2005-2025

WATER FACILITY PLAN

DECEMBER 2004

TRUCKEE MEADOWS WATER AUTHORITY

Section I

EXECUTIVE SUMMARY

PURPOSE & OBJECTIVES:

The objectives of the 2025 Water Facility Plan (WFP) are as follows:

1. Determine the necessary water distribution and treated water storage facilities to meet the forecasted demands and resource optimization goals in the 2025 Water Resource Plan (WRP).
2. Determine the optimum combination of facilities that satisfy TMWA and NAC 445A criteria while minimizing the financial cost to the community.
3. Obtain District Health acceptance of the Facility Plan to reduce and streamline subdivision submittal, review and approval requirements.
4. Secure Regional Water Planning Commission approval for conformance with the regional plan.
5. Provide a firm foundation to fairly allocate facility costs to new growth and existing customers.
6. Identify the phasing of improvements to allow timely completion of improvements prior to the need, as well as to insure the logical and orderly expansion of the water system.
7. Provide cost information and project construction timing for the Ten Year Financial and Funding Plan.

INTRODUCTION:

This planning effort represents the first time that TMWA has fully utilized the capabilities of GIS technology to develop a fully integrated database consisting of water meter billing information attached to the associated land parcel. The result was an average day demand data set which is very accurate from a perspective of both geographical distribution and total volume. In addition, daily meter reads obtained during the summer of 2003 provided actual peak day water use data that provided average day to maximum day peaking factors by rate class. In general, it is believed that this is the most accurate data that TMWA planning engineers have ever been able to work with.

FUTURE DEMANDS & FACILITY COST SUMMARY:

The maximum day demand on TMWA's supply and distribution facilities is anticipated to increase from about 152 million gallons per day (MGD) in 2005 to about 201 MGD in 2025 (a 32 percent increase over the 20 year period). Due to the future conversion of all remaining flat rate users to metered rates, it is anticipated that overall system demand will decrease slightly in the 2010 timeframe (it is assumed that the system is 100 percent metered in the next three

years). The estimated decrease in demand almost entirely offsets new demand from in-fill development within portions of the existing system, thus some older parts of the distribution system will see very little, if any net growth in demand over the 20-year planning period. WFP demand projections were developed independently and then compared to WRP estimates. It was anticipated that some adjustment and reconciliation with WRP projections would be necessary, but the two demand sets were in close agreement, which is summarized below.

2005-2025 Maximum Day Demand Projections*

Year	WRP MDD (MGD)	WFP MDD (MGD)	Percent Difference
2005	153.1	152.1	(0.3)
2010	159.6	161.0	0.9
2015	171.0	177.1	3.6
2020	180.5	189.7	5.1
2025	189.5	201.0	6.1

* The difference between WRP and WFP forecasts include: (1) the WFP uses more recent and accurate parcel size data with current peaking factors to arrive at revised meter retrofit savings that are about 4 MGD less than the WRP estimate; and (2) the WFP includes 4 MGD for the Verdi area and an additional 3.2 MGD for SVGID, which was not included in the WRP. After considering these factors, the net result is a 0.3 MGD difference (189.5 vs. 189.8) between the two demand projections.

The major growth in water demand is expected to primarily occur in four geographic areas as summarized below:

2005-2025 High Growth Areas

Service Area	Increase in Retail MDD (MGD)	Increase in Wholesale MDD (MGD)	Total Increase In MDD (MGD)
Northwest - Verdi	8.7	4.0	12.7
Spanish Springs	15.9	5.3	21.2
So. Truckee Meadows	(0.3)	6.7	6.4
North Virginia - Stead	2.7	4.8	7.5
Totals	**27.0**	**17.6**	**47.8**

The estimated cost of water system facilities required to meet the demands of new growth and/or correct deficiencies for existing customers are summarized below under the categories of Supply, Storage, Distribution and Pumping Systems.

2005-2025 Facility Costs & Preliminary Allocations

Facility Category	Total Estimated Costs	Costs Allocated to New Growth	Costs Allocated to Existing Customers
Supply	$51.0 M	$41.4 M	$ 9.6 M
Storage	$53.3 M	$30.7 M	$22.6 M
Distribution	$53.7 M	$40.7 M	$13.0 M
Pumping	$30.9 M	$21.6 M	$ 9.3 M
Totals	**$188.9 M**	**$134.4 M**	**$54.5 M**

As indicated in 2005-2025 High Growth Areas table above, the majority of the new demand is expected to occur in the Spanish Springs area over the next 20 years. As might be expected, a proportional share (approximately $25M) of the $53.7M in distribution facility costs is tentatively allocated to Feeder Main Areas 2, 2A, 4 and 5. Although the next highest increase in demand is expected to occur in the Northwest (including Verdi), the preliminary allocation of facility costs to Area 3 are relatively small. This is because the bulk of the Verdi distribution and storage facilities would be constructed downstream of the wholesale meter point and most likely built and dedicated by developers. Some relatively high facility costs are anticipated for the North Valleys area since a complete rebuild or replacement of both the North Virginia and Stead supply systems is required for new growth and/or normal age related replacement purposes. Since the details regarding costs, allocation of costs and the probable impact on water rates and developer facility charges will be presented in the 10-Year Funding Plan, the 2025 WFP will focus on the facility requirements and the phasing or timing of those improvements.

FACILITY REQUIREMENTS:

A brief discussion of the major Supply, Distribution, Pumping and Storage facility recommendations with required project in-service dates and estimated costs are presented below:

Major Supply Improvements

Project	Required Completion	Estimated Cost
A. Highland Canal Lining	**2005-2010**	**$1,100,000/ year**
B. Glendale Pumping Improvements	**2006**	**$3,500,000**
C. Glendale Diversion	**2010**	**$9,000,000**
D. Sparks Groundwater Treatment Plant	**2013**	**$12,000,000**
E. New Production Wells		
Stead-Silver Lake Wells	**2005**	**$1,600,000**
Tucker Well	**2006**	**$1,000,000**
School District Well	**2016**	**$1,000,000**
Longley #2 Well	**2017**	**$1,000,000**
F. Chalk Bluff Expansions		
Phase 4	**2018**	**$10,500,000**
Phase 5	**2025**	**$10,500,000**

A. Highland Canal Lining

The Highland Canal is the primary raw water conveyance system for Chalk Bluff due to the cost of pumping from the Orr Ditch diversion, the increase in water quality afforded by the upstream diversion and the higher reliability of gravity flow. The Highland Canal currently has the capacity to deliver about 60 percent of the current net treatment capacity of the Chalk Bluff plant. Approximately 23,800 feet of the 38,700 feet total length of the Highland Canal between the diversion head works and Chalk Bluff has been improved. The long-term goal of the Highland Canal improvements is to provide a secure, protected, all-weather conveyance system capable of diverting as much of the Chalk Bluff supply by gravity flow as possible. In some locations such as the Mogul area, existing flume sections represent a potential major liability from damage to personal property should a canal failure occur. The proposed Mogul Bypass project would eliminate the potential liability.

B. Glendale Pumping Improvements

The net treatment capacity of the Glendale plant is about 34.5 MGD, but the existing raw water diversion capacity limits net production to about 27 MGD. When the new arsenic standard goes into effect in 2006, TMWA will begin delivering up to 7.6 MGD of high arsenic groundwater to the Glendale site from the Mill, Corbett and Greg wells to insure PCE remediation goals continue to be met and to preserve normal production capacity. Arsenic concentrations in these wells are such that they can be blended with finished water from the plant and thus add to and not displace surface water treatment capacity. Following construction of the Glendale diversion, blending of groundwater at the finish water pump station wet well during a non-drought year would require a finish water pumping rate from the Glendale plant of around 45 MGD. Expansion of the finish water pumping capacity will take full advantage of the available plant treatment capacity, maximize surface water production in a non-drought year, reduce dependence on Chalk Bluff and provide flexibility to operate the Mill and Corbett PCE wells on a year-round basis. The planning and design of this facility will include an analysis of both high- and/or low-head pumping into the Highland and Sparks Regulated gravity zones, respectively, to minimize energy costs and the potential of piping additional arsenic wells to Glendale for treatment. The cost of this improvement is included in the Arsenic Compliance budget.

C. Glendale Diversion

An appropriate mix of ground water and surface water supplies are necessary to meet demands in both a drought and a non-drought year. As the population grows, it will become even more important to delay or extend the use of drought reserves from upstream reservoirs (referred to as Privately Owned Stored Water (POSW)) in the event of an extended drought situation. Once upstream POSW is released, it is critical to capture that water at either the Chalk Bluff Treatment Plant via the Highland Canal or the Orr Ditch pump station, or at the Glendale Treatment Plant. The minimum river flow expected to be available for diversion at Glendale during the critical drought year is 25 cubic feet per second (cfs), which consists of the minimum 20 cfs bypass flow beyond the Orr Ditch diversion structure when the pump station is operated plus an assumed 5 cfs of combined contributions from City storm drains and natural river acccretion between Chalk Bluff and Glendale. This results in a minimum surface water supply to Glendale of about 16.2 MGD. The Glendale Diversion project is necessary in part to allow capture of that important POSW under drought (low flow) conditions. This drought year surface water supply to Glendale, in conjunction with existing high arsenic

ground water supplies will insure that the plant can continue to produce a finished water flow near its rated capacity. During a non-drought year, the Glendale Diversion will provide reliable delivery of up to 38 MGD of river water to the Glendale plant to maximize surface water production and take full advantage of the 34.5 MGD of available net treatment capacity. In addition, the new diversion will improve reliability, reduce the environmental impact of diversion maintenance, enhance the fisheries habitat, improve recreational opportunities, and provide some flood benefits. This project does not create significant additional non-drought year capacity without increasing the finished water pumping capacity from the plant. Due to the significant non-capacity related aspects of this project, it may be constructed one to two years earlier than noted above if environmental and construction permits and funding assistance are secured.

D. Sparks Groundwater Treatment Plant

To maintain water service during drought conditions and to maximize the yield of TMWA's water resources under all conditions, it will be necessary to develop a groundwater production capacity of at least 72.6 MGD. This estimate is based on the provisions of the conjunctive use agreement which allows TMWA to pump approximately 22,000 AF in a drought year. Maximizing the yield of this drought supply results in a peak month extraction of 6900 AF, or 72.6 MGD. Although the Glendale plant has adequate treatment capacity (37.5 MGD) to allow adding more arsenic groundwater to the treatment train during a drought year (the Pezzi, Poplar #1 and Terminal wells are already piped to Glendale), a separate groundwater treatment facility is recommended due to: (a) a resulting increase in overall system reliability; (b) a reduction in raw water piping costs by locating the treatment facility closer to potential sources; and (c) because additional non-drought capacity is created (additional groundwater sent to Glendale would only displace surface water in a "normal" year). Because Sparks would benefit from the addition of another reliable supplemental source of supply; additional good quality groundwater sources have been extremely hard to locate and develop; and because new supply capacity must be developed anyway, the project needs to be implemented.

E. New Production Wells

The conjunctive use of ground and surface water supplies provides many benefits to the TMWA system. An adequate groundwater supply is necessary to maintain water service during periods of drought or other periods when surface supplies are temporarily curtailed. In an emergency

situation where surface supplies are unavailable and mandatory conservation is imposed, groundwater could satisfy the essential indoor water needs of the community for an extended period. TMWA also utilizes its groundwater as a peaking supply to meet seasonal peak use demands that exceed surface water treatment capacity. Strategically located production wells can reduce distribution system facility requirements by placing supply sources closer to areas of large demand that may be located a great distance away from surface water production facilities (e.g. Spanish Springs well). In order to defer Chalk Bluff Phase 4 expansion as long as possible and provide adequate drought period supply, it is necessary to develop about 73 MGD of net groundwater capacity. Current groundwater capacity is about 61 MGD including the arsenic wells that are piped to Glendale. The total increase in groundwater capacity from the new well projects will be about 6.4 MGD.

F. Chalk Bluff Treatment Plant Expansion

The proposed Glendale and groundwater improvements will provide adequate drought supply and meet resource optimization goals while also providing new capacity to meet the anticipated needs of new development for the next 11-13 years. At that point in time, additional sources of supply will be needed. The additional supply will most likely be provided by constructing Chalk Bluff Phase 4, unless additional groundwater rights are developed and extraction of those rights is allowed by the State Engineer. Once drought supplies are secured and resource optimization goals are met, the most cost effective alternative for creating additional supply is through expansion of the Chalk Bluff plant.

Major Distribution Improvements

Major distribution facility improvements are presented below by regional area of influence and contribution:

Projects	Required Completion	Estimated Cost
A. Sparks-Spanish Springs		
NE Sparks Feeder Main Ph. 3	2005	$4,236,000
NE Sparks Feeder Main Ph. 4	2009	$3,466,000
NE Sparks Feeder Main Ph. 5	2010	$1,533,000
NE Sparks Feeder Main Ph. 6	2012	$4,173,600
NE Sparks Feeder Main Ph. 7	2018	$1,227,000
SE Sparks Feeder Main Ph. 1	2009	$ 248,000
SE Sparks Feeder Main Ph. 2	2020	$2,048,000
B. North Valleys		
Silver Lake Main Improvements	2005	$2,570,000
Stead-North Virginia Trans. Main	2009	$9,800,000
Hoge Main	2009	$ 475,000
Raleigh Heights Trans. Main	2009	$1,789,000
Raleigh-Stead Trans. Main	2013	$4,050,000
C. Northwest-Verdi		
US 40 - Mae Anne Parallel Main	2008	$ 664,000
Mogul Parallel Main	2009	$2,014,000
Mayberry River Crossing	2010	$ 180,000

A. Sparks Distribution Improvements

Due to the lack of good quality of groundwater sources of sufficient volume in northeast Sparks, it is necessary to convey surface water production from the Glendale treatment plant over a very long distance out to the Spanish Springs area. A similar situation will also exist when the proposed Copper Canyon project begins development on the east side of Sparks. Several alternatives that had potential to offset or reduce the size of required distribution facilities in Sparks were evaluated, including a groundwater treatment plant (GWTP) and a low-head pumping facility south of Spanish Springs valley. As intuitively anticipated, a Sparks GWTP reduces the main size between Glendale and the GWTP location; however, there is very little that can be done to reduce the main size from the GWTP to Spanish Springs valley. This is because a very large pipe is required just to overcome cumulative friction losses produced as a result

of the significant length of the main (pipe velocity is relatively low for a surprisingly wide range of pipe diameters). The proposed Disc Drive pump station may only be operated for 3-4 months per year, but its contribution during the peak use period reduces Sparks Feeder main costs by about $3 million. The projects listed above are just a short list of the major facilities. As previously mentioned, the total cost of distribution facilities for the Sparks area is about $25 million over the next 20 years. The need for these facilities is directly related to growth and will be paid for by new development through appropriate area-based feeder main fees.

B. North Valleys Distribution Improvements

With the annexation of the Sky Vista development in Stead in the mid-1990's, it was projected that the Stead main would need to be replaced with a higher capacity pipeline around 2001. Sierra's purchase of the Silver Lake system in the late 1990's provided sufficient additional peak day supply to delay the Stead main replacement project, but did not indefinitely defer the need for a higher capacity pipeline, nor the need to replace the aging existing pipeline. From a water resource perspective, the Regional Water Planning Commission (RWPC) has recommended that further use of Truckee river water rights for growth in the North Valleys be limited, due to the additional return flow dedication requirement associated with the export of Truckee river water outside of the Truckee Meadows basin. Even if a groundwater importation project provides adequate supply to the North Valleys, it is still several years out and it is uncertain whether it will replace the supply for existing customers within the TMWA retail service area. The existing Stead main is approximately 50-years old and is approaching the end of its useful life. Most of the major leaks in recent years have occurred in the low pressure section of the pipeline between the Stead #2 pump station and the Stead tanks where the wall thickness of the cement mortar lined steel pipe is less. However, demand for new water service TMWA's North Virginia system is very strong and the analyses have indicated that a combined Stead-North Virginia pump system replacement project would be the most cost effective alternative to develop. The project would be completed in two phases with the initial pipeline and pumping improvements delivering water to the Raleigh Heights system followed by a phase two pipeline extension to Stead. Due to the commitment to serve existing customers in the Stead area, TMWA would be responsible for a portion of the Stead-North Virginia system and all of the Raleigh-Stead system.

C. Northwest-Verdi Distribution Improvements

The Northwest-Verdi projects listed above do not include any facilities required to serve Verdi beyond an assumed meter point at Mogul and does not reflect oversizing investment already made in the 2003 Mayberry parallel main project.

Storage Improvements

Projects	Required Completion	Estimated Cost
A. Gravity Zones		
Hunter Creek Gravity Storage	**2007**	**$6,650,000**
Highland Gravity Storage	**2008**	**$6,650,000**
B. Pumped Storage Zones		
1.25 MG Beaumont Tank	**2005**	**$1,780,000**
1.5 MG Ridgeview Tank	**2006**	**$2,760,000**
4.0 MG Pyramid Tank	**2006**	**$4,520,000**
1.5 MG Vista #2 Tank	**2006**	**$1,800,000**
1.25 MG D'Andrea Tank	**2006**	**$1,875,000**
1.5 MG Community College Tank	**2006**	**$2,000,000**
2.5 MG Raleigh Heights #3 Tank	**2008**	**$2,750,000**
0.75 MG Vista #3 Tank	**2008**	**$1,125,000**
1.25 MG Caughlin #2 Tank	**2009**	**$1,750,000**
2.0 MG Stead Tank	**2012**	**$2,400,000**

A. Gravity Zone Storage Improvements

An analysis of 2005 treated water storage requirements indicates a slight overall surplus of about 4.5 MG for the major gravity zones (Hunter Creek, Highland and Sparks Regulated). From a system hydraulic standpoint, surplus storage in the Hunter Creek zone can flow by gravity to the Highland zone, which in turn can pass flow "downstream" to the Sparks regulated zone. Working "backwards" in the gravity flow scheme, the Sparks regulated gravity zone will have a projected 2005 storage deficit of around 19.6 MG, the Highland zone will have a projected 2005 storage surplus of about 0.7 MG and the Hunter Creek zone will have a 2005 storage surplus of about 23.4 MG. The large surplus at Hunter Creek is appropriate since the zone's elevation provides the hydraulic flexibility to supply all other gravity zones in an emergency situation. The projected

growth in wholesale demands will slightly increase the operating storage requirements in the gravity reservoirs to meet the incremental volume between max day and peak hour demands. However, the 2025 storage projections indicate that the gravity zones will still contain an overall surplus of storage (from a TMWA design criteria standpoint), primarily because the Canoe Hill wholesale demand is shifted from the gravity zone to a tank zone (the proposed 2006 Pyramid tank in Spanish Springs). From a Nevada Administrative Code (NAC) total capacity compliance standpoint, a minor amount of additional operating storage is required to satisfy the requirements of NAC 445A.66725 under 2005 max day demand conditions. Even with the addition of 10 MG of gravity storage, it is possible that there could still be a slight deficit in total capacity (per NAC 445A.6672) under 2025 peak hour demand conditions. However, the accuracy of 2025 demand estimates does not warrant an addition of more than 10 MG of storage at this time. In addition, the increased maintenance requirements of the two major treated water storage reservoirs constructed with liners and floating covers (one 30 MG reservoir at Hunter Creek and one 20 MG reservoir at Highland) has revealed a need for redundant storage facilities within these zones. Because of the need for additional operating storage and redundancy concerns, it is recommended that additional gravity storage be constructed within both the Hunter Creek and Highland zones.

B. Pumped Storage Improvements

The pumped storage tank projects reflect only those facilities that will be paid in whole or part by existing customers, either as incremental oversizing of storage facilities to serve new development, or as stand alone additional storage required for existing customers. The estimated costs above do not reflect the anticipated cost sharing with new development. Additional storage is required to eliminate existing storage deficiencies (Vista #2, Community College, Caughlin) or provide storage where none currently exists (Ridgeview, Pyramid, D'Andrea, Vista #3). The Stead tank may be constructed at a Raleigh Heights site since gravity flow from there to Stead is possible. The Vista #3 tank will cover existing customers in the Wingfield Hills pump zone. The Caughlin tank is a very important storage facility because it provides emergency backup to seven continuous pumping zones in addition to the eight pump zones it normally serves. The existing deficit may be due to several factors, including higher actual demands or that the original sizing of the Caughlin tank may not have considered simultaneous emergency service to all zones. Detailed discussions of storage deficits can be found in the Storage section of this report.

Pumping System Improvements

Pumping System Projects	Required Completion	Estimated Cost
Pyramid-Point View	**2005**	**$1,150,000**
Hunter Creek-Ross	**2005**	**$ 900,000**
Glendale High-Lift	**2006**	**$3,500,000**
Truckee River Highlands #1 & #2	**2007**	**$1,500,000**
Vista #2 & #3 Capacity Increase	**2008**	**$ 600,000**
North Virginia-Stead	**2009**	**$8,600,000**
Spanish Springs #2 Capacity Increase	**2010**	**$ 500,000**
Disc Drive Low Head	**2015**	**$ 800,000**

The pump system projects noted above are driven by various factors including new growth as well as increased reliability for existing customers. Pump stations that will only serve new growth are not necessarily shown in the table above.

The Pyramid pump station project is necessary to expand capacity to the west side of Spanish Springs valley and also provides the opportunity to eliminate the deteriorated Point View continuous pumping station.

Water use within the Hunter Creek and Ross pump zones has increased to the point where adequate peak hour pressures cannot be maintained with current pumping equipment. Consolidation of these two old underground pump stations into one new building at the Hunter Creek reservoir site is cost effective and with the addition of standby power generation, almost all of the existing Caughlin storage deficit will be eliminated from an NAC compliance standpoint.

Replacement of the Glendale Hi-Lift station (in conjunction with the Glendale diversion project) will allow full utilization of the plant's treatment capacity; creating about 7.5 MGD of additional surface water capacity and another 7.6 MGD of capacity from blending high arsenic groundwater (Mill, Corbett & Greg) without having to construct separate treatment facilities.

The original Vista #1 pump station was located in an underground vault within the right-of-way of Vista Boulevard and was subject to repeated flooding from groundwater intrusion. This station was replaced in 2004 with a new above ground building and also provided with higher capacity pumps to meet future needs. Vista #2 & #3 will also need capacity increases in the near future in conjunction with the #2 tank project.

The cost of the proposed combined North Virginia-Stead system (including the pipeline) would be shared by new North Virginia development and existing Stead customers.

The Truckee River Highlands pump system will meet demands in the lower Northgate area without having to pump into the higher Northgate #1 & #2 tank zones and will also free up pumping capacity at US 40 for potential increased pumping to Somersett or Verdi. The cost of this system is currently being collected through a feeder main fee for Area 3.

The Disc Drive Low Head facility reduces Sparks Feeder Main capital costs and only needs to be operated during peak use months.

The pumping capacity of the Spanish Springs #2 pump station will need to be expanded to meet the future needs of the Spanish Springs valley. Any increase in capacity would be paid for by growth.