located to minimize the amount of surface water flow, stormwater runoff, and snowmelt into them because of their original design function of storing recycled water. There is one unnamed canyon located near the southeast corner of the Harvey Place Reservoir that flows to Harvey Place Reservoir. This project would construct the infrastructure necessary to capture this surface water flow and direct it to the Indian Creek Reservoir.

Implementation of this project is contingent upon the required recycled water storage volume in the Harvey Place Reservoir. If the total volume of recycled water increases, or the lands receiving recycled water for irrigation decreases, then additional storage may be required in the Harvey Place Reservoir. Additionally, projections indicate that in the year 2028 the Harvey Place Reservoir will be near its capacity limits.

### 11.4.1 Project Description

This project involves constructing an intercepting ditch near the southeast corner of the Harvey Place Reservoir to intercept stormwater and drainage flows that currently flow into the Harvey Place Reservoir and divert them to the Indian Creek Reservoir. The purpose of this project would be to reduce stormwater flow into the Harvey Place Reservoir thereby increasing the

available storage volume of the Reservoir. Another benefit of this project will be to increase the freshwater flushing flows to the Indian Creek Reservoir.

The length of Diversion Ditch would be approximately 2600 feet. The Diversion Ditch would start at an existing culvert for the Airport road at the unnamed drainage. The alignment would generally follow the airport road alignment to Indian Creek Reservoir. The ditch capacity would be based on a detailed hydrological analysis of the tributary watershed.

The conceptual cost for the Diversion Ditch to divert stormwater away form Harvey Place Reservoir to Indian Creek Reservoir is $0.4 million.

### 11.4.2 Project Considerations

A method of sediment control may be necessary to reduce sediment loading in the Indian Creek Reservoir. The disadvantages of this project include capital cost expenditure and the District would have additional operation and maintenance responsibilities.

Since the construction of Harvey Place Reservoir in 1988 only the flood of 1997 caused significant concerns for the District. In that year the surface water flows into Harvey Place Reservoir threatened the required storage capacity and created the potential for a spill from the reservoir in the event of subsequent storms. To alleviate the situation, the District received permission to land apply its recycled water outside of the irrigation season. Implementation of this project would help the District in avoiding a spill from the Harvey Place Reservoir in a large flood event.

## 11.5 Project No. 18 - Indian Creek Reservoir Spillway Channel

This project addresses the purpose and need statements:

- PN-7. Operational control of the distribution system is insufficient.
- PN-10. Recycled water system improvements are needed to improve operational flexibility.

The implementation of this project is contingent with respect to the District's desire to reduce operational constraints in the event of catastrophic floods.

The existing Harvey Place Reservoir infrastructure includes a spillway to comply with dam safety regulations. The spillway prevents water from over-topping the dam.

### 11.5.1 Project Description

The Indian Creek Reservoir spillway originally discharged to Indian Creek. This was permissible when the District utilized tertiary treatment at its wastewater treatment plant in South Lake Tahoe. However, with the construction of Harvey Place Reservoir, the Indian Creek Reservoir spillway configuration resulted in spillway discharge to Harvey Place Reservoir. This project involves the construction of a spillway channel for Indian Creek Reservoir that conveys reservoir spillage around Harvey Place Reservoir to Indian Creek. The project has an added benefit of intercepting stormwater flow entering the east side of Harvey Place Reservoir.

The length of the channel would be approximately 6,000 feet. The capacity of the channel as planned would match the existing capacity of the 24-inch diameter Indian Creek Reservoir outlet pipeline. Alternatively a detailed hydrological study could identify the probable maximum flood to establish the design capacity.

The conceptual cost for the Indian Creek Reservoir Spillway Channel is $0.9 million.

### 11.5.2 Project Considerations

Similar to Project No. 17 (page 11-84) project considerations for this project involve the likelihood of an uncontrolled release from Harvey Place Reservoir. The 1997 flood event created operational problems for the District that required a variance from the Lahontan Regional Water Quality Control Board for release of recycled water from Harvey Place Reservoir. Project implementation is a question of the likelihood of catastrophic flood events and the District's desire to increase its operational flexibility.

# Section 12: Fresh Water Management Projects

## 12.1 Water Right Management

West Fork of the Carson River water rights are the cornerstone of the freshwater irrigation, water quality improvement opportunities, and conjunctive use of resources and infrastructure in Alpine County. The water currently available for the recreational pool of Indian Creek Reservoir is transferred surface water rights from the District owned property in Diamond Valley. These rights are planned to be supplemented with other transferred rights in the future to provide a reliable source of water for the Indian Creek Reservoir fishery.

In addition to using agricultural water rights for Indian Creek Reservoir maintenance, the movement of freshwater through the system has great benefits to habitat quality and conveyance efficiency. By using the available storage and conveyance facilities to maximize the needs of multiple users many solutions to management objects can be developed.

An assessment and quantification of District owned water rights can be found in Appendix G - Water Rights. There are two freshwater management projects and implementation of each is contingent on the success of the District's current Hypolimnetic Oxygenation System project, and the District's ability to meet minimum water surface elevations in Indian Creek Reservoir.

## 12.2 Project No. 19 - Use of Mud Lake Winter Diversion for Indian Creek Reservoir Flushing Flow

This project addresses the purpose and need statement:

- PN-9. Ability to meet Indian Creek Reservoir water quality requirements is impaired and the District needs to meet TMDL requirements for the Indian Creek Reservoir.

Project No. 19 would divert winter flows in Indian Creek through Indian Creek Reservoir before reaching Mud Lake Reservoir in Nevada. The flushing flows would be diverted from Indian Creek via the Upper Dressler Ditch.

The construction of the Indian Creek Reservoir Hypolimnetic Oxygenation System project intends to help ensure water quality maintenance throughout Indian Creek Reservoir, preventing elevated phosphorus levels from polluting downstream water bodies. While Project No. 19 is a management project, it will require infrastructure improvements to increase flushing flows to Indian Creek Reservoir. The Upper Dressler Ditch conveyance Improvements (Project No. 15, page 11-82) address capacity and reliability issues of flow to Indian Creek Reservoir. This operational change has great promise as a means of improving water quality at the cost of agreement of parties and operation changes.

## 12.3 Project No. 20 - Storage of Water for Downstream Users

This project addresses the purpose and need statement:

- PN-9. Ability to meet Indian Creek Reservoir water quality requirements is impaired and the District needs to meet TMDL requirements for the Indian Creek Reservoir.

In an effort to maintain a higher recreational pool in Indian Creek Reservoir, water from transferred water rights can be stored in Indian Creek Reservoir for later use by downstream

users. It is currently difficult to reliably fill or replace losses in Indian Creek Reservoir during drought years. By storing water for later release, the pool elevation can be maintained longer in the season thereby increasing fishery habitat quality, and recreational opportunity.

Water releases from Indian Creek Reservoir can be conveyed to downstream users via Indian Creek and the East Fork of the Carson River.

Indian Creek Reservoir has capacity to provide seasonal storage for freshwater diverted from the West Fork of the Carson River and Indian Creek. As a means of providing freshwater resources later in the growing season, or in the winter months when the river is low, Alpine Decree water rights may be transferred to storage in Indian Creek Reservoir and released at a later time for agriculture or municipal and industrial demands.

This process could require approval by the U.S. District Court Water Master, and the Nevada State Engineer. The negotiations require the determination of conveyance paths and transmission losses, and demonstrate that storage operations would not hinder existing water rights holders, or violate provisions of the Decree. Additionally, reviews in other Federal Courts may be required.

## 12.4 Potential Temporary and Permanent Freshwater Right Transfers

Transfer of District freshwater rights from Diamond Valley Ranch to Indian Creek Reservoir allows for increased operational flexibility. For example, a temporary transfer of water rights could occur with approvals during construction of the irrigation fields in Diamond Valley. In addition, if a rancher applying recycled water opts out of his agreement, an increase in recycled water application could occur on Diamond Valley Ranch and the District could possibly transfer water rights from the ranch to Indian Creek. Finally, for wet year seasonal cycles, recycled water could be removed from Harvey Place Reservoir to keep it from overflowing and could be applied to Diamond Valley Ranch; this also could result in a temporary transfer of water rights from the ranch to Indian Creek Reservoir. A permanent transfer of water rights from Diamond Valley Ranch to Indian Creek Reservoir could occur when the ranch is converted fully to recycled water irrigation.

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# Section 13: Master Plan Implementation and Summary Recommendations

The Master Plan is a guidance manual to provide the District with ideas for infrastructure and management projects to be implemented to keep pace with the changing environment in the Lake Tahoe Basin and Alpine County.

Implementation of master plan projects will adhere to and comply with the standard practices and the Mitigation and Monitoring Plan provided in Appendix D of the Certified Environmental Impact Report accompanying this master plan. The standard practices are based on existing and on-going District policies and programs or are required by law. The standard practices are detailed in Appendix D of the Certified Environmental Impact Report and include the following 35 separate standard practices.

SP-1 Dam Safety
SP-2 Standard Traffic Control Procedures
SP-3 Emergency Response Vehicles Will Not be Impacted
SP-4 Maintain Maximum Number of Open Lanes on Roadways
SP-5 Avoid Traffic Disruption on Major Highways
SP-6 Fence or Cover Trenches
SP-7 Access to Businesses and Residences
SP-8 Repair Road Damage and Revegetate Temporarily Disturbed Areas
SP-9 Park Within Construction Easements
SP-10 Limit Ingress/Egress of Construction Equipment
SP-11 Erosion Control/Stormwater Pollution Prevention Plan
SP-12 Standard Noise Control Practices - Construction Phase
SP-13 Standard Noise Control Practices - Operation Phase
SP-14 Standard Air Quality Practices - Construction Phase
SP-15 Standard Air Quality Practices - Operation Phase
SP-16 Slope Stabilization Design
SP-17 Pipeline Design Features in Active Fault Zones
SP-18 Liquefaction Stabilization Design
SP-19 Standard Engineering Methods for Expansive Soils
SP-20 Standard Engineering Methods for Corrosive Soils
SP-21 Temporary Containment and Impoundment Siting Design
SP-22 Mosquito Prevention
SP-23 Delineate Wetlands, Waters of the United States, and Riparian Habitat
SP-24 Prepared Wetland and Riparian Mitigation and Monitoring Plan
SP-25 Sensitive Resource Program
SP-26 Sensitive Plant Projection
SP-27 Avoid Impacts to Wetland and Riparian Habitats
SP-28 Remove Weak Surficial Deposits from Basin Footprints
SP-29 Management of Hazardous Materials/Waste During Construction
SP-30 Pre-Construction Surveys for Nesting Raptors and Wildlife Nurseries
SP-31 Pre-Construction Marking and Fencing of Sensitive Native Plant Communities
SP-32 Pre-Construction Marking and Fencing of Wetlands and Riparian Habitat
SP-33 Surface and Groundwater Protection Plan
SP-34 Application of Temporary Containment Infrastructure Maintenance and Monitoring
SP-35 Conveyance Infrastructure Maintenance Plan

The Master Plan projects include three classifications, namely recommended projects, contingent projects and future projects as described in Section 8.

A Decision Tree presented in Figure 13.1 (at the end of Section 13) lists project implementation considerations based on various triggers to compensate for increased recycled water production, changes in available application areas for recycled water, or changes in application rates resulting from application technology or regulations. There are three trigger mechanisms discussed in greater detail in the following subsections.

This section also includes a capital improvement plan for construing the recycled water infrastructure projects, and a description of the future projects identified in the Master Plan. Lastly, a list of summary recommendations is provided.

## 13.1 Development Triggered Project Implementation

Development triggered project implementation includes projects that result in additional lands being used as application areas as well as application of technology projects that increase the amount of water consumed on an acre-feet per acre basis. The latter project type includes high water consuming projects, where the increased application areas include the use of the Diamond Valley property, expansion of Alpine County agricultural lands, and export of excess recycled water to Nevada.

The potential for loss of application areas in Alpine County is difficult to assess. With the proper incentive for contract irrigators to use the recycled water and maintain existing ranching practices, it is possible to lose very little of the existing application areas. However, with the trend of large ranches being fragmented into smaller, less efficient ranches, and the prospect of ranches being more valuable as semi-rural home sites, the potential for the development of the application areas exists.

The Decision Tree, Figure 13.1 (at the end of Section 13), indicates several directions for development triggered project implementation. The first and easiest to implement is the expansion of recycled water application in Diamond Valley, including the recycled water required to support the irrigation fields. An acre of application area lost from the system results in an approximately 3.25 acre-feet annual additional direct land application requirement that needs to be developed in the system. The 3.25 acre-feet per year direct land application rate is an assumed rate used for planning purposes in this Master Plan and can be verified through the preparation of Nutrient Management Plans. For comparison purposes Table 13.2, (page 13-93) Annual Flow and Application Acreage Data, develops values using a range of other possible application rates.

## 13.2 Recycled Water Production Triggered Project Implementation

Data provided in Section 5 indicate an increase in recycled water production in the next 20 years. The following summarizes recycled water volumes, the acreage required for direct application to land, and the corresponding surplus or deficiency for the years 2008 and 2028.

Year 2008

- Harvey Place Reservoir Release: 4,738 Acre-feet
- Acreage Required for Direct Land Application: 1,458 Acres
- Application Land Deficiency: 3 Acres (based on a 3.25 acre-feet/acre/year recycled water application rate

Year 2028

- Harvey Place Reservoir Release: 5,848 Acre-feet
- Acreage Required for Direct Land Application: 1,799 Acres
- Application Land Deficiency: 344 Acres (this stated deficiency does not include the potential acreage for irrigation with recycled water at the Diamond Valley Ranch

The annual peak recycled water outflow from Harvey Place Reservoir was 4,738 acre-feet in 2007 and is estimated to increase to 5,848 acre-feet by 2028 (See Tables 13.1 and 13.2, page 13-93). Using a planning application rate of 3.25 acre-feet per acre per year, 1,458 acres are required for recycled water application in the year 2008 while 1,799 acres are required in the year 2028.

Currently (2008) recycled water is being applied to 1,455 acres of 1,883 permitted acres. Sufficient application acreage is not currently available (1,455 acres actual versus 1,458 acres needed); the direct land application deficiency is projected to increase by 2028 (1,455 acres actual versus 1,799 acres needed). Sufficient application acreage is available in 2028 if additional permitted acreage is utilized (1,883 acres permitted versus 1,799 acres needed), however, utilization of additional permitted acreage may be difficult due to topographical land constraints.

To determine application volumes for the blended water irrigators Bruns, Gansberg and Neddenriep, an estimate was made of the delivery of the ranchers' water rights on the West Fork of the Carson River. The available water supply from the West Fork was estimated using data from the USGS gauging station at Woodfords (Appendix C), and compared to the cumulative West Fork water right allotments (Appendix G). Ranchers whose water rights fall below average river flow matches of the cumulative column for a given month of the irrigation season do not receive water for that month. The delivery volumes are summarized in Appendix G.

The above evaluation does not account for application of blended water or the 20% additional capacity desired by the District.

Four ranches currently blend fresh water with recycled water which increases the amount of recycled water runoff. A summary of blending practices per ranch is shown in Table 13.3 (page 13-94). An estimate of the average amount of fresh water available to the four ranches is 2,643

acre-feet (see Appendix D). Assuming a worst case scenario that all freshwater available is delivered with no losses and that a tailwater collection system exists, the additional 2,643 acre-feet of blended water would require an additional application area of 816 acres, using the planning value of 3.25 acre-feet per acre per year application factor. The additional 816 acre requirement means the existing actual application acreage is deficient by 816 acres and the needed 2028 application acreage is deficient by 1,157 acres when blending water is considered.

**Table 13.1 - Acreage and Recycled Water Application Data by Ranch (Current)**

| Ranch | Total Acreage | Permitted Recycled Water Application Acreage | Current Recycled Water Application Acreage | Current Recycled Water Supply Permitted by LRWQCB (AF/year) | Recycled Water Unblended Usage Applying 3.25* AF/Acre (AF/year) | Recycled Water Unblended Application Rate Using Maximum Allotted Supply (AF/year) | Freshwater Right Long-Term Average (AF/year) | Average Blended Water Volume (AF/year) |
|---|---|---|---|---|---|---|---|---|
| Bruns | 570 | 170 | 140 | 650 | 455 | 4.64 | 710 | 1165 |
| Gansberg | 863 | 505 | 500 | 650 | 1625 | 1.30 | 589 | 2214 |
| Neddenriep | 458 | 458 | 458 | 650 | 1489 | 1.42 | 1344 | 2833 |
| Ace Hereford | 933 | 250 | 190 | 650 | 618 | 3.42 | | |
| Celio | 228 | 100 | 47 | 200 | 152 | 4.26 | | |
| Brooke (includes On-Farm) | 732 | 400 | 120 | 800 - 2000 | 390 | 16.67 | | |
| TOTAL | 3784 | 1883 | 1455 | NA | 4729 | NA | 2643 | 6212 |

* Application rate assumed value for planning purposes.

**Table 13.2 - Annual Flow and Application Acreage Data**

| Assumed Application Rate (Acre-Feet/Acre/Year) Item | 2.5 | 3.0 | 3.25 | 4.0 |
|---|---|---|---|---|
| Harvey Place Reservoir Inflow 2006 (AF/year) | 4873 | 4873 | 4873 | 4873 |
| Harvey Place Reservoir Inflow 2028 (AF/year) | 6498 | 6498 | 6498 | 6498 |
| Harvey Place Reservoir Outflow 2006 (AF/year) | 4738 | 4738 | 4738 | 4738 |
| Harvey Place Reservoir Outflow 2028 (AF/year) | 5848 | 5848 | 5848 | 5848 |
| Permitted Application Acreage (Acres) | 1883 | 1883 | 1883 | 1883 |
| Current Application Acreage (Acres) | 1455 | 1455 | 1455 | 1455 |
| Application Acreage Required 2007 (Acres) | 1895 | 1579 | 1458 | 1185 |
| Actual Application Acreage 2007 Surplus (Acres) | -440 | -125 | -3 | 270 |
| Application Acreage Required 2028 (Acres) | 2339 | 1949 | 1799 | 1462 |
| Permitted Application Acreage 2028 Surplus (Acres) | -456 | 66 | 84 | 421 |
| Actual Application Acreage 2028 Surplus (Acres) | -884 | -494 | -344 | -7 |
| Fresh Water Additional Application Acreage Required (Acres) | 1057 | 881 | 813 | 661 |
| Application Acreage Required for Blended Water in 2007 | 2952 | 2460 | 2271 | 1846 |
| Actual Blended Water Application Acreage Surplus in 2007 | -1497 | -1005 | -816 | -391 |
| Application Acreage Required for Blended Water in 2028 | 3396 | 2830 | 2612 | 2123 |
| Actual Blended Water Application Acreage Surplus in 2028 | -1941 | -1375 | -1157 | -668 |

** Does not include District owned Diamond Valley Ranch with 900 available application acres.

Tables 13.1 and 13.2 do not include District-owned Diamond Valley Ranch with 900 acres available for recycled water application.

**Table 13.3 - Annual Blended Water Application per Ranch**

| Rancher Name | AVERAGE Total Freshwater Delivered per Irrigation Season (AF) | Current Allotted Recycled Water Supply (AF) | Estimated Average Total Blended Water Volume (AF) | Area Needed for Direct Land Application of Blended Water* (Ac) | Total Permitted Area (Ac) | Area Deficit/Surplus (Ac) | Tailwater Volume (AF/Yr) |
|---|---|---|---|---|---|---|---|
| Bruns | 710 | 650 | 1360 | 419 | 170 | 249 (Deficit) | 808 |
| Gansberg | 589 | 650 | 1239 | 381 | 505 | 124 (Surplus) | 0 |
| Neddenriep | 1344 | 650 | 1994 | 614 | 458 | 156 (Deficit) | 505 |
| **Rancher Name** | **MINIMUM** Total Freshwater Delivered per Irrigation Season (AF)** | **Current Allotted Recycled Water Supply (AF)** | **Estimated Minimum Total Blended Water Volume (AF)** | **Area Needed for Direct Land Application of Blended Water* (Ac)** | **Total Permitted Area (Ac)** | **Area Deficit/Surplus (Ac)** | **Tailwater Volume (AF/Yr)** |
| Bruns | 176 | 650 | 826 | 254 | 170 | 84 (Deficit) | 273 |
| Gansberg | 288 | 650 | 938 | 289 | 505 | 216 (Surplus) | 0 |
| Neddenriep | 660 | 650 | 1310 | 403 | 458 | 55 (Surplus) | 0 |

* An application rate of 3.25 AF/Acre was assumed for planning purposes to determine the area needed for direct land application of the blended water on each ranch.
** *The available fresh water supply from the West Fork was estimated using the USGS gaging station at Woodfords, and compared to the cumulative West Fork water right allotments. The Alpine Decree is the basis of the water rights presented. Rights that fall below where the river flow matches the cumulative column do not receive water. Table 1 of Appendix C of the Master Plan presents the average annual hydrograph for the West Fork at Woodfords based on data from 1938 to 1999, as well as the hydrograph for the driest year (1977). These data were used to develop the estimated average and minimum freshwater volume delivered, respectively, per month of the irrigation season, as shown above.

## 13.3 Regulation Triggered Project Implementation

Regulation may trigger additional application site development or the creation of high use projects such as wetlands, and sprinkler irrigation systems. Currently regulatory requirements are not insisting on a change to the distribution and application system, although it is recognized that buffer zones, tail water, and open conveyances need to be addressed as the population living in proximity to application areas increases.

The single greatest change in recycled water irrigation area could result from the implementation of restrictive use setbacks defined in Title 22 of California Water Code (see section 6.2.2, page 6-43). In addition, a basin-wide Nutrient Management Plan, which may be required by California's proposed Recycled Water Policy, could modify recycled water application rates and possibly result in the need for additional lands for the District's management of recycled water.

## 13.4 Diamond Valley Land Use Strategies

The District's acquisition of the Diamond Valley Ranch should assist the District in realizing long-term security and flexibility in meeting future recycled water direct land application needs. Aside from additional groundwater monitoring wells, the first project to be implemented in Diamond Valley should be the irrigation fields (Section 9.1, page 9-61). If the state regulation of preparing Nutrient Management Plans reduces the application rate from the planning value of 3.25 acre-feet per acre per year, more irrigation lands may be needed to manage all of the recycled water on an annual basis.

Initially this facility is planned to be supported with freshwater resources diverted from the West Fork of the Carson River, or from existing springs on the property. As the need for recycled water application areas increases, resulting from production, regulatory, or development triggers, this facility can be irrigated with recycled water. As shown in Figure 13.1, Contingent Project Decision Tree (at the end of Section 13), additional lands may be utilized for recycled water irrigation to complement the land lost to development or regulations and recycled water production increase.

## 13.5 Potential Future Master Plan Projects

The Recycled Water Facilities Master Plan includes six projects that may possibly be implemented in the future. The implementation of these projects is contingent on various factors affecting District operations and changed conditions in the future. Implementation costs and potential revenue are not developed for components listed in the "future" category. These components are considered to be concepts at this time.

### 13.5.1 Develop Recycled Water Wholesale Program

Implementation of a recycled water wholesale program would provide revenue to the District and offset the District's costs associated with recycled water infrastructure improvements and system operation and maintenance. The recycled water would be sold to each user by the District or the District would wholesale the water to parties who in turn would distribute the water to each individual user.

To implement a recycled water wholesale program an accounting and billing system would have to be developed. Additional flow monitoring and flow totalizing meters would be installed for more accurate metering of recycled water volumes for billing purposes. No revenue analysis

has been performed for future projects of this Master Plan, therefore an estimate of the potential revenue is not provided. No regulatory permit issues are anticipated with the implementation of this future project.

Implementation of this project may compromise the system's reliability with regard to distribution of a known volume of recycled water if users refuse to pay. Additionally, the District's flexibility with regard to maintaining a consumer base of multiple users could be impacted. On the other hand, by receiving income for the use of recycled water, the District would have increased flexibility with regard to selecting and implementing system improvements.

### 13.5.2 Biosolids Composting

This project could include a future facility on the Diamond Valley Ranch that could enable the District to compost the biosoilds generated from its South Lake Tahoe wastewater treatment plant. The application of biosoilds to land is subject to environmental regulations. The long term disposal of the District's biosoilds is primarily an issue related to treatment plant operations. By including this project as a portion of the Master Plan the District reserves the opportunity to implement it; however, additional CEQA environmental documentation will be required.

### 13.5.3 Become a Water Rights Buyer/Broker

In this project the District could assume the role of a water rights buyer/broker with the ability to acquire surface water right entitlements for support of Indian Creek Reservoir, and remove or maintain land in production. The District already owns considerable freshwater rights that represent real value. The District could also become a water rights seller or leaser to receive benefit from the inherent value of the water rights it owns.

### 13.5.4 Power Generation

Electrical power generation was raised as a potential concept for evaluation during the initial phase of Master Plan development. Analysis was conducted to establish and evaluate potential sites for power generation facilities, the use of the electrical power supply generated, and the methods, feasibility, usefulness, overall cost and payback period for implementation.

Two general alternatives were developed regarding the site for power generation. One alternative included multiple power stations along the length of the C-Line located such that pipeline pressures remained less than 150 psi. The second alternative consisted of a single power generation station located near the terminus of the C-Line. This alternative resulted in pipeline pressures exceeding 900 psi. Both alternatives were based on the use of turbines for power generation.

Two general alternatives were developed regarding the use of the power generated. The first called for selling the power generated to the Sierra Pacific Power Company and feeding the generated power into the local electrical power supply grid. The other alternative called for District self-use of the power generated. In the second alternative electrical power conductors could be installed with C-Line replacement construction. The conductors could carry the generated power back to the Tahoe Basin for District use to offset electrical power costs for operation of the pump stations for the A-Line and B-Line.

An economic analysis was conducted of the alternatives developed. The power generation alternative was rejected because of numerous factors. The primary reason for the rejection was that the payback period exceeded 30 years. That is, it would require more than 30 years for the

District to realize an economic benefit from the capital expenditure required to implement power generation. Another reason for rejection was the considerable cost involved. Without funding assistance the capital costs were too high for the District to absorb.

Other factors worked against the concept of power generation. The regulations pertaining to supplying power to the electrical power supply grid were unfavorable for some power generators. The efficiency of the available equipment was insufficient. The task of reconstructing the C-Line is daunting and not required due to pipeline condition at this time.

The concept of power generation is categorized as a Master Plan concept that has potential for implementation in the future and should be revaluated with future updates of the Master Plan. Regulatory and technological changes may someday favor the possibility of District power generation.

### 13.5.5 Extend the C-Line to the State Line

The C-Line is an existing 20-inch diameter pipeline conveying the District's recycled water from Luther Pass to the Harvey Place Reservoir. The C-line receives recycled water from the A-Line and B-Line located within the Lake Tahoe Basin, and generally follows the West Fork of the Carson River from Hope Valley.

Extending the C-Line to the Nevada State Line is a future project that may or may not be implemented based on numerous contingencies and issues. If, due to loss of existing land irrigating with recycled water, the District needs to find additional land for irrigation use of its recycled water, then the irrigators in Nevada represent an opportunity to the District for those additional lands to be irrigated with recycled water.

The C-Line currently is aligned along CA Highway 88. Near Woodfords the C-Line turns southeast to convey recycled water to the Harvey Place Reservoir. The C-Line extension project would begin near Woodfords and extend to the Nevada State Line. The length of the C-Line extension could be reduced if the District owned the Diamond Ditch or had permission for its use to convey recycled water to Nevada. In this case the C-Line extension project would begin near the Paynesville Bridge. The C-Line extension could be aligned in combination of old and new CA Highway 88 right of way.

The pipeline diameter of the C-Line extension would most likely match the diameter of the existing C-Line. If this project is implemented, a more detailed analysis needs to be conducted to identify potential alignments, size the pipeline and evaluate pressure conditions. The project would require environmental review and documentation prior to bidding and construction. In addition, an agreement would have to be secured with Nevada irrigators for winter storage of the recycled water, otherwise additional infrastructure would need to be considered to allow continued storage in Harvey Place Reservoir during the off-season.

### 13.5.6 Injection Well Program

In water resource management, an injection well is a well used to inject water into the groundwater aquifer as opposed to extracting water from the aquifer. Injection wells provide artificial recharge of the groundwater aquifer. Surface water and treated wastewater are used as the source water for injection wells. The quality of the water and the injection location and depth are key factors in an injection well program. The quality of the water must not degrade the existing water of the aquifer and the injection location and depth determine the functionality and usefulness of the injection well.

In the future, the District could possibly implement an injection well program for it's recycled water. Implementation would depend on various factors including insufficient sites for land application of the recycled water, the quality of the treated wastewater discharged by the District's treatment facility, and cost/benefit considerations. The benefit of an injection well program for the District is primarily another method of managing its recycled water. An injection well program would also have an environmental benefit of recharging groundwater.

The Diamond Valley Ranch is a good candidate for injection well sites. A pipeline extending from the existing C-Line would be needed to convey water to injection well site(s). The quality of the recycled water would need to be improved to implement an injection well program and the program would have to be permitted by the Lahontan Regional Water Quality Control Board. Groundwater transmission studies would be necessary to evaluate, design and estimate the effectiveness of the injection well program.

An injection well program would be developed only if sufficient land is unavailable for irrigation with recycled water. Disadvantages include the significant capital expenditure required to implement the program (including treatment plant improvements and injection well construction) and the project generates no revenue for the District.

## 13.6 Decision Tree and Causal/Direct Effects

Figure 13.1, Contingent Project Decision Tree, lists projects whose implementation is contingent upon application of a trigger or completion of another project. Project 1, Irrigate Diamond Valley Ranch with recycled water, is a recommended project and is included for continuity. Several future projects are also included to provide additional project options. Future master plan projects shown are: Project 7 (District Pasture Subsurface Irrigation Pilot Project), Injection Wells and Extend the C-Line to Nevada. The Decision Tree lists both recycled water and fresh water triggers. A trigger is described as a change of current conditions. The Decision Tree shows projects arranged in four tiers. Tier 1 projects are considered more likely for initial installation than the remaining tiered projects as they can be easily implemented and will provide needed system improvements.

Selection of any project from the Decision Tree for implementation should not be based solely upon the Decision Tree but upon all current information known by the District which may impact their operations.

Tier 1 contingent projects include: Project 14, Snowshoe Thompson No. 1 conveyance capacity improvements and Project 17, Diversion Ditch for Stormwater Flow away from Harvey Place Reservoir and to Indian Creek Reservoir. Project 14 is a freshwater project which could be implemented when impacted by any of the following three triggers: 1) Capacity and reliability of the freshwater conveyance system is compromised, 2) water surface elevation in Indian Creek Reservoir is not being met consistently and 3) Hypolimnetic Oxygenation System does not improve Indian Creek Reservoir water quality. Project 17 is identified as a recycled water project and could be implemented by the trigger involving Harvey Place Reservoir storage capacity concerns.

Tier 2 projects include Project 8 (West Fork Pipeline) which could utilize the upper Fredericksburg roadway alignment to distribute recycled water to lands west of the West Fork of the Carson River. This project would probably be implemented if irrigation of Diamond Valley Ranch with recycled water was already maximized. Another Tier 2 project is Project 10 (Wade Valley Pipeline), from Diamond Valley to the waterfall pipeline forebay and installation of a

pipeline from the beginning of the Wade Valley Pipeline to the Harvey Place Reservoir Outlet Pipe. This project could be triggered by the Economic Benefit Trigger if it is desired to make recycled water available to irrigators in Nevada. Project 10 could also be initialized if the trigger, continued erosion of recycled water conveyances, occurs or if ranches prohibit use of the Diamond Ditch for recycled water conveyance to Nevada. The future Master Plan Project, Extend C-Line to Nevada, is also included in the Decision Tree and works in conjunction with Project 13 (make recycled water available to irrigators in Nevada).

Tier 2 projects also include Project 18 (Indian Creek Reservoir Spillway Channel), which could be triggered by Harvey Place Reservoir storage capacity concerns, and freshwater Project 15 (Upper Dressler Ditch Conveyance Improvements). Project 15 could be triggered by completion of Project 14 (Snowshoe Thompson No. 1 Conveyance Capacity Improvements), or by Upper Dressler Ditch erosion concerns. If after Project 15 (Upper Dressler Ditch Conveyance Improvements) is installed and Indian Creek Reservoir TMDL limits are not being met, implementation of Project 19 (use of Mud Lake winter flows for Indian Creek Reservoir flushing) may be necessary. In addition, if Indian Creek Reservoir minimum elevation requirements are not being met then implementation of Project 20 (storage of water in Indian Creek Reservoir for downstream users) may also be necessary.

Project 9 (On-Farm pipeline), to distribute recycled water to lands east of the West Fork of the Carson River, is a Tier 3 project which might be installed if excess recycled water is available after installation of Project 8 (the West Fork pipeline)

Tier 4 Projects include recycled water project 7 (District Pasture Subsurface Irrigation Pilot Project) and a future project (injection wells). These projects might be necessary if excess recycled water remains after installation of Project 9 (the On-Farm Pipeline). The Tier 4 Project 16 (Indian Creek Treatment Wetlands) might also be implemented if the Hypolimnetic Oxygenation System project currently underway does not improve Indian Creek Reservoir water quality. Water discharged from Indian Creek Reservoir would receive additional treatment downstream of Harvey Place Reservoir if Project 16 is implemented.

## 13.7 Conceptual Project Cost

A summary of Conceptual Costs for Master Plan Projects is shown in Table 13.4 (Page 13-100). The cost estimates are based upon the project concepts developed within this Master Plan and should be considered conceptual costs. Actual project costs may vary from the costs shown.

**Table 13.4: Conceptual Costs for Master Plan Projects[1]**

(Note: All costs are in Millions)

| Project No. | Project | Materials Cost[2] | Installation Cost[3] | Subtotal | ±30% Contingency | Subtotal | Total[4] | Project Type | Section in Master Plan |
|---|---|---|---|---|---|---|---|---|---|
| 1 | **Recycled Water Irrigation Fields on Diamond Valley Ranch** | 0.92 | 1.0 | 1.92 | 0.58 | 2.50 | 3.50 | Recommended | 9.1 |
| 2 | **Harvey Place Reservoir Bypass Pipelines** | 0.97 | 3.8 | 4.77 | 1.43 | 6.20 | 8.68 | Recommended | 9.2 |
| 3 | **Diamond Valley Ranch Irrigation Fields Pump Back Station** | 0.06 | 0.3 | 0.36 | 0.11 | 0.47 | 0.66 | Recommended | 9.3 |
| 4 | **Diamond Valley Freshwater/Recycled Water Irrigation System** | | | | | | | Recommended | 9.4 |
| | Phase 1: Irrigation Fields Facility Irrigation | 0 | 0 | 0 | 0 | 0 | 0 | | |
| | Phase 2: Diamond Valley Irrigation Distribution Network | 0.32 | 0.7 | 1.02 | 0.31 | 1.33 | 1.86 | | |
| | Phase 3: Irrigation of the Jungle | 0.48 | 1.1 | 1.58 | 0.48 | 2.06 | 2.88 | | |
| 5 | **Diamond Ditch Conveyance Improvements** | 0.13 | 0.5 | 0.63 | 0.19 | 0.82 | 1.15 | Recommended | 9.5 |
| 6 | **Waterfall Pipeline Forebay and Pipeline** | 0.27 | 0.8 | 1.07 | 0.32 | 1.39 | 1.95 | Recommended | 9.6 |
| | | | | | | **Recommended Projects Subtotal** | **$ 20.68** | | |
| 7 | **District Pasture Subsurface Irrigation System Pilot Project** | 0.07 | 0.17 | 0.24 | 0.07 | 0.31 | 0.44 | Contingent | 9.7 |
| 8 | **West Fork Pipeline[5]** | | | | | | | Contingent | 9.8 |
| | Alternate Alignment 1 - Fredericksburg Rd | 0.42 | 2.1 | 2.52 | 0.76 | 3.28 | 4.59 | | |
| | Alternate Alignment 2 - Highway 88 | 0.45 | 2.3 | 2.75 | 0.83 | 3.58 | 5.01 | | |
| | Alternate Alignment 3 - Chambers Ln | 0.49 | 2.5 | 2.99 | 0.9 | 3.89 | 5.44 | | |
| 9 | **On-Farm Pipeline** | 0.26 | 1.3 | 1.56 | 0.47 | 2.03 | 2.84 | Contingent | 9.9 |
| 10 | **Wade Valley Pipeline** | 0.29 | 1.4 | 1.69 | 0.51 | 2.2 | 3.08 | Contingent | 9.10 |
| See note (6) | | | | | | | | | |
| 14 | **Snowshoe Thompson No. 1 Conveyance Capacity Improvements** | 0.33 | 1.3 | 1.63 | 0.49 | 2.12 | 2.97 | Contingent | 11.1 |
| 15 | **Upper Dressler Ditch Conveyance Improvements** | 0.38 | 1.0 | 1.38 | 0.41 | 1.79 | 2.51 | Contingent | 11.2 |
| 16 | **Indian Creek Treatment Wetlands** | 0.17 | 0.3 | 0.47 | 0.14 | 0.61 | 0.86 | Contingent | 11.3 |
| 17 | **Ditch Diversion for Stormwater Flow Away from Harvey Place Reservoir and to Indian Creek Reservoir** | 0.04 | 0.2 | 0.24 | 0.07 | 0.31 | 0.44 | Contingent | 12.2 |
| 18 | **Indian Creek Reservoir Spillway Channel** | 0.09 | 0.4 | 0.49 | 0.15 | 0.64 | 0.89 | Contingent | 12.3 |
| | | | | | | **Contingent Projects Subtotal** | **$ 29.07** | | |
| | | | | | | **Total** | **$ 49.75** | | |

(1) Costs shown in Table 13.4 are rounded and are based upon 2008 dollars.
(2) Includes taxes at 7.75%.
(3) Includes contractor OH&P at ±15%.
(4) Includes ±40% for detailed facility planning, engineering, permitting, environmental documentation and construction administration.
(5) For the purposes of Table 13.4, the Fredericksburg Road alignment of the West Fork Pipeline is assumed to be the most likely to be constructed and is therefore the only West Fork Pipeline cost included in the contingent projects subtotal.
(6) Projects 11, 12 and 13 are management projects, the conceptual cost for which is not shown.

## 13.8 Capital Improvement Plan

The Master Plan includes a total of 20 projects, in addition to six projects to potentially be implemented in the future (refer to Figure 8.1, located at the end of Section 8, which depicts all of the 20 Master Plan projects). Of these 20 projects, eight of them are recommended to be implemented as soon as possible and 12 of them are contingent projects that may or may not be implemented depending upon various trigger mechanisms. Of the eight recommended projects there are four that should be constructed in order to resolve the issue of the inadequacy of the On-Farm emergency disposal system. The implementation of these four projects has other benefits to the District discussed later in this section. The four projects recommended to be constructed in the near future include the following.

(1) Project No. 1 - Recycled Water Irrigation Fields on Diamond Valley Ranch
(2) Project No. 2 - Harvey Place Reservoir Bypass Pipelines
(3) Project No. 3 - Diamond Valley Ranch Irrigation Fields Pump Back Station
(4) Project No. 4 - Diamond Valley Freshwater / Recycled Water Irrigation System

The other four projects should be constructed as the need arises and funds become available. Table 13.5 shows a capital improvement plan for the implementation of the three projects recommended to be constructed.

**Table 13.5: Capital Improvement Plan**

| Project No. | Project Description | Construction Period | Approximate Project Cost (M$) |
|---|---|---|---|
| 2 | HPR Bypass Pipelines (C-Line Bypass Portion) | First Summer | 1.0 |
| 1 | Center Pivot Irrigation Fields (3 of 5) | Second Summer | 1.5 |
| 1 | Two Irrigation Fields Using Surface Irrigation | Third Summer | 1.0 |
| | | Total | 3.5 |

*The Irrigation of the Jungle is considered to be an additional phase of the Diamond Valley Ranch irrigation system and therefore this cost is not included in Table 13.5.

Project No. 1 is the Irrigation Fields on Diamond Valley Ranch. Project No. 3 includes the pump back station that is planned to be used to pump the emergency stored water back to the Harvey Place Reservoir and to the Diamond Ditch after construction of Project No. 2.

Project No. 2 is the Harvey Place Reservoir Bypass Pipeline Project. The Harvey Place Reservoir bypass pipeline is planned to connect to the C-Line near the District Pasture and extend to the Irrigation Fields. The Harvey Place Reservoir bypass line is planned to connect to the Harvey Place Reservoir /Irrigation Field Connector pipeline allowing for a second method of flow entering the Harvey Place Reservoir or the Diamond Ditch. Once the construction of Project No. 3 is complete, the irrigation fields can be emptied to either the Harvey Place Reservoir or the Diamond Ditch.

With completion of Project No. 1 and 2 there will be additional acreage for direct land application of recycled water which is another benefit to the District. This acreage could be used to offset any existing irrigated land that may be lost to development or other causes. The application of recycled water on Diamond Valley Ranch will require a permit from the Lahontan Regional Water Quality Control Board which is a recommendation of the Master Plan. Project No. 4 (Diamond Valley Freshwater / Recycled Water Irrigation System) could also provide land for

application of recycled water in the event additional land is lost that is currently irrigated with recycled water.

## 13.9 Summary Recommendations

The Master Plan and its Appendices include numerous recommendations. This section provides a summary of the recommendations which include general recommendations, recommendation for Master Plan projects to be implemented in the near future, groundwater monitoring recommendations, land and easement recommendations, and recommendations for projects with contingent implementation.

### 13.9.1 General Recommendations

1) Adopt the Master Plan

It is recommended that the District's Board of Directors adopt the Recycled Water Facilities Master Plan and the associated Environmental Impact Report, to secure environmental approval and secure regulatory approval to implement the projects of the Master Plan.

2) Prepare Master Plan Addendum After Completion of NMPs

It is recommended the District prepare an addendum to the Master Plan after completion of Nutrient Management Plans (NMP). The addendum would primarily address the impacts on land application needs for recycled water based on application rates identified in the NMPs.

3) Master Plan Updating

The District should reevaluate the Master Plan every 5 years, including rancher agreement negotiations, to address changed conditions.

4) Do Not Exceed 0.8% Channel Slopes

It is recommended that no new unlined open channels be constructed with slopes of 0.8 percent or greater. Furthermore, if erosion continues to be a problem or if channel flows increase, it is recommended that the District consider replacing all existing unlined channel sections with slopes of 0.8 percent or greater with lined channels or pipelines.

### 13.9.2 Recommended Projects for Implementation in the Near Future

The following projects are recommended to be implemented in the near term (in other words, in the next five to eight years). Included project types are for recycled water infrastructure, recycled water management, and freshwater management projects.

#### 13.9.2.1 Recycled Water Infrastructure Project Recommendations

1) Abandon the On-Farm Recycled Water Emergency Disposal Site

An investigation of the integrity, functionality and feasibility of the On-Farm facility was conducted. Based on location, soils characteristics, regulatory compliance, required maintenance and ease of use, it is recommended that the District relocate their primary emergency disposal facility to the Diamond Valley Ranch in the form of a temporary storage facility and abandon in-place the On-Farm system.

2) Construct Project No.'s 1, 2, 3, 4, 5, and 6

Construct project numbers 1, 2, 3, 4, 5 and 6 of the Master Plan. Construction of the other recycled water infrastructure projects of the Master Plan are contingent upon various triggers. The projects recommended to be constructed include the following.

a. Project No. 1 - Recycled Water Irrigation Fields on Diamond Valley Ranch
b. Project No. 2 - Harvey Place Reservoir Bypass Pipelines
c. Project No. 3 - Diamond Valley Ranch Irrigation Fields Pump Back Station
d. Project No. 4 - Diamond Valley Freshwater / Recycled Water Irrigation
e. Project No. 5 - Diamond Ditch Conveyance Improvements
f. Project No. 6 - Waterfall Pipeline Forebay and Pipeline

### 13.9.2.2 Recycled Water Management Project Recommendations

1) Investigate Acquisition of the Diamond Ditch

It is recommended the District evaluate the possibility of securing ownership of the Diamond Ditch and determine the benefits and liabilities that ownership entails.

2) Evaluate All Recycled Water Conveyance Adjacencies and Crossings of the West Fork of the Carson River

It is recommended that the District evaluate liabilities of the existing recycled water conveyance facilities adjacent to and crossing the West Fork of the Carson River. These include bridge crossings, inverted siphons, and nearby ditches. If liabilities of concern are found, the District should take action to mitigate the liabilities.

3) Utilize 3.25 acre-feet per acre per year Irrigation Application Rate Until Completion of Nutrient Management Plan(s)

All lands receiving the District's recycled water in Alpine County including potential future users should be based on the planning value application rate of 3.25 acre-feet per acre per year unless modified by a formal Nutrient Management Plan.

4) Prepare Nutrient Management Plans

Project No. 11 of the Master Plan, Prepare Nutrient Management Plans, is recommended to be implemented because it will establish the appropriate recycled water application rate for each of the contract irrigator ranches. Although the State of California proposed Recycled Water Policy may only require preparation of a basin-wide Nutrient Management Plan, it is in the District's best interest that the District prepare the Nutrient Management Plans in coordination with each contract irrigator and educate the contract irrigators of the requirements of the Nutrient Management Plan. The Nutrient Management Plan recycled water irrigation application rate information can be used to modify the "effluent contract" for each contract irrigator and in turn, each contract irrigator's Lahontan Regional Water Quality Control Board permit for application of recycled water.

5) Secure Permit for Irrigating the Diamond Valley Ranch with Recycled Water

It is recommended the District commence securing a permit from the Lahontan Regional Water Quality Control Board for irrigating the Diamond Valley Ranch with recycled water. Project No. 12, Permitting for Recycled Water Use in Diamond Valley, should be implemented because it will allow the District to apply recycled water on the Diamond Valley Ranch if lands currently irrigated with recycled water are lost to subdivision or some other reason.

6) Evaluate Contracts/Permit RW Application Volumes

It is recommended the District evaluate the differences between recycled water delivery volumes permitted under the Lahontan Regional Water Quality Control Board-Rancher

agreements and the Diamond Ditch Agreement and Modification Agreement. Currently the Diamond Ditch Modification Agreement includes delivery volumes that exceed the total volume permitted by the Lahontan Regional Water Quality Control Board. The delivery volumes should match and the District should maximize the delivery volumes to the contract irrigators while remaining within limits that do not degrade the groundwater quality or as determined upon completion of a Nutrient Management Plan.

7) Adjust Diamond Ditch Agreement Annual Volumes to Tie to Actual Amount Available

It is recommended that the District adjust the Diamond Ditch Agreement (Modification Agreement) to provide to the contract irrigators a recycled water flow volume based on the actual amount the District has available each year and proportional to each rancher's land area and safe application rates as determined by Nutrient Management Plans.

8) Commence Permitting for Existing Contract Irrigator Land Application in Nevada

Considering the potential loss of acreage for direct land application of recycled water, it is recommended the District begin pursuing permitting irrigation with recycled water for existing contractor irrigators with lands that extend into the State of Nevada. Although the contract irrigators have a tailwater agreement with NDEP, the tailwater flow into the state of Nevada is not permitted by the Lahontan Regional Water Quality Control Board. The permitting could possibly be accomplished when Nutrient Management Plans are prepared, the permitting would improve the District's flexibility and may forestall the implementation of the contingent projects of the Master Plan.

#### 13.9.2.3 Freshwater Management Project Recommendations

1) Detailed Evaluation of Indian Creek Reservoir Spill Potential

It is recommended the District conduct further study to evaluate the spill potential from Indian Creek Reservoir and the possibility of constructing a dedicated Indian Creek Reservoir spillway on the east side of Harvey Place Reservoir. Currently a spill from the Indian Creek Reservoir flows into Harvey Place Reservoir. With an extreme flooding event, the possibility exists that the Indian Creek Reservoir spill would force a spill from Harvey Place Reservoir even with the temporary storage provided by the proposed Diamond Valley Ranch Irrigation Fields. An Indian Creek Reservoir spillway channel has additional benefits including (1) intercepting surface water flows entering the east side of the Harvey Place Reservoir and (2) allowing continued fresh water flow in Indian Creek if maintenance is required for the Indian Creek Reservoir outlet pipeline under the Harvey Place Reservoir. It should be noted the use of a temporary pump would be required to lift water from Indian Creek Reservoir into the spillway channel and the Harvey Place Reservoir would have to be drained to perform the aforementioned Indian Creek Reservoir outlet pipeline maintenance.

2) Continue Implementation of Indian Creek Reservoir Hypolimnetic Oxygenation System Project

It is recommended the District continue implementation of the Hypolimnetic Oxygenation System project at the Indian Creek Reservoir to meet interim and long-term targets of the Indian Creek Reservoir Total Maximum Daily Loads.

3) Hold Freshwater Rights from Diamond Valley Ranch

It is recommended the District hold its freshwater rights from the Diamond Valley Ranch purchase and perform one or a combination of the following, (1) irrigate the Diamond Valley Ranch and District Pasture, (2) transfer surplus rights to Indian Creek Reservoir, (3) lease the rights, or find another beneficial use.

### 13.9.3 Groundwater Monitoring Recommendations

The following recommendations pertain to groundwater monitoring by the District in Alpine County.

1) Install Additional Groundwater Monitoring Wells on the Diamond Valley Ranch

It is recommended that the installation of additional groundwater monitoring wells be the first project the District implements on the Diamond Valley Ranch property. Placement of the groundwater monitoring wells should be based upon the findings of the Alisto Study, preliminary design of the Diamond Valley Ranch irrigation fields and staff recommendations. Installation locations should also be reviewed and approved by Lahontan.

2) Install Other Groundwater Monitoring Wells as Recommended by Alisto

It is recommended the District install additional groundwater monitoring wells in locations away from the Diamond Valley Ranch as recommended in the Alisto study and by staff recommendations, subject to Lahontan approval.

### 13.9.4 Land and Easement Recommendations

The following recommendations pertain to land and easement considerations of District facilities.

1) Finalize All Easements

It is recommended that the District conduct a full evaluation of easements to verify those the District currently holds and those the District needs for all properties that are associated with either freshwater or recycled water. Any gaps that are identified should be addressed by securing an easement.

2) Map Alpine County Metes and Bounds

It is recommended the District identify the metes and bounds of Alpine County properties (associated with District operations) with GIS mapping to make sure the limits of ownership are properly defined.

3) Perform Title Search

It is recommended the District ask a title company to perform a search for all documents recorded with the District as either the Grantee or the Grantor and obtain copies of the recorded documents for the District's files.

4) Obtain Preliminary Title Reports for All District Acquired Property

It is recommended the District obtain a preliminary title report on all acquired properties.

5) Research BLM and USFS Rights of Way

It is recommended the District research the Bureau of Land Management and Forest Service records for all right of way easements granted to the District.

6) Determine Encroachment Rights for Caltrans Right of Way

It is recommended the District determine what encroachment rights have been granted to the District within State highway rights of way.

7) Organize District Land Ownership Files

It is recommended the District organize individual files for each District owned or operated facility easement or right of way and include a copy of the recorded document.

8) Obtain Legal Agreement Regarding Condemnation Proceeding 909

It is recommended the District obtain a legal opinion on whether or not the District in fact acquired fee title to the two easements involved in Condemnation proceeding 909 (Heise).

## 13.9.5 Recommendations for Projects with Contingent Implementation

The following recommendations are provided for Master Plan projects that have contingent implementation. They include project types for recycled water infrastructure, recycled water management, freshwater infrastructure, freshwater management, and groundwater monitoring projects.

### 13.9.5.1 Recycled Water Infrastructure Contingent Projects

1) Irrigate Additional Lands on Diamond Valley Ranch with Recycled Water

Loss of land currently being irrigated with recycled water can be replaced by utilizing additional acreage on the Diamond Valley Ranch once it is permitted for reuse and pending completion of the irrigation fields (Project No. 1). The irrigation fields could be the first area to irrigate with recycled water. Beyond that, additional lands could include areas of the District pasture and the Jungle.

2) Modify Control Box Overflow at Bar Screen No. 5

It is recommended that the control box overflow at Bar Screen No. 5 be modifed if the District does not implement Project No. 6, the Waterfall Forebay and Pipeline. The Diamond Ditch Agreement requires a minimum flow of 25 cfs in the Diamond Ditch. Two choke points (at the Snowshoe Thompson No. 3 diversion structure and Bar Screen No. 5) currently limit the Diamond Ditch flow to approximately 20 cfs. Project No. 6 addresses these two choke points. To improve the Diamond Ditch Flow Rate and to increase operational flexibility, either of the following is recommended: (1) provide improvements at Bar Screen No. 5 area to route spill water to a nearby field and away from the river, or (2) construct a new bar screen at a location above the Diamond Ditch Waterfall with a flow limiting weir and an overflow side outlet that discharges to Wade Valley.

3) Install Energy Dissipation in Eroded Section of the Diamond Ditch

The two steep channel sections in the Diamond Ditch system have experienced excessive erosion. It is recommended that energy dissipation and erosion control measures be implemented at this location in the form of lining the ditch with riprap.

### 13.9.5.2 Recycled Water Management Contingent Projects

1) Implement West Fork Pipeline Project (Project No. 8)

It is recommended the District implement the West Fork Pipeline project if it wishes to reduce potential operational constraints from the flow of blended freshwater and recycled water in the Fredericksburg Ditch system. The West Fork pipeline project includes metering of recycled water application on contract irrigator lands to assist the ranchers in ensuring the proper amount of recycled water is applied.

### 13.9.5.3 Freshwater Infrastructure Contingent Projects

1) Implement Project No. 14 and Project No. 15

It is recommended that District implement Project No. 14, Snowshoe Thompson Ditch No. 1 Conveyance Capacity Improvements, and Project No. 15, Upper Dressler Ditch Conveyance Improvements if additional freshwater flow to the Indian Creek Reservoir is deemed necessary and the District has a difficult time meeting its water surface elevation requirements at Indian Creek Reservoir. The additional freshwater flow may be needed if the current oxygenation project does not meet Indian Creek Reservoir TMDLs, or if contingent Project No. 19, Use Mud Lake Winter Flows for Indian Creek Reservoir Flushing, or contingent Project No. 20, Storage of Water for Downstream Users, are implemented in the future.

2) Implement Project No. 18, Indian Creek Reservoir Spillway Channel

It is recommended the District implement Project No. 18, Indian Creek Reservoir Spillway Channel if it is determined that a Probable Maximum Flood would cause a domino effect spill from the Indian Creek Reservoir and the Harvey Place Reservoir.

#### 13.9.5.4 Freshwater Management Contingent Projects

1) Evaluate Drainage Conditions Prior to Project No. 15 Implementation

An estimate of the total quantity of runoff produced by the watershed area above the Upper Dressler Ditch is recommended if Project No. 15, Upper Dressler Ditch Conveyance Improvements, is implemented. If a pipeline replaces portions of the existing Upper Dressler Ditch, storm runoff to Harvey Place Reservoir will increase and may potentially reduce its storage capacity.

#### 13.9.5.5 Groundwater Contingent Recommendations

1) Conduct Tracer Study

It is recommended the District conduct a caffeine tracer study if the need arises to differentiate between nitrate concentration in the groundwater from the District's recycled water used in irrigation practices, and the nitrate concentration resulting from cattle grazing and other sources. A caffeine tracer study would separate out anthropogenic nitrates (those produced by humans) from those resulting from cattle and other natural sources. The study should be conducted in the Nevada/California border area and in areas where higher concentrations of nitrate are found. It is also recommended that monitoring wells be installed further down gradient of recycled water application areas to determine how quickly nitrates attenuate through dilution with groundwater.

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