City of Sparks TMSA/FSA
Conceptual Facility Master Plan

Volume 1 of 2

January, 2008

Prepared for:
City of Sparks
910 Roberta Lane
Sparks, Nevada 89431

Regional Water Planning Commission
c/o Washoe County Department of Water Resources
4930 Energy Way
Reno, Nevada 89502

Prepared by:
Stantec Consulting
6980 Sierra Center Parkway Suite 100
Reno, Nevada 89511
Tel:(775) 850-0777
Fax: (775) 850-0787

Project #180101085

TABLE OF CONTENTS

Section One – Introduction

1.1 Purpose and Scope 1
1.2 Concurrency 1
1.3 Regional Coordination 2
1.4 Planning Approach 3
1.5 Description of Study Area 5
1.6 Population Forecast 6
1.7 Conceptual Level Analysis 8

Section Two – Transportation

2.1 Introduction 9
2.2 Population and Development Forecasts 10
2.3 Existing Transportation Network 10
2.4 Future Transportation Network 11
2.5 Phasing of Capital Improvements 11
2.6 Conclusions 13

Section Three – Water

3.1 Related Studies 14
3.2 Existing Water Demands, Supply and Facilities 16
3.2.1 Introduction 16
3.2.2 Water Demands and Future Water Demand Estimation Methods 16
3.3 Water Purveyors, Supply, Rights and Availability 18
3.3.1 Municipal Water Service Purveyors 18
3.3.2 Water Supply 19
3.3.3 Water Rights 22
3.4 Existing Water Facilities 26
3.4.1 TMWA 26
3.4.2 Washoe County Department of Water Resources 27
3.5 Surface Water Supply 27
3.5.1 Surface Water Quality and Treatment Facilities 27

3.5.2 Groundwater Supply 28
3.5.3 Groundwater Quality and Treatment Facilities 28
3.6 Existing Water Distribution System Facilities 29
3.6.1 Pipeline Facilities 29
3.6.2 Pump Station Facilities 30
3.6.3 Existing Storage Tank Facilities 31
3.7 Proposed Water Facilities Planning Considerations 31
3.7.1 Regulatory Review and Considerations 33
3.7.2 Design Criteria 34
3.7.3 Potential Private Well Conversions 34
3.7.4 Future Water Demands by Priority Service Area 35
3.7.5 Future Water Demand Summary 38
3.8 Proposed Water Facilities 38
3.8.1 Supply and Treatment Facilities 39
3.8.2 Distribution System Facilities 40
3.8.3 Water Distribution Facility Summary 42
3.8.4 Estimated Water Facility Costs 42
3.9 Summary 45

Section Four – Wastewater / Reclaimed Water

4.1 Related Studies 47
4.2 Existing Wastewater and Reclaimed Water Facilities 49
4.2.1 Wastewater Flow Rates and Volumes 49
4.2.2 Wastewater Strength 50
4.2.3 Wastewater Facilities 52
4.2.4 Reclaimed Water Facilities 55
4.3 Proposed Wastewater and Reclaimed Water Facilities 57
4.3.1 Regulatory Review and Considerations 60
4.3.2 Design Criteria 61
4.3.3 Potential Septic System Conversions 62
4.3.4 Treated Wastewater Effluent Quality Goals 62
4.3.5 Year 2030 Wastewater Flow Rates and Volumes 63
4.3.6 Proposed Year 2030 Wastewater Facilities 63
4.3.7 Wastewater Facility Costs 66
4.3.8 Year 2030 Reclaimed Water Facilities 67

4.3.9 Reclaimed Water Facility Cost 70
4.4 Summary 71

Section Five – Drainage

5.1 Introduction 73
5.2 Data Collection, Base Mapping & GIS Database Development 73
5.3 Existing Drainage Facility Master Plans, Reports and Studies 74
5.4 Future TMSA/FSA Drainage Master Plan Areas 76
5.5 Existing and Proposed Facilities and Capital Improvement Projects 77
5.5.1 Proposed Facilities & Capital Improvement Projects by Priority Area 78
5.6 Concurrence with the City of Reno and Washoe County TMSA/FSA Facility Plan 80
5.7 Proposed FSA Facilities 80
5.7.1 Proposed FSA Facilities by Priority Service Area and Conceptual Level Estimate of Drainage Facility Costs 81
5.8 TMSA/FSA Future Development Design Criteria 82
5.9 Conclusions 82
5.10 References 84

List of Tables

No.	Description	Page
Table 1.1	Land Area Allocations Between the TMSA Boundaries	2
Table 1.2	Sparks TMSA/FSA Study Area Characteristics by Priority Service Area, 2005	5
Table 1.3	Population Forecast Used to Determine Respective Portion of the TMSA	6
Table 1.4	Full Buildout Projected Population, Units and Employees by Priority Service Area, Sparks TMSA/FSA	8
Table 2.1	Transportation Service Corridors Proposed in Priority Area 2	12
Table 2.2	Transportation Service Corridors Proposed in Priority Area 4	12
Table 2.3	Transportation Service Corridors Proposed in Priority Area 6	12
Table 3.1	Summary of Related Water Facility Studies	14
Table 3.2	Existing Potable Water Demands by Priority Service Area	18
Table 3.3	Hydrographic Basins Within TMSA/FSA Study Area	20

Table 3.4	Summary of Surface Water Treatment Facilities	28
Table 3.5	Number of Groundwater Supply Wells By Owner	28
Table 3.6	Existing Total Pipeline Lengths	29
Table 3.7	Existing Transmission and Distribution Pipelines Within The City of Sparks TMSA/FSA	27
Table 3.8	Existing Treated Water Pump Stations	30
Table 3.9	Existing Treated Water Pump Stations By Priority Service Area	30
Table 3.10	Existing Treated Water Storage Tanks	31
Table 3.11	Existing Treated Water Pump Stations by Priority Service Area	31
Table 3.12	Existing and Future Planning Data By Priority Service Area	32
Table 3.13	Density Assumptions By Priority Service Area	32
Table 3.14	Water Facility Design Criteria	34
Table 3.15	Potential Private Well System Conversions by Priority Service Area	35
Table 3.16	Year 2030 Average Day Demand by Priority Service Area	35
Table 3.17	Year 2030 Maximum Day Demand by Priority Service Area	36
Table 3.18	Year 2030 Peak Hour Demand by Priority Service Area	36
Table 3.19	Year 2030 Water Storage Requirements by Priority Service Area	37
Table 3.20	Year 2030 Water Demand Summary by Priority Service Area	38
Table 3.21	Year 2030 Pipeline Facilities	40
Table 3.22	Year 2030 Pipeline Facilities by Priority Service Area	40
Table 3.23	Year 2030 Pump Station Facilities by Priority Service Area	41
Table 3.24	Water Storage Demand by Priority Service Area	41
Table 3.25	Year 2030 Water Facility Summary by Priority Service Area	42
Table 3.26	Future Water Facility Summary by Priority Service Area	42
Table 3.27	Year 2030 Pipeline Facility Costs by Priority Service Area	44
Table 3.28	Year 2030 Pump Station Facility Costs by Priority Service Area	44
Table 3.29	Year 2030 Storage Tank Facility Costs by Priority Service Area	45
Table 4.1	Related Wastewater and Reclaimed Water Facility Planning Studies	48
Table 4.2	Existing Wastewater Flow Rates and Volumes by Priority Service Area	50
Table 4.3	Existing Wastewater Characterization	52

Table 4.4	Typical Composition of Domestic Wastewater	53
Table 4.5	Existing Wastewater Lift Stations	53
Table 4.6	Existing Wastewater Lift Stations	54
Table 4.7	Summary of TMWRF Information	55
Table 4.8	Existing Reclaimed Water Use Areas	56
Table 4.9	Existing Reclaimed Water Pipeline Facilities	57
Table 4.10	Existing and Future Population by Priority Service Area	58
Table 4.11	Priority Area Information	59
Table 4.12	Wastewater Facility Design Criteria	61
Table 4.13	Potential Septic System Conversions by Priority Service Area	62
Table 4.14	Year 2030 Wastewater Flow Volumes by Priority Service Area	63
Table 4.15	Year 2030 Treatment Facility Summary Information	64
Table 4.16	Year 2030 Wastewater Pipeline Summary Information	65
Table 4.17	Year 2030 Wastewater Lift Station Summary	66
Table 4.18	Year 2030 Wastewater Treatment Facility Cost Summary	67
Table 4.19	Year 2030 Wastewater Facility Cost by Priority Service Area	67
Table 4.20	Year 2030 Reclaimed Water Lift Station Facilities	69
Table 4.21	Year 2030 Reclaimed Water Pipeline Facilities	69
Table 4.22	Year 2030 Reclaimed Water Storage Facilities	69
Table 4.23	Year 2030 Reclaimed Water Facility Cost Summary	70
Table 4.24	Reclaimed Water Facility Cost Summary by Priority Service Area	71
Table 5.1	Regional Regression Equation – HEC-1 Peak Flow Rate Comparison	77
Table 5.2	TMSA Proposed Flood Control Facilities	79
Table 5.3	FSA Proposed Facilities	80
Table 5.4	FSA Facilities and Cost by Priority Service Area	82

List of Plates

No.	Description	
Plate 1.0	Facility Plan Priority Service Area and TAZ Boundaries	Map Pocket
Plate 2.0	Future Roadway Network and Service Corridors - 2030	Map Pocket

Plate 3.0 Existing and Proposed Water Facilities – 2030 ..... Map Pocket
Plate 4.0 Existing and Proposed Wastewater Facilities – 2030 ..... Map Pocket
Plate 5.0 Watershed Basins and Floodplains – 2030..... Map Pocket

List of Figures

No.	Description
Figure 1.1	Facility Plan Study Area and Priority Area Boundaries
Figure 1.2	Regional TMSA Boundaries and Sparks FSA Area
Figure 1.3	Private and Publically Owned Land by Major Category
Figure 1.4	Development Opportunities and Constraints
Figure 1.5	2030 Projected Population by Traffic Analysis Zone ("TAZ")
Figure 1.6	Full Build-Out Projected Population by Traffic Analysis Zone ("TAZ")
Figure 2.1	Existing and Proposed Roadway Network and Traffic Assignments - 2030
Figure 3.1	Existing Water Service Providers and Service Territories
Figure 3.2	Existing and Proposed Water Facilities - 2030(C16)
Figure 3.3	Existing and Proposed Water Facilities – 2030 (C17)
Figure 3.4	Existing and Proposed Water Facilities – 2030 (C18)
Figure 3.5	Existing and Proposed Water Facilities – 2030 (D16)
Figure 3.6	Existing and Proposed Water Facilities – 2030 (D17)
Figure 3.7	Existing and Proposed Water Facilities - 2030(D18)
Figure 3.8	Existing and Proposed Water Facilities -2030 (D19)
Figure 3.9	Existing and Proposed Water Facilities – 2030 (E15)
Figure 3.10	Existing and Proposed Water Facilities – 2030 (E16)
Figure 3.11	Existing and Proposed Water Facilities – 2030 (E17)
Figure 3.12	Existing and Proposed Water Facilities – 2030 (E18)
Figure 3.13	Existing and Proposed Water Facilities – 2030 (E19)
Figure 3.14	Existing and Proposed Water Facilities – 2030 (F15)
Figure 3.15	Existing and Proposed Water Facilities – 2030 (F16)
Figure 3.16	Existing and Proposed Water Facilities – 2030 (F17)

Figure 3.17 Existing and Proposed Water Facilities – 2030 (F18)
Figure 4.1 Existing and Future Wastewater Facilities – 2030 (C16)
Figure 4.2 Existing and Future Wastewater Facilities -2030 (C17)
Figure 4.3 Existing and Future Wastewater Facilities – 2030 (C18)
Figure 4.4 Existing and Future Wastewater Facilities – 2030 (D16)
Figure 4.5 Existing and Future Wastewater Facilities – 2030 (D17)
Figure 4.6 Existing and Future Wastewater Facilities -2030 (D18)
Figure 4.7 Existing and Future Wastewater Facilities -2030 (D19)
Figure 4.8 Existing and Future Wastewater Facilities -2030 (E15)
Figure 4.9 Existing and Future Wastewater Facilities -2030 (E16)
Figure 4.10 Existing and Future Wastewater Facilities -2030 (E17)
Figure 4.11 Existing and Future Wastewater Facilities -2030 (E18)
Figure 4.12 Existing and Future Wastewater Facilities -2030 (E19)
Figure 4.13 Existing and Future Wastewater Facilities -2030 (F15)
Figure 4.14 Existing and Future Wastewater Facilities -2030 (F16)
Figure 4.15 Existing and Future Wastewater Facilities -2030 (F17)
Figure 4.16 Existing and Future Wastewater Facilities -2030 (F18)
Figure 5.1 Existing and Proposed Flood Control Facilities -2030 (C16)
Figure 5.2 Existing and Proposed Flood Control Facilities -2030 (C17)
Figure 5.3 Existing and Proposed Flood Control Facilities -2030 (C18)
Figure 5.4 Existing and Proposed Flood Control Facilities -2030 (D16)
Figure 5.5 Existing and Proposed Flood Control Facilities -2030 (D17)
Figure 5.6 Existing and Proposed Flood Control Facilities -2030 (D18)
Figure 5.7 Existing and Proposed Flood Control Facilities -2030 (D19)
Figure 5.8 Existing and Proposed Flood Control Facilities -2030 (E15)
Figure 5.9 Existing and Proposed Flood Control Facilities -2030 (E16)
Figure 5.10 Existing and Proposed Flood Control Facilities -2030 (E17)
Figure 5.11 Existing and Proposed Flood Control Facilities -2030 (E18)
Figure 5.12 Existing and Proposed Flood Control Facilities -2030 (E19)
Figure 5.13 Existing and Proposed Flood Control Facilities -2030 (F15)

Figure 5.14 Existing and Proposed Flood Control Facilities -2030 (F16)
Figure 5.15 Existing and Proposed Flood Control Facilities -2030 (F17)
Figure 5.16 Existing and Proposed Flood Control Facilities -2030 (F18)

SECTION ONE

Introduction and Planning Overview

1.1 PURPOSE AND SCOPE

On August 23 2005, in response to a lawsuit filed on behalf of Washoe County seeking judicial review and declaratory judgment regarding the Regional Planning Governing Board's certification of Reno's annexation program, the cities of Sparks and Reno and Washoe County agreed to abide by the Program of Annexation Settlement Agreement ("ASA"). The salient points outlined in the mediated ASA allow the cities to adopt new annexation programs, seek extensions to current Programs of Annexation, modifications to the Truckee Meadows Service Area ("TMSA") boundaries to incorporate unincorporated area within each city's sphere of influence that will receive public services and facilities in the future, and finally, enhanced facility planning by all parties. The settlement agreement conditions were formulated into amendments to the regional plan. The Regional Planning Governing Board formally adopted the regional plan amendments by Resolution 06-03 in July 2006.

Since July 2006, the local governments have sought to comply with the new goals and policies of the Regional Plan. The primary stipulation is the identification of a Future Service Area ("FSA") based upon a population forecast range and development of service and facility plans to support the long term growth on land within the FSA and TMSA. The services and facilities are to be provided concurrent with the impacts associated with growth and development.

The City of Sparks contracted with Stantec Consulting Inc. in June 2007 to prepare a Conceptual Facility Master Plan for the City of Sparks TMSA/FSA in accordance with the Regional Plan requirements. The facility plan addresses water supply, treatment and distribution; wastewater collection and treatment; reclaimed water use; flood control; and transportation. Stantec's scope of work was augmented to include a complete transportation plan that will be integrated into the Sparks Master Plan. This project received the majority of its funding from the Regional Water Planning Commission's Regional Water Management Fund. Figure 1.1 illustrates the Sparks TMSA/FSA which collectively defines the study area boundary. The City of Sparks staff also divided the study area into six (6) individual Priority Service Area ("PSA") boundaries. These areas are also shown in Figure 1.1.

1.2 CONCURRENCY

In accordance with the ASA and the Regional Plan, Sparks, Reno and Washoe County must establish concurrency standards that are consistent for all jurisdictions. Concurrency requires that public facilities and services necessary to support development be available "concurrent' with the impacts of development. The facilities and services subject to these requirements

include water, wastewater, flood control and roads, although parks, schools, and solid waste could have been included in this list. A Concurrency Management Working Group, made up of representatives from all three local governments, defined the term "Concurrency" in a draft document titled Concurrency Management Principles, dated January 11, 2007. This document also describes the key elements of a facility plan as follows:

> *"Each facility plan must (i) include provisions regarding funding and timelines, (ii) include an assessment of all responsible alternatives to additional capital investment (such as resource conservation, efficient design, and so forth), (iii) identify which facilities are required to address existing deficiencies, (iv) identify which facilities are required for new development, and (v) which facilities are required to address both existing deficiencies and new development."*

The Conceptual Facility Master Plan prepared for the City of Sparks TMSA/FSA includes all of these key elements. This plan, coupled with the Sparks Master Plan elements that address land use, housing, transportation, infrastructure, conservation, recreation and open space, will guide Sparks in achieving future growth that is sustainable and creates desirable areas to live, work and play.

1.3 REGIONAL COORDINATION

The City of Sparks TMSA/FSA Conceptual Facility Master Plan has been prepared in coordination with the facility planning completed for the City of Reno and Washoe County portions of the TMSA. The general format and grid mapping system established in the Reno and Washoe County facility plan documents has been replicated in the City of Sparks facility plan to ease the review and information retrieval process. These facility plans all have been prepared at a "30,000-foot" level to provide the agencies and the Regional Water Planning Commission ("RWPC") with the required information on facilities, services and costs in order to implement a regionally-coordinated plan for funding and construction of these facilities. Figure 1.2 illustrates the Sparks, Reno and Washoe County portions of the TMSA and FSA for the City of Sparks as of June 2007. The TMSA land area calculation for each jurisdiction is shown in Table 1.1.

TABLE 1.1 LAND AREA ALLOCATIONS BETWEEN TMSA BOUNDARIES

TMSA	Total Area (Square Miles)	Incorporated Area (Square Miles)	TMSA/FSA Area (Square Miles)
Sparks	127	34	93
Reno	162	102	60
Washoe County	6,542	6,542	93

Source: GIS shape files TMSA05-07 provided by the City of Sparks; incorporated jurisdiction boundary files provided by the Washoe County, Regional Mapping Committee; Stantec Consulting, Inc.

1.4 PLANNING APPROACH

The following approach was developed in coordination with the City of Sparks staff to project future infrastructure needs for water, wastewater, flood control and transportation:

- Utilize existing facility planning documents provided by the City of Sparks and other reference material to develop an understanding of the backbone infrastructure and projected facility needs.
- Utilize development plans for major master planned projects where more detailed information is available for existing and planned infrastructure.
- Utilize the City of Sparks TAZ forecast of population, units and employees at full build-out of the TMSA/FSA to generate water demands, wastewater flows, reclaimed water reuse and conceptual level facility plans for the backbone infrastructure, including flood control and transportation.
- Utilize the 2004-2025 Washoe County Comprehensive Regional Water Management Plan prepared by the Regional Water Planning Commission and Washoe County Department of Water Resources dated January 2008.
- Utilize the Truckee Meadows Water Authority ("TMWA") 2005-2025 Water Resource Plan for significant information regarding available water resources and forecasting methodology that might affect the analysis, dated March 2003.
- Reference the TMSA/FSA Water, Wastewater and Flood Management Facility Plan prepared by Eco:Logic for the City of Reno, Washoe County and the Regional Water Planning Commission, dated June 2007.
- Utilize the Water and Wastewater Facility Plans on Industrial Zone Lands along the Lower Truckee River within Washoe County, Final Report prepared by AGRA, dated August 2000.
- Utilize the Spanish Springs Water Facility Plan prepared by the Washoe County Department of Water Resources dated 2003.
- Reference the Washoe County Comprehensive Plan, Draft Warm Springs Area Plan prepared by Washoe County, dated January 2007.
- Reference the Washoe County Amendment to Warm Springs Ranch Wastewater treatment Plan Facility Plan prepared by Eco:Logic, amended August 2006.
- Utilize the Spanish Springs Valley Water Reclamation Facility Plan prepared by Stantec Consulting Inc., dated September 2005.
- Utilize the Vista-Prater Sewer Interceptor Facility Plan prepared by Summit Engineering, dated January 2005.
- Reference the City of Sparks Effluent Reuse System Overview prepared by AMEC, dated August 2004.

- Utilize the Effluent Reuse Infill Project Feasibility Study prepared by AMEC, dated January 2005.
- Utilize the Boneyard Flat Effluent Storage Draft Report prepared by AMEC, dated November 2004.
- Utilize the City of Sparks Drainage Master Plan prepared by Manhard Consulting, dated August 2006.
- Utilize the D'Andrea Drainage Master Plan prepared by Manhard Consulting, dated August 2006.
- Utilize the Draft Washoe County Regional Flood Control Master Plan Framework prepared by WRC, Inc., dated July 2005.
- Utilize the Drainage Master Plan for Sun Valley, Washoe County, Nevada prepared by SEA, Inc., dated April 1997; Addendum (0133-95-1).
- Utilize the Spanish Springs Valley Flood Control Master Plan, Washoe County, Nevada prepared by Harding ESE, dated January 2001.
- Utilize the Storm Drainage Master Plan The Foothills at Wingfield Springs prepared by Wood Rodgers, dated February 2004.
- Utilize the 2030 Regional Transportation Plan dated November 18, 2004.
- Utilize the Regional Transportation Improvement Program dated October 20, 2006.
- Utilize the Regional Transportation Commission Memorandum dated September 13, 2007 entitled, "Review and Discussion of Long Range Planning."
- Utilize the Regional Road Impact Fee System General Administrative Manual and Capital Improvements Plan, 4th Ed., dated December 3, 2007.
- Utilize the Nevada DOT Statewide Transportation Improvement Program, 2007-2010 (Amended 11/27/06).
- Utilize the Vista Boulevard Corridor Study prepared by Solaegui Engineers, dated March 2007.
- Utilize the East Truckee Canyon River Plan prepared by the City of Sparks, dated March 2007.
- Utilize the Traffic Analysis Update for Copper Canyon-Vista Property prepared by Solaegui Engineers, dated February 19, 2007.
- Utilize the Tracy-Clark Properties Area Plan prepared by The Planning Center, dated October 7, 2005.
- Develop planning level cost estimates for the infrastructure. The estimates of demand, flow and cost have been allocated to the priority service areas.
- Provide a comparison of potential water demands against potentially available water resources by priority area.

1.5 DESCRIPTION OF STUDY AREA

The City of Sparks Conceptual Facility Master Plan study area encompasses approximately 127 square miles. It includes the incorporated City of Sparks and portions of unincorporated Washoe County west of Pyramid Highway and east of Vista Blvd. The City of Reno's incorporated boundary abuts Sparks on the west and south sides. For planning purposes, the City of Sparks identified six (6) priority service areas. Priority Service Area 1 encompasses the incorporated city boundaries. Priority Service Area 2 includes much of the developable land east of Vista Blvd. and adjacent to I-80. The Priority Service Area 2 boundary extends to the Tracy Interchange. Priority Service Area 3 generally includes the unincorporated Washoe County land on the west side of Pyramid Highway. Priority Service Area 4 includes the land north and east of Wingfield Springs. Priority Service Area 5 is located in the far upper eastern portion of the TMSA. Finally, Priority Area 6 is located in the center of the study area and predominately includes land owned by the United States of America (Bureau of Land Management).

Figure 1.3, Land Ownership by Major Category, illustrates the magnitude of private versus public ownership within the study area. There are approximately 33,520 recorded parcels collectively amounting to approximately 81,478 acres. While the publicly owned parcels account for only 10% of all parcels, the combined acreage of the public parcels accounts for 37% of the study area land. The growth projections prepared by the City of Sparks assume development on a portion of the publicly owned parcels.

The vast majority of land area within the incorporated city (Priority Service Area 1) is built-out. The developed density in the City of Sparks is approximately 3.29 persons per acre. The Regional Plan policies promote new development at 4 persons per acre. Priority Service Area 3, encompassing unincorporated Washoe County development east of Pyramid Highway, contains the second highest established population. The land area in Priority Service Areas 2, 4 5 and 6 is predominately vacant. Table 1.2 summarizes the general characteristics of each Priority Service Area.

TABLE 1.2 SPARKS TMSA/FSA STUDY AREA CHARACTERISTICS BY PRIORITY SERVICE AREA, 2005

Priority Service Area	Acres	Population	Year 2005 Residential Units	Employees
1	23,579	77,651	30,975	48,807
2	12,387	0	0	0
3	3,735	2,775	1,110	570
4	5,627	530	212	15
5	10,665	0	0	35
6	25,483	220	88	0
Total	81,478	81,176	32,385	49,437

Source: City of Sparks TAZ Population Estimates and Projection Spreadsheet; Stantec Consulting, Inc.

The Conceptual Facility Master Plan evaluates the presence of existing facilities and proposes additional facilities to accommodate future demand based on projected growth. This evaluation is applied to the entire study area for the years 2030 and full build-out (assumed at 2095) and also to individual PSAs for the same time frames.

1.6 POPULATION FORECAST

This conceptual facility plan has been prepared to cover the TMSA and FSA as defined by the City of Sparks. Subsection 4.3.1 of the Settlement Agreement specified the population forecast range data for 2030 that was to be used by each entity as the forecast for their jurisdiction. A value of 4 people per acre for the urban areas of Reno and Sparks was established based on historic development patterns. The population forecast divided by 4 determines the total allowable acreage within the portion of the TMSA and FSA under the jurisdiction of each respective entity. Table 1.3 below identifies the population forecast range that is to be used in preparing the City of Sparks TMSA/FSA Conceptual Facility Master Plan.

TABLE 1.3 POPULATION FORECAST USED TO DETERMINE RESPECTIVE PORTION OF THE TMSA

All numbers in thousands (1000s)	1980 Census	2000 Census	Population Increase per year (historic)	2004 Population Estimate	Population Increase per year (recent trend)	2030 Projection with historic trend	2030 Projection with recent trend
Reno	101	180	3.95	199	4.75	302	323
Sparks	41	66	1.25	82	4.00	115	186
Unincorporated Washoe County	52	93	2.05	102	2.25	155	161
Washoe County Total	194	339	7.25	383	11.00	572	669

Source: Truckee Meadows Regional Planning Agency, Settlement Agreement (Program of Annexation), *County of Washoe vs. Washoe County Regional Governing Board and City of Reno*, Case No. CV02-03469, page 4.

Stantec obtained an Excel spreadsheet from the City of Sparks that identified the projected dwelling units, population, and employment figures for selected years and full build out. The spreadsheet was a bi-product of the growth forecast model prepared by the Regional Transportation Commission ("RTC") with significant planning input by the City of Sparks staff. Stantec also received a digital copy of the Geographic Information Systems ("GIS") shape file of RTC's Traffic Analysis Zone ("TAZ"). The build-out projections provide the best available estimate of what the long term need for facilities might be in order to satisfy the concurrency requirement of the ASA. Stantec reviewed the information provided by RTC with the City of Sparks staff to confirm its accuracy prior to using the data as the basis for this water, wastewater, reclaimed water, flood control and transportation facility planning effort. According to the information provided by Sparks staff, the population in 2002 was 75,142 persons (based on an estimate of 30,057 dwelling units); a total of 42,722 employees; and a total of 3,039 hotel rooms for the entire study area.

The population projections developed by Sparks staff was based on planning level analysis of the TMSA/FSA area coupled with the Regional Plan policy of planning for 4 persons per developable acre. Stantec utilized available topographic contour intervals to create slope and hillshade GIS shape files in order to quantify the suitable areas for new development based on slopes less than 30 percent. According to the acre values, there is approximately 25,568 developable acres in Priority Areas 2 through 6. Based on the land area of approximately 57,899 acres within these priority areas, 44 percent would be considered developable based on the slope analysis. Figure 1.4 identifies the locations of the developable land in addition to the publicly-owned parcels. It is readily apparent that Priority Areas 2, 3, 4 and 5 can easily accommodate the projected growth.

A few of the TAZ polygons cross Sparks/Washoe County jurisdictional boundaries in the upper west area near priority area 3. However, there is nothing in the model to distribute existing development between the two entities. In order to prevent a double counting of projected units, the City of Sparks staff revised their estimates of population, dwelling units and employees to reflect only the portion of future growth that is anticipated to occur within the City of Sparks. The population projections for the years 2030 and full build-out are shown in Figures 1.5 and 1.6.

As previously discussed, the TAZ boundaries do not always follow jurisdictional boundaries. This is also the case with the PSA boundaries. In order to identify future population, residential units and employees by priority area, Stantec utilized GIS to integrate the Regional Transportation Commission TAZ data and the City of Sparks Priority Service Area shape files. There are approximately sixteen (16) TAZ's that cross over PSA boundaries. Stantec used aerial photography, the parcel base and assessor data to distribute the projected population, units and employees at both the year 2030 and build-out between the individual priority service areas. The information provided in tables 1.4 and 1.5 below is our "best guess" on the appropriate distribution between priority areas and was developed as a base for the facility planning and cost estimates.

TABLE 1.4 2030 PROJECTED POPULATION, UNITS AND EMPLOYEES BY PRIORITY SERVICE AREA, SPARKS TMSA/FSA

Priority Service Area	Acres	Population	Residential Units	Employees
1	23,579	128,473	51,389	80,404
2	12,387	16,288	6,515	36,196
3	3,735	3,865	1,546	2,522
4	5,627	2,488	995	0
5	10,665	413	165	35
6	25,483	15,510	6,204	125
Total	81,478	167,035	66,814	119,282

Source: City of Sparks TAZ Population Estimates and Projection Spreadsheet; Stantec Consulting Inc. According to the information in Table 1.4, the population in the Sparks TMSA/FSA is anticipated to increase from 75,142 persons in 2002 to 167,035 persons by the year 2030. This projected growth represents an average annual increase of approximately 4.3 percent. Table 1.5 provides the estimates for full build-out of the TMSA/FSA which is assumed to be the year 2095.

TABLE 1.5 FULL BUILD-OUT PROJECTED POPULATION, UNITS AND EMPLOYEES BY PRIORITY SERVICE AREA, SPARKS TMSA/FSA

Priority Service Area	Acres	Population	Residential Units	Employees
1	23,579	162,600	65,040	83,493
2	12,387	35,600	14,240	60,655
3	3,735	11,952	4,781	6,865
4	5,627	20,520	8,208	0
5	10,665	44,960	17,984	1,570
6	25,483	59,835	23,934	435
Total	81,478	335,467	134,187	153,018

Source: City of Sparks TAZ Population Estimates and Projection Spreadsheet; Stantec Consulting Inc.

1.7 CONCEPTUAL LEVEL ANALYSIS

The City of Sparks TMSA/FSA Conceptual Facility Master Plan consists of several components including projected improvements for water, wastewater, flood control, reclaimed water reuse and transportation infrastructure improvements. The infrastructure sizes and locations are conceptual and based upon a planning level analysis. It is anticipated that the recommendations will be further refined as more detailed information becomes available and development plans are prepared.

SECTION TWO

Transportation

2.1 INTRODUCTION

The primary objective of the transportation component of the City of Sparks TMSA/FSA Conceptual Facility Master Plan is to identify and program transportation corridors both in the incorporated area of the City of Sparks and in the areas slated for future growth and development. The planning horizons are the year 2030 (short-term) and a long term planning horizon of full build-out or the year 2095. This plan also determines the appropriate phasing of these improvements in accordance with each of the pre-defined Priority Service Areas ("PSA"). Stantec worked closely with the City of Sparks and the Washoe County Regional Transportation Commission ("RTC") in completing the analysis and preparing the recommendations put forth in this master plan. The geographic scope of the transportation analysis is identified in Figure 1.1. The basis of the work effort completed by Stantec is the RTC's 2030 Regional Transportation Plan ("RTP") dated November 2004. The RTC is currently updating this document to include its recently completed transportation forecast modeling.

The RTC recognizes the difficulty of planning for roadways and roadway corridors that will be needed to address future growth based on a population projection for a specific time frame i.e., the year 2030. Unfortunately trends are not always predictable and rates of growth can change significantly from year to year. A previous focus on incremental growth has also obscured the need to develop new arterial corridors, such that the right-of-way for these corridors becomes much more expensive to acquire when the need arises. Many regional roads reached and/or exceeded their programmed capacity long before they were scheduled to do so pursuant to previous population forecasts. This was due, in part, to rapid and significant growth during the 1990s and the early years of the second millennium. In response to these challenges, the RTC has undertaken a "Long-Long Range Planning" exercise to evaluate demands for transportation services and facilities beyond the year 2040 in of the Truckee Meadows and the future service areas for Sparks and Reno. The City of Sparks TMSA/FSA Conceptual Facility Master Plan addresses the intent of the RTC's planning efforts by identifying the necessary and realistic alignments of the transportation corridors. These corridors also contain the major water and wastewater infrastructure to serve existing and future development.

One of the goals of this study is to identify potential gaps or insufficiencies in the RTP within the City of Sparks with respect to the planned number of basic lanes (road capacity) and intersection levels-of-service, and to address these gaps by the addition of new roads/lanes in the Sparks Sphere of Influence ("SOI") (Priority Service Areas 2, 3 and 4) and the Future Service Area ("FSA") (Priority Service Areas 5 and 6). While the roadway

network for PSAs 1, 2 and 3 has been mostly established and/or planned in previous studies, the future transportation network required for development in the FSA has only recently been identified, starting with the RTC's Long-Long Range Planning exercise. By building on the City of Sparks/RTC updated land use information and using the RTC transportation model, this master plan identifies future transportation and service corridors that will be needed in the FSA. The planning exercise also identifies the impacts of new development on the existing transportation network. It is recommended that these impacts be mitigated with additional network improvements (primarily additional lanes and intersection improvements).

It is not the intent of this transportation plan to replicate work previously conducted by the RTC. Rather, the approach is to examine the incremental impacts of more specific land use planning information that has become available from the City for the TMSA/FSA. In addition, the RTC recently upgraded its transportation model from the EMME/2 software to EMME/3 and is updating to the 2040 RTP. The scenario modeling conducted as part of this master plan effort utilized the latest software and information available, including the aforementioned updated land use data and population/employee forecasts from the City of Sparks.

2.2 POPULATION AND DEVELOPMENT FORECASTS

The Cities of Sparks and Reno and Washoe County routinely provide population and employment forecasts to RTC to be used as input to the transportation planning model, and have done so recently as part of the current ongoing 2040 RTP update. While a number of measures of population and employment are collected and forecasted by the City, RTC uses the number of dwelling units as the population variable, and the number of employees and number of hotel rooms as employment variables, in the trip forecasting model. This information is compiled on the basis of Transportation Analysis Zones ("TAZs"). Traffic volumes generated are assigned to roads by the EMME/3 model and used to determine the necessary number of lanes required for each transportation corridor. For this transportation plan, forecasts were generated for the years 2013, 2018, 2030, 2035 and 2040. In order to qualify as a "regional road", year 2040 AADT must be greater than 5,000. While it is possible to use non-regional (i.e. – local/collector) roads as service corridors, major water and sewer lines will tend to follow the major or regional roads.

The background information on the land use planning data and forecasts used in the transportation model was discussed in Section One – Introduction and Planning Overview.

2.3 EXISTING TRANSPORTATION NETWORK

Existing arterial roads and highways, and those new roads, widenings and improvements planned by RTC/NDOT, have already been incorporated into the latest update of the RTC transportation model. The existing network includes all roads within the Truckee Meadows Service Area ("TMSA"), FSA and extra-territorial areas, such as Storey County and Carson

City. A detailed summary of the existing road network, along with planned improvements, performance measures and policies, can be found in Chapter 3 of the RTP.

2.4 FUTURE TRANSPORTATION NETWORK

The RTC generated traffic forecasts to the year 2040 based on updated land use data. City of Sparks staff verified TAZ-based growth forecasts for population and employees and provided the Stantec with an Excel spreadsheet of dwelling units, hotel rooms and employees by TAZ boundary for each TAZ within the study area. As discussed in Section One, Stantec identified the developable land areas. Using this compiled information, a conceptual road network for the TMSA/FSA was developed and is illustrated in Figure 2.1. The TMSA/FSA road network was developed in consultation with City staff, taking into account: topography, existing development, potential access to future developable areas, and strategic connections to existing streets and highways. Road corridors were adjusted in some areas to avoid primary drainage courses or established development in order to allow these corridors to better facilitate the incorporation of water, sewer and reclaimed water infrastructure in the same corridor. The TMSA/FSA proposed road network was not meant to establish final alignments for these corridors, but instead, to delineate feasible corridors to which traffic and services could be assigned (i.e., a "skeleton" for future development). The costs for needed infrastructure and facilities to support demand are also provided.

Figure 2.1 (small format) and Plate 2.0 (large format) illustrate the recommended TMSA/FSA road network. It consists of a series of arterial corridors which have been superimposed on a map of the existing street network, TAZ structure and aerial photograph base. A "shape file" from the street network GIS was provided to RTC with model inputs (land use variables describing population and employment forecasts), and run through the EMME/3 model by RTC staff, assigning traffic volumes to existing, planned and proposed TMSA/FSA corridors. The result was a series of recommended roadway widening projects and other roadway improvements within the existing transportation network, plus the construction of new transportation service corridors in the TMSA/FSA. The new model inputs were provided to the RTC to complete a second iteration of the model run and provide Stantec with the output for our facility planning efforts.

2.5 PHASING OF CAPITAL IMPROVEMENTS

The planning of new transportation facilities and service corridors within the City of Sparks and TMSA/FSA is based on the pre-defined Priority Service Areas which establish an order for future development. Priority Areas 2 and 3 encompass lands that will be developed in the near future and are of the highest priority.

In Priority Areas 1 and 3, all of the required transportation facilities (except those under NDOT jurisdiction, e.g. – I-80 widening projects) have already been provided, or have been planned by RTC, and are already incorporated into the RTP and current Capital

Improvements Plan for the Regional Road Impact Fee ("RRIF") System. In Priority Area 5, no new arterial roads are anticipated, although there would be an eventual need for collector/local roads to provide access to future developments in the area. It is assumed that these collector roads and associated services would be built by a land developer at his/her cost. Similarly, new developments in Areas 1, 3 and 4 would require construction of privately-funded collector/local roads and services, and improvements to existing roads, based on needs and mitigation defined by traffic impact assessment reports. The following tables provide a breakdown of the transportation service corridors on a Priority Service Area basis.

TABLE 2.1 TRANSPORTATION SERVICE CORRIDORS PROPOSED IN PRIORITY AREA 2

Corridor	Estimated Percentage of Corridor Attributable to Priority Service Area 2
Truckee Canyon Road	100
North Frontage Road	100
Frontage-Truckee Canyon Connector	100
Patrick Road (from I-80 to Truckee Canyon Road)	100
Spanish Springs Road	50

Source: Stantec Consulting, Inc.

TABLE 2.2 TRANSPORTATION SERVICE CORRIDORS PROPOSED IN PRIORITY AREA 4

Corridor	Estimated Percentage of Corridor Attributable to Priority Service Area 4
Central N-S Arterial	50

Source: Stantec Consulting, Inc.

TABLE 2.3 TRANSPORTATION SERVICE CORRIDORS PROPOSED IN PRIORITY AREA 6

Corridor	Estimated Percentage of Corridor Attributable to Priority Service Area 6
Baring Extension	100
Vista Extension	100
Spanish Springs Road	50
Patrick Road (north of Truckee Canyon Road)	100
Petroglyph Road	100
Central N-S Arterial	50

Source: Stantec Consulting, Inc.

2.6 CONCLUSIONS

New arterial transportation service corridors will be necessary to service traffic demands that will arise from the City's land use plan. These recommended corridors are shown on Plate 2.0 and provide a framework for future development in the expanded areas of the City. In addition to the proposed new corridors, improvements will be required to the existing road network in the eastern area of the incorporated City of Sparks. Development will also add pressure to widen Interstate 80 to support the TMSA/FSA development.

SECTION THREE

Water Facilities

The purpose of Section Three of the City of Sparks TMSA/FSA Conceptual Facility Master Plan ("Facility Plan") is to identify the facilities required to support growth projected to the year 2030 in the City of Sparks TMSA/FSA and the costs of the infrastructure identified. Details of the City of Sparks TMSA/FSA planning area, including future population data and the division of the TMSA/FSA into six separate Priority Service Areas, was presented in Section One, Introduction and Planning Overview. Refer to Section One for this and additional planning overview information.

3.1 RELATED STUDIES

The existing water infrastructure in place serving the City of Sparks TMSA/FSA has been developed through previous facility planning efforts. In preparing this facility master plan, Stantec assembled and reviewed published documents provided by the city of Sparks and other sources relating water infrastructure serving the study area. The Truckee Meadows Water Authority ("TMWA") prepared a facility plan projected through the year 2025 that addresses the water facility needs within the city limits of Sparks and the majority of the City's Sphere of Influence.

Table 3.1, *Summary of Related Water Facility Studies*, lists the reports related to water facility planning that have been completed and relate to the City of Sparks TMSA/FSA.

TABLE 3.1 SUMMARY OF RELATED WATER FACILITY STUDIES

Report Name	Study Date	Priority Service Area Applicability	Description
Analysis of Decreed Truckee River Water Rights and Projections of Future Demand Reference: Stantec for WCRWPC	Nov. 2001	1 - 6	Summarized Truckee River water rights availability and future water demands.
TMSA/FSA Water, Wastewater, and Flood Management Facility Plan Reference: Ecologic for COR and RWPC	Jun. 2007	1 - 6	This facility plan has been prepared to project future demand and wastewater flows for the City of Reno and Washoe County Truckee Meadows Service Area and Future Service Area, and to project the necessary improvements for water, wastewater and flood control infrastructure.

TABLE 3.1 (CONT.) SUMMARY OF RELATED WATER FACILITY STUDIES

Report Name	Study Date	Priority Service Area Applicability	Description
2004-2025 Washoe County Comprehensive Regional Water Management Plan Reference: RWPC, WCWR	Jan. 2005	1 - 6	This plan provides the region with recommended structural and conservation measures for managing the potable water supply. Topics include denitrification of water supply and wastewater facilities, flood control and drainage projects, and development of a water conservation plan.
2005-2025 Water Facility Plan Reference: TMWA	Dec. 2004	1 - 4, 6	In this plan the phasing of projected water system improvements is identified. A proposed Sparks groundwater treatment plant and Sparks distribution and pumping improvements are discussed. The necessary water distribution and treated water storage facilities to meet the forecasted demands and resource optimization goals in the 2025 water resource plan (see below) are described.
2005-2025 Water Resource Plan Reference: TMWA	Mar. 2003	1 - 4	An overview of water production facilities, service commitments and demand forecast are provided in this plan.
Water and Wastewater Facility Plans on Industrial Zoned Lands along the Lower Truckee River within Washoe County, Final Report Reference: AGRA Infrastructure for RWPC, WCDWR	Aug. 2000	2	This plan discusses water and wastewater infrastructure plans for the Mustang and Tracy industrial development areas. A phasing strategy is presented, along with estimated costs to meet current, proposed and future demand.
Spanish Springs Water Facility Plan Reference: WCDWR	2003	1, 3, 4, 6	The planning area covers approximately 40,000 acres and includes Washoe County's (County) Spanish Springs Truckee Meadows Service Area (TMSA/FSA) and a portion of Spark's TMSA/FSA. This report utilizes full build-out for its projections and proposes supply, blending, transmission and storage improvements necessary to meet projected demand. Total improvement cost is estimated at approximately $11.34 million.

3.2 EXISTING WATER DEMANDS, SUPPLY AND FACILITIES

3.2.1 Introduction

This section provides information pertaining to the following: existing water demand within the City of Sparks TMSA/FSA, water rights and water resources both inside and outside of the Truckee Meadows; freshwater supply and availability; and water purveyor information and their existing water services facilities.

3.2.2 Water Demands and Future Water Demand Estimation Methods

Water demand represents the actual consumption of potable water. In facility planning, water demand is based in the Nevada Administrative Code ("NAC") requirements and individual design criteria established by each water purveyor. Different types of water demand are developed to serve as the basis for the design and construction of water facilities. The different types of typical demand used include: average day demand, maximum day demand and peak hour demand. Another important water demand factor is fire protection demand. Fire protection demand requires a certain flow rate of water be available for fire fighting for a certain duration at all times. The fire flow rate and duration vary with the building type. The Uniform Fire Code provides fire demand values for planning and designing water system facilities.

Potable water demand is generally based on the needs of residential, commercial and industrial customers. Water demands are often presented on an equivalent residential unit ("ERU") basis. An ERU represents a typical household. Assigning an assumed occupancy value (2.5 people per ERU was utilized in this facility plan) establishes future population and in turn an idea of the future water demand. Historic, actual use records are used to estimate the water demand per ERU. Water demand for commercial and industrial customers can also be expressed in terms of ERUs resulting in a common method of addressing all demands to be met (i.e. residential, commercial and industrial).

There are other methods of estimating commercial and industrial demands including the following:

- A per acre basis for the commercial and industrial development;
- A plumbing fixture count basis for the commercial and industrial structures;
- A specific water demand analysis based on the actual commercial or industrial activity type; and
- An employee count basis.

Of the four listed above the first three methods require specific knowledge of the actual type of commercial and industrial development. The fourth method, the employee count basis, is the most predictable and was used to estimate future demand the water facility plan.

There are many variables that can affect existing and future water demand; typically however conservative assumptions are used to address the variables in demand from water intensive users such as breweries or food processing facilities to less water intensive users such as warehousing and storage.

The following subsections provide additional information pertaining to the three methods to express water demand. Table 3.2 identifies the estimated demand for potable water based on these three methods.

- Average Day Demand
  - Average day demand, as the name implies, represents the daily average of annual water demand. Average day demand is used to estimate the future annual water demand. The average day demand per ERU, per the Nevada Administrative Code is 0.5 gallons per minute per ERU which is equivalent is 720 gallons per day per ERU. Table 3.2 presents the existing average day demand by City of Sparks TMSA/FSA Priority Service Area. The average day demand values presented in Table 3.2 are based on 2005 Traffic Analysis Zone ("TAZ") planning data.
- Maximum Day Demand
  - Maximum day demand represents the day in any given year of maximum water demand. This demand value addresses the seasonal changes in water demand with summer as the maximum demand season primarily due to increased demand resulting from irrigation activities of individual households. Water storage tanks are designed to provide an operational storage meeting the maximum demand for the area served by the storage tank. Maximum day demands are usually taken from actual flow records. From these flow records a maximum day demand factor is developed. The maximum day demand factor is applied to the average day demand to identify future maximum day demands. Maximum day demand factors vary but are typically around 2.0 which is the factor used for this planning study. Table 3.2 presents the maximum day demand by City of Sparks TMSA/FSA planning area and are based on 2005 Traffic Analysis Zone planning data.
- Peak Hour Demand
  - Peak hour demand represents the maximum instantaneous demand within a water service area. This demand value addresses the daily fluctuation in water demand. Peak hour demands are used to size transmission and distribution pipelines such that the flow velocity of the pipeline does not

exceed a defined threshold. Like maximum day demand, peak hour demands are expressed as a factor of the average day demand. The peak hour factor can be established through a demand analysis based on actual usage and measured flow rates but often inadequate data is available and the peak factor is established based on engineering judgment. Typical peak hour factors range from 1 to 3. For this Facility Plan a peak hour factor of 3 was used.

TABLE 3.2 EXISTING POTABLE WATER DEMANDS BY PRIORITY SERVICE AREA

Priority Service Area	Average Day Demand (MGD)[1]	Maximum Day Demand (MGD)[1]	Annual Demand (MG)[2]
1	25.24	50.48	9,213
2	0.43	0.86	157
3	1.15	2.30	420
4	0.26	0.52	95
5	0.10	0.20	37
6	0.43	0.86	157
Total	27.61	55.22	10,079

Notes: [1] (MGD) Millions of Gallons Per Day.
[2] (MG) Millions of Gallons.

3.3 WATER PURVEYORS, SUPPLY, RIGHTS AND AVAILABILITY

Adequate water supply is essential for growth to occur in the Truckee Meadows. The tremendous growth throughout the region in the last 20 years has resulted in the conversion of a significant amount of water right from agricultural use to municipal and industrial use. While there is still a considerable amount of water right available for similar conversion the supply is ultimately limited. As a precious resource that has recently been treated as a commodity, water rights experienced an incredible increase in value in the last five years. With the current development slow down, water right prices have stabilized. However, with the Truckee Meadows being such a desirable place to live, it is likely that aggressive development will resume and the need for solving water supply issues will have to be addressed.

3.3.1 Municipal Water Service Purveyors

Washoe County, through its Department of Water Resources, and TMWA are currently the only providers of municipal water service within the City of Sparks TMSA/FSA Conceptual Facility Master Plan study area. Refer to Figure 3.1, Existing Water Service Providers, for the limits of the water service provider territories.

The majority of PSA 1 is within the service area of TMWA, while the PSAs 2 and 3 are primarily within the service area of Washoe County, with some relatively small portions of each being within the service area of TMWA.

- Truckee Meadows Water Authority ("TMWA")

  TMWA is the largest purveyor in the area and provides service to more than 90,000 customers. TMWA also provides wholesale water to the Sun Valley General Improvement District and to the Washoe County Department of Water Resources ("WCDWR").

  TMWA operates a fully-integrated water distribution system, including two surface water treatment plants (Chalk Bluff and Glendale) and numerous production wells located throughout the distribution system. About 85 percent of the TMWA water deliveries come from surface water sources.

- Washoe County Department of Water Resources ("WCDWR")

  WCDWR provides municipal water service to approximately 14,000 customers through 18 stand-alone water systems located throughout their service area. The Desert Springs water system abuts the study area. The Spring Creek water system serves persons of PSA 1 adjacent to the Pyramid Highway and south of La Posada. All of the Washoe County Systems use groundwater as the source of supply, and some of the systems also receive wholesale water from TMWA.

- Sun Valley General Improvement District ("SVGID")

  SVGID provides municipal water service to approximately 6,000 customers within its service area. While SVGID does not serve any portion of the Sparks TMSA/FSA, portions of the SVGID service area abut PSA 3 of study area. All of the water delivered by the SVGID comes from wholesale water purchase contracts with TMWA.

- Sky Ranch Water Service Corporation

  Sky Ranch Water Service Corporation, an affiliate of Utilities, Inc. provides municipal water service to approximately 600 customers located in Spanish Springs Valley. The service area of this purveyor abuts the City of Sparks PSA 1. The Sky Ranch water systems delivers water diverted from two production wells located within its system.

3.3.2 Water Supply

The following subsections provide information on the three (3) sources of water supply for the Truckee Meadows.

- Local Groundwater

  - The Nevada State Engineer administers ground water within the State on the basis of hydrographic basins.

    The entire state has been divided into hydrographic basins and a perennial yield has been determined for each basin. A perennial yield is an estimate of the amount of water that annually recharges the groundwater resource

within a specific basin. It is the policy of the State Engineer to not allow appropriations in excess of the perennial yield. There are some basins in the state where existing water rights exceed the perennial yield. In most cases, these over-allocations have occurred in basins where the nature of the basin was not clearly understood or adequate recharge information was not available.

Under existing law, the State Engineer is prohibited from granting permits to appropriate public waters in basins where: (1) there is no unappropriated water available; (2) the proposed use or change conflicts with existing rights; (3) the proposed use or change conflicts with the protected interests in existing domestic wells; or (4) the proposed use or change threatens to prove detrimental to the public interest.

Table 3.3 identifies hydrographic basins that comprise the study area for the Facility Plan.

TABLE 3.3 HYDROGRAPHIC BASINS WITHIN TMSA/FSA STUDY AREA

Basin #	Hydrographic Basin	Perennial Yield (Acre Feet)
83	Tracy Segment	11,500*
84	Warm Springs Valley	3,000
85	Spanish Springs Valley	1,000
87	Truckee Meadows	27,000

Note: *Per State Engineer Ruling No. 5747.

Summaries of the current status of each hydrographic basin by application and by manner of use have been reviewed as part of this planning study. Based on this review, it appears that little if any unappropriated groundwater is available in any of these basins.

Existing valid groundwater rights within these basins could be acquired and the Point of Diversion, Place of Use and Manner of Use can be changed through Application to, and approval of, the State Engineer. This scenario assumes that wells of adequate capacity and acceptable water quality can be developed.

- Truckee River
  - All rights to the waters of the Truckee River and its tributaries were adjudicated and affirmed by the final Decree in, *"The United States of America, Plaintiff, vs. Orr Water Ditch Company, et al., Defendants"*, in Equity Docket No. A-3 (Orr Ditch Decree).

    The operation of the Truckee River System and the diversion and distribution of its waters is administered by the Federal Watermaster, and all changes

of existing Truckee River water rights are administered by the Nevada State Engineer. Pursuant to the Orr Ditch Decree and State Engineer's Ruling No. 4683, granting all unappropriated water of the Truckee River to the Pyramid Lake Paiute Tribe there is no unappropriated water available for appropriation within the Truckee River system. Existing valid Truckee River water rights can be acquired and the Point of Diversion, Place and Manner of Use of the acquired rights can be changed through Application to, and approval of, the State Engineer.

Under the surface water treatment rule enforced by the U.S. Environmental Protection Agency, all surface water used for municipal purposes must be treated by suitable filtration and disinfection facilities. Consequently, any existing surface water rights acquired for conversion to municipal purposes must be treated at an existing water treatment facility or at a filtration facility to be constructed in the future. If Truckee River water rights are used to serve new developments within the City of Sparks TMSA/FSA and treated wastewater is not returned to the river, an additional 0.50 acre foot of water rights will have to be dedicated for every 1.00 acre foot of demand. This dedication requirement is referred to as the return flow credit.

- Non Local Groundwater
  - Several projects have been proposed to import groundwater from nearby hydrographic basins into hydrographic basins within the study area of the City of Sparks TMSA/FSA Conceptual Facility Master Plan. Proposed projects known of at the time of preparation of this document are summarized as follows:
    1. Aqua Trac, LLC filed a series of applications with the State Engineer on May 27, 2005, October 18, 2005, January 26, 2006, March 1, 2006, June 6, 2006, and October 26, 2006. The applications proposed to appropriate groundwater from Granite Springs Valley Hydrographic Basin (Basin #78) for municipal purposes and deliver the water to a number of other hydrographic basins, including those that include the study area of this water facility plan. As a result of a recent administrative hearing held by the State Engineer, all of the Aqua Trac, LLC applications were denied on the grounds of: (1) insufficient available water at the proposed source; (2) the requirements for demonstrating a need for the water were not satisfied; (3) no specific beneficial use of the water was identified; (4) no evidence was provided as to the amount of water required for a specific project; and (5) granting the applications would be detrimental to the public interest (Refer to State Engineer Ruling No. 5782).

2. Northern Washoe County Project

Sonterra Development Company, LLC and High Rock Holding, LLC have filed a series of applications with the State Engineer proposing to export groundwater from Hualapai Flat (Basin #24) and San Emidio Desert (Basin #22). The applications propose to use the water for municipal purposes and to deliver the water to locations within Storey County and Lyon County (Fernley, Silver Springs, Dayton and Stagecoach). All of the applications have been protested by a number of parties and no dates have been set for administrative hearings to be held by the State Engineer.

Since the actual location of the route of the proposed delivery pipeline is currently unknown, it cannot be determined if this project, if approved, could economically provide water to the City of Sparks TMSA/FSA.

3. Other Projects

Other importation projects have been proposed from time to time, and it is anticipated that other proposals will come forward in the near future. The Vidler Project is nearing completion and will deliver groundwater from Honey Lake Valley into Lemmon Valley.

Typically, these projects, when first proposed, had not received all of the necessary approvals. In some cases, the actual terminus of the proposal is not known nor has the route of the delivery systems been sufficiently defined. Projects such as these will have to be evaluated in the future to determine if a project may be able to deliver water to the City of Sparks TMSA/FSA study areas in a cost effective manner.

3.3.3 Water Rights

The State Engineer manages water rights in the State of Nevada. Water rights policies in Nevada are strictly controlled to protect the environment. Water rights have been, for the most part, fully allocated in the Truckee Meadows areas. The following two subsections discuss water right dedication policies and the current status of water resource availability.

- Water Rights Dedication Policies

  All applicants for new or expanded water service must dedicate water resources to the applicable water purveyor in an amount sufficient to meet the estimated demand of the proposed project plus any other water resources that may be required under the rules and regulations of the purveyor. Upon full compliance with this requirement, the applicant will receive a "will serve" commitment letter. To receive TMWA service, applicants must typically dedicate mainstem Truckee

River water rights to TMWA in exchange for issuance of a "will serve" letter. The dedicated mainstem water rights must be sufficient to meet the estimated demand of the project plus an eleven percent (11%) drought factor. For example, a project having an estimated demand of 10 acre feet must dedicate 10.0 x 1.11 acre feet, or 11.10 acre feet. TMWA will also accept groundwater rights permitted by the State Engineer for the Authority's use at a rate of 1.0 acre foot of the water right for every 1.0 acre foot of demand. Other water resources such as non-mainstem Truckee River water rights and imported water may be used for dedication subject to the Authority's approval and their determination of the actual amount of water rights required.

Since the majority of the Washoe County water systems rely on groundwater for their source of supply, applicants for new or expanded water service must dedicate groundwater rights permitted by the State Engineer for the County's use at a rate of 1.0 acre foot of water rights for every 1.0 acre foot of demand. The County's basic water demand is 1.12 acre feet per single family residential unit. The demands for other types of development are determined by the County on a case-by-case basis.

3.3.4 Water Resource Availability

- Truckee River Water Rights

  Pursuant to the Orr Ditch Decree and State Engineer's ruling No. 4683 granting all unappropriated water of the Truckee River to the Pyramid Lake Paiute Tribe, there is no unappropriated water available within the Truckee River System. Existing Truckee River Agricultural water rights may be acquired and converted to municipal uses. Issues regarding the acquisition of Truckee River water rights are as follows:

  - The acquired water rights must be in good standing with no known title problems.
  - Approval of the State Engineer of a change of Point of Diversion, Place of Use and Manner of Use Application will be required.
  - The acquired water rights will be subject to the application of the drought factor in effect at the time of the conversion of the water rights to municipal uses.
  - In areas where treated waste water is not returned to the Truckee River, additional water rights will be required to satisfy return flow credit requirements.
  - All surface water used for municipal purposes must be treated at a suitable water treatment facility and the treated water must meet all applicable water quality standards.

Currently TMWA is the only water purveyor operating surface water treatment facilities serving potable water to residents of the Truckee Meadows. If adequate capacity is not available to treat surface waters, existing treatment facilities will have to be expanded or new treatment facilities constructed.

- Local Groundwater

  Based on information provided by the State Engineer, little if any unappropriated groundwater is available in the hydrographic basins that are included in the Facility Plan study areas.

  Existing primary groundwater rights within these basins may be acquired and converted to municipal uses. Issues regarding the acquisition of existing local groundwater rights are as follows:

  - The acquired water rights must be in good standing with no known title problems.
  - Approval of the State Engineer of a change of Point of Diversion, Place of Use and Manner of Use Application will be required.
  - In some hydrographic basins, the State Engineer may only allow the conversion of the consumptive use portion of an irrigation water right being converted to municipal uses.
  - Water purveyors must be able to locate sites where production wells of suitable capacity and water quality can be developed. Extensive hydro-geologic investigations may be required to determine if suitable sites are available.
  - All groundwater developed for municipal uses must meet all applicable water quality standards.

  The groundwater available in some areas may require expensive treatment to adequately remove contaminants such as arsenic and fluoride. The available groundwater resources in any basin can be acquired by counties, municipalities, water purveyors, corporations or private individuals.

  The State Engineer does not designate or reserve certain water rights in a particular basin for the future use of counties, municipalities or water purveyors. As a result, these entities must compete amongst themselves and with private individuals and others for the acquisition of available water resources in any basin.

  The expanded and future Truckee Meadows service areas of the City of Sparks are located in hydrographic basins that also include service areas of Washoe County and/or the City of Reno. All three entities will be

anticipating the future use of the limited water resources available in a basin to meet the projected future water demands within their respective services areas.

Applications to the State Engineer are all assigned a priority date coincident with the date the proper application was filed. When reviewing pending applications within a hydrographic basin, the State Engineer will consider the Applications in priority order. Therefore, the time of filing of applications to convert water rights to municipal uses is a very important consideration in the acquisition of water to serve new areas. Depending on the amount of adequate recharge information available, or if the nature of a particular hydrographic basin is not clearly understood, it may be possible to demonstrate to the State Engineer that the existing perennial yield of a basin should be increased and that additional water is available for appropriation. Extensive hydro geologic studies, including basin modeling, would have to be completed in order to convince the State Engineer that the perennial yield of a basin should be increased.

- Groundwater

  Issues regarding the acquisition of future water supplies from importation of groundwater from nearby hydrographic basins are as follows:

  - All water delivered through an importation project must meet all applicable water quality standards.
  - Since importation projects propose moving water from one hydrographic basin to another, and in some cases, from one county to another, the applications filed with the State Engineer will almost always be protested by any number of counties, water purveyors, corporations, environmental groups or private individuals. As a result, the approval process will usually take a minimum of six months and most likely several years.
  - Depending on the distance of the source of the water from the proposed place of use, and the complexity of the required infrastructure, water acquired from an importation project will be quite expensive when compared to other possible available resources.

- Water Availability Recommendations

  - Due to the fact there is and will continue to be an increasing number of parties seeking water resources to address future growth, and given the scarcity of these resources available, the City of Sparks should seriously consider establishing a water resources acquisition program. The City could acquire water rights from the resources available, change the rights to municipal use, and bank the water for future development

within the TMSA/FSA service area. The City would then be in a better position to attract developers and negotiate reimbursement costs to offset the acquisition costs.

- There are a number of other rapidly developing areas in northern Nevada. Storey County, Fernley, Silver Springs, Stagecoach and Dayton are all seeking water resources to accommodate their projected growth. Because of limited water resource availability, water importation projects may be necessary for continued growth.
- The City of Sparks should immediately begin discussions with the proponents of the importation projects identified above with the goal of reserving some capacity in these projects. Capacity commitments could be secured through option agreements, payment of funds, or letters of understanding among the parties involved.

3.4 EXISTING WATER FACILITIES

3.4.1 TMWA

The Truckee Meadows Water Authority ("TMWA") provides water service to the majority of the Truckee Meadows region. The service territory limits of TMWA can be generally described with Stead as the northern limit for the western half of the Truckee Meadows and La Posada Drive as the northern limit in the eastern half of the Truckee Meadows. The service territory generally extends to Mogul as the western limit and TMWA serves all of northwest Reno. Zolezzi Lane is the southern limit west of Highway 395. The eastern edge of the TMWA service territory is bounded by US 395 in the extreme southern limit of its service territory, to McCarran Blvd on the south side of the Truckee River and the eastern edge of Sparks on the north of the Truckee River.

TMWA has over 90,000 customer service connections including residential, commercial and industrial customers. Approximately 85 percent of the water delivered to TMWA customers comes from the Truckee River. The water is treated at either the Chalk Bluff or Glendale water treatment plants and delivered to TMWA's customers. The remaining 15 percent of the water delivered to its customers come from 22 separate groundwater wells. Of these 22 wells 17 are located within the City of Sparks TMSA/FSA.

The TMWA water distribution system is extensive and includes over 1,300 miles of pipelines with approximately 375 miles of pipeline within the City of Sparks TMSA/FSA. The TMWA water distribution system includes 44 water storage tanks with 12 of these within the City of Sparks TMSA/FSA. There are 108 pumping stations owned and operated by TMWA in the region with 17 of the pump stations within the City of Sparks TMSA/FSA.

3.4.2 Washoe County Department of Water Resources

The Washoe County Department of Water Resources operates 18 separate water systems in the region. Of these eighteen, two provide service within the City of Sparks TMSA/FSA. The Spring Creek Water System provides water service to customers along Pyramid Highway in the Spanish Springs Valley and south of La Posada Drive The Spring Creek Water System serves numerous residential subdivisions including but not limited to: Spring Creek Spring Ridge, Sierra Vista, Sierra Del Sol, Desert Springs, North Springs Estates, The Highlands at Cimarron and the Foothills at Wingfield Village. The Truckee Canyon Water System is a very small system located in the Truckee Canyon east of Vista Boulevard.

Within the City of Sparks TMSA/FSA the Washoe County Department of Water Resources serves exclusively groundwater to its customers from five supply wells within the City of Sparks TMSA. The water distribution system include, five storage tanks and a total of 22 miles of pipe within the City of Sparks TMSA/FSA. Additionally there are three existing pump stations within the City of Sparks TMSA/FSA.

3.5 SURFACE WATER SUPPLY

Currently the surface water supply for drinking water within the Truckee Meadows is provided exclusively by the Truckee River.

Lake Tahoe is the source of the Truckee River and a portion of its content is allocated for drinking water supply source. Additionally, there are a number of reservoirs within the Truckee River watershed. The reservoirs are managed by the Federal Watermaster an Officer of the United States District Court for the State of Nevada. The reservoirs serve multiple purposes including water supply, flood control, and recreation. Besides the potable water interests of the Truckee River by the inhabitants of the Truckee Meadows, there are farming interests in Fallon and Fernley, and Paiute Indian Tribe interests with respect to Pyramid Lake. These interests often compete and the Truckee River Operating Agreement has been established to manage the surface waters of the Truckee River watershed.

3.5.1 Surface Water Quality and Treatment Facilities

The surface water quality of the Truckee River is generally good. The quality is subject to seasonal variations primarily due to spring runoff and is also susceptible to impaired quality after forest fire events within the watershed. TMWA provides treatment of the Truckee River source at its Chalk Bluff and Glendale facilities. Surface water treatment is subject to federal and state regulations to protect the public health. The treatment facilities must meet primary and secondary quality standards. Both the Chalk Bluff and Glendale facilities have a good record of effective treatment of the Truckee River water source. Summary data for these facilities is provided in Table 3.4.

TABLE 3.4 SUMMARY OF SURFACE WATER TREATMENT FACILITIES

Item	TMWA Chalk Bluff	TMWA Glendale	Total
In-Service Date	1994	1976	
Rated Treatment Capacity (MGD)[1]	90.0	29.0	119.0
Rated Treatment Capacity (MGY)[2]	32,850	10,585	43,435
Existing Retail Population in Sparks (persons)	65,700		
Existing Retail Population in Reno (persons)	173,800		
Existing Retail Population in unincorporated county areas (persons)	11,400		

Notes: [1] (MGD) Millions of Gallons Per Day.
[2] (MGY) Millions of Gallons Per Year.

3.5.2 Groundwater Supply

Groundwater constitutes approximately a 31 percent share of the drinking water supply provided to the residents of the Truckee Meadows. Both TMWA and WCDWR own and operate municipal supply wells, providing groundwater to water consumers. In addition to the municipal supply wells there are many privately owned wells in use in the City of Sparks TMSA/FSA. Table 3.5 provides a summary of the existing groundwater supply wells by well owner.

TABLE 3.5 NUMBER OF GROUNDWATER SUPPLY WELLS BY OWNER

Well Owner	Total No. of Supply Wells	Wells Within the City of Sparks TMSA/FSA	Wells Within PSA 1	Wells Within PSA 2	Wells Within PSA 3	Wells Within PSA 4	Wells Within PSA 5	Wells Within PSA 6
TMWA	22	17	15	0	2	0	0	0
WCDWR[1]	10	5	5	0	0	0	0	0
Private[2]	N/A	277	184	23	45	1	24	0

Notes: [1] The WCDWR well data presented is for well facilities north of the Truckee River.
[2] The private well data is for areas within the City of Sparks TMSA/FSA.

3.5.3 Groundwater Quality and Treatment Facilities

Groundwater quality varies with the basin from which it is provided. Often groundwater quality is good enough that treatment is not required. However, chlorine, in its various forms, is often used to disinfect groundwater and provides a persistent disinfectant residual in the water delivered to consumers.

There are groundwaters that have contaminants of concern with respect to public health including nitrate, arsenic, iron and manganese and others. Treatment processes exist to reduce the concentrations of these constituents to suitable levels.

3.6 EXISTING WATER DISTRIBUTION SYSTEM FACILITIES

The existing water distribution facilities are shown in Figures 3.2 through 3.17 (Volume 2 of 2). Water distribution facilities generally include pipelines, pump stations, storage tanks and pressure control facilities. Regulations exist that dictate the pressure of the water delivered to consumers. Water distribution networks consist of pressures zones that generally maintain the water pressure between 40 and 100 psi. Pressures zones are elevation-based and within a single pressure zone the elevation difference is typically between 100 and 150 feet.

3.6.1 Pipeline Facilities

Currently the only significant water distribution pipeline networks within the City of Sparks TMSA/FSA are in PSA 1. There is a minor water distribution system in PSA 2. Distribution pipeline networks are designed with loops such that if a pipeline is compromised for some reason, water has an alternative path to reach the consumer.

The existing pipeline network is generally in good condition. Both TMWA and WCDWR are active in assuring their distribution pipelines have adequate capacity and are maintained in good condition.

Pipeline facilities are categorized as transmission pipelines which are generally large diameter pipelines (18-inch diameter for this facility plan) and distribution pipeline facilities. Branching off the transmission pipelines are distribution pipelines which convey water to the end user. Table 3.6 provides a summary of the pipeline facilities in the Truckee Meadows and within the City of Sparks TMSA/FSA. Table 3.7 presents a breakdown of transmission and distribution system pipelines within the City of Sparks TMSA/FSA.

TABLE 3.6 EXISTING TOTAL PIPELINE LENGTHS

Pipeline Facilities	Total System Wide (Miles)	Total Within Sparks TMSA/FSA (Miles)
TMWA	1,346	376
WCDWR	109	22
Combined	1,455	398

TABLE 3.7 EXISTING TRANMISSION AND DISTRIBUTION PIPELINES WITHIN THE CITY OF SPARKS TMSA/FSA

Pipeline Facilities	Transmission Pipelines (Miles)	Distribution Pipelines (Miles)
TMWA	26	350
WCDWR[1]	1	21

Note: [1] WCDWR pipeline facilities listed are for facilities north of the Truckee River.

3.6.2 Pump Station Facilities

Pump station facilities lift water through the various pressures zones and normally to storage tanks. Pump stations along with storage tanks assure the water delivered to the consumer is provided within an acceptable pressure range. Pressure control facilities either sustain or reduce water pressure to assure the proper pressure range is maintained within each pressure zone. In PSA 1 there is a total of 31 distinct pressure zones; the minimum elevation is 4,380 and the maximum elevation is 5,480 with PSA 1.

Pumps stations are rated on their pumping capacity in terms of gallons per minute. Pump station facilities usually include an auxiliary power supply so water can continue to be delivered in the event of a power outage. If a pump station does not pump to a storage tank there are usually a range of pump sizes within a pump station to meet normal demands and fire flow demands. They usually include a jockey pump to sustain pressure during periods of low demand i.e., evening and nighttime hours.

Table 3.8 provides information pertaining to existing pump station facilities in the Truckee Meadows and within the City of Sparks TMSA/FSA. Table 3.9 provides a breakdown of pump station facilities by PSA.

TABLE 3.8 EXISTING TREATED WATER PUMP STATIONS

Water Utility	Total Number of Pumping Stations (Count)	Total Number of Pump Stations Within Sparks TMSA/FSA (Count)
TMWA	108	17
WCDWR	9	3
Combined	117	20

Notes: [1] WCDWR pipeline facilities listed are for facilities north of the Truckee River.

TABLE 3.9 EXISTING TREATED WATER PUMP STATIONS BY PRIORITY SERVICE AREA

Priority Service Area	Treated Water Pump Stations
1	18
2	0
3	2
4	0
5	0
6	0
Total	20

3.6.3 Existing Storage Tank Facilities

Water storage tank facilities store treated water and are used to meet water demands in service areas that are served by the storage tank. Storage demand components include operating storage which provides storage to meet maximum day demands and fire storage. Storage tanks are usually constructed of either steel or pre-stressed concrete. Table 3.10 provides information pertaining to existing water storage tank facilities in the Truckee Meadows and within the City of Sparks TMSA/FSA. Table 3.11 provides a breakdown of water storage tank facilities by PSA.

TABLE 3.10 EXISTING TREATED WATER STORAGE TANKS

Water Utility	Total Number of Storage Tanks Within the Truckee Meadows	Total Number of Storage Tanks Within the City of Sparks TMSA/FSA
TMWA	44	12
WCDWR[1]	10	4
Combined	54	16

Note: [1] WCDWR pipeline facilities listed are for facilities north of the Truckee River.

TABLE 3.11 EXISTING TREATED WATER PUMP STATIONS BY PRIORITY SERVICE AREA

Priority Service Area	Number of Treated Water Storage Tanks
1	14
2	0
3	2
4	0
5	0
6	0
Total	16

3.7 PROPOSED WATER FACILITIES PLANNING CONSIDERATIONS

The Regional Transportation Commission developed Traffic Analysis Zones (TAZ) for planning transportation facilities within the Truckee Meadows. TAZ data includes the Equivalent Residential Unit (ERU) count and the employee count within each TAZ. City of Sparks planning personnel modified the TAZ data for the purpose of preparing this facility plan taking into consideration their vision of growth in the City of Sparks TMSA/FSA. The City of Sparks created six priority service areas as discussed in Section 1. The City of Sparks is currently preparing a master plan to identify future land uses within the six Priority Service Areas. The TAZ data was distributed through the Priority Service Areas and where TAZ and Priority Service Area boundaries did not match, a percentage share was identified to distribute the TAZ data accordingly.

The ERU data was used to establish the population of the Sparks TMSA/FSA in the year 2030 as roughly 167,000 inhabitants, increase of 77,000 people from the current

population of 90,000. Summary planning data presented in Table 3.12 including existing and future population, ERU's and employees by Priority Service Area.

TABLE 3.12 EXISTING AND FUTURE PLANNING DATA BY PRIORITY SERVICE AREA

Priority Service Area	Total Area (Acres)	Existing Population (2005)	Future Population (2030)	Existing ERU's (2005)	Future ERU's (2030)	Existing Employees (2005)	Future Employees (2030)
1	23,579	81,000	128,478	32,315	51,389	49,422	80,404
2	12,388	940	16,287	376	6,515	4,096	36,196
3	3,736	3,788	3,865	1,515	1,546	1,365	2,522
4	5,628	914	2,488	366	995	17	0
5	10,665	352	413	141	165	3	35
6	25,484	1,489	15,510	596	6,204	0	125
Total	81,480	88,483	167,041	35,309	66,814	54,903	119,282

Source: City of Sparks and Stantec Consulting, Inc.

For each PSA the land assumed to be developed by the year 2030 was taken from TAZ data, and the ERU count was distributed equally though the development area taking into consideration land to be occupied by commercial and industrial uses. The resultant densities are presented in Table 3.13. The density for each PSA was developed using the following formula:

Density (ERU/Acre) = Future ERU/Developable Area – (Future Employees/30 Employees per Acre)

It should be noted that for PSA 2, a value of 70 employees per acre was use as opposed to the 30 employees per acre as shown in the formula.

TABLE 3.13 DENSITY ASSUMPTIONS BY PRIORITY SERVICE AREA

Priority Service Area	ERU Density (ERU/acre)
1	2.9
2	4.0
3	3.0
4	0.6
5	1.8
6	3.9

Source: City of Sparks and Stantec Consulting, Inc.

Water demands were developed using the design criteria presented in section 3.7.2. Conceptual level planning was performed to size and locate water facilities for the land assumed to be developed by the year 2030. Water facilities for PSA 1 and 3 were taken largely from existing master facility plans. An analysis was conducted to assess the impact of the year 2030 population on existing and previously planned water facility improvements to determine if additional facilities would be necessary of the year 2030 population PSA 1. It is important to note that the planned water facilities assume an adequate water supply is available in the future.

To meet year 2030 prospected growth, new water facilities were planned for PSAs 2, 3, 4, and 6. For PSA 1 new water facilities are detailed in the TMWA 2005-2025 Facility Plan. The details are omitted from this facility plan, due to Homeland Security considerations. For PSA 5 no new water facilities were planned. With a year 2030 projected population of 413 and the rural nature of the area it is assumed water supply will be by private domestic well. Water facilities for PSAs 2, 3, 4 and 6 were sited based on the following considerations:

- Proximity to existing water treatment and distribution facilities;
- Valley and basin topography;
- Transportation corridors; and
- Development progressing radially outwards from existing development.

Possible points of connection from the developed area of Priority Service Area One were developed for PSA 3 to the west and PSAs 4 and 6 to the east.

Pipeline facilities were aligned generally along proposed roadways to convey water to storage tank facilities. The pipelines were sized based on peak hour flow rates throughout the PSA. In some instances planned water facilities are located in a certain PSA may serve other PSAs.

3.7.1 Regulatory Review and Considerations

Potable water systems are subject to federal, state, and local regulations to protect public health. The federal Safe Drinking Water Act established water quality guidelines for public water systems. The Nevada Division of Environmental Protection, Bureau of Safe Drinking Water and the Washoe County Department of District Health are responsible for the enforcement of drinking water regulations. NAC Chapter 445A details drinking water regulations for all public water system within the state. Local jurisdictions such as District Health may augment the regulations as required but the minimum standards set by the federal government and the State of Nevada must be met. Drinking water standards include, but are not limited to, the following:

- Drinking water quality;
- Allowable pressure ranges;
- Treated water storage requirements; and
- Distribution system redundancy.

With the passage of time, water quality regulations have become increasing stringent. New water treatment technologies have been developed and introduced to meet the ever increasing standards that have been promulgated. The quality of

the drinking water supplied to Truckee Meadows customers meets all current regulations.

3.7.2 Design Criteria

In planning water facilities, a key element is establishing design criteria. Design criteria comes from both state regulations and criteria established by the entity responsible for the water system operations. The planning and water design criteria used for the water facility plan is presented in Table 3.14.

TABLE 3.14 WATER FACILITY DESIGN CRITERIA

Item	Value
Residents per ERU	2.5
Average Day Demand per ERU	720 gpd[1]/ERU
Average Day Demand per Employee	40 gpd/employee
Maximum Day Demand Factor Coefficient	2.0
Maximum Day Demand	1,440 gpd/ERU
Peak Hour Factor Coefficient	1.5
Allowable Pressure Range	40-100 psi[2]
Maximum Pipeline Flow Velocity	8 fps[3] (6 fps[3] preferred)
Hazen Williams Factor for New Pipes	125
Operational Storage for Water Storage Tanks	15% of Max. Day
Fire Protection Storage for Water Storage Tanks	4,000 gpm[4] for a 4 hour duration
Emergency Storage for Water Storage Tanks	1 Day of Average Use

Notes: [1] (gpd) Gallons Per Day.
[2] (psi) Pounds Per Square Inch.
[3] (fps) Feet Per Second.
[4] (gpm) Gallons Per Minute.

Average Day Demand: The value of 720 gpd/ERU is taken form Nevada Administrative Code Chapter 445A.

Average Day Demand per Employee: A design criteria of 40 gpd/employee was used to account for variable water demand rates based on the type of workplace (i.e. commercial and industrial).

Maximum Day Demand Factor: The value of 2 is based on historical records and comparison with maximum day demand factors used in previous facility plans.

Peak Hour Factor: The peak hour factor used as design criteria is based on historical records and comparison with peak hour factors used in previous facility plans.

Tank Storage Requirements: The design criteria are based on NAC Chapter 445A.

3.7.3 Potential Private Well Conversions

Currently in the City of Sparks TMSA/FSA there are 277 individually owned, private well systems. While there are relatively few private well systems, the facility plan assumes all of these would be converted to the community water system as time passes. The number of individual, private wells within the City of Sparks TMSA/FSA was counted and an assumed demand of 1,000 gallons per day was assigned for each private well conversion to public water system. Table 3.15 presents existing private well information by PSA and the resultant water demands for conversion to community water systems.

Conversion of private wells represents an opportunity to free up groundwater rights and make them available for conversion, municipal and industrial use. Quantification of the potential increased water supply from private well conversions is beyond the scope of this conceptual facility planning effort. The water facility plan does not consider the potential use of existing private wells as a source of public groundwater supply.

TABLE 3.15 POTENTIAL PRIVATE WELL SYSTEM CONVERSIONS BY PRIORITY SERVICE AREA

Priority Service Area	Number of Private Well Systems	Number of Potential Private Well Conversions to Community Water	Average Day Demand of Potential Private Well Conversions (MGD)[1]	Maximum Day Demand of Potential Private Well Conversions (MGD)[1]	Peak Hour Flow Rate of Potential Private Well Conversions (GPM)[2]
1	184	184	0.13	0.26	0.39
2	23	23	0.02	0.04	0.06
3	45	45	0.03	0.06	0.09
4	1	1	0.0007	0.0014	0.002
5	24	24	0.02	0.04	0.06
6	0	0	0	0	0
Total	277	277	0.20	0.40	0.60

Notes: [1] (MGD) Millions of Gallons Per Day.
[2] (GPM) Gallons Per Minute.

3.7.4 Future Water Demands by Priority Service Area

- Average Day Demand

Average day demand was defined in Subsection 3.2.2 and the design criterion for average day demand was provided in section 3.7.2. Table 3.16 presents the average day demand by PSA. The estimated average day demand for the City of Sparks TMSA/FSA in the year 2030 is approximately 533\ MGD. The minimum average day demand of 0.14 MGD is in PSA 4 and the maximum average day demand of 40.35 MGD is in PSA 1.

TABLE 3.16 YEAR 2030 AVERAGE DAY DEMAND BY PRIORITY SERVICE AREA

Priority Service Area	Average Day Demand (MGD)[1]	Average Day Demand from Potential Private Well Conversions (MGD)[1]	Total Average Day Demand (MGD)[1]
1	40.22	0.13	40.35
2	6.14	0.02	6.16
3	1.21	0.03	1.24
4	0.72	0	0.72
5	0.12	0.02	0.14
6	4.47	0	4.47
Total	52.88	0.20	53.08

Notes: [1] (MGD) Millions of Gallons Per Day.

- Maximum Day Demand

  Maximum day demand was defined in Subsection 3.2.2 and the design criterion for maximum day demand was provided in Subsection 3.7.2. Table 3.17 presents the maximum day demand by PSA for the year 2030. The maximum day demand for the City of Sparks TMSA/FSA is 208 MGD. The smallest maximum day demand of 0.28MGD is in PSA 4 and the largest maximum day demand of 80.70 MGD is in PSA 1. Maximum day demands are used to establish the operating storage requirement of water storage tank facilities.

TABLE 3.17 YEAR 2030 MAXIMUM DAY DEMAND BY PRIORITY SERVICE AREA

Priority Service Area	Maximum Day Demand (MGD)[1]	Maximum Day Demand from Potential Private Well Conversions (MGD)[1]	Total Maximum Day Demand (MGD)[1]
1	80.44	0.26	80.70
2	12.28	0.04	12.32
3	2.42	0.06	2.48
4	1.44	0	1.44
5	0.24	0.04	0.28
6	8.94	0	8.94
Total	105.76	0.40	106.16

Notes: [1] (MGD) Millions of Gallons Per Day.

- Peak Hour Demand

  Peak hour demand was defined in Section 3.2.2 and the design criterion for average day demand was provided in section 3.7.2. Table 3.18 presents the maximum peak hour demand within each PSA. The minimum peak hour demand of 0.42 MGD is in PSA 4 and the maximum peak hour demand of 121 MGD is in PSA 1. Peak hour demand rates are used to size pipeline facilities.

TABLE 3.18 YEAR 2030 PEAK HOUR DEMAND BY PRIORITY SERVICE AREA

Priority Service Area	Maximum Peak Hour Demand Within Priority Service Area (MGD)[1]	Maximum Peak Hour Demand from Private Well Conversions (MGD)[1]	Total Peak Hour Demand (MGD)[1]
1	120.66	0.39	121.05
2	18.42	0.06	18.48
3	3.63	0.09	3.69
4	2.16	0	2.16
5	0.36	0.06	0.42
6	13.41	0	13.41
Total	158.64	0.60	159.21

Notes: [1] (MGD) Millions of Gallons Per Day.

- Water Storage Facility Requirements

  In addition to the operational flexibility they provide, water storage tank facilities also assure that water is available when the source of supply is compromised or unavailable. By implementing emergency water conservation measures, tank storage can help meet demand during periods of supply outage. Storage tanks have operating ranges and a minimum amount of water must be available at all times. The tank pad elevation establishes the upper elevation of the first pressure zone below the tank. The first water service customer is typically about 100 feet below the storage tank pad elevation. For service to pressure zones below the first pressure zone below the tank, pressure reducing facilities are used to maintain an acceptable water pressure range. Optimum water system operation involves filling water storage tanks during evening and night hours when water demand is at a daily minimum.

- Operational Storage

  Per NAC 445A water storage tank operating storage is defined as 15 percent of the maximum day demand. Table 3.19 presents the storage requirement for each City of Sparks TMSA/FSA Priority Service Area.

- Fire Storage

  Fire storage requirements are based on the Uniform Fire Code and NAC requirements. Without detailed land use planning or zoning established for the City of Sparks TMSA/FSA, the maximum fire demand has been assumed. The assumed demand was used in sizing the future water storage tank facilities. Table 3.20 summarizes the fire storage and fire flow rates by PSA. The fire storage demand used is 4,000 gpm for a minimum duration of 4 hours.

- Emergency Storage

  Per NAC 445A emergency storage must equal one average day demand volume.

TABLE 3.19 YEAR 2030 WATER STORAGE REQUIREMENTS BY PRIORITY SERVICE AREA

Priority Service Area	Fire Protection Storage (MG)[1]	Operational Storage (MG)[1]	Emergency Storage (MG)[1]	Storage Required from Potential Private Well Conversions (MG)[1]	Total Storage Demand (MGD)[2]
1	2	12.07	40.22	0.13	54.42
2	3	1.84	6.14	0.02	11.00
3	1	0.36	1.21	0.03	2.60
4	3	0.22	0.72	0	3.94
5	4	0.04	0.12	0.02	4.18
6	6	1.34	4.47	0	11.81
Total		15.87	52.88	0.20	87.95

Notes: [1] (MG) Millions of Gallons.
[2] (MGD) Millions of Gallons Per Day.

3.7.5 Future Water Demand Summary

Table 3.20 presents a summary of the future water demands within the City of Sparks TMSA/FSA.

TABLE 3.20 YEAR 2030 WATER DEMAND SUMMARY BY PRIORITY SERVICE AREA

Priority Service Area	Average Day Demand (MG)[1]	Maximum Day Demand (MG)[1]	Fire Protection Demand		Tank Storage Demand (MG)[1]	Maximum Peak Hour Flow Rate Demand
			Flow	Tank Storage (MG)[1]		
1	40.35	80.70	4,000	2	54.42	121.05
2	6.16	12.32	4,000	3	11.00	18.48
3	1.24	2.48	4,000	1	2.6	3.69
4	.72	1.44	4,000	3	3.94	2.16
5	0.14	0.28	4,000	4	4.18	0.42
6	4.47	8.94	4,000	19	11.81	13.41
Total	53.08	106.16		19	87.95	159.21

Notes: [1] (MG) Millions of Gallons.

3.8 PROPOSED WATER FACILITIES

For the proposed water facilities see Plate 3.1 (Volume 1 of 2) and Figures 3.2 through 3.17 (Volume 2 of 2).

The City of Sparks TMSA/FSA Conceptual Facilities Master Plan estimates the water demand within the Sparks TMSA/FSA for the year 2030 based on the TAZ data provided by the City of Sparks. The source of water supply is near its limits in the Truckee Meadows and the water facility plan has been developed under the assumption that additional water supplies can be secured to support growth within the City of Sparks TMSA/FSA.

In the absence of a defined source of water supply, the water facility plan includes five connections points to the existing water distribution system based on the priority ranking system design by the City of Sparks. PSA 1 receives service first; PSA 6 receives service last. For growth within PSA 1, upsizing of existing and previously planned water distribution pipelines may be required as described in the TMWA 2005-2025 facility plan. This water facility plan does not address the rehabilitation of aging water distribution system pipelines.

Currently, the public water systems of the City of Sparks TMSA/FSA are operated by TMWA and the WCDWR. The City of Sparks has successfully owned and operated wastewater and reclaimed water systems and may consider establishing its own water distribution system to serve its citizens in PSAs 2 through 6.

3.8.1 Supply and Treatment Facilities

The following section address water supply and treatment for groundwater supply, surface water supply and imported water supply.

- Groundwater

  Due to the lack of available groundwater supply in the City of Sparks TMSA/FSA, the water facility plan does not site new supply well facilities. The capacity of groundwater supply wells varies with the safe yield of the aquifer from which the wells draws, the well casing size, and pump equipment. Generally municipal groundwater supply wells vary from 300 to 3000 gallons per minute.

  Groundwater treatment usually involves only chlorination to disinfect the water. There are common groundwater contaminates that require additional treatment as discussed previously. The treatment is usually supplied at the wellhead to allow for the direct delivery to customers,

- Surface Water

  Due to the current lack of surplus surface water supply, the water facility plan does not identify future surface water supply within the Truckee Meadows. Surface water treatment is required by regulation to protect public health as discussed in previous sections. Surface water treatment facilities typically cost in the range of $1 - $3 per gallon of treatment capacity.

- Imported Water

  To address water supply deficiencies in the Truckee Meadows, numerous imported water supply plans have been developed. Currently the Honey Lake importation project is under construction. As discussed in subsection 3.3.2, other proposed importation projects include the following:

  - Aquatrac
  - Intermountain Pipeline
  - Empire Farms

  Importation projects include many obstacles to overcome before they can be implemented. These include:

  - Environmental impacts
  - Public opposition in the export area
  - High capital and operation and maintenance costs

  If demand based on growth dictates, a way will be found to overcome the obstacles of importation projects. Las Vegas is an example of looking far

beyond its borders in an effort to find additional water supplies to support its projected growth.

3.8.2 Distribution System Facilities

This water facility plan presents distribution facilities required to serve the projected growth of the City of Sparks TMSA/FSA to the year 2030. The distribution system facilities include: (1) pipeline facilities; (2) pump station facilities; and (3) storage tank facilities.

- Pipeline Facilities

  Pipeline facilities convey water from the source of treated supply throughout the distribution system and to storage tank facilities. The water facility plan presents only backbone pipeline facilities which are pipelines larger than 12 inches in diameter and larger. Facility planning for smaller distribution system piping is not possible for PSAs 2 through 6 until more definitive land use planning and zoning is completed. For PSA 1, the *TMWA 2005 - 2025 Water Facility Plan* addresses the pipeline improvement needs for growth within the city limits of Sparks and its sphere of influence in Spanish Springs Valley.

Table 3.21 presents the total length of pipeline facilities that will be needed in the year 2030. The values presented for 8 and 10-inch diameter pipelines are based on typical footage on a per acre basis for the assumed density of the PSAs. Table 3.22 presents the linear distances of water pipeline by diameters required by PSA.

TABLE 3.21 YEAR 2030 PIPELINE FACILITIES

Pipeline Diameter (Inches)	Pipeline Length (Miles)	Priority Service Area To Be Served
16	34.54	2, 3, 4, 6
24	10.60	2, 3, 6
Total	45.15	

TABLE 3.22 YEAR 2030 PIPELINE FACILITIES BY PRIORITY SERVICE AREA

Priority Service Area	16" Diameter Pipeline (Miles)	24" Diameter Pipeline (Miles)
1	Per TMWA 2025 Plan	Per TMWA 2025 Plan
2	18.09	1.24
3	2.42	3.78
4	6.17	0
5	0	0
6	7.86	5.58
Total	34.54	10.60

- Pump Station Facilities

  Pump station facilities for the projected growth of the Sparks TMSA/FSA to the year 2030 are represented in Table 3.23. The planned pump station facilities assume above ground installations and could utilize a variety of pump types. The facility plan assumes the use of horizontal split case pumps for booster pump station facilities. The pump facilities would be equipped with emergency power supply. The pump station facilities have been sited such that pipeline pressures do not exceed 150 pounds per square inch ("psi") which is the pressure rating of common pipeline material used for water distribution.

TABLE 3.23 YEAR 2030 PUMP STATION FACILITIES BY PRIORITY SERVICE AREA

Priority Service Area	Total Number of Pump Stations Within Priority Service Area
1	Per TMWA 2025 Plan
2	7
3	2
4	3
5	0
6	5
Total	17

- Water Storage Tank Facilities

  Future water storage tank facilities have been developed as part of this water facility plan. The storage tanks sites have been strategically sited around the assumed (year 2030) development areas of each PSA. Water storage tanks can be either steel or prestressed concrete. Steel tanks are either bolted or welded. The water facility plan assumes welded steel tanks will be utilized within the City of Sparks TMSA/FSA. Table 3.24 presents the total number of water storage tanks and the combined capacity by Priority Service Area for the year 2030.

TABLE 3.24 WATER STORAGE DEMAND BY PRIORITY SERVICE AREA

Priority Service Area	Total Number of Water Storage Tank Facilities	Total Volume of Water Storage Tank Facilities (MG)[1]
1	Per TMWA 2025 Plan	Per TMWA 2025 Plan
2	8	12
3	2	3
4	1	4
5	0	0
6	4	12
Total	15	31

Note: [1] (MG) Millions of Gallons.

3.8.3 Water Distribution Facility Summary

A summary of the proposed water distribution facilities by PSA to serve the projected population of the City of Sparks TMSA/FSA in the year 2030 is presented in table 3.25.

TABLE 3.25 YEAR 2030 WATER FACILITY SUMMARY BY PRIORITY SERVICE AREA

Priority Service Area	Length of Pipeline Facilities (Miles)	Number of Storage Tanks Facilities	Volume of Storage Tank Facilities (MG)[1]	Number of Pump Stations
1	Per TMWA 2025 Plan	Per TMWA 2025 Plan	Per TMWA 2025 Plan	Per TMWA 2025 Plan
2	79.53	8	12	7
3	21.50	2	3	2
4	15.97	1	4	3
5	0	0	0	0
6	68.44	4	12	5
Total	185.44	15	31	17

Note: [1] (MG) Millions of Gallons.

3.8.4 Estimated Water Facility Costs

Stantec developed estimated costs for the water facilities needed to support projected growth to the year 2030. Table 3.27 provides cost summary. The total estimated cost of the water facilities required to serve the year 2030 population of the City of Sparks TMSA/FSA is $257.6 million. The water facilities will support a projected City of Sparks TMSA/FSA population in the year 2030 of approximately 167,000. PSA 4 has the lowest estimated water facility costs estimated at $59.7 million.

TABLE 3.26 FUTURE WATER FACILITY COST SUMMARY BY PRIORITY SERVICE AREA

Priority Service Area	Supply and Treatment Facilities Cost (Million $)	Pipeline Facilities Cost (Million $)	Pump Station Facilities Cost (Million $)	Storage Tank Facilities Cost (Million $)	Total Cost (Million $)
1	Per TMWA 2025 Plan	Per TMWA 2025 Plan	Per TMWA 2025 Plan	Per TMWA 2025 Plan	Per TMWA 2025 Plan
2	80.70	22.92	2.80	18.00	124.42
3	12.32	17.63	0.80	4.50	35.25
4	2.48	12.66	1.20	6.00	22.34
5	0	0	0	0	0
6	3.00	52.54	2.00	18.00	75.54
Total	98.50	105.75	6.80	46.50	257.55

Note: Costs are presented in year 2008 dollars.

- Groundwater Supply Wells Costs

  Groundwater supply wells have not been established as a part of this water facility plans due to the factor that most of the available groundwater has been

allocated. Solving water supply problems will be a regional issue for the Truckee Meadows. Generally the cost to site, drill and equip a municipal well can range from $0.5 to $1.0 million. The variability in cost is a result of factors including the well casing size, the depth of the well, the proximity of electrical power supply to the well site, and other factors. The cost of wellhead treatment also varies. The cost is contingent upon type and concentration of the contaminants requiring treatment and the volume of water to be treated. Wellhead treatment costs can range from $0.1 to 0.5 million per wellhead. Centralized treatment of multiple wells is costly because of the distance between the supply wells and the need for dedicated pipeline facilities from the well to the treatment site before the treated ground water can be introduced into the water distribution system.

In order to provide an estimate of the cost of developing groundwater supplies in portions of the City of Sparks TMSA/FSA, assumptions must be made. PSAs 4, 5 and 6 are the most likely candidates for water service using local groundwater. The total of demand within these three PSAs is approximately 5.2 MGD. Assuming and average well output of 1000 gpm (1.44 MGD), a total of 4 wells would be required to meet this demand. Assuming an average cost of $750,000 per well (including wellhead treatment) the total capital cost of groundwater supply wells is approximately $3 million. This assumes that groundwater is available to meet the year 2030 demand.

- Treatment Facility Costs

  Surface water treatment facilities were not developed as part of the water facility plan because of the lack of available surface water supply. However, if local surface water sources become available, it would be beneficial to the City of Sparks officials to have an idea of surface water treatment facility costs. The cost to plan, design, and construct a surface water treatment facility can range from $1 to $3 dollars per gallon of treated water depending upon various factors including the treatment facility site, the quality of the raw water, and the treatment processes used. PSAs 1, 2, and 3 are most suitable for surface water supply and given their year 2030 combined total demand of 47.6 MGD, the cost of the surface water treatment facility capacity improvements are estimated at $95.2 million using a unit cost of $2 per gallon of water treated.

- Pipeline Facility Costs

  The total cost of pipeline facilities to serve PSAs 2 through 6, in the City of Sparks TMSA/FSA is estimated to be $105.8 million and pipeline facility costs by PSA are presented in Table 3.27. Since detailed land use planning and zoning has not yet been developed for a large portion of the City of Sparks TMSA/FSA, certain assumptions were required to identify the distribution pipeline costs. Based on historical trends, the average cost per acre for water

distribution service to residential areas is approximately $17,000 per acre. This unit cost was applied to developable acreage by Priority Service Area to establish the estimated costs for distribution pipelines shown in Table 3.27.

TABLE 3.27 YEAR 2030 PIPELINE FACILITY COSTS BY PRIORITY SERVICE AREA

Priority Service Area	Transmission Pipelines (Million $)	Distribution Pipelines (Million $)
1	Per TMWA 2025 Plan	Per TMWA 2025 Plan
2	18.76	4.16
3	7.09	10.54
4	5.86	6.80
5	0	0
6	14.54	38.00
Total	46.25	59.50

Note: Costs are presented in year 2008 dollars.

- Pump Station Facility Costs

  Total pump station facility costs by priority service area are presented in Table 3.28. The cost of pump station facilities is influenced by factors including size and scale, the building structure type, the type of pumps used and the accessory and ancillary components of the pump station. Pump station unit costs range from $1,000 to $1,500 per horsepower. A unit price of $1,300 per horsepower was used to develop the pump station costs presented below in Table 3.28.

TABLE 3.28 YEAR 2030 PUMP STATION FACILITY COSTS BY PRIORITY SERVICE AREA

Priority Service Area	Cost (Million $)
1	
2	2.8
3	0.8
4	1.2
5	0
6	2.0
Total	6.8

Note: Costs are presented in year 2008 dollars.

- Storage Tank Facility Costs

  Total costs for water storage tank facilities by priority service area are presented in Table 3.29. The cost of water storage tanks varies with the material of construction, the difficulty of site access, and other factors. Typical unit prices for water storage tanks range from $1 to $2 dollars per gallon. A unit price of $1.50 per gallons was used to establish the estimated costs presented in Table 3.29.

TABLE 3.29 YEAR 2030 STORAGE TANK FACILITY COSTS BY PRIORITY SERVICE AREA

Priority Service Area	Cost (Million $)
1	Per TMWA 2025 Plan
2	18.0
3	4.5
4	6.0
5	0
6	18.0
Total	46.5

Note: Costs are presented in year 2008 dollars.

3.9 SUMMARY

Conceptual level water facility planning has been performed for the City of Sparks TMSA/FSA to support a projected population in the year 2030 of approximately 167,000 persons. The total average day water demand for the projected population is 53 MGD.

The City of Sparks TMSA/FSA consists of six separate Priority Service Areas. The existing city limits of Sparks and the Spanish Springs Valley constitute PSA 1. PSA 1 is the only PSA with substantial existing development. Growth within this area will generally include in-fill and vertical growth. This area is provided water service primarily by the TMWA with a small area in the Spanish Springs Valley served by the WCDWR. TMWA has prepared a facility plan covering the years 2005 though 2025 that recommends water facilities needed to serve the majority of PSA 1. PSA 2 through 6 are generally undeveloped and represent future growth areas beyond the city limits and the Spanish Springs Valley. These areas will require new water facilities.

PSA 2 is on the north side of the Truckee River in the Truckee Canyon east of Vista Blvd. PSA 2 is planned for industrial development with supporting residential uses. If surface water was available, the area would be ideal for a surface water treatment facility and storage tanks located on the hillsides to the north.

PSA 3 is located west of Pyramid Highway. The southern two thirds are mountainous and is generally not suited for additional development. The northern third encompasses developable land. Water service to this area is conducive for connection to the existing water system serving the Spanish Springs Valley.

PSA 4 is located northeast of the Spanish Springs Valley. The area is mostly mountainous with a few developable valleys. The WCDWR operates a water system nearby and could possibly expand service into this priority service area.

PSA 5 encompasses the Warm Springs Valley. This PSA is best suited for a stand alone water distribution system. The projected population in the year 2030 is slightly over 400 and given the small population and remote location. this area is best suited for private

domestic well service as opposed to a community water system at least through the year 2030.

PSA 6 is located east of the City of Sparks. The topography varies dramatically with significant slopes but has developable valleys and plateaus. This PSA is suitable for a stand alone water system in the eastern half and connection to the existing water distribution system in the western half.

A lack of adequate water supply, either groundwater or surface water, is a major obstacle that must be overcome for growth can occur in the City of Sparks TMSA/FSA. Nearly all of the available groundwater and surface water rights have been allocated. The City of Sparks is not alone with respect to this problem. The City of Reno and unincorporated Washoe County both face this obstacle. A coordinated regional effort is necessary to solve this region's water supply problems. The western region water commission ("WRWC") scheduled for establishment in April 2008 is the entity best suited for meeting this need. Water importation projects have been conceived and proposed; another is currently under construction. Importation, conservation, water reclamation, reuse and innovative solutions will be required to solve the water supply problems in the Truckee Meadows.

This water facility plan is conceptual and addresses long term planning concerns. Detailed land use planning and zoning has not been completed for the TMSA/FSA. Completion of more detailed land use plans will be necessary before more detailed facility plans can be prepared.

The projected growth within the City of Sparks TMSA/FSA results in a future City of Sparks of considerable size. To achieve this growth Sparks will have to coordinate closely with the Regional Water Planning Commission and its successor organization (the WRWC) and with the TMWA and the WCDWR to secure water resources that will allow projected growth to occur. Furthermore, the City should consider evaluating and investigating its options with the water importation projects currently underway. It should be clear that without additional water supplies, growth will be limited in the City of Sparks. The City should be more proactive in making sure an adequate water supply is available in order for grown to occur.

The City may also want to consider becoming a water purveyor. The City of Sparks owns and operates effective wastewater and reclaimed water systems. PSAs 2, 4, 5 and 6 are essentially undeveloped. The City, in coordination with the development community, could create water systems to serve its citizens. Water purveyorship could allow the city to bank water rights for future growth and become active in the water right market.

SECTION FOUR

Wastewater / Reclaimed Water

Wastewater service for the City of Sparks Truckee Meadows Service Area is, for the most part, managed by the City of Sparks. The cities of Sparks and Reno own and operate the wastewater collection system that services the majority of residents within the Sparks city limits and its sphere of influence. Specifically services are provided to Priority Service Areas ("PSA") One and Three. The cities of Sparks and Reno cooperatively own, operate and maintain the Truckee Meadows Water Reclamation Facility ("TMWRF") for treatment, disposal and reuse of wastewater generated in Sparks and Reno.

Wastewater service is also provided by the Washoe County Department of Water Resources ("WCDWR") north of PSA 5, Warm Springs. The WCDWR owns and operates the collection system and the Wastewater Reclamation Facility serving the Warm Springs Valley. The defined limits of PSA 5 for the City of Sparks TMSA/FSA includes lands located southerly, and higher in elevation, than the Warm Springs portion of Washoe County's TMSA. Wastewater service for PSAs 2, 4 and 6 currently include private septic tank and leach field treatment and disposal systems.

The Truckee Meadows Regional Plan, prepared by the Truckee Meadows Regional Planning Agency ("TMRPA") and the *Washoe County 208 Water Quality Management Plan (2004)* ("208 Plan") define the parameters for wastewater treatment management within the service territory. The 208 Plan addresses the effects of continued growth and development on the TMSA/FSA boundaries and provides water quality planning to a horizon year of 2030.

4.1 RELATED STUDIES

The City of Sparks, with its ownership of the municipal wastewater system, has been proactive in planning, designing and constructing improvements to its wastewater system. For the majority of the existing wastewater infrastructure facility plans have been prepared as planning tools to assure that the community's present and future needs are met. Generally, master planning is followed by facility planning, preliminary design reports, design reports, capital improvement plans, and construction documents. Collectively these documents serve as a record of wastewater facility development within the City of Sparks TMSA/FSA.

A summary of the existing wastewater planning documents is provided in Table 4.1, *Related Wastewater and Reclaimed Water Facility Planning Studies*. Wastewater facility planning for the City of Sparks TMSA/FSA Conceptual Facility Master Plan ("Facility Plan") has been developed to the conceptual level in this report. Portions of the documents presented in Table 4.1 have been utilized in this Facility Plan.

TABLE 4.1 RELATED WASTEWATER AND RECLAIMED WATER FACILITY PLANNING STUDIES

Report Name	Study Date	Priority Service Area Applicability	Description
TMSA/FSA Water, Wastewater, and Flood Management Facility Plan Reference: Eco:Logic for COR	Jun. 2007	1 - 6	This facility plan has been prepared to project future demand and wastewater flows for the City of Reno and Washoe County Truckee Meadows Service Area and Future Service Area, and to project the necessary improvements for water, wastewater and flood control infrastructure.
Facility Plan for Spanish Springs Facility Water Reclamation Facility Reference: Stantec Consulting, Inc.	Sep. 2005	1, 3, 4, 6	The report evaluates two planning alternatives to determine the most appropriate sanitary servicing method for Spanish Springs: construction of a new facility in Spanish Springs and continued servicing via TMWRF. It was determined that continuing TMWRF service for the area was the most viable alternative.
Effluent Reuse Infill Project Feasibility Study Reference: AMEC Infrastructure	Jan. 2005	1 - 6	Explores the feasibility and cost of delivering effluent to schools and City Parks for use as irrigation water. Two effluent distribution alignments, within York and South 4th Street in Sparks, were determined cost-effective over a 20-year planning period.
Vista – Prater Sewer Interceptor Facility Plan Reference: Summit Engineering	Jan. 2005	1	This plan examines the existing and future capacity issues of the Vista-Prater Interceptor and proposes a combination of replacement, supplementation, and bypass of existing sewers for the study area.
Boneyard Flat Effluent Storage Reference: AMEC Infrastructure	Nov. 2004	1 - 6	Describes a plan to prepare the playa to receive effluent discharged from TMWRF for one month in the fall and one month in the spring each year. It is recommended that the effluent applied to Boneyard Flat be disposed of via percolation to supplement the gradually depleting groundwater supply in the area.
City of Sparks Effluent Reuse System Overview Reference: AMEC Infrastructure	August 2004	1 - 6	Describes the different components of the Sparks effluent reuse system, including pump station, storage tank, booster pump station, distribution system, user sites, and truck fill stations.
Washoe County Amendment to Warm Springs Ranch Wastewater Treatment Plant Facility Plan Reference: Eco:Logic	Mar. 2004 (Amended Aug. 2006)	6	The plant facility plan and amendment propose treatment plant design and effluent disposal methods for the Warm Springs Valley planning area. Disposal methods include use of rapid infiltration basins and reuse via golf course irrigation, requiring tertiary treatment of effluent (instead of secondary treatment as proposed in the 2004 draft plan). The report includes mapping of the proposed wastewater infrastructure.

TABLE 4.1 (CONT). RELATED WASTEWATER AND RECLAIMED WATER FACILITY PLANNING STUDIES

Report Name	Study Date	Priority Service Area Applicability	Description
Water and Wastewater Facility Plans on Industrial Zoned Lands along the Lower Truckee River within Washoe County, Final Report Reference: AGRA Infrastructure for RWPC, WCDWR	Aug. 2000	1 - 6	This plan discusses water and wastewater infrastructure plans for the Mustang and Tracy industrial development areas. A phasing strategy is presented, along with estimated costs to meet current, proposed and future demand.

Legend: (COR) City of Reno.
(RWPC) Regional Water Planning Commission.
(WCDWR) Washoe County Department of Water Resources.

4.2 EXISTING WASTEWATER AND RECLAIMED WATER FACILITIES

4.2.1 Wastewater Flow Rates and Volumes

Existing wastewater flow rates within the City of Sparks TMSA/FSA are presented in *Table 4.2 - Existing Wastewater Flow Rates and Volumes*. The flow rates are based upon 2005 Traffic Analysis Zone ("TAZ") data, are listed by PSAs, and include the average day flow, the maximum month daily flow and the highest peak hour flow rate within the PSAs. The following subsections provide additional information regarding existing wastewater flow rates:

- Average Daily Flow Rate
  - The average daily flow rate is based upon the total flow throughout the year. It provides a good indication of wastewater facility needs. However, fluctuation in flow rates require additional statistical evaluation as presented in the following two subsections. Based upon 2005 TAZ data the existing average daily flow rate for the City of Sparks TMSA/FSA is 9.54 MGD.
- Maximum Month Daily Flow Rate
  - Wastewater facility planning includes evaluation of flow rate fluctuations observed during the maximum month of sewage flow. Historically, maximum month flows are analyzed to identify flow generally attributed to combined sewers of the eastern United States. In the Truckee Meadows, the storm sewer and sanitary sewer systems are separated and the maximum month flow generally represents increased flow due to inflow and infiltration (I/I). Inflow and infiltration primarily occurs during the rainy season and is caused by surface flows entering the wastewater piping system and by higher groundwater levels. The City of Sparks does not suffer from a severe I/I problem because of its active, ongoing maintenance program. Its proactive management of wastewater facilities is evidenced by the number of wastewater and reclaimed water facility planning studies already

completed. Generally, the daily average of maximum month flow rate is used to establish the required capacity of wastewater treatment facilities.

The daily average of maximum month flow is generally expressed as a factor of the annual average daily flow. With detailed flow records specific factors can be established. For this study a factor of 1.4 has been established for maximum month flow for PSA 1 and a factor of 1.2 has been established for PSAs 2 through 6. These factors have been applied to the 2005 TAZ data resulting in an existing total maximum month average daily flow within the Sparks TMSA/FSA of 13.2 MGD.

- Peak Hour Flow Rates
  - Wastewater flow rates are also analyzed on a peak hour flow rate basis. Peak hour flow rates vary throughout the system and are of course greatest at the entrance to the wastewater treatment facility. The peak hour flow rate is used to size collection system pipelines to assure that adequate conveyance capacity is available to prevent sanitary sewer overflows. Like maximum month flows, peak hour factors are developed based upon historical data. The peak hour factor for this study is 2.5. This factor is based on comparative analysis of the rated studies presented in Table 4.2,. The maximum peak hour flow rate in PSA 1 is 21.83 MGD.

TABLE 4.2 EXISTING WASTEWATER FLOW RATES AND VOLUMES BY PRIORITY SERVICE AREA

Priority Service Area	Average Daily Flow		Maximum Monthly Daily Flow	Maximum Peak Hour Flow Within Priority Service Area
	MGD[1]	MGY[2]		
1	8.73	3,186	12.22	21.83
2	0.10	37	0.12	0.25
3	0.41	150	0.49	1.03
4	0.10	37	0.12	0.25
5	0.04	15	0.05	0.10
6	0.16	58	0.19	0.40
Total	9.54	3,483	13.19	23.86

Notes: [1] (MGD) Millions of Gallons Per Day.
[2] (MGY) Millions of Gallons Per Year.

4.2.2 Wastewater Strength

Wastewater strength is characterized by a variety of factors. The primary factors are the biochemical oxygen demand, the total suspended solids and the concentration of nitrogen. Wastewater strength varies with the sources i.e. residential, commercial or industrial generating the wastewater. The City of Sparks operates a pre-treatment program for various types of commercial and industrial facilities. Two examples of the pretreatment programs include: (1) restaurants are required to have grease traps to prevent too much grease from entering the

collection system and flowing to the water reclamation facility ("WRF"); and (2) industrial facilities often require pretreatment to prevent a contaminant from flowing to WRF's that are not designed to handle the contaminant.

The existing wastewater strength within the City of Sparks TMSA is typical of many communities. Table 4.3, *Existing Wastewater Characterization*, provides an overview of the existing wastewater strength of the influent to TMWRF. It should be noted that with the substantial amount of recent growth wastewater strength has increased as a result of water conservation measures in newer homes. The potential exists for additional increase in wastewater strength as time progresses.

- Biochemical Oxygen Demand ("BOD")
  - Biochemical oxygen demand is a measure of wastewater strength and generally represents the oxygen deficiency in wastewater. BOD is reduced in treatment facilities by aeration. Typical BOD values range from 110 to 350 mg/L which compares favorably to the value of 201.74 mg/L as presented in Table 4.3.
- Total Suspended Solids ("TSS")
  - Total suspended solids is a measure of the concentration of suspended solids in wastewater and its treated effluent. Total suspended solids is expressed in terms of mg/L and typical values range from 120 to 400 mg/L. The total suspended solids value presented in Table 4.3 falls within the typical total suspended solids range of community wastewater.
- Nitrogen and Other Constituents
  - The concentration of nitrogen in wastewater is an important factor. As a rule nitrogen in wastewater is derived primarily from ammonia. Wastewater treatment processes generally convert ammonia to nitrites and nitrates. The reduction of nitrogen concentration in effluent is important because nitrogen can have differing effects on the environment depending on its oxidation state. For example, ammonia is toxic to fish and other aquatic life and because it is highly reactive with oxygen, ammonia can deplete the dissolved oxygen in water. In addition, all forms of nitrogen can be taken up by algae and photosynthetic bacteria and increased levels of these organisms, which can lead to increased turbidity and reduced oxygen levels. Finally, nitrate is a potential health hazard because excessive levels can lead to methemoglobinemia or "blue baby" syndrome in children. In the body, nitrate coverts hemoglobin to methemoglobin, which binds oxygen less effectively and can lead to decreased oxygen levels that can be fatal. Minimizing nitrate concentration is vital in disposing treated wastewater effluent to prevent degradation of surface and groundwaters. Nitrogen is expressed in a variety of manners as shown in

Table 4.4, *Typical Composition of Domestic Wastewater.* The nitrogen concentration of influent to TMWRF is typical for community wastewater.

4.2.3 Wastewater Facilities

The existing wastewater facilities within the City of Sparks ("COS") TMSA/FSA are shown in figures 4.1 though 4.16 (Volume 2 of 2) of this facility plan. Wastewater facilities generally include collection system pipelines, pump stations and treatment facilities.

The existing wastewater collection and treatment facilities serving the cities meet the current need, but as growth occurs, additional capacity will be required. Furthermore, as existing wastewater facilities age, rehabilitation or replacement is required. The condition of the existing COS wastewater facilities is generally good. The following subsections provide additional information regarding existing COS wastewater facilities.

Based upon TMWRF influent data from January 2002 to November 2007, existing wastewater for Reno-Sparks was characterized for biochemical oxygen demand ("BOD"), total suspended solids ("TSS"), ammonia as nitrogen, and nitrate-nitrite as nitrogen. For planning purposes, Reno and Sparks are assumed to produce wastewater of similar quality, so that the average values presented are used as typical wastewater quality values for the Sparks TMSA/FSA and Existing Service Area ("ESA") planning areas.

TABLE 4.3 EXISTING WASTEWATER CHARACTERIZATION

Constituent	Average Value, 2002-2007 (mg/L)[1]
BOD	201.74
TSS	167.21
Ammonia Nitrogen	24.95
Nitrate+Nitrite Nitrogen	0.07

Notes: [1] (mg/L) Milligrams Per Liter.

Total nitrogen in wastewater is composed of organic nitrogen and inorganic nitrogen (ammonia, nitrate and nitrite). The concentrations of each of the types of nitrogen in the treatment plant influent depend upon the composition of the discharges to the collection system and the conditions within the collection system prior to entering the treatment plant. The main factors that control the nitrogen balance in wastewater are the nature of the wastewater (domestic versus industrial), as wells as oxygen, bacteria and temperature levels. Values for typical strength domestic wastewater as determined by Metcalf and Eddy, Inc, *Wastewater Engineering Treatment, Disposal, and Reuse*, Third edition, 1991 are shown below in Table 4.4

TABLE 4.4 TYPICAL COMPOSITION OF DOMESTIC WASTEWATER

Parameter	Average Concentration (mg/L)[1]	Typical Range (mg/L)[1]
Ammonia Nitrogen	25	12 - 50
Nitrate+Nitrite	0	0
Organic Nitrogen	15	8 - 35
Total Nitrogen	40	20 - 85

Notes: [1] (mg/L) Milligrams Per Liter.

TMWRF does not test its influent for organic nitrogen. Since the ammonia nitrogen in TMWRF influent matches the typical composition of domestic wastewater shown in Table 4.5, *Existing Wastewater Interceptors*, it is assumed that the average value of organic nitrogen in wastewater for the study area is 15 mg/L. Therefore, the total nitrogen average influent concentration for the study area is assumed for planning purposes to be 40 mg/L.

- Existing Collection Systems
  - The existing wastewater collection system consists of collection mains which include both gravity mains and force mains which convey raw sewage under pressure. Interceptors are larger diameter pipelines that receive flow from collection mains and convey it to the treatment facility

    The existing City of Sparks wastewater collection system includes approximately 42.6 miles of pipelines and seven individual lift stations. The combined pumping capacity of all the existing lift stations is 2.8 MGD. A summary of the existing collection system facilities within the City of Sparks TMSA/FSA is presented in Tables 4.5 and 4.6.

TABLE 4.5 EXISTING WASTEWATER INTERCEPTORS

Name	Diameter (Inches)		Length (Feet)
	Minimum	Maximum	
NE Interceptor	30	30	25,100
NW Interceptor	30	36	5,700
South Spanish Springs	33	42	14,100
North Spanish Springs	36	39	12,300

TABLE 4.6 EXISTING WASTEWATER LIFT STATIONS

Location	In-Service Date	Capacity (gpm)[1]	Capacity (MGD)[2]
1199 O'Callaghan drive	1998	150	0.22
1102 Spice Island Drive	1997	250	0.36
2102 East Greg Street	1997	420	0.60
1450 Disc Drive (Fire #4)	1997	80	0.12
300 Howard Drive (Marina Park)	2001	200	0.29
1152 Bayshore Drive (Marina Village)	2003	850	1.22
1515 South Rock Blvd (Rock Park)	2000	N/A	N/A
Parlanti Lane (Helms Trailer Park)	1976	N/A	N/A

Notes: [1] (gpm) Gallons Per Minute.
[2] (MGD) Millions of Gallons Per Day.

- Existing Treatment Facilities
  - Wastewater treatment facilities are often referred to as wastewater treatment plants or water reclamation facilities. The Truckee Meadows Water Reclamation Facility ("TMWRF") provides treatment of wastewater from the cities of Reno and Sparks and portions of unincorporated Washoe County. The cities of Sparks and Reno cooperatively finance, manage, operate and maintain TMWRF, and they also coordinate facility expansions. TMWRF uses an activated sludge treatment process and provides tertiary treatment of wastewater. The Nevada Division of Environmental Protection has issued a discharge permit for TMWRF through the National Pollutant Discharge Elimination System ("NPDES") program. Since a portion of TMWRF's treated effluent is released to the Truckee River the discharge permit for TMWRF has very stringent limits. Portions of the TMWRF effluent is reclaimed and recycled as reuse water also known as treated effluent or reclaimed water. Strict limitations on reclaimed water reuse also form the basis of the discharge permit for TMWRF.

    Water reclamation facilities must also manage the solids generated from community sewer systems. At TMWRF the solids are anaerobically digested, dewatered and either applied to the ground as fertilizer (under regulatory requirements) or disposed in landfills.

    TMWRF is well operated and maintained. The facility first went into operation in 1964, and has undergone many improvements and capacity expansions throughout the years. The most recent facility expansion was completed in 2006 to increase the rated treatment capacity to 46 MGD. Table 4.7 provides summary information pertaining to TMWRF.

TABLE 4.7 SUMMARY OF TMWRF INFORMATION

Item	Relative Numbers
Original In-Service Date (Year)	1964
Most Recent Treatment Capacity Increase (Year)	2006
Rated Treatment Capacity (MGD)[1]	46.48
Current (Permitted) Annual Average Daily Flow (MGD)[1]	31.5 (51.2)
Reno Capacity Share (%)	66.3
Sparks Capacity Share* (%)	33.7
Current Annual Volume Treated** (MG)[2]	10,950
Current Annual Reclaimed Water Reuse (MG)[2]	525
Current Annual Discharge Volume to River (MG)[2]	10,425

Notes: [1] (MGD) Millions of Gallons Per Day.
[2] (MG) Millions of Gallons.
*Sparks has permanently leased 1.8 MGD treatment capacity to the Sun Valley General Improvement District.
**As of 2000, based on 2004-2005 Washoe County Comprehensive Regional Water Management Plan.

4.2.4 Existing Reclaimed Water Facilities

The City of Sparks owns and operates a very effective reclaimed water system which substantially reduces the demand for freshwater in the Truckee Meadows. The reclaimed water system supplies treated wastewater effluent to several golf courses, city parks and other landscaped areas within the City of Sparks TMSA/FSA. Reclaimed water facilities include source of supply pump stations, distribution system piping, booster pump stations, and storage facilities.

The following subsections provide information regarding existing reclaimed water supply quality and quantity.

- Reclaimed Water Supply Quality and Quantity
  - The source of supply for the City of Sparks reclaimed water system is TMWRF. The quality of treated wastewater effluent controls its reuse. The following two subsections address the reclaimed water quality.
- Reclaimed Water Supply and Reuse
  - Reclaimed water supply is generally available and reused during the irrigation months of April through October. Several factors exist which control the available quantity of reuse water. These include the amount of raw wastewater treated and environmental considerations of discharge from TMWRF to the Truckee River. The majority of reuse water from TMWRF is used in the City of Sparks. A portion of the treated flow is also applied at the University Farms located near TMWRF.

    In 2006 the total discharge volume of TMWRF was approximately 31,137 acre feet. Of this total, approximately 2,600 acre feet (8.4 percent) were

reused in irrigation. Table 4.8 provides information regarding the reuse sites of the City of Sparks water reclaimed water system.

TABLE 4.8 EXISTING RECLAIMED WATER USE AREAS

Description	Annual Usage (MG)[1]
City of Sparks – Spanish Springs #1	133
City of Sparks – Parks	98
D'Andrea Golf Course	210
Washoe County School District	15
Washoe County Parks and Recreation Department	20
First Tee Golf Course	6
Martin Marietta Materials	80
City of Sparks – Spanish Springs Area #2	75
Total	637

Notes: [1] (MG) Millions of Gallons.

- Reclaimed Water Quality
  - Reclaimed water quality is a function of the level of treatment provided by the wastewater treatment facility producing the effluent. In Nevada, the Nevada Division of Environmental Protection (NDEP) classifies treated wastewater effluent quality and controls the reuse of the effluent. The controlled use of treated wastewater effluent is generally based on the fecal coliform and total coliform concentrations, along with other considerations.

    Requirements for bacteriological quality of reuse water are set forth in the reuse categories defined in the Nevada Administration Code ("NAC") 445A.276, use of treated effluent. Requirements for bacteriological quality of effluent. In general reuse within City of Sparks TMSA/FSA is assumed to require classification reuse category A. This category of reuse allows non-controlled public access to reuse areas.

    The NDEP requires that an Effluent Management Plan be prepared for each place of use of reclaimed water. An Effluent Management Plan details the restrictions and precautions for reclaimed water reuse including the following considerations: (1) reclaimed water class; (2) buffer zones for application; and (3) permissible hours of application.

- Reclaimed Water Pump Stations

  The main pump station for the City of Sparks reclaimed water system is located at TMWRF. The current pumping capacity of the main pump station is approximately 20,000 gpm. The City of Sparks also operates a reclaimed water booster pump station. This booster pump station is located in Spanish Springs on Kiley Ranch and pumps water to the outer limits of the City of Sparks

reclaimed water system. The pump station consists of two 350 horsepower splitcase pumps and two 100 horsepower end suction pumps. The maximum design pressure of the pump station is 200 psi and the discharge header elevation is 4,469 feet.

- Reclaimed Water Distribution System

  The existing reclaimed water distribution system includes a storage tank, distribution pipelines, metering facilities and water truck fill stations. A 30-inch diameter main distribution pipeline extends from TMWRF; branches off of this trunk line serve reuse sites located within the City. The City owns and operates a 3.25 million gallon reclaimed water storage tank located in the Spanish Springs Valley near the Golden Eagle Regional Park, which is currently under construction. Table 4.9, *Existing Reclaimed Water Pipeline Facilities*, presents information regarding the existing reclaimed water pipelines comprising the City of Sparks reclaimed water system.

TABLE 4.9 EXISTING RECLAIMED WATER PIPELINE FACILITIES

Pipe Material	Diameter (Inches)	Length (Feet)
Ductile Iron	35	216
	30	53,874
	24	3,219
	20	18,297
	18	7,459
	16	16,681
	12	3,745
	10	176
PVC	12	4,287
	10	142
	8	11,177
	6	3,921
	4	1,816

4.3 PROPOSED WASTEWATER AND RECLAIMED WATER FACILITIES

This section provides information regarding planning information, data, assumptions and methodology employed in preparation of this wastewater and reclaimed water conceptual facility master plan. Refer to Plate 4.0 (Volume 1 of 2) and Figures 4.1 through 4.16 (Volume 2 of 2) for a graphical presentation of the proposed wastewater and reclaimed water facilities.

The Regional Transportation Commission developed Traffic Analysis Zones ("TAZ") for planning transportation facilities within the Truckee Meadows. TAZ data includes the Equivalent Residential Unit (ERU) count and the employee count within each TAZ. City of

Sparks planning personnel modified the TAZ data for the purpose of preparing this facility plan taking into consideration their vision of growth in the City of Sparks TMSA/FSA. The City of Sparks created six priority service areas as discussed in Section 1. The City of Sparks is currently preparing a master plan to identify future land uses within the six PSAs. The TAZ data was distributed through the PSAs and where TAZ and PSA boundaries did not match, a percentage share was identified to distribute the TAZ data accordingly.

The TAZ data was used to establish a prospected population of the Sparks TMSA/FSA at roughly 167,000 inhabitants. Summary planning data is presented in Table 4.10, *Existing and Future Population by Priority Service Area*, including existing and future population, ERU's and employees by PSA. The City of Sparks is currently preparing a Master Plan to identify future land uses within the six Priority Service Areas.

TABLE 4.10 EXISTING AND FUTURE POPULATION BY PRIORITY SERVICE AREA

Priority Service Area	Total Area (Acres)	Existing Population (2005)	Future Population (2030)	Existing ERU's (2005)	Future ERU's (2030)	Existing Employees (2005)	Future Employees (2030)
1	23,579	81,000	128,478	32,315	51,389	49,422	80,404
2	12,388	940	16,287	376	6,515	4,096	36,196
3	3,736	3,788	3,865	1,515	1,546	1,365	2,522
4	5,628	914	2,488	366	995	17	0
5	10,665	352	413	141	165	3	35
6	25,484	1,489	15,510	596	6,204	0	125
Total	81,480	88,483	167,041	35,309	66,814	54,903	119,282

Source: City of Sparks and Stantec Consulting, Inc.
Notes: [1] *(ERU's) Equivalent Residential Units.*

When existing ground slope exceeds 30 percent, the land is assumed to be too expensive to develop. For each PSA the amount of developable land was determined and the ERU count was distributed equally though the developable land area taking into consideration land occupied by commercial and industrial uses. The resultant densities are presented in Table 4.11, *Priority Service Area Information*. A density of 30 employees per acre was assumed for planning purposes. The formula used to determine densities is as follows:

Density (ERU/Acre) = Future ERU/Developable Area – (Future Employees/30 Employees per Acre)

It should be noted that for PSA 2 a value of 70 employees per acre was used in the formula presented above.

TABLE 4.11 PRIORITY SERVICE AREA INFORMATION

Priority Service Area	ERU Density (ERU/acre)
1	2.9
2	4.0
3	3.0
4	0.6
5	1.8
6	3.9

Wastewater volumes were developed using the design criteria as discussed in Subsection 4.3.2, *Design Criteria.* Conceptual level planning was performed to size and locate wastewater facilities appropriate for each PSA. Wastewater facilities for PSA 1 and 3 were taken largely from existing master and facility plans and an analysis should be conducted to assess the impact on existing and previously planned wastewater facility improvements of the year 2030 population of PSA 1. It is important to note that the planned wastewater facilities assume that an adequate water supply is available in the future.

For PSAs 2 and 6 new wastewater facilities are planned for the year 2030 buildout. Wastewater facilities were sited based upon the following considerations:

- Proximity to existing WRF's;
- Valley and basin topography; and
- Sewershed topography.

Possible points of connection to the developed area of PSA 1 were developed for flow from PSA 3 and for flow from a portion of PSAs 2, 4 and 6. All of PSA 3 wastewater flows are planned to be treated at TMWRF as well as portions of PSAs 2, 4 and 6 and south. The sum total of additional flows to be treated at TMWRF, resulting from the year 2030 buildout of these Priority Service Areas is 7.8 MGD.

Pipeline facilities were aligned generally along proposed roadways to collect from individual sewersheds for conveyance to the existing TMWRF facility and the new water reclamation facilities discussed in this facility plan. Pipelines were sized based on peak hour flow rates throughout the PSAs. Wherever possible gravity pipelines are utilized. Wastewater lift stations was sited at the lower end of the sewersheds, to clear a topographical obstacle. In some instances planned wastewater facilities located in one PSA may also serve another PSA.

It is not yet possible to estimate future reclaimed water demand or application sites for PSAs 2 through 6 until land use planning and zoning is finalized. Therefore this facility plan identifies the amount of treated wastewater effluent available by PSA. In general, the source of supply of freshwater will have a bearing on the reclaimed water reuse. It is assumed that

if local groundwater is the source of freshwater supply, treated wastewater effluent will be reused in the summertime for irrigation and disposed of by groundwater recharge in the winter months. If the source of freshwater supply is imported water, 100% reuse of the treated wastewater effluent will be utilized to reduce the amount of imported water required.

4.3.1 Regulatory Review and Considerations

The Nevada Division of Environmental Protection ("NDEP") is the regulatory authority responsible for wastewater and reclaimed water. The NDEP issues discharge permits that regulate the quality of treated wastewater effluent and its reuse. Treated wastewater effluent quality is a function of the treatment provided. Various levels of wastewater treatment exist ranging from simple lagoon systems to complex mechanical treatment facilities utilizing numerous unit processes. Mechanical facilities commonly utilize an activated sludge process, as used at TMWRF. Contingent upon the disposal and reuse methods utilized tertiary treatment may be provided (as TMWRF does) to further treat the wastewater. This includes disinfection and filtering. Effluent disposal is accomplished either to groundwaters of the state through rapid infiltration basins or conjunctive use wells or to surface waters of the State of Nevada.

NDEP also regulates the disposal of solids resulting from wastewater treatment. The residual solids are known as biosoilds. Biosolids are classified as Class A and Class B. Class A biosolids contain no detectable levels of pathogens. Class A biosolids that meet strict requirements for vector attraction and metals contents only require a permit for land application. Class B biosolids are treated but still contain detectable levels of pathogens; these biosolids are subject to buffer requirements, public access and crop harvesting restrictions. NDEP also regulates wastewater collection systems. Their primary responsibility is to assure that sanitary sewer overflows are avoided.

Wastewater regulations are subject to change as technological advances are made and as environmental conditions dictate. Of particular concern regarding future regulatory changes are emerging contaminates including endocrine disrupters. An endocrine is a chemical or natural breakdown product that mimics hormones in the body and can have an adverse effect on wildlife or humans. Many pharmaceuticals and personal care products are potential endocrine disruptors. Lastly NDEP regulates design criteria for wastewater facilities as discussed in the following subsections.

The Truckee River Operating Agreement ("TROA") was last negotiated in February, 2007 to achieve greater flexibility in the operation of Truckee River reservoirs, thereby achieving greater water use efficiency in the Truckee River Basin. The

following TROA elements are relevant to wastewater and reclaimed water planning for Sparks.

- Reno, Sparks and Washoe County agree to provide 6,700 acre feet of water rights for water quality purposes (TROA 1.E.4).
- Excess surface water rights in the amount of 0.11 acre-feet are required for each acre foot of new water service commitment, commencing October 21, 2004 until the Truckee Meadows Water Authority (TMWA) normal demand equals 119,000 acre-feet per year (TROA 4.B.2).
- TMWA may deliver up to 3,000 acre-feet per year of Truckee River water outside the Truckee River Basin without obtaining water rights for return flows to the Truckee River. Except for the 3,000 acre-feet referenced above, when an Orr Ditch Decree water right is used to provide water to its service areas outside the basin, TMWA must utilize additional water rights to provide water in the Truckee River in the amount and location equivalent to the water reclamation facility (WRF) return flows which would have returned to the river if the water rights usage outside the basin had been within an area served by a WRF discharging effluent to the river (TROA 4.G).

4.3.2 Design Criteria

In planning wastewater facilities a key element is establishing design criteria. Design criteria is obtained from both state regulations and criteria established by the agency responsible for the wastewater system operation. The wastewater design criteria used for this facility plan is presented in Table 4.12, *Wastewater Facility Design Criteria.*

TABLE 4.12 WASTEWATER FACILITY DESIGN CRITERIA

Item	Relative Number
Residents per ERU (count)	2.5
Daily Flow Per ERU (GPD[1]/ERU)	270
Daily Flow per Employee (GPD/employee)	40
Peak Hour Factor	2.5
Water Reclamation Facility Sizing Factor	1.5
Maximum Depth of Flow in Existing Pipelines (% full)	75
Maximum Depth of Flow in New Pipelines (% full)	50
Minimum Flow Velocity (fps[2])	2

Notes: [1] *(GPD) Gallons Per Day.*
[2] *(fps) Feet Per Second.*

Daily Flow per ERU: The value of 270 GDP/ERU is based upon the Washoe County 208 Plan.

Daily Flow per Employee: A typical design criteria of 40 GDP/employee is used to account for variable wastewater generation volumes based on the type of workplace (i.e., commercial and industrial).

4.3.3 Potential Septic System Conversions

Currently in the City of Sparks TMSA/FSA there are 478 individually owned sewage disposal systems which utilize septic tank with a leaching field for disposal to groundwater. While there are relatively few private septic systems, the facility plan assumes all of these would be converted to a community wastewater system as time passes. The TAZ data ERU count accounts for the conversion of existing septic systems. Table 4.13, *Potential Septic System Conversions by Priority Service Area,* presents existing septic system information by PSA and the resultant potentially added wastewater flow rate resulting from conversion to community wastewater systems to the public sewer system. Each septic system is assumed to be equivalent to one ERU for the flow rate estimate of potential conversions.

TABLE 4.13 POTENTIAL SEPTIC SYSTEM CONVERSIONS BY PRIORITY SERVICE AREA

Priority Service Area	Number of Existing Septic Systems	Number of Potential Septic Conversions to Community Sewer	Flow Rate of Potential Conversions (MGD)[1]
1	282	282	0.076
2	32	32	0.009
3	142	142	0.038
4	0	0	0
5	22	0	0.006
6	0	0	0
Total	478	478	0.129

Notes: [1] (MGD) Millions of Gallons Per Day.

4.3.4 Treated Wastewater Effluent Quality Goals

Treated wastewater effluent quality goals are based upon the disposal method utilized. It has been conservatively assumed that a high quality effluent will be produced to provide flexibility in disposal. Tertiary treatment will be provided and the target concentrations of typical quality effluent parameters are as follows:

- Fecal Coliform – 200 MPN/100mL
- BOD_5, uninhibited –20 mg/L
- TSS – 20 mg/L
- Total Nitrogen – 1.36 mg/L (estimated from the TMWRF Waste Discharge Requirements for major constituents)

Additionally, there are Total Maximum Daily Load ("TMDL") considerations if treated wastewater effluent is discharged to the Truckee River.

4.3.5 Year 2030 Wastewater Flow Rates and Volumes

The design criteria used to estimate the year 2030 wastewater flow rates is presented in section 4.3.2. It is assumed that adequate freshwater supply is available throughout the planning period used in this report. Table 4.14, *Year 2030 Wastewater Flow Volumes by Priority Service Area*, presents the year 2030 wastewater flow rates by PSA.

TABLE 4.14 YEAR 2030 WASTEWATER FLOW VOLUMES BY PRIORITY SERVICE AREA

Priority Service Area	Annual Average Daily Flow (MG)[1]		Maximum Month Daily Flow (MG)[1]	
	Existing	Year 2030	Existing	Year 2030
1	10.70	17.09	26.75	42.73
2	0.27	3.21	0.68	8.03
3	0.46	0.52	1.15	1.30
4	0.10	0.27	0.25	0.68
5	0.04	0.05	0.1	0.13
6	0.16	1.68	0.4	4.20
Total	11.73	22.82	29.33	57.07

Notes: [1] (MG) Millions of Gallons.

4.3.6 Proposed Year 2030 Wastewater Facilities

Figures 4.1 through 4.16 (Volume 2 of 2) list the conceptual wastewater treatment facilities needed for the City of Sparks TMSA/FSA. The following subsections provide information for the planned wastewater facilities. Proposed future reclaimed water facilities are presented in Section 4.3.8.

- Treatment Facilities

  The year 2030 wastewater treatment facilities proposed are included in Figures 4.1 through 4.16 (Volume 2 of 2). There are two new treatment facilities proposed with rated capacities of 2.1 (PSA 6) and 4.8 (PSA 2) MGD serving 5,104 and 11,827 equivalent ERU's respectively. TMWRF will also be required to treat an additional 7.9 MGD to meet wastewater treatment needs. The treatment facilities are summarized in Table 4.15 – *Year 2030 Treatment Facility Summary Information* in the year 2030.

  The rated capacity of the needed treatment facilities located in the developed Priority Service Areas is based upon a 1.5 sizing factor to average day flow. This factor is used to account for the uncertainty of growth and potential changes in the population to be served from that planned.

  Each of the new facilities are planned to provide tertiary treatment. Treated wastewater effluent disposal will include both discharge to groundwater using

rapid infiltration basins or recharge wells as well as effluent storage basins and storage tanks.

It is assumed that biosolids will be processed at each treatment facility with disposal as land applied fertilizer or be landfill disposed.

It is estimated that PSA 5 will have a 2030 population of 413 people along with 35 employees. This population base is not large enough to economically support a wastewater treatment facility. Until the population increases to about 12,000 which will provide an average day wastewater flow of 2 MGD, a local treatment facility is not advisable. In the interim it is recommended that individual septic tanks with leach fields be utilized in accordance with Washoe County District Board of Health regulations. Installation of dry sewers is also recommended as a requirement for development in PSA 5 to support conversion to a community wastewater collection system in the future.

Additionally, more detailed facility planning will be required prior to the design and construction of any of the proposed wastewater treatment facilities listed in this report.

TABLE 4.15 YEAR 2030 TREATMENT FACILITY SUMMARY INFORMATION

Facility	Locations Serviced (Priority Service Area)	Treatment Capacity (MGD)[1]	Annual Effluent Reused (AFY)[2]	Annual Effluent Disposed to Groundwater (AFY)[2]
P2 – WRF	2	4.8	2,130	1,460
P6 – WRF	6	2.1	900	675

Notes: [1] (MGD) Millions of Gallons Per Day.
[2] (AFY) Acre Feet Per Year.

- Wastewater Collection System Facilities

  The conceptual wastewater collection facilities required to meet the year 2030, the City of Sparks needs are presented in figures 4.1 through 4.16 (Volume 2 of 2). The collection facilities include pipelines and lift stations. The following two subsections provide additional information for collection system pipelines and pump stations respectively.

- Wastewater Collection System Pipelines

  The wastewater collection system pipelines for the proposed City of Sparks TMSA/FSA buildout include collection mains, both gravity mains and force mains, and interceptor pipelines that intercept gravity pipelines. Gravity conveyance is used wherever possible in the proposed collection system. The collection system pipelines were sized based on peak hour flow rate design criteria as discussed in Section 4.3.2, *Design Criteria*.

The six PSAs have significant elevation variation within each PSA. The maximum elevation difference is in PSA Six and varies from 4,360 to 7,400 feet above sea level.

For PSA 1 existing infrastructure will require capacity increase to convey an additional 7.8 million gallons per day of wastewater to TMWRF. Table 4.16, *Year 2030 Wastewater Pipeline Summary Information*, provides summary information for proposed interceptors of the various PSAs. The sewershed which contains each wastewater pipeline is listed in the second column, City of Sparks ("COS"), Truckee Canyon ("TC"), and Dry Lakes ("DL").

Wastewater pipelines are designated by PSA type (main versus trunkline), and number, with lower numbers generally closer to their respective water reclamation facilities. For example, the pipeline with designation P2-T1C is a portion of the trunkline collecting flows from PSA 2, and is the third segment from the proposed water reclamation facility for that area.

TABLE 4.16 YEAR 2030 WASTEWATER PIPELINE SUMMARY INFORMATION

Reach #	Sewershed	Length (ft)	Diameter (in)	Slope (ft/ft)	Q Total (MGD)[1]	Capacity 0.5 d/D[2] (MGD)[1]
P1-M1	CS	2,000	8	0.005	0.03	0.26
P1-M2	CS	1,000	8	0.010	0.25	0.36
P1-T1	CS	6,500	10	0.015	0.61	0.81
P2-M1	CS	5,500	8	0.150	0.03	1.39
P2-M2	TC	1,500	8	0.005	0.20	0.25
P2-M3	TC	8,000	8	0.005	0.03	0.25
P2-T1A	TC	6,200	24	0.005	3.80	4.80
P2-T1B	TC	6,200	21	0.006	2.90	3.68
P2-T1C	TC	3,500	18	0.005	1.68	2.23
P2-T1D	TC	20,000	15	0.005	1.30	1.37
P2-T1E	TC	5,000	10	0.005	0.35	0.47
P2-T2	TC	5,500	18	0.030	4.20	5.46
P3-M1	CS	7,000	8	0.044	0.25	0.75
P3-M2	CS	6,500	8	0.038	0.20	0.70
P4-T1	CS	16,000	10	0.030	0.71	1.14
P6-M1	CS	13,500	8	0.05	0.55	0.81
P6-M2	CS	4,500	8	0.013	0.20	0.41
P6-T1	DL	7,000	12	0.020	1.38	1.51
P6-T2	DL	4,000	10	0.013	0.69	0.75
P6-T3	DL	7,000	12	0.005	0.69	0.76
P6-T4	DL	5,500	10	0.015	0.69	0.81

Notes: [1] (MGD) Millions of Gallons Per Day.
[2] (d/D) Depth of Flow / Diameter

- Wastewater Collection System Lift Stations and Force Mains

  A total of three new wastewater lift stations will be required to support year 2030 population of the Sparks TMSA/FSA, one is located in PSA 2 and two are located in PSA 6. One lift station located in PSA 6 is needed to pump raw sewage to a treatment facility. Two of the three lift stations, located in PSA 2 and 6 are needed to dispose of treated wastewater and are utilized for wastewater reuse or recharge. The proposed lift station facility needed for pumping wastewater is summarized in Table 4.17, *Year 2030 Wastewater Lift Station Summary*. The remaining two lift stations needed for reuse distribution of treated effluent are summarized in Table 4.20, *Year 2030 Reclaimed Water Lift Station Facilities*. The total length of force main required to pump raw sewage is approximately 5,500 feet a 6-inch diameter pipe. The planned lift station will include auxiliary power supply in the event of power failure and a minimum of 24 hours of emergency storage capacity. The required horsepower for the proposed lift station is 50 horsepower.

  The existing lift stations within PSA 1 may require rehabilitation and/or upsizing. Detailed evaluation of the existing lift stations is beyond the scope of this conceptual facility master plan. As growth occurs in PSA 1 existing lift station rehabilitation and upsizing evaluation can be conducted on a case by case basis.

  The City of Sparks is standardizing on above ground lift stations utilizing self-priming centrifugal pumps and this conceptual facility master plan assumes this configuration of lift station.

TABLE 4.17 YEAR 2030 WASTEWATER LIFT STATION SUMMARY

Name	Priority Service Area	Flow Quantity GPM[1]	Flow Quantity MGD[2]	Horsepower	Force Main Diameter (inches)	Approximate Force Main Length (feet)
P6 - LS	6	382	50	50	6	5,500

Notes: [1] (GPM) Gallons Per Minute.
[2] (MGD) Millions of Gallons Per Minute.

4.3.7 Wastewater Facility Costs

A summary of the estimated cost of the wastewater treatment facilities required to meet the needs of the City of Sparks TMSA/FSA year 2030 population is presented in Table 4.18, *Year 2030 Wastewater Treatment Facility Cost Summary*. Table 4.19, *Year 2030 Wastewater Facility Cost by Priority Service Area*, provides the wastewater facility cost by PSA and includes the cost of the treatment facility, the collection trunk pipelines, and any needed lift stations. The estimated costs shown

are based on the year 2008 dollars in this conceptual facility master plan. Where a treatment facility services multiple PSAs the cost has been allocated based upon the number of ERUs served within the PSA. Costs shown reflect inclusion of the skeletal trunkline collector system and the wastewater treatment facility. It is expected the subdivision builders will assume the cost for sewer collection infrastructure within their subdivision areas.

TABLE 4.18 YEAR 2030 WASTEWATER TREATMENT FACILITY COST SUMMARY

Name	Type (New, Rehab, Upsize)	Location (Priority Service Area)	Estimated Cost (Millions $)
P2-WRF	New	2	6
P6-WRF	New	6	3
TMWRF	Upsize	1	78

TABLE 4.19 YEAR 2030 WASTEWATER FACILITY COST BY PRIORITY SERVICE AREA

Priority Service Area	Estimated Treatment Facility Cost (Millios $)	Estimated Pipeline Facility Cost (Millions $)	Estimated Lift Station Facility Cost (Millions $)	Estimated Total Cost (Millions $)
1	68.0	1.8	0	69.8
2	48.0	18.3	0	66.3
3	4.0	2.2	0	6.2
4	3.0	3.2	0	6.2
5	0	0	0	0
6	24.0	9.0	0.2	33.2
Total	147.0	34.5	0.2	181.7

4.3.8 Year 2030 Reclaimed Water Facilities

Year 2030 reclaimed water facilities developed as part of this conceptual facility master plan for the City of Sparks include source of supply lift stations and transmission pipelines to storage tanks and recharge areas. A distribution system for the reclaimed water by PSA has not been established because at the time of this writing land use planning and zoning has not been completed for PSAs 2 though 6. The following subsections provide additional information regarding the year 2030 reclaimed water facilities.

Because of the unknown demand for reclaimed water on the freshwater source a strategy has been developed for each treatment facility to discharge treated effluent either to rapid infiltration for disposal to groundwater or to a storage tank for reuse in irrigation. Effluent storage tanks distributed throughout buildable land areas have not been developed as part of this conceptual facility master plan. Contingent upon future reclaimed water demand and freshwater source of supply, effluent storage reservoirs or storage lagoons may be required to store treated wastewater effluent through the winter until demand begins with the next irrigation season.

Storage facilities for reclaimed water reuse should be placed in the vicinity of the proposed water reclamation facilities. A lift station will pump the treated effluent to either reuse distribution or to ground water recharge. The reclaimed water tanks are sized by assuming a sufficient volume of storage adequate to provide two days flow to effluent reuse areas during emergency periods when the lift station may not be operational. Detailed facility planning will be required to site the treated effluent storage tanks.

The existing reclaimed water distribution system operated by the City of Sparks is supplied by TMWRF and was recently expanded to provide up to 27.4 MGD of reclaimed water. The major portion of this reclaimed water is used in the City of Sparks with some being used at the University Farms. The current capacity is adequate to meet demands in the City of Sparks and the Spanish Springs Valley for the foreseeable future. The only expected changes to the existing City of Sparks reclaimed water system is the addition of users to the existing system.

- Available Reclaimed Water Volume

  The two new water reclamation facilities needed by the year 2030 will produce an effluent of suitable quality for reuse irrigation by providing tertiary treatment. The annual volume of reclaimed water available from each of the new water reclamation facility by the year 2030 is assumed to equal the total volume of wastewater entering each wastewater reclamation facility as summarized below:

  - P2-WRF – 3,600 AFY
  - P6-WRF – 1,600 AFY

  If the primary source of freshwater needed at buildout of the Sparks TMSA/FSA is by importation all available reclaimed water will be utilized in order to minimize the amount of water needed for import. Storage of the reclaimed water will be needed during the winter months for reuse application during the following irrigation season. The storage volume required by the year 2030 will be about 40 percent of the total yearly volume of available reclaimed water as summarized below:

  - P2-WRF – 1,500 AFY
  - P6-WRF – 700 AFY

  If the primary source of freshwater is local groundwater the amount of treated effluent needed for reuse application will be about 60 percent of the total yearly volume of available reclaimed water summarized with the remaining 40 percent discharge to groundwater as follows:

- P2-WRF – 2,100 AFY
- P6-WRF – 900 AFY

Under this scenario the amount of water to be recharged during the winter months equals the amount of winter months storage needed for reuse application of reclaimed water as listed above.

As developed in this conceptual facility master plan by the year 2030 there will be an additional 7.8 MGD effluent flowing to the TMWRF, a portion of which will be available for reuse.

- Reclaimed Water Distribution and Storage Facilities

  Refer to Figures 4.1 through 4.16 (Volume 2 of 2) for proposed locations of future reclaimed water facilities. Table 4.20, *Year 2030 Reclaimed Water Lift Station Facilities*, presents summary information for the reclaimed water supply lift stations and Table 4.21, *Year 2030 Reclaimed Water Pipeline Facilities*, provides summary information regarding reclaimed water distribution pipelines. Table 4.22, *Year 2030 Reclaimed Water Storage Facilities*, presents information regarding future reclaimed water storage tanks.

TABLE 4.20 YEAR 2030 RECLAIMED WATER LIFT STATION FACILITIES

Name	Location (Priority Service Area)	Horsepower Required	Capacity (MGD)[1]
P2-LS	2	75	4.8
P6-LS	6	50	2.1

Notes: [1] (MGD) Millions of Gallons Per Day.

TABLE 4.21 YEAR 2030 RECLAIMED WATER PIPELINE FACILITIES

Type	Size (Inches)	Length (Feet)
Gravity	12	3,100
	21	1,000
Force Main	4	40,300
	6	1,500
	80	500
	12	1,000

TABLE 4.22 YEAR 2030 RECLAIMED WATER STORAGE FACILITIES

Location (Priority Service Area)	Capacity (MG)[1]
2	3.0
6	1.5

Notes: [1] (MG) Millions of Gallons.

4.3.9 Reclaimed Water Facility Cost

A summary of the estimated cost of the future reclaimed water facilities is presented in Table 4.23, *Year 2030 Reclaimed Water Facility Cost Summary*, and Table 4.24, *Reclaimed Water Facility Cost Summary by Priority Service Area*, distributes these costs by PSA. Assumptions used for all estimated costs listed in preparation of this City of Sparks TMSA/FSA Conceptual Facility Master Plan follow: (1) cost estimates shown are conceptual and are intended to show magnitude of cost only; (2) costs are shown based upon the year 2008 dollars; and (3) estimated costs of proposed piping are included only for the utility pipe trunk main backbone or skeletal system for the injection or reuse facility shown.

Costs not included in the cost estimates shown in this report are: (1) right-of-way, easements or acquisitions; (2) water right acquisition; (3) regulatory or environmental permitting; (4) legal; (5) electric power supply; (6) operation and maintenance; (7) capital equipment replacement; and (8) geotechnical, surveying, engineering and construction quality control.

A more complete cost analysis should be prepared as a next step which further refine a more detailed and alternative plans and routes and identifies areas of environment impact. Such analysis is beyond the present scope of work of this Conceptual Facility Master Plan.

TABLE 4.23 YEAR 2030 RECLAIMED WATER FACILITY COST SUMMARY

Facility	Type (New, Rehab, Upsize)	Location (Priority Service Area)	Estimated Cost (Millions $)
P2-Lift Station	New	2	0.5
P6-Lift Station	New	6	0.3
Subtotal			$0.8
P2-Transmission Pipeline	New	2	3.5
P6-Transmission Pipeline	New	6	1.2
Subtotal			$4.7
P2-Storage Tank	New	2	4.5
P6-Storage Tank	New	6	2.5
Subtotal			$7.0
P2-Recharge Basin	New	2	1.2
P6-Recharge Basin	New	6	0.7
Subtotal			$1.9
Total			$14.4

TABLE 4.24 RECLAIMED WATER FACILITY COST SUMMARY BY PRIORITY SERVICE AREA

Priority Service Area	Lift Station Facilities Cost (Millions $)	Pipeline Facilities Cost (Millions $)	Storage Facilities Cost (Millions $)	Recharge Basin Cost (Millions $)	Total (Millions $)
1	0	0	0	0	0
2	0.5	3.5	4.5	1.2	9.7
3	0	0	0	0	0
4	0	0	0	0	0
6	0.3	1.2	2.5	0.7	4.7
Total	0.8	4.7	7.0	1.9	14.4

4.4 SUMMARY

Existing wastewater and reclaimed water facilities are presented in this conceptual facility master plan for the year 2030 population of the City of Sparks TMSA/FSA. The estimated cost of these facilities has also been developed. The following two subsections provide summary information for the proposed wastewater and reclaimed water facilities and their estimated costs, respectively.

- Wastewater Facilities

  The existing wastewater facilities serving the City of Sparks TMSA/FSA generally includes the following: (1) the TMWRF with an existing rated treatment capacity of 46 MGD (this facility also serves the City of Reno and portions of unincorporated Washoe County); (2) 43 miles of pipeline for sewage collection up to 60-inches in diameter; (3) eight sanitary sewer lift stations with a total pumping capacity of 2.8 MGD; and (4) 478 private septic systems located within the City of Sparks TMSA/FSA.

  To support the projected year 2030 population of 167,040 persons, the following wastewater facilities will be required: (1) 2 new WRF's with a combined treatment capacity of 6.9 MGD; (2) expansion of the existing TMWRF to treat an additional 7.8MGD for the City of Sparks TMSA/FSA; (3) approximately 26.9 miles of sewage collection trunkline up to 24-inches in diameter; and (4) one sanitary sewer lift station with a pumping capacity of 0.83 MGD.

  The estimated cost for wastewater facilities required to support the year 2030 population of the Sparks TMSA/FSA total $181.7 million grouped by category as follows: (1) treatment facilities: $147 million; (2) pipeline facilities: $34.5 million; and (3) lift station facilities $0.2 million. This does not include any cost to upgrade the existing City of Sparks collection system.

- Reclaimed Water Facilities

  The existing reclaimed facilities serving the City of Sparks TMSA/FSA include the following: (1) a reclaimed water supply pump station at the TMWRF with a rated capacity of 20,000 GPM (28.8 MGD). This facility also supplies reclaimed water

to areas within the city of Reno TMSA; (2) approximately 23 miles of pipeline for reclaimed water distribution trunkline up to 30-inches in diameter; (3) one reclaimed water booster pump station; and (4) one reclaimed water storage tank with a capacity of 3.25 million gallons.

To support the year 2030 population of the Sparks TMSA/FSA the following reclaimed water facilities will be required. (1) approximately 9 miles of pipeline for reclaimed water distribution trunkline piping up to 21 inches in diameter: (2) two reclaimed water lift stations with a combined capacity of 6.9 GPM; and (3) two reclaimed water storage tanks with a combined capacity of 4.5 million gallons.

The estimated cost for reclaimed water facilities required to support the year 2030 population of the Sparks TMSA/FSA totals $14.4 million grouped by category as follows: (1) lift station facilities: $0.8 million; (2) pipeline facilities: $4.7 million; (3) reclaimed water storage facilities: $7 million; and (4) recharge basins: $1.9 million.

SECTION FIVE

Flood Control

5.1 INTRODUCTION

This section has been prepared in part to satisfy the Regional Water Planning Commission's 2004 – 2025 Washoe County Regional Water Management Plan Policy 3.1.a, which recommends the development of a Regional Floodplain Management Plan and a Regional Flood Control Master Plan. It also identifies the flood control facilities required to support build out growth in the City of Sparks TMSA and FSA areas, estimates the cost of those facilities in 2007 dollars by Priority Service Areas and recommends future development design criteria to supplement existing criteria.

5.2 DATA COLLECTION, BASE MAPPING AND GIS DATABASE DEVELOPMENT

Existing drainage master plans and reports were collected from the City of Sparks as well as other various sources to identify existing and proposed flood control structures and capital improvement program facilities within the City of Sparks. The previously identified existing and proposed facilities were incorporated into a comprehensive drainage GIS database for the Conceptual Facility Master Plan. The GIS database, created by Stantec, included the following:

- Washoe County 2-foot contour interval topography.
- USGS 10-meter Digital Elevation Model (DEM) coverage.
- USGS 7.5-minute Quadrangle Maps
- 2006 National Agricultural Imagery Program Aerial
- Federal Emergency Management Agency (FEMA) Digital Flood Insurance Rate Map (D-Firm) coverage.
- Previously prepared watershed basin delineations (scanned or digital).
- Previously identified flood control improvements (scanned or digital).

The GIS database contains existing and proposed facility descriptions, locations, sizes and a photo of the facility, if existing.

5.3 EXISTING DRAINAGE FACILITY MASTER PLANS, REPORTS AND STUDIES

The following previously prepared drainage facility master plans, reports and studies were referenced for watershed delineations, existing and proposed flood control improvements and capital improvement program facilities. A brief description of each report follows. Section 5.11 References provides a full list of data used in the preparation of this report.

- *2004 – 2025 Washoe County Comprehensive Regional Water Management Plan (RWMP)*, Regional Water Planning Commission, WRC, January 2005.
  - Proposed Policy Strategies applicable to this report are:
    1. An analysis is performed to identify flood and erosion hazard areas and potential mitigation measures.
    2. Natural recharge areas are identified and protected.
    3. Flood control projects developed by local governments will be reviewed by the RWPC to ensure coordination of local projects with regional water management objectives, including but not limited to, regionally coordinated flood damage reduction, preservation or enhancement of recharge, preservation of natural drainage ways, preservation of riparian habitat, protection or enhancement of surface and groundwater quality.
  - The goals and policies of the RWMP applicable to this report are:
    1. Policy 1.3.b – Protection and Enhancement of Groundwater Recharge.
    2. Policy 3.1.a – Regional Floodplain Management and Regional Flood Control Master Plan.
    3. Policy 3.1.b – Floodplain Storage within the Truckee River Watershed.
    4. Policy 3.1.c – Floodplain Storage outside the Truckee River Watershed.
    5. Policy 3.1.d – Truckee River Restoration.
    6. Policy 3.1.e – Watershed Protection.
    7. Policy 3.1.g – Management Strategies for Slopes Greater than 15 Percent.
    8. Policy 3.1.i – Floodplain Management / Flood Control Projects Subject to RWPC Review.
    9. Policy 4.1.a – Facility Plans and Infrastructure Studies – Conformance with Regional Water Plan.
    10. Policy 4.1.b – Timing and Sizing of Facilities.
    11. Policy 4.1.c – RWPC Programs and Policies to Reinforce Goals of Regional Plan.
    12. Policy 4.1.d – Inclusion of Non-Economic Criteria in Evaluation of Alternatives.

13. Policy 4.1.e – Economic Decision Making Criteria.
14. Policy 4.1.f – Facilities Excluded from Conformance Review.
15. Policy 4.1.g – Examination of Long Term Impact on Availability of Water Resources.
16. Policy 4.2.a – Involvement of RWPC in Water Related Issues.

- *Washoe County Regional Flood Control Master Plan Framework (WCRFCMP),* WRC Engineering, Inc., July 2005.
  - The WCRFCMP is an update to the Conceptual Washoe County Flood Control Master Plan prepared by KJC in 1991.
  - The purpose of the update was to evaluate the existing and projected drainage and flooding conditions and to recommend regional drainage facilities that reduce future flood damages within the region.
- *City of Sparks Drainage Master Plan (SDMP),* Washoe County, Nevada, Parsons, May 2002.
  - The SDMP evaluated existing drainage facilities and recommended proposed 5-year and 100-year drainage facilities for areas within the City of Sparks, bound generally by the Sun Valley and Spanish Springs drainage divide to the north, the Truckee River to the south, the corporate boundary to the west and Vista Boulevard to the east.
  - The previously prepared D'Andrea, Desert Highlands and Sun Valley study models were included in the citywide model. The Spanish Springs model was used for the North Truckee Drain analysis, but not included in the model and the Vista hydrologic basin area was separately modeled, but not included in the citywide model.
  - The study found that existing drainage facilities adequately convey the 5-year event in approximately 80% of the city and identified locations where existing drainage facilities do not adequately convey the 5-year and or 100-year event.
- *Drainage Master Plan for Sun Valley,* Washoe County, Nevada, SEA Incorporated, April 1997.
  - This report, prepared for Washoe County, developed a valley wide hydrologic analysis for the 10-year and 100-year peak events as well as developed a conceptual storm drain master plan for the 10-year event.
  - The Sun Valley Detention Basin was designed by Kennedy Jenks in 1995.
  - The entirety of Sun Valley drains to the Wildcreek Detention Dam, designed by SEA, Incorporated in 1997. The dam was sized to reduce the 100-year, 6-hour outflow to approximately 213cfs.
  - The Stone Creek Detention Basin diverts 120 cfs of 210 cfs (100-year, 24-hour event) to the Spanish Springs Watershed and 21 cfs to the Stone Creek Detention

basin D1. The remaining outflows are conveyed in Klondike Drive and remain in the Sun Valley Drainage Basin.

Watershed delineations from previous reports, including Spanish Springs, the City of Sparks, Sun Valley, D'Andrea, Desert Highlands, Miramonte, the Vista's and portions of the Truckee Canyon were compiled in GIS. Areas along the watershed divides required some modification to provide seamless mapping and therefore areas shown on the figures may not depict exact areas shown in the respective hydrologic analyses. Watershed basin delineations are shown and their origin identified on Plate 5.1-Watershed Basins and Floodplains.

5.4 FUTURE TMSA/FSA DRAINAGE MASTER PLAN AREAS

Watersheds for areas outside of existing Master Plan Study areas were initially delineated in ArcMap using the 10-meter DEM, while final watersheds were delineated by hand using USGS 1:24,000 DRG's. The watersheds were subdivided to approximate 1-square mile areas, taking into account "developable areas". For a description of "developable areas", see Section 1.6 and Figure 1.5.

Stantec originally anticipated utilizing HEC-1/HEC-HMS to estimate peak flow rates for the proposed floodplain delineations within the future TMSA/FSA areas, but due to time constraints and consistency with the City of Reno and Washoe County TMSA/FSA Facility Plan, prepared by Eco:Logic and HDR, the USGS Regional Regression Equations were used. The results from Region 5 and 6 were compared with previously prepared HEC-1 models within the study area at four locations; one in the Truckee Canyon, one in Warm Springs, one in Sun Valley, and one in Spanish Springs. Most areas compared favorably to the Region 6 equations, with the exception of the Truckee Canyon, which compared slightly better with the Region 5 equations. The Spanish Springs area compared the least favorably but was within 15% of the HEC-1 modeling. For consistency, the Region 6 equations were used for all future TMSA/FSA watershed peak flow estimates. Plate 5.1 – Watershed Basins and Floodplains shows the existing and proposed watersheds and Table 5.1 Regional Regression Equation – HEC1 Peak Flow Rate Comparison details the estimates at the four locations.

TABLE 5.1 REGIONAL REGRESSION EQUATION – HEC-1 PEAK FLOW RATE COMPARISION

Location	Basin	Equivalent Basin	Basin Area (sq mi)	HEC-1 (100y)	Region 5 (100y)	Region 6 (100y)	Percent Difference
Sun Valley 6	SW11	SW11	0.65	265	281	373	
	SW121	SW12	0.60	363	275	376	
	SW122		0.35		179	284	
Total			1.60	628	581	607	0.03
Spanish Springs 6	10B1	10B1	1.32	261	588	638	
	10A	10A	2.11	221	728	687	
	9	9	1.67	183	661	666	
Total			5.10	665	1,549	1,157	-0.74
Warm Springs 6	WS1	CC1-CC18	14.53	1,175	2,133	1,165	0.01
Total	WS2	HC1-HC4, WC1-WC10	13.26	1,109	1,796	991	0.11
Truckee Canyon 6	M1	TC7A	0.12	113	283	408	
	M2		0.46	241			
	M3	TC8A, TC8B	0.16	176	743	911	
	M4		0.01	16			
	M5		1.77	595			
Total			2.52	1,141	1,340	1,309	-0.15

Utilizing the peak flow rates estimated with the Regional Regression Equations, floodplains were developed for the future TMSA/FSA areas using HEC-RAS. Cross sections were taken in ArcMap and imported into HEC-RAS models utilizing HEC-GeoRAS. Peak flow rates from the Regional Regression Equations were used to develop 100-year floodplains for "blueline" streams with 1-square mile or greater contributing watersheds within "developable areas". Manning's "n" values were assumed to be 0.045 for overbank areas and 0.035 for stream channels. The floodplains were then imported back into ArcMap for floodplain delineation mapping.

5.5 EXISTING AND PROPOSED FACILITIES AND CAPITAL IMPROVEMENT PROJECTS

Existing and proposed flood control facilities developed in the previously prepared flood control master plans and reports have been included in the mapping and cost estimates contained in this report. Existing facilities are shown on Figures 5.1 through 5.16 as yellow, while proposed facilities are show as magenta and facilities that are currently under construction are shown as green. Previously developed flood control facilities were not verified for existing capacity or updated for newly developable areas that drain to these flood control facilities. For new developable areas that naturally drain to existing flood control facilities, it was assumed that future development will be required to provide onsite

detention and verify compliance with the previously prepared flood control master plans for both peak flow rate and volume.

City of Sparks Approved Capital Improvement Program (CIP) For Fiscal Years 2007 – 2008 through 2011 – 2012 includes the following:

- CIP #8068 refers to the Reach 9 Construction, Engineering, Construction Administration and Right-of-way with $2,000,000 slated for fiscal year 2007-2008. Reach 9 will be several hundred feet wide and approximately 6000-feet long extending from Pyramid Highway to the Sparks Detention Dam. This CIP also includes $500,000 for the enlargement of the Sparks Detention Basin to be completed in fiscal year 2008-2009.
- CIP #8090 refers to the North Truckee Drain Realignment (Basin 10B) with $1,000,000 slated for fiscal year 2007-2008 and $10,000,000 slated for fiscal year 2008-2009. These fees include the design and construction of the North Truckee Drain (NTD) Realignment from I-80 to the Truckee River. This project is a Corps of Engineers Early Action Item and will use COE / Washoe County Flood Sales Tax Funding and Sparks will receive a $790,000 reimbursement from Washoe County.
- CIP #8094 refers to the Peoples Ditch Piping Phases II and III with $800,000 slated in fiscal year 2007-2008, $500,000 in fiscal year 2008-2009 and $500,000 in fiscal year 2009-2010 to include the piping of the Peoples Ditch along Stanford Way and adjacent side streets to provide adequate drainage.
- CIP #8095 refers to the Wild Creek Golf Course Detention Dam with $105,000 slated for fiscal year 2007-20008 and $1,000,000 for fiscal year 2010-2011. This project includes the design and construction of the Wild Creek Golf Course Detention Dam to reduce peak flow rates from Sun Valley. Storm drain planning is also included with $100,000 slated for both fiscal year 2010-2011 and 2011-2012.
- CIP #8115 refers to the Boneyard Flat Flood Control Improvements with $76,000 slated per fiscal year for 2007-2008, 2008-2009, 2009-2010, 2010-2011 and 2011-2012, for a total budget of $380,000. This project is a regional facility that will share costs with Washoe County.

5.5.1 Proposed Facilities and Capital Improvement Projects by Priority Service Area

The proposed improvements described above are all located in Priority Service Area 1. Table 5.2 identifies the proposed facilities and capital improvement projects previously identified. Total costs for previous facilities were converted to 2007 dollars at 3% inflation per year.

TABLE 5.2 TMSA PROPOSED FLOOD CONTROL FACILITIES

Grid Location	Area	Element	Location	Improvement Type	2007 (Thousand $)
D17	Spanish Springs	D2-6	SR 445 (Portion Reach 9)	Culvert	$386
D17		D2-7	SR 445 – Orr Ditch (Portion Reach 9)	Channel	$933
D16/D17		SP-1 (Pr)	Pyramid Highway (Reach 4 / Stonebrook)	Channel	$0
D17		SP-2	Reach 9	Channel	$0
D17		SP-3		Raise Detention Facility	
D17		SP-4		Detention Facility	
D17		SP-5		Detention Facility	$6,589
Subtotal					$7,908
D18	D'Andrea	D3-1	Detention Site	Detention Basin	$1,733
					$1,733
C18	Parsons	Basin 8A	Wild Creek	Embankment	$117
D18		Basin 8C6	McCarran Blvd.	Lowering McCarran	$284
D18		Basin 5	Baring and Sparks Blvd.	Storm Drain	$2,933
D18		North Truckee Dr.	Sparks Blvd.	Channel Widening	$7,954
Subtotal					$11,288
D17	COS CIP	8068	Reach 9 – Constr, Eng., Constr.Admin & R/W		$2,500
D18		8090	Basin 10B - N. Truckee Drain Realignment	Channel	$11,000
D18		8094	Storm Drain – Peoples Ditch - Phases II & III	Storm Drain	$1,800
C18		8095	Storm Drain - Wild Creek GC Detention Dam	Detention	$1,305
		8115	Boneyard Flat Flood Control Improvements		$380
Subtotal					$16,985
Total					$37,914

5.6 CONCURRENCE WITH THE CITY OF RENO AND WASHOE COUNTY TMSA/FSA FACILITY PLAN

The extents of each figure shown in this report is based upon a grid system that was originated in Eco:Logic/HDR's *City of Reno and Washoe County TMSA/FSA Facility Master Plan*. Both reports therefore have overlapping coverage of portions of the Truckee Meadows. Two figures in this report, Figure 5.2 – Existing and Proposed Flood Control Facilities (C17) and Figure 5.4 – Existing and Proposed Flood Control Facilities (D16) coincide with HDR's Sun Valley TMSA – Figure 14-C17 and Spanish Springs TMSA – Figure 14-D16, respectively. Discrepancies between the two exist that will be rectified through further coordination with HDR and Washoe County to establish the proposed improvements that are physically located within the County that drain to the City of Sparks and are show on the City of Sparks mapping. The proposed improvements located within Washoe do not affect the facilities or costs shown in this report.

5.7 PROPOSED FSA FACILITIES

Locations of proposed flood control improvements were identified based upon proposed major arterial roadway locations, developable areas, topography and upstream contributing watershed area. Proposed culverts were sized with Flowmaster for the estimated 100-year event as described in Section 5.4 above. Culvert sizes and lengths were based upon natural topography slope and roadway right-of-way with an assumed 20-foot fill. Table 5.3 – FSA Proposed Facilities identifies the proposed culverts as shown on Figures 5.1 through 5.16

TABLE 5.3 FSA PROPOSED FLOOD CONTROL FACILITIES

Crossing	Q(cfs) assumed	Length (ft)	Slope (ft/ft)	H (ft)	W (ft)	# Units	n	Q(cfs) design
TC19_1	323	218	0.04	4.0	4.0	1	0.013	367
TC18E_1	2,183	218	0.02	6.0	8.0	2	0.013	1,114
TC17V_1	7,386	218	0.02	6.0	10.0	5	0.013	1478
TC17V_2	621	218	0.03	4.0	8.0	1	0.013	769
TC17U_1	143	218	0.10	4.0	4.0	1	0.013	580
TC17U_2	1,116	218	0.04	4.0	6.0	2	0.013	621
TC17R_1	1,776	218	0.01	4.0	8.0	4	0.013	444
TC17K_1	345	218	0.03	4.0	6.0	1	0.013	538
TC17H_1	2,288	218	0.01	6.0	8.0	3	0.013	788
TC17I_1	408	218	0.02	4.0	6.0	1	0.013	439
TC17H_2	1,835	182	0.01	6.0	10.0	2	0.013	1,045
TC17G_1	805	182	0.04	4.0	8.0	1	0.013	888
TC17G_2	86	182	0.06	4.0	4.0	1	0.013	449
TC17D_1	1,030	182	0.01	6.0	10.0	1	0.013	1,045
DL3_1	1,252	182	0.01	6.0	12.0	1	0.013	1,309
DL3_2	717	182	0.02	4.0	10.0	1	0.013	822
DL2_1	717	182	0.03	4.0	8.0	1	0.013	769

TABLE 5.3 (CONT.) FSA PROPOSED FLOOD CONTROL FACILITIES

Crossing	Q(cfs) assumed	Length (ft)	Slope (ft/ft)	H (ft)	W (ft)	# Units	n	$Q(cfs)_{design}$
DL1_1	283	182	0.04	4.0	4.0	1	0.013	367
TC15C_1	626	218	0.03	4.0	8.0	1	0.013	769
TC15B_1	1,106	218	0.02	4.0	8.0	2	0.013	628
TC15B_2	1,106	218	0.03	4.0	12.0	1	0.013	1,248
TC13B_1	494	218	0.04	4.0	6.0	1	0.013	621
TC13A_1	262	218	0.04	4.0	4.0	1	0.013	367
TC12B_1	806	218	0.06	4.0	8.0	1	0.013	1,088
TC11D_1	1,934	218	0.02	4.0	12.0	2	0.013	1,019
TC10B_1	550	218	0.04	4.0	6.0	1	0.013	621

5.7.1 Proposed FSA Facilities by Priority Service Area and Conceptual Level Estimate of Drainage Facility Costs

Table 5.4 below are details of the proposed improvements by priority area and estimates a preliminary opinion of probable construction cost for those facilities.

TABLE 5.4 FSA FACILITIES AND ESTIMATED COST BY PRIORITY SERVICE AREA

PSA	Crossing	Fig #	Length (ft)	H (ft)	W (ft)	# Units	Unit Price (lf)	Struct $	Const $	Other Costs $	Total by PSA $
1	SS19B_1	D17	182	4	4	1	$420	$76	$99	$184	
											$184
2	TC10B_1	E18	218	4	6	1	$420	$92	$119	$220	
2	TC11D_1	E18	218	4	12	2	$630	$275	$357	$661	
2	TC12B_1	E18	218	4	8	1	$525	$114	$149	$275	
2	TC15B_1	E18	218	4	8	2	$525	$229	$298	$551	
2	TC15B_2	E18	218	4	12	1	$630	$137	$179	$330	
2	TC17V_1	F17	218	6	10	5	$735	$801	$1,041	$1,927	
2	TC17V_2	F17	218	4	8	1	$525	$114	$149	$275	
2	TC15C_1	F18	218	4	8	1	$525	$114	$149	$275	
2	TC18E_1	F18	218	6	8	2	$630	$275	$357	$661	
2	TC19_1	F18	218	4	4	1	$420	$92	$119	$220	
								$0			$5,395
4	DL1_1	E16	182	4	4	1	$420	$76	$99	$184	
								$0			$184
6	SS19A_1	D17	182	4	4	1	$180	$33	$43	$79	
6	SS19A_2	D17	182	4	4	1	$150	$27	$35	$66	
6	DL2_1	E17	182	4	8	1	$525	$96	$124	$230	
6	DL3_1	E17	182	6	12	1	$735	$134	$174	$322	
6	DL3_2	E17	182	4	10	1	$578	$105	$137	$253	
6	TC17D_1	E17	182	6	10	1	$735	$134	$174	$322	
6	TC17G_1	E17	182	4	8	1	$525	$96	$124	$230	
6	TC17H_1	E17	218	6	8	3	$630	$412	$536	$991	

TABLE 5.4 FSA FACILITIES AND ESTIMATED COST BY PRIORITY SERVICE AREA

PSA	Crossing	Fig #	Length (ft)	H (ft)	W (ft)	# Units	Unit Price (lf)	Struct $	Const $	Other Costs $	Total by PSA $
6	TC17H_2	E17	182	6	10	2	$735	$268	$348	$643	
6	TC17I_1	E17	218	4	6	1	$420	$92	$119	$220	
6	TC17K_1	E17	218	4	6	1	$420	$92	$119	$220	
6	TC13A_1	E18	218	4	4	1	$420	$92	$119	$220	
6	TC13B_1	E18	218	4	6	1	$420	$92	$119	$220	
6	TC17R_1	F17	218	4	8	4	$525	$458	$595	$1,101	
6	TC17U_1	F17	218	4	4	1	$420	$92	$119	$220	
6	TC17U_2	F17	218	4	6	2	$420	$183	$238	$440	
6	TC17G_2		182	4	4	1	$420	$76	$99	$184	
											$5,961

Notes: *Assumed at 30%
**Assumed at 85%
***All $ are in thousands

5.8 TMSA/FSA FUTURE DEVELOPMENT DESIGN CRITERIA

Future development shall comply with existing specific standards, ordinances and City of Sparks Design Manuals including the following:

- Proposed improvements shall comply with the City of Sparks Hydrologic Criteria and Drainage Design Manual (HC&DDM).
- Major Regional Flood Control Facilities shall comply with the City of Sparks HC&DDM, the Washoe County Comprehensive Regional Water Management Plan, including the Regional Floodplain Management Plan and the Regional Flood Control Master Plan as well as applicable Regional Drainage Master Plans.
- Policies to protect natural drainageways should include setbacks as follows:
  - All driveways, aisles, service areas, and parking areas shall be setback a minimum of 100 feet from the centerline of any natural drainageways ordinary high water mark or the 100-year floodplain, whichever is greater, and
  - Structures shall be setback a minimum of 300 feet from the centerline of the natural drainageway's ordinary high water mark. Pedestrian and vehicular bridges, and structures required for flood control shall be exempt.
  - New development shall include emergency access to natural drainageways for repair and rescue equipment.
  - Encroachments to natural drainageways

5.9 CONCLUSIONS

The City of Sparks TMSA/FSA Flood Control Facility Master Plan identified, mapped and updated costs for all proposed flood control improvements previously identified within the

City of Sparks TMSA area, delineated watersheds within the FSA areas and developed locations and costs for proposed flood control infrastructure within the City of Sparks FSA areas to support build out growth within these areas. Costs were then tallied by Priority Service Area. A GIS database was created to combine all existing and proposed flood control infrastructure and associated watershed basins within the City of Sparks TMSA and FSA areas.

REFERENCES

1. *2004 – 2025 Washoe County Comprehensive Regional Water Management Plan,* Regional Water Planning Commission, Washoe County Department of Water Resources, January 2005.
2. *City of Sparks Drainage Master Plan,* Parsons, May 2002.
3. *Draft Washoe County Regional Flood Control Master Plan Framework,* WRC, Inc., July 2005.
4. *Spanish Springs Valley Flood Control Master Plan,* Washoe County, Nevada, Harding ESE, January 2001.
5. *Drainage Master Plan for the Spanish Springs Valley,* Washoe County, Nevada, SEA, Inc., April 1996.
6. *Drainage Master Plan for Sun Valley,* Washoe County, Nevada, SEA, Inc., April 1997; Addendum. (0133-95-1)
7. *Preliminary Hydrologic and Hydraulic Analysis for Warm Springs Ranch, Washoe County, Nevada,* Stantech Consulting, Inc., October 1997.
8. *Truckee Canyon Properties, Ltd, Washoe County, Nevada,* Stantech Consulting, Inc., February 1998. (26000045 or 0184-04-4)
9. *Washoe County Flood Control Master Plan Concept Level Report – Volume 1,* Kennedy/Jenks/Chilton, January 1991.
10. *Hydrology Report for the North Spanish Springs Detention Facility,* Washoe County, Nevada, May 2006, Quad Knopf.
11. *Preliminary Hydrologic and Hydraulic Analysis for Hoss Equipment of Nevada,* Washoe County, Nevada, Stantech Consulting, May 1998.
12. *Drainage Report for the Rockland Development Group, LLC, Tracy-Clark Interchange,* Washoe County, Nevada, Stantec Consulting, Inc., July 2003.
13. *Flood Control Master Plan Perimeter Storm Drainage Update Sparks Marina Park,* Sparks, Nevada, Nimbus Engineers, February 24, 2004.
14. *D'Andrea Drainage Master Plan,* Manhard Consulting, August, 2006.
15. Pah Rah Park / Springland Drive Floodway Drainage Report, Stantec Consulting, Inc., December 2007.
16. *Stonebrook Conditional Letter of Map Revision Request,* Wood Rodgers, May 2006.
17. *Storm Drainage Master Plan The Foothills at Wingfield Springs,* Wood Rodgers, February 2004.

CITY OF SPARKS TMSA/FSA
CONCEPTUAL FACILITY MASTER PLAN

Plate: 1.0

Facility Plan Priority Service Area and TAZ Boundaries

Legend

- Priority Service Area Boundary & Number
- TAZ Boundary with Population Projection
- Developable Areas (<30% Slope) - Buildout
- Developable Areas (<30% Slope) - 2030
- Truckee River

Street Centerlines

- Freeway
- Highway
- Major Arterial
- Publicly Owned Parcels

0 1,500 3,000 6,000 9,000 Feet

1:36,000

Stantec Consulting
6980 Sierra Center Parkway
Suite 100
Reno, NV 89511

Tel: (775) 850-0777
Fax: (775) 850-0787
stantec.com

Date: January 11, 2008

CITY OF SPARKS TMSA/FSA
CONCEPTUAL FACILITY MASTER PLAN

Plate: 2.0

Future Roadway Network and Service Corridors - 2030

Legend

- Priority Service Area Boundary
- Developable Areas (<30% Slope)
- Interchanges
- Arterial Road
- Collector/Local Road

0 1,500 3,000 6,000 9,000 12,000 Feet

1:36,000

Stantec Consulting
6980 Sierra Center Parkway
Suite 100
Reno, NV 89511

Tel: (775) 850-0777
Fax: (775) 850-0787
stantec.com

Date: January 9, 2008

CITY OF SPARKS TMSA/FSA
CONCEPTUAL FACILITY MASTER PLAN

Plate: 3.0

Existing and Proposed Water Facilities - 2030

Legend

- Study Area Boundary
- Proposed Tank Locations
- Proposed Pump Stations

Proposed Water Mains

- 12"
- 16"
- Pressure Zone Boundaries & Elevation
- Existing Private Wells
- TMWA Pump Stations
- TMWA Tank Locations
- TMWA 8" Mains or greater
- TMWA Wells
- WCDWR Well Locations
- WCDWR 8" Mains or greater
- Priority Service Area Boundary & Number
- Arterial Road
- Collector/Local Road
- Truckee River
- Developable Areas (<30% Slope) - Buildout
- Developable Areas (<30% Slope) - 2030

0 1,500 3,000 6,000 9,000 Feet

1:36,000

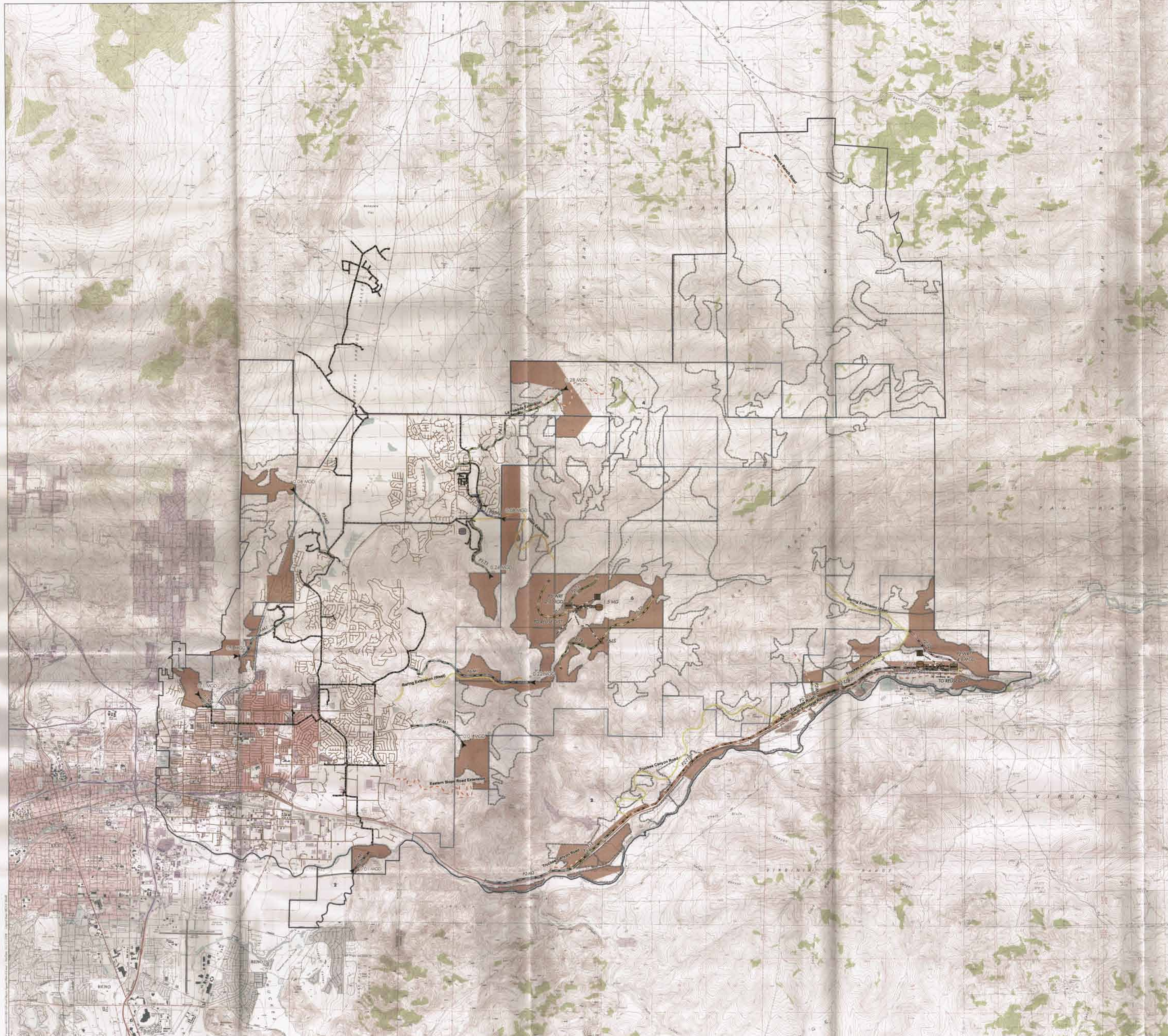
Stantec Consulting
6980 Sierra Center Parkway
Suite 100
Reno, NV 89511

Stantec

Tel: (775) 850-0777
Fax: (775) 850-0787
stantec.com

The City of Sparks

Date: January 11, 2008



CITY OF SPARKS TMSA/FSA
CONCEPTUAL FACILITY MASTER PLAN

Plate: 4.0

Existing and Proposed Wastewater Facilities - 2030

Legend

- Study Area Boundary
- Priority Service Area Boundary & Number
- Developable Areas (<30% Slope) - Buildout
- Developable Areas (<30% Slope) - 2030
- Truckee River
- Existing Sewer Lines
- Existing WCDWR Effluent Storage
- City of Sparks Effluent Lines
- Municipal Wastewater Tie-in Point

Proposed Wastewater Mains

- 8"
- 10"
- 12"
- 15"
- 18"
- 21"
- 24"
- 27"
- 36"
- Proposed Force Mains
- Proposed Effluent Mains
- Proposed Lift Station
- Proposed Recharge Area
- Proposed Effluent Water Storage
- Proposed Water Reclamation Facility
- Arterial Road
- Collector/Local Road

NOTE:
NOT ALL EXISTING INFRASTRUCTURE IS SHOWN

0 1,500 3,000 6,000 9,000 Feet
1:36,000

Stantec Consulting
6980 Sierra Center Parkway
Suite 100
Reno, NV 89511
Tel: (775) 850-0777
Fax: (775) 850-0787
stantec.com

Date: January 11, 2008

CITY OF SPARKS TMSA/FSA
CONCEPTUAL FACILITY MASTER PLAN

Plate: 5.0

Watershed Basins and Floodplains - 2030

Legend

- Priority Service Area Boundary
- Developable Areas (<30% Slope) - 2030
- Developable Areas (<30% Slope) - Buildout
- Truckee River
- Conceptual Masterplan Floodplains
- Conceptual Masterplan Cross Sections
- Watershed Boundaries

Watershed Studies

- City of Sparks Conceptual Master Plan
- City of Sparks Flood Control Master Plan
- D'Andrea Study
- Foothills Study
- Pah Rah Study
- Spanish Springs Flood Control Master Plan
- Sun Valley Drainage Master Plan

FEMA Flood Zones (D-FIRM)

- Zone X (500-yr)
- Zone A
- Zone AE
- Zone AH
- Zone AO

0 1,500 3,000 6,000 9,000 Feet

1:36,000

Stantec Consulting
6980 Sierra Center Parkway
Suite 100
Reno, NV 89511

Tel: (775) 850-0777
Fax: (775) 850-0787
stantec.com

Date: January 11, 2008