Chapter 3

Background on Water Quality and Wastewater

List of Tables

List of Figures

Purpose and Scope

This chapter provides background information as well as the current status of regional wastewater activities and water quality issues. It also presents a number of planning and management issues that require action and/or further evaluation. These issues must be considered together with other water management planning objectives to determine appropriate future actions and recommendations.

Summary of Findings

Following are the major findings resulting from the analysis of water quality and wastewater treatment issues in the planning area:

- **A multi-faceted approach will be required to manage water quality issues associated with increased wastewater flows to the Truckee Meadows Water Reclamation Facility (TMWRF).** Achieving and maintaining long-term Truckee River water quality objectives will be essential to continue to provide for planned growth within the region. The TMWRF provides centralized wastewater treatment for the majority of the Truckee Meadows community. Over 31,000 acre-feet (af) of treated effluent is discharged to the Truckee River via Steamboat Creek. During the irrigation season, effluent is diverted to supply an extensive reuse distribution system. Current effluent irrigation demand is approximately 3,000 af/yr. River water quality standards are in many ways stricter than drinking water standards and, therefore, require different management strategies than standards and rules that apply to drinking water. Planned facility improvements at TMWRF will soon be under construction and will increase treatment capacity to approximately 46.5 million gallons per day (MGD). To meet anticipated National Pollutant Discharge Elimination System (NPDES) river discharge permit requirements, TMWRF must achieve a complex balance between treatment process improvements, effluent reuse needs and water rights requirements, Truckee River water quality, and numerous other interrelated, regional water management objectives.

- **Close coordination with the Pyramid Lake Paiute Tribe (Tribe) and other stakeholders is key to achieving long-term Truckee River water quality objectives.** The Tribe has established water quality and water quantity goals for the lower Truckee River and Pyramid Lake. Recent studies have demonstrated that there are opportunities for TMWRF and the Tribe to work together to improve river water quality through river restoration, flow augmentation and other non-point source reductions. As part of this program, the Cities may be able to compensate for additional nitrogen and total dissolved solids (TDS) loads for the river.

- **Cooperation and coordination with other entities both upstream and downstream on the Truckee River should also be pursued.** The impacts to the entire watershed affecting the Truckee River must be well comprehended and mitigated. Remedies to historic environmental damage must be included. Rapid commercial and industrial development in the Tracy area of Storey County, as well as significant development plans in California, have the potential to impact river water quality improvement programs underway in Washoe County.

- **The completion of the Lawton/Verdi Interceptor will provide the opportunity to begin reducing pollutant loads to the Truckee River in the Truckee Canyon hydrographic**

basin. In Verdi, three small wastewater treatment plants at Boomtown, Verdi Meadows and Gold Ranch will be decommissioned when the Lawton/Verdi Interceptor is constructed. The interceptor will also provide capacity for sewering hundreds of individual septic systems, which may also provide an opportunity for pollutant trading by reducing the indirect flow of, non-point source contaminants to the river.

- **Securing effluent reuse sites for the South Truckee Meadows Water Reclamation Facility (STMWRF) is critical.** The STMWRF is a regional facility that does not discharge to a creek, river or lake. STMWRF is one of the few 100% water reclamation facilities in the United States. Current effluent demand is approximately 2,220 af/yr. As the area continues to develop, there are plans for extending the effluent reuse system throughout the Damonte Ranch area and up the Mt. Rose Highway. The currently identified future effluent demand is estimated at 6,179 af/yr. This compares to approximately 10,000 af/yr for the projected build-out wastewater flows to STMWRF.

- **In closed hydrographic basins such as Cold Springs and Lemmon Valley, long-term monitoring is required to ensure that no detrimental build-up of contaminants or impacts to groundwater quality results from wastewater disposal practices.** In closed hydrographic basins, treated wastewater is disposed of by a number of practices including infiltration basins to groundwater, effluent reuse and wetlands enhancement. However, over the long-term, pollutants such as nitrogen or TDS may accumulate in the underlying aquifers to potentially unacceptable levels. The feasibility of alternative disposal options can be limited by hydrographic basin, which can drive other options such as export of treated wastewater outside of the basins. Export of treated effluent is currently being investigated for the Reno-Stead Water Reclamation Facility (RSWRF) expansion to accommodate possible growth that may result from imported water. Effluent export is also being investigated for Lemmon Valley and Cold Springs wastewater treatment facilities.

- **New information regarding wastewater collection and TMWRF connection costs for Spanish Springs has resulted in a re-evaluation of the feasibility of a Spanish Springs wastewater treatment facility.** The 1995–2015 Regional Water Plan references a finding that states “piping wastewater influent from Spanish Springs to TMWRF for treatment is more cost-effective than building a satellite plant.” However, recent concerns regarding connection costs and discharge limitations at TMWRF have resulted in a re-evaluation of wastewater treatment and disposal alternatives by Washoe County.

- **In areas where large numbers of septic systems exist in close proximity to one another, or where there is little recharge, septic system effluent can recycle through the groundwater system, increasing pollutants to unacceptable levels.** Septic systems are generally used in areas where centralized wastewater treatment is not provided. Currently, these areas include Warm Springs Valley, Washoe Valley, Golden Valley, Lemmon Valley, Spanish Springs Valley, and areas of Cold Springs Valley. In 2000, the Nevada Division of Environmental Protection (NDEP) issued a directive to Washoe County to plan for sewering existing lots with septic systems in the Spanish Springs area due to elevated nitrate concentrations detected in public drinking water wells.

- **There is evidence that septic system effluent in the groundwater within the Verdi area is migrating to the Truckee River.**

3.1 Wastewater Treatment and Related Water Quality Overview

Figure 3-1 depicts the wastewater treatment facilities within the jurisdiction for this plan. There are two regional facilities (TMWRF and STMWRF) with well-defined service areas. The major facilities are summarized in Table 3-1:

Table 3-1
Study Area Wastewater Treatment Facilities

Facility	Current (Permitted) Average Daily Flow	Hydrographic Basin	Owner	Comment
Truckee Meadows Water Reclamation Facility	31.5 MGD (51.2 MGD)	Truckee Meadows, Sun Valley, Spanish Springs Valley, Truckee Canyon	Cities of Reno / Sparks	Discharges to the Truckee River via Steamboat Creek, with effluent reuse
Verdi Meadows Wastewater Treatment Facility	0.023 MGD (0.028 MGD)	Truckee Canyon	Verdi Meadows Utility Company	Flows will be diverted to TMWRF
Boomtown Wastewater Treatment Facility	0.14 MGD (0.18 MGD)	Truckee Canyon	Boomtown	Flows will be diverted to TMWRF
Gold Ranch Wastewater Treatment Facility	0.010 MGD (0.010 MGD)	Truckee Canyon	Gold Ranch	Flows will be diverted to TMWRF
South Truckee Meadows Water Reclamation Facility	1.8 MGD (3.0 MGD)	Truckee Meadows, Pleasant Valley	Washoe County	100% reuse of effluent
Reno-Stead Water Reclamation Facility	1.1 MGD (1.5 MGD)	Lemmon Valley	City of Reno	Wetlands enhancement, with effluent reuse
Lemmon Valley Wastewater Treatment Plant	0.22 MGD (0.3 MGD)	Lemmon Valley	Washoe County	Facility may be decommissioned in future with flows routed to RSWRF
Cold Springs Wastewater Treatment Facility	0.13 MGD (0.35 MGD)	Cold Springs Valley	Washoe County	Rapid infiltration basins

Regional wastewater treatment facilities provide an effective means to manage the area's water resource and water quality objectives. However, in many areas throughout Washoe County, residential uses are not presently developed at densities that can financially support regional wastewater treatment facilities. In these instances, septic systems have been installed to manage wastewater treatment and disposal needs. Areas with septic systems are not without their own challenges. When large numbers of systems are installed in relatively close proximity to one another, the treated wastewater from the septic systems infiltrates into the local groundwater. Over the years, certain constituents such as nitrate can become concentrated in the groundwater, potentially impacting groundwater supplies for drinking water. These issues are discussed in greater detail in Section 3.7.

Throughout the community, effluent reuse is providing a beneficial use for the disposal of treated effluent. Reuse programs are underway in the Cities of Sparks and Reno, and additional areas of Washoe County. Use of effluent provides a predictable way to manage effluent disposal needs, and provides a drought-proof alternative water supply for non-potable uses, extending the region's limited water resources. This practice is constrained, however, because when effluent reuse removes water that would have otherwise been returned to the Truckee River, water rights must be dedicated in order for downstream water rights to be satisfied. Careful consideration must be given to balancing the need for effluent reuse to meet disposal requirements compared with the water rights needed to implement the reuse programs. Sections 3.8 and 3.9 describe the current status and future of effluent reuse within the Truckee Meadows.

3.2 Truckee Meadows Water Reclamation Facility Service Area

As shown on Figure 3-1, the service area for TMWRF includes portions of the Truckee Meadows, Truckee Canyon, Sun Valley, Lemmon Valley, and Spanish Springs Valley hydrographic basins. There are three small wastewater treatment facilities within the Verdi/Mogul portion of the service area. They will continue to operate until a regional interceptor is extended to a point where the plants can be decommissioned with flows re-routed through the interceptor to TMWRF.

The TMWRF is located at the east end of Clean Water Way on the south side of the Truckee River in the City of Sparks. The effluent generated by this advanced wastewater treatment plant is discharged into Steamboat Creek near its confluence with the Truckee River. During the irrigation season, effluent is also diverted into an extensive regional effluent reuse program.

The plant currently has a capacity of 44 MGD 30 day average. The capacity of the plant is allocated between the Cities of Reno and Sparks. The City of Reno owns 26.5 MGD of the capacity, and the City of Sparks owns 13.5 MGD of the capacity. The City of Sparks has permanently leased a total of 1.8 MGD to the Sun Valley General Improvement District (SVGID). The City of Sparks has also temporarily leased 0.50 MGD to Washoe County until 2005. SVGID permanently sub-leases a portion of their capacity (0.48 MGD) to Washoe County, leaving Sun Valley with a permanent capacity of 1.32 MGD.

A new NPDES permit was issued by NDEP in October 2003 increasing the permitted average daily flow to 51.2 MGD. The current average day annual (ADA) influent flow to TMWRF is 31.5 MGD. Current expansion activities will increase the ADMMF plant capacity to 46.48 MGD. Upon completion of the expansion project, the City of Reno will own 31.89 MGD of capacity and the City of Sparks will own 14.59 MGD of capacity.

The liquid treatment processes include: equalization basin, raw sewage screening, influent pumping, grit removal, primary clarification, activated sludge secondary treatment, secondary clarification, phosphorus stripping tanks, nitrification trickling filters, fluidized bed denitrification reactors, effluent dual media filtration, and effluent disinfection using chlorine and dechlorination using sodium bisulfite. The solids handling processes include: waste-activated sludge thickening, anaerobic digestion, and sludge dewatering using centrifuges.

3.2.1 Water Quality and Wastewater Issues Specific to TMWRF

Adherence to Truckee River Water Quality Standards

TMWRF discharges treated effluent to the Truckee River via Steamboat Creek. The current effluent discharge limits for TMWRF are based on Truckee River water quality standards. These standards were developed to protect the quality of the water relative to the beneficial uses established for defined reaches of the river. From the 1950s through the mid-1980s, secondary effluent was discharged to the river. Water quality characteristics of secondary effluent include unfiltered treatment with no nutrient removal associated with the wastewater process.

When TMWRF initiated expansion plans, grants were pursued from the US Environmental Protection Agency (EPA). As part of the EPA grant-funding requirements, an environmental impact statement (EIS) was completed for the master project (a 20 MGD expansion). The findings of the EIS resulted in improvements being incorporated into the master plan for TMWRF, which included the removal of phosphorus and nitrogen. At that time, TMWRF effluent discharge limits were established at what was considered an achievable level of removal for the available technology. By 1989, the TMWRF successfully implemented nutrient removal processes for both nitrogen and phosphorus. Phosphorus removal was achieved using a biological nutrient removal process known as PhoStrip.

In 1988, the NDEP identified the Truckee River as impaired, and listed it on its 303(d) list. Subsequently the NDEP developed total maximum daily loads (TMDLs) for total nitrogen (TN), total phosphorus (TP) and total dissolved solids (TDS). The TN and TP TMDLs were developed due to the presence of low dissolved oxygen levels in the lower river. The TDS TMDL was established to be protective of Pyramid Lake and lower Truckee River loadings. The TN and TP TMDLs were developed using the Dynamic Stream Simulation Analysis Model - temperature (DSSAMt), which was a water quality model developed by Rapid Creek Research. The Truckee River TMDLs and associated TMWRF waste load allocations (WLAs) are water-quality based for protection of the river ecosystem rather than based on technology.

The DSSAMt model was used to establish the nutrient TMDLs, load allocations (LAs) and WLAs. However, there are concerns associated with the DSSAMt model, including the algal algorithms, use of disputed or unverified coefficients, model formulation, lack of data, and others. In addition, concerns were raised regarding the lack of a model peer review, as the model is a proprietary model and not available to the public.

With the establishment of the TMDLs, WLAs were included in the TMWRF NPDES permit, which limited the discharge of TN, TP, and TDS. Table 3-2 documents the TMDL and associated LAs for non-point sources, and WLAs for point sources. Figure 3-2 shows locations for TMDLs and other Truckee River water quality standards.

Table 3-2
Summary of Truckee River Total Maximum Daily Loads,
Waste Load Allocations and Load Allocations

Source	Nitrogen	Phosphorus	TDS
Non-Point Sources/Background (LA)	450 lbs/day	75.25 lbs/day	None assigned
TMWRF (WLA)	500 lbs/day (annual average) 500 lbs/day (30 day average, May–Oct.)	134 lbs/day	120,168 lbs/day
Vista Canyon Group (WLA)	16.7 lbs/day	4.75 lbs/day	9,730 lbs/day
Sparks Marina Lake (WLA)	33.3 lbs/day	WLA Trade Agreement	19,390 lbs/day
TMDL	1,000 lbs/day	214 lbs/day	900,528 lbs/day

The Truckee River TMDLs were developed based upon the 1988 flow conditions in the river. Concerns exist that these flow conditions in the lower river were not representative, resulting in the establishment of TMDLs at Vista (upstream of Derby Dam) that are overly protective of upstream water quality standards in order to meet lower river water quality standards under low flow conditions. One issue identified with achieving lower Truckee River water quality standards is low flow conditions. By increasing the flows in the lower Truckee River and preventing huge flow variations due to diversions, downstream water quality and the overall river ecosystem could be greatly improved.

The Cities of Reno and Sparks are implementing non-structural programs on the Truckee River to evaluate the existing TMDLs, and to implement a water quality trading program between point and non-point sources. As part of this program, a comprehensive watershed/water quality modeling approach has been applied and calibrated to the Truckee River watershed. The program uses three water quality models, specifically the Watershed Analysis Risk Management Framework (WARMF) model and the Hydrologic Simulation Program-Fortran (HSPF) and DSSAMt. The modeling framework provides the technical basis for evaluating and potentially revising the existing TMDL (in compliance with the watershed rule), evaluation of a seasonal discharge program, and the development of a watershed trading program.

TMDL revision involves re-doing model simulations conducted for the original TMDL using the updated modeling framework. The TMDL refinement also involves the evaluation of implementing a seasonal or flow-based discharge program for TMWRF, and the inclusion of consideration for dissolved organic nitrogen. The development of a water quality trading program involves modeling the impacts of various structural or non-structural alternatives on the Truckee River to determine the viability of a proposed trade, to develop specific trades, and associated trade ratios.

Coordination with the Tribe's Water Quality and Quantity Goals

The Tribe has established water quality standards for the lower Truckee River on the Tribe's reservation land under authority granted by the EPA. Prior to the development of the water quality standards by the Tribe, NDEP had developed water quality standards for the lower Truckee River, which were protective of Pyramid Lake. In 2001, the Tribe established the final water quality standards that are protective of both the lower river and Pyramid Lake and submitted them to the EPA for review and approval. The standards are based on studies conducted by Dr. John Reuter of the University of California at Davis in conjunction with the Pyramid Lake Fisheries and the EPA. In addition to the water quality standards established by NDEP, the Tribe added additional requirements for the lower Truckee River and Pyramid Lake. These standards include 36 additional constituent toxins and 19 proposed toxins, which are at more restrictive levels than required by NDEP.

There have recently been substantial efforts completed for the examination of Pyramid Lake and the lower Truckee River. These studies have demonstrated that there may be opportunities to work together to improve river water quality, and maintain or improve the ability of TMWRF to meet discharge standards. Technical and scientific work would be required to prove specific program components. The Tribe and local entities are cooperating with regards to the nitrogen and TDS loads for the river.

There is also a program to purchase Truckee River water rights in order to maintain in-stream flows and enhance water quality in the lower Truckee River. This program was mandated by the 1996 Water Quality Settlement Agreement, an agreement signed by the Tribe, the Department of the Interior, the EPA, the Department of Justice, the NDEP, the Cities of Reno and Sparks, and Washoe County. The agreement funds the contribution of $12 million from the Department of the Interior, and $12 million from the Cities of Reno and Sparks and Washoe County for the acquisition of water rights on the Truckee River for in-stream flows to Pyramid Lake. (See also Chapter 7.)

Seasonal Modifications of Total Maximum Daily Loads for the Truckee River

The total nutrient loading to the river occurs from point sources (e.g. TMWRF, Tahoe-Truckee Sanitation Agency (T-TSA), Vista Canyon Group, Sparks Marina Lake) and non-point sources (e.g. North Truckee Drain, Steamboat Creek, agricultural runoff, effluent from septic systems). The nutrient assimilative capacity of the river can vary depending upon many factors. Water temperature, sunlight, and quantity of flow are major parameters that determine how much of a given nutrient the Truckee River can assimilate or carry without harming fish or the ecosystem. Increasing the allowable loading of nutrients during winter conditions of cold temperatures and reduced sunlight would be a valuable tool in wastewater facility planning. Discharge permit modifications that allow seasonal discharge or variations in river loading from summer to winter could do the following:

- Reduce the need for storage of effluent during non-irrigation times and, thus, reduce capital costs for new facilities.
- Allow for more workable plant operations that allow a greater degree of nitrogen variation.

- Encourage discussion between the Tribe and local entities to consider possible options that might allow more nutrient loads to Pyramid Lake during a time that would not harm river or lake ecosystems.
- Save plant chemical costs (operations and maintenance).

Flow Augmentation Benefits on River Water Quality

Flow augmentation as supplemental water, especially in the lower Truckee River during normally low flows, warm weather, and long daylight conditions, can improve the ability of the river to carry a higher nutrient load than current water quality standards allow. In addition, higher river flows may help support the appropriate biological community required to sustain designated beneficial uses. Higher flows in the river to Pyramid Lake could have the following effects:

- Improve long-term river riparian development
- Reduce TDS concentrations in Pyramid Lake by increasing the quantity of water
- Decrease the occurrences of low dissolved oxygen levels in the river
- Improve aesthetics and overall health of the river ecosystem
- Increase the nutrient assimilative capacity of the river. Hence increase the nutrient TMDLs and potentially TMWRF WLAs
- Decrease and help maintain lower water temperatures during summer

Viability of Water Quality Trading

Many communities have faced the high cost of building treatment facilities to meet receiving water quality standards. Water quality trading is being evaluated and implemented around the country. The EPA supports water quality trading as a means to improve water quality and to help point source discharges comply with effluent limits. Water quality trading can occur between point/point sources; point/non-point sources; non-point and non-point sources, pretreatment and point sources and inter-plant trades. Water quality trading between a point source and non-point source, allows for a point source to invest in non-point source or pollution load reduction and receive a credit toward its discharge rather than having to construct additional wastewater unit processes to comply with water quality standards.

This approach promotes more economical and efficient water quality improvements. The reasoning in these cases has usually followed economic factors; it may be more cost-effective to remove non-point pollution sources than to construct a more sophisticated wastewater facility. In addition, with discharge concentrations as low as they are, non-point sources provide a better cost-benefit ratio in that there is a greater improvement in water quality through the reduction of non-point source loads. RWPC Policy 2.1.b, below, supports the concept of reducing non-point source loading to the Truckee River and water quality trading:

> ***Policy 2.1.b: Reduction of Non-point Source Pollution for TMWRF Pollution Credit***
>
> *Options for centralized wastewater treatment with surface water discharge shall include alternatives for reducing non-point source pollution, which may be more environmentally sensitive, and shall be pursued as pollutant credits for TMWRF.*

Trading opportunities include: agricultural return flow reduction, best management practices, storm water treatment, livestock management, septic system conversion and treatment, river restoration, etc. For example, as the City of Sparks develops into Spanish Springs, the land will

be converted from agricultural to urban resulting in a decrease in the agricultural return flows from this area. Monitoring of flows and water quality within the North Truckee Drain should be performed to quantify potential pollutant source reductions.

It has been documented that septic systems can contribute high nitrogen loadings to groundwater. In certain locations, discharges from septic systems may also contribute large non-point source loads to surface water bodies. A 1985 tracer study conducted in the Verdi area indicated that septic system effluent in the groundwater is migrating to the Truckee River (Washoe County, 1985). Figure 3-3 shows that septic systems are located throughout the Region and particularly close to the Truckee River in the Verdi and Mogul area. A thorough discussion of this subject appears in Section 3.7.

Water quality trading of total phosphorus, total nitrogen, and total dissolved solids discharges between the Sparks Marina Lake, Vista Canyon Group, and TMWRF under their umbrella clause agreement allows the dischargers to share their WLAs to assist in meeting their NPDES permits while maintaining the overall WLA. Other non-point pollutant sources to the Truckee River include Steamboat Creek and the North Truckee Drain. Flows from Steamboat Creek are not likely to decrease and control of non-point pollution sources may be difficult, however not impossible to achieve. Sources of pollutant loading to Steamboat Creek include agricultural return flows, geothermal sources, urban runoff, stream bank erosion and mercury from historic mining and ore processing.

Potential water quality trading projects that could help achieve water quality standards are projects that improve the Truckee River morphology or channel environment. This long-term effort requires changing land management practices that have contributed to or caused the river degradation in addition to providing sufficient water for in-stream flows. Because the channel is in a degraded state, it is very sensitive to changes in nutrients and temperature. Successful efforts directed toward improving the channel condition and creating habitat for spawning, will result in a river that is less sensitive to changes in nutrient loading and able to provide habitat to support identified beneficial uses. An increase in river flows would result in the river being better able to assimilate nutrient loads. The secondary benefit would be an aesthetically pleasing environment and an amenity to the region.

Reduction of Non-point Source Pollutants to the Truckee River

Reduction and alleviation of non-point, or diffuse source pollutants to the Truckee River protects water quality and in turn may allow TMWRF to comply with existing WLAs. During normal and higher flows in the river, nutrient pollutants are generally not a problem. To continue with the river discharge, the community must be proactive to prevent river degradation from other point or non-point sources of pollution. In addition to preventing river degradation, improvements need to be made to the ecosystem, in particular the health of the river and the fisheries. Not only will this benefit future capacity needs but will also protect the viability of existing TMWRF facilities.

The water quality standards for the Truckee River at Farad (the California and Nevada state line) are defined to be protective of upstream beneficial uses. The Lahontan Regional Water Quality Control Board (LRWQCB) is responsible for establishing and maintaining the water quality standards for the California section of the Truckee River. These standards are also to be protective of downstream beneficial uses.

NDEP is responsible for the establishment and maintenance of water quality standards on the Nevada side of the Truckee River. Diffuse source pollution is the most difficult to regulate. Agricultural return flows are currently exempt from regulation in the Clean Water Act. Further retirement of agricultural lands within the Vista-Nixon reach (Tracy Segment hydrographic basin) will also allow for pollutant trade opportunities. The Tahoe-Truckee Sanitation Agency (T-TSA) is expanding their facilities to meet planned growth. The Cities of Reno and Sparks, along with the Tribe, succeeded in reaching a settlement with T-TSA on discharge standards to the Truckee River and concurrently T-TSA was able to obtain funding for conversion of its ion exchange process to biological nutrient removal (BNR) resulting in the overall reduction of nutrient and TDS loads to the upper Truckee River.

Groundwater inflow to the Truckee River also provides a source of TDS. During low-flow conditions, TDS concentrations can increase between Vista and Nixon from 300 mg/l to over 600 mg/l. This major increase has been primarily attributed to groundwater return flow to the river as a result of irrigation and canal seepage from the Truckee Irrigation Canal. Reno, Sparks and Washoe County are evaluating the feasibility of water quality trading for TDS from several non-point sources along the river from Chalk Creek (upstream of TMWA's Chalk Bluff WTP Orr Ditch Pump Station) to Pyramid Lake. To the extent this TDS loading can be quantified and removed, a water quality trade may be negotiated resulting in the possibility of permitting increased loads from TMWRF.

Rapid development of Storey County within the Tracy area could affect Truckee River water quality. Cooperation and coordination of river water quality objectives should be pursued with other entities both upstream and downstream on the river to provide for no adverse impacts to river water quality.

Active data gathering to determine the extent of pollutant sources will allow more accurate assessment of river loading. The Cities of Reno and Sparks and Washoe County have funded the development and implementation of the WARMF model. The model is a decision support system (DSS) to help identify and quantify non-point source and point source loadings and to run various non-structural alternative scenarios of the river both upstream and downstream from the Truckee Meadows. It has been calibrated and verified to the Truckee River system with approximately seven years of data. WARMF is a predictive tool that models both present and future conditions, including changing land use conditions under various management scenarios. This model helps determine the benefits of seasonal discharges, non-structural alternatives, and other components with respect to meeting TMDLs.

WARMF contains five modules. The engineering module is a dynamic watershed simulation model that calculates daily runoff, groundwater flow, hydrology and water quality of river segments, and stratified reservoirs. The data module contains meteorology, air quality, point source, reservoir release, and flow diversion data. The knowledge module contains reference information about legal constraints. The TMDL module provides a series of steps to specify an intended use, establish water quality criteria for the intended use, and calculate TMDLs to meet the intended use. The consensus module helps stakeholders reach consensus on a watershed management plan, taking into account cost and other social and political factors. WARMF divides a watershed into land catchments, stream segments and lake layers. Land catchments are further divided into canopy and soil layers. These watershed compartments are connected to form a network for hydrologic and water quality simulations. WARMF also provides a good database for the available water quality data in the system.

Regionalization of Small Wastewater Treatment Facilities within the Truckee Canyon Hydrographic basin

Reno and Washoe County are taking a proactive approach in developing plans to identify possible pollutant loading to the Truckee River within the Truckee Canyon (Verdi) area. Several existing package wastewater treatment plants are in operation, but they do not remove pollutant loads from the river corridor. A general consensus has been to plan for facilities that will remove the major wastewater contributions from this area and sewer to TMWRF. In 2001, Washoe County received federal grant funds to move forward with the extension of the Lawton/Verdi Interceptor. Design and permitting of the interceptor is ongoing. The interceptor will allow for removal of numerous septic systems and three wastewater treatment plants, discussed below.

Boomtown Wastewater Facility

Boomtown is a hotel, casino, and RV park located on I-80 near Verdi. The Boomtown Wastewater Facility is a secondary treatment plant utilizing rotating biological contactors in parallel with extended aerator, activated sludge plant that also provides flow equalization followed by long-term storage. This allows for irrigation of alfalfa 7 to 8 months per year. Winter flows are accumulated and recharged into a leach system that is carefully monitored by four monitor wells. Sludge is stabilized, thickened, and transported to the Lockwood Landfill in Storey County. Current processing is 0.1 to 0.14 MGD. The permitted capacity for the facility is 0.18 MGD. Elimination of this facility is proposed when the Lawton/Verdi Interceptor is constructed.

Verdi Meadows Wastewater Treatment Facility

The Verdi Meadows Wastewater Treatment Facility is located in east Verdi and serves the River Oak subdivision. Currently there are approximately 170 homes on the system. The processing consists of an aeration pond recently equipped with 3 aspirating aerators (2-7½ Hp and 1-10 Hp) which provides anoxic mixing, aerobic stabilization and a settling decant interval between midnight and 3 a.m. The modified plant is currently meeting the permit standards. Effluent disposal provisions include seasonal storage reservoir and irrigation. The facility currently processes 23,000 gallons per day (GPD).

In the past, the NDEP has expressed concerns that the facility was not being operated in compliance with its permit and issued a finding of alleged violation to the facility owner. The facility is permitted for 28,000 GPD upon meeting various permit conditions. A compliance schedule outlining necessary improvements was prepared. This facility's discharge permit includes a condition requiring it to be abandoned when the Lawton/Verdi Interceptor is available.

Gold Ranch Wastewater Treatment Facility

The Gold Ranch Wastewater Treatment Facility is a small privately-owned extended aeration activated sludge treatment facility utilizing ON/OFF aeration. It has a rated capacity of 25,000 GPD and currently processes 10,000 GPD serving the Gold Ranch tourist commercial property near the California – Nevada border. Effluent disposal is via a leach field system. This facility's discharge permit contains a condition requiring it to be abandoned when the Lawton/Verdi Interceptor is available.

3.3 South Truckee Meadows Water Reclamation Facility Service Area

Located at the southern base of the Huffaker Hills and originally constructed in 1991, the STMWRF is a secondary treatment facility recently expanded and improved to include tertiary filtration. The facility expansion, completed in 2003, increased the processing capacity from 1.5 to 3 MGD. Although the facility is presently permitted for 3 MGD, it is expandable to 6 MGD. STMWRF currently serves 7,000 customers in the South Truckee Meadows and current influent flow is approximately 1.8 MGD.

The treatment process consists of influent pumping, fine screening, metering, and secondary treatment by oxidation ditch process combined with two conventional secondary clarifiers for solids separation. Effluent from the facility is filtered, disinfected to the 2.2 Total Coliform standard, stored year-round in the Huffaker Reservoir, and reused for irrigation water. Huffaker Reservoir has a storage capacity of 4,000 af. Waste solids are pumped to the TMWRF for final treatment and disposal.

Improvements in wastewater collection system infrastructure will consist of expansion of sewer interceptors, particularly those serving the Galena Fan area. The Mt. Rose interceptor will be extended in the near future from the Montreux subdivision to the Mt. Rose ski area. The St. James's subdivision will be submitting a sewer interceptor alignment that will follow U.S. 395 south through Pleasant Valley before turning west toward that subdivision.

3.4 Reno-Stead Water Reclamation Facility Service Area

The RSWRF is located in Stead and is operated by the City of Reno. It serves the area of Stead within the Reno city limits on the west side of the valley, including the Stead Airport and Silver Lake areas as shown in Figure 3-1. In 1974, the City of Reno replaced the original trickling filter plant with an activated sludge plant. The plant was modified in 1987 to improve the secondary clarification and effluent disinfection processes and in 1994, the sludge drying beds were replaced with centrifuge dewatering. The plant was upgraded in 2000 to provide high quality effluent for reuse purposes.

The RSWRF has the capacity to treat an average annual flow of 1.25 MGD using preliminary headworks processes (influent screening, aerated grit removal and biofilter for odor control), activated sludge secondary processes (oxidation ditch and secondary clarifier), effluent filtration and effluent disinfection and dechlorination. The plant effluent either discharges by gravity to Swan Creek, which drains to the Swan Lake wetlands in the Lemmon Valley playa, or it is pumped to several sites within the community for turf irrigation. All effluent is disinfected to meet the total coliform standard for unrestricted reuse. Effluent pumped for reuse typically carries a residual chlorine concentration of 1 mg/l. Effluent discharged to the creek is dechlorinated to meet the 0.1 mg/l total residual chlorine concentration standard.

The City of Reno is currently under final design of the RSWRF expansion, which will increase treatment capacity to 2.0 MGD. The improvements include a new headworks, new aeration basins and blower building, an additional secondary clarifier, activated sludge pump station improvements, conversion of the oxidation ditch to an emergency storage basin, new tertiary filter equipment, and a new solids handling and disposal system. Waste solids will be pumped to TMWRF for final treatment and disposal, similar to the solids disposal operation at STMWRF.

Lemmon Valley Wastewater Treatment Plant

The Lemmon Valley Wastewater Treatment Plant is located in East Lemmon Valley at the southeast end of Lemmon Lake and is operated by Washoe County. It currently serves 1,100 homes within East Lemmon Valley, Black Springs, and Horizon Hills. It is a secondary treatment plant and was built in 1971. It currently processes 0.22 MGD and has a permitted capacity of 0.3 MGD.

The treatment plant consists of a grit well, comminutor, wet well pump station, contact stabilization tank, secondary clarification, and aerobic sludge digestion. Effluent is discharged to evaporation ponds, including a 0.65 MGD discharge allowed to the Swan Lake playa for water balance management. The facility does not have an effluent reuse program. Digested solids are sent to sludge-drying beds or to solids ponds during wet weather months.

Facility Planning

Washoe County and the City of Reno are presently evaluating build-out wastewater collection, treatment and disposal facilities from the perspective of an integrated system within the Lemmon Valley and Stead area. The Reno-Stead Water Reclamation Facility Plan (ECO:LOGIC, 2004) was prepared to evaluate the feasibility of combining wastewater collection and treatment within the study area. It is anticipated that in the future, the Lemmon Valley Wastewater Treatment Plant may be decommissioned and wastewater treatment and effluent reuse facilities for the region would be centralized at the RSWRF.

There are limitations to the amount of effluent that can be discharged to the Swan Lake wetlands and Lemmon Valley playa, so an evaluation of effluent disposal options is being conducted to identify long-term wastewater disposal options for the Stead and Lemmon Valley service areas. Options under investigation include expanded effluent reuse including seasonal storage, conversion of TMWA's Stead Main to supply effluent to Northwest Reno, and export of effluent to Long Valley Creek to the west of Stead or to Bedell Flat to the north of the Stead Airport.

3.5 Cold Springs Wastewater Treatment Facility Service Area

The Cold Springs Wastewater Facility is a secondary treatment plant located in the northern portion of Cold Springs Valley. It was constructed in 1996 to process 0.35 MGD. The plant currently serves approximately 600 homes and average daily influent flow is about 130,000 gallons. The facility is a sequential batch reactor utilizing biological nutrient removal of nitrogen (3-5 mg/l total nitrogen). Solids are stabilized onsite and effluent disposal is through rapid infiltration beds.

Planning is currently underway for a facility upgrade and expansion to 0.80 MGD. The Cold Springs Wastewater Facility Plan (Kennedy/Jenks, 2002) recommends that the expanded plant serve an elementary school, all new residential development and some homes currently served by individual septic systems.

In 1997 a nitrate plume in the shallow aquifer of Cold Springs Valley was found to exceed the 10 mg/l state action level. Monitoring of the shallow aquifer in 2001 showed a significant increase in the nitrate concentrations. The Cold Springs Wastewater Facility Plan recommends alternatives that include sewering several areas currently served by septic systems. Based on groundwater studies, once these areas are taken off septic systems, the nitrate concentrations

in the shallow aquifer should start a gradual decrease and return to below the 10 mg/l action level. New development in the area is connecting to the Cold Springs Wastewater Facility.

3.6 Wastewater Planning for Other Areas

3.6.1 Lower Truckee River

Mustang and Patrick / Tracy Areas

Undeveloped, industrial zoned lands are located in the Mustang and Patrick / Tracy areas. To help protect water quality within the Truckee River, wastewater facility plans for these areas recommend that treatment facilities be implemented that include biological nitrogen removal, with effluent disposal by subsurface disposal and/or landscape irrigation. In addition to the potential development and sewering of industrial areas within Washoe County, there are also potentially significant pollutant sources resulting from the Storey County side of the river. This area includes existing industrial development such as Kal Kan and Kaiser Aluminum, and continued commercial and industrial development within the Tahoe Reno Industrial Center (TRIC). Wastewater from the existing industries is treated either through on-site facilities, or in the case of TRIC, through a small community sewer collection and treatment system. Wastewater disposal is managed by a combination of effluent irrigation and/or sub-surface infiltration. Wastewater treatment facilities along the Lower Truckee River are shown in Figure 3-4.

As this area of Storey County continues to grow, it will be important to monitor groundwater and surface water quality to check for non-point source pollutants entering the Truckee River. These additional pollutant loads have the potential to impact sensitive river water quality improvement programs underway in Washoe County. Joint wastewater treatment and facility planning could be economically advantageous to both Washoe and Storey counties and should be considered in future work.

Wadsworth Wastewater Treatment Facility

This area's long-term sewer and potable water supply may require a separate planning effort as this area continues to grow. Possible solutions include an interagency approach for combined facilities with the Tribe, the Town of Fernley and Washoe County. Currently, the Pyramid Lake Paiute Tribe facility provides secondary treatment and disposal through sedimentation and facultative lagoons for the town of Wadsworth. Rapid infiltration basins are constructed, but evaporation in the lagoons has dominated the disposal process. Current influent flow is approximately 35,000 GPD. No discharge permit is required for this facility. The Wadsworth Wastewater Treatment Facility is mentioned for regional information and coordination purposes only; it does not fall under the jurisdiction of this Regional Water Plan.

Except for the town of Wadsworth, septic systems will continue to be used in this area within the planning time frame. There is evidence of nitrate contamination to the groundwater within the Wadsworth area, indicating the need for community sewering. Additionally, the Stampmill Estates subdivision may need sewering. Discussions are currently underway among Washoe County, the Tribe, and the Town of Fernley to seek an area-wide water and wastewater strategy.

3.6.2 Warm Springs

Septic systems will continue to service a majority of this area. However, within the Specific Plan Area east of Pyramid Highway, a future wastewater treatment plant is anticipated. The planned development to be served includes an estimated 750 lots, resulting in an estimated average flow rate of 0.24 MGD. The proposed treatment plant will be built in two phases with effluent disposal accomplished using rapid infiltration basins. A concept also being considered is recovery of the treated effluent from the aquifer for irrigation reuse.

3.6.3 Washoe Valley

Within New Washoe City, nitrate contamination to the groundwater system is occurring. Effluent from septic systems is suspected as the nitrate source. Community sewer would seem to be the appropriate method of protecting this drinking water source; however, none is currently planned or anticipated. The extent to which this contamination is a potential health problem has not been determined.

3.6.4 Golden and Lemmon Valley

Both the East and West Lemmon Valley hydrographic basins and Golden Valley, a sub-basin within East Lemmon Valley, are deficient in sustained perennial yields for water supply. All of Golden Valley's domestic wastewater treatment and disposal needs are provided by individual septic systems.

Groundwater samples from some areas of Golden Valley exceed state and federal drinking water standards for nitrate. Additionally, Widmer and McKay (1992) predicted that nitrate concentrations would increase over time. Washoe County and the Bureau of Reclamation (BOR) implemented a federally funded artificial groundwater recharge pilot project by injecting fresh water into the Golden Valley aquifer from 1989 to 1998.

There are two alternatives for Lemmon Valley and Golden Valley. One is to provide a potable water supply and/or sewer via community system(s). A second alternative is to artificially recharge groundwater within the basin so that nitrate concentrations would be reduced to acceptable levels. For Golden Valley, the recharge required is estimated to be up to 300 af/yr. Results of the 1989 to 1998 study indicated that injection improved water quality with respect to nitrate. The program has since been approved, funded by establishing a Golden Valley recharge service area and implemented. The program injects approximately 100 af of fresh water per year into the Golden Valley aquifer.

3.6.5 Spanish Springs

In 2000, NDEP issued a directive to the County to plan for sewering of existing lots with septic systems in the Spanish Springs area due to elevated nitrate concentrations detected in public drinking water wells. A facility plan has been adopted by the Board of County Commissioners for phased sewering of the existing lots with septic systems in the area. The plan requires 75% grant funding for the sewering to proceed. It is anticipated that the phased sewering will commence in early 2005. The wastewater collection systems have been and are continuing to be extended into new areas of growth.

The current 208 Water Quality Management Plan (Washoe County, 1994) identifies Spanish Springs Valley as a Water Reclamation Facility Study Area and indicates that a combined

TMWRF/Spanish Springs Valley Water Reclamation Facility (SSVWRF) Plan will address the feasibility of a SSVWRF. As stated earlier, the 1995–2015 Regional Water Plan references a finding in the Regional Wastewater Facilities Master Plan (Carollo Engineers, 1997) regarding wastewater treatment for Spanish Springs, "piping (sewage) influent from Spanish Springs to TMWRF for treatment is more cost-effective than building a satellite plant". However, recent concerns expressed by Washoe County regarding discharge limitations, nutrient removal at TMWRF and connection costs have led to the "Feasibility Analysis Wastewater Treatment and Disposal Facilities in Spanish Springs Valley" (Kennedy/Jenks, 2003). A new facility plan, expected to be completed in 2004, will address Washoe County's concerns

3.7 On-site Sewage Disposal (Septic) Systems

The cumulative effect of septic systems on surface waters is not easily calculable or measurable. It may take years to begin detecting increased pollutant loads in surface water resources. Because groundwater quality standards are often much less restrictive than river standards, protection of groundwater quality to the level of the drinking water standard may not provide adequate protection to nearby surface waters. This situation may potentially exist in the Verdi, Spanish Springs, Mogul, Ambrose Park, and Island 18 areas (Figure 3-3).

In areas where there is little recharge, effluent from septic system leach fields can recycle through the groundwater system, increasing pollutants to unacceptable levels. This trend was found in sampling of municipal wells in portions of Spanish Springs, Lemmon Valley, Golden Valley and New Washoe City.

RWPC Policy 2.2.a, in conjunction with Washoe County District Health Department regulations and Washoe County development policies, responds to issues of groundwater contamination resulting from septic systems. The policy is as follows:

> ***Policy 2.2.a: Septic Tank Density and Groundwater Pollution***
>
> *Development density and groundwater quality/accountability issues should determine whether individual sewage disposal systems can be utilized. When adverse surface or groundwater impacts occur as a result of a concentration of septic systems, alternative sewage disposal, groundwater treatment, or other techniques shall be implemented. The selection of techniques to achieve this performance standard shall be based on cost, longevity of the solution, and existence of a credible entity to be responsible for the continuing performance of the selected system. Future individual septic systems shall not be allowed in densities that would degrade groundwater or surface water quality such that it no longer meets beneficial use standards.*

In some areas of Washoe County, the number of septic systems allowed has been limited based on an analysis of the potential impacts to water quality. One such area is Verdi, where the Washoe County Comprehensive Plan allows a maximum of 1,300 septic systems (Washoe County, 2002).

The options for mitigation of nitrate contamination due to high densities of septic systems have been studied regionally (AGRA, 2000), in Spanish Springs (WCDWR, 2002), Cold Springs (Kennedy/Jenks, 2002) and Golden Valley (WCDWR, 2004). The results of these various analyses have coalesced around four possible mitigation strategies:

- Conversion of septic systems to a municipal sewer system
- Conversion of septic systems to nitrate reducing septic systems
- Dilution of groundwater via artificial recharge with treated drinking water resources
- Pumping of high nitrate groundwater for non-potable uses to remove nitrates from the groundwater aquifer

The Washoe County District Health Department is undertaking several measures to reduce future potential impacts from septic systems. For example, effective 2001, the minimum lot or parcel size for new subdivisions and second or subsequent parcel maps proposing to use septic disposal was established at 5 acres. Smaller lots may be considered if it can be shown that adequate measures have been taken to ensure that the smaller lot area will not have a greater impact to the groundwater quality than the 5 acre lot size.

Adequate measures might include the installation of nitrate reducing septic systems. These systems have received considerable interest from the public in Spanish Springs Valley as a potential low cost alternative to conventional sewer service for dwellings currently using septic systems. Although studies in other parts of the country have documented that nitrate reducing septic systems can effectively reduce nitrate levels, WCDWR staff has not been able to obtain any long-term performance data that confirms their ability to consistently meet an effluent standard of 10 ppm nitrate-N.

Additionally, the actual cost of system operation and maintenance (O&M) is unknown. Because these systems contain mechanical components, such as electric pumps and blowers that enable nitrate reduction, a certain level of regular technical attention is required to ensure the system is adjusted and operating properly. It is important to document the necessary O&M inspections because the Washoe County District Health Department, who has approval authority for this type of system, would need to establish O&M schedules as part of their approval. It is also important to understand the costs associated with regularly scheduled O&M so that long-term cost comparisons can be made with respect to other alternatives.

In 2002, WCDWR staff proposed a one-year pilot program to gather data on system performance, O&M requirements and costs for several nitrate reducing septic systems. While preparing to initiate the pilot program, staff identified a project being conducted in central Oregon with goals and methodologies very similar to those of the proposed WCDWR pilot program. The Oregon Department of Environmental Quality is conducting the La Pine National Decentralized Wastewater Demonstration Project in cooperation with Deschutes County, the EPA, and USGS. The multi-year project is studying the performance of 11 individual systems installed at residences in the La Pine, Oregon area.

The project's main tasks include field-testing the individual systems, development of a three dimensional groundwater/nitrate fate and transport model, development of a long-term maintenance program and development of a low-interest loan program. After visiting with the investigators at the project site, WCDWR staff concluded that the results would be applicable to the issues and needs in this region.

3.8 Effluent Reuse Programs

Effluent reuse provides both local and regional benefits. Using treated effluent provides a more predictable way to ensure pollutant removal when compared with river discharge and may help alleviate potential difficulties in meeting WLAs but likewise competes with water needs for in-

stream flows. Water that is transferred out of the Truckee River basin (i.e. water that does not return to TMWRF) usually requires that an additional 50% be dedicated to provide for that depletion. In some areas effluent reuse makes good sense, while in the central Truckee Meadows the least cost approach to effluent disposal is still river discharge. The NDEP establishes reclaimed water quality standards for reuse which delineate reclaimed water quality requirements, buffer zones, signage, run-off capture, and other requirements.

Diversion of treated effluent away from the Truckee River provides a mechanism to meet water quality improvement discharge limitations for the TMWRF. For other wastewater facilities, effluent reuse provides a sound method of disposal and beneficial use through irrigation and other uses. As the region grows according to its land use plans, effluent reuse allows the growth to be accommodated while remaining within TMWRF discharge permit limits. Reno, Sparks, and Washoe County are working to improve the river ecosystem. The benefits are intended to improve the nutrient assimilative capacity of the river, which will allow more flexibility in meeting the TMWRF discharge permit. The main local benefit in the use of effluent is that it provides a drought-resistant non-potable water source, even in times of water-use restriction and conservation.

Effluent is generally used for irrigation of large turf areas and agricultural crops, and wetlands needs, with typical users being golf courses, parks, schools, and farms. In the Region, approximately 760 acres are irrigated for agricultural uses, and greater than 1,625 acres are irrigated for landscaping needs.

Irrigation Demand Factors

The irrigation season for the Washoe County area is assumed to be from April 15 through November 15. This constitutes a 30-week or a 214-day irrigation season. The monthly irrigation demand was developed using mostly evapotranspiration (ET) data. The irrigation season demand used by local governments in their respective planning documents ranges from 44.91 to 47 inches per year/acre of irrigated turf (3.7 to 3.9 af/yr per acre of turf), with the exception of some of the existing and proposed golf course sites where information from course managers was used to predict effluent demand.

3.8.1 TMWRF Effluent Reuse

Existing Effluent Reuse Sites

TMWRF currently supplies treated effluent to several sites in the City of Sparks and to the University of Nevada, Reno's (UNR's) Agricultural Experiment Station property. The effluent is sampled and monitored at the end of the chlorination process to ensure the water meets or exceeds regulatory requirements. The effluent delivery system consists of two separate pump stations located at TMWRF and two transmission lines. One pump station and pipeline serves UNR's Agricultural Experiment Station property located adjacent to the treatment plant and the other serves the users in the City of Sparks.

Table 3-3 shows the low and high range estimate of demands for the eight sites currently receiving effluent from TMWRF for irrigation purposes. The locations of these sites are depicted on Figures 3-5 and 3-6. Seven of the eight sites receive effluent via the City of Sparks system. The remaining site and largest single user, UNR Farms, receives effluent via the City of Reno system.

Table 3-3
Existing Effluent Reuse Sites and
Estimated TMWRF Effluent Demands

Mgmt Entity	Site	Low Estimate		High Estimate	
		Acres Irrigated	Demand (af/yr)	Acres Irrigated	Demand (af/yr)
Sparks	Don Mello Sports Complex	14.4	56	14.4	56
Sparks	Sparks Blvd & Van Meter Park	3.9	15	3.9	15
Sparks	Shadow Mountain Sports Complex	19.6	77	19.6	77
Sparks	Shelly Park	5.0	20	5.0	20
Sparks	Wildcreek Golf Club	127.6	477	127.6	477
Sparks	Pah Rah Park	11.3	44	11.3	44
Sparks	D'Andrea Golf Course	89.4	334	89.4	334
Reno	UNR Farms	760.0	1,781	803.0	3,145
Sparks	Willow Creek Park	3.9	15	3.9	15
Sparks	Les Hicks Park	1	4	1	4
Sparks	Truck Fill Stations	n/a	20	n/a	20
Sparks	Reed High School	12	47	12	47

Three more City of Reno sites are anticipated to come online in 2004, the Hidden Valley Golf Course, Rosewood Lakes Golf Course, and Rosewood Meadows Golf Course. Effluent delivery to these sites is dependent upon completion of the first segment of the TMWRF – STMWRF inter-tie pipeline.

Since 2000, the Cities of Reno and Sparks, as well as UNR, have developed plans to increase the use of effluent and construct infrastructure. Approximately 5% of TMWRF effluent, about 1.5 MGD, was used for irrigation in 2000; the remainder was discharged to the Truckee River.

Potential Effluent Reuse Sites

Figures 3-5 and 3-6 indicate the locations of future potential effluent sites and infrastructure that have been investigated by the Cities of Reno and Sparks under their respective effluent reuse programs. The City of Sparks system (Figure 3-5) extends north from TMWRF through the City of Sparks and into the north central part of the Spanish Springs Valley. The City of Reno system, currently serving the UNR Farms area, will extend south and west from TMWRF into the central Truckee Meadows area (Figure 3-6).

Table 3-4 summarizes total potential acres irrigated and effluent demand that could be realized with the successful implementation of all projects identified in the tables on Figures 3-5 and 3-6. Future potential sites are classified as either "soft" or "firm", depending on the level of confidence in the future delivery of effluent to the site. These numbers continue to be refined as new information becomes available and facility planning for specific projects is completed.

Table 3-4
Total Potential TMWRF Effluent Demands by Hydrographic Basin

Hydrographic Basin	Low Estimate		High Estimate	
	Acres Irrigated	Demand (af/yr)	Acres Irrigated	Demand (af/yr)
Truckee Meadows				
Existing Sites	1,031	2,795	1,074	4,159
Future Potential Sites	816	3,785	1,277	5,589
Total Truckee Meadows	1,847	6,580	2,351	9,748
Spanish Springs Valley				
Future Potential Sites	1,510	5,649	1,510	5,649
Total TMWRF	3,357	12,229	3,861	15,397

The City of Sparks has identified 20 potential reuse sites with an estimated total annual effluent demand upon implementation of all projects of 6,663 af/yr as shown in Table 3-5. This demand is expected to be fully realized by 2034. Sparks assumes a length of time, depending on each project, over which the demand would increase to the designed peak demand rate.

The City of Sparks infrastructure currently extends to the intersection of Eagle Canyon Drive and Pyramid Highway in Spanish Springs.

The City of Reno has identified 20 potential sites with an estimated total annual effluent demand upon implementation of all projects of 8,734 af/yr. In some cases, a range is shown for demand and irrigation acres to reflect some uncertainty in how much of the particular site would be irrigated. This demand is expected to be fully realized and have the necessary facilities constructed by 2010. Construction of the City of Reno effluent system will follow a phased implementation schedule where each project's demand will be fully realized concurrently with the completion of construction.

Combining the potential effluent demands for the Reno and Sparks systems, yields total projected effluent demands for TMWRF at 2005, 2010, 2015 and 2025, as depicted in Table 3-5. A number of factors will be balanced by the Cities in the future as additional planning is performed to implement specific reuse projects. These factors include available water rights, cost of infrastructure, interest on the part of property owners in receiving effluent, river water quality needs and potential benefits that might be realized from implementation of non-structural Truckee River water quality improvement projects and/or discharge permit modifications.

Table 3-5
Phasing of Potential TMWRF Effluent Demands (af/yr)

System	2005		2010		2015		2025	
	Low Estimate	High Estimate	Low Estimate	High Estimate	Low Estimate	High Estimate	Low Estimate	High Estimate
Reno	3,905	5,357	5,566	8,734	5,566	8,734	5,566	8,734
Sparks	3,503	3,503	4,824	4,824	6,158	6,158	6,663	6,663
Total	7,408	8,860	10,390	13,558	11,724	14,892	12,229	15,397

3.8.2 STMWRF Effluent Reuse

As stated at the beginning of this chapter, the South Truckee Meadows Water Reclamation Facility is one of the few 100% water reclamation facilities in the United States. Treated effluent is used for community irrigation of parks, schools, golf courses, and thoroughfare median landscapes. The South Meadows Industrial Park, Double Diamond and Damonte Ranch areas currently irrigate with effluent and therefore conserve potable water. Effluent is supplied to the ArrowCreek and Wolf Run Golf Courses and is provided to the Washoe County South Valley Regional Park near U.S. 395.

Under current operation, surface water from Howards and Thomas Creek is combined with treated effluent and pumped to Huffaker Reservoir. Effluent from Huffaker Reservoir and STMWRF is filtered and disinfected to provide a high quality irrigation water meeting regulatory and end-user requirements. Based on current wastewater flow projections and the water balance for Huffaker Reservoir, the creek water currently being used to supplement the STMWRF effluent supply may no longer be required for irrigation of existing sites after 2004.

Current effluent demand is approximately 2,220 af/yr. As the area continues to develop, plans for extending the effluent reuse system up the Mt. Rose Highway to serve other potential uses are being investigated.

Future potential reuse sites and estimated demands are depicted in Figure 3-7. These sites were split into two categories, which represent the likelihood of these sites using effluent for irrigation. The first category consists of sites identified in prior work as having a relatively high likelihood of receiving effluent. These are referred to as “firm sites”. The second category consists of sites having a good potential of using effluent for irrigation, but are considered more preliminary and require further evaluation to determine their feasibility. These sites are referred to as “soft sites”. Table 3-6 summarizes total potential effluent demand at 6,179 af/yr based on planning to date. Washoe County has not yet developed a phasing schedule. This compares to approximately 10,000 af/yr for the projected build-out wastewater flows to STMWRF.

Table 3-6
Total Potential STMWRF Effluent Demands by Hydrographic Basin

Hydrographic Basin	Acres Irrigated	Demand (af/yr)
Truckee Meadows		
Existing Sites	615	2,220
Future Potential Sites	356	2,241
Total Truckee Meadows	971	4,461
Pleasant Valley Future Potential Sites	502	1,718
Total	1,473	6,179

TMWRF – STMWRF Inter-tie Pipeline

The use of an effluent inter-tie pipeline, which would interconnect TMWRF and STMWRF via Huffaker Reservoir, is a possible solution to provide additional seasonal irrigation supplies necessary for the South Truckee Meadows area. This supply would enable the conversion of tributary water that is currently used for irrigation to potable supplies and would also provide a potential short-term solution to the current discharge limitation placed on TMWRF to the Truckee River.

As the TMWRF service area continues to develop, effluent in excess of the permit limit could be sent to Huffaker Reservoir or a new storage reservoir. A potential scenario is TMWRF expands to approximately 46 MGD ADMMF while the discharge permit limit remains at 40 MGD ADMMF. In this case, the excess flow could be used for irrigation in the summer months and stored in the winter months. The winter storage volume could either be used for the next year's irrigation season or returned to TMWRF and discharged to the Truckee River during low effluent flow periods. For this scenario, an inter-tie pipeline would be needed to connect TMWRF to the Huffaker Reservoir and STMWRF.

3.8.3 RSWRF Effluent Reuse

The Reno Stead Water Reclamation Facility produces effluent for irrigation and sustaining flows for the Lemmon Lake (Swan Lake) Wetlands. During the winter and when wastewater flows are in excess of effluent irrigation demands, the effluent is discharged into a natural drainage channel that flows to the nearby Swan Lake playa. This is the primary disposal site for RSWRF, which is permitted to discharge an average of 1.5 MGD (1,680 af/yr) to the playa. A minimum of 159 million gallons per year (490 af/yr) is sent to the Swan Lake playa per an agreement to sustain existing wetlands. Under their present operation, the RSWRF sends an average of 0.70 MGD, or about 65% of its total flow to be used for reuse from March to October. All of the effluent is discharged to the Swan Lake playa from November to February.

Approximately 0.05 MGD (33 af/yr) of effluent is sent to Mayors Park, and 0.9 MGD (591 af/yr) is sent to the Sierra Sage Golf Course. Mayors Park only receives a small amount of effluent to balance the nitrogen uptake. Effluent is also supplied to Washoe County's North Valley Sports

Complex. During 2003, the sports complex received up to 0.22 MGD, which will eventually taper off to about 0.15 MGD (99 af/yr). Potential new reuse services include J.C. Penney and a local elementary/middle school, as the existing reuse pipeline is located near these two sites.

Because all effluent is currently used for irrigation and wetlands habitat in Swan Lake, substantial increases in reuse amounts for new users will not be available until an additional water supply is brought into the Stead area. Should this planned growth occur, there are plans for additional plant expansions from 2.0 MGD to 4.0 MGD, with an ultimate build-out capacity of approximately 7.0 MGD. Additional studies are ongoing to evaluate future discharge options for RSWRF, including expanded effluent reuse with and without seasonal storage, additional discharge to the Swan Lake wetlands and playa, and seasonal discharge to areas outside of the Lemmon Valley hydrographic basin. Estimated effluent demands for existing reuse sites in the Stead area are summarized in Table 3-7, actual deliveries to date have been less than 400 af/yr. Figure 3-8 depicts the existing effluent infrastructure and reuse sites in the Stead area.

Table 3-7
Existing RSWRF Effluent Demands

Hydrographic Basin	Acres Irrigated	Demand (af/yr)
Lemmon Valley		
Existing Sites	n/a	722
Total Lemmon Valley	n/a	722

References Cited

AGRA Infrastructure, 2000, Water and Wastewater Facility Plans on Industrial Zoned Lands along the Lower Truckee River within Washoe County.

AGRA Infrastructure, 2000, Strategies to Reduce the Cost of Converting Septic Tanks to Community Sewers in Washoe County.

AMEC Infrastructure, 2001, Sparks Effluent Pipeline Extension Facility Plan Amendment.

Broadbent and Associates, 2001, Groundwater Flow and Solute Transport Model, North Cold Springs Valley, Washoe County, Nevada.

Carollo Engineers, 1997, Regional Wastewater Facilities Master Plan. Prepared for City of Reno, City of Sparks, Washoe County Department of Water Resources.

Carollo Engineers, 1999, Reno/Sparks/Washoe County Regional Wastewater Reclamation Facilities Design Phases I & II, Draft Report.

District Health Department, District Board of Health Regulations Governing Sewage, Wastewater, and Sanitation, Revision Approved July 25, 2001.

ECO:LOGIC, 2004, Reno-Stead Water Reclamation Facility Plan

ECO:LOGIC, 2002, South Truckee Meadows Facility Plan.

ECO:LOGIC, 2002, Phase I North Valleys Facility Plan Technical Memorandum No. 3.

Kennedy/Jenks Consultants, 2002, Cold Springs Wastewater Facility Plan.

Kennedy/Jenks Consultants, 2003, Feasibility Analysis Wastewater Treatment and Disposal Facilities in Spanish Springs Valley.

Kennedy/Jenks Consultants and CH2M Hill, 1992, Regional Water Supply and Quality Study Phase I.

Kennedy/Jenks Consultants and CH2M Hill, 1994, Regional Water Supply and Quality Study Phase II, Technical Memorandum 11.1, March 4, 1993.

Kennedy/Jenks Consultants, 2003, Feasibility Analysis Wastewater Treatment and Disposal Facilities in Spanish Springs Valley, prepared for Washoe County Department of Water Resources.

Stantec Consulting Inc., 2002, Lawton/Verdi Wastewater Facility Plan, Washoe County, Nevada.

Washoe County Department of Water Resources, 2002, Spanish Springs Valley Nitrate Occurrence Facility Plan.

Washoe County Department of Water Resources, 2004, Washoe County Artificial Recharge Project, Golden Valley, Washoe County, Nevada, 2003 Annual Report.

Washoe County, August 2002, Washoe County Comprehensive Plan: Verdi Area Plan