Volume 2

Physical Settings of Selected Streams in Clark, Lincoln, and White Pine Counties Groundwater Development Project

January 2008

PREFACE

This report was prepared by the Southern Nevada Water Authority. The U.S. Geological Survey served as technical advisor to the Bureau of Land Management in the review of this report.

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CONTENTS

Preface i
List of Figures vii
List of Tables xiii
List of Acronyms and Abbreviations xv
1.0 Introduction 1-1
1.1 Project Background 1-1
1.2 Regional Groundwater Flow Systems 1-1
1.3 Purpose and Scope 1-3
1.4 Document Organization 1-3
2.0 Methods, Procedures and Data Analysis 2-1
2.1 Data Collection 2-1
2.1.1 Photographic Documentation 2-1
2.1.2 Discharge Measurements 2-1
2.1.3 Drainage Area Characteristics 2-3
2.2 Location Description 2-4
2.3 Estimation of Mean Annual Discharge of Ungaged Streams 2-4
2.4 Data Analysis 2-5
2.4.1 Determination of Baseflow Conditions 2-6
2.4.2 Selection of Miscellaneous Discharge Measurements 2-8
2.4.3 Calculation of Annual Flows (Q_m) 2-10
2.4.4 Limitations 2-10
3.0 Physical Description of Streams 3-1
3.1 Spring Valley (HA 184) 3-1
3.1.1 Stage Canyon 3-3
3.1.2 Siegel Creek 3-4
3.1.3 Silver Creek 3-4
3.1.4 North Creek 3-4
3.1.5 Frenchman Creek 3-6
3.1.6 Muncy Creek 3-7
3.1.7 Kalamazoo Creek 3-7
3.1.8 Piermont Creek 3-10
3.1.9 Garden Creek 3-11
3.1.10 Bassett Creek 3-12
3.1.11 Little Negro Creek 3-13
3.1.12 Odgers Creek 3-15
3.1.13 McCoy Creek 3-16
3.1.14 Taft Creek 3-16
3.1.15 Ranger Creek 3-18
3.1.16 South Taft Creek 3-20
3.1.17 Stephens Creek 3-21

3.1.18 Cleve Creek 3-22
3.1.19 Bastian Creek 3-26
3.1.20 Eightmile Creek 3-27
3.1.21 Negro Creek 3-27
3.1.22 Willard Creek 3-29
3.1.23 Shingle Creek 3-29
3.1.24 Pine and Ridge Creeks 3-32
3.1.25 Williams Creek 3-34
3.1.26 Swallow Canyon Creek 3-35
3.2 Snake Valley (HA 195) 3-37
3.2.1 Indian Farm Creek 3-37
3.2.2 Granite Creek 3-41
3.2.3 Trout Creek 3-43
3.2.4 Birch Creek 3-44
3.2.5 Swan Creek 3-46
3.2.6 Marble Wash 3-47
3.2.7 Smith Creek 3-47
3.2.8 Hampton Creek 3-49
3.2.9 Hendrys Creek 3-51
3.2.10 Silver Creek 3-52
3.2.11 Weaver Creek 3-53
3.2.12 Strawberry Creek 3-54
3.2.13 Lehman Creek 3-54
3.2.14 Baker Creek 3-60
3.2.15 Snake Creek 3-61
3.2.16 Big Wash 3-67
3.2.17 Lexington Creek 3-68
3.2.18 Chokecherry Creek 3-70
3.3 White River Valley (HA 207) 3-70
3.3.1 White River 3-73
3.3.2 Ellison Creek 3-75
3.3.3 Water Canyon Creek 3-77
3.3.4 Forest Home Creek 3-79
3.4 Muddy River and Meadow Valley Wash 3-80
3.4.1 Discharge 3-81
3.4.2 Diversions and Regulation 3-83
3.4.2.1 Meadow Valley Wash 3-83
3.4.2.2 Muddy River 3-84
3.4.3 Continuous Gaging Stations 3-85

4.0 Summary 4-1

5.0 References 5-1

CONTENTS (CONTINUED)

Appendix A - Miscellaneous Discharge and Gaging Station Locations

Appendix B - Annual Discharges at Gaging Stations

B.1.0 Annual Discharges at Gaging Stations B-1

Appendix C - Miscellaneous Discharge Measurement Data for Streams in Spring, Snake, and White River Valleys

C.1.0 Miscellaneous Discharge Measurement Data. C-1

C.2.0 References. C-22

Appendix D - Physical Characteristics of Drainage Areas in Spring, Snake, and White River Valleys

D.1.0 Physical Characteristics of Drainage Areas D-1

Appendix E - Discharge Estimates for Ungaged Streams Listed by Station Number and by Measurement Date

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FIGURES

NUMBER	TITLE	PAGE
1-1	Location of Project Basins	1-2
2-1	Mean Annual Discharges of Selected Gaging Stations in Eastern Nevada, 1940-2006	2-5
2-2	Type-A Hydrograph Streams	2-6
2-3	Type-B Hydrograph Streams	2-8
2-4	Example of the Process and Criteria used to Evaluate Miscellaneous Discharge Measurements	2-9
2-5	Period of Record for Selected Gaging Stations in Northeastern Nevada	2-11
2-6	Mean Monthly Discharge of Steptoe and Cleve Creek near Ely, Nevada, and Trout Creek near Callao, Utah	2-11
3-1	Miscellaneous Measurement Sites on Streams in Spring Valley, White Pine and Lincoln Counties, Nevada	3-2
3-2	Measurement Sites on Siegel Creek	3-5
3-3	North Creek	3-6
3-4	Kalamazoo Creek	3-8
3-5	Measurement Sites on Kalamazoo Creek	3-9
3-6	Piermont Creek	3-11
3-7	Garden Creek	3-13
3-8	Measurement Sites on Bassett Creek	3-14
3-9	Little Negro Creek	3-15
3-10	McCoy Creek	3-17
3-11	Taft Creek	3-18
3-12	Measurement Sites on Taft, South Taft, and Ranger Creeks	3-19
3-13	Ranger Creek	3-20

FIGURES (CONTINUED)

NUMBER	TITLE	PAGE
3-14	South Taft Creek	3-21
3-15	Stephens Creek	3-22
3-16	Cleve Creek	3-23
3-17	Hydrograph of Mean Annual Discharge at Cleve Creek near Ely, Nevada	3-24
3-18	Measurement Sites on Cleve Creek	3-25
3-19	Bastian Creek	3-27
3-20	Eightmile Creek	3-28
3-21	Negro Creek	3-29
3-22	Measurement Sites on Negro Creek	3-30
3-23	Willard Creek	3-31
3-24	Shingle Creek	3-33
3-25	Pine and Ridge Creeks below their Confluence	3-33
3-26	Williams Creek	3-34
3-27	View of Swallow Canyon Spring Looking Upstream from Diversion Structure toward Discharge Measurement Section	3-35
3-28	Swallow Canyon Diversion Structure, July 28, 2004	3-36
3-29	Close-Up of Destroyed Swallow Canyon Diversion Structure, July 28, 2005	3-36
3-30	Measurement Sites on Streams in Snake Valley, Nevada and Utah	3-38
3-31	Indian Farm Creek	3-41
3-32	Granite Creek near Callao, Utah	3-42
3-33	Trout Creek near Callao, Utah	3-43
3-34	Hydrograph of Mean Annual Discharge at Trout Creek near Callao, Utah	3-44

FIGURES (CONTINUED)

NUMBER	TITLE	PAGE
3-35	Measurement Sites on Trout and Birch Creeks	3-45
3-36	Birch Creek	3-46
3-37	Swan Creek at Devil's Gate	3-47
3-38	Smith Creek	3-48
3-39	Hampton Creek	3-49
3-40	Measurement Sites on Hampton Creek	3-50
3-41	Hendrys Creek	3-51
3-42	Silver Creek	3-52
3-43	Weaver Creek	3-53
3-44	Measurement Sites on Strawberry Creek	3-55
3-45	Strawberry Creek	3-56
3-46	Measurement Sites on Lehman Creek	3-57
3-47	Hydrograph of Mean Annual Discharge at Lehman Creek near Baker, Nevada	3-58
3-48	Lehman Creek	3-59
3-49	Hydrograph of Mean Annual Discharge at Baker Creek at Narrows, near Baker, Nevada	3-61
3-50	Baker Creek	3-62
3-51	Measurement Sites on Baker Creek	3-63
3-52	Snake Creek	3-64
3-53	Measurement Sites on Snake Creek	3-66
3-54	Big Wash	3-67
3-55	Measurement Sites on Big Wash	3-69

FIGURES (CONTINUED)

NUMBER	TITLE	PAGE
3-56	Lexington Creek	3-70
3-57	Measurement Sites on Streams in White River Valley	3-71
3-58	Hydrograph of Mean Annual Discharge at Steptoe Creek near Ely, Nevada	3-72
3-59	Measurement Sites on White River	3-74
3-60	White River near Red Mountain near Preston, Nevada (09415460)	3-75
3-61	Measurement Sites on Ellison Creek	3-76
3-62	Ellison Creek	3-77
3-63	Measurement Sites on Water Canyon Creek	3-78
3-64	Hydrograph of Mean Annual Discharge at Water Canyon Creek near Preston, Nevada	3-79
3-65	Forest Home Creek	3-81
3-66	Measurement Sites on Muddy River and in Meadow Valley Wash	3-82
3-67	Gaging Station Periods of Record for the Muddy River and Its Tributaries	3-85
3-68	Hydrograph of Mean Annual Discharge at Muddy River near Moapa, Nevada	3-86
3-69	Mathews Canyon	3-88
3-70	Pine Canyon	3-89
3-71	Muddy River near Glendale, Nevada	3-90
3-72	Hydrograph of Mean Annual Discharge at Muddy River near Glendale, Nevada	3-91
3-73	Muddy River near Overton, Nevada	3-92
3-74	Hydrograph of Mean Annual Discharge at Muddy River near Overton, Nevada	3-92
3-75	Muddy River at Lewis Avenue at Overton, Nevada	3-93
3-76	Hydrograph of Mean Annual Discharge at Muddy River near Overton, Nevada	3-94

FIGURES (CONTINUED)

NUMBER TITLE PAGE

3-77 Hydrograph of Mean Annual Discharge at Muddy River above Lake Mead near Overton, Nevada 3-95

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TABLES

NUMBER	TITLE	PAGE
2-1	Bed Material Grain Size Division	2-3
2-2	Basin Characteristics of Selected Gaging Stations	2-7
3-1	Estimated Average Annual Streamflow for Ungaged Perennial Streams Within Spring Valley and Cleve Creek	3-3
3-2	Synoptic Discharge Measurement Data for Kalamazoo Creek	3-10
3-3	Synoptic Discharge Measurement Data for Piermont Creek	3-12
3-4	Synoptic Discharge Measurement Data for Bassett Creek	3-13
3-5	Synoptic Discharge Measurement Data for McCoy Creek	3-17
3-6	Synoptic Discharge Measurement Data for Cleve Creek - USGS	3-24
3-7	Synoptic Discharge Measurement Data for Cleve Creek - SNWA	3-26
3-8	Synoptic Discharge Measurement Data for Negro Creek	3-31
3-9	Synoptic Discharge Measurement Data for Shingle Creek	3-32
3-10	Mean Annual Discharge for Snake Valley (HA 195)	3-39
3-11	Synoptic Discharge Measurement Data for Strawberry Creek	3-56
3-12	Synoptic Discharge Measurement Data for Lehman Creek	3-59
3-13	Synoptic Discharge Measurement Data for Baker Creek - SNWA	3-62
3-14	Synoptic Discharge Measurement Data for Baker Creek - USGS	3-64
3-15	Synoptic Discharge Measurement Data for Snake Creek	3-65
3-16	Synoptic Discharge Measurement Data for Big Wash	3-68
3-17	Mean Annual Discharge for White River Valley	3-73
3-18	Synoptic Discharge Measurement Data for Water Canyon Creek	3-80
A.1-1	Miscellaneous Discharge Measurement Sites and Gaging Station Locations	A-1

TABLES (CONTINUED)

NUMBER	TITLE	PAGE
B.1-1	Annual Discharges of Gaging Stations	B-1
C.1-1	Miscellaneous Discharge Measurement Data	C-1
D.1-1	Physical Characteristics of Drainage Areas in Spring Valley, NV--HA 184	D-2
D.1-2	Physical Characteristics of Drainage Areas in Snake Valley, NV and UT--HA 195	D-4
D.1-3	Physical Characteristics of Drainage Areas in the White River Valley, NV--HA 207	D-5
E.1-1	Discharge Estimates for Ungaged Streams in Spring Valley, NV	E-1

ACRONYMS

BLM	Bureau of Land Management
CCC	Civilian Conservation Corps
ET	evapotranspiration
GIS	geographic information system
HA	hydrographic area
MVIC	Moapa Valley Irrigation Company
NDWR	Nevada Division of Water Resources
NPC	Nevada Power Company
SNWA	Southern Nevada Water Authority
USACE	U.S. Army Corps of Engineers
USGS	U.S. Geological Survey
UTM	Universal Transverse Mercator

ABBREVIATIONS

°C	degrees Celsius
af	acre-foot
afs	acre-feet per season
afy	acre-feet per year
amsl	above mean sea level
cfs	cubic feet per second
cm	centimeter
ft	foot
gpm	gallons per minute
mi	mile
µs	microsiemen

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1.0 INTRODUCTION

This report describes selected perennial and ephemeral streams in portions of east-central and southeastern Nevada and adjacent western Utah. Descriptions of the general setting, surficial geology of the drainage area, discharge, diversions and water use are given for each selected stream. Estimates of mean annual discharge of each selected stream. Estimates of perennial stream flow in Spring, Snake, and White River valleys were also made. The attributes of the Muddy River and its tributaries are also discussed, and an estimate of its mean annual discharge is also provided for various reaches of the river.

1.1 Project Background

The Clark, Lincoln and White Pine Counties Groundwater Development Project (hereafter referred to as the Project) proposes to develop unused groundwater resources within selected hydrographic areas of eastern Nevada where the Southern Nevada Water Authority (SNWA) holds groundwater rights and applications. These basins include Coyote Spring, Delamar, Dry Lake, Cave, Spring, and Snake valleys (hereafter referred to as the Project Basins) and are depicted in Figure 1-1.

In 2004, SNWA applied to the Bureau of Land Management (BLM) for issuance of rights of way to construct Project facilities, most of which will be located on public lands administered by the BLM. These facilities include groundwater production wells, water conveyance facilities, water storage and regulating reservoirs, and power facilities. BLM issuance of these rights of way to construct, maintain, and operate these facilities requires a federal action for which the National Environmental Policy Act and Endangered Species Act must be considered. BLM has determined that preparation of an environmental impact statement is required to assess the potential environmental effects that may result from permitting the rights of way, including the potential indirect effects of the proposed groundwater development. This report was prepared in support of that assessment.

1.2 Regional Groundwater Flow Systems

A set of hydraulically connected valleys is defined as a flow system. A single valley that is not hydraulically connected to another valley can be defined as its own flow system. Several flow systems, as defined by Harrill et al. (1988) and Nichols (2000), occur within the study area and vicinity. The primary flow systems of interest to the Project are: the White River, Goshute Valley, Great Salt Lake Desert, and Meadow Valley Flow systems. The regional groundwater flow system prevailing within the study area and vicinity is composed of multiple hydrographic areas, also called valleys or basins. Spring and Snake valleys are part of the Great Salt Lake Desert Flow System; while Cave, Dry Lake, Delamar, and Coyote Springs valleys are all a part of the White River Flow System. In many of the northern valleys, evapotranspiration (ET) is the principal source of groundwater discharge. However, the valleys in the central-southern part of the system have a

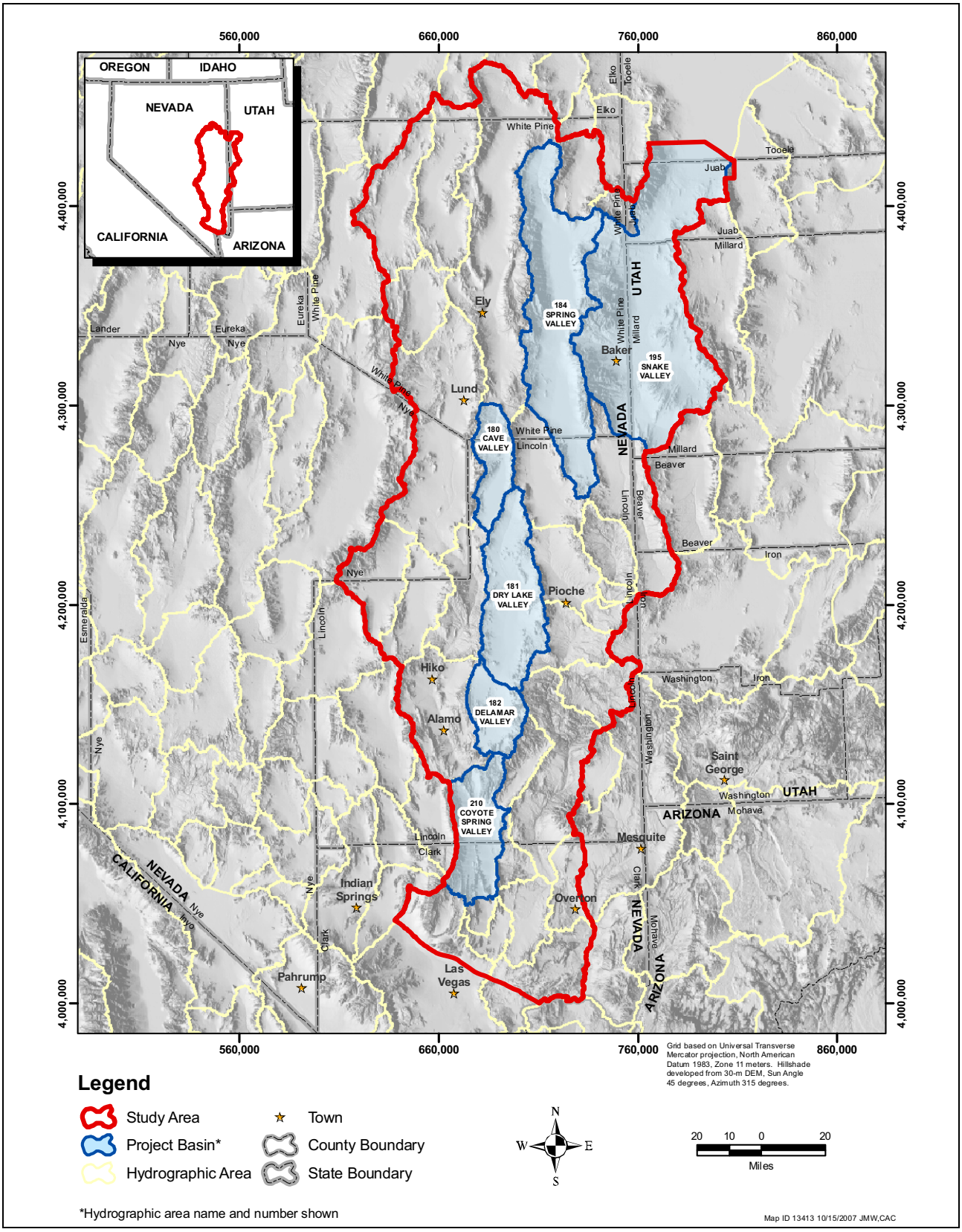

Figure 1-1
Location of Project Basins

significant amount of groundwater discharge as subsurface outflow through the carbonate aquifer. Although numerous structural features (Dettinger et al., 1995; SNWA, 2003) compartmentalize different parts of the carbonate aquifer system, the hydraulic connectivity of the valleys is believed to be expansive.

1.3 Purpose and Scope

The purpose of this report is to provide data and documentation of the baseline hydrologic conditions of selected perennial and ephemeral streams that were compiled during inventories in the study area. Selected streams located within Snake, Spring, and White River valleys were inventoried and each was described in detail. The Muddy River and its tributaries, including Meadow Valley Wash, are also described in this report. The scope includes compilation of historical data, photographic documentation, collection of miscellaneous discharge measurements, acquisition of historical and current diversion data, documentation of anthropogenic influences, and a basic description of the individual drainage areas. Estimates of each stream's mean annual discharge were calculated and then summed together with published stream gaging records to calculate an estimated annual perennial streamflow for Spring, Snake, and White River valleys.

1.4 Document Organization

This document consists of the following sections and appendices:

- Section 1.0 provides a description of the project background, description of regional flow systems, the purpose and scope of this report, and an overview of the structure of this report.
- Section 2.0 documents the methods and procedures used to collect and analyze the data compiled in this report.
- Section 3.0 documents the current physical characteristics of selected streams in eastern Nevada.
- Section 4.0 provides a summary of the findings of this report.
- Section 5.0 provides a list of references cited in this report.
- Appendix A tabulates the miscellaneous discharge and gaging station locations and other attributes of these sites.
- Appendix B tabulates the published annual discharges of gaging stations in this report.
- Appendix C tabulates the miscellaneous discharge measurement data in this report.
- Appendix D tabulates the physical characteristics of each drainage area in this report.
- Appendix E tabulates discharge estimates for Spring Valley.

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2.0 METHODS, PROCEDURES AND DATA ANALYSIS

This section describes the methods and procedures used to collect the data analyzed in this report and provides a brief explanation of the technique used to estimate the long-term mean annual discharge of the ungaged perennial streams.

2.1 Data Collection

Data sources include published reports, published and preliminary data from the U.S. Geological Survey (USGS), and field investigations conducted by SNWA.

Investigations conducted by SNWA of the selected perennial streams included compilation of existing data and information, including published and unpublished reports and databases; photographic documentation; discharge measurements; and a written description of the physical setting of the stream, including a basic description of the surficial geology of each drainage area. Data collection procedures were established to ensure consistent and accurate collection of data during the stream inventory. Key aspects of the data collection program are as follows:

- Photographic documentation
- Discharge measurement
- Written description of each stream and drainage area.

2.1.1 Photographic Documentation

Photographs were taken of the cross section, stream banks, surrounding vegetation, and diversion facilities including any impoundments, head gates, flumes, weirs, and irrigation canals.

2.1.2 Discharge Measurements

Miscellaneous Discharge Measurements

Miscellaneous discharge measurements for perennial streams were compiled from:

- USGS National Water Information System
- Water-Supply Papers regarding Surface Water Supply of the United States from 1914 to 1963
- Water Resources for Nevada annual data reports from 1964 to 2005

- Water Resources Bulletins and Biennial Reports published by the Office of the Nevada State Engineer

- Reports prepared by Ertec Western, Inc., for the U.S. Air Force's MX Missile-Siting Investigation (Ertec, 1981).

Data from the sources listed above augment the miscellaneous discharge measurements performed by SNWA since 1993.

Both the SNWA and outside datasets include site attribution and miscellaneous discharge values, including the date, time, and magnitude of the measured flow. Where available, qualifiers were included so that the accuracy and quality of the discharge measurements could be assessed. Specific data types include the following:

- Site ID
- Location data
- Measurement date (mm/dd/yy) and time
- Measured/Reported Discharge (cfs)
- Measurement Accuracy Rating
- Data Source.

Suitable sites for SNWA's miscellaneous discharge measurements were selected based on access to the channel, channel geometry, bed material, and observations of flow. Location data for each site were collected using Global Positioning System equipment. The measurements were made using either Price AA or Pygmy vertical-axis current meters, each having a standard rating dated June, 1999. Measurements made by SNWA before June 1999 used the USGS standard rating tables for pygmy and AA meters computed in 1980. The measurements were then calculated and checked. Each measurement was rated as excellent (2 percent error), good (5 percent error), fair (8 percent error) or poor (over 8 percent error). These ratings were based on guidelines found in Rantz et al. (1982a and b) and Sauer and Meyer (1992). Discharge measurements were made and computed using the standard methods outlined in Rantz et al. (1982a and b) and Malone (1931). Grain sizes of the bed material and bank material were measured or estimated and then classified using the Wentworth scale modified from Buffington and Montgomery (1999). Table 2-1 describes the grain size division and names.

Discharge at Gaging Stations

The USGS developed discharge ratings for gaging stations using a stage-discharge relationship. The rating is developed by making discharge measurements and recording the observed stage during the measurement. After sufficient measurements are made, a rating curve is developed by plotting the stage against the discharge. Once this rating is developed, routine visits are made to the gaging station to measure the discharge and verify the validity of the rating in use at that station. Mean daily discharges are computed using the gage height record (usually recorded every 15 or 60 minutes) at the station in conjunction with the discharge rating. From these mean daily values, monthly and annual discharges and statistics are computed. If the stream channel is subjected to frequent changes, thereby affecting the stage-discharge relationship, then the discharge is computed using the shifting-control method, in which correction factors are applied to the stage- discharge relationship

Table 2-1
Bed Material Grain Size Division

Aggregate Type	Aggregate Detail	Size Range	
		millimeters	inches (approximate)
Boulder	Coarse	>1,024	>40
	Medium	512 to 1,024	20 to 40
	Fine	256 to 512	10 to 20
Cobble	Coarse	128 to 256	5 to 10
	Fine	64 to 128	2.5 to 5
Gravel	Coarse	16 to 64	0.63 to 2.5
	Medium	8 to 16	0.32 to 0.64
	Fine	2 to 8	0.08 to 0.32
Sand	Coarse	0.5 to 2	0.02 to 0.08
	Fine	0.125 to 0.5	--
Fine material (silts/clays)	--	< 0.125	--

Source: Modified from Buffington and Montgomery, 1999

based on physical discharge measurements. A more detailed explanation of rating development and the computation of discharge records can be found in Rantz et al. (1982a and b).

In the study area, there are currently 15 active gaging stations: 7 are on the Muddy River and its tributaries, and 8 elsewhere in the study area. The period of record varies greatly from station to station. Records of annual discharges including the mean, minimum, and maximum annual discharges are listed in this report by stream and station number.

2.1.3 Drainage Area Characteristics

Physical characteristics of the drainage areas discussed in this report were determined using geographic information system (GIS) applications. All area calculations including total drainage area, area above 8,000 ft-amsl, and minimum, maximum and average elevations, for each drainage area were derived using the National Elevation Dataset, which is a 30 m digital elevation model maintained by the USGS (USGS-WEB); these values are reported in square miles. Stream length was determined by measuring the distance from the measurement site closest to the mountain block and above any diversions to the basin divide; this value is reported in miles. The channel slope was calculated by the methods of Hess and Bohman (1996), Hess (2002) and Ries et al. (2007). The channel slope was measured at two points along the stream: at 10 percent and 85 percent of the stream's total length, measured upstream from the measurement cross section nearest the mountain block and above any diversions. Stream slope is reported in feet per mile and was also derived using the National Elevation Dataset. The drainage area characteristics are tabulated by hydrographic area in Appendix D.

Using GIS applications and a digital version of the geologic map provided in Volume 1, an estimate of the proportions of volcanic, clastic, metamorphic, carbonate, and intrusive rocks, and alluvial deposits was calculated.

2.2 Location Description

All coordinates for miscellaneous discharge measurement sites and stream gaging stations provided in this report are reported in Universal Transverse Mercator (UTM) Zone 11 using the North American Datum of 1983. Elevations for individual drainage areas were determined using the USGS 30 m digital elevation model referenced to North American Vertical Datum of 1988.

2.3 Estimation of Mean Annual Discharge of Ungaged Streams

Various techniques have been used to estimate the annual runoff of ungaged streams. Different methods for indirect estimation of stream discharge have been reported by Lamke and Moore (1965), Moore (1968), Hedman and Osterkamp (1982), and Hess and Bohman (1996). Lamke and Moore (1965) and Moore (1968) developed regional runoff-altitude relationships based on miscellaneous streamflow data; using the runoff-altitude relationship, runoff from the mountain front can be derived. Hedman and Osterkamp (1982) used an empirical equation to obtain an estimate of discharge based on channel geometry and bed material data; however, when used on ephemeral streams, this technique has a 75 percent error. Hess and Bohman (1996) developed multiple-regression equations to relate streamflow statistics and the physical and climatic characteristics of the drainage for estimating stream flow. The method underestimates some drainage areas and overestimates others due to the inability of the method to account for the geologic variability within the mountain block.

The concurrent measurement technique described by Moore (1968) was chosen to estimate the discharge of perennial streams addressed in this report. This technique was chosen because it only uses measured values to estimate long term streamflow. A brief description follows.

Available miscellaneous discharge measurements for each of the ungaged perennial streams were evaluated to determine which were suitable for use in estimating the average annual flow using the concurrent measurement method described in Moore (1968, p. 35). To apply this method of estimation, the data required to compute the estimate include miscellaneous discharge measurements for the ungaged perennial streams and the mean daily and mean annual flows for a gaged stream of similar runoff characteristics. The method is expressed by the equation:

$$Q_m = Q_M(Q_a/Q_b) \qquad \text{(Eq. 2-1)}$$

where

Q_m = Long-term mean annual flow at the ungaged stream
Q_M = Long-term mean annual flow at the gaged stream

Q_a = Measured discharge at the ungaged stream
Q_b = Mean daily discharge at the gaged stream for the same day Q_a was measured.

Values for Q_M and Q_b are derived from the record of mean daily flows from the gaged site.

An observation noted by Moore (1968, p. 35) is that the surface runoff characteristics between two streams are typically different to some degree. This is understandable since the physical attributes of each drainage area are likely different, thereby influencing the shape of the runoff hydrograph. To minimize these potential differences, Moore (1968, p. 35) recommends that the method only be applied to concurrent measurements acquired during baseflow conditions.

Discharges of ephemeral streams were not calculated due to the difficulty associated with measuring ephemeral flows.

2.4 Data Analysis

Miscellaneous discharge measurements for the ungaged perennial streams in Spring, Snake and White River Valleys were compiled from both SNWA and non SNWA sources. Gaging station data from Railroad, Steptoe, Spring, Snake and White River Valleys were obtained from the USGS (NWIS, 2006). These gaging station data were checked for climatic variability by graphically comparing their annual discharges Figure 2-1.

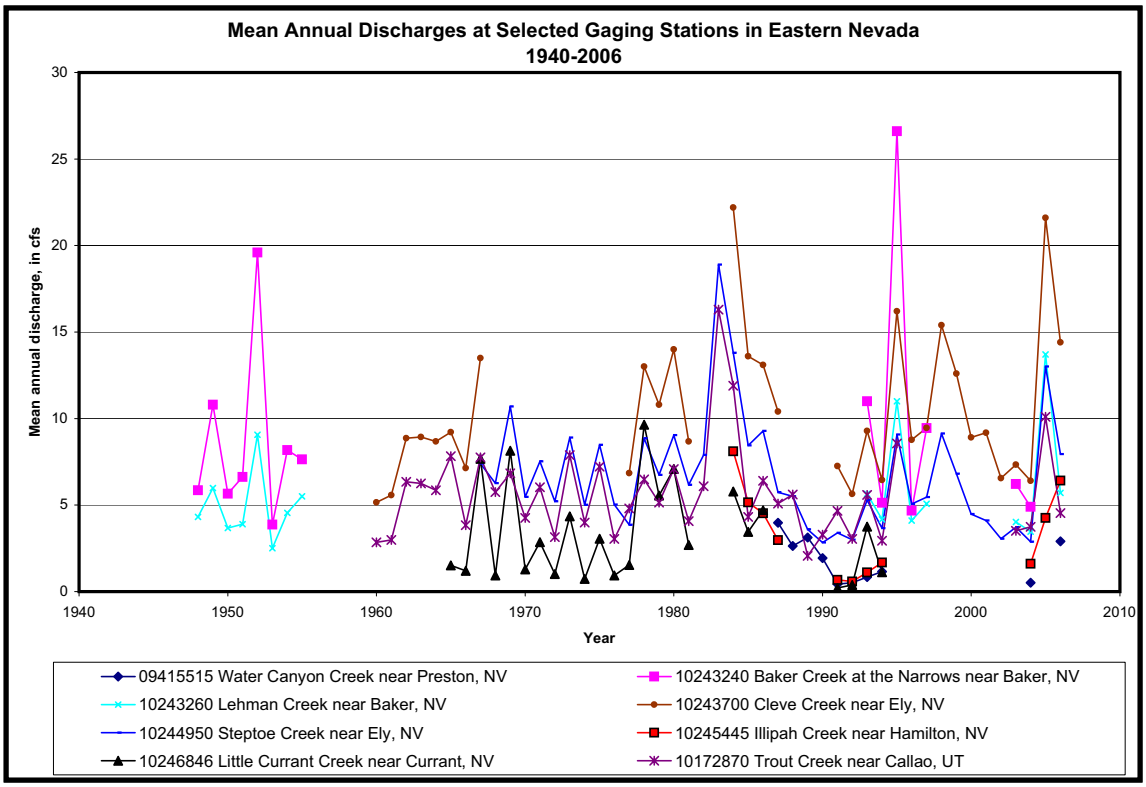

Figure 2-1
Mean Annual Discharges of Selected Gaging Stations in Eastern Nevada, 1940-2006

Based on the hydrographs depicted in Figure 2-1, it is apparent that the streams are influenced by climate patterns in a similar manner. The gaging stations used in the analysis were chosen based on their proximity to the streams in Spring, Snake, and White River valleys; length of record; and period of record relevant to the miscellaneous measurement data.

2.4.1 Determination of Baseflow Conditions

Baseflow months are defined in this report as those months that account for less than 10 percent of the total annual discharge. Runoff months are defined in this report as those months that account for 10 percent or more of the total annual discharge Figure 2-2.

The surface runoff characteristics of two nearby catchments can vary due to differences in precipitation, temperature, drainage area, geology (lithology and structure), type and density of vegetative cover, and stream-channel morphology. These characteristics influence the shape of the runoff hydrograph; therefore, it is important that concurrent discharges applied in the analysis represent baseflow conditions as described by Moore (1968).

Hydrographs, of the monthly percentage of the annual flow, were constructed using data from all of the nearby gaging stations having a period of record greater than 5 years to determine the general period of baseflow. Table 2-2 provides summary statistics for these gaging stations. Based on their hydrographs the gaged streams were grouped into 2 categories. They will be referred to as Type-A or Type-B. Six gaged streams were grouped into Type-A, and 2 gaged streams were grouped in the Type-B category.

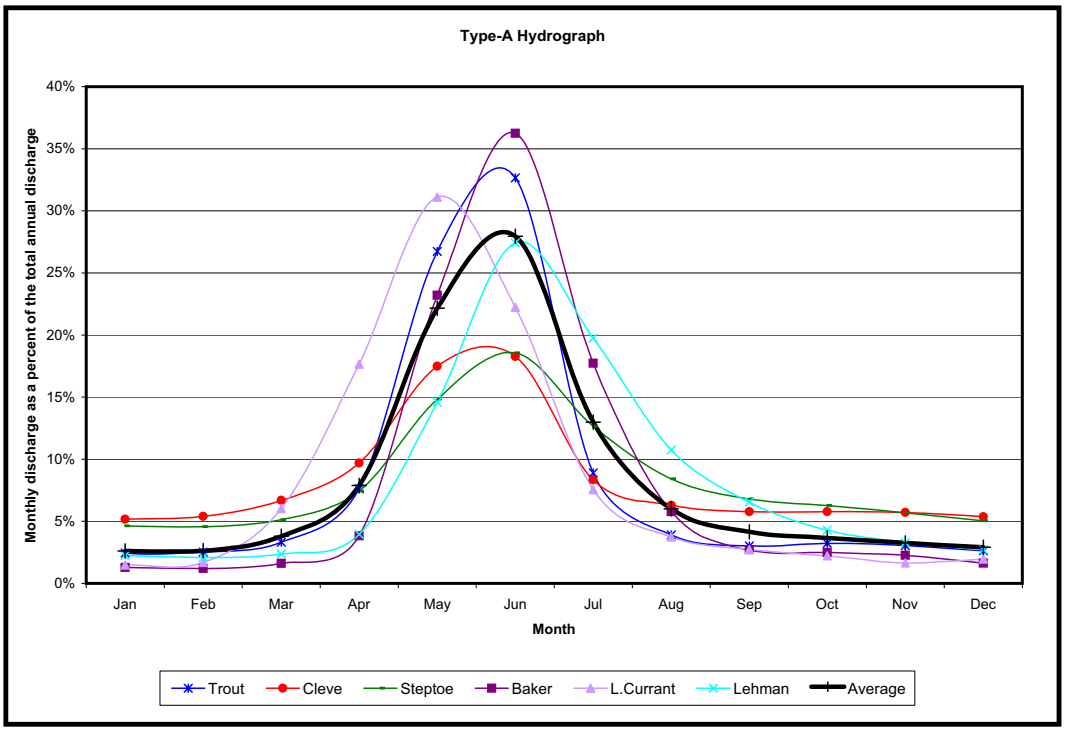

Figure 2-2
Type-A Hydrograph Streams

Table 2-2
Basin Characteristics of Selected Gaging Stations

Gaging Station Name	USGS ID No.	Hydrograph Type	Period of Record	Years of Record	Drainage Area (mi^2)	Period of Baseflow	Altitude of Gaging Station (ft)	Average Altitude above Gaging Station (ft)	Percentage of Surficial Geologic Deposits in the Drainage Area					
									Alluvium	Volcanic	Carbonate	Clastic	Metamorphic	Intrusive
Baker Creek at Narrow near Baker, NV[a]	10243240	Type-A	12/47 to 9/55, 10/92 to 9/97	13	16.4	August through April	6,750	9,545	1	0	5	77	0	17
Cleve Creek near Ely, NV[b]	10243700	Type-A	6/14 to 12/16, 10/59 to 9/67, 10/76 to 9/81, 12/82 to 9/87, 3/90 to present	32	31.8	July through March	6,200	8,854	2	0	41	57	0	0
Lehman Creek near Baker, NV[b]	10243260	Type-A	7/47 to 9/55, 10/92 to 9/97, 7/02 to present	16	11	September through April	6,700	9,738	33	0	1	55	9	2
Little Currant Creek near Currant, NV[c]	10246846	Type-A	10/64 to 9/81, 5/83 to 9/86, 3/90 to 9/94	21	12.9	July through March	6,700	8,319	9	37	47	6	0	0
Steptoe Creek near Ely, NV[b]	10244950	Type-A	6/66 to present	39	11.1	August through April	7,440	8,971	0	3	96	1	0	0
Trout Creek near Callao, UT[d]	10172870	Type-A	10/58 to 9/95, 7/02 to present	39	8.19	August through April	6,200	9,239	20	0	0	0	80	0
Illipah Creek near Hamlin, NV[b]	10245445	Type-B	6/83 to 9/87, 1/03 to present	9	31.5	November through May	6,840	7,869	6	19	75	0	0	0
Water Canyon Creek near Preston, NV[b]	09415515	Type-B	5/83 to 9/87, 3/90 to 12/94, 4/03 to present	9	11	October through June	6,400	8,082	10	6	84	0	0	0

Data Sources:
[a]USGS Water Resources Data-NV, 1997
[b]USGS Water Resources Data-NV, 2005
[c]USGS Water Resources Data-NV, 1994
[d]USGS Water Resources Data-UT, 2005

The Type-A hydrograph exhibits large changes in discharge during the runoff period, reflecting the spring snowmelt. The Type-B streams have a hydrograph that exhibit small changes in discharge throughout the year (Figure 2-3). Based on field investigations, it was determined that the ungaged streams considered in this analysis (i.e, perennial streams in Spring, Steptoe, and White River valleys) exhibit the same characteristics of the Type-A hydrograph. The base flow periods for Cleve, Steptoe and Trout Creeks were determined to be as follows: Cleve Creek baseflow is from July 1 to March 31; Steptoe Creek baseflow is from August 1 to April 30; and Trout Creek is from August 1 to April 30.

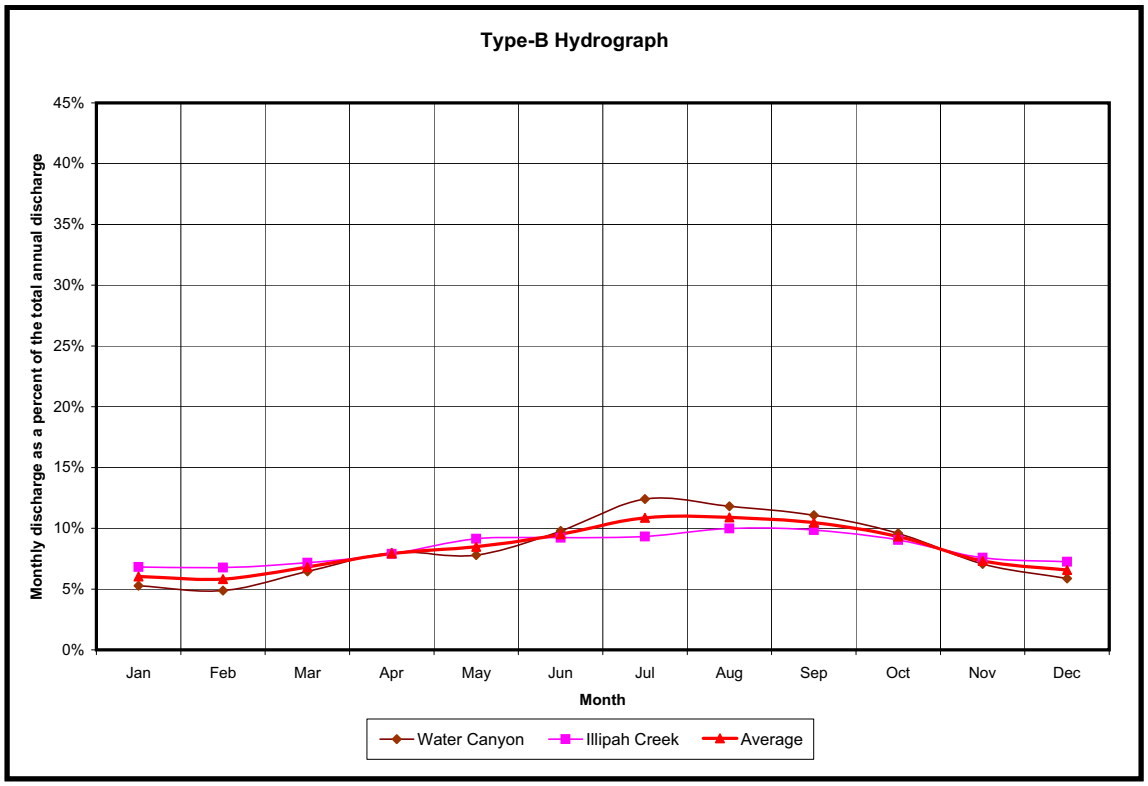

Figure 2-3
Type-B Hydrograph Streams

2.4.2 Selection of Miscellaneous Discharge Measurements

An example of the process and criteria by which the miscellaneous discharge measurements were evaluated is depicted in Figure 2-4 and incorporate the number and location of the measurements, when they were taken, and whether they were made above or below points of diversion. Miscellaneous discharge measurements for the ungaged streams were used only if they were conducted during the baseflow period of the gaged stream.

The miscellaneous measurements sites for individual perennial streams were evaluated and grouped based on coordinate data, comments regarding the site location, and field reconnaissance to identify anthropogenic influences or geologic features that would effect the streamflow between sites. Each site was assigned an index number. Sites and their associated measurements were excluded from the

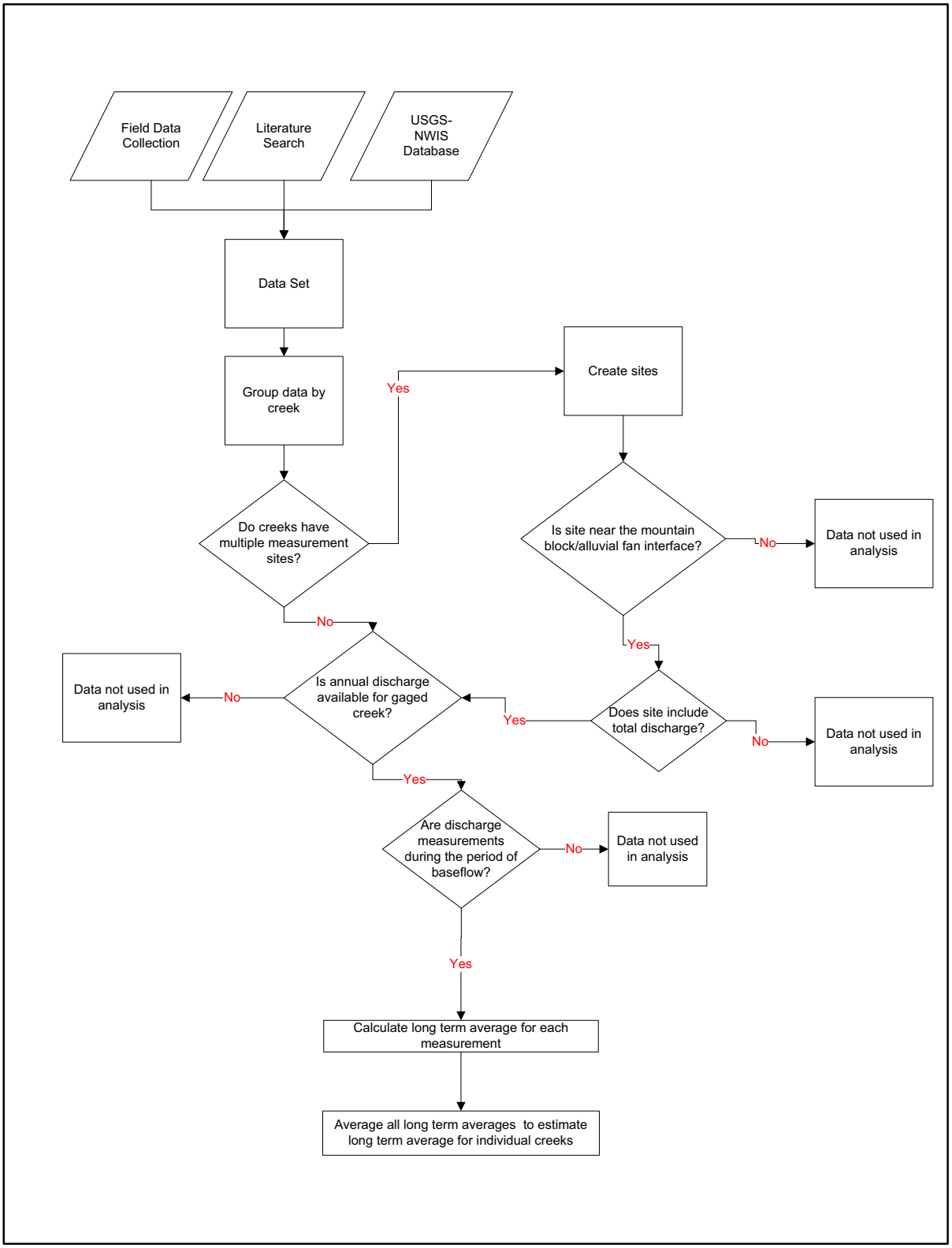

Figure 2-4
Example of the Process and Criteria used to Evaluate Miscellaneous Discharge Measurements

analysis if (1) the site location was not near or at the mountain block-alluvial interface and (2) the measurements were made below a diversion and did not represent the total streamflow. Measurements were also excluded if their records were assigned date accuracy codes of month or year. Without the specific day of the measurement a mean daily flow cannot be determined to compute the estimate.

2.4.3 Calculation of Annual Flows (Q_m)

After evaluating all of the available miscellaneous discharge measurements, it was determined many of the miscellaneous discharge measurements qualified to be used in the analysis based on the evaluation criteria. Rather than choose just one miscellaneous measurement for the calculation of the annual flow (Q_m), it was determined that all qualified measurements had value and should be incorporated into the analysis. This was accomplished by using each miscellaneous measurement to calculate an annual flow (Q_m) for the corresponding stream. In this way, all of the qualified data were considered in the analysis.

An annual flow (Q_m) was calculated for each miscellaneous measurement using (1) the discharge value for the measurement, (2) the mean daily flow for a gaged creek corresponding to the date of the miscellaneous measurement (Q_b), and (3) the mean annual flow for the same gaged stream (Q_M). Appendix B contains all the annual discharge values for gaging stations in the study area including those used as Q_M in the estimation of annual discharge values. Appendix C contains all the miscellaneous discharge measurement values (Q_a). The average of all the calculated annual flows (Q_m) for a given site was used as the estimate for the average annual flow of the corresponding stream. Some of the ungaged streams had gaging stations operated for short time periods of one or two years. This data was incorporated by averaging it with the miscellaneous stream discharge measurement results (Q_m).

Based on the criteria described in Sections 2.4 and 2.4.1, the gaging stations selected for computing estimates of annual flow for ungaged streams included: Cleve Creek near Ely, Nevada, for Spring Valley; Trout Creek near Callao, Utah, for Snake Valley; and Steptoe Creek near Ely, Nevada, for White River Valley. Figure 2-5 depicts the period of record for each of these gaging stations, and Figure 2-6 depicts the mean monthly discharge for each station.

2.4.4 Limitations

Limitations of this analysis is principally derived from the accuracy and number of concurrent measurements, the accuracy of stream gage records, and consistency between the respective surface-runoff characteristics of the gaged and ungaged streams. Differences in the surface-water runoff characteristics between the gaged and ungaged streams result in differences in the Q_b/Q_M and Q_a/Q_M ratios. The influence of surface-water runoff characteristics would be reduced if the data used for the concurrent measurements (Q_a and Q_b) were collected during baseflow conditions. The temporal distribution of data for the ungaged streams is insufficient to precisely determine the period during which baseflow conditions exist; therefore, the periods of baseflow were assumed to coincide with the gaged streams.

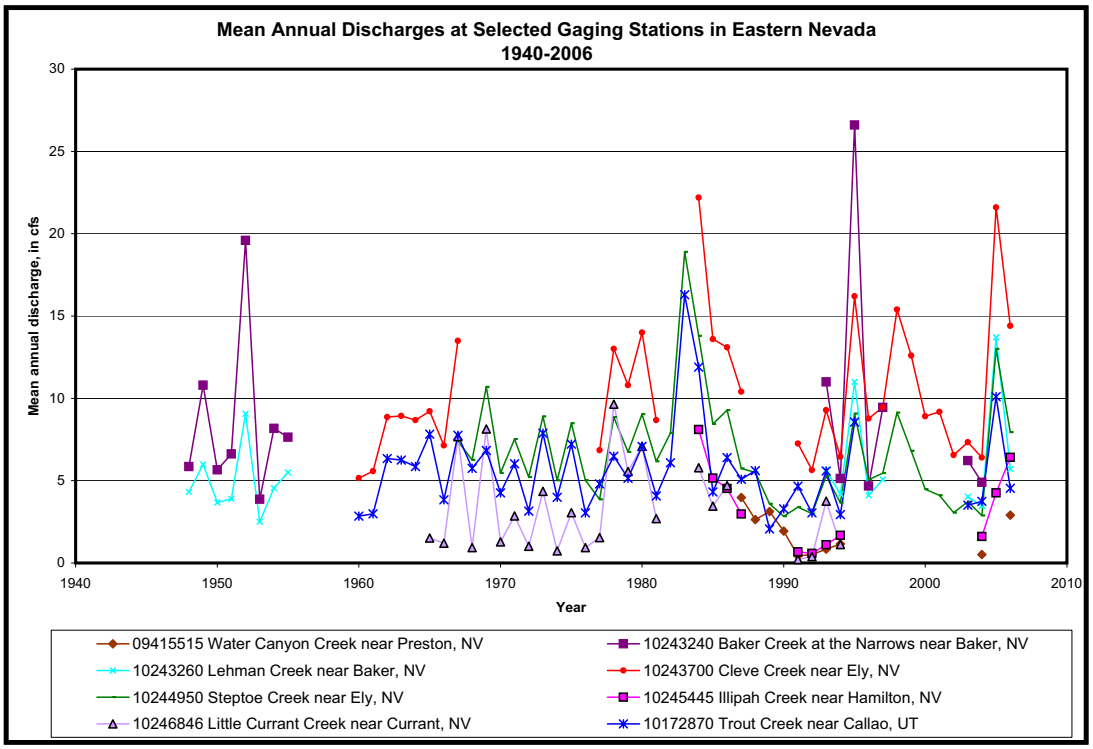

Figure 2-5
Period of Record for Selected Gaging Stations in Northeastern Nevada

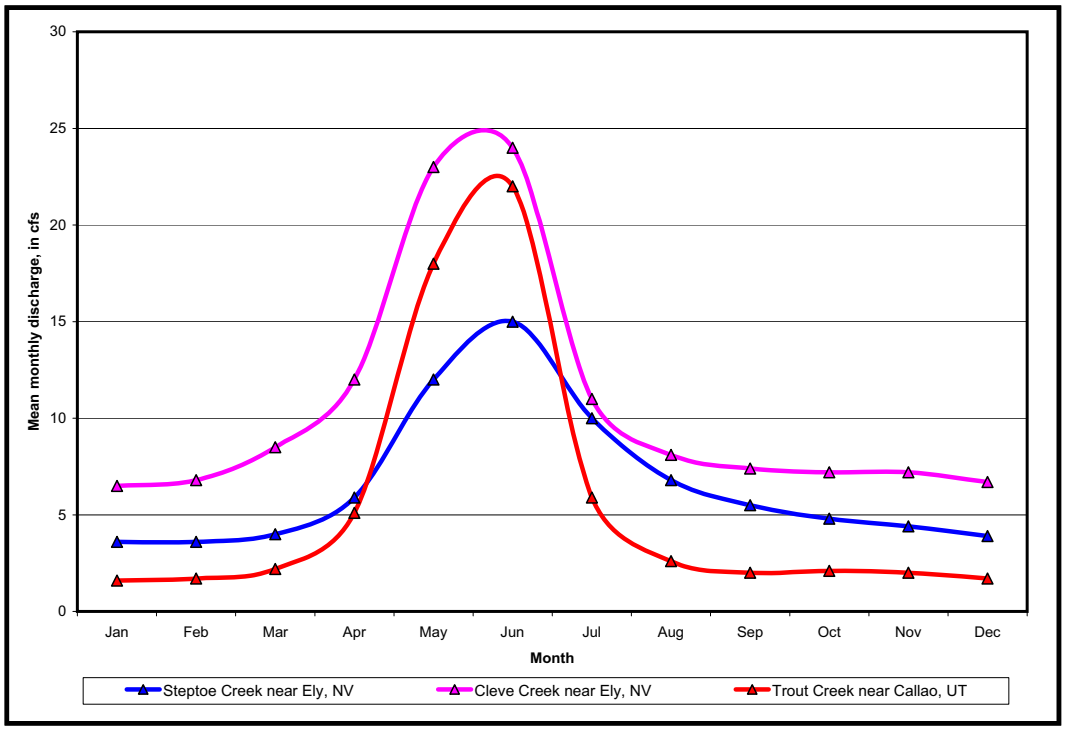

Figure 2-6
Mean Monthly Discharge of Steptoe and Cleve Creek near Ely, Nevada, and Trout Creek near Callao, Utah

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3.0 PHYSICAL DESCRIPTION OF STREAMS

3.1 Spring Valley (HA 184)

Spring Valley comprises the southwestern portion of the Great Salt Lake Groundwater Flow System. The valley is approximately 120 mi long and averages 16 mi wide. Spring Valley is bounded by the Schell Creek Range to the west, the Antelope Range to the north, the Snake Range and the Limestone Hills to the east, the Wilson Creek Range to the south, and the Fortification Range to the southwest. Most of Spring Valley is in White Pine County, Nevada, except for its southernmost portion, which is located in Lincoln County, Nevada. U.S. Highway 50 bisects the valley, and U.S. Highway 93 runs along the western flank of the valley. As part of this study, 27 perennial streams were inventoried in Spring Valley; the locations of the miscellaneous measurement sites and the Cleve Creek gaging station are depicted in Figure 3-1.

Using an evaluation and analysis of miscellaneous discharge measurements for ungaged perennial streams, this report estimates the perennial streamflow for Spring Valley using the continuous gage records for Cleve Creek and the concurrent measurement method described in Moore (1968). Using this method, the long-term average annual perennial streamflow for Spring Valley was estimated at 62 cfs, or 45,000 afy (Table 3-1). Due to the large size of the data set, it is presented in detail in Appendix E.

The perennial streamflow estimate of 62 cfs, in this report, falls within the range of previous estimates. Rush and Kazmi (1965) estimate 50 cfs (36,000 afy) for the total average annual streamflow. The estimate derived by this analysis is larger than the estimate reported by Rush and Kazmi (1965) because an additional fourteen perennial streams were included in the analysis. Based on this analysis, the perennial streamflow from these fourteen streams is approximately 20 cfs. When added to the 50 cfs reported by Rush and Kazmi (1965), an estimate of 70 cfs is computed, which is very close to the 62 cfs derived by the analysis in this report. SNWA (2006) compares favorably with this report. Small changes in the discharge estimates based on additional data is the reason for the small decline from 65 cfs reported in SNWA (2006) to 62 cfs in this analysis. Based on the available data for perennial streams within Spring Valley, the perennial streamflow derived in this report is consistent with that SNWA (2006) and Rush and Kazmi (1965).

General physical attributes of each drainage area, such as measurement location, size of drainage area, and station identification numbers, are listed in Appendix A; annual discharges for each gaging station are listed in Appendix B; miscellaneous discharge measurements are provided in Appendix C; physical attributes of the drainage areas are given in Appendix D.

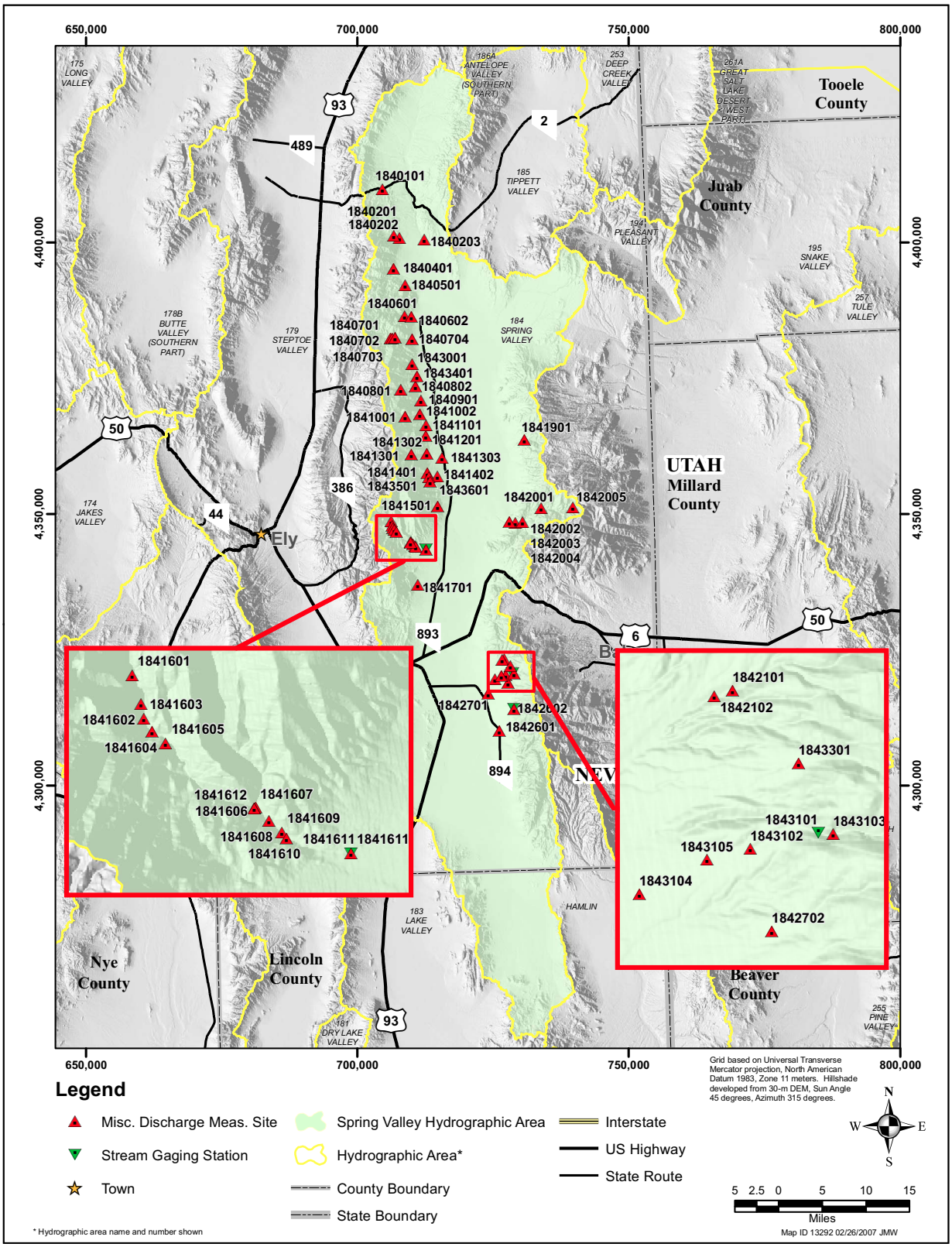

Figure 3-1
Miscellaneous Measurement Sites on Streams in Spring Valley, White Pine and Lincoln Counties, Nevada

Table 3-1
Estimated Average Annual Streamflow for Ungaged Perennial Streams Within Spring Valley and Cleve Creek

Station Number	Stream Name		Q_m (cfs)
1840201	Siegel Creek		1.03
1840401	North Creek		1.24
1840501	Frenchman Creek		0.54
1840602	Muncy Creek		1.90
1840704	Kalamazoo Creek		6.00
1840802	Piermont Creek		1.68
1840901	Garden Creek		0.39
1841002	Bassett Creek		4.99
1841101	Little Negro Creek		0.86
1841201	Odgers Creek		2.37
1841302	McCoy Creek		6.74
1841401	Taft Creek		2.62
1841501	Stephens Creek		1.04
1841701	Bastian Creek		2.75
1841901	Eight Mile Creek		0.98
1842004	Negro Creek		2.62
1842101	Willard Creek		0.92
1842201	Swallow Creek		7.65
1842602	Dry Canyon and Williams Canyon		1.02
1842702	Pine and Ridge Creeks		1.18
1843001	Meadow Creek		0.78
1843101/02	Shingle Creek		0.96
1843301	Board Creek		0.03
1843401	North Creek		0.01
1843501	Ranger Creek		0.06
1843601	South Taft Creek		0.69
1841611	Cleve Creek (USGS, 2006)		10.5
	Totals	**cfs**	**62**
		afy	**45,000**

3.1.1 Stage Canyon

Stage Canyon is located on the eastern flank of the Schell Creek Range in northern Spring Valley, and its measurement site is identified as station number 1840101 on Figure 3-1. The drainage area is approximately 9 mi^2, with 14 percent of the area being above 8,000 ft-amsl. The elevations in the drainage area range from 6,550 to 9,060 ft-amsl. The average elevation for the drainage area is 7,440 ft-amsl. The lithology of the drainage area is about 28 percent volcanic rock, 16 percent carbonate rock, and 56 percent valley fill.

In this analysis Stage Canyon is considered an intermittent stream. Discharge at Stage Canyon has been measured four times since 1998. In 2000 and 2001 the creek was observed to be dry.

3.1.2 Siegel Creek

Siegel Creek is located in the Schell Creek Range in northwest Spring Valley, and its measurement sites are identified as station numbers 1840201 through 1840203 on Figure 3-2. The drainage area is nearly 6 mi^2, with 53 per cent of the area being above 8,000 ft-amsl. Elevations range from 6,680 ft-amsl near the measurement site to 10,170 ft-amsl at the basin divide, with an average elevation of 8,210 ft-amsl. The surficial geology of the drainage area is comprised of carbonate rocks (65 percent), volcanic rocks (12 percent), clastic (4 percent), metamorphic rocks (1 percent), and alluvial material (18 percent).

The banks of Siegel Creek are composed of sediments that range in size from silt and fine sand (85 percent) to large cobbles and boulders (15 percent). The bed material is poorly sorted, like the banks, with sediment that is subangular to subrounded and ranging in size from gravel to large cobbles. The channel is incised 1 to 2 ft within a much broader channel.

The average annual discharge of Siegel Creek is estimated to be 1.03 cfs or 746 afy. The discharge is captured below the measurement section by a reservoir with approximately 0.25 to 0.5 acres in surface area. The water is used for agricultural purposes at the ranch downstream.

3.1.3 Silver Creek

Silver Creek is located in northern Spring Valley, and its drainage area size is approximately 2 mi^2 with over 83 percent of the area being above 8,000 ft-amsl. The surficial geology of the drainage area is comprised of carbonate rocks (75 percent), clastic rocks (20 percent), and metamorphic rocks (5 percent). Elevations range from 7,160 ft-amsl to over 10,280 ft-amsl at the hydrographic basin divide, with an average basin elevation of 8,890 ft-amsl.

Silver Creek is an ephemeral stream based on observation that it was dry during a July 1998 field visit.

3.1.4 North Creek

North Creek is located in northern Spring Valley on the eastern slope of the Schell Creek Range, and its measurement site is identified as station number 1840401 on Figure 3-1. The drainage area size is approximately 3 mi^2 and approximately 82 percent of the area is above 8,000 ft-amsl. Seventy-eight percent of the surficial geology is carbonate rock, 13 percent is clastic rock, and 9 percent is volcanic rock. Drainage area elevations range from 6,950 ft-amsl at the measurement site to approximately 10,260 ft-amsl, with an average elevation of 8,620 ft-amsl.

The natural channel of North Creek is overgrown with dense vegetation including trees and shrubs. Bed material is mostly large cobbles and small boulders of carbonate rock, and the steep bank's composition is a poorly sorted mixture of silts, sands, gravels, cobbles, and boulders. The diversion channel, where the discharge is measured, has steep grass- and brush-lined banks and is 85 percent fine-grained material (Figure 3-3).

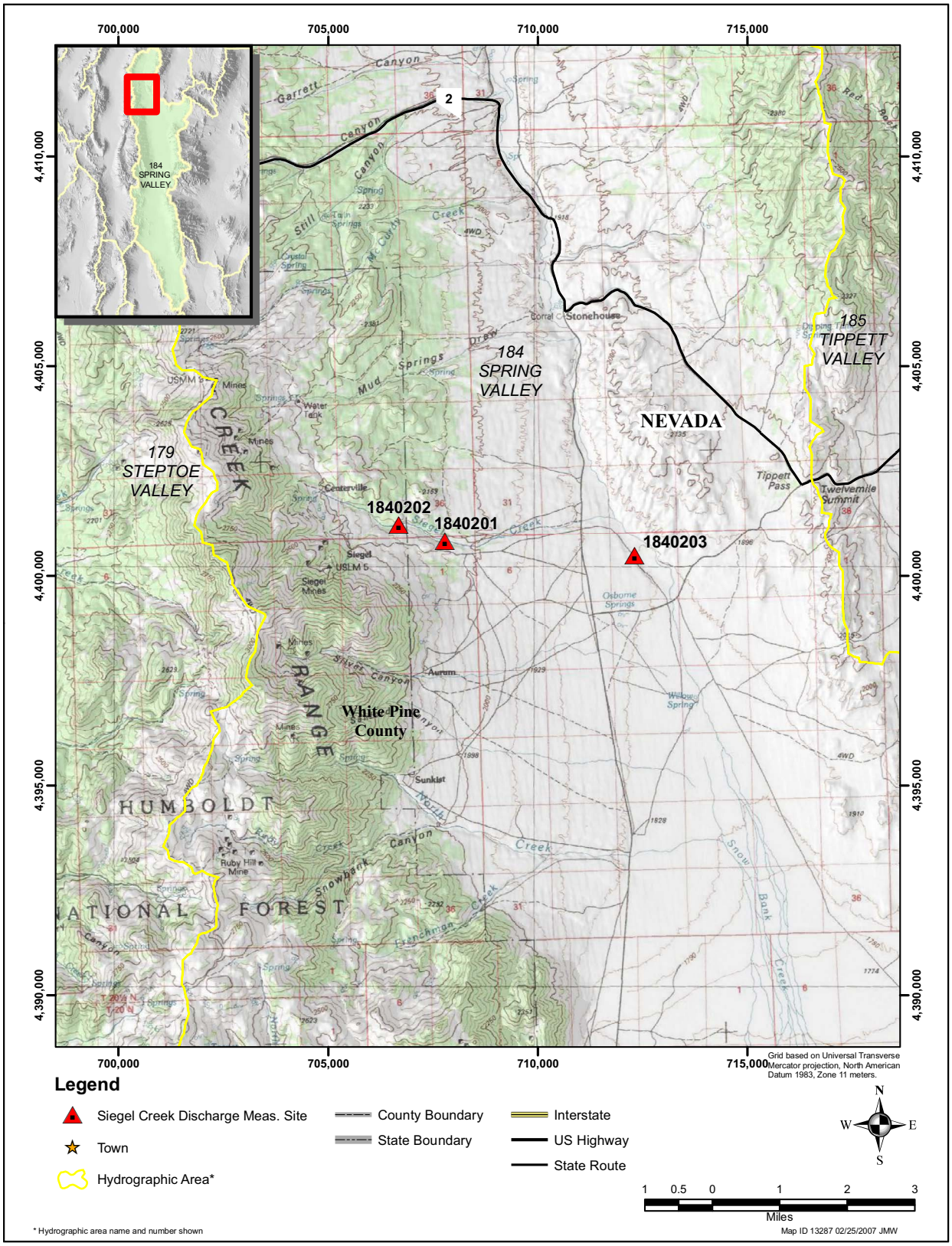

Figure 3-2
Measurement Sites on Siegel Creek

Figure 3-3
North Creek

The measurement section is located 15 to 20 ft below the head of the diversion channel. Since late 2006 only a portion of the flow is captured by the diversion. An additional measurement section located in the natural channel is used to measure the total flow at the mountain block. The estimated annual discharge is 1.24 cfs or 898 afy.

The diversion is in poor condition below the measurement section, and the diverted water stays in the channel approximately 75 ft before it returns to the main channel.

3.1.5 Frenchman Creek

Frenchman Creek is located in northern Spring Valley, and its measurement site is identified as station number 1840501 on Figure 3-1. The drainage area is located on the eastern slope of the Schell Creek Range and is approximately 5 mi^2 in area. Elevations range from 6,520 ft-amsl near the measurement section to 8,970 ft-amsl, with an average elevation of 7,690 ft-amsl. Only 27 percent of that area is above 8,000 ft-amsl. The surficial geology of the drainage area is comprised of carbonate rocks (63 percent), volcanic rocks (33 percent), with the balance being alluvial deposits.

The natural channel has steep grass- and brush-lined banks composed of fine-grained materials like sand and silt with some small gravel. The bed material in the channel is composed of poorly sorted small boulders, cobbles, and gravels.

The estimated flow of Frenchman Creek to be 0.54 cfs (391 afy). During periods of base flow, the entire flow of the creek is lost to infiltration and ET before it reaches the main road.

3.1.6 Muncy Creek

Muncy Creek discharges from the eastern slope of the Schell Creek Range, and its measurement sites are identified as station numbers 1840601 and 1840602 on Figure 3-1. The drainage area is 14 mi^2 and ranges in altitude from 6,180 ft-amsl at its mouth to 9,820 ft-amsl at the basin divide, with an average altitude of 8,270 ft-amsl. Approximately 70 percent of the drainage area is above 8,000 ft-amsl. Carbonate and volcanic rocks comprise 59 percent and 28 percent, respectively, of the surficial geology. The balance of the outcrops are intrusive (1 percent), metamorphic (1 percent), clastic (3 percent), and alluvial deposits (8 percent).

Muncy Creek is a natural channel with steep brush-lined banks. The bank material is poorly sorted, with clasts from sand and silt to large cobbles and small boulders at the measurement site.

Miscellaneous discharge measurements have been made by USGS during 1964 at station number 1840601 and by SNWA from 1998 to present at site 1840602. Based on the measurement data the annual average discharge is estimated to be 1.90 cfs (1,380 afy).

No water use records exist for Muncy Creek prior to 1907, but it is likely with the establishment of the Silver Mountain mining district in 1870 that the water has been used for mining and milling activities (Hose et al., 1976). The waters of Muncy Creek have been used for stock, and irrigation.

3.1.7 Kalamazoo Creek

Kalamazoo Creek flows westward from the eastern slope of the Schell Creek Range, and its measurement sites are identified as station numbers 1840701 through 1840704 on Figure 3-1. The 15 mi^2 area that Kalamazoo Creek drains has a surficial geology comprised of carbonate rocks (39 percent), volcanic rocks (40 percent), clastic rocks (13 percent), metamorphic rocks (4 percent), and alluvial material (4 percent). The average altitude of the drainage area is 8,250 ft-amsl, with altitudes ranging from 6,220 ft-amsl at the mountain block-alluvial fan interface to 10,900 ft-amsl at the basin divide along the south fork of the creek.

The channel of Kalamazoo Creek at 1840704 is incised into poorly sorted alluvial deposits that fill the bottom of a narrow canyon. The banks are lined with grasses and willows with quartzite outcrops within a short distance. The bed material is poorly sorted, with particles ranging from sand to large cobbles and small boulders that are angular to subangular in roundness (Figure 3-4).

From 1964 to 1992, miscellaneous measurements were periodically made by USGS, and SNWA has made miscellaneous measurements at station number 1840704 from 1993 to present. In 1997, SNWA

Figure 3-4
Kalamazoo Creek

conducted a study to determine gains and losses in Kalamazoo Creek below the confluence of the north and south forks of Kalamazoo Creek. For that study, during July 16-18, 1997, discharge measurements were made at four sites along Kalamazoo Creek identified on Figure 3-5. Station number 1840704 was measured at the mouth of the canyon above the 4-ft flume diversion structure. Station number 1840703 was measured above the USFS Kalamazoo Creek campground and below the fault/contact. Station number 1840702 was measured above the fault and contact of carbonate and quartzite rocks, and station number 1840701 was measured below the confluence of the north and south forks, with results listed in Table 3-2.

The results of the synoptic measurements indicate a small loss of approximately 0.17 cfs between sites 1840701 and 1840702. While the loss is within the range of measurement error, the consistency of the discharge measurements at both sites supports this conclusion. Between sites 1840702 and 1840703 the measurement data shows an approximate 3.85 cfs gain at the structural contact between the carbonate and clastic rocks (Kalamazoo Spring). From 1840703 to 1840704, an approximate 1.13 cfs increase in discharge was observed. An average 4.85 cfs gain was observed between sites 1840701 to 1840704. An average annual discharge of 6.00 cfs (4,340 afy) is estimated for Kalamazoo Creek.

Water currently used for irrigation is divided by a splitter box and conveyed via unlined ditch to its place of use on the valley floor.

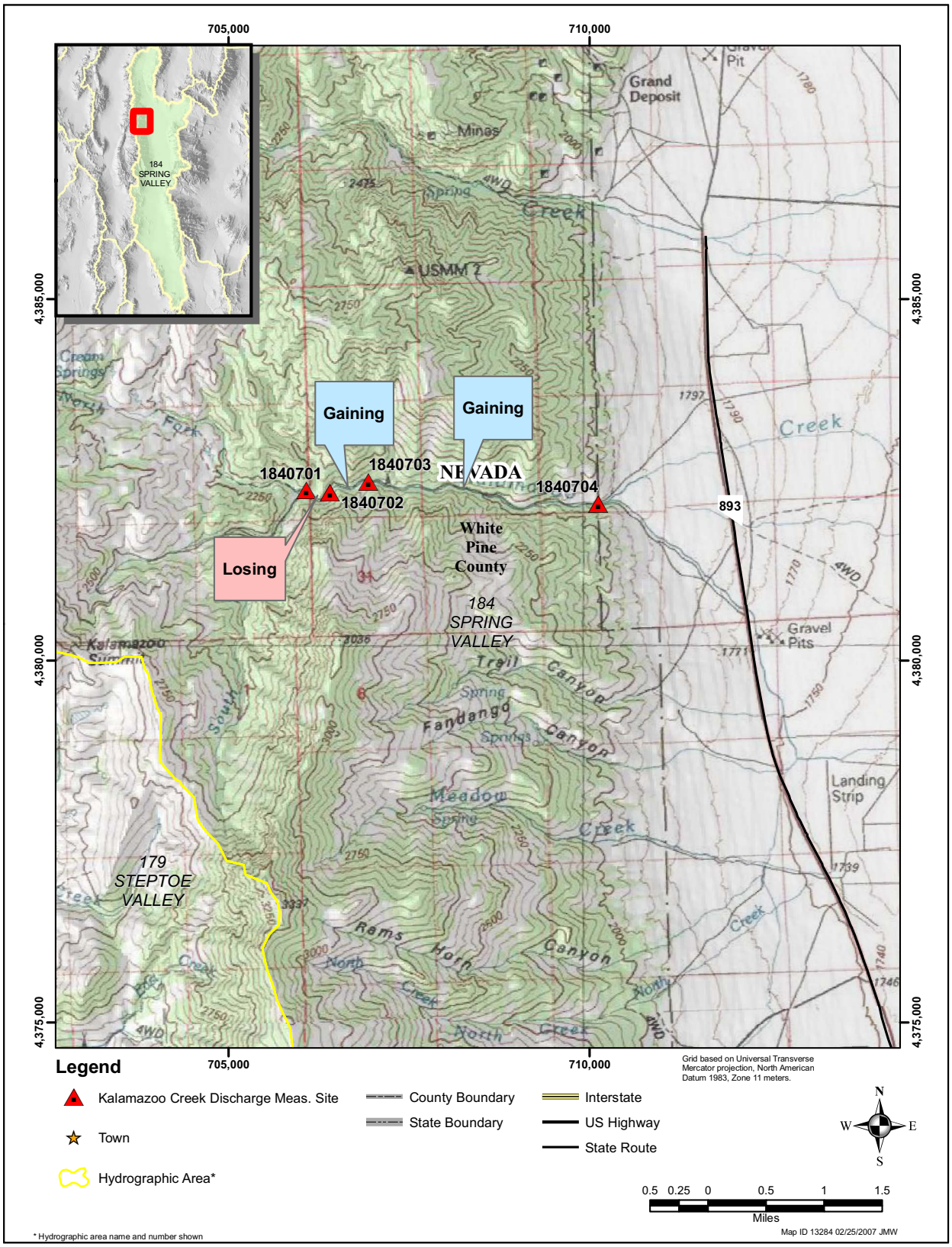

Figure 3-5
Measurement Sites on Kalamazoo Creek

Table 3-2
Synoptic Discharge Measurement Data for Kalamazoo Creek

Station Number	Date	Discharge (cfs)	Measurement Rating	Average Discharge (cfs)	Change in Average Discharge (cfs)
1840701	7/16/1997	0.994	Fair	--	--
1840702		0.803	Fair	--	-0.191
1840703		4.66	Fair	--	3.86
1840704		5.62	Good	--	0.960
1840701	7/17/1997	1.09	Good	1.01	--
		0.999	Good		
		1.02	Good		
		0.937	Good		
1840702	7/17/1997	0.885	Good	0.846	-0.164
		0.815	Good		
		0.837	Good		
1840703	7/17/1997	4.59	Fair	4.68	3.83
		4.76	Fair		
1840704	7/17/1997	5.74	Fair	5.82	1.14
		5.75	Good		
		5.83	Good		
		5.98	Good		
		5.79	Good		
1840701	7/18/1997	1.05	Good	1.04	--
		1.02	Good		
1840702		0.884	Good	0.884	-0.156
1840703		4.86	Fair	4.74	3.86
		4.63	Fair		
1840704		6.04	Good	6.04	1.30

3.1.8 Piermont Creek

Piermont Creek drains a portion of the Schell Creek Range, and its measurement site is identified as station numbers 1840801 and 1840802 on Figure 3-1. The drainage area varies in elevation from 6,510 ft-amsl at its mouth, to 11,070 ft-amsl at the basin divide, with an average elevation of 8,900 ft-amsl. Eighty-one percent of the nearly 8 mi^2 catchment is above 8,000 ft-amsl. The surficial geology of the drainage area is comprised of clastic rocks (54 percent), metamorphic rocks (27 percent), and carbonate rocks (19 percent). A measurement section for Piermont Creek is shown in Figure 3-6.

Piermont Creek is incised 4 to 6 ft in a narrow canyon partially filled with alluvial deposits. The banks of the creek above the Piermont Mine are steep and densely lined with trees and brush. Below the mine, at the mouth of the canyon, the channel widens and at times of high water becomes braided. Large piles of mine waste occur near the stream, some of which have partially eroded into the stream

Figure 3-6
Piermont Creek

bed. The loosely consolidated, poorly sorted bed material is angular to subrounded and ranges in size from coarse gravel to small boulders at site 1840802.

Miscellaneous measurements were made at Piermont Creek by USGS from 1976 to 1982 and by SNWA from 1996 to 2005. Descriptions of the USGS measurement site match the location of the SNWA measurement site, so all discharge data are considered equivalent. The estimated long-term annual discharge is 1.68 cfs (1,220 afy). During July 1999, SNWA performed a synoptic discharge study to determine the gaining and losing reaches of Piermont Creek (Table 3-3). The data collected indicate a loss of 0.68 cfs between 1840801 and 1840802. Considering the consistency of the measured values at both sites, this is considered to be an accurate number. The water is most likely lost to infiltration into the less consolidated material between the measurement sections.

3.1.9 Garden Creek

Garden Creek drains a portion of the eastern slope of the Schell Creek Range through a narrow canyon, and its measurement site is identified as station number 1840901 on Figure 3-1. This catchment ranges in elevation from 6,250 to 10,830 ft-amsl at the basin divide, with an average elevation of 8,400 ft-amsl. This is one of the smaller drainages in Spring Valley, covering an area of nearly 3 mi^2. The surficial geology of the drainage area is 88 percent metamorphic rocks and 12 percent clastic rocks.

Table 3-3
Synoptic Discharge Measurement Data for Piermont Creek

Station Number	Date	Time	Discharge (cfs)	Measurement Rating	Average Discharge (cfs)	Change in Average Discharge (cfs)
1840801	7/14/1999	10:05	3.44	Fair	3.50	--
		11:00	3.54	Fair		
		12:00	3.59	Fair		
		13:00	3.46	Fair		
		14:00	3.45	Fair		
1840802	7/14/1999	10:30	2.90	Good	2.82	-0.68
		11:28	2.87	Good		
		12:29	2.74	Good		
		13:30	2.83	Good		
		13:55	2.74	Good		

Figure 3-7 provides a photo of Garden Creek at the measurement cross section. Heavy vegetation growing in the channel and canyon controls the channel's morphology. Garden Creek is often split into multiple channels at or below the mountain block. At the measurement cross section, the channel is incised below its banks nearly 2 ft. Bed material consists of subangular to subrounded clasts of metamorphic and clastic rocks.

Discharge measurements have been made at Garden Creek since 1998. The average annual streamflow is estimated to be 0.39 cfs (282 afy).

3.1.10 Bassett Creek

Bassett Creek drains a portion of the eastern slope of the Schell Creek Range, and its measurement sites are identified by station numbers 1841001 and 1841002 on Figure 3-1. The elevation ranges from 6,600 ft-amsl at the measurement section to 11,880 ft-amsl at the basin divide, with an average elevation of 9,440 ft-amsl. Of the 6 mi^2 drainage area, 86 percent is above 8,000 ft-amsl. The surficial geology is comprised primarily of clastic rocks (65 percent) and metamorphic rocks (35 percent). The channel is heavily overgrown with trees and brush and is characterized by large boulders and cobbles that are rounded to subrounded in nature. The channel is incised to approximately 1.5 ft-bgs and has steep banks. Discharge at Bassett Creek was measured quarterly from 1964 through mid-1992; after mid-1992 the discharge was measured on an annual basis.

Synoptic discharge measurements were made on Bassett Creek on July 26, 2000, by SNWA (Table 3-4). Station number 1841001 was chosen approximately 1.7 mi upstream of station number 1841002, which is located at the mountain block-alluvial fan interface. A loss of 0.55 cfs was observed between the two sites over a distance of approximately 1.7 mi, which equates to 0.32 cfs lost per mile (Figure 3-8). The average annual streamflow for Bassett Creek is 4.99 cfs or 3,610 afy.

Figure 3-7
Garden Creek

Table 3-4
Synoptic Discharge Measurement Data for Bassett Creek

Station Number	Date	Time	Discharge (cfs)	Measurement Rating	Average Discharge (cfs)	Change in Average Discharge (cfs)
1841001	7/26/2000	12:29	4.30	Fair	4.00	--
		13:30	3.68	Fair		
		15:00	4.02	Fair		
1841002	7/26/2000	12:00	3.28	Fair	3.45	-0.55
		12:55	3.58	Fair		
		14:00	3.49	Fair		

3.1.11 Little Negro Creek

Little Negro Creek drains a portion of the eastern slope of the Schell Creek Range, and its measurement site is identified as station number 1841101 on Figure 3-1. Little Negro Creek drains a small 3 mi^2 area that ranges in altitude from 6,320 ft-amsl at the measurement section above the diversion, to over 11,800 ft-amsl. The average altitude of the drainage area is 8,610 ft-amsl. The

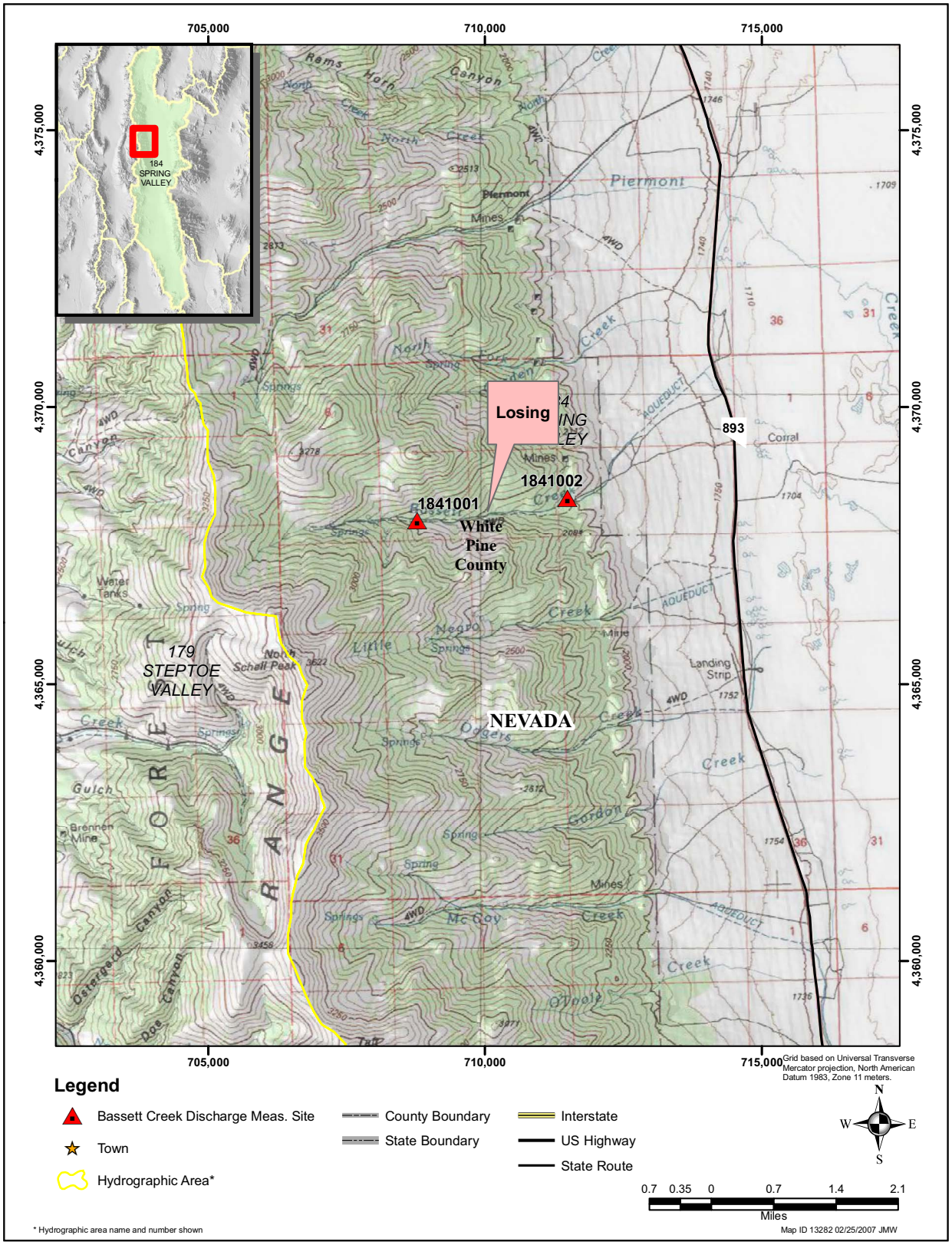

Figure 3-8
Measurement Sites on Bassett Creek

surficial geology is composed of 32 percent clastic rocks and 68 percent metamorphic rocks. Little Negro Creek is incised nearly 3 ft-bgs around the creek with steep grass- and brush-lined banks composed of silt, cobbles, and small boulders. The bed material is subangular to subrounded, and about 30 percent of the bed material is large cobbles to small boulders. The remainder of the bed material is coarse gravel to small cobbles. The discharge measurement site is located about 50 ft upstream of the diversion, where a small game trail crosses the creek. The water collects behind the diversion dam, forms a small reservoir, and is then conveyed down the hill via a buried pipeline. Figure 3-9 shows the measurement section for Little Negro Creek. The average annual discharge for the creek is 0.86 cfs (623 afy).

Figure 3-9
Little Negro Creek

3.1.12 Odgers Creek

Odgers Creek is located on the eastern slope of the Schell Creek Range, and its measurement site is identified as station number 1841201 on Figure 3-1. Odgers Creek drains a nearly 4 mi^2 area, with altitudes ranging from 6,500 to over 11,700 ft-amsl. With over 80 percent of the basin above 8,000 ft-amsl, it has an average elevation of 9,140 ft-amsl. The surficial geology of the drainage area is comprised of clastic rocks (49 percent), metamorphic rocks (40 percent), and alluvial material (11 percent). The creek is incised about 1.5 ft at the measurement cross section, 25 ft upstream of the diversion pipe. Bed material in Odgers Creek is composed of subangular to subrounded clasts of metamorphic and clastic rocks. The bed material ranges in size from coarse gravel to large cobbles

and small boulders. The channel has grass- and brush-lined banks near the measurement section, while upstream the heavy brush makes access to the channel difficult. The water enters a aqueduct just below the measurement section and travels approximately 1 mi down the alluvial fan to the road. From there the water discharges from the aqueduct and into a culvert, where it crosses the road and flows into two ditches that convey the water north and south to the appropriate place of use. During November 1972, USGS began making miscellaneous measurements about every two months. In 1975 the data collection was temporarily adjusted to reduce data collection to quarterly intervals. This was continued until June 1992, when USGS ceased making discharge measurements. In 1993 SNWA began its data collection program on this stream and made annual discharge measurements. The estimated annual discharge of Odgers Creek is 2.37 cfs (1,720 afy).

3.1.13 McCoy Creek

McCoy Creek is located on the eastern slope of the Schell Creek Range, and its measurement sites are identified as station numbers 1841301 through 1841303 on Figure 3-1. The creek drains an area of 6.2 mi^2. The average elevation of the drainage area is 9,400 ft-amsl, with a minimum elevation of 6,620 ft-amsl and a maximum elevation of 11,770 ft-amsl. Approximately 85 percent of the basin is above 8,000 ft-amsl and has a surficial geology composed of clastic rocks (53 percent), metamorphic rocks (37 percent), alluvial material (10 percent). In July and August 1964, USGS made two discharge measurements. McCoy Creek was not measured again until USGS began quarterly measurements in 1991 and ended in 1992. After 1992 SNWA began conducting annual discharge measurements of McCoy Creek. On July 15, 1999, SNWA conducted a synoptic discharge study on McCoy Creek. Two sites were selected: the first at the junction of the mountain block and alluvial fan, and the second 1.8 mi upstream. It was determined that the creek gained 1.85 cfs between the two sites. On October 25, 2005, a discharge measurement was made at the mountain block cross section (1841302) and also at the end of the aqueduct before the discharge is split into two streams (1841303). Only one measurement was made at each site, and these indicated a loss of over 1.5 cfs, indicating that the aqueduct is in poor condition or that between the intake of the aqueduct and site 1841302 the stream bed is very permeable. The estimated annual streamflow of McCoy Creek is 6.74 cfs (4,880 afy). Figure 3-10 shows a measurement section at McCoy Creek.

Diverted water is conveyed by aqueduct to the diversion structure, where the water can be split into two streams. One stream is diverted south into a ditch where the water is conveyed to its place of use, and the second allows the water to flow east, where after a short distance it can be diverted to irrigate crops at the northern portion of the place of use (Table 3-5).

3.1.14 Taft Creek

Taft Creek is located on the eastern slope of the Schell Creek Range, and its measurement sites are identified as station numbers 1841401 and 1841402 on Figure 3-1. Taft Creek drains an area of 4.3 mi^2, and has the highest average elevation, 9,800 ft-amsl, of any creek in Spring Valley. Elevations in the drainage range from 6,980 ft-amsl at the measurement section to over 11,700 ft-amsl at the basin divide. The surficial geology of the drainage is comprised of alluvial deposits (20 percent), clastic rocks (55 percent), and metamorphic rocks (25 percent). Taft Creek is measured in the 2.50-ft-wide concrete diversion before it enters a drop pipe. The natural channel

Figure 3-10
McCoy Creek

Table 3-5
Synoptic Discharge Measurement Data for McCoy Creek

Station Number	Date	Time	Discharge (cfs)	Measurement Rating	Average Discharge (cfs)	Change in Average Discharge (cfs)
1841301	7/15/1999	10:05	6.85	Fair	6.58	--
	7/15/1999	11:00	6.62	Fair		
	7/15/1999	13:20	6.40	Fair		
	7/15/1999	14:15	6.46	Fair		
1841302	7/15/1999	9:05	8.61	Good	8.43	1.85
	7/15/1999	9:46	8.33	Good		
	7/15/1999	10:35	8.51	Good		
	7/15/1999	11:30	8.70	Good		
	7/15/1999	12:31	8.46	Good		
	7/15/1999	13:30	7.98	Good		

above the diversion has steep brush-lined banks, and the bed material is subrounded to rounded clasts of metamorphic and clastic rocks. The discharge is measured at the diversion structure. The water is diverted via a concrete and rock dam and channel that funnels water through a drop pipe. The pipe conveys the water through to a larger diversion structure. At the lower diversion structure, which is a concrete and rock dam, the waters from South Taft Creek and Ranger Creek converge with the water from Taft Creek. At the lower diversion structure, the water can be routed into a large drop pipe or turned back to the natural channel (Figures 3-11 and 3-12).

Figure 3-11
Taft Creek

During 1964 USGS measured Taft Creek below South Taft Creek. These measurements are not considered equivalent to station number 1841401 and are reported under station number 1841402. Discharge has been measured intermittently at Taft Creek since 1980. In July 1991, USGS measured the discharge quarterly; these measurements ended in June 1992. The estimated average annual discharge of Taft Creek is 2.62 cfs (1,900 afy).

3.1.15 Ranger Creek

Ranger Creek is located on the eastern slope of the Schell Creek Range, and its measurement site is identified as station number 1843501 on Figure 3-1. The creek drains a relatively small area of 1.6 mi^2, and the drainage area ranges in altitude from 6,570 ft-amsl at the measurement site to over 11,400 ft-amsl at the basin divide, and averages nearly 8,490 ft-amsl. Sixty-nine percent or 1.1 mi^2 of the drainage area is above 8,000 ft-amsl, and the surficial geology is predominately metamorphic rocks (60 percent) with clastic rocks and alluvial deposits accounting for 20 percent each. Ranger Creek is a small creek with banks lined by vegetation. The estimated average annual discharge of Ranger Creek is 0.06 cfs (43 afy). The water is collected in the same diversion as Taft and South Taft creeks and is assumed to be used for irrigation (Figure 3-13).

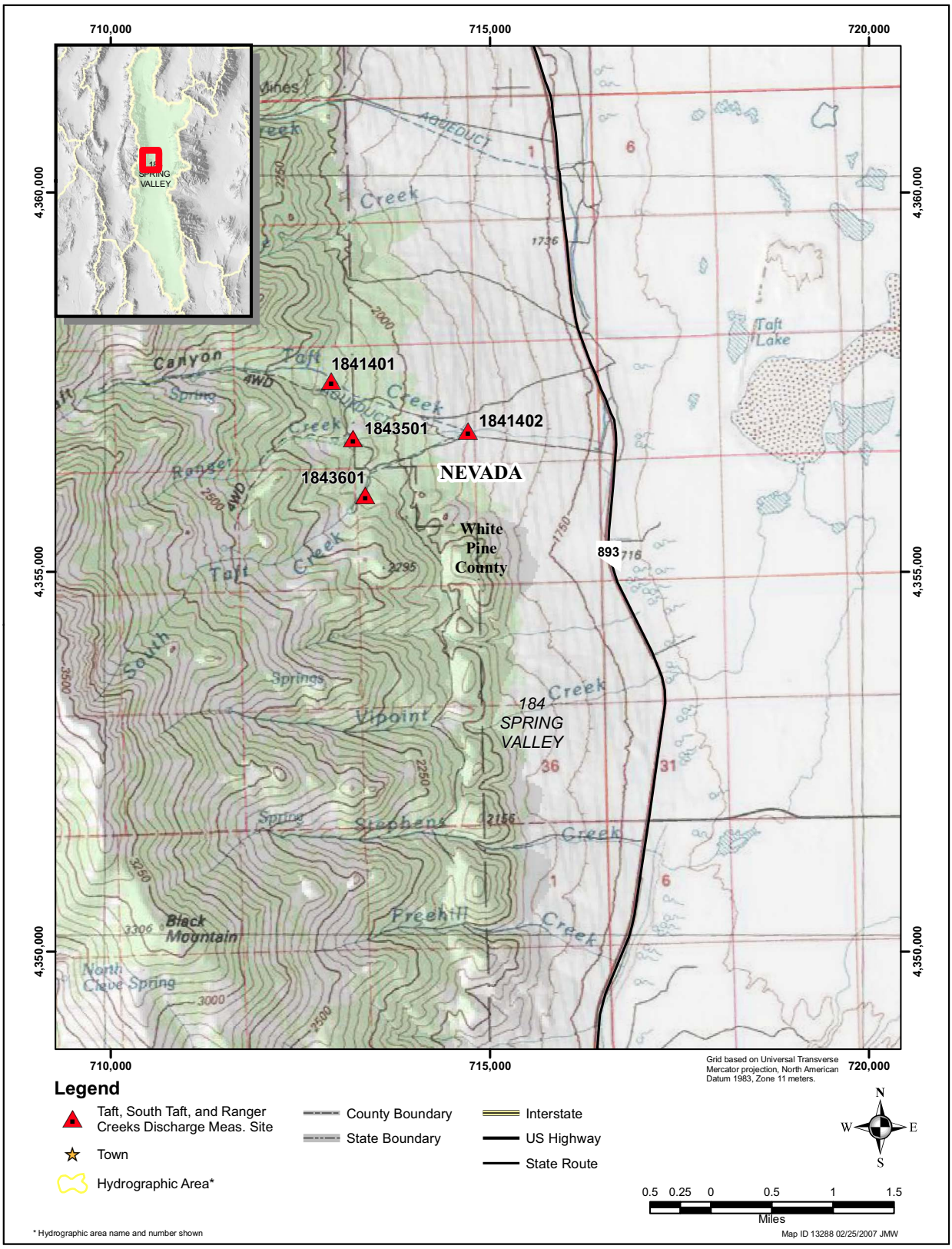

Figure 3-12
Measurement Sites on Taft, South Taft, and Ranger Creeks

Figure 3-13
Ranger Creek

3.1.16 South Taft Creek

South Taft Creek is located on the eastern slope of the Schell Creek Range, and its measurement site is identified as station number 1843601 on Figure 3-1. The creek drains an area of 3.2 mi^2, from an altitude of 11,730 at the basin divide to 6,570 ft-amsl at the measurement section. Nearly 75 percent of the drainage area is above 8,000 ft-amsl. The surficial geology of the drainage area is comprised of clastic rocks (41 percent), metamorphic rocks (22 percent), and alluvial deposits (37 percent).

The banks of South Taft Creek are steep and lined with willows and other vegetation. The left bank is at the foot of a hillside, and the creek is incised about 2 ft. Approximately 85 percent of the bed material has diameters larger than 6-in., and the channel is littered with large debris (Figure 3-14).

Figure 3-14
South Taft Creek

A discharge of 0.72 cfs was measured at South Taft Creek on July 25, 2006. The estimated mean annual discharge is 0.69 cfs or 500 afy.

3.1.17 Stephens Creek

Stephens Creek is located on the eastern slope of the Schell Creek Range, and its measurement site is identified as station number 1841501 on Figure 3-1. The creek drains a 3 mi^2 area that ranges in elevation from 6,560 ft-amsl at the measurement site to 11,480 ft-amsl at the basin divide, and averages 8,970 ft-amsl. More than 75 percent of the basin is over 8,000 ft-amsl. The surficial geology of the basin is composed of clastic rocks (58 percent) and metamorphic rocks (42 percent). The creek has steep brush-lined banks (Figure 3-15). At the measurement cross section above the diversion, the bed material is comprised of small cobbles and coarse gravel. A discharge of 0.99 cfs was measured July 25, 2006. The estimated mean annual discharge is 1.04 cfs or 753 afy.

The stream is diverted into an aqueduct through a square notch weir, where it is used for irrigation.

Figure 3-15
Stephens Creek

3.1.18 Cleve Creek

Cleve Creek, also known as Cleveland Creek, is located on the eastern slope of the Schell Creek Range, and its measurement sites are identified as station numbers 1841601 through 1841612 on Figure 3-1. Cleve Creek has a drainage area of 32 mi^2 making it the largest drainage area in Spring Valley. The surficial geology of the basin is composed of nearly equal amounts of carbonate (41 percent) and clastic rocks (57 percent), and 2 percent of the area is covered by alluvial deposits. The elevation at the USGS gaging station Cleve Creek near Ely, Nevada (10243700) is 6,200 ft-amsl. The creek is lined by steep banks and is incised approximately 4 ft at the gaging station (Figure 3-16).

USGS has maintained a gaging station on Cleve Creek intermittently since 1914. The complete period of record of Cleve Creek is as follows: June 1914 to December 1916; October 1959 to September 1967; October 1976 to September 1981; December 1982 to September 1987; and March 1990 to present. The long-term mean annual discharge is 10.5 cfs, the maximum and minimum average annual discharges were 22.2 in 1984 and 5.15 in 1960. In 2006 the mean annual discharge was 14.4 cfs (USGS, 2006) (Figure 3-17).

USGS conducted a synoptic discharge measurement study during the 1982 water year. The study primarily involved the south fork of Cleve Creek, which is upstream of the north fork of Cleve Creek.

Figure 3-16
Cleve Creek

A loss of 1.14 cfs was observed from station 1841601 to station 1841612 over a distance of 3.7 mi. Below station 1841612, the North Fork of Cleve Creek (1841606) was measured, and a discharge of 8.89 cfs was recorded. This fork contributes the majority, and at times the entirety, of the discharge in Cleve Creek. Assuming the losses and gains between station numbers 1841612 and 1841606, the combined discharge at the confluence (near site 1841607) of the North and South Forks of Cleve Creek was 9.08 cfs during the study. The discharge measured at station 1841610 was reported to be 8.97 cfs. When taking the measurement error into account, a loss of greater than 1 cfs was measured on the South Fork of Cleve Creek, and no measurable gain or loss could be determined below the North Fork of Cleve Creek (Figure 3-18) (Table 3-6).

SNWA conducted a similar study during July 14 and 15, 1997. The SNWA study consisted of four measurement sites from just below the confluence of the North and South Forks of Cleve Creek (1841607) to the gaging station Cleve Creek near Ely, Nevada (1841611). A seepage loss of 0.81 cfs was measured between these two points over the 2-day study (Table 3-7).

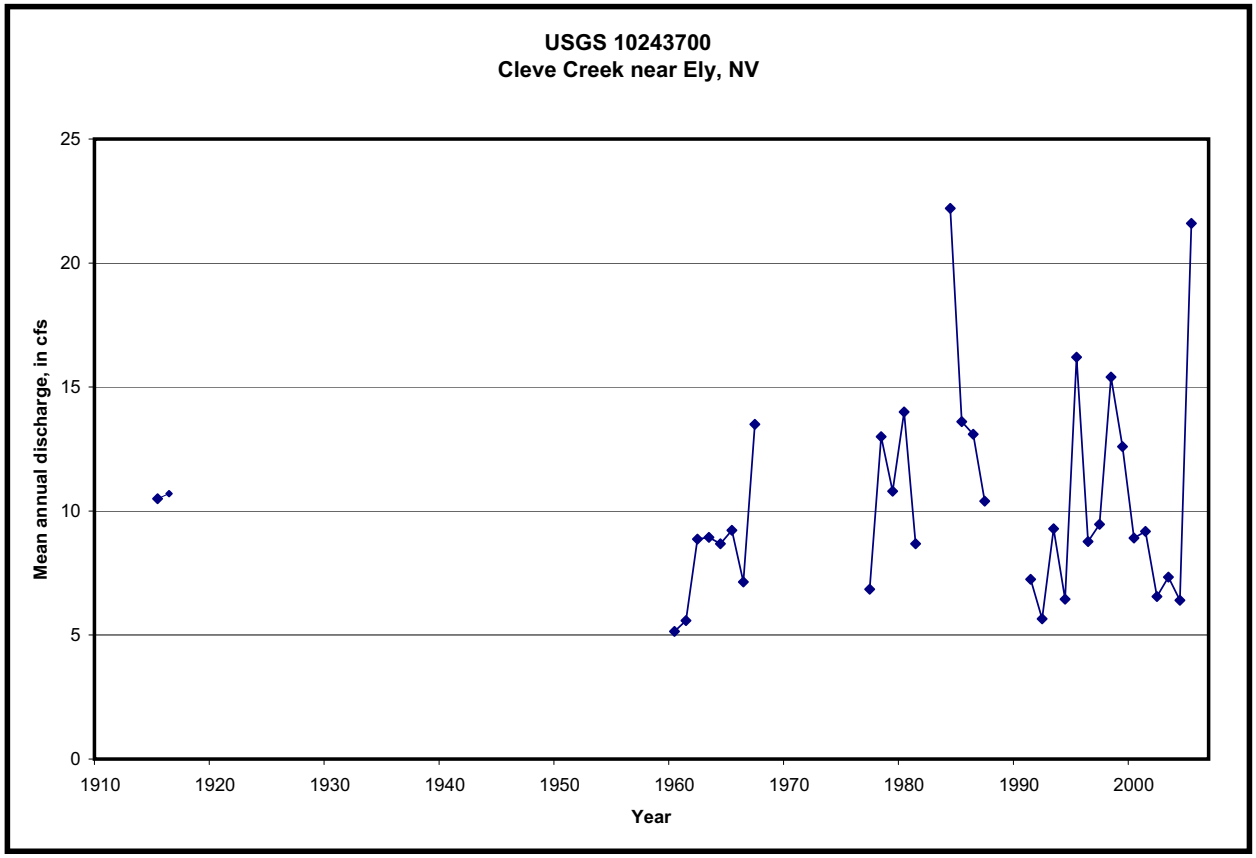

Figure 3-17
Hydrograph of Mean Annual Discharge at Cleve Creek near Ely, Nevada

Table 3-6
Synoptic Discharge Measurement Data for Cleve Creek - USGS

Station Number	Date	Time	Discharge (cfs)	Measurement Rating	Average Discharge (cfs)	Change in Average Discharge (cfs)
1841601	8/24/1982	--	1.33	--	--	--
1841602		--	1.13	--	--	-0.2
1841603		--	1.33	--	--	0.2
1841604		--	0.96	--	--	-0.37
1841605		--	0.17	--	--	-0.79
1841612		--	0.19	--	--	0.02
1841606		--	8.89	--	--	--
1841610		--	8.97	--	--	8.78
1841606	10/6/1987	--	5.97	--	--	--
1841612		--	0.03	--	--	--

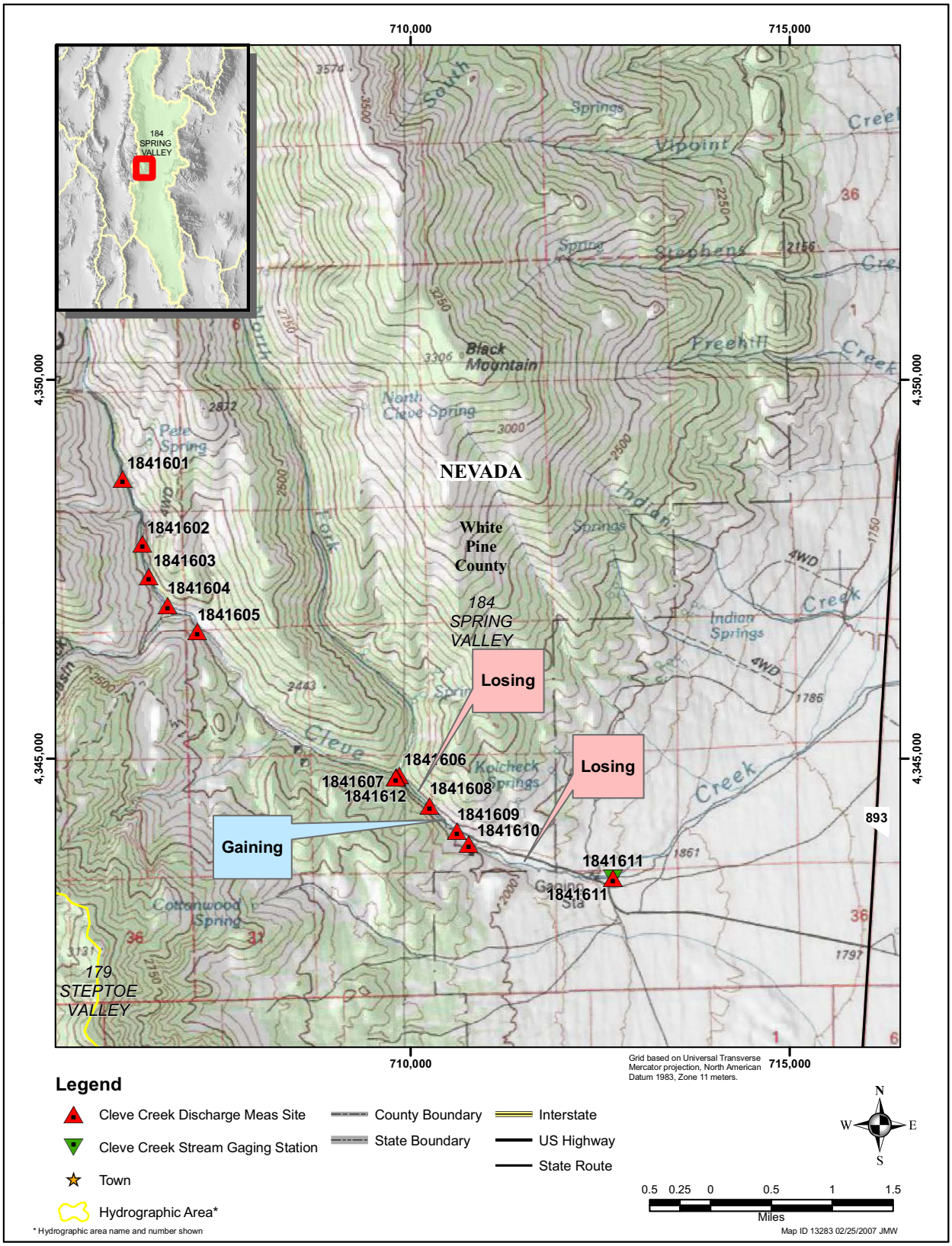

Figure 3-18
Measurement Sites on Cleve Creek

Table 3-7
Synoptic Discharge Measurement Data for Cleve Creek - SNWA

Station Number	Date	Time	Discharge (cfs)	Measurement Rating	Average Discharge (cfs)	Change in Average Discharge (cfs)
1841607	5/17/1993	--	37.9	Fair	38	--
1841607		--	38.1	Fair		--
1841608		--	34.8	Fair	--	-3.2
1841609		--	40.4	Fair	--	5.6
1841611		8:00	37.7	Fair	--	-2.7
1841607	7/14/1997	10:32	9.28	Fair	8.86	--
		11:25	9.09	Fair		
		12:50	8.78	Fair		
		13:42	8.81	Fair		
		14:35	8.55	Fair		
		15:25	8.64	Fair		
1841611	7/14/1997	11:20	7.11	Fair	7.60	-1.26
		13:30	8.27	Good		
		15:05	7.61	Good		
		16:30	7.43	Fair		
1841607	7/15/1997	8:36	8.35	Fair	8.39	--
		10:52	8.35	Fair		
		15:02	8.48	Good		
1841608	7/15/1997	10:40	6.41	Good	6.60	-1.79
		15:49	6.79	Fair		
1841609	7/15/1997	8:58	9.06	Fair	8.52	1.92
		13:11	8.52	Fair		
		15:00	7.97	Fair		
1841611	7/15/1997	9:48	8.98	Good	8.04	-0.48
		13:43	7.41	Fair		
		16:05	7.74	Good		
1841607	7/16/1997	6:15	8.26	Fair	--	--
1841608		6:52	8.16	Fair	--	-0.10
1841609		7:27	8.62	Fair	--	0.46
1841611		6:00	6.48	Fair	--	-2.14

3.1.19 Bastian Creek

Bastian Creek is located on the eastern slope of the Schell Creek Range, and its measurement site is identified as station number 1841701 on Figure 3-1. The creek drains an area of 2.7 mi^2, and the surficial geology is 99 percent carbonate rock and 1 percent alluvial deposits. Like other perennial streams, it is spring fed throughout the year. The highest point in the drainage area is nearly 10,500 ft-amsl. About 52 percent of the drainage area is above 8,000 ft-amsl. The discharge at Bastian Creek has been measured intermittently since 1998. The estimated average annual discharge is 2.75 cfs (1,990 afy). The spring is diverted from its natural channel near Bastian Spring and is conveyed via an unlined canal over the alluvial fan to its place of use (Figure 3-19).

Figure 3-19
Bastian Creek

3.1.20 Eightmile Creek

Eightmile Creek is located on the western slope of the Snake Range, and its measurement site is identified as station number 1841901 on Figure 3-1. The creek drains an area of 3.1 mi^2, and the surficial geology of the drainage area is composed of clastic rocks (68 percent), intrusive rocks (16 percent), carbonate rocks (13 percent), and alluvial deposits (3 percent). The elevation of the drainage area ranges from 6,570 ft-amsl at the measurement section to over 9,300 ft-amsl at the basin divide. The average elevation of the drainage area is nearly 8,100 ft-amsl, with about 57 percent of the drainage area above 8,000 ft-amsl.

The measurement cross section is located approximately 50 ft upstream from a small reservoir used for irrigation. The channel is shallow and narrow, and the stream bed is bedrock (Figure 3-20). Discharge was measured once in 1964 by USGS and then intermittently by SNWA since 1998. The estimated average annual discharge for Eightmile Creek is 0.98 cfs (710 afy).

3.1.21 Negro Creek

Negro Creek is located on the western slope of the Snake Range, and its measurement sites are identified as station numbers 1842001 through 1842005 on Figure 3-1. Draining nearly 28 mi^2, Negro Creek has one of the largest drainage areas in Spring Valley. The drainage has an average

Figure 3-20
Eightmile Creek

elevation of over 8,220 ft-amsl. Altitudes in the drainage area vary from 6,200 ft-amsl at the discharge measurement section to over 12,010 ft-amsl along the western slope of Mt. Moriah. The surficial geology is composed of carbonate rocks (78 percent), clastic rocks (13 percent), and a small amount of alluvial deposits (9 percent). The creek is incised, in a broad canyon, approximately 40 ft below the top of the alluvial fan. The banks of the creek are lined with heavy brush in the lower part of the drainage area and heavy brush and trees in the upstream portion of the drainage area (Figure 3-21).

Discharge measurements have been made intermittently by SNWA since 1998. During 2001, a synoptic discharge measurement study was conducted. On August 8, 2001, the discharge was measured at three sites on Negro Creek. The first site (1842001) was measured above the confluence of Salt Marsh Creek and Negro Creek (Figure 3-22). The second and third sites (1842002 and 1842003) were measured near the ranch house. No change in discharge was observed between sites 1842001 and 1842002, and a small increase in discharge of 0.27 cfs was observed between sites 1842002 and 1842003 (Table 3-8). On August 6, 2003, a measurement was made at sites 1842002 and 1842003 showing an increase in discharge of 0.65 cfs. The estimated long-term average discharge is 2.62 cfs (1,900 afy).

Figure 3-21
Negro Creek

3.1.22 Willard Creek

Willard Creek is located on the western slope of the southern Snake Range, and its measurement sites are identified as station numbers 1842101 and 1842102 on Figure 3-1. The creek drains an area of 3.8 mi^2, that ranges in elevation from 6,980 ft-amsl to over 11,500 ft-amsl, with an average elevation of over 8,800 ft-amsl. Approximately 75 percent of the nearly 4 mi^2 drainage area is above 8,000 ft-amsl. The surficial geology of the drainage area is comprised of metamorphic rocks (76 percent), intrusive rocks (13 percent), clastic rocks (1 percent), and alluvial material (10 percent).

Discharge was measured once by USGS in 1964 and then quarterly at station number 1842101 beginning July 1991 and ending June 1992. On July 26, 2006, SNWA established station number 1842102 (approximately 0.25 miles below site 1842101) due to accessibility. A discharge of 0.22 cfs and a temperature of 22.1°C was measured by SNWA at site 1842102 (Figure 3-23). The discharge was measured where the road crosses the creek. Below site 1842102 the creek is diverted into a small reservoir for irrigation. The estimated long-term average discharge is 0.92 cfs (666 afy).

3.1.23 Shingle Creek

Shingle Creek is located on the western slope of the Snake Range, and its measurement sites are identified as station numbers 1843101 through 1843105 on Figure 3-1. The creek drains an area of 2 mi^2, with altitudes in the drainage area ranging from 7,400 to 11,730 ft-amsl. The average elevation

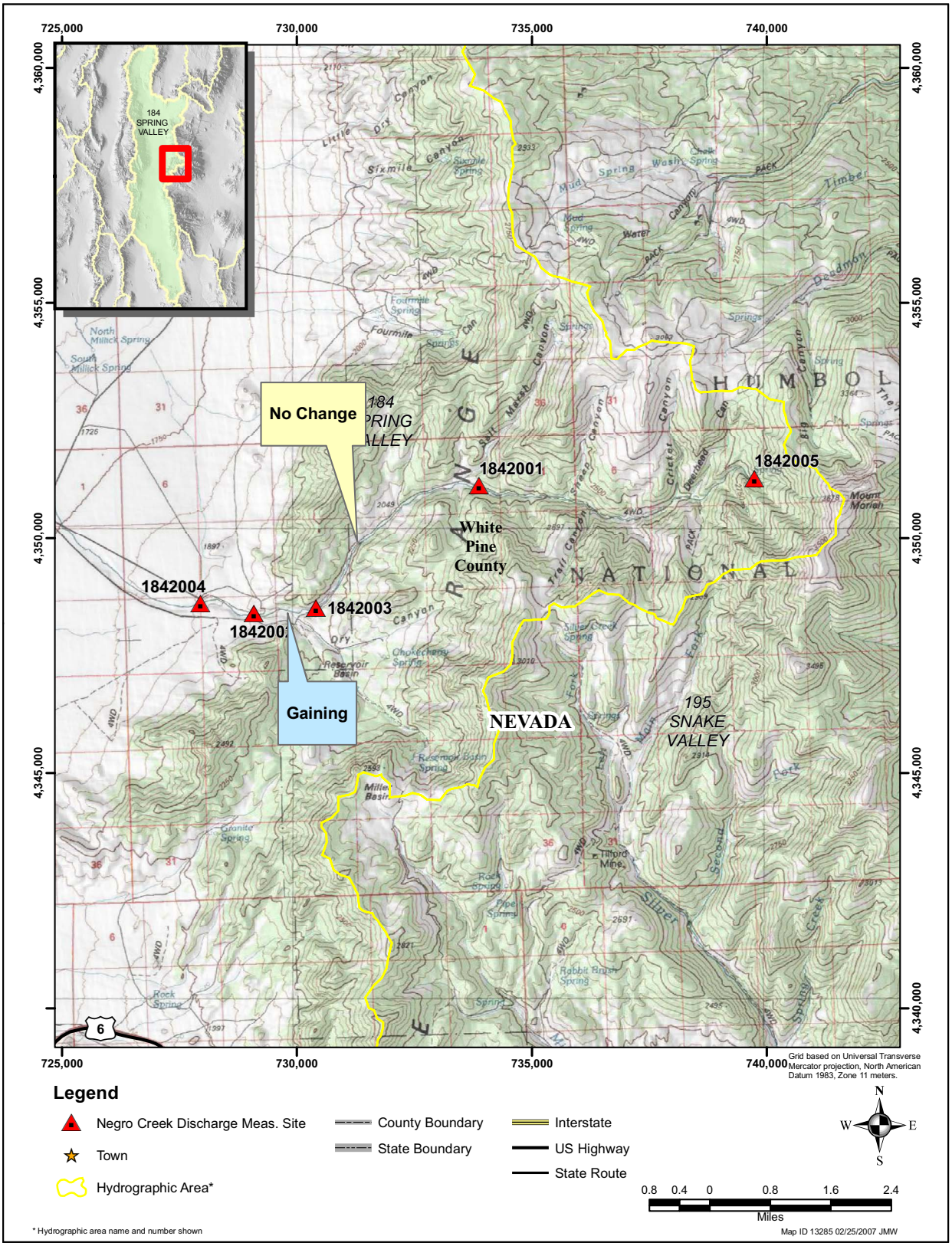

Figure 3-22
Measurement Sites on Negro Creek

Table 3-8
Synoptic Discharge Measurement Data for Negro Creek

Station Number	Date	Time	Discharge (cfs)	Measurement Rating	Average Discharge (cfs)	Change in Average Discharge (cfs)
1842001	8/8/2001	13:12	1.31	Good	1.35	--
		13:55	1.39	Good		
		14:49	1.36	Good		
1842002	8/8/2001	13:27	1.37	Fair	1.35	0.00
		14:35	1.32	Fair		
		15:30	1.35	Fair		
1842003	8/8/2001	11:09	1.51	Fair	1.62	0.27
		12:00	1.61	Fair		
		12:57	1.67	Fair		
		13:55	1.67	Fair		
		14:58	1.62	Fair		

Figure 3-23
Willard Creek

is 9,550 ft-amsl. The drainage area is comprised primarily of metamorphic rocks (88 percent), clastic rocks (6 percent), intrusive rocks (1 percent), and alluvial material (5 percent).

The channel of Shingle Creek is incised nearly 4 ft, below the surrounding area. The bed material is predominately cobbles to boulders. The banks are lined with grass, brush, trees and are steep. USGS operated and maintained the Shingle Creek near Great Basin National Park boundary near Osceola, Nevada gaging station from October 2003 through September 2004 (Table 3-9). The USGS, during June and October 2003, performed a synoptic discharge measurement study. The results showed little loss in both June and October (Elliott et al., 2006). SNWA made a discharge measurement during July 26, 2006, and recorded a flow of 1.14 cfs (Figure 3-24). The average annual flow is estimated to be 0.96 cfs or 695 afy.

Table 3-9
Synoptic Discharge Measurement Data for Shingle Creek

Station Number	Date	Time	Discharge (cfs)	Measurement Rating	Average Discharge (cfs)	Change in Average Discharge (cfs)
1843103	6/11/2003	13:10	2.02	Fair	--	--
1843101	6/11/2003	12:55	2.02	Fair	2.02	0.00
		13:00	1.99	Poor		
		13:20	2.05	Poor		
		13:42	2.01	Poor		
1843105	6/11/2003	12:25	1.71	Fair	--	-0.31
1843104	6/11/2003	12:10	1.83	Fair	--	0.12
1843103	10/9/2003	9:30	0.77	Fair	--	--
1843101	10/9/2003	9:20	0.73	Poor	0.73	-0.04
		9:36	0.72	Poor		
		9:47	0.73	Poor		
		9:57	0.74	Poor		
1843105	10/9/2003	9:10	0.63	Fair	--	-0.10
1843104	10/9/2003	8:55	0.59	Poor	--	-0.04

3.1.24 Pine and Ridge Creeks

Although Pine and Ridge creeks are two separate creeks, because of their small drainage areas and close proximity to each other they are treated in this report as one drainage area. Pine and Ridge creeks drain the western flank of Wheeler Peak in the Snake Range, and their measurement sites are identified as station numbers 1842701 and 1842702 on Figure 3-1. The combined drainage area of these two creeks is 4.0 mi^2. Elevation in the drainage area ranges from approximately 7,190 to nearly 13,000 ft-amsl at Wheeler Peak, and the average elevation is about 9,100 ft-amsl. The surficial geology of the drainage area is comprised mainly of alluvial deposits (14 percent), metamorphic rocks (64 percent), clastic rocks (15 percent), and intrusive rocks (7 percent). Figure 3-25 shows a measurement section on the creek.

Figure 3-24
Shingle Creek

Figure 3-25
Pine and Ridge Creeks below their Confluence

In 1964, USGS measured Pine and Ridge creeks at the downstream end of an aqueduct. During a field visit to Pine and Ridge creeks on August 16, 2006, SNWA measured a discharge of 0.93 cfs. The stream was incised approximately 2 ft into the surrounding alluvial deposits; the banks were steep and some were undercut. The alluvial material was obviously being held in place by the tree roots. An estimated annual discharge of 1.18 cfs was calculated for Pine and Ridge Creeks.

3.1.25 Williams Creek

Williams Creek drains the southwest flank of Wheeler Peak located in the Snake Range, and its measurement site is identified as station number 1842602. The average elevation of the drainage area is 9,680 ft-amsl, with altitudes ranging from 7,340 to over 11,760 ft-amsl. The surficial geology of the drainage is nearly equal amounts of clastic and intrusive rocks, 49 and 50 percent, respectively, with 1 percent of alluvial material.

USGS operated and maintained the Williams Canyon above aqueduct near Minerva, Nevada gage during water years 2003 and 2004. On August 16, 2006, the discharge measured by SNWA was 0.64 cfs. The discharge measurement was made near the upstream end of the diversion channel located approximately 150 ft downstream of the former USGS gaging station site. The channel is in a heavily forested area and has coarse bed material. The natural portion of the channel, upstream of the measurement section, is incised in the alluvial material and has steep undercut banks. The estimated average annual discharge is 1.02 cfs or 738 cfs (Figure 3-26).

Figure 3-26
Williams Creek

3.1.26 Swallow Canyon Creek

Swallow Canyon Spring is in Swallow Canyon approximately 2 mi northeast of Minerva, Nevada, and 2.5 mi east of Shoshone, Nevada, on the west slope of the Snake Range. The spring discharges from Paleozoic carbonate rocks at the mouth of Swallow Canyon. The discharge of Swallow Canyon Spring is variable because of seasonal fluctuations of its water source and local precipitation events. Discharges have been measured at over 50 cfs and at times the creek has been observed as dry. The estimated long term mean annual discharge is 7.65 cfs or 5,540 afy. The bed material at the discharge measurement section ranges in size from large boulders to coarse gravel, the majority being medium-sized boulders. The velocity of the creek is high enough to prevent finer sediment accumulation. The left bank is a steep carbonate cliff; the right bank is lined with heavy brush consisting mainly of wild roses and stinging nettles and is comprised of cobbles, gravel, and boulders. The channel is incised approximately 15 ft along the canyon's southern edge. The discharge is measured 10 to 25 ft above the diversion pipe depending upon the stage of the creek (Figure 3-27). The diversion infrastructure consists of a small concrete dam and 20-in. diameter head gate, which can allow any portion of the discharge to be divided between the diversion or the natural channel. The diversion after the head gate is a 20-in. diameter pipe, which after approximately 400 yards, transitions from pipe to open channel. The water is then routed toward Minerva, Nevada, where it is used on the valley floor to support livestock and agriculture. During the unusually high runoff period in 2005, the diversion structure and head gate were destroyed (Figures 3-28 and 3-29).

Figure 3-27
View of Swallow Canyon Spring Looking Upstream from Diversion Structure toward Discharge Measurement Section

Figure 3-28
Swallow Canyon Diversion Structure, July 28, 2004

Water is bypassing the structure in the upper right of the photograph.

Figure 3-29
Close-Up of Destroyed Swallow Canyon Diversion Structure, July 28, 2005

3.2 Snake Valley (HA 195)

Snake Valley comprises the central portion of the Great Salt Lake Desert Flow System. The valley is approximately 95 mi long and 40 mi wide. Snake Valley is bounded by the Snake Range to the west, the Confusion Range, Conger Range, and Burbank Hills to the east, and a low alluvial divide to the south. To the north, Snake Valley opens to the Great Salt Lake Desert. U.S. Highway 50 traverses the southern one-third of the valley and runs east-west through the Snake Range. As part of this study 24 streams were inventoried in Snake Valley. Figure 3-30 provides the locations of the measurement stations on these streams.

After an evaluation and analysis of miscellaneous discharge measurements for ungaged perennial streams, through the end of the 2006 water year, the perennial streamflow for Snake Valley was estimated using the continuous gage records for Trout Creek near Callao, UT and Cleve Creek near Ely, Nevada. Trout Creek was used to estimate streams north of Mt. Moriah and Cleve Creek was used to estimate the creeks south of Mt. Moriah. Two creeks were chosen because during the verification process it was determined that Trout Creek over estimated the discharges for the creeks south of Mt. Moriah. Cleve Creek was chosen to estimate the southern portion of Snake Valley because of its lengthy and complete record. The estimated average annual perennial streamflow, not including Warm Springs or Big Springs, for Snake Valley is 43,000 afy.

The perennial streamflow estimates derived by this analysis are within the range of previous estimate by Hood and Rush (1965), in which an estimate of 58,000 afy was reported for the mean annual streamflow for the valley, including runoff in Hamlin Valley; the eastside of Snake Valley; and Warm Spring and Big Springs. To perform a relative comparison, the 58,000 afy must be discounted by 20,000 afy. This figure is arrived at by subtracting Hamlin Valley (7,000 afy), the East side of Snake Valley (1,000 afy) and an estimated 6,000 afy each for Big Spring and Warm Spring. This leaves a remainder of 38,000 afy. The estimate derived by this analysis is larger than the estimate reported by Hood and Rush (1965) because this analysis included an additional seven sites (six perennial streams and one additional gaging station). Based on this analysis, the perennial streamflow from these seven streams is approximately 8,000 afy. When added to the 38,000 afy reported by Hood and Rush (1965), an estimate of 46,000 afy is computed, which is very close to the 43,000 afy derived by the analysis in this report (Table 3-10). Based on the available data for perennial streams within Snake Valley, the perennial streamflow derived by this analysis is consistent with that reported by Hood and Rush (1965).

General physical attributes about the each drainage area, such as measurement location, size of drainage area, and station identification numbers, are listed in Appendix A; miscellaneous discharge measurements are given in Appendix C. Detailed descriptions of the streams of Snake Valley are given in the following sections. Annual discharges for each gaging station are listed in Appendix B. Detailed descriptions of the streams of Snake Valley are provided in the following sections and the physical attributes of the drainage areas are given in Appendix D.

3.2.1 Indian Farm Creek

Indian Farm Creek drains from the eastern flank of the Deep Creek Range Snake Valley, Juab County, Utah, and its measurement site is identified as station number 1950101 on Figure 3-30. The Indian

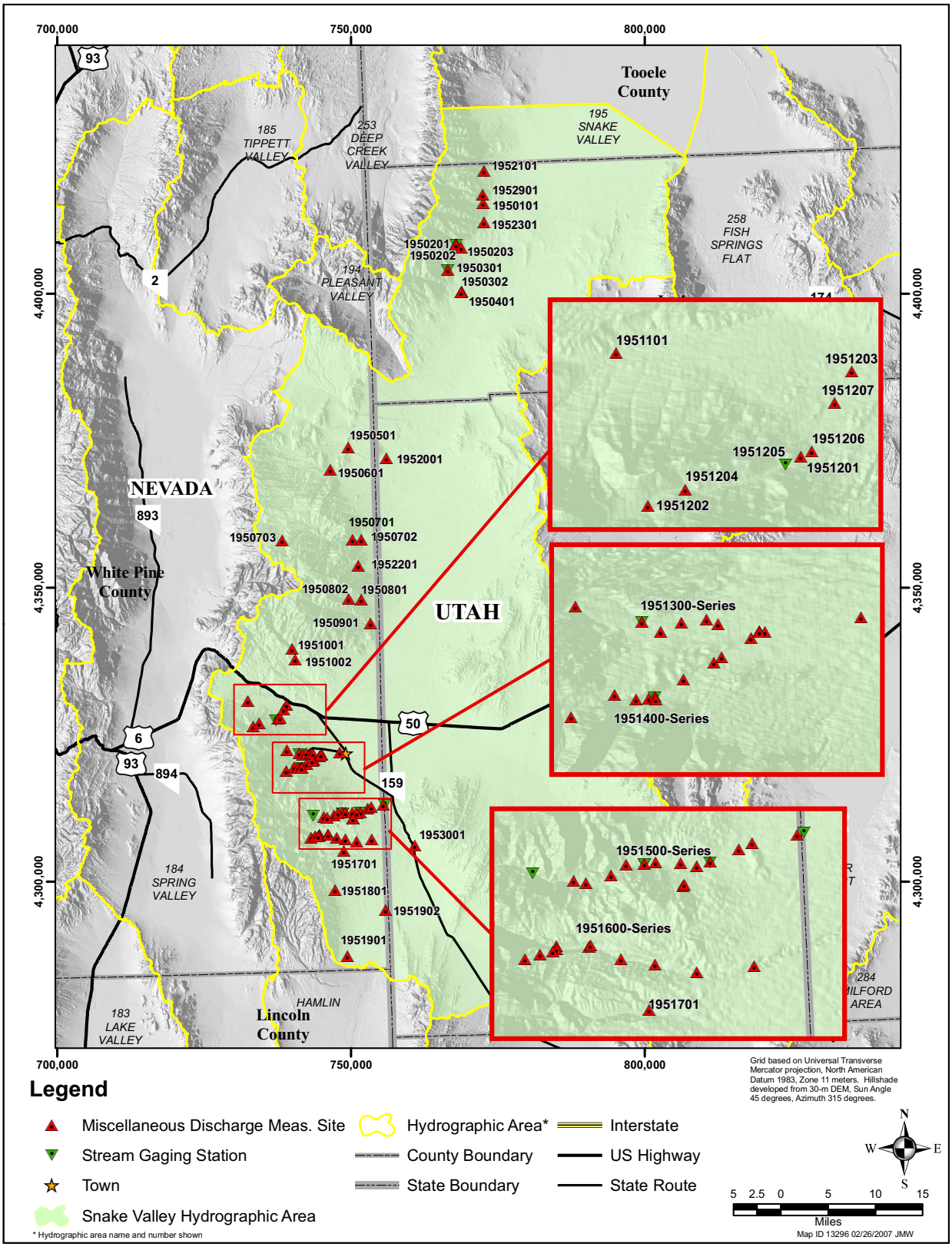

Figure 3-30
Measurement Sites on Streams in Snake Valley, Nevada and Utah

Table 3-10
Mean Annual Discharge for Snake Valley (HA 195)
(Page 1 of 2)

Station Number	Station Name	Data Source	Gaging Station used to estimate ungaged discharge	Measurement Date	Date Accuracy	Q_a Discharge (cfs)	Measurement Rating	Q_b MDV (cfs)	Q_a/Q_b	Q_M (2006)	Q_m (2006)	Long Term Average (2006)
1950101	Indian Farm Creek near Callao, UT	Squires, 2004	Trout Creek near Callao, UT	10/31/2004	Day	1.53	Fair	2.5	0.612	5.68	3.48	4.24
		SNWA		8/3/2005	Day	4.71	Fair	4.4	1.07	5.68	6.08	
		SNWA		10/4/2005	Day	1.11	Good	2	0.555	5.68	3.15	
1950401	Birch Creek above Trout Creek near Trout Creek, UT	Squires, 2004	Trout Creek near Callao, UT	10/31/2004	Day	1.55	Fair	2.5	0.620	5.68	3.52	4.39
		SNWA		8/3/2005	Day	4.08	Fair	4.4	0.927	5.68	5.26	
1950701	Smith Creek above Diversion and Trail Head	USGS, 1964	Trout Creek near Callao, UT	7/12/1964	Day	3.16	--	7.1	0.445	5.68	2.53	4.66
		SNWA		8/4/2005	Day	6.41	Fair	4.2	1.53	5.68	8.69	
		SNWA		10/4/2005	Day	0.975	Good	2	0.488	5.68	2.77	
1950801	Hampton Creek above Forest Boundary	USGS, 1964	Cleve Creek near Ely, NV	7/12/1964	Day	1.18	--	8.6	0.137	10.5	1.44	0.728
		Squires, 2004		10/30/2004	Day	0.2	Poor	7.7	0.026	10.5	0.273	
		SNWA		8/4/2005	Day	0.721	Fair	16	0.045	10.5	0.472	
1950901	Hendrys Creek at Bridge to Rock Quarry	USGS, 1964	Cleve Creek near Ely, NV	7/12/1964	Day	3.09	--	8.6	0.359	10.5	3.77	2.62
		USGS, 1991		7/17/1991	Day	2.57	--	6.7	0.384	10.5	4.03	
		USGS, 1992		10/24/1991	Day	1.30	--	5.5	0.236	10.5	2.48	
		USGS, 1992		12/7/1991	Day	1.21	--	5.4	0.224	10.5	2.35	
		USGS, 1992		3/18/1992	Day	1.26	--	6.3	0.200	10.5	2.10	
		Squires, 2004		10/30/2004	Day	1.25	Good	7.7	0.162	10.5	1.70	
		SNWA		8/4/2005	Day	3.41	Fair	16	0.213	10.5	2.24	
		SNWA		10/4/2005	Day	2.64	Good	12	0.220	10.5	2.31	
1951002	Silver Creek 0.8 miles above Forest Boundary	SNWA	Cleve Creek near Ely, NV	8/4/2005	Day	9.62	Fair	16	0.601	10.5	6.31	5.10
		SNWA		10/4/2005	Day	4.44	Good	12	0.370	10.5	3.88	
1951101	Weaver Creek above Sage Creek	Squires, 2004	Cleve Creek near Ely, NV	10/29/2004	Day	0.00	Excellent	7.9	0.00	10.5	0.00	0.383
		SNWA		8/4/2005	Day	1.17	Fair	16	0.073	10.5	0.766	

Table 3-10
Mean Annual Discharge for Snake Valley (HA 195)
(Page 2 of 2)

Station Number	Station Name	Data Source	Gaging Station used to estimate ungaged discharge	Measurement Date	Date Accuracy	Q_a Discharge (cfs)	Measurement Rating	Q_b MDV (cfs)	Q_a/Q_b	Q_M (2006)	Q_m (2006)	Long Term Average (2006)
1951201	Strawberry Creek at National Forest Boundary[a]	USGS, 1964	Cleve Creek near Ely, NV	7/12/1964	Day	1.85	--	8.6	0.215	10.5	2.26	1.46
		Elliott et al, 2006		2003	Year	--	--	--	--	--	0.700	
		Elliott et al, 2006		2004	Year	--	--	--	--	--	0.460	
		Squires, 2004		10/29/2004	Day	0.75	Fair	7.9	0.095	10.5	0.998	
		SNWA		8/4/2005	Day	4.43	Fair	16	0.277	10.5	2.91	
1951508	Snake Creek (Site 8)	USGS, 1964	Cleve Creek near Ely, NV	7/11/1964	Day	7.55	--	8.8	0.858	10.5	9.01	9.50
		SNWA		8/24/1993	Day	5.91	Fair	6.5	0.908	10.5	9.53	
		USGS, 2003		10/7/2003	Day	2.31	Fair	5.6	0.413	10.5	4.34	
		SNWA		8/4/2005	Day	23.0	Fair	16	1.44	10.5	15.1	
1951605	Big Wash at Hidden Canyon Guest Ranch	USGS, 1964	Cleve Creek near Ely, NV	7/11/1964	Day	1.80	--	8.8	0.205	10.5	2.15	1.44
		Squires, 2004		10/28/2004	Day	0.590	Fair	8.4	0.070	10.5	0.74	
1951701	Lexington Creek at National Forest Boundary	USGS, 1991	Cleve Creek near Ely, NV	7/17/1991	Day	0.00	--	6.7	0.00	10.5	0.00	0.226
		USGS, 1992		10/24/1991	Day	0.00	--	5.5	0.00	10.5	0.00	
		USGS, 1992		12/7/1991	Day	0.00	--	5.4	0.00	10.5	0.00	
		Squires, 2004		10/28/2004	Day	0.00	Excellent	8.4	0.00	10.5	0.00	
		SNWA		8/3/2005	Day	1.84	Fair	17	0.108	10.5	1.13	
Total Estimated Long-Term Annual Discharge for Ungaged Streams (cfs)												**34.7**

Note:
Q_a = Measured discharge at the ungaged stream;
Q_b = Mean daily discharge at the gaged stream for the same day Q_a was measured;
Q_m = Unknown long-term mean annual flow at the ungaged stream;
Q_M = Long-term mean annual flow at the gaged stream;
Q_M is from Trout Creek near Callao, UT and Cleve Creek near Ely, NV.

[a]Annual discharge includes 2 years of gaging station record published in Elliott et al, 2006

Trout Creek Measured Long Term Annual Discharge (cfs)	5.68
Granite Creek Measured Long Term Annual Discharge (cfs)	4.33
Lehman Creek Measured Long Term Annual Discharge (cfs)	5.67
Baker Creek Measured Long Term Annual Discharge (cfs)	9.08
Total Estimated Discharge (cfs)	59.5
Total Estimated Discharge (afy)	43,005

Farm Creek drainage area is approximately 6 mi^2 with nearly 60 percent of the area higher than 8,000 ft-amsl. The drainage area ranges in elevation from 5,520 ft-amsl at the mouth of the canyon, to about 12,000 ft-amsl at Haystack Peak, with an average basin elevation of approximately 8,540 ft-amsl. The surficial geology of the drainage area is composed primarily of Tertiary intrusive rocks (80 percent) and Quaternary-Tertiary alluvial deposits (20 percent).

The channel of Indian Farm Creek is moderately incised, and the bed material at the cross section is 90 to 95 percent fine sand to coarse gravel (less than 0.75 in.) of granitic origins (Figure 3-31).

Miscellaneous discharge measurements were made during August and October, 2005. On August 3, 2005, the discharge was 4.71 cfs and on October 4, 2005, 1.11 cfs was measured. An average annual discharge is estimated to be 4.24 cfs (3,070 afy).

Indian Farm Creek is diverted via an unlined ditch and is then conveyed to the valley floor, where the water is used for irrigation and livestock.

Figure 3-31
Indian Farm Creek

3.2.2 Granite Creek

Granite Creek drains southwestward from the southern slope of Ibapah Peak and the northern slope of Red Mountain in the Deep Creek Range Snake Valley, and its measurement sites are identified as station numbers 1950201 through 1950203 on Figure 3-30. Granite Creek's drainage area is approximately 8 mi^2, with approximately 75 percent of the area above 8,000 ft-amsl in elevation.

Elevations range from 6,350 ft-amsl near the Granite Creek gaging station to 12,070 ft-amsl near the basin divide. The average drainage area elevation is 9,070 ft-amsl. The surficial geology is composed of intrusive rocks (45 percent), clastic rocks (3 percent), metamorphic rocks (35 percent), and alluvial deposits (17 percent).

Bed material is very coarse, with 80 to 85 percent exceeding 4 in. in size and an absence of fine-grained material indicating regular occurrences of high velocities. The banks of the creek are composed mainly of coarse metamorphic and granitic gravels and sands held in place by tree roots and grasses (Figure 3-32).

Figure 3-32
Granite Creek near Callao, Utah

Granite Creek is measured by USGS; its discharge data is published annually as Granite Creek near Callao, Utah station (10172875), by USGS-Utah District. Mean daily discharge values are computed from gage height records, and these records are available from June 2003 to present. The mean annual discharge is 4.33 cfs (3,135 afy) (USGS, 2006). The gaging station is located on the right bank approximately 50 ft upstream of an agricultural diversion. The gage pool is controlled by a Cippoletti weir, with a V-notch weir in the center to measure low flows.

The diversion works appear able to divert all but the highest flows of the creek into an aqueduct that conveys the water to the valley floor, where it is used for irrigation and livestock.

3.2.3 Trout Creek

Trout Creek drains the southern slope of Red Mountain and the eastern flank of the Deep Creek Range, and its measurement sites are identified as station numbers 1950301 and 1950302 on Figure 3-30. Trout Creek drains an area of approximately 8 mi^2, with 82 percent of the area above 8,000 ft-amsl. The drainage elevations range from 6,190 ft-amsl near the gaging station to over 11,000 ft-amsl at the hydrographic basin divide, and the average elevation is 9,200 ft-amsl. The surficial geology is composed of metamorphic rocks (80 percent) and Quaternary-Tertiary alluvial deposits (20 percent). Figure 3-33 shows a measurement section for Trout Creek.

Figure 3-33
Trout Creek near Callao, Utah

Mean daily discharges are computed from gage height records recorded at the Trout Creek near Callao, Utah (10172870) gaging station. Records at Trout Creek are available from October 1958 to September 1995 and from July 2002 to present. During water year 2006, the annual discharge was 4.54 cfs (3,290 afy). The mean, minimum, and maximum annual discharges are 5.68, 2.07 (1989), and 16.3 cfs (1983), respectively (Figures 3-34 and 3-35) (USGS, 2006).

Downstream from the mouth of the canyon, Trout Creek flows into an unlined channel across a large alluvial fan, where it joins Birch Creek and flows onto the valley floor. On October 31, 2004, the discharge of Trout Creek was 0.90 cfs, measured above the confluence with Birch Creek. According

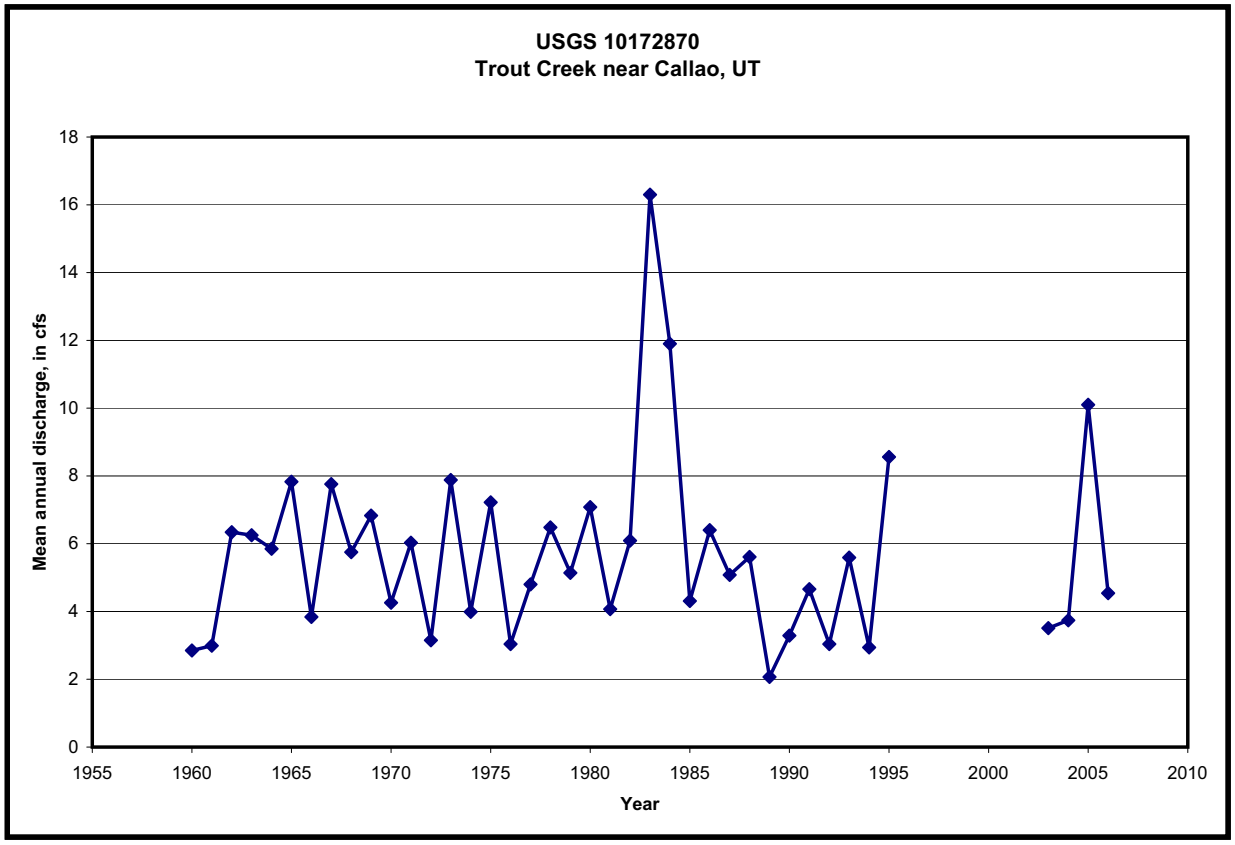

Figure 3-34
Hydrograph of Mean Annual Discharge at Trout Creek near Callao, Utah

to Meinzer (1911) the water of Trout and Birch creeks was used for irrigation at two ranches. Currently the water is used on the valley floor for irrigation and livestock and supports a large grove of tamarisk and Russian olive trees.

3.2.4 Birch Creek

Birch Creek drains the western flank of the Deep Creek Range, and its measurement site is identified as station number 1950401 on Figure 3-30. The drainage area of Birch Creek is approximately 9 mi^2, and elevations range from 5,210 ft-amsl at the mouth of the canyon to over 11,000 ft-amsl near the basin divide. Approximately 80 percent of the drainage area is above 8,000 ft-amsl, with an average elevation of 8,620 ft-amsl. The surficial geology of the drainage is composed of pre-Cambrian metamorphic rock (92 percent) and Quaternary-Tertiary alluvium (8 percent).

Birch Creek was measured above its confluence with Trout Creek. The channel is overgrown with willow and salt cedar; it is incised approximately 1.5 ft into the surrounding alluvial fan (Figure 3-36). The channel is armored with bed material of which 80 to 85 percent is 1- to 3-in. gravel. Velocities are high enough that there is very little fine-grained material in the channel, except for the banks.

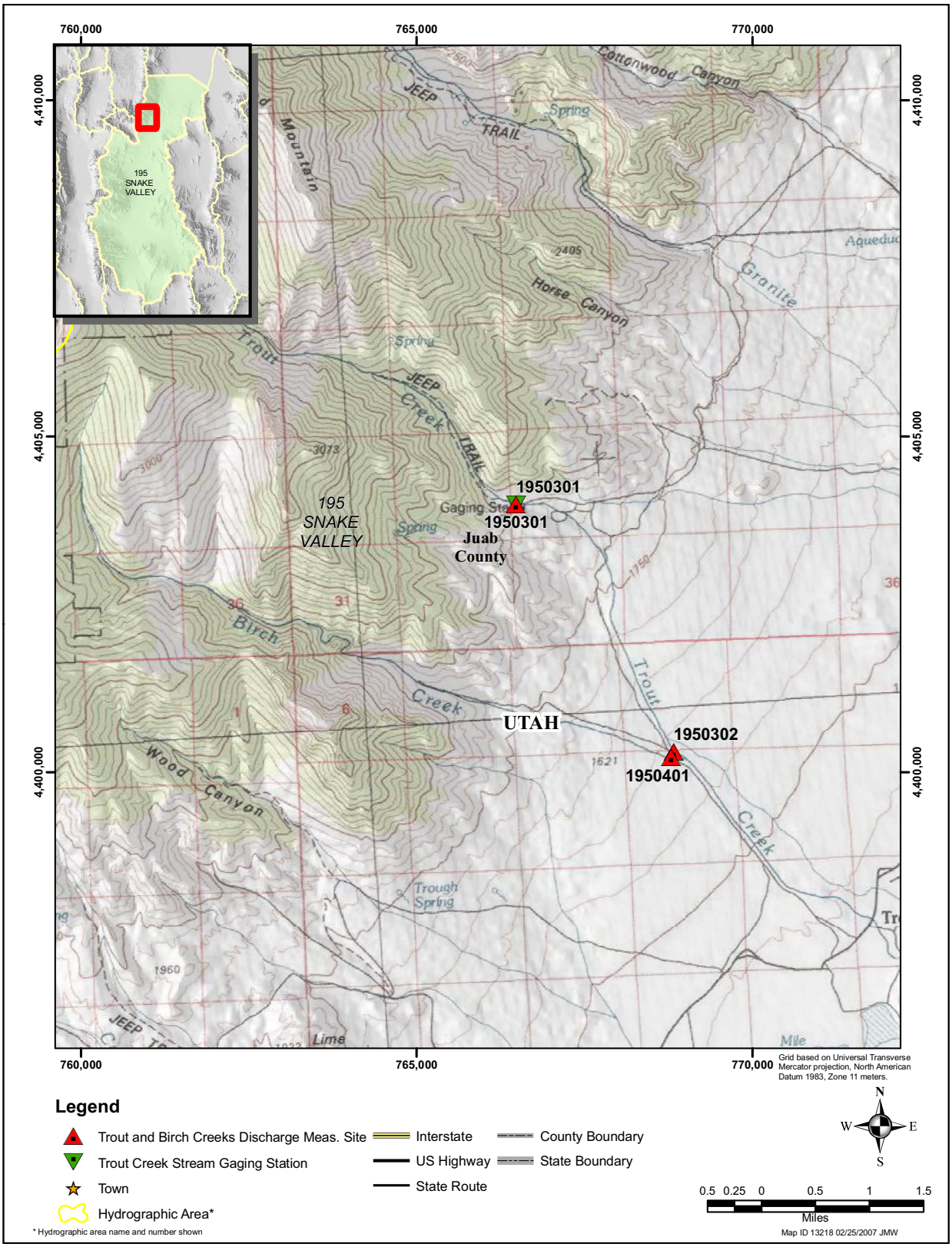

Figure 3-35
Measurement Sites on Trout and Birch Creeks

Figure 3-36
Birch Creek

Discharge was measured during October 2004 and October 2005. The estimated mean annual discharge for Birch Creek is 4.39 cfs (3,180 afy).

An unknown quantity of water may be diverted via pipeline to the town of Trout Creek. Because of access issues to the site where the creek exits the mountain block, no accurate description of diversion works or amount of water diverted was made as part of this study.

3.2.5 Swan Creek

Swan Creek is located on the western side of Snake Valley, and its measurement site is identified as station number 1950501 on Figure 3-30. The drainage basin's elevations range from 5,840 ft-amsl at Devil's Gate to about 9,000 ft-amsl near the basin divide. The average elevation of the drainage area is 7,130 ft-amsl, and 14 percent of the 24 mi^2 drainage area is above 8,000 ft-amsl. The surficial geology of the drainage is composed carbonate rock (84 percent) and alluvial material (16 percent).

Field visits by Squires (2004) and SNWA in 2005 observed no flow at Devil's Gate (Figure 3-37).

Figure 3-37
Swan Creek at Devil's Gate

One diversion is constructed at Devil's Gate. The diversion structure is a wide stone concrete dam approximately 3 ft high and 6 ft wide. The dam has a 2-in. polyvinyl tube that conveys water to a guzzler on the downstream side of Devil's Gate.

3.2.6 Marble Wash

Marble Wash is located in the northern part of the Snake Range, and its measurement site is identified as station number 1950601 on Figure 3-30. Approximately 44 percent of the 22-mi^2 drainage area is over 8,000 ft-amsl in elevation. The drainage area ranges in elevation from 6,180 to over 9,000 ft-amsl, with an average elevation of 7,960 ft-amsl. The surficial geology of the drainage is composed of carbonate rocks (98 percent) and clastic rocks (2 percent).

Field observations by Squires (2004) and SNWA in 2005 recorded no discharge. No diversions were observed, so it is assumed all water infiltrates or is lost to ET.

3.2.7 Smith Creek

Smith Creek drains the eastern slope of the Snake Range and the northern slope of Mount Moriah, and its measurement sites are identified as station numbers 1950701 and 1950702 on Figure 3-30. Smith Creek's drainage area is the largest in Snake Valley, approximately 55 mi^2, and ranges in altitude from 5,670 ft-amsl at the diversion structure to over 11,000 ft-amsl near the hydrographic divide. Approximately 70 percent of the drainage area is above 8,000 ft-amsl, with an average elevation of 8,490 ft-amsl.

The Smith Creek drainage area is one of the most lithologically diverse drainage areas in Snake Valley. The surficial geology of the drainage is composed of carbonate rocks (62 percent), Tertiary intrusive rocks (3 percent), pre-Cambrian clastic rocks (33 percent), and Quaternary-Tertiary alluvial material (2 percent). The upper part of the drainage area is highly dissected by numerous faults. Smith Creek has two main tributaries: Rye Grass Canyon in the north and Deadman Creek in the southern third of the drainage area.

Smith Creek is incised approximately 3 to 4 ft into the alluvium on the south side of the canyon. Bed material ranges from coarse sand to large cobbles and small boulders. Near the diversion the channel banks are lined with light brush, small trees, and grass (Figure 3-38).

Figure 3-38
Smith Creek

During 2005 two discharge measurements were made upstream from the diversion. On August 4, the discharge was 6.41 cfs, and on October 4, it was measured as 0.98 cfs. The estimated average annual discharge is 4.66 cfs (3,370 afy).

Smith Creek is diverted approximately 250 ft above the wilderness boundary. The diversion is formed by riprap held together by wire mesh. This forms a small dam and grade-control structure that diverts the flow from the main channel into a drop box, from which the water is conveyed to the valley floor via aqueduct where it is used for irrigation and livestock.

3.2.8 Hampton Creek

Hampton Creek drains the southeastern slope of Mount Moriah in the Snake Range, and its measurement sites are identified as station numbers 1950801 and 1950802 on Figure 3-30. Hampton Creek's drainage area is approximately 8 mi^2, with approximately 75 percent of the drainage area above 8,000 ft-amsl in elevation. The drainage area ranges from 6,390 to 11,030 ft-amsl in elevation, with the average elevation being approximately 8,830 ft-amsl. The surficial geology is composed of clastic rocks (63 percent) and carbonate rocks (37 percent).

The Hampton Creek channel closely follows the southern edge of the canyon and is narrow and incised into the small amount of alluvium. The majority of the bed material is fine sand and silt with some larger metamorphic clasts. Approximately 25 percent of the bed material at the cross section was greater than 2 in. in size. The banks are steep and heavily vegetated with large trees and thick brush (Figure 3-39).

Figure 3-39
Hampton Creek

A discharge of 0.72 cfs was measured on August 4, 2005. The annual average discharge is estimated to be 0.728 cfs (530 afy). Figure 3-40 shows the measurement locations for Hampton Creek.

No diversions were observed, and it is believed that the water infiltrates into the alluvial fan before it reaches the fan's toe.

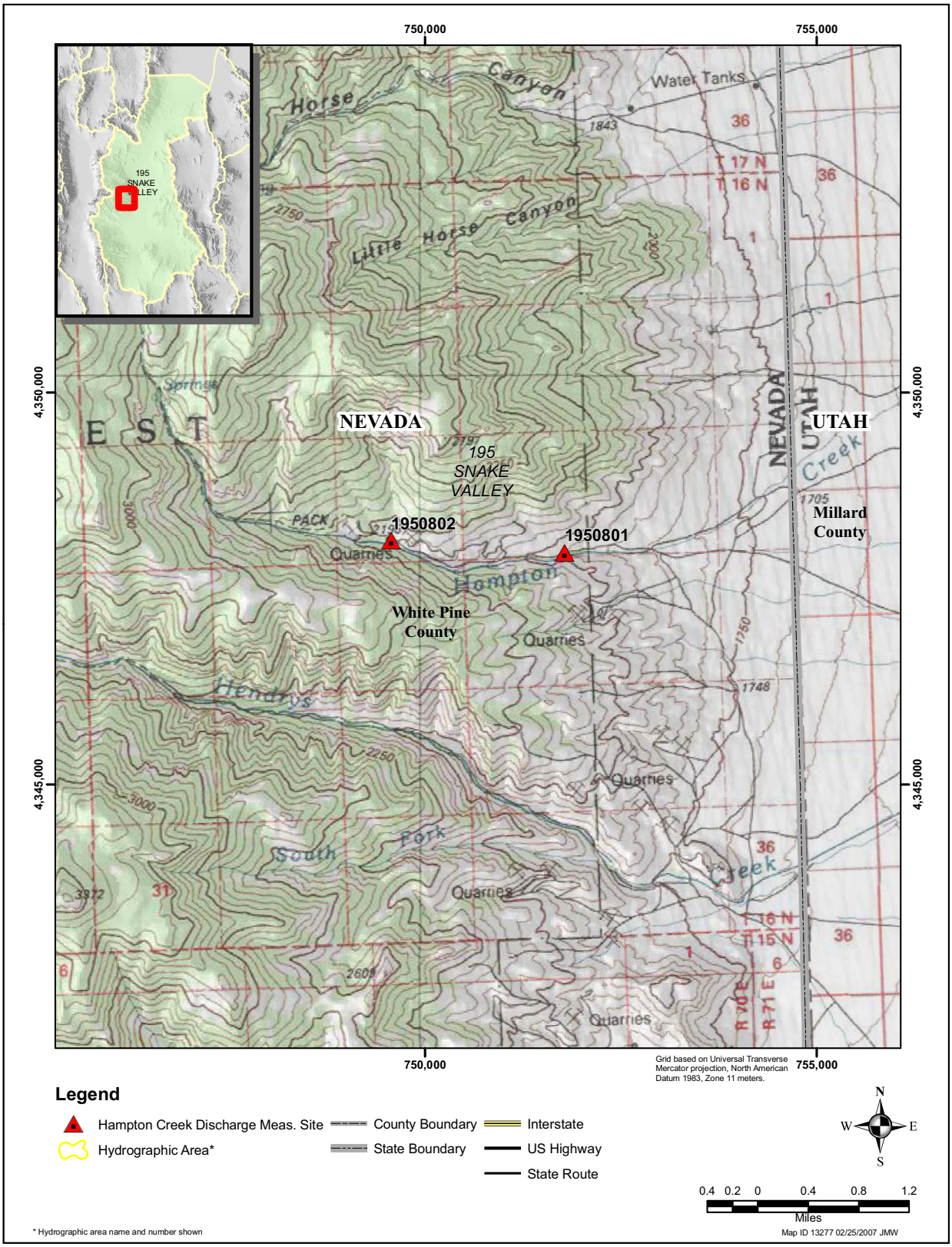

Figure 3-40
Measurement Sites on Hampton Creek

3.2.9 Hendrys Creek

Hendrys Creek is located along the eastern side of the Snake Range, and its measurement site is identified as station number 1950901 on Figure 3-30. The drainage area of Hendrys Creek is nearly 24 mi^2, and elevations range from 5,640 ft-amsl at the mouth of the canyon to 12,040 ft-amsl near the hydrographic divide. The average altitude for the drainage area is 8,990 ft-amsl. Seventy-five percent of the drainage area exceeds 8,000 ft-amsl in elevation. Like Hampton Creek, the surficial geology of Hendrys Creek's drainage area is composed of carbonate rocks (38 percent) and clastic rock (62 percent).

Hendrys Creek channel has been highly modified by mining activities in the canyon. Large quarries are located along the channel throughout the canyon. The slates and other metamorphic rocks are being mined for use as decorative stone. At the measurement section, the bed material is 80 to 85 percent greater than 4 in. in diameter. The banks are steep, composed of silts and large clasts of metamorphic rocks, and lined with moderate amounts of trees and brush (Figure 3-41).

During August and October of 2005, the discharge was measured as 3.41 and 2.64 cfs, respectively. USGS measured the creek several times from July 1991 through June 1992; when averaged, these measurements result in a discharge of 1.42 cfs for that period. The mean annual discharge in this report is estimated as 2.62 cfs (1,900 afy).

Figure 3-41
Hendrys Creek

No diversions were observed, and it is believed that the water of Hendrys Creek is lost to infiltration once it leaves the mouth of the canyon.

3.2.10 Silver Creek

Silver Creek is located along the eastern side of the Snake Range, and its measurement sites are identified as station numbers 1951001 and 1951002 on Figure 3-30. The Silver Creek drainage area is approximately 23 mi^2, with 83 percent of the area higher than 8,000 ft-amsl. The drainage area's elevation ranges from 6,480 ft-amsl at the mouth of the canyon to over 10,000 ft-amsl at the basin divide, with an average drainage elevation of approximately 8,800 ft-amsl. The surficial geology of the drainage area is comprised of carbonate rocks (61 percent), intrusive rocks (29 percent), and clastic rocks (10 percent).

At the measurement section, Silver Creek is incised approximately 6 ft below the surrounding area on the alluvial fan within a narrow canyon. The banks are steep, composed primarily of fine-grained material and heavily lined with vegetation. Bed material was medium- to coarse-grained sands, cobbles, and small boulders (Figure 3-42).

Figure 3-42
Silver Creek

In October 2004, the discharge of Silver Creek was measured 2 mi upstream of the National Forest boundary. The measurement cross section was moved to 0.8 mi above the National Forest boundary, because heavy runoff during the winter of 2004/2005 washed out the road. Discharge was measured

on August 4, 2005, at 9.62 cfs and again on October 4, 2005, at 4.44 cfs. The average annual discharge of Silver Creek is estimated to be 5.10 cfs (3,690 afy).

Near the base of Sacramento Pass the creek fills a small reservoir used for irrigation and livestock, near Baker, Nevada.

3.2.11 Weaver Creek

Weaver Creek is located in southwestern Snake Valley, and its measurement site is identified as station number 1951101 on Figure 3-30. Weaver Creek drains an area of 6.6 mi^2, and approximately 50 percent of the area is above 8,000 ft-amsl in elevation. The elevation of the drainage area ranges from 6,790 ft-amsl near the measurement section to 10,000 ft-amsl near the drainage area divide, with an average elevation of 8,130 ft-amsl. The surficial geology of the drainage area is comprised of intrusive rocks (18 percent), metamorphic rocks (44 percent), clastic rocks (17 percent), and alluvial material (21 percent). Figure 3-43 shows the measurement section at Weaver Creek.

Figure 3-43
Weaver Creek

Squires (2004) observed no flow in Weaver Creek on October 29, 2004, and field notes indicated that there was no flow even farther upstream from the observation point. On August 4, 2005, 1.17 cfs was measured where the creek had washed out the road. The estimated mean annual discharge is 0.383 cfs (277 afy).

Given the high variability in the discharge of Weaver Creek, it is unlikely that the flow is diverted and more likely that the water infiltrates into the alluvial fan at the mouth of the canyon.

3.2.12 Strawberry Creek

Strawberry Creek is 8 mi northwest of the town of Baker, Nevada, and its measurement sites are identified by station numbers 1951201 through 1951207 on Figure 3-30. The drainage area of Strawberry Creek is 8 mi^2, and 77 per cent of the area is above 8,000 ft-amsl in elevation. The drainage area elevation ranges from 6,740 ft-amsl to 11,510 ft-amsl at the drainage area divide, with an average elevation of 8,850 ft-amsl. The surficial geology of the drainage area is comprised of intrusive rocks (22 percent), metamorphic rocks (44 percent), clastic rocks (20 percent), and alluvial material (14 percent). Figure 3-44 shows the location of measurement sites on Strawberry Creek.

Miscellaneous discharge measurements were made at site 1951201 on July 12, 1964 by USGS (1.85 cfs); on October 29, 2004, by Squires (2004), who reported 0.75 cfs; and on August 4, 2005, when SNWA measured 4.43 cfs.

A synoptic discharge study (Elliott et al., 2006) was completed by the USGS in June and October of 2003 (Table 3-11), which reported a gain from station 1951202 to 1951204 during both the June 11 and October 8 measurements. The results from this study show a loss in both June and October between station numbers 1951204 and 1951205. Mixed results were observed in the data between stations 1951205 and 1951206. In June a significant change of 0.8 cfs was observed, but during October a loss of 0.08 cfs was observed. The data for both June and October show a small loss between stations 1951206 and 1951207. The final reach showed mixed results, with a significant loss between station numbers 1951207 and 1951203 during the June study and a small gain during October (Elliott et al., 2006).

The USGS operated and maintained the Strawberry Creek above Great Basin Park Boundary near Baker, Nevada gaging station from October 2003 through September 2004. Because of the gaging station's short period of record, the gage data was averaged with the data obtained from the miscellaneous discharge method to determine an annual discharge. The estimated annual discharge is 1.46 cfs (1,060 afy) (Table 3-10).

No diversions were observed above the USGS gaging station, and it is assumed that the discharge infiltrates into the alluvial fan (Figure 3-45).

3.2.13 Lehman Creek

Lehman Creek drains the eastern slope of Wheeler Peak and flows eastward through Lehman Caves National Monument towards Baker, Nevada, and its measurement sites are identified as station numbers 1951301 and 1951304 through 1951308. The drainage area is 11 mi^2, and approximately 78 percent of the area is above 8,000 ft-amsl. The elevation of the drainage area ranges from 6,400 ft-amsl near the measurement section to over 13,000 ft-amsl at the summit of Wheeler Peak, with an average elevation of 9,330 ft-amsl. The surficial geology of the drainage area is comprised mostly of clastic rocks (55 percent), alluvial material (33 percent), carbonate rocks (1 percent), intrusive rocks (2 percent), and metamorphic rocks (9 percent). Figure 3-46 shows the measurement sites on Lehman Creek.

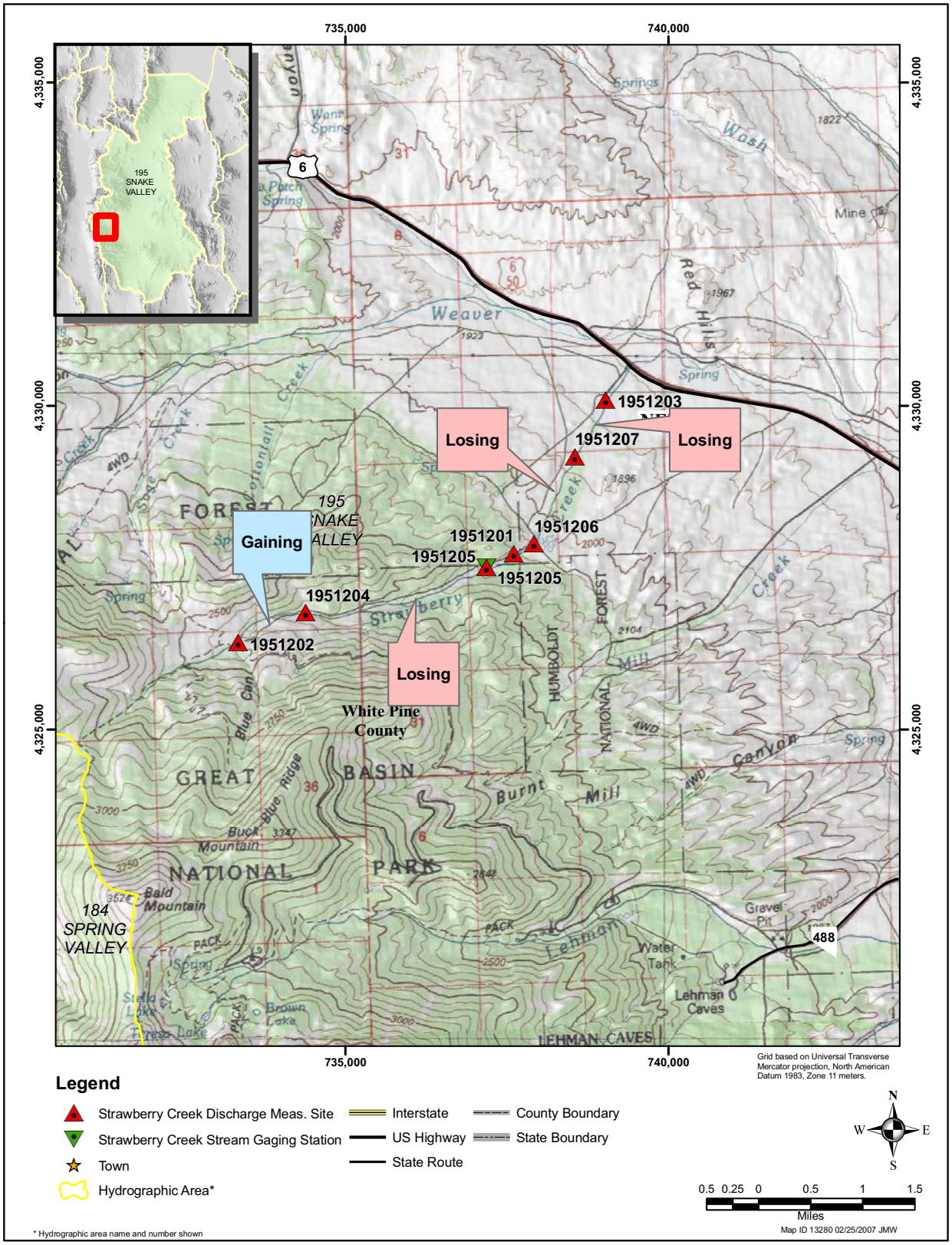

Figure 3-44
Measurement Sites on Strawberry Creek

Table 3-11
Synoptic Discharge Measurement Data for Strawberry Creek

Station Number	Date	Time	Discharge[a] (cfs)	Measurement Rating	Change in Discharge (cfs)
1951203	6/11/2003	7:45	2.32	Fair	--
1951207		8:05	2.76	Fair	0.44
1951205		8:15	2.37	Fair	-0.39
1951206		8:15	3.18	Fair	0.81
1951204		8:20	2.96	Fair	-0.22
1951202		8:40	2.29	Fair	-0.67
1951205	10/8/2003	13:45	0.31	Poor	--
1951204		13:50	0.43	Poor	0.12
1951206		13:55	0.25	Poor	-0.18
1951207		13:55	0.17	Poor	-0.08
1951204		14:00	0.12	Good	-0.05
1951203		14:05	0.17	Fair	0.05

[a]Discharge data from Elliott et al., 2006

Figure 3-45
Strawberry Creek

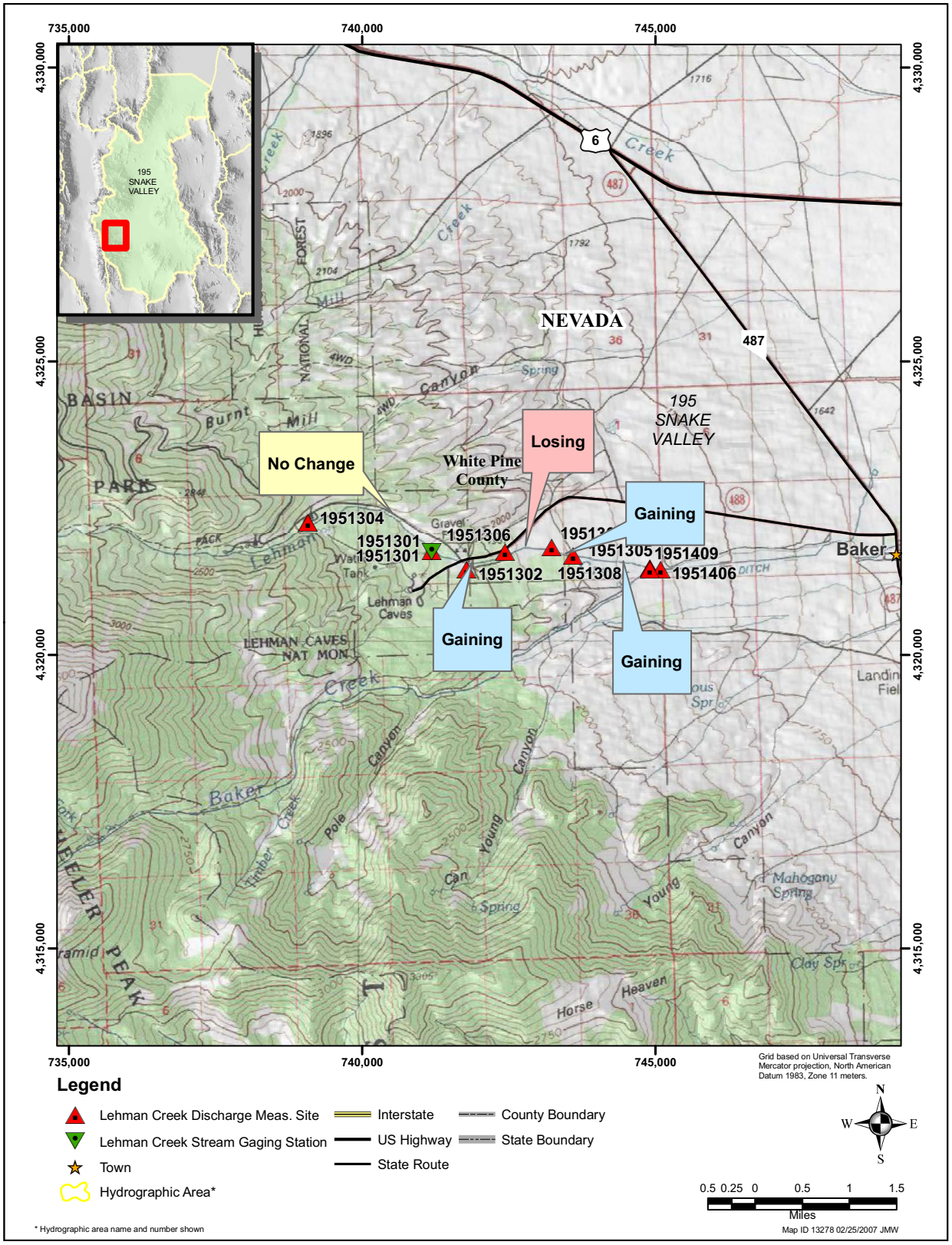

Figure 3-46
Measurement Sites on Lehman Creek

USGS has operated and maintained the Lehman Creek near Baker, Nevada gaging station (1951301) intermittently since October 1947 to present (2006). Periods of record include, October 1947 through September 1955, October 1992 through September 1997, and July 2002 through present (2006). Annual discharges range from 2.51 cfs (1,817 afy) in 1953 to 13.7 cfs (9,919 afy) reported in the 2005 water year (USGS, 2005). The mean annual discharge reported by the USGS is 5.67 cfs (4,105 afy) (USGS, 2005) (Figure 3-47). Figure 3-48 shows a measurement locations for Lehman Creek.

During July 22, 2003 and October 7, 2003, USGS conducted a synoptic discharge measurement study (Elliott et al., 2006) on Lehman Creek. This study showed that results are similar during July and October. The reach between 1951304 and 1951301 showed a slight loss in July and a small gain in October, but because the changes were within measurement error, this reach showed no change. Between sites 1951301 and 1951306 substantial gains were observed during both July and October. The reach between stations 1951306 and 1951307 showed a significant loss during October, but there is no data available for this reach during the July study. Substantially gaining reaches were located over the rest of the study area that included station numbers 1951307, 1951308 and 1951305 (Table 3-12).

The creek is not diverted above the gaging station. It flows eastward into the town of Baker, Nevada, where it is used for irrigation and livestock purposes.

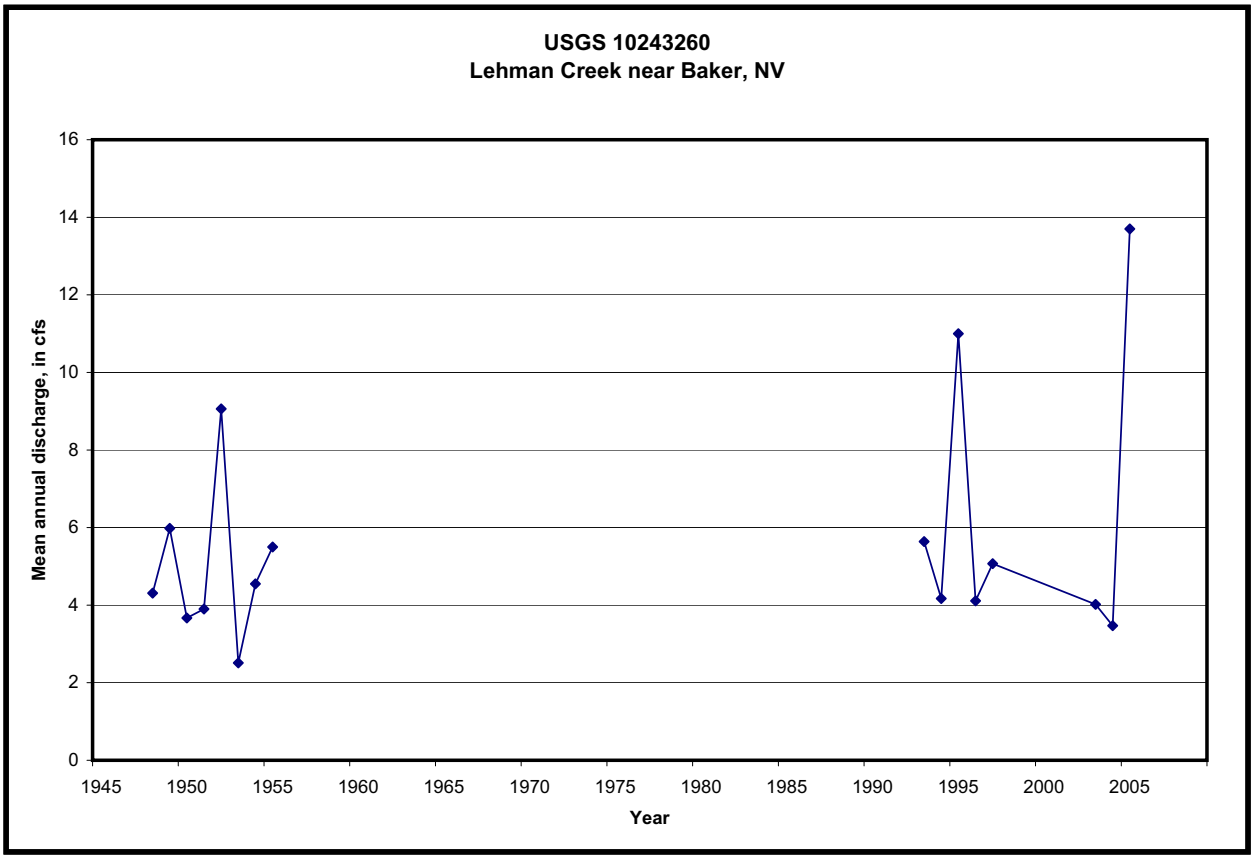

Figure 3-47
Hydrograph of Mean Annual Discharge at Lehman Creek near Baker, Nevada

Figure 3-48
Lehman Creek

Table 3-12
Synoptic Discharge Measurement Data for Lehman Creek

Station Number	Date	Time	Discharge[a] (cfs)	Measurement Rating	Change in Discharge (cfs)
1951304	7/22/2003	12:50	6.57	Good	--
1951301		12:55	6.15	Fair	-0.42
1951306		13:15	8.82	Good	2.67
1951307		--	--	--	--
1951308		13:10	9.91	Good	1.09
1951305		14:30	11.7	Fair	1.79
1951304	10/7/2003	8:30	2.56	Good	--
1951301		8:10	2.58	Fair	0.02
1951306		9:00	4.19	Good	1.61
1951307		8:50	0.49	Good	-3.7
1951308		8:40	5.03	Good	4.54
1951305		7:55	5.16	Fair	0.13

[a]Discharge data from Elliott et al., 2006

3.2.14 Baker Creek

Baker Creek is about 4 mi west of the town of Baker, Nevada, and its measurement sites are identified as station numbers 1951401 through 1951413 on Figure 3-30. The drainage area is approximately 17 mi^2, and about 85 percent of this area is above 8,000 ft-amsl in elevation. The elevation of the drainage area ranges from 5,200 ft-amsl to over 12,000 ft-amsl at Baker Peak, with an average elevation of 9,520 ft-amsl. The surficial geology of the Baker Creek drainage area is comprised of clastic rocks (77 per cent), intrusive rocks (17 per cent), carbonate rocks (5 perc ent), and alluvial material (1 percent).

Baker Creek has been mea sured by USGS at two di fferent gaging stations. The Baker Creek near Baker, Nevada (10243250) gaging station, located 1.25 mi downstream of Pole Cre ek and 1.5 mi downstream of the Nar rows operated from August 1913 to November 1916. The ave rage annual discharge was 19 cfs (13,900 af y) for the per iod of record (Wells, 1960). The second gage was the Baker Creek at Na rrows near Baker, Nevada (10243240) gaging station (Figure 3-49). It was in operation from October 1947 to September 1955 and October 1992 to September 1997. The ga ge was located 0.5 mi downstream of Pole Canyon and about 1 mi downstream of the Nar rows. The average annual discharge was 9.08 cfs (6,970 afy) for the period of record (USGS, 2006). The large difference between the two gaging stations' annual dis charge is most likely due to natural climatic variations.

Figure 3-50 shows a measurement section on Baker Creek. On August 24, 1993, a synoptic discharge study was conducted by SNWA to de termine the gaining and losing reaches of this stream (Table 3-13).

Between station numbers 1951403 and 191404 a small gain of 0.5 cfs was observed. Between station numbers 1951404 and 1951405 no change in discharge could be determined when measurement error is assumed. For the reach between station numbers 1951405 and 1951406, a large gain of 7.80 cfs was observed. Measurements at station numbers 1951406 and 1951407 demonstrated no change in the discharge when measurement error is accounted for (Figure 3-51 and Table 3-14).

Elliott et al. (2006) reports results from two synoptic discharge measurement studies. The first took place on July 22, 2003, and the second took place on October 8, 2003. The two sets of results differed slightly but we re generally consistent with each other. A substantial gain was observed between station numbers 1951408 and 1951410 during both the July and O ctober studies. Signi ficant losses occurred in the re ach between station numbers 1951410 and 1951402. No si gnificant change was observed between station numbers 1951402 and 1951413 during either the July or Oc tober measurement events. The reach between station numbers 1951413 and 1951409 had a small gain during July but a small loss was observed that October (Elliott et al., 2006).

No diversions or regula tion exist upstream of the gaging stations, but downstream from the gaging stations Baker Creek merges with Lehman Creek. The c ombined flow of the two creeks flows eastward into the town of Baker, Nevada, where it is used for irrigation and livestock.

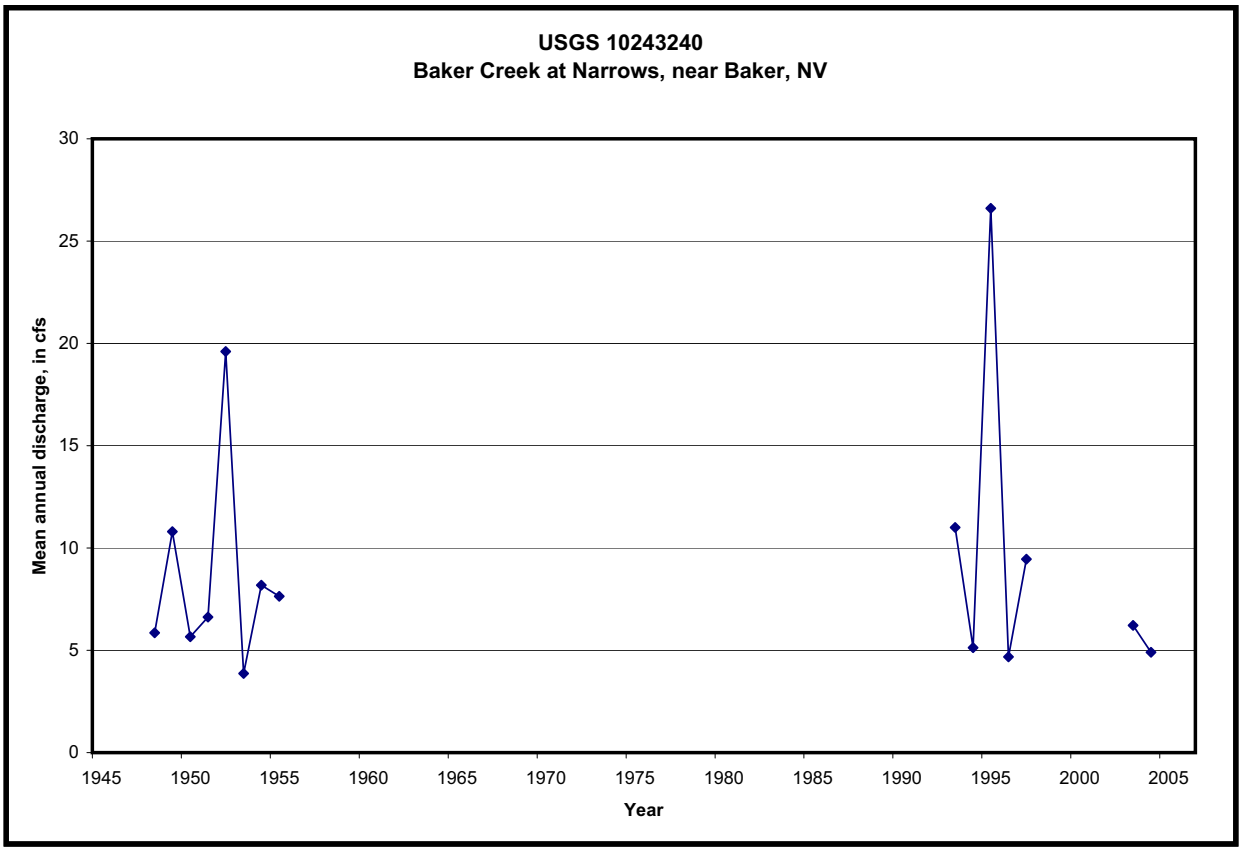

Figure 3-49
Hydrograph of Mean Annual Discharge at
Baker Creek at Narrows, near Baker, Nevada

3.2.15 Snake Creek

Snake Creek drains a portion of the southern Snake Range, and its measurement sites are identified as station numbers 1951501 through 1951517 on Figure 3-30. The drainage area is over 28 mi^2, with nearly half of its area above 8,000 ft-amsl in elevation. The drainage area ranges in elevation from 5,560 ft-amsl at the bottom of the drainage area to almost 12,000 ft-amsl at Mt. Washington, with an average elevation of approximately 8,000 ft-amsl. The surficial geology of the Snake Creek drainage is comprised of carbonate rocks (40 percent), intrusive rocks (27 percent), clastic rocks (19 percent), and alluvial material (14 percent).

Snake Creek is one of the larger streams in Snake Valley. The banks of the creek are steep and lined with dense vegetation. Bank material is composed of silts and sands with cobbles up to 6 in. in diameter. Bed material at the upper sites of the creek is 80 to 85 percent greater than 4 in. in diameter, with subrounded to subangular cobbles and boulders. Further downstream, the bed material is 90 to 95 percent coarse sand. Figure 3-52 shows a measurement section on Snake Creek.

From September 1913 to September 1915, discharge was measured by USGS at the Snake Creek near Baker, Nevada (1951512) gage . Supplemental records include gage heights and discharge

Figure 3-50
Baker Creek

Table 3-13
Synoptic Discharge Measurement Data for Baker Creek - SNWA

Station Number	Date	Time	Discharge (cfs)	Measurement Rating	Change in Discharge (cfs)
1951403	8/25/1993	9:08	2.9	Fair	--
1951404		10:19	3.4	Fair	0.50
1951405		11:24	3.3	Fair	-0.10
1951406		11:54	11.1	Fair	7.8
1951407		--	11.4	Fair	0.30

measurements from June 1916 to January 1917 measured by USGS (Wells, 1960). During these periods of record there were no complete years of data collection; therefore, there are no annual discharge values available.

During June and October 2003, USGS conducted a synoptic discharge study on Snake Creek. The results of this study are given in Table 3-15. The results were mixed at many of the sites. Between station number 1951512 and 1951514 a significant loss was observed in June and a small gain was measured during October. The reach between 1951514 and 1951515 also had mixed results during June and October; in June, the reach between these two sites had a measurable gain, and in October

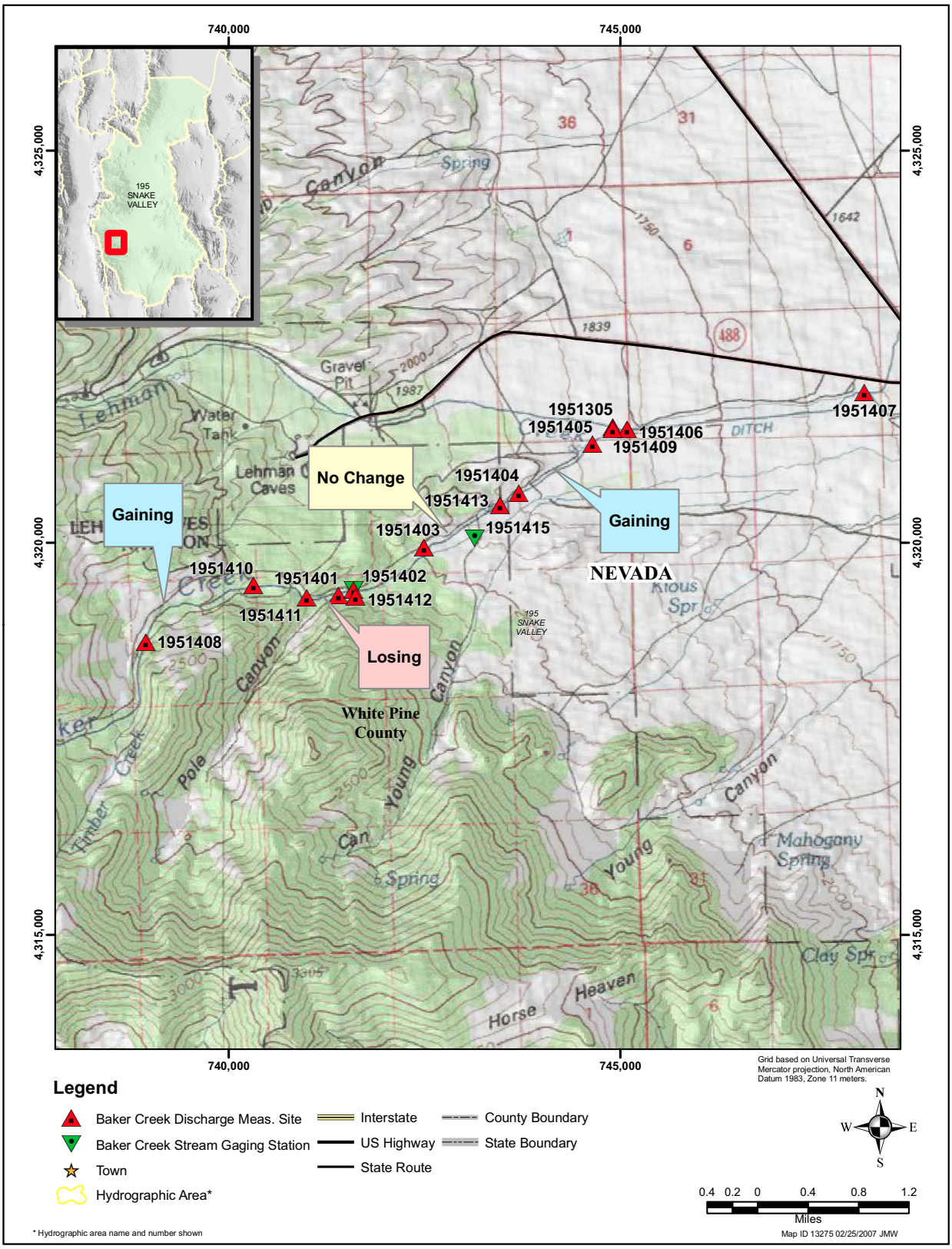

Figure 3-51
Measurement Sites on Baker Creek

Table 3-14
Synoptic Discharge Measurement Data for Baker Creek - USGS

Station Number	Date	Time	Discharge[a] (cfs)	Measurement Rating	Change in Discharge (cfs)
1951408	7/22/2003	8:00	6.66	Good	--
1951410		8:25	8.07	Good	1.41
1951411		--	--	--	--
1951402		8:40	3.31	Good	-4.76
1951413		9:05	3.37	Fair	0.06
1951409		9:10	3.9	Good	0.53
1951408	10/8/2003	8:40	3.03	Good	--
1951410		8:30	4.31	Good	1.28
1951411		8:10	3.24	Good	-1.07
1951402		8:30	1.92	Fair	-1.32
1951413		8:30	2.03	Fair	0.11
1951409		8:20	1.64	Fair	-0.39

[a]Data from Elliott et al., 2006

Figure 3-52
Snake Creek

Table 3-15
Synoptic Discharge Measurement Data for Snake Creek

Station Number	Date	Time	Discharge (cfs)[a]	Measurement Rating	Change in Discharge (cfs)
1951512	6/10/2003	14:25	15.5	Good	--
1951514		14:00	12.9	Good	-2.60
1951515		14:05	13.9	Good	1.00
1951503		13:40	13.7	Fair	-0.20
1951517		9:45	2.02	Fair	--
1951506		14:05	14.8	Fair	1.1
1951508		13:30	14.3	Fair	-0.5
1951513		13:25	14.6	Good	0.3
1951512	10/7/2003	12:55	1.05	Fair	--
1951514		13:40	1.14	Fair	0.09
1951515		14:00	0.92	Fair	-0.22
1951503		--	0.00	--	-0.92
1951517		13:40	1.78	Fair	--
1951506		14:00	2.42	Fair	2.42
1951508		13:30	2.31	Fair	-0.11
1951513		13:35	1.88	Fair	-0.43

[a]Data from Elliott et al., 2006

the reach lost water. The next reach downstream, between sites 1951515 and 1951503, had a small loss of discharge during June and October. During the same period a gain was observed in the reach between sites 1951503 and 1951506. In the reaches from sites 1951506 to 1951513 during June, no changes in discharge were observed. In October over this same reach a small loss was observed.

Discharge was measured at two sites on August 25, 2005. At the upper site the discharge was measured as 15.7 cfs, and at the lower site the discharge was measured as 23 cfs. Spring Creek Spring, which flows into Snake Creek, was flowing 4.59 cfs on the same date. On October 4, 2005, the upper site had a discharge of 2.11 cfs and for the lower site 6.56 cfs. Spring Creek Spring was also measured on this date and was discharging at a rate of 4.59 cfs. Based on the synoptic discharge measurement study the annual discharge was calculated at site 1951508. The estimated mean annual discharge of Snake Creek is 9.50 cfs (6,880 afy) (Figure 3-53).

The water from Spring Creek, which flows into Snake Creek, is diverted and used for operations at the Nevada Division of Wildlife Rearing Station. The channel was modified in the 1940s when the Bonita Mine, a placer tungsten mine, was in operation. Up to 40 pits and shafts were constructed in the gravels to as deep as 25 ft without hitting bedrock (Hose et al., 1976). These operations undoubtedly had an effect on channel morphology and discharge. Currently, the water flows across the valley floor to Garrison, Utah, where it is used for irrigation and livestock.

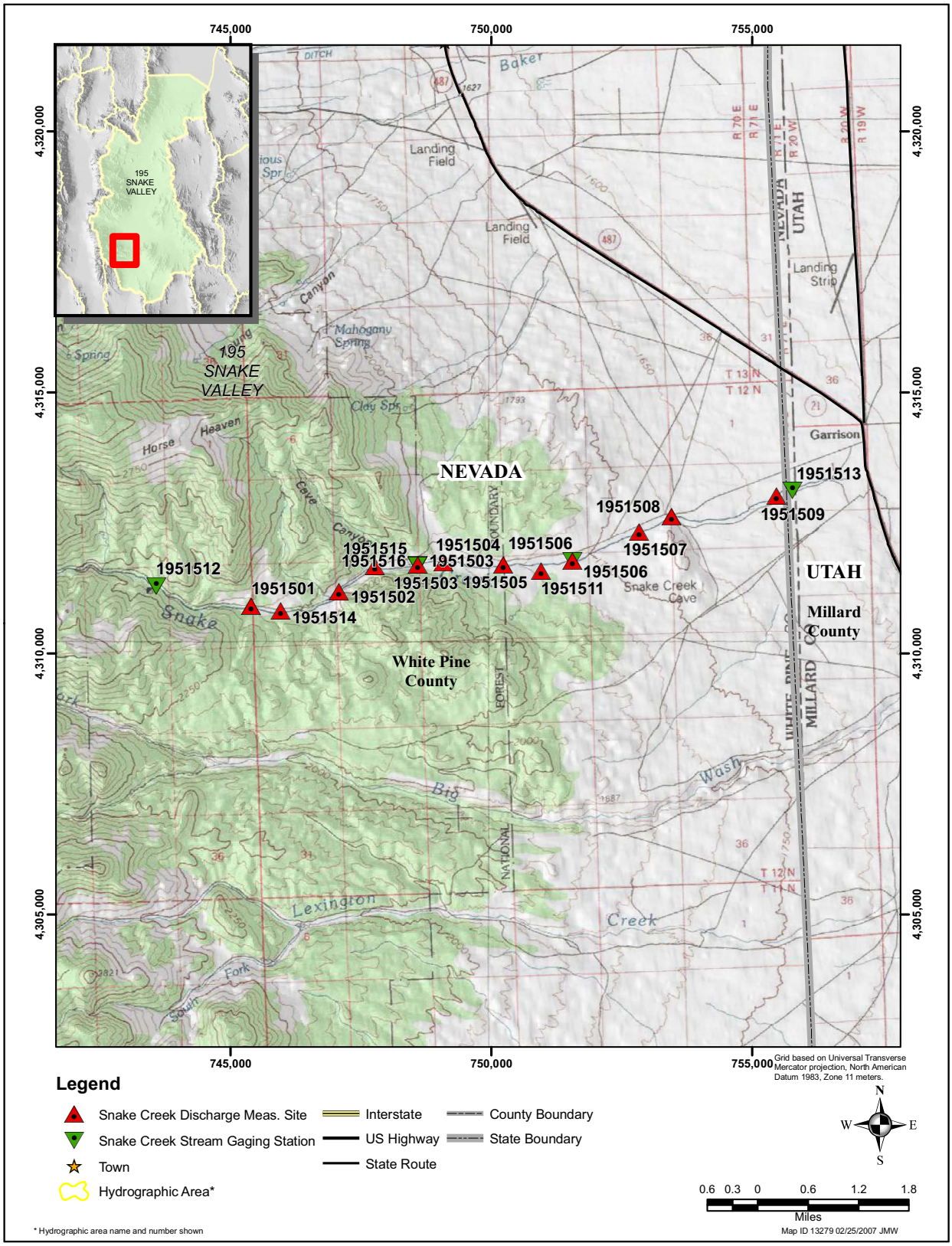

Figure 3-53
Measurement Sites on Snake Creek

3.2.16 Big Wash

Big Wash drains a portion of the southern Snake Range and its measurement sites are identified as station numbers 1951601 through 1951607. The Big Wash drainage area is approximately 28 mi ^{2}, with about 58 percent over 8,000 ft-amsl in elevation. The drainage area ranges from 5,870 ft-amsl at the Hidden Canyon Guest Ranch to over 11,000 ft-amsl at Mt. Washington, with an average elevation of 8,370 ft-amsl. The surficial geology of the drainage area is comprised of carbonate rocks (72 percent), intrusive rocks (2 percent), clastic rock (2 percent), and alluvial material (24 percent) Figure 3-54 shows a measurement section on Big Wash.

Figure 3-54
Big Wash

On June 10, 2003 and October 6, 2003, USGS conducted a synoptic discharge measurement study on Big Wash. Small changes were observed in each reach during both June and October, but they were not consistent with each other. A reach may gain in June and then lose in October. The overall result is that the stream gains between station numbers 1951609 and 1951607, in both June and October. The detailed results for each reach are given in Table 3-16.

SNWA conducted a synoptic discharge measurement study during October 5, 2005 on Big Wash. The North Fork of Big Wash at station number 1951601 was observed to be dry, but large debris piles were still covering the road from the 2005 spring runoff, and the South Fork was flowing approximately 1.0 cfs. Over a distance of approximately 0.8 mi the creek gains 0.62 cfs for a total discharge of 1.62 cfs, as measured at a station number 1951603, upstream of the Hidden Canyon Guest Ranch station number 1951605. Access was not gained to the Hidden Canyon Guest Ranch, so no discharge measurement was made at that location. The final measurement was made 1.6 mi downstream of the Hidden Canyon Guest Ranch at station number 1951606. At this cross section the

Table 3-16
Synoptic Discharge Measurement Data for Big Wash

Station Number	Date	Time	Discharge (cfs)[a]	Measurement Rating	Change in Discharge (cfs)
1951609	6/10/2003	9:04	3.02	Fair	--
1951608		9:00	1.49	Fair	-1.53
1951602		9:00	4.51	Good	3.02
1951610		8:50	4.44	Good	-0.07
1951611		8:10	4.47	Fair	0.03
1951607		8:05	5.05	Good	0.58
1951609	10/6/2003	--	0	--	--
1951608		14:10	0.3	Fair	0.3
1951602		14:20	0.06	Poor	-0.24
1951610		--	0	--	-0.06
1951611		14:40	0.14	Good	0.14
1951607		13:55	0.51	Poor	0.37

[a]Discharge data from Elliott et al, 2006

creek is incised approximately 100 ft into the alluvial fan and has steep grass- and brush-lined banks. A discharge of 2.94 cfs was measured, indicating a gain in discharge of 1.32 cfs. The estimated mean annual discharge of Big Wash is 1.44 cfs (1,040 afy) (Figure 3-55).

Topographic maps show several ponds in the Big Wash drainage area, but none were observed. One diversion was observed at the Hidden Canyon Guest Ranch. The creek flows through a concrete structure, and a small amount is diverted via drop box into a 6-in. line. The flow meter reported 200 gpm being diverted on August 3, 2005. After this small diversion, the rest of the flow continues downstream and across the valley to Pruess Lake.

3.2.17 Lexington Creek

Lexington Creek drains a portion of the southern Snake Range, and its measurement site is identified as station number 1951701 on Figure 3-30. The drainage area for Lexington Creek is about 12 mi^2, and 51 percent of this area is above 8,000 ft-amsl in elevation. Elevations in the drainage range from 6,390 to over 10,000 ft-amsl near the hydrographic divide, with an average elevation of the drainage area is 8,070 ft-amsl. The surficial geology of the drainage area is carbonate rocks (67 percent), intrusive rocks (16 percent), alluvial material (16 percent), and clastic rocks (1 percent). Figure 3-56 shows the measurement section on Lexington Creek.

USGS made observations several times from the summer of 1991 to the summer of 1992; all observations reported no flow and are assumed to be rated as excellent. Squires (2004) observed no flow on October 28, 2004. On August 3, 2005, SNWA measured 1.84 cfs at the mouth of the canyon. Based on the previously listed observations, the estimated annual discharge of Lexington Creek is estimated to be 0.226 cfs (164 afy).

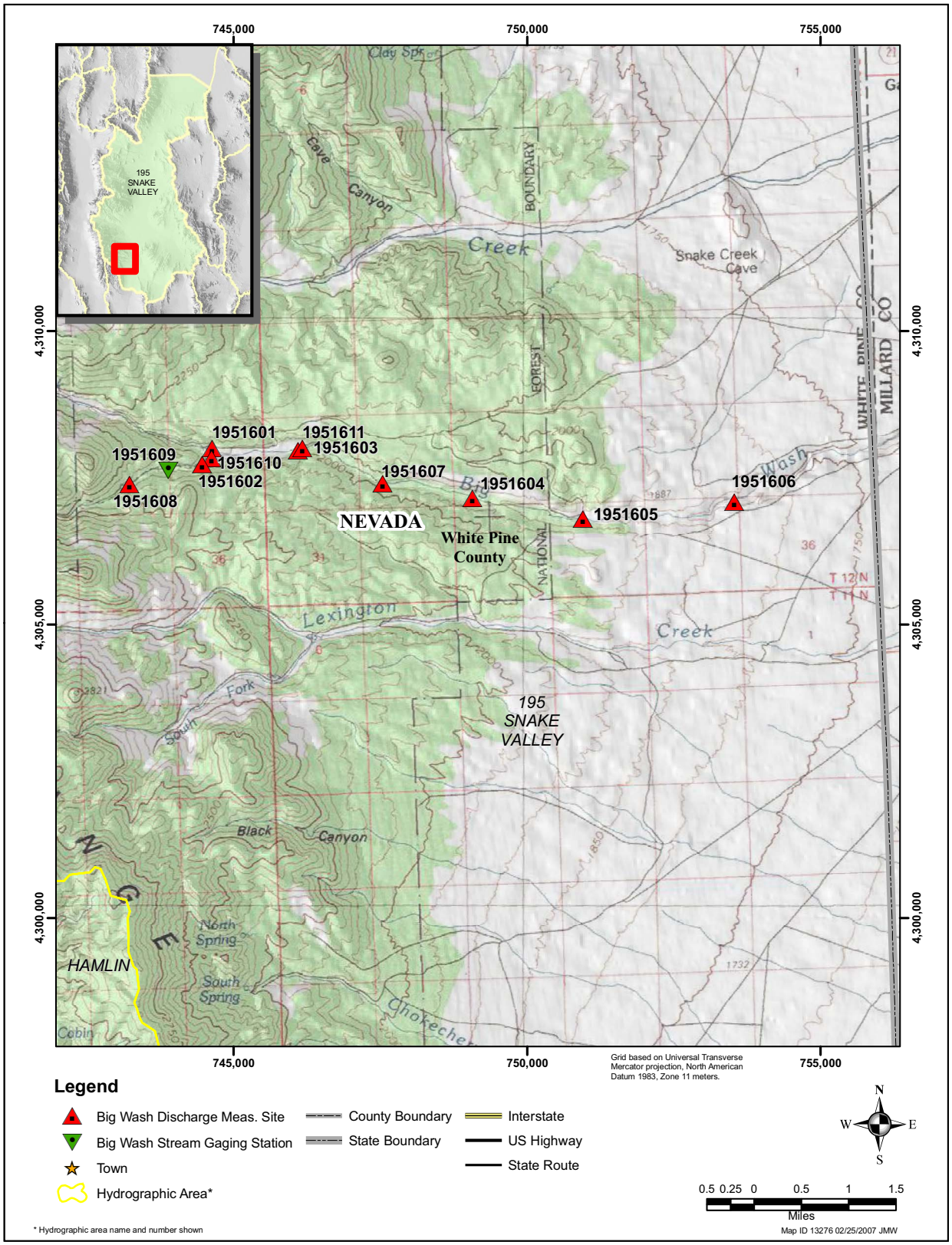

Figure 3-55
Measurement Sites on Big Wash

Figure 3-56
Lexington Creek

3.2.18 Chokecherry Creek

Chokecherry Creek is located in the southern portion of the Snake Range, and its measurement site is identified as station number 1951801 on Figure 3-30. The drainage area for Chokecherry Creek is 2.5 mi^2, with 56 percent of this area above 8,000 ft-amsl in elevation. The elevation of the drainage area ranges from 6,670 to over 9,000 ft-amsl, and the average elevation of the drainage area is 8,130 ft-amsl. The surficial geology of the drainage area is 100 percent carbonate rock.

Squires (2004) reported that Chokecherry Creek was dry. The SNWA field investigation in August 2005 also observed a dry channel.

3.3 White River Valley (HA 207)

White River Valley comprises most of the northern third of the White River Flow System and is the largest valley in the flow system. The valley is approximately 80 mi long and approximately 22 mi wide at Lund, Nevada. White River Valley is bounded by the White Pine Range in the northwest, the Horse and Grant ranges to the west, the Egan Range to the east, and a low alluvial divide that separates the valley from Garden and Coal valleys. The surface water drainage of White River Valley is contiguous with Pahroc Valley to the southeast. State Route 318 travels north-south along the eastern side of the valley and intersects U.S. Highway 6 north of Lund, Nevada. As part of this study, four perennial streams were inventoried in White River Valley. Figure 3-57 presents the locations of the stream gaging stations in White River Valley.

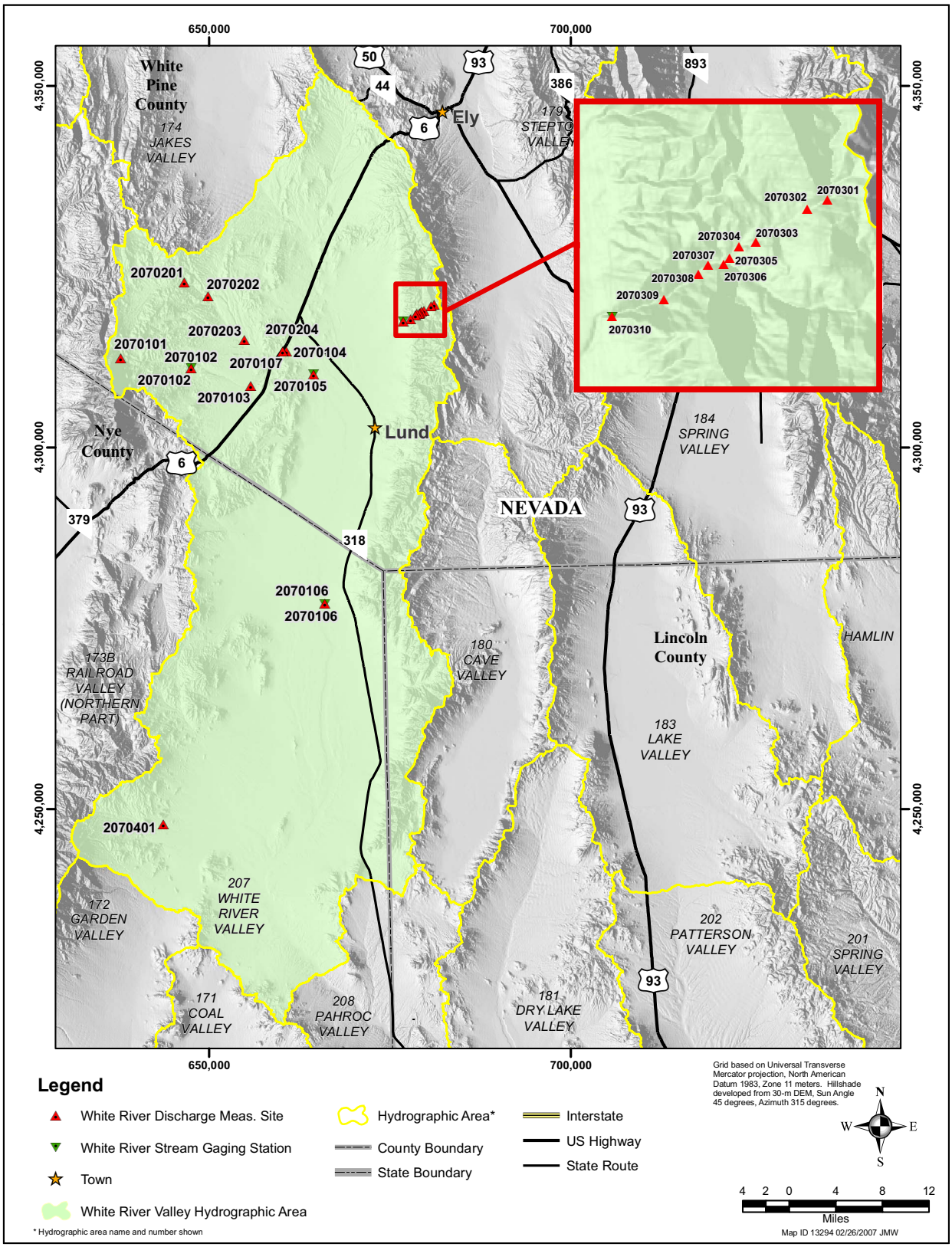

Figure 3-57
Measurement Sites on Streams in White River Valley

After an evaluation and analysis of miscellaneous discharge measurements for White River Valley's ungaged perennial streams, the perennial streamflow for White River Valley was estimated using the continuous gage records for White River, Water Canyon Creek, and the concurrent measurement method described in Section 2.0. Steptoe Creek near Ely, Nevada (station number 10244950), was chosen as the basis of this method due to its long period of record, similar latitude, and close proximity to White River Valley (Figure 3-58). The estimated mean annual perennial streamflow for White River Valley is 12,525 afy (Table 3-17).

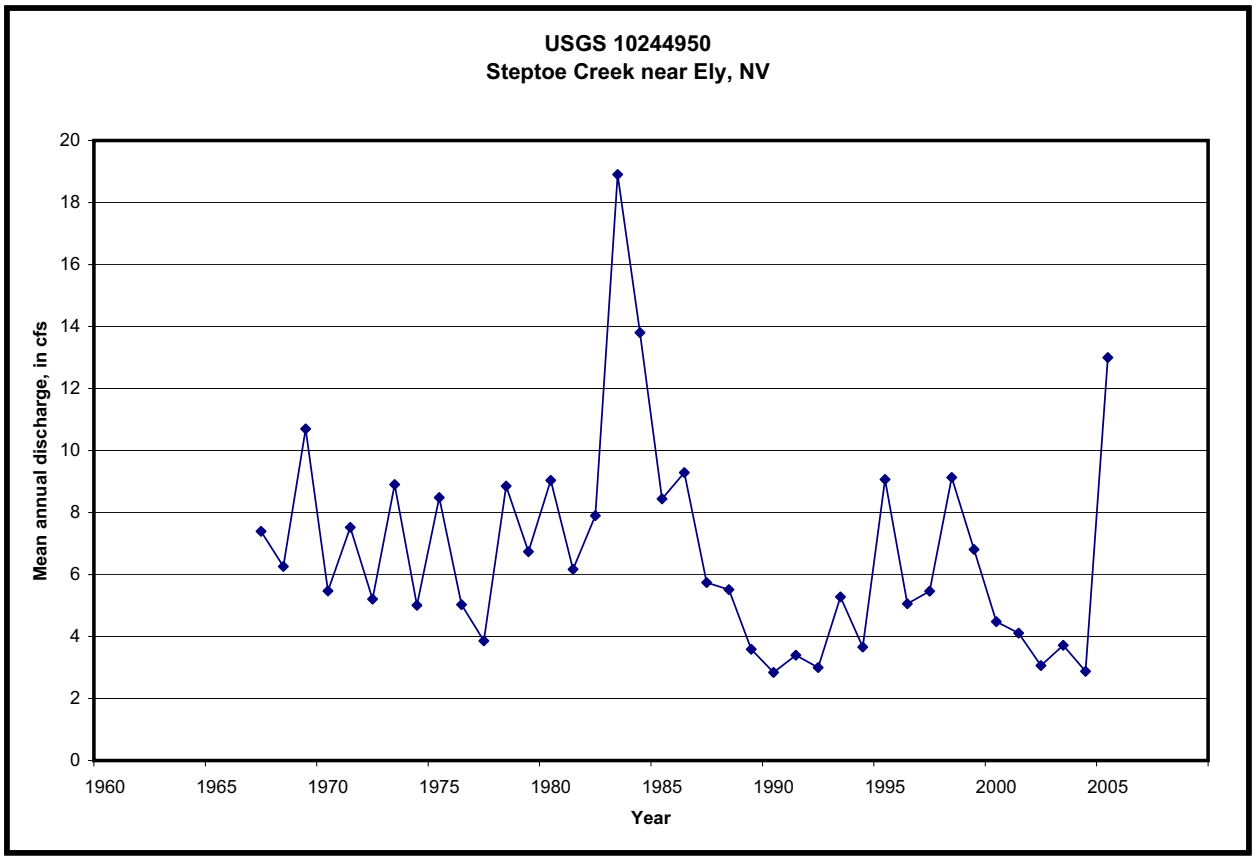

Figure 3-58
Hydrograph of Mean Annual Discharge at Steptoe Creek near Ely, Nevada

The U.S. Department of Agriculture (USDA, 1942) estimated the mean annual discharge of the White River at 15 cfs or 11,000 afy. According to *Water for Nevada: Report 3*, (Scott et al., 1971), the annual runoff in White River Valley is 26,000 afy; however, this estimated figure may include the major springs on the valley floor. Assuming that Scott et al. (1971) incorporated the springs listed in the report, the annual runoff total can be discounted by 16,000 afy, yielding a perennial streamflow estimate of 10,000 afy.

General physical attributes about the each drainage area, such as measurement location, size of drainage area, and station identification numbers, are listed in Appendix A, and miscellaneous discharge measurements are given in Appendix C. Detailed descriptions of the four perennial streams

Table 3-17
Mean Annual Discharge for White River Valley

Station Number	Station Name	Data Source	Measurement Date	Date Accuracy	Qa Discharge (cfs)	Measurement Rating	Q_b MDV (cfs)	Q_a/Q_b	Q_M (2006)	Mean Annual Discharge Q_m
2070202	Ellison Creek at Willow Grove, NV	SNWA	10/27/2005	Day	1.94	Fair	8.0	0.24	6.77	1.62
2070401	Forest Home Creek near Forest Home, NV	SNWA	8/4/2003	Day	1.17	Fair	4.4	0.27	6.77	1.83
									Ungaged Streams Estimated Long Term-Annual Discharge (cfs)	3.45
									White River Measured Long Term-Annual Discharge (cfs)	11.90
									Water Canyon Measured Long Term-Annual Discharge (cfs)	1.95
									Total Estimated Discharge (cfs)	17.3
									Total Estimated Discharge (afy)	12,525

in White River Valley are provided in the following sections and the physical attributes of the drainage areas are given in Appendix D.

3.3.1 White River

The White River drains the eastern slopes of the White Pine Range, and its measurement sites are identified as station numbers 2070101 through 2070107 on Figures 3-59 and 3-60. The average altitude of the drainage area is approximately 8,000 ft-amsl, with elevations ranging from approximately 6,500 to over 11,400 ft-amsl. Upstream of the USGS gaging station, the surficial geology of the drainage area is dominated by volcanic rocks (73 percent), carbonate rocks (25 percent), and alluvial material (2 percent); below the gaging station, alluvial and fluvial deposits make up the valley floor. According to Maxey and Eakin (1949), during the summer months the White River flows as far south as Lund, Nevada, before the river goes dry due to irrigation diversions, infiltration, and evaporation. During the winter months it was not unusual for the river to flow about 15 mi south of the Adams-McGill Reservoir, which is about 50 mi south of Lund, Nevada (Maxey and Eakin, 1949). This flow was undoubtedly sustained by Sunnyside Creek, Hot Creek, and numerous small springs.

Discharge has been measured intermittently since the early part of the 20th century by USGS, NDWR, and recently by SNWA. These measurements include records from several stream gaging stations operated by USGS and several miscellaneous discharge measurements made by NDWR between August 1908 and December 22, 1947 (Maxey and Eakin, 1949) at several different sites along the White River. From January 2003 through the present, USGS has operated and maintained the White River near Red Mountain near Preston, Nevada (09415460) gage (Figure 3-60). The average annual discharge is 11.9 cfs (8,600 afy), the minimum annual discharge is 1.94 cfs measured in water year 2004, and the maximum annual discharge is 22.3 cfs measured in 2005. During the 2006 water year an average annual discharge of 11.4 cfs (8,250 af) was recorded. Station number 2070103 (White River at Midland Trail Bridge above McQuean Ranch) was measured intermittently from July 8, 1915, through June 24, 1943; these measurements were made primarily during the months of May, June, and July. On December 22, 1947, two measurements were made: one on the White River (station number 2070107) and the other on Ellison Creek (station number 2070204)

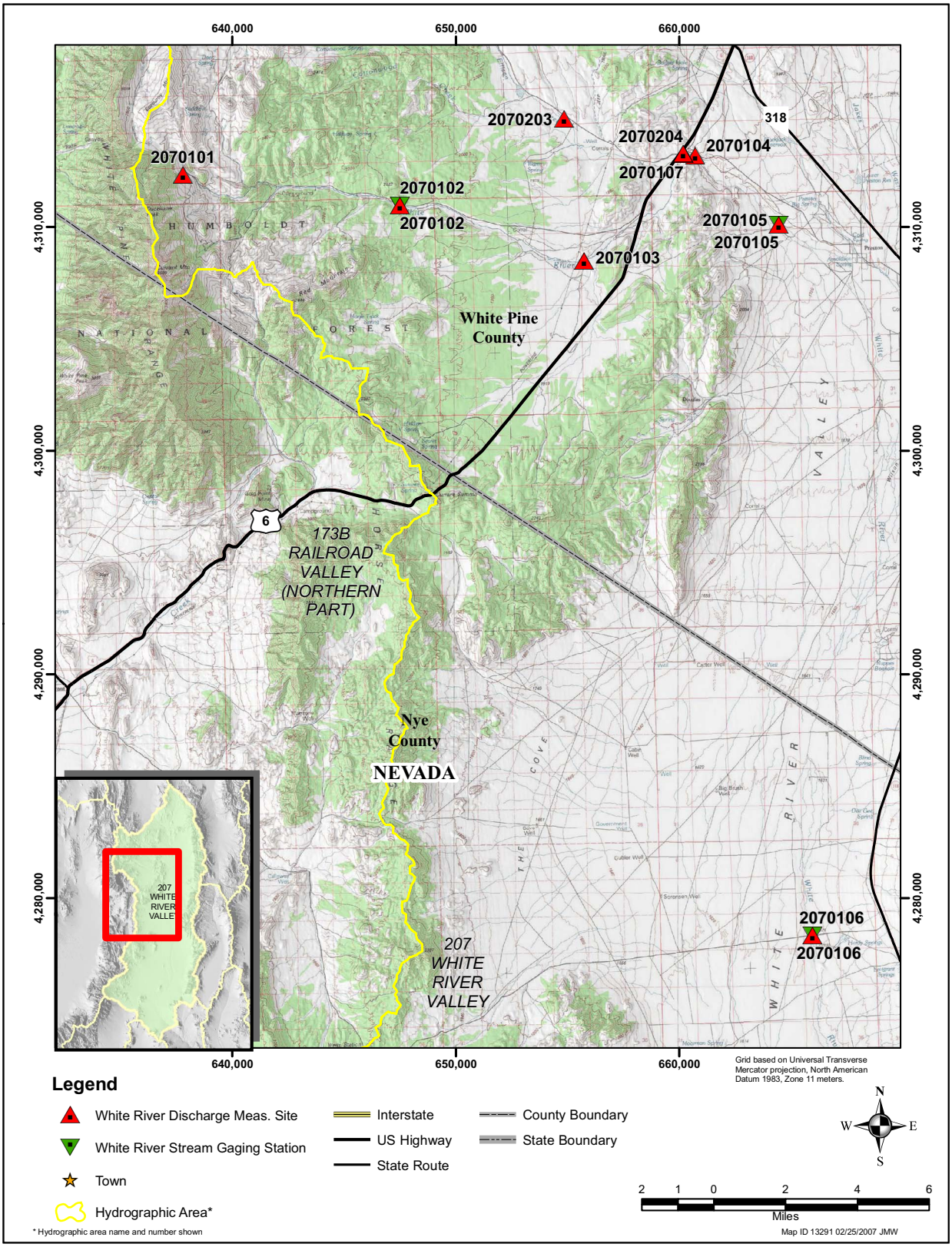

Figure 3-59
Measurement Sites on White River

Figure 3-60
White River near Red Mountain near Preston, Nevada (09415460)

above the confluence of the two creeks, for a combined discharge of 2.09 cfs. A discharge of 13.31 cfs was measured at station number 2070104 (Berryman-Rosevear diversion) on April 29, 1936.

The White River near Preston, Nevada (09415500) gaging station was located 250 ft upstream of the North and South side dividing flume. Its location has been published in USGS Water-Supply Papers 390 and 1313 as being located in Section 4, Township 12 North, and Range 61 East, but based on field investigations and point-of-diversion maps submitted to NDWR in support of water rights, the location should be Section 3, Township 12 North, and Range 61 East. The gage was in operation only from May 27 through September 30, 1914. The maximum daily discharge was 24 cfs, recorded on June 26, 1914, and from September 4 to 30, 1914, the river was dry. From September 1990 through September 1994, and again from December 1999 thorough 2005, USGS operated and maintained the gaging station White River near Lund, Nevada (09415550). The station was located about 17 mi south of Lund, Nevada, at an elevation of 5,300 ft-amsl. The annual mean discharge for the period of record is 0.19 cfs. The maximum annual discharge was 1.00 cfs, and the gage recorded zero flow during 1994, 2002, 2003, 2004, and 2005.

3.3.2 Ellison Creek

Ellison Creek drains the eastern slope of the White Pine Range, and its measurement sites are identified as station numbers 2070201 through 2070204 on Figure 3-61. The drainage area above station number 2070202 is 41.9 mi^2, with an average elevation of 7,790 ft-amsl. Elevations range from 6,500 ft-amsl at the measurement site to over 9,500 ft-amsl at the drainage area divide. The surficial geology of the drainage area is comprised of volcanic rocks (50 per cent), carbonate rocks

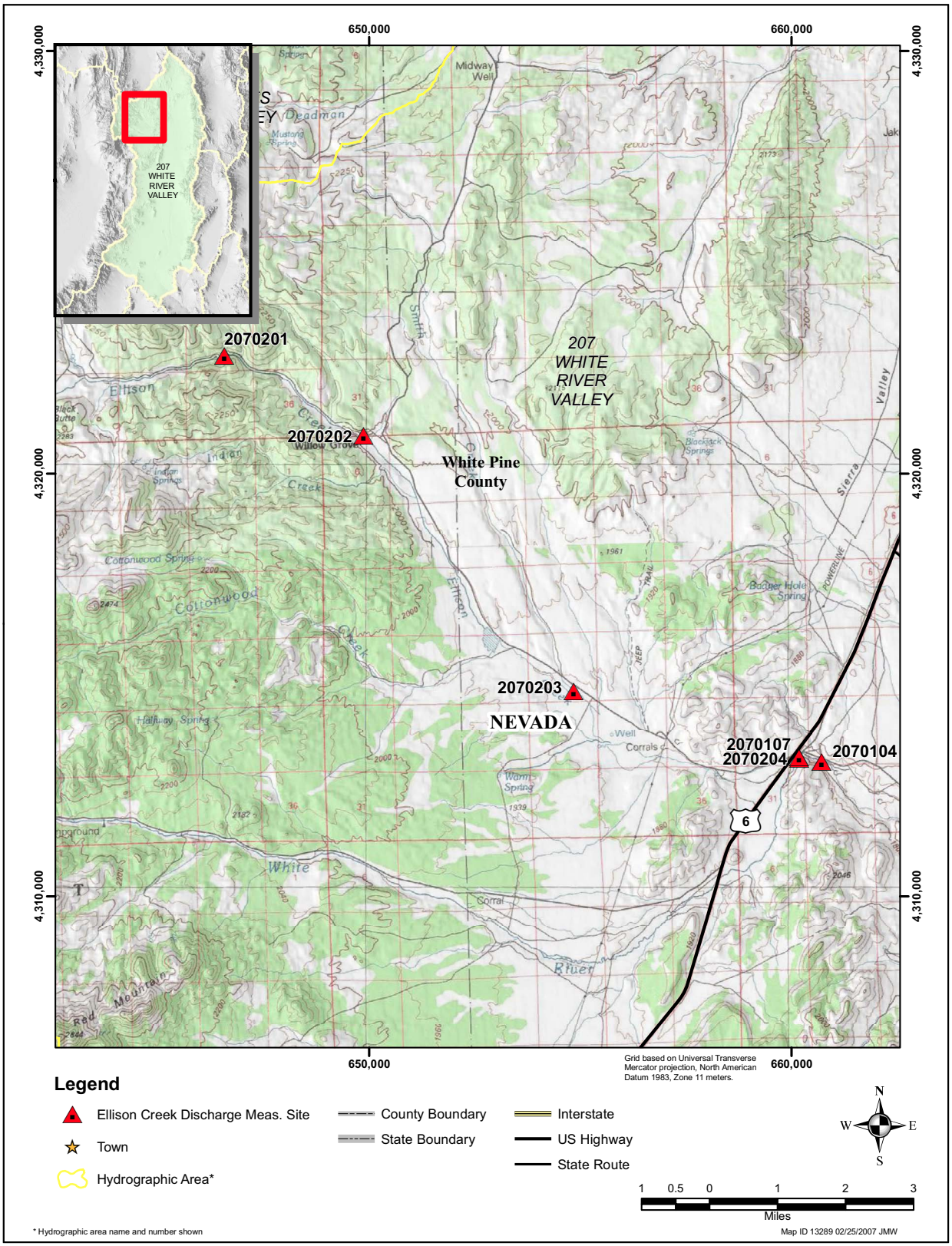

Figure 3-61
Measurement Sites on Ellison Creek

(21 percent), and alluvial material (29 percent). At station number 2070201 the creek is incised about 1 ft around the surrounding area, but at station number 2070202 the creek emerges from a deep gorge onto a broad valley.

Discharge measurements have been made at three sites along Ellison Creek. On October 27, 2005, SNWA measured the discharge at two different sites: at station number 2070201 approximately 2.7 mi upstream and in the canyon along a well-graded dirt road, and station number 2070202 at the mouth of Ellison Creek. The measured discharges were 1.65 cfs and 1.94 cfs, respectively, indicating a slight increase of 0.29 cfs along the stream reach. The estimated mean annual discharge for Ellison Creek is 1.62 cfs (1,170 afy). Figure 3-62 is a photograph of one of the measurement sections for Ellison Creek.

Figure 3-62
Ellison Creek

3.3.3 Water Canyon Creek

Water Canyon drains a portion of the western slope of the Egan Range, and its measurement sites are identified as station numbers 2070301 through 2070310 on Figures 3-57 and 3-63. The drainage area is 11 mi^2, with an average elevation of 8,080 ft-amsl. Elevations in the drainage area range from 6,440 to nearly 10,000 ft-amsl at the basin divide. The surficial geology is comprised of carbonate rocks (84 percent), volcanic rocks (6 percent), and alluvial material (10 percent).

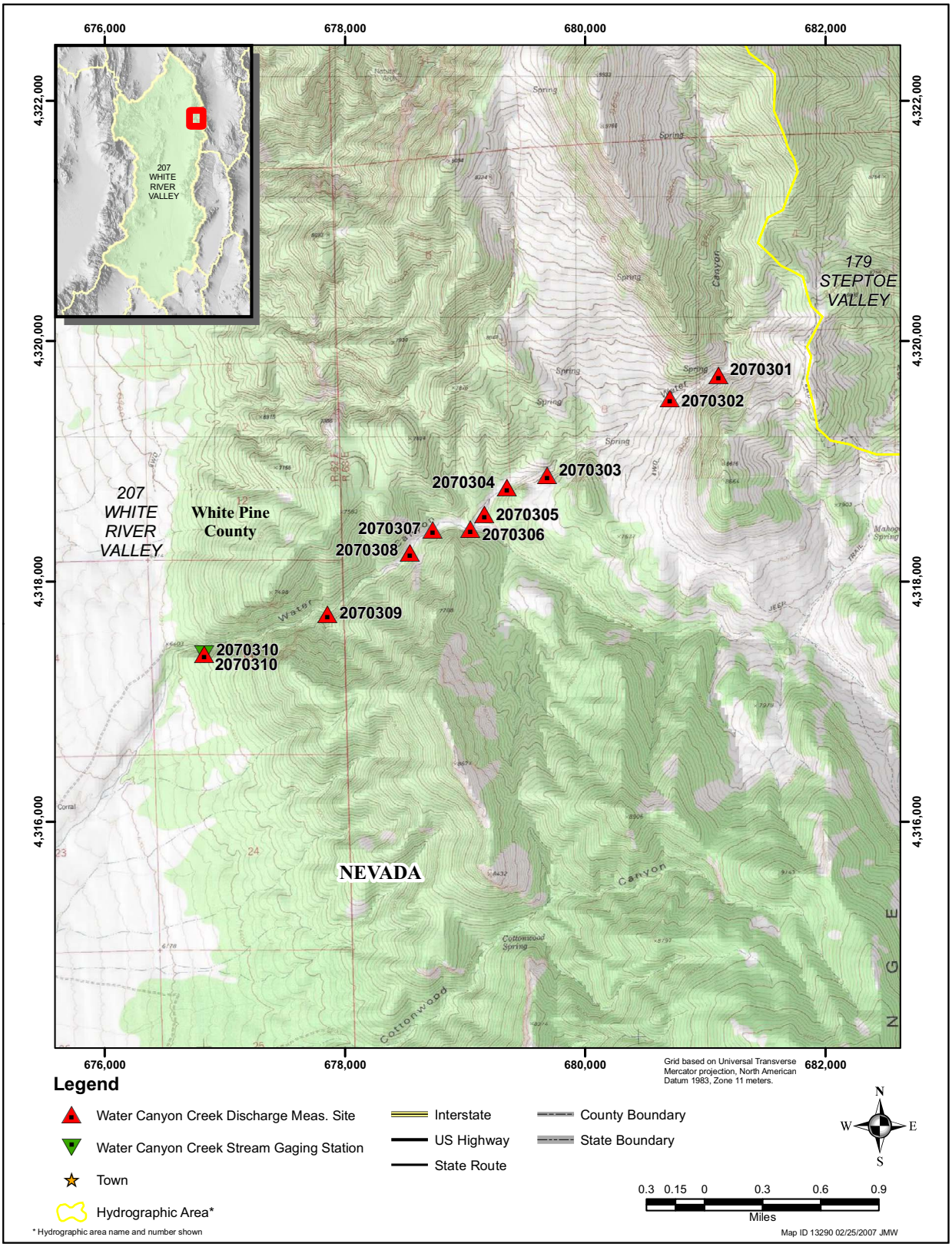

Figure 3-63
Measurement Sites on Water Canyon Creek

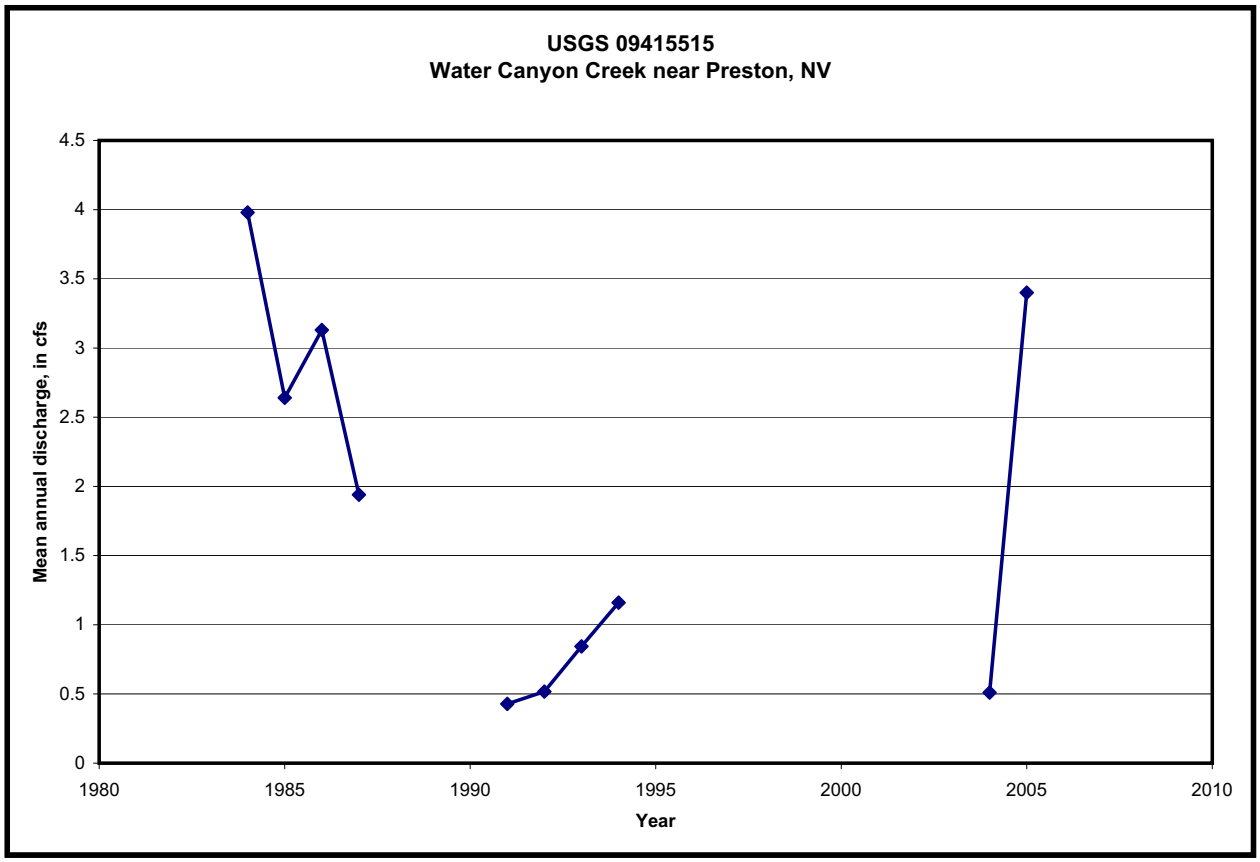

Figure 3-64
Hydrograph of Mean Annual Discharge at Water Canyon Creek near Preston, Nevada

The discharge of Water Canyon Creek has been measured intermittently since August 1982 (Figure 3-64). The USGS has operated a gaging station, Water Canyon Creek near Preston, Nevada, since May 1983. The period of record for this station consists of three short periods of approximately 4 years each. The gage was in operation from May 1983 to September 1987, March 1990 to December 1994, and April 2003 to present. The minimum annual discharge was 0.43 cfs, recorded during the 1991 water year. The maximum annual discharge is 3.98 cfs, recorded during the 1984 water year. The average annual discharge for the period of record is 1.95 cfs (1,410 afy). In 2006 the average annual discharge was 2.91 cfs (2,110 af). In 1982 and 1985, USGS conducted two synoptic discharge measurement studies on Water Canyon Creek. The results are found in Table 3-18.

The water from Water Canyon Creek is used for irrigation in the area near Preston, Nevada.

3.3.4 Forest Home Creek

Forest Home Creek drains the eastern slope of the Grant Range in southwestern White River Valley, and its measurement site is identified as station number 2070401 on Figure 3-57. Forest Home Creek's drainage area is approximately 0.4 mi^2, with elevations ranging from 5,920 ft-amsl at the measurement site to 9,560 ft-amsl near Timber Mountain. The average altitude is 7,790ft-amsl. The

Table 3-18
Synoptic Discharge Measurement Data for Water Canyon Creek

Station Number	Station Name	August 25, 1982		October 8, 1985	
		Discharge	Change in Discharge	Discharge	Change in Discharge
		(cfs)			
2070301	Water Canyon Creek at 7,720 ft altitude	--	--	0.28	--
2070302	Water Canyon Creek at 7,540 ft altitude	3.26	--	2.75	2.47
2070303	Water Canyon Creek at 7,160 ft altitude	2.98	-0.28	2.87	0.12
2070304	Water Canyon Creek at 7,060 ft altitude	3.55	0.57	--	--
2070305	Water Canyon Creek above unnamed left bank tributary	4.18	0.63	2.25	--
2070306	Water Canyon Creek below unnamed left bank tributary	3.42	-0.76	2.54	0.29
2070307	Water Canyon Creek at 6,870 ft altitude	3	-0.42	--	--
2070308	Water Canyon Creek at 6,830 ft altitude	3.09	0.09	2.42	--
2070309	Water Canyon Creek at 6,650 ft altitude	3.15	0.06	2.31	-0.11
2070310	Water Canyon Creek near Preston, NV	--	--	2.2	-0.11

surficial geology of the drainage area is comprised of carbonate rocks (28 percent), clastic rocks (17 percent), and alluvial material (55 percent).

The channel of the creek is lined with grass, brush, and trees (Figure 3-65). The channel is incised about 0.25 ft below the surrounding land surface. SNWA measured a discharge of 1.17 cfs on August 4, 2003. The long-term mean annual discharge is estimated to be 1.83 cfs (1,320 afy) based on the methods described in Section 2.0.

3.4 Muddy River and Meadow Valley Wash

The Muddy River drains parts of central, southern, and eastern Nevada and is the relic portion of the White River. The total drainage area before the Muddy River discharges into Lake Mead is over 8,000 mi^2, and can be divided into two main drainage sub-areas: the Muddy River and Meadow Valley Wash. The Muddy River drainage area extends from Coyote Spring Valley (HA 210), which is drained by Pahranagat Wash, then enters Arrow Canyon and finally joins the Muddy River in the Muddy River Springs Area (HA 219). The second drainage area is the Meadow Valley Wash drainage area. This area drains Spring Valley (HA 201), Eagle Valley (HA 202), Dry Valley (HA 198), Panaca Valley (HA 203), Clover Valley (HA 204), and Lower Meadow Valley Wash (HA 205). Below the confluence of the Meadow Valley Wash and White River drainage areas, the Muddy River drains California Wash (HA 218). The discussion in the following sections focuses on the perennial streamflow originating from the Muddy River Springs and Meadow Valley Wash drainage (Figure 3-66).

Figure 3-65
Forest Home Creek

3.4.1 Discharge

The Muddy River is a perennial stream from its source springs near Moapa, Nevada, until completely diverted at Wells Siding by the Moapa Valley Irrigation Company (MVIC). The flow is steady throughout the year except when affected by floods. While floods are infrequent events, they can influence the annual discharge totals greatly. The floods on the Muddy River are generally of two types. The first type of flood is the flash flood, which is characterized by large peaks of short duration brought on by runoff from high-intensity convective storms. Flash floods usually occur during "Monsoon Season," which is from June through the end of September. The second type of flood, the winter flood is brought on by higher than normal runoff of melting snow pack. Occasionally floods of a large magnitude are brought on by rapid snow melt caused by a heavy warm rain falling upon the snow pack. These floods are of long duration, and cause more damage than a typical flash flood.

During September 1963 and February 2001 the USGS conducted synoptic discharge studies on the Muddy River and its tributaries (Beck and Wilson, 2006). The 2001 study measurement sites were chosen closely match previous investigations sites so that a reasonable comparison between the studies could be made. Beck and Wilson (2006) state that February was chosen as the optimum time

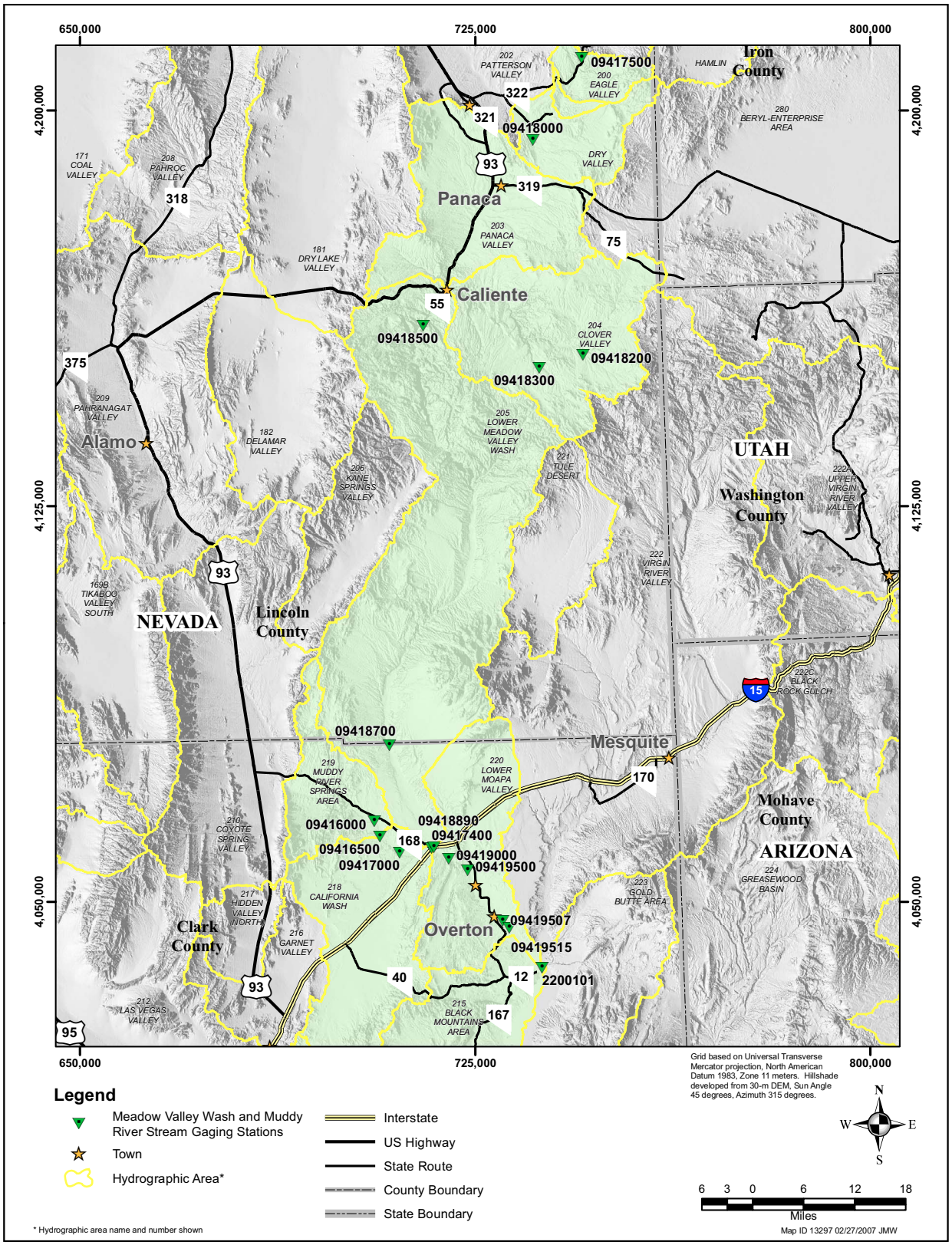

Figure 3-66
Measurement Sites on Muddy River and in Meadow Valley Wash

to conduct this study because of low losses to ET, and steady baseflow. Twenty-nine sites were measured for discharge and water temperature specific conductance, and pH. Fifteen of the sites were located in the Muddy Springs Area, and 14 were located long the main stem of the Muddy River from Moapa, Nevada to Overton, Nevada. The results of the study showed that the Muddy River from its headwaters in the Muddy Springs area to the Muddy River near Moapa, NV-09416000 (Moapa) is a gaining stream, due to numerous springs contributing groundwater to the stream flow. The specific conductance rose slightly from 989 to 1,010 µS/cm near the Moapa gaging station and the temperature was steady at 26°C. From the Moapa gaging station to Muddy River at Railroad Pumping Station near Moapa, NV-09417000 (Railroad) there was a net loss of approximately 1 cfs. The electrical conductivity of the water rose slightly from 1,010 to 1,020 µS/cm and the water temperature dropped from 26 to 21.4°C. From the Railroad measurement site to the Muddy River at I-15 near Glendale, NV-09418890 (I-15) the discharge increased from 34.1 to 38.7 cfs, from agricultural returns, and groundwater inflow. The water property measurements of Between I-15 and the Muddy River near Glendale, NV-09419000 (Glendale) the river losses slightly over 1 cfs. Specific conductance values increased from 1,360 to 1,380 µS/cm and the water temperature dropped from 18.8 to 17.8°C. From Glendale to the Muddy River below Anderson Wash, near Logandale-09419490 (Anderson Wash), a change in discharge from 37.4 at Glendale to 41.3 at Anderson Wash was measured (Beck and Wilson, 2006). The specific conductance rose to 1,400 µS/cm and the temperature dropped to 17.2°C. Below the Anderson Wash measurement site the entire flow of the Muddy River is diverted for irrigation storage, direct irrigation or industrial applications at the Wells Siding Diversion site of the former USGS gaging station Muddy River near Overton, NV-09419500. At Overton, SNWA gaging station Muddy River at Lewis Avenue at Overton, NV-0941507 a discharge of 4.17 cfs was measured and specific conductance of 3,390 µS/cm and water temperature of 10.7°C were measured (Beck and Wilson, 2006). This gage measures agricultural returns and flood events on the Muddy River.

3.4.2 Diversions and Regulation

3.4.2.1 Meadow Valley Wash

Meadow Valley Wash is regulated by four dams of differing sizes. Eagle Valley Reservoir is located in Eagle Valley, HA 200, approximately 20 mi east of Pioche, Nevada, in Spring Valley State Park and covers approximately 65 acres; its dam was built in 1965 to impound the winter runoff to support agriculture year round. Downstream from the Eagle Valley Reservoir is Echo Canyon Reservoir, which is in Rose Valley, HA 199, located 12 mi east of Pioche, Nevada. This 65-acre reservoir was completed in 1970 for the purposes of flood control and providing water storage for agriculture.

Mathews Canyon Dam was constructed in 1957 by the U.S. Army Corps of Engineers (USACE) for the purpose of flood control and is located 20 mi east of Caliente, Nevada, in Clover Valley HA 204. The drainage area above the dam is approximately 34 mi^2. The highest elevation in the drainage area is 7,000 ft-amsl, and the elevation at the dam is 5,420 ft-amsl. When the water impounded by the dam reaches spillway elevation, the lake covers an area of 299 acres and has a volume of 6,270 af (USACE, 2000).

Pine Canyon Dam was constructed contemporaneously with Mathews Canyon Dam in 1957 for the purpose of flood control. As in Mathews Canyon, streamflow in Pine Canyon is ephemeral but can produce large floods. Pine Canyon Dam is about 18 mi east of Caliente, Nevada, and 2 mi southwest of Mathews Canyon in Clover Valley HA 204. The drainage area behind the dam is about 45 mi^2; the reservoir covers an area of 254 acres and has a volume of 7,840 af at the spillway (USACE, 1974).

3.4.2.2 Muddy River

Arrowhead Canyon Dam was built in 1934 by the Civilian Conservation Corps to reduce the risk of floods on the Muddy River. This is a small rock and concrete dam, approximately 35 ft high and 45 ft wide. A 24-in. diameter pipe acts as a spillway (Smith, 1938).

Nevada Power Company (NPC) diverts water from the Muddy River just above the USGS gaging station (Muddy River near Moapa, Nevada; station number 09416000). From here NPC pumps water directly from the river into a pipeline that conveys it to the Reid Gardner Power Generating Station in Moapa, Nevada. NPC has been diverting water in this manner since 1968 and diverts approximately 2,000 to 3,000 afy (LVVWD, 2001).

MVIC diverts the entire flow of the Muddy River for agricultural uses below Glendale, Nevada. The Wells Siding diversion was built by the Civilian Conservation Corps (during the same era as the Arrowhead Canyon Dam) and is 677 ft long and 30 ft high (Smith, 1940). On the west side of the structure is a flood bypass channel, and on the east side is a rock and masonry spill way.

Originally, water was diverted to Bowman Reservoir through three headgates and by a separate diversion channel. Historically, water has been diverted to both the east and west sides of Lower Moapa Valley through a head gate and splitter box. The splitter box was used to convey water to a 4-ft flume that routes the water down the west side of the valley and through a 2-ft flume which routes the water to the east side of the valley. Water supplies on the east side of the valley are augmented by controlled releases from Bowman Reservoir.

After the flood of January 12, 2005, the Wells Siding diversion works sustained heavy damage due to a faulty headgate. Currently, the new diversion works at Wells Siding consist of two subterranean 30-in.-diameter pipes that convey the water to the west side of the valley from a new concrete drop box fed by the three original headgates. The eastern side of the valley will continue to be served by Bowman Reservoir and a new ditch that ties the dropbox to the old eastern channel. This structure was designed to act as a reservoir that temporarily stores peak discharges and also to divert water for storage in Bowman Reservoir for irrigation in the summer. At Wells Siding the entire Muddy River is diverted, except during flood events, with only agricultural return flows, flood flows, and groundwater inflows reaching Lake Mead. The amount of water reaching Lake Mead is estimated between 6,000 and 9,000 afy.

Near the terminus of the Muddy River between the town of Overton, Nevada, and Lake Mead, the river water is diverted to the Overton Wildlife Management Area. The diversion works include a small lift station, ditches, and headgates that route the water to large shallow ponds where it is used by wildlife.

3.4.3 Continuous Gaging Stations

Gaging stations have been operated on the Muddy River and its tributaries since the early 1900s. Figure 3-67 presents the periods of record for each of these gaging stations. Stations that presented partial records were not considered for this analysis due to the abundance of continuous gaging stations on these streams. The stations are described below in upstream-to-downstream order and are located on Figure 3-66. Annual discharges for each gaging station are listed in Appendix B.

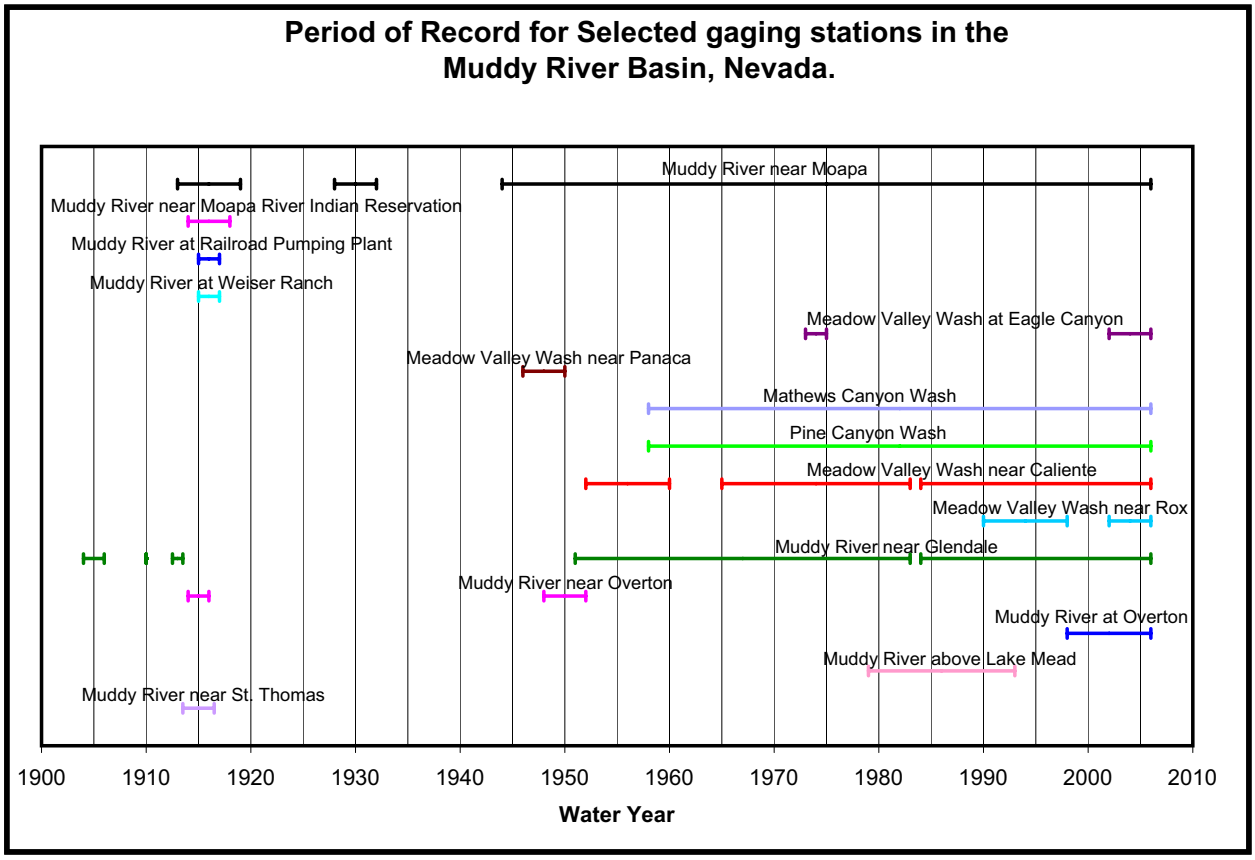

Figure 3-67
Gaging Station Periods of Record for the Muddy River and Its Tributaries

USGS Gaging Station No. 09416000 – Muddy River near Moapa, Nevada

The Muddy River near Moapa, Nevada (Moapa) gaging station is located on the rivers left bank and upstream of the Warm Springs Road bridge, 5 mi northwest of Moapa, Nevada. Although the drainage area is large (3,820 mi^2), it is estimated that 3,720 mi^2 of that area is noncontributing (USGS, 2005). The Moapa gage operated intermittently until 1944, but since then it has been in continuous operation. The gage has been operated by the USGS except for two short periods when it was operated by the Nevada Agricultural Experiment Station (from 1928 to 1932) and the U.S. Bureau of Reclamation (from 1944 through 1948) (Wells, 1954). The perennial flow for this reach of the Muddy River originates from springs found 1 to 2.5 mi upstream of the gage. Above these springs the channel becomes intermittent. Prior to 1977, the annual discharge records included diversions by NPC upstream of the gage. An average annual discharge of 33.2 cfs (24,070 af) was

measured during water year 2006. The highest annual discharge was 49.6 cfs during water year 1958, and the lowest annual discharge of 30.4 cfs was recorded in water year 2004. The long-term average annual discharge is 41.0 cfs (29,680 afy) for the period of record (Figure 3-68) (USGS, 2006).

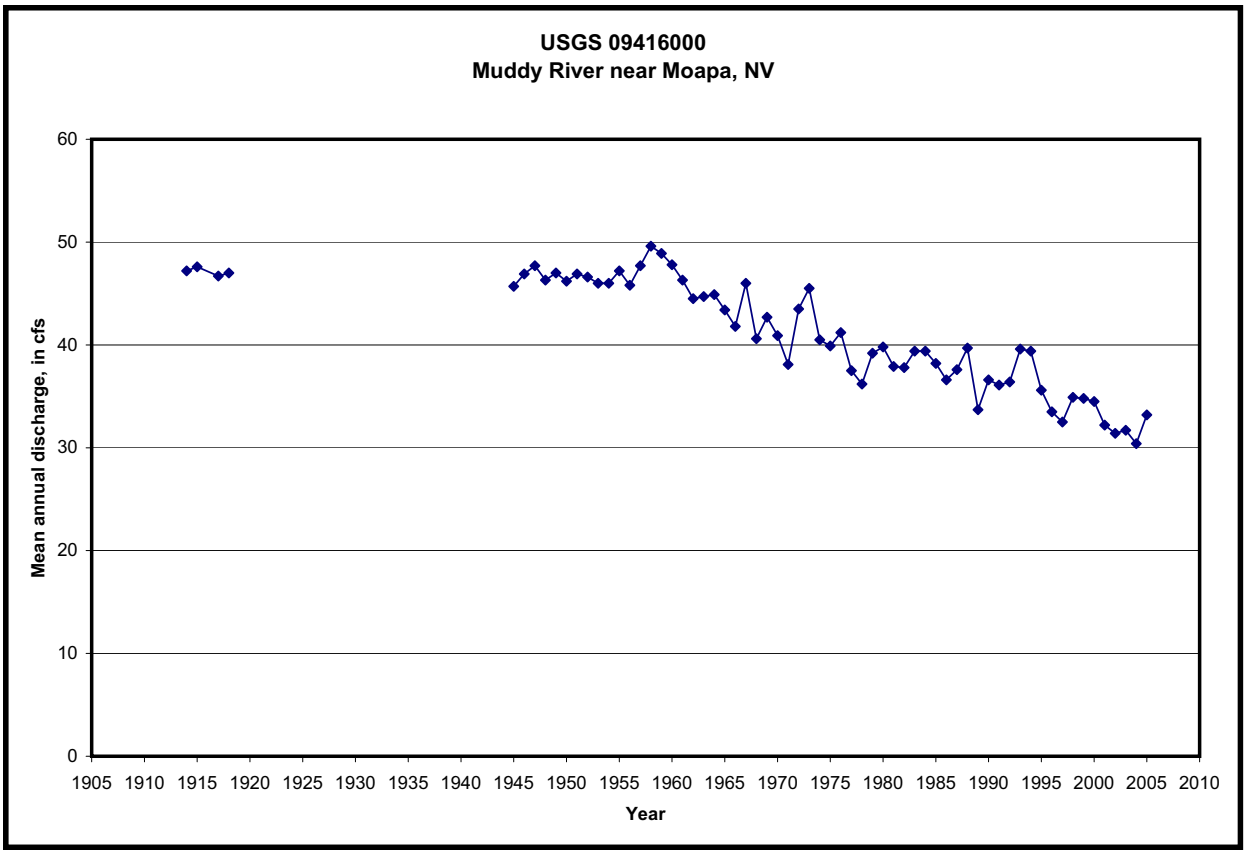

Figure 3-68
Hydrograph of Mean Annual Discharge at Muddy River near Moapa, Nevada

USGS Gaging Station No. 09416500 – Muddy River at White Narrows near Moapa, Nevada

The Muddy River at White Narrows near Moapa, Nevada was in continuous operation from September 1914 through September 1918 and was referred to as the Muddy River above Moapa River Indian Reservation (Reservation). The Reservation gaging station was located 2.5 mi downstream of the Moapa gaging station and 3.5 mi west of Moapa, Nevada. The gage was moved 90 ft downstream during December 1914. With a large drainage area of, 3,890 mi^2 (Wells, 1954), only about 107 mi^2 of that area contributes directly to surface runoff. The maximum annual discharge for the period of record is 47.9 cfs (34,630 afy) during 1915, the minimum annual discharge is 46.4 cfs (33,610 afy) and the long-term average annual discharge is 47.3 cfs (34,272 afy) (Wells, 1954).

USGS Gaging Station No. 09417000 – Muddy River at Railroad Pumping Plant, near Moapa, Nevada

During the water years 1915-17, USGS operated the Muddy River at Railroad Pumping Plant, near Moapa, Nevada (Railroad) gaging station. The Railroad gage is located 1.75 mi southwest of Moapa, Nevada. Only for the 1916 and 1917 water years did the gage produce a complete data record; and in those two years the annual discharge averaged 44.0 cfs (31,855 afy). Irrigation diversions watered one ranch and 200 acres on the Reservation between the Railroad gage and the Reservation gage. Only an area of about 121 mi^2 contributes directly to runoff out of the 3,900 mi^2 drainage area (Wells, 1954).

USGS Gaging Station No. 09417400 – Muddy River at Weiser Ranch, near Moapa, Nevada

From December 1915 through September 1917 the Muddy River at Weiser Ranch, near Moapa, Nevada (Weiser Ranch) gaging station was in continuous operation. The Weiser Ranch gage recorded complete data for only one water year, 1917, before it was discontinued. The average annual discharge was 41.2 cfs (29,790 afy) for water year 1917. The gage was located 3 mi southeast of Moapa, Nevada. Of the 4,360 mi^2 drainage area only an area of about 406 mi^2 contributes directly to surface runoff. There are several irrigation diversions above the Weiser Ranch gage, including Weiser Canal, which is 200 ft upstream of the gage (Wells, 1954).

USGS Gaging Station No. 09417500 – Meadow Valley Wash at Eagle Canyon near Ursine, Nevada

Meadow Valley Wash at Eagle Canyon near Ursine, Nevada, (Ursine) gaging station is located along the rivers left bank 1.2 mi north of Ursine, Nevada, at the State Route 322 bridge. The gaging station measures a 293-mi^2 drainage area, and the elevation at the gage is 5,670 ft-amsl. The Ursine gaging station operated from 1962 to 1974; from 1974 to 1975 only miscellaneous discharge measurements were made at this site. The gage was re-established in December 2002 and has since remained in continuous operation. Prior to 1972, the Ursine gage was referred to as Spring Valley Creek near Ursine, Nevada. The discharge record is influenced by regulated flows from Eagle Valley Reservoir, which is located 1.3 mi upstream of the gage. An average annual discharge of 8.84 cfs (6,400 af) during the 2006 water year. The maximum annual discharge for the period of record is 20.8 cfs (15,060 afy) measured during the 2005 water year, the minimum annual discharge is 4.49 cfs (3,250 afy) was recorded during the 1974 water year, and the long-term average annual discharge is 7.86 cfs (5,700 afy) (USGS, 2006).

USGS Gaging Station No. 09418000 – Meadow Valley Wash near Panaca, Nevada

Meadow Valley Wash near Panaca, Nevada (Panaca) gaging station was located 6 mi northeast of Panaca, Nevada, and 9 mi southeast of Pioche, Nevada. The gage is located at the Delmues Ranch on the east side of Condor Canyon. The gaging station measures a 450-mi^2 drainage area, and the gage's data record was affected by irrigation diversions above the station. The Panaca gage was in service from December 1945 to December 1950. The maximum annual mean discharge was 5.48 (3,970 afy)

during the 1947 water year, and the minimum annual discharge was 3.28 cfs (2,370 afy) during the 1949 water year. The 4-year mean annual discharge was 4.02 cfs (2,910 afy) (Wells, 1954).

USGS Gaging Station No. 09418200 – Mathews Canyon Wash near Caliente, Nevada

The Mathews Canyon Wash near Caliente, Nevada (Mathews) gaging station is located on the downstream end of the outlet to Mathews Canyon Reservoir, 20 mi east of Caliente, Nevada, and 2 mi southeast of Barclay, Nevada, at the head of Clover Creek. The drainage area above the gage is 34 mi^2, and the discharge is regulated by Mathews Canyon Dam. The highest elevation in the drainage area is 7,000 ft-amsl, and the elevation at the gage is 5,409 ft-amsl. The Mathews gage has been in continuous operation since 1958, when the reservoir was constructed. USGS operated and maintained the Mathews gage from 1958 until 1984, when USACE took over and thereafter operated the gage (USGS, 1984). USACE maintains and operates gaging stations on both the inflow and outflow of the reservoir. Records are available upon request from USACE (Figure 3-69) (USACE, 2006).

Figure 3-69
Mathews Canyon

USGS Gaging Station 09418300 – Pine Canyon Wash near Caliente, Nevada

Pine Canyon Wash near Caliente, Nevada (Pine) gaging station is located downstream of the outlet of Pine Canyon Reservoir. The gaging station is located 18 mi southeast of Caliente, Nevada, and 4 mi southwest of Barclay, Nevada. The drainage area upstream of the gage is about 45 mi^2, and the discharge is regulated by Pine Canyon Dam. The gage has been in continuous operation since 1958. From 1958 to 1984, USGS operated and maintained the gage (USGS, 1984). USACE maintains and operates gaging stations on both the inflow and outflow of the reservoir. Records are available upon request from USACE (Figure 3-70) (USACE, 2006).

Figure 3-70
Pine Canyon

USGS Gaging Station 09418500 – Meadow Valley Wash near Caliente, Nevada

Meadow Valley Wash near Caliente, Nevada (Caliente) gaging station is located along the left bank of Meadow Valley Wash 4.5 mi southwest of Caliente, Nevada. The gage was first installed in January 1951 and subsequently has been relocated several times. The gaging station was moved during 1955, 1998, and 2005 and was in continuous operation from January 1951 to September 1960, November 1964 to September 1983, October 1984 to January 2005, and April 2005 to present. In January 2005 the gage was destroyed but later reinstalled in April 2005. The drainage area is about 1,670 mi^2, and the elevation at the gage is 4,200 ft-amsl. During the 2006 water year an average annual discharge of 7.12 cfs (5,150 af) was measured. The maximum annual discharge was 61.5 cfs (44,526 afy) during the 1993 water year, and the minimum annual discharge was 0.41 cfs (297 afy) during the 2004 water year. The long-term average annual discharge was 10.2 cfs (7,380 afy) reported by USGS in water year 2006 (USGS, 2006).

USGS Gaging Station 09418700 – Meadow Valley Wash near Rox, Nevada

The Meadow Valley Wash near Rox, Nevada (Rox) gaging station was first installed in February 1987 on the right bank of Meadow Valley Wash about 0.5 mi south of Rox, Nevada. The Rox gage was moved the left bank of Meadow Valley Wash about 3 mi downstream of Rox, Nevada. Like other gaging stations on Meadow Valley Wash, the Rox gage has an intermittent record since its installation. The period of record includes February 1987 to September 1994, October 2001 to January 2005, and March 2005 to September 2005 when the gage was discontinued. During the

floods of January 2005, the gage was destroyed. The drainage area above the gage is 2,384 mi^2, and the gage is at an elevation of 1,855 ft-amsl. The maximum annual discharge was 10.8 cfs (7,819 afy) during the 1993 water year, and the minimum annual discharge was 0.47 cfs (340 afy) during the 2004 water year. The long-term average annual discharge was 2.37 cfs (1,720 afy) reported by USGS in water year 2005 (USGS, 2005).

USGS Gaging Station No 09419000 – Muddy River near Glendale, Nevada

The Muddy River near Glendale, Nevada (Glendale) gaging station has been operated intermittently since April 1910. A gage height exists for the period of record from January 1904 to December 1906. The Glendale gage has been in its current location since February 1950; it is located on the rivers left bank at the Narrows of the Muddy River 2 mi southeast of Glendale, Nevada. The drainage area is 6,780 mi^2, of which only 3,000 mi^2 contributes to surface water runoff. During the 2006 water year the average annual discharge was 34.6 cfs (25,030 af). The maximum annual discharge was 72.2 cfs (52,273 afy) during the 2005 water year, and the minimum annual discharge was 30.4 cfs (22,010 afy) during the 1997 water year. The long-term average annual discharge is 42.6 cfs (30,870 afy) reported by USGS in water year 2006 (Figures 3-71 and 3-72) (USGS, 2006).

Figure 3-71
Muddy River near Glendale, Nevada

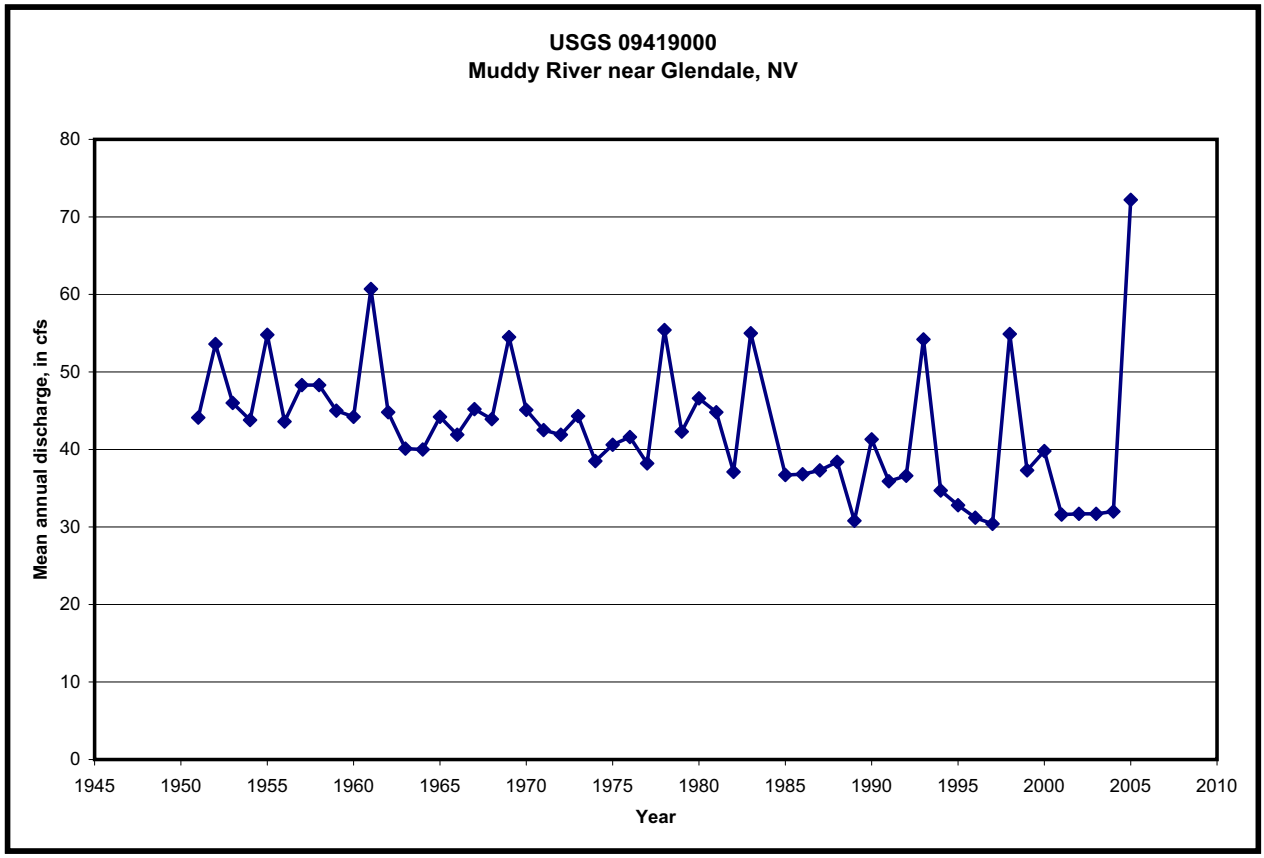

Figure 3-72
Hydrograph of Mean Annual Discharge at Muddy River near Glendale, Nevada

USGS Gaging Station 09419500 – Muddy River near Overton, Nevada

The Muddy River near Overton, Nevada (Wells Siding) gaging station was located at the Wells Siding Diversion Dam 2.5 mi northwest of Logandale, Nevada and 6.5 mi northwest of Overton, Nevada. At an elevation of 1,432 ft-amsl, the gage measures the discharge from a drainage area of 8,180 mi^2, of which approximately 4,230 mi^2 directly contributes to the runoff. The gage was installed in December 1947 and was in continuous operation until September 1954. The average annual discharge was 6.08 cfs (4,400 afy) for the period of record. The Wells Siding gaging station is directly below the diversions of the MVIC. Hendricks (1964) also reported data from St. Thomas, Nevada, with the Wells Siding gage's record. The two stations are separated by over 15 mi and are discussed separately in this report (Figures 3-73 and 3-74) (Hendricks, 1964).

Figure 3-73
Muddy River near Overton, Nevada

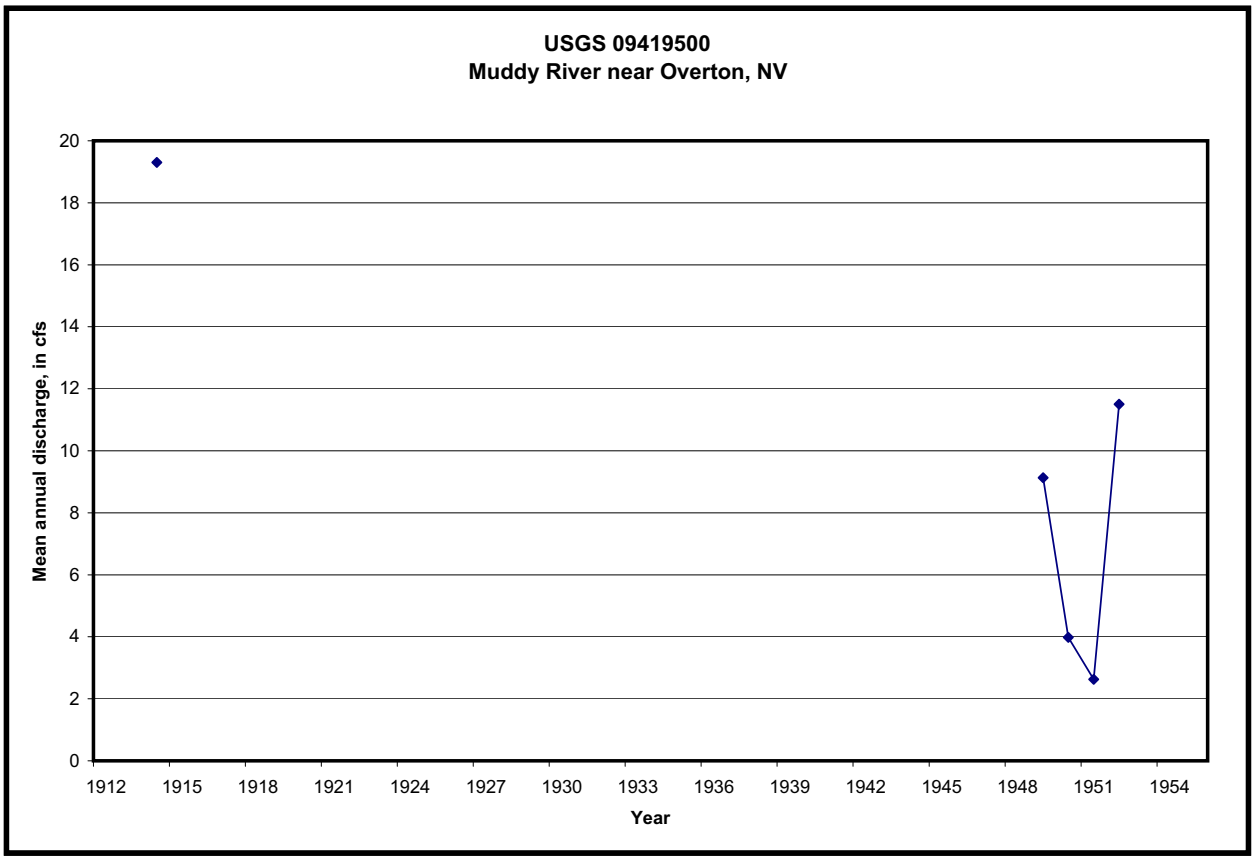

Figure 3-74
Hydrograph of Mean Annual Discharge at Muddy River near Overton, Nevada

Gaging Station 09419507 – Muddy River at Lewis Avenue at Overton, Nevada

Installed on the left bank at the Lewis Avenue Bridge in Overton, Nevada, the Muddy River at Lewis Avenue at Overton, Nevada (Overton) gaging station has been in continuous operation since August 1997. The gage measures the discharge from a drainage area of 6,940 mi^2, of which 3,240 mi^2 contributes directly to surface runoff. The elevation of the gage is 1,251 ft-amsl. The gaging station accounts for only the water that by-passes the diversion works at Wells Siding and any returns from agricultural runoff. The maximum annual discharge was 18.9 cfs (13,683 afy) during the 1998 water year. The record for the 2005 water year was incomplete due to damage incurred by heavy equipment used to repair a flood-damaged bridge. Without several months of data, the annual discharge for 2005 was 23,700 afy. The minimum annual discharge was 8.76 cfs (6,342 afy) during the 2004 water year. The average annual discharge is 12.9 cfs (9,370 afy) reported by SNWA in water year 2004 (Figures 3-75 and 3-76) (USGS, 2005).

Figure 3-75
Muddy River at Lewis Avenue at Overton, Nevada

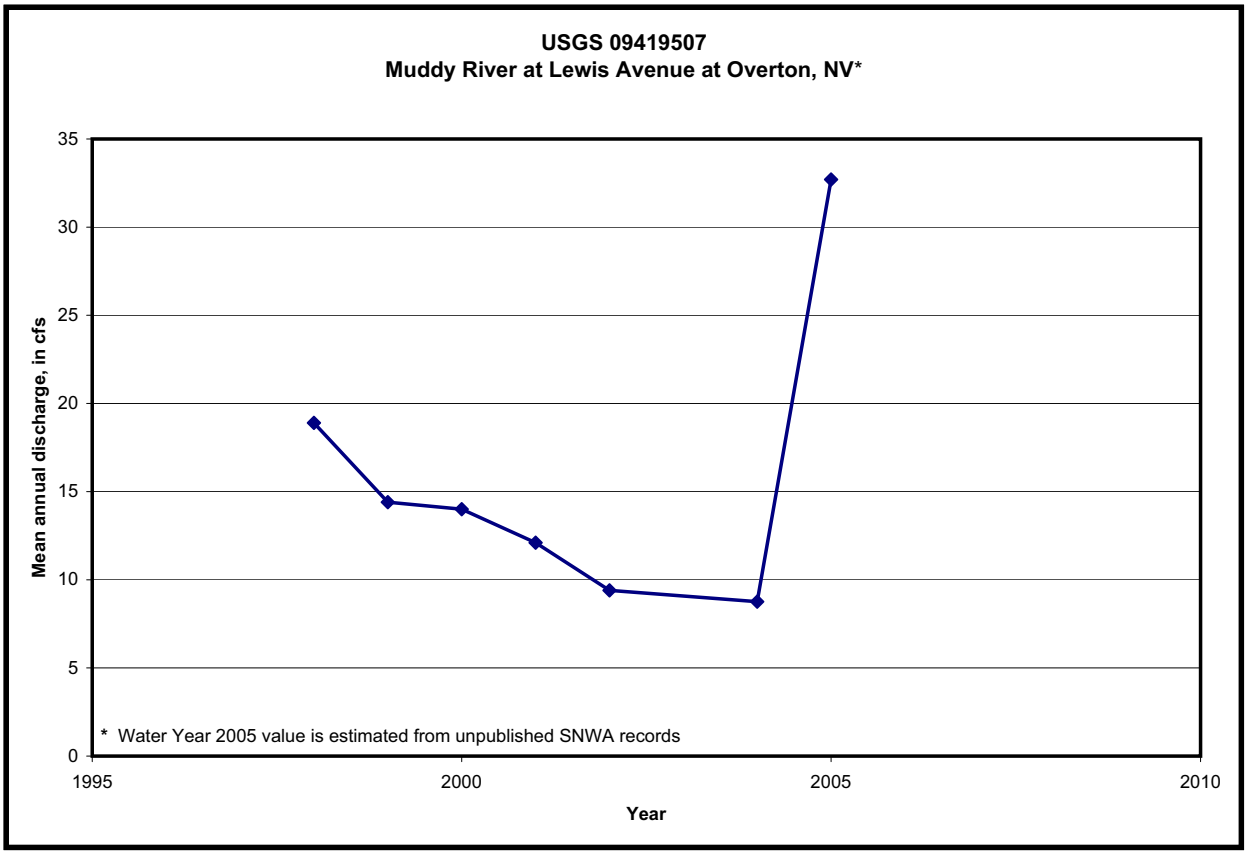

Figure 3-76
Hydrograph of Mean Annual Discharge at Muddy River near Overton, Nevada

USGS Gaging Station No. 09419515 – Muddy River above Lake Mead near Overton, Nevada

Located in the Overton State Wildlife Management Area operated by the Nevada Division of Wildlife, the Muddy River above Lake Mead near Overton, Nevada, (Lake Mead) gaging station operated from October 1978 to September 1983 and from October 1984 until the gage was discontinued in September 1993. The drainage area above the location of the gaging station is 8,310 mi^2, with only 4,300 mi^2 directly contributing to runoff (USGS, 2005). The gage was moved two times: before January 1979 the gage was located 1.4 mi downstream, and from January 1979 to September 1991 the gage was located 0.4 mi downstream. Currently, the gaging station is located immediately downstream of a diversion structure. The water diverted above the gage is used at the wildlife management area to support wildlife habitat. The maximum annual discharge was 18.9 cfs (13,684 afy) during the 1990 water year, and the minimum annual discharge was 3.56 cfs (2,577 afy) during the 1986 water year. The average annual discharge is 9.25 cfs (6,700 afy) reported by the USGS in water year 1993 (Figure 3-77) (USGS, 1993).

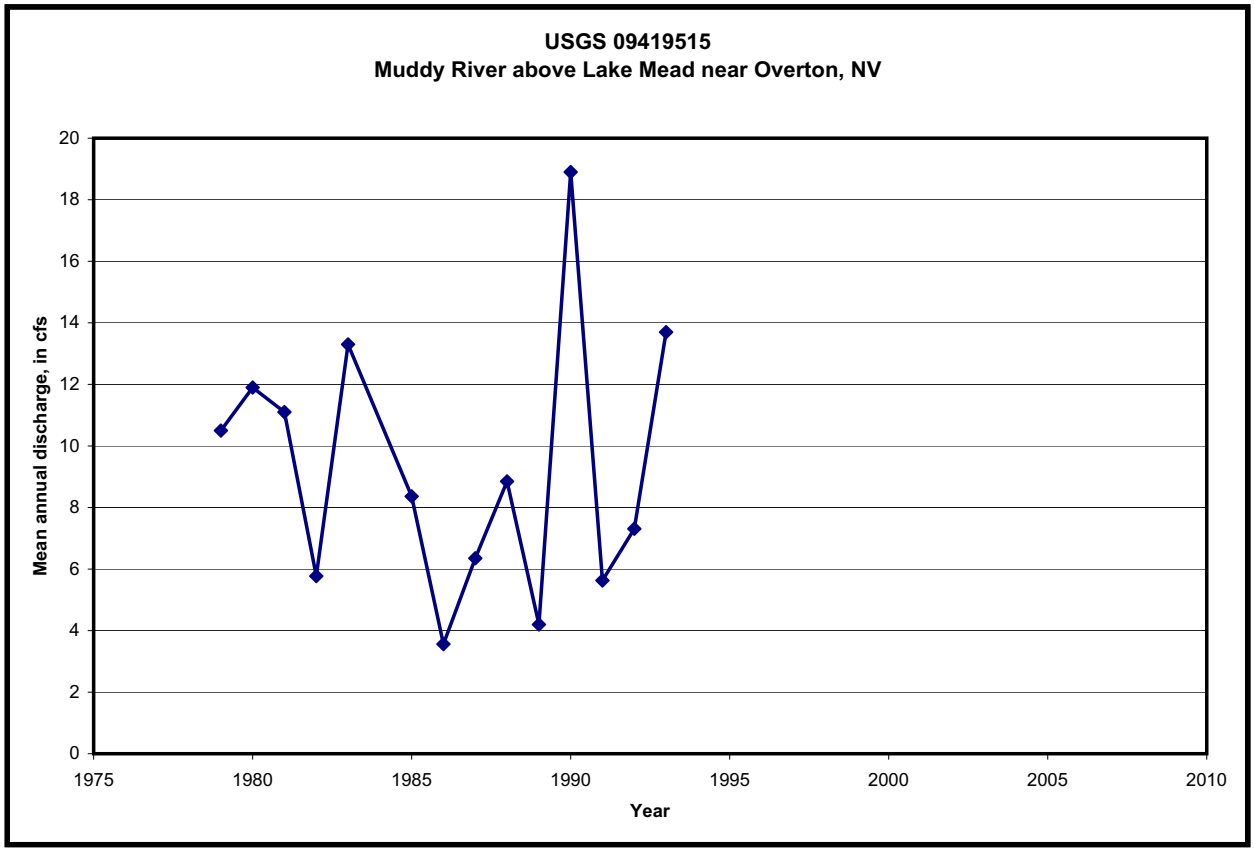

Figure 3-77
Hydrograph of Mean Annual Discharge at
Muddy River above Lake Mead near Overton, Nevada

Muddy River near St. Thomas, Nevada

This was one of the earliest gaging stations on the Muddy River. The location of the gage is described as 0.5 mi above the mouth of the Muddy River and 1.5 mi downstream from St. Thomas, Nevada. The St. Thomas gage operated from May 1913 to September 1916 (Wells, 1954).

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4.0 SUMMARY

Using standardized data collection techniques, selected perennial and ephemeral streams in Snake, Spring, and White River valleys, as well as Meadow Valley Wash and the Muddy River and its tributaries, were inventoried.

Data in this report came from published reports, published and preliminary data from the USGS, and field investigations conducted by SNWA through water year 2006. Investigations conducted by SNWA of the perennial streams included compilation of existing information and data from available data sources, including published and unpublished reports and databases, photographic documentation, discharge measurements, and a written description of the physical setting of the stream. Geographic information systems were used to generate summary statistics describing the drainage area size, elevations, and composition of the surficial geology. Information both historic and current about diversions, water rights, and water use was included when possible.

Based on field observations, most perennial streams have diversions at or near the mountain block-alluvial fan interface. These diversions typically route the water to lined ditches or culverts that minimize the losses, while the water is conveyed to its place of use. The conditions and construction of diversions and aqueducts are quite varied. Some diversions are relatively new and are made of reinforced concrete, such as at Granite Creek in Snake Valley. Others are constructed of rock and mortar, such as at Taft Creek in Spring Valley. Most of the streams in these valleys, as well as the Muddy River, have been and are currently used primarily for irrigation.

Both continuous and miscellaneous discharge records were used to estimate streamflow. Estimates of average annual discharge were derived for each of the perennial streams, using the technique described by Moore (1968). The perennial streamflow estimates for Spring Valley, Snake Valley, and White River Valley are 45,000, 43,000, and 12,600 afy, respectively. These results compared favorably with previous investigations.

The Muddy River is the largest stream in the study area. It averages 30,980 afy at Glendale, Nevada, below the confluence with Meadow Valley Wash. Downstream of Glendale, Nevada, the entire base flow of the river is diverted for irrigation use, and approximately 4,000 afy is stored off the stream in Bowman Reservoir. Based on gaging station records, an estimated 6,000 to 9,000 afy discharges into Lake Mead.

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5.0 REFERENCES

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Appendix A

Miscellaneous Discharge and Gaging Station Locations

Table A.1-1
Miscellaneous Discharge Measurement Sites and Gaging Station Locations
(Page 1 of 8)

Station Number	Station Name	HA[a]	UTM Easting[b] (m)	UTM Northing[b] (m)	Alias	USGS Station Number	Drainage Area (mi^2)
1840101	Stage Canyon near Ely	184	704,607	4,409,809		--	8.6
1840201	Siegel Creek at Mountain Block	184	707,782	4,400,822		--	5.5
1840202	Siegel Creek near Siegel, NV	184	706,684	4,401,213		--	--
1840203	Siegel Creek at Doutre Ranch	184	712,308	4,400,481		--	--
1840301	Silver Creek at Mountain Block	184	707,030	4,397,579		--	2.4
1840401	North Creek at Sunkist, NV	184	706,672	4,395,129		--	3.2
1840501	Frenchman Creek at Mountain Block	184	708,758	4,392,107		--	4.8
1840601	Muncy Creek (USGS)	184	708,705	4,386,426		--	--
1840602	Muncy Creek at Muncy Ranch	184	709,979	4,386,314		--	14
1840701	Kalamazoo Creek (Site 4)	184	706,082	4,382,348		--	--
1840702	Kalamazoo Creek (Site 3)	184	706,408	4,382,324		--	--
1840703	Kalamazoo Creek (Site 2)	184	706,940	4,382,468		--	--
1840704	Kalamazoo Creek (Site 1)	184	710,123	4,382,169		--	14.6
1840801	Piermont Creek above Piermont, NV (Site 2)	184	707,968	4,372,851		--	--
1840802	Piermont Creek at Mountain Block at Piermont, NV	184	710,688	4,373,529	Piermont Creek near McGill, NV (USGS)	10243760	7.5
1840901	Garden Creek at Mountain Block	184	711,705	4,370,891		--	2.9
1841001	Bassett Creek (Site 2)	184	708,774	4,367,945		--	--
1841002	Bassett Creek at Mountain Block	184	712,218	4,368,637	Bassett Creek near McGill (USGS), NV	10243750	6.3
1841101	Little Negro Creek above Diversion near Bassett Ranch	184	712,626	4,366,360		--	3.0
1841201	Odgers Creek at Mountain Block	184	713,098	4,364,305	Odgers Creek near McGill, NV	10243745	3.9
1841301	McCoy Creek (Site 2)	184	709,945	4,360,977		--	--
1841302	McCoy Creek at Mountain Block	184	712,804	4,361,152		--	6.2
1841303	McCoy Creek below aqueduct above splitter box	184	715,655	4,360,330		--	--
1841401	Taft Creek at Diversion	184	712,906	4,357,514		--	4.3
1841402	Taft Creek below South Taft Creek	184	714,714	4,356,856		--	--
1841501	Stephens Creek at Mountain Block	184	716,035	4,351,417		--	2.9
1841601	Cleve Creek below Pete Spring	184	706,197	4,348,685		--	--

Table A.1-1
Miscellaneous Discharge Measurement Sites and Gaging Station Locations
(Page 2 of 8)

Station Number	Station Name	HA[a]	UTM Easting[b] (m)	UTM Northing[b] (m)	Alias	USGS Station Number	Drainage Area (mi^2)
1841602	Cleve Creek 3,000 ft below Pete Spring	184	706,460	4,347,828		--	--
1841603	Cleve Creek 4,500 ft below Pete Spring	184	706,543	4,347,398		--	--
1841604	Cleve Creek above Kolcheck basin tributary	184	706,788	4,347,016		--	--
1841605	Cleve Creek below Kolcheck basin tributary	184	707,186	4,346,670		--	--
1841606	Cleve Creek North Fork at mouth (USGS)	184	709,852	4,344,771		--	--
1841607	Cleve Creek (Site 4)	184	709,808	4,344,757		--	--
1841608	Cleve Creek (Site 3)	184	710,248	4,344,375		--	--
1841609	Cleve Creek (Site 2)	184	710,613	4,344,036		--	--
1841610	Cleve Creek at Campground	184	710,764	4,343,870		--	--
1841611	Cleve Creek near Ely (Site 1)	184	712,669	4,343,423	Published as 10-2437.0 from 1968-69, Cleve Creek near Ely, NV	10243700	31.8
1841612	Cleve Creek above North Fork Cleve Creek	184	709,805	4,344,739		--	--
1841701	Bastian Creek at Mountain Block	184	711,105	4,336,914		--	2.7
1841901	Eight Mile Creek at Mountain Block	184	730,800	4,363,720		--	3.1
1842001	Negro Creek above Salt Marsh Canyon (Site 4)	184	733,873	4,351,112		--	--
1842002	Upper Lower Negro Creek near Ranch House (Site 1)	184	729,080	4,348,390		--	--
1842003	Lower Lower Negro Creek near Ranch House (Site 2)	184	730,403	4,348,509		--	27.4
1842004	Negro Creek Below Ranch (Site 3)	184	727,948	4,348,593	Published as unnamed tributary near First Butte in 1964 annual data report (USGS)	--	--
1842101	Willard Creek (USGS)	184	727,010	4,323,280		--	3.8
1842102	Willard Creek	184	726,693	4,323,170		--	--
1842201	Swallow Canyon above Diversion near Minerva, NV	184	729,884	4,302,523		--	3.5
1842301	Conners Pass Creek near Shoshone, NV.	184	704,749	4,324,212	Published as 10-2436.6 from 1962-69	10243660	0.45
1842501	Cooper Canyon Creek near Ely, NV	184	709,988	4,330,737		--	25.9
1842601	Dry Canyon and Williams Canyon	184	726,112	4,310,122		--	--
1842602	Williams Canyon above aqueduct near Minerva, NV	184	728,892	4,314,021		10243630	--
1842701	Pine and Ridge Creeks	184	724,118	4,316,882		--	4.0
1842702	Pine and Ridge Creeks below Confluence (Site 2)	184	727,728	4,318,879		--	--

Table A.1-1
Miscellaneous Discharge Measurement Sites and Gaging Station Locations
(Page 3 of 8)

Station Number	Station Name	HA[a]	UTM Easting[b] (m)	UTM Northing[b] (m)	Alias	USGS Station Number	Drainage Area (mi^2)
1842901	Fandango Creek	184	710,736	4,378,527		--	0.9
1843001	Meadow Creek at Mountain Block	184	710,082	4,377,496		--	2.8
1843101	Shingle Creek near Great Basin National Park boundary near Osceola, NV	184	728,578	4,320,677		10243640	--
1843102	Shingle Creek at mountain block	184	727,332	4,320,388		--	--
1843103	Shingle Creek at Park Boundary	184	728,844	4,320,654		--	2.2
1843104	Shingle Creek at pipeline diversion	184	725,311	4,319,565		--	--
1843105	Shingle Creek at national forest boundary	184	726,546	4,320,187		--	--
1843301	Board Creek below mountain block and spring	184	728,214	4,321,950		--	0.8
1843401	North Creek at Mountain Block above Robinson Ranch	184	710,943	4,375,323		--	2.7
1843501	Ranger Creek at road crossing	184	713,198	4,356,760		--	1.6
1843601	South Taft Creek at Mountain Block	184	713,329	4,356,039		--	3.2
1843701	McCurdy Creek at road crossing	184	705,417	4,407,142		--	2.9
1843801	Still Canyon below Twin Springs	184	704,943	4,408,554		--	--
1843901	Ohio Canyon	184	727,562	4,325,219		--	--
1844001	Rams Horn	184	712,415	4,377,173		--	1.3
1844201	Trail Creek at mountain block	184	710,873	4,379,610		--	1.9
1844301	Snowbank Canyon	184	707,695	4,394,061		--	--
1844401	Sanford Canyon	184	708,360	4,395,930		--	0.6
1844501	Silver Canyon	184	707,118	4,397,571		--	--
1844601	Mud Springs Draw	184	707,398	4,404,787		--	4.9
1844701	Cottonwood Creek	184	708,238	4,343,175		--	3.2
1844901	Unnamed, between Garrett and Spring Gulch	184	709,104	4,413,939		--	--
1845001	Spring Gulch at road crossing	184	708,508	4,415,761		--	--
1845101	Spring Valley Creek at road crossing	184	710,802	4,422,498		--	--
1845201	Horse Canyon	184	709,927	4,420,909		--	2.1
1845301	Box Canyon	184	709,656	4,423,170		--	1.3

Table A.1-1
Miscellaneous Discharge Measurement Sites and Gaging Station Locations
(Page 4 of 8)

Station Number	Station Name	HA[a]	UTM Easting[b] (m)	UTM Northing[b] (m)	Alias	USGS Station Number	Drainage Area (mi^2)
1845401	Sampson Creek at mountain block	184	708,826	4,430,043		--	--
1950101	Indian Farm Creek near Callao, UT	195	772,503	4,415,325		--	5.6
1950201	Granite Creek near Callao, UT	195	768,819	4,407,802		--	8.1
1950202	Granite Creek 0.7 miles above mountain front	195	767,910	4,408,285		--	--
1950203	Granite Creek at mountain front	195	768,777	4,407,789		--	--
1950301	Trout Creek near Callao, UT	195	766,481	4,403,983		--	8.4
1950302	Trout Creek above Birch Creek	195	768,827	4,400,306		--	--
1950401	Birch Creek above Trout Creek near Trout Creek, UT	195	768,790	4,400,216		--	9.7
1950501	Swan Creek at Devil's Gate	195	749,525	4,373,854		--	23.9
1950601	Marble Wash at Homestead	195	746,456	4,369,964		--	22.1
1950701	Smith Creek above Diversion and Trail Head	195	750,274	4,358,129		--	56.2
1950702	Smith Creek at National Forest Boundary	195	751,778	4,358,112		--	--
1950801	Hampton Creek above Forest Boundary	195	751,861	4,347,914		--	--
1950802	Hampton Creek at Campground above Quarry	195	749,506	4,348,065		--	7.5
1950901	Hendrys Creek at Bridge to Rock Quarry	195	753,378	4,343,807		--	23.6
1951001	Silver Creek 2.0 miles above Forest Boundary	195	740,013	4,339,652		--	--
1951002	Silver Creek 0.8 miles above Forest Boundary	195	740,551	4,337,786		--	23.0
1951101	Weaver Creek above Sage Creek	195	732,450	4,330,598		--	6.6
1951201	Strawberry Creek at National Forest Boundary	195	737,606	4,327715		--	7.8
1951202	Strawberry Creek at Blue Canyon Creek Confluence	195	733,346	4,326,341		--	--
1951203	Strawberry Creek at pipeline diversion	195	739,031	4,330,092		--	--
1951204	Strawberry Creek 0.8 mile downstream of Blue Canyon Confluence	195	734,391	4,326,804		--	--
1951205	Strawberry Creek above Great Basin National Park boundary near Baker, NV	195	737,185	4,327,505		10243280	--
1951206	Strawberry Creek 0.5 mile downstream of park boundary	195	737,920	4,327,867		--	--
1951207	Strawberry Creek 0.6 miles upstream of pipeline diversion	195	738,553	4,329,213		--	--

Table A.1-1
Miscellaneous Discharge Measurement Sites and Gaging Station Locations
(Page 5 of 8)

Station Number	Station Name	HA[a]	UTM Easting[b] (m)	UTM Northing[b] (m)	Alias	USGS Station Number	Drainage Area (mi^2)
1951301	Lehman Creek near Baker, NV	195	741,187	4,321,757		10243260	11.0
1951304	Lehman Creek at lower Lehman Campground	195	739,077	4,322,254		--	--
1951305	Lehman Creek upstream of Baker Creek confluence	195	744,903	4,321,476		--	--
1951306	Lehman Creek at Sage Way	195	742,439	4,321,740		--	11.4
1951307	Lehman Creek 800ft upstream of Circle M Road	195	743,231	4,321,826		--	--
1951308	Lehman Creek at Circle M Road	195	743,597	4,321,683		--	--
1951401	Baker Creek at Pole Canyon (Site 6)	195	741,403	4,319,324		--	--
1951402	Baker Creek at narrows, near Baker, NV	195	741,932	4,319,466	Published as 10-2432.4 from 1963-69	10243240	16.4
1951403	Baker Creek (Site 1)	195	742,379	4,319,788		--	--
1951404	Baker Creek (Site 2)	195	743,705	4,320,629		--	--
1951405	Baker Creek (Site 3)	195	744,644	4,321,251		--	--
1951406	Baker Creek (Site 4)	195	745,085	4,321,443		--	--
1951407	Baker Creek (Site 5)	195	748,117	4,321,907		--	16.8
1951408	Baker Creek at Lower Baker Creek Campground	195	738,943	4,318,732		--	--
1951409	Baker Creek upstream of Lehman Creek confluence	195	744,904	4,321,446		--	--
1951410	Baker Creek upstream of Narrows	195	740,318	4,319,453		--	--
1951411	Baker Creek at Three Hole Cave	195	740,997	4,319,289		--	--
1951413	Baker Creek at National Forest boundary	195	743,465	4,320,476		--	--
1951501	Snake Creek (Site 1)	195	745,396	4,310,904		--	--
1951502	Snake Creek (Site 2)	195	747,084	4,311,179		--	--
1951503	Snake Creek at Great Basin National Park boundary near Baker, NV (Site 3)	195	748,587	4,311,685		10243232	--
1951504	Snake Creek (Site 4)	195	749,088	4,311,743		--	--
1951505	Snake Creek at National Forest boundary (Site 5)	195	750,225	4,311,695		--	--
1951506	Snake Creek below Spring Creek near Garrison, UT	195	751,552	4,311,771	Snake Creek (Site 6a)	10243233	--
1951507	Snake Creek below Rearing Station (Site 7)	195	752,834	4,312,320		--	--
1951508	Snake Creek (Site 8)	195	753,449	4,312,614		--	28.4

Table A.1-1
Miscellaneous Discharge Measurement Sites and Gaging Station Locations
(Page 6 of 8)

Station Number	Station Name	HA[a]	UTM Easting[b] (m)	UTM Northing[b] (m)	Alias	USGS Station Number	Drainage Area (mi^2)
1951509	Snake Creek (Site 9a)	195	755,465	4,313,004		--	--
1951512	Snake Creek near Baker, NV	195	743,413	4,311,271		--	30.0
1951513	Snake Creek at NV-UT state line	195	755,770	4,313,118		10243234	--
1951514	Snake Creek near Standing Snake Pinnacle	195	745,958	4,310,800		--	--
1951515	Snake Creek 0.4 mile upstream of Cave Canyon	195	747,764	4,311,659		--	--
1951516	Snake Creek above pipeline near Baker, NV	195	743,577	4,311,282		10243230	30.0
1951517	Snake Creek upstream of Rearing Station	195	750,374	4,310,723		--	--
1951601	Big Wash North Fork	195	744,633	4,307,991		--	--
1951602	Big Wash South Fork	195	744,621	4,307,822		--	--
1951603	Big Wash Creek at Hunting Camp	195	746,096	4,307,960		--	--
1951604	Big Wash above Hidden Canyon Lodge	195	749,070	4,307,145		--	--
1951605	Big Wash at Hidden Canyon Guest Ranch	195	750,951	4,306,797		--	--
1951606	Big Wash Below Power Line	195	753,530	4,307,083		--	27.9
1951607	Big Wash at fishpond pipeline diversion	195	747,536	4,307,392		--	--
1951609	South Fork Big Wash gage upstream of park boundary	195	743,886	4,307,619		10243228	--
1951610	South Fork Big Wash upstream of North Fork confluence	195	744,462	4,307,729		--	--
1951611	Big Wash 0.85 miles downstream of confluence of North and South forks	195	746,166	4,307,998		--	--
1951701	Lexington Creek at National Forest Boundary	195	748,801	4,305,123		--	11.7
1951801	Chokecherry Creek	195	747,331	4,298,545		--	2.5
1952101	Basin Creek at Boulder Canyon near Callao, UT	195	772,627	4,420,787		--	--
1952201	Horse Canyon at 4WD Trail Head	195	751,239	4,353,623		--	--
1952301	Red Cedar Creek at Diversion	195	772,653	4,412,049		--	--
1952901	Tom's Creek above confluence with Indian Farm Creek	195	774,359	4,417,049		--	--
2040101	Mathews Canyon Dam Inflow	204	745,362	4,153,834		--	--
09418200	Mathews Canyon Wash near Caliente, NV	204	745,486	4,153,807		09418200	34.0
2040201	Pine Canyon Dam Inflow	204	738,062	4,151,215		--	--
09418300	Pine Canyon Wash near Caliente, NV	204	737,201	4,151,252		09418300	45.0

Table A.1-1
Miscellaneous Discharge Measurement Sites and Gaging Station Locations
(Page 7 of 8)

Station Number	Station Name	HA[a]	UTM Easting[b] (m)	UTM Northing[b] (m)	Alias	USGS Station Number	Drainage Area (mi^2)
2070102	White River near Red Mountain, near Preston, NV	207	647,487	4,310,964		09415460	28.2
2070103	White River at Midland Trail Bridge above McQuean Ranch	207	655,730	4308483	White River above McQuean Ranch (Maxey and Eakin,1949), White River at Midland Trail Bridge (Maxey and Eakin, 1949), White River above all diversions except that of A. Lee (Maxey and Eakin, 1949)	--	--
2070104	White River at Berryman-Rosevear Diversion	207	660,714	4,313,179		--	--
2070105	White River near Preston, NV	207	664,450	4,310,116		09415500	--
2070106	White River near Lund, NV	207	665,969	4,278,331		09415550	703
2070107	White River above confluence with Ellison Creek near U.S. Highway 6	207	660,187	4,313,253		--	--
2070201	Ellison Creek above Washburn Station, NV	207	646,570	4,322,766		--	--
2070202	Ellison Creek at Willow Grove, NV	207	649,871	4,320,883		--	--
2070203	Smith Creek above confluence with Ellison Creek	207	654,843	4,314,835		--	--
2070204	Ellison Creek above confluence with White River near U.S. Highway 6	207	660,176	4,313,273		--	--
2070301	Water Canyon Creek at 7,720 ft altitude	207	681,108	4,319,715		--	--
2070302	Water Canyon Creek at 7,540 ft altitude	207	680,704	4,319,520		--	--
2070303	Water Canyon Creek at 7,160 ft altitude	207	679,683	4,318,880		--	--
2070304	Water Canyon Creek at 7,060 ft altitude	207	679,349	4,318,780		--	--
2070305	Water Canyon Creek above unnamed left bank tributary	207	679,161	4,318,560		--	--
2070306	Water Canyon Creek below unnamed left bank tributary	207	679,044	4,318,433		--	--
2070307	Water Canyon Creek at 6,870 ft altitude	207	678,731	4,318,426		--	--
2070308	Water Canyon Creek at 6,830 ft altitude	207	678,543	4,318,237		--	--
2070309	Water Canyon Creek at 6,650 ft altitude	207	677,856	4,317,728		--	--
2070310	Water Canyon Creek near Preston, NV	207	676,828	4,317,396		09415515	11.0
2070401	Forest Home Creek near Forest Home, NV	207	643,629	4,247,921		--	0.40
9416000	Muddy River near Moapa, NV	219	705,855	4,065,298		09416000	3,820/40[c]

Table A.1-1
Miscellaneous Discharge Measurement Sites and Gaging Station Locations
(Page 8 of 8)

Station Number	Station Name	HA[a]	UTM Easting[b] (m)	UTM Northing[b] (m)	Alias	USGS Station Number	Drainage Area (mi^2)
9416500	Muddy River at White Narrows near Moapa, NV	218	706,945	4,062,302	Muddy River above Moapa River Indian Reservation, near Moapa, NV. Muddy River above Moapa Indian Reservation near Moapa, NV	09416500	3,890/107[c]
9417000	Muddy River at Railroad Pumping Plant near Moapa, NV	218	710,670	4,059,309		09417000	3,900/121[c]
9417400	Muddy River at Weiser Ranch near Moapa, NV	218	716,737	4,060,170		09417400	4,360/406[c]
9417500	Meadow Valley Wash at Eagle Canyon, near Ursine, NV	201	745,234	4,209,955		09417500	293.0
9418000	Meadow Valley Wash near Panaca, NV	198	735,965	4,194,410		09418000	450.0
9418500	Meadow Valley Wash near Caliente, NV	205	715,251	4,159,609		09418500	1,670.0
9419000	Muddy River near Glendale, NV	220	719,946	4,058,093		09419000	6,780/3,000[c]
9419500	Muddy River near Overton, NV	220	723,577	4,055,869		09419500	8,180/4,230[c]
9419507	Muddy River at Lewis Avenue at Overton, NV	220	730,224	4,046,398		09419507	6,940/3,240[c]
9419515	Muddy River above Lake Mead near Overton, NV	220	731,508	4,045,011		09419515	7215/3,300[c]
2200101	Muddy River near St. Thomas, NV	220	737,700	4,037,477		--	<8,310/<4,300[c]

[a] Hydrographic area number.
[b] Coordinates are in Universal Transverse Mercator, Zone 11, North American Datum of 1983.
[c] The first value is the total drainage area, the second is the portion of the drainage area directly contributing to runoff.

References

Maxey, G.B., and Eakin, T.E., 1949, Groundwater in the White River Valley, White Pine, Nye, and Lincoln Counties, Nevada: Nevada State Engineer, Water Resources Bulletin 8.

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Appendix B

Annual Discharges at Gaging Stations

B.1.0 ANNUAL DISCHARGES AT GAGING STATIONS

Table B.1-1 tabulates the annual discharge of gaging stations in the study area as reported in NWIS.

Table B.1-1
Annual Discharges of Gaging Stations
(Page 1 of 8)

Station Number	Station Name	Water Year	Mean Annual Discharge (cfs)[a]	Mean Annual Discharge (afy)
09415460	White River near Red Mountain near Preston, NV	2004	1.94	1,405
		2005	22.3	16,145
		2006	11.4	8,250
09415515	Water Canyon Creek near Preston, NV	1984	3.98	2,882
		1985	2.64	1,911
		1986	3.13	2,266
		1987	1.94	1,405
		1991	0.428	310
		1992	0.517	374
		1993	0.844	611
		1994	1.16	840
		2004	0.510	369
		2005	3.40	2,460
		2006	2.91	2,110
09416000	Muddy River near Moapa, NV	1914	47.2	34,173
		1915	47.6	34,462
		1917	46.7	33,811
		1918	47.0	34,028
		1945	45.7	33,087
		1946	46.9	33,956
		1947	47.7	34,535
		1948	46.3	33,521
		1949	47.0	34,028
		1950	46.2	33,449
		1951	46.9	33,956
		1952	46.6	33,738
		1953	46.0	33,304
		1954	46.0	33,304
		1955	47.2	34,173
		1956	45.8	33,159
		1957	47.7	34,535
		1958	49.6	35,910
		1959	48.9	35,404
		1960	47.8	34,607
		1961	46.3	33,521

Table B.1-1
Annual Discharges of Gaging Stations
(Page 2 of 8)

Station Number	Station Name	Water Year	Mean Annual Discharge (cfs)[a]	Mean Annual Discharge (afy)
09416000	Muddy River near Moapa, NV (cont.)	1962	44.5	32,218
		1963	44.7	32,363
		1964	44.9	32,508
		1965	43.4	31,422
		1966	41.8	30,263
		1967	46.0	33,304
		1968	40.6	29,394
		1969	42.7	30,915
		1970	40.9	29,612
		1971	38.1	27,584
		1972	43.5	31,494
		1973	45.5	32,942
		1974	40.5	29,322
		1975	39.9	28,888
		1976	41.2	29,829
		1977	37.5	27,150
		1978	36.2	26,209
		1979	39.2	28,381
		1980	39.8	28,815
		1981	37.9	27,440
		1982	37.8	27,367
		1983	39.4	28,526
		1984	39.4	28,526
		1985	38.2	27,657
		1986	36.6	26,498
		1987	37.6	27,222
		1988	39.7	28,743
		1989	33.7	24,399
		1990	36.6	26,498
		1991	36.1	26,136
		1992	36.4	26,354
		1993	39.6	28,670
		1994	39.4	28,526
		1995	35.6	25,774
		1996	33.5	24,254
		1997	32.5	23,530
		1998	34.9	25,268
		1999	34.8	25,195
		2000	34.5	24,978
		2001	32.2	23,313
		2002	31.4	22,734
		2003	31.7	22,951
		2004	30.4	22,010
		2005	33.2	24,037
		2006	33.2	24,037

Table B.1-1
Annual Discharges of Gaging Stations
(Page 3 of 8)

Station Number	Station Name	Water Year	Mean Annual Discharge (cfs)[a]	Mean Annual Discharge (afy)
09417000	Muddy River at Railroad Pump Plant near Moapa, NV	1916	44.5	32,218
		1917	43.4	31,422
09417400	Muddy River at Weiser Ranch near Moapa, NV	1917	41.2	29,829
09418700	Meadow Valley Wash near Rox, NV	1988	2.32	1,680
		1989	1.14	825
		1990	1.29	934
		1991	1.33	963
		1992	3.43	2,483
		1993	10.8	7,819
		1994	1.02	738
		2002	1.08	782
		2003	0.845	612
		2004	0.468	339
		2005	--	--
09419000	Muddy River near Glendale, NV	1951	44.1	31,928
		1952	53.6	38,806
		1953	46.0	33,304
		1954	43.8	31,711
		1955	54.8	39,675
		1956	43.6	31,566
		1957	48.3	34,969
		1958	48.3	34,969
		1959	45.0	32,580
		1960	44.2	32,001
		1961	60.7	43,947
		1962	44.8	32,435
		1963	40.1	29,032
		1964	40.0	28,960
		1965	44.2	32,001
		1966	41.9	30,336
		1967	45.2	32,725
		1968	43.9	31,784
		1969	54.5	39,458
		1970	45.1	32,652
		1971	42.5	30,770
		1972	41.9	30,336
		1973	44.3	32,073
		1974	38.5	27,874
		1975	40.6	29,394
		1976	41.6	30,118
		1977	38.2	27,657
		1978	55.4	40,110
		1979	42.3	30,625
		1980	46.6	33,738
		1981	44.8	32,435
		1982	37.1	26,860

Table B.1-1
Annual Discharges of Gaging Stations
(Page 4 of 8)

Station Number	Station Name	Water Year	Mean Annual Discharge (cfs)[a]	Mean Annual Discharge (afy)
09419000	Muddy River near Glendale, NV (cont.)	1983	55.0	39,820
		1985	36.7	26,571
		1986	36.8	26,643
		1987	37.3	27,005
		1988	38.4	27,802
		1989	30.8	22,299
		1990	41.3	29,901
		1991	35.9	25,992
		1992	36.6	26,498
		1993	54.2	39,241
		1994	34.7	25,123
		1995	32.8	23,747
		1996	31.2	22,589
		1997	30.4	22,010
		1998	54.9	39,748
		1999	37.3	27,005
		2000	39.8	28,815
		2001	31.6	22,878
		2002	31.7	22,951
		2003	31.7	22,951
		2004	32.0	23,168
		2005	72.2	52,273
		2006	34.6	25,030
09419500	Muddy River near Overton, NV	1914	19.3	13,973
		1949	9.13	6,610
		1950	3.98	2,882
		1951	2.63	1,904
		1952	11.5	8,326
09419507	Muddy River at Lewis Avenue at Overton, NV	1998	18.9	13,684
		1999	14.4	10,426
		2000	14.0	10,136
		2001	12.1	8,760
		2002	9.40	6,806
		2004	8.76	6,342
09419515	Muddy River above Lake Mead near Overton, NV	1979	10.5	7,602
		1980	11.9	8,616
		1981	11.1	8,036
		1982	5.77	4,177
		1983	13.3	9,629
		1985	8.36	6,053
		1986	3.56	2,577
		1987	6.35	4,597
		1988	8.85	6,407
		1989	4.20	3,041
		1990	18.9	13,684

Table B.1-1
Annual Discharges of Gaging Stations
(Page 5 of 8)

Station Number	Station Name	Water Year	Mean Annual Discharge (cfs)[a]	Mean Annual Discharge (afy)
09419515	Muddy River above Lake Mead near Overton, NV (cont.)	1991	5.63	4,076
		1992	7.31	5,292
		1993	13.7	9,919
10243223	Decathon Canyon below Great Basin National Park Boundary near Minerva, NV	2003	0	0
		2004	0	0
10243228	South Fork Big Wash above Great Basin National Park Boundary near Baker, NV	2003	0.693	502
		2004	0.365	264
10243230	Snake Creek above Pipeline near Baker, NV	2003	3.00	2,172
		2004	2.39	1,730
10243232	Snake Creek at Great Basin National Park Boundary near Baker, NV	2003	1.38	999
		2004	1.05	760
10243233	Snake Creek below Spring Creek near Garrison, UT	2004	3.82	2,766
10243240	Baker Creek at Narrows, near Baker, NV	1948	5.85	4,235
		1949	10.8	7,819
		1950	5.66	4,098
		1951	6.62	4,793
		1952	19.6	14,190
		1953	3.87	2,802
		1954	8.18	5,922
		1955	7.64	5,531
		1993	11.0	7,964
		1994	5.13	3,714
		1995	26.6	19,258
		1996	4.68	3,388
		1997	9.45	6,842
		2003	6.22	4,503
		2004	4.90	3,548
10243250	Baker Creek near Baker, NV	1915	16.5	11,946
10243260	Lehman Creek near Baker, NV	1948	4.31	3,120
		1949	5.98	4,330
		1950	3.67	2,657
		1951	3.90	2,824
		1952	9.06	6,559
		1953	2.51	1,817
		1954	4.55	3,294
		1955	5.50	3,982
		1993	5.64	4,083
		1994	4.17	3,019
		1995	11.0	7,964
		1996	4.11	2,976
		1997	5.07	3,671
		2003	4.02	2,910
		2004	3.47	2,512
		2005	13.7	9,919
		2006	5.70	4,120

Table B.1-1
Annual Discharges of Gaging Stations
(Page 6 of 8)

Station Number	Station Name	Water Year	Mean Annual Discharge (cfs)[a]	Mean Annual Discharge (afy)
10243265	Rowland Spring at Great Basin National Park near Baker, NV	2003	2.35	1,701
		2004	2.21	1,600
10243280	Strawberry Creek above Great Basin National Park Boundary near Baker, NV	2003	0.701	508
		2004	0.459	332
10243630	Williams Canyon above aqueduct near Minerva, NV	2003	1.27	919
		2004	0.985	713
10243640	Shingle Creek near Great Basin National Park Boundary near Osceola, NV	2003	0.931	674
		2004	0.757	548
10243700	Cleve Creek near Ely, NV	1915	10.5	7,602
		1916	10.7	7,747
		1960	5.15	3,729
		1961	5.58	4,040
		1962	8.87	6,422
		1963	8.94	6,473
		1964	8.68	6,284
		1965	9.22	6,675
		1966	7.14	5,169
		1967	13.5	9,774
		1977	6.85	4,959
		1978	13.0	9,412
		1979	10.8	7,819
		1980	14.0	10,136
		1981	8.68	6,284
		1984	22.2	16,073
		1985	13.6	9,846
		1986	13.1	9,484
		1987	10.4	7,530
		1991	7.25	5,249
		1992	5.65	4,091
		1993	9.29	6,726
		1994	6.45	4,670
		1995	16.2	11,729
		1996	8.77	6,349
		1997	9.46	6,849
		1998	15.4	11,150
		1999	12.6	9,122
		2000	8.91	6,451
		2001	9.18	6,646
		2002	6.55	4,742
		2003	7.34	5,314
		2004	6.40	4,634
		2005	21.6	15,638
		2006	14.4	10,410
10244950	Steptoe Creek near Ely, NV	1967	7.39	5,350
		1968	6.26	4,532
		1969	10.7	7,747

Table B.1-1
Annual Discharges of Gaging Stations
(Page 7 of 8)

Station Number	Station Name	Water Year	Mean Annual Discharge (cfs)[a]	Mean Annual Discharge (afy)
10244950	Steptoe Creek near Ely, NV (cont.)	1970	5.47	3,960
		1971	7.52	5,444
		1972	5.21	3,772
		1973	8.90	6,444
		1974	5.01	3,627
		1975	8.48	6,140
		1976	5.03	3,642
		1977	3.86	2,795
		1978	8.85	6,407
		1979	6.74	4,880
		1980	9.04	6,545
		1981	6.17	4,467
		1982	7.90	5,720
		1983	18.9	13,684
		1984	13.8	9,991
		1985	8.44	6,111
		1986	9.29	6,726
		1987	5.74	4,156
		1988	5.51	3,989
		1989	3.59	2,599
		1990	2.84	2,056
		1991	3.40	2,462
		1992	3.00	2,172
		1993	5.28	3,823
		1994	3.66	2,650
		1995	9.07	6,567
		1996	5.06	3,663
		1997	5.46	3,953
		1998	9.13	6,610
		1999	6.81	4,930
		2000	4.48	3,244
		2001	4.11	2,976
		2002	3.06	2,215
		2003	3.72	2,693
		2004	2.88	2,085
		2005	13.0	9,412
		2006	7.94	5,750
10245005	Duck Creek near Cherry Creek, NV	1986	45.1	32,652
		1987	44.9	32,508
10245040	Goshute Creek near Cherry Creek, NV	1984	8.99	6,509
		1985	2.62	1,897

Table B.1-1
Annual Discharges of Gaging Stations
(Page 8 of 8)

Station Number	Station Name	Water Year	Mean Annual Discharge (cfs)[a]	Mean Annual Discharge (afy)
10245445	Illipah Creek near Hamilton, NV	1984	8.11	5,872
		1985	5.16	3,736
		1986	4.53	3,280
		1987	2.98	2,158
		1991	0.676	489
		1992	0.583	422
		1993	1.11	804
		1994	1.68	1,216
		2004	1.61	1,166
		2005	4.26	3,084
		2006	6.42	4,650

[a]Mean Annual DIscharge data from NWIS

Appendix C

Miscellaneous Discharge Measurement Data for Streams in Spring, Snake, and White River Valleys

C.1.0 MISCELLANEOUS DISCHARGE MEASUREMENT DATA

Table C.1-1 tabulates the discharge measurements of streams in the study area.

Table C.1-1
Miscellaneous Discharge Measurement Data
(Page 1 of 21)

Station Number	HA	Date	Date Accuracy	Discharge (cfs)	Measurement Accuracy	Data Source
1840101	184	7/13/1998	Day	0.15	Fair	SNWA
1840101	184	7/12/1999	Day	0.09	Fair	SNWA
1840101	184	7/24/2000	Day	Dry	Fair	SNWA
1840101	184	8/6/2001	Day	Dry	Fair	SNWA
1840201	184	7/16/1996	Day	1.3	Fair	SNWA
1840201	184	7/13/1998	Day	2.65	Fair	SNWA
1840201	184	7/12/1999	Day	2.66	Good	SNWA
1840201	184	7/24/2000	Day	0.25	Fair	SNWA
1840201	184	7/26/2000	Day	0.474	Fair	SNWA
1840201	184	8/6/2001	Day	0.12	Fair	SNWA
1840201	184	7/16/2002	Day	0.21	Fair	SNWA
1840201	184	8/6/2003	Day	0.67	Fair	SNWA
1840201	184	7/28/2004	Day	0.29	Fair	SNWA
1840201	184	7/28/2005	Day	2.95	Fair	SNWA
1840201	184	8/16/2006	Day	0.895	Fair	SNWA
1840202	184	10/25/2005	Day	1.6	Good	SNWA
1840203	184	7/16/1964	Day	2.0	--	Rush and Kazmi, 1965
1840301	184	7/17/1998	Day	Dry	Fair	SNWA
1840401	184	7/14/1964	Day	2.23	--	USGS, 1964
1840401	184	7/17/1996	Day	1.13	Fair	SNWA
1840401	184	7/14/1998	Day	3.11	Fair	SNWA
1840401	184	7/17/1998	Day	2.74	Fair	SNWA
1840401	184	7/12/1999	Day	2.4	Fair	SNWA
1840401	184	7/24/2000	Day	0.60	Fair	SNWA
1840401	184	7/25/2000	Day	0.554	Fair	SNWA
1840401	184	7/25/2000	Day	0.572	Fair	SNWA
1840401	184	7/25/2000	Day	0.611	Fair	SNWA
1840401	184	7/25/2000	Day	0.656	Fair	SNWA
1840401	184	8/6/2001	Day	0.37	Good	SNWA
1840401	184	8/9/2001	Day	0.421	Fair	SNWA
1840401	184	7/16/2002	Day	0.68	Fair	SNWA
1840401	184	8/6/2003	Day	0.67	Good	SNWA
1840401	184	7/28/2004	Day	0.564	Fair	SNWA

Table C.1-1
Miscellaneous Discharge Measurement Data
(Page 2 of 21)

Station Number	HA	Date	Date Accuracy	Discharge (cfs)	Measurement Accuracy	Data Source
1840401	184	7/28/2005	Day	2.05	Fair	SNWA
1840401	184	10/25/2005	Day	0.981	Fair	SNWA
1840401	184	8/16/2006	Day	1.42	Poor	SNWA
1840501	184	7/17/1996	Day	0.66	Good	SNWA
1840501	184	7/14/1998	Day	0.898	Fair	SNWA
1840501	184	7/17/1998	Day	0.86	Fair	SNWA
1840501	184	7/12/1999	Day	1.04	Good	SNWA
1840501	184	8/7/2001	Day	0.104	Fair	SNWA
1840501	184	8/15/2006	Day	0.384	Fair	SNWA
1840601	184	7/14/1964	Day	4.23	--	USGS, 1964
1840601	184	8/15/1964	Day	1.98	--	USGS, 1964
1840602	184	7/16/1998	Day	5.17	Good	SNWA
1840602	184	7/17/1998	Day	5.14	Fair	SNWA
1840602	184	7/13/1999	Day	5.04	Good	SNWA
1840602	184	7/24/2000	Day	0.806	Poor	SNWA
1840602	184	7/24/2000	Day	1.06	Poor	SNWA
1840602	184	7/27/2000	Day	0.75	Fair	SNWA
1840602	184	8/7/2001	Day	0.8	Fair	SNWA
1840602	184	8/16/2006	Day	0.824	Fair	SNWA
1840701	184	7/16/1997	Day	0.994	Fair	SNWA
1840701	184	7/17/1997	Day	0.937	Good	SNWA
1840701	184	7/17/1997	Day	0.999	Good	SNWA
1840701	184	7/17/1997	Day	1.02	Good	SNWA
1840701	184	7/17/1997	Day	1.09	Good	SNWA
1840701	184	7/18/1997	Day	1.02	Good	SNWA
1840701	184	7/18/1997	Day	1.05	Good	SNWA
1840701	184	7/27/2000	Day	0.362	Fair	SNWA
1840701	184	8/9/2001	Day	0.309	Fair	SNWA
1840701	184	7/28/2005	Day	0.971	Fair	SNWA
1840702	184	7/16/1997	Day	0.803	Fair	SNWA
1840702	184	7/17/1997	Day	0.815	Good	SNWA
1840702	184	7/17/1997	Day	0.837	Good	SNWA
1840702	184	7/17/1997	Day	0.885	Good	SNWA
1840702	184	7/18/1997	Day	0.884	Good	SNWA
1840702	184	7/12/1998	Day	2.63	Fair	SNWA
1840702	184	7/27/2000	Day	2.9	Fair	SNWA
1840702	184	8/9/2001	Day	0.164	Fair	SNWA
1840703	184	7/16/1997	Day	4.66	Fair	SNWA
1840703	184	7/17/1997	Day	3.74	Fair	SNWA
1840703	184	7/17/1997	Day	4.59	Fair	SNWA
1840703	184	7/17/1997	Day	4.76	Fair	SNWA
1840703	184	7/18/1997	Day	4.63	Fair	SNWA
1840703	184	7/18/1997	Day	4.86	Fair	SNWA

Table C.1-1
Miscellaneous Discharge Measurement Data
(Page 3 of 21)

Station Number	HA	Date	Date Accuracy	Discharge (cfs)	Measurement Accuracy	Data Source
1840703	184	7/12/1998	Day	9.72	Good	SNWA
1840703	184	8/7/2003	Day	3.0	Fair	SNWA
1840703	184	7/28/2005	Day	6.57	Fair	SNWA
1840704	184	7/14/1964	Day	6.87	--	USGS, 1964
1840704	184	8/15/1964	Day	5.95	--	USGS, 1964
1840704	184	6/1/1980	Month	4.01	--	ERTEC, 1981
1840704	184	12/8/1982	Day	5.29	--	USGS, 1983
1840704	184	6/30/1983	Day	28.2	--	USGS, 1983
1840704	184	10/26/1983	Day	6.68	--	USGS, 1985
1840704	184	6/13/1984	Day	27.2	--	USGS, 1985
1840704	184	11/7/1984	Day	7.52	--	USGS, 1985
1840704	184	2/5/1985	Day	5.75	--	USGS, 1985
1840704	184	5/24/1985	Day	12.1	--	USGS, 1985
1840704	184	7/12/1991	Day	4.42	--	USGS, 1991
1840704	184	10/22/1991	Day	3.18	--	USGS, 1992
1840704	184	12/3/1991	Day	3.02	--	USGS, 1992
1840704	184	3/16/1992	Day	3.42	--	USGS, 1992
1840704	184	6/24/1992	Day	3.03	--	USGS, 1992
1840704	184	6/23/1993	Day	9.64	Fair	Katzer and Donovan, 2003
1840704	184	7/15/1996	Day	4.75	Good	SNWA
1840704	184	7/16/1996	Day	5.05	Good	SNWA
1840704	184	7/16/1997	Day	5.62	Good	SNWA
1840704	184	7/17/1997	Day	5.74	Fair	SNWA
1840704	184	7/17/1997	Day	5.75	Good	SNWA
1840704	184	7/17/1997	Day	5.79	Good	SNWA
1840704	184	7/17/1997	Day	5.83	Good	SNWA
1840704	184	7/17/1997	Day	5.98	Good	SNWA
1840704	184	7/18/1997	Day	6.04	Good	SNWA
1840704	184	7/12/1998	Day	9.31	Fair	SNWA
1840704	184	7/14/1998	Day	9.96	Fair	SNWA
1840704	184	7/13/1999	Day	7.26	Good	SNWA
1840704	184	7/24/2000	Day	3.27	Fair	SNWA
1840704	184	7/27/2000	Day	3.51	Fair	SNWA
1840704	184	8/9/2001	Day	3.77	Poor	SNWA
1840704	184	7/16/2002	Day	3.1	Fair	SNWA
1840704	184	8/7/2003	Day	3.35	Fair	SNWA
1840704	184	7/28/2004	Day	2.73	Fair	SNWA
1840704	184	7/27/2005	Day	10.1	Fair	SNWA
1840704	184	10/25/2005	Day	5.38	Fair	SNWA
1840704	184	8/15/2006	Day	4.87	Fair	SNWA
1840705	184	8/9/2001	Day	2.62	Fair	SNWA
1840801	184	7/14/1999	Day	3.45	Fair	SNWA
1840801	184	7/14/1999	Day	3.45	Fair	SNWA

Table C.1-1
Miscellaneous Discharge Measurement Data
(Page 4 of 21)

Station Number	HA	Date	Date Accuracy	Discharge (cfs)	Measurement Accuracy	Data Source
1840801	184	7/14/1999	Day	3.46	Fair	SNWA
1840801	184	7/14/1999	Day	3.54	Fair	SNWA
1840801	184	7/14/1999	Day	3.59	Fair	SNWA
1840802	184	7/18/1972	Day	0.91	--	USGS, 1972
1840802	184	11/1/1972	Day	1.39	--	USGS, 1973
1840802	184	1/24/1973	Day	1.08	--	USGS, 1973
1840802	184	4/26/1973	Day	5.69	--	USGS, 1973
1840802	184	5/21/1973	Day	26.0	--	USGS, 1973
1840802	184	7/25/1973	Day	1.5	--	USGS, 1973
1840802	184	9/18/1973	Day	1.14	--	USGS, 1973
1840802	184	5/14/1974	Day	6.32	--	USGS, 1974
1840802	184	6/12/1974	Day	4.23	--	USGS, 1974
1840802	184	8/20/1974	Day	0.52	--	USGS, 1974
1840802	184	10/1/1974	Day	0.49	--	USGS, 1975
1840802	184	1/14/1975	Day	1.78	--	USGS, 1975
1840802	184	5/19/1975	Day	30.4	--	USGS, 1975
1840802	184	6/12/1975	Day	22.8	--	USGS, 1975
1840802	184	9/18/1975	Day	1.48	--	USGS, 1975
1840802	184	4/21/1976	Day	2.17	--	USGS, 1976
1840802	184	6/23/1976	Day	2.38	--	USGS, 1976
1840802	184	8/19/1976	Day	0.79	--	USGS, 1976
1840802	184	10/13/1976	Day	1.14	--	USGS, 1977
1840802	184	2/23/1977	Day	1.06	--	USGS, 1977
1840802	184	4/21/1977	Day	1.95	--	USGS, 1977
1840802	184	8/24/1977	Day	1.04	--	USGS, 1977
1840802	184	4/19/1978	Day	4.95	--	USGS, 1978
1840802	184	5/18/1978	Day	11.2	--	USGS, 1978
1840802	184	7/24/1978	Day	1.53	--	USGS, 1978
1840802	184	10/2/1978	Day	1.08	--	USGS, 1979
1840802	184	2/21/1979	Day	1.06	--	USGS, 1979
1840802	184	5/22/1979	Day	14.1	--	USGS, 1979
1840802	184	9/18/1979	Day	0.74	--	USGS, 1979
1840802	184	1/23/1980	Day	1.05	--	USGS, 1980
1840802	184	12/8/1982	Day	2.6	--	USGS, 1983
1840802	184	7/16/1996	Day	1.09	Good	SNWA
1840802	184	7/14/1998	Day	5.94	Fair	SNWA
1840802	184	7/15/1998	Day	6.47	Fair	SNWA
1840802	184	7/17/1998	Day	4.96	Fair	SNWA
1840802	184	7/14/1999	Day	2.74	Good	SNWA
1840802	184	7/14/1999	Day	2.74	Good	SNWA
1840802	184	7/14/1999	Day	2.82	Good	SNWA
1840802	184	7/14/1999	Day	2.83	Good	SNWA
1840802	184	7/14/1999	Day	2.87	Good	SNWA

Table C.1-1
Miscellaneous Discharge Measurement Data
(Page 5 of 21)

Station Number	HA	Date	Date Accuracy	Discharge (cfs)	Measurement Accuracy	Data Source
1840802	184	7/14/1999	Day	2.9	Good	SNWA
1840802	184	7/14/1999	Day	2.91	Good	SNWA
1840802	184	7/24/2000	Day	0.923	Good	SNWA
1840802	184	7/27/2000	Day	0.682	Fair	SNWA
1840802	184	7/27/2000	Day	0.733	Fair	SNWA
1840802	184	8/8/2001	Day	0.511	Fair	SNWA
1840802	184	8/9/2001	Day	0.703	Good	SNWA
1840802	184	7/16/2002	Day	1.11	Fair	SNWA
1840802	184	8/7/2003	Day	0.562	Fair	SNWA
1840802	184	7/28/2004	Day	0.558	Fair	SNWA
1840802	184	7/28/2005	Day	1.96	Poor	SNWA
1840802	184	10/25/2005	Day	1.96	Fair	SNWA
1840802	184	7/27/2006	Day	1.46	Fair	SNWA
1840901	184	7/14/1998	Day	1.12	Fair	SNWA
1840901	184	7/13/1999	Day	0.926	Fair	SNWA
1840901	184	8/7/2001	Day	0.098	Fair	SNWA
1840901	184	7/27/2006	Day	0.27	Fair	SNWA
1841001	184	7/26/2000	Day	3.68	Fair	SNWA
1841001	184	7/26/2000	Day	3.89	Fair	SNWA
1841001	184	7/26/2000	Day	4.38	Fair	SNWA
1841002	184	7/16/1964	Day	5	--	Rush and Kazmi, 1965
1841002	184	8/15/1964	Day	3.13	--	USGS, 1964
1841002	184	3/21/1968	Day	2.66	--	USGS, 1968
1841002	184	5/1/1968	Month	8.53	--	USGS, 1968
1841002	184	6/18/1968	Day	18.8	--	USGS, 1968
1841002	184	9/24/1968	Day	2.48	--	USGS, 1968
1841002	184	12/4/1968	Day	2.37	--	USGS, 1969
1841002	184	2/11/1969	Day	2.15	--	USGS, 1969
1841002	184	4/21/1969	Day	4.08	--	USGS, 1969
1841002	184	5/21/1969	Day	15.7	--	USGS, 1969
1841002	184	6/23/1969	Day	13.3	--	USGS, 1969
1841002	184	7/23/1969	Day	4.53	--	USGS, 1969
1841002	184	9/23/1969	Day	2.61	--	USGS, 1969
1841002	184	11/23/1969	Day	2.48	--	USGS, 1970
1841002	184	3/10/1970	Day	2.14	--	USGS, 1970
1841002	184	5/26/1970	Day	18.6	--	USGS, 1970
1841002	184	6/24/1970	Day	16.3	--	USGS, 1970
1841002	184	9/22/1970	Day	2.75	--	USGS, 1971
1841002	184	11/19/1970	Day	2.62	--	USGS, 1971
1841002	184	1/27/1971	Day	2.32	--	USGS, 1971
1841002	184	4/21/1971	Day	6.11	--	USGS, 1971
1841002	184	5/21/1971	Day	12.2	--	USGS, 1971
1841002	184	6/22/1971	Day	22.0	--	USGS, 1971

Table C.1-1
Miscellaneous Discharge Measurement Data
(Page 6 of 21)

Station Number	HA	Date	Date Accuracy	Discharge (cfs)	Measurement Accuracy	Data Source
1841002	184	7/27/1971	Day	5.62	--	USGS, 1971
1841002	184	9/26/1971	Day	2.66	--	USGS, 1971
1841002	184	11/16/1971	Day	3.54	--	USGS, 1972
1841002	184	2/22/1972	Day	2.15	--	USGS, 1972
1841002	184	3/21/1972	Day	3.5	--	USGS, 1972
1841002	184	5/2/1972	Day	4.47	--	USGS, 1972
1841002	184	7/18/1972	Day	3.1	--	USGS, 1972
1841002	184	10/31/1972	Day	2.48	--	USGS, 1973
1841002	184	1/24/1973	Day	1.95	--	USGS, 1973
1841002	184	4/26/1973	Day	4.09	--	USGS, 1973
1841002	184	9/18/1973	Day	4.27	--	USGS, 1973
1841002	184	10/30/1973	Day	4.51	--	USGS, 1974
1841002	184	1/30/1974	Day	2.19	--	USGS, 1974
1841002	184	3/18/1974	Day	2.83	--	USGS, 1974
1841002	184	5/14/1974	Day	10.9	--	USGS, 1974
1841002	184	6/12/1974	Day	9.83	--	USGS, 1974
1841002	184	8/20/1974	Day	2.94	--	USGS, 1974
1841002	184	10/1/1974	Day	2.24	--	USGS, 1975
1841002	184	1/14/1975	Day	1.68	--	USGS, 1975
1841002	184	5/19/1975	Day	20.2	--	USGS, 1975
1841002	184	6/12/1975	Day	26.5	--	USGS, 1975
1841002	184	9/18/1975	Day	2.69	--	USGS, 1975
1841002	184	4/21/1976	Day	2.61	--	USGS, 1976
1841002	184	6/23/1976	Day	6.69	--	USGS, 1976
1841002	184	8/19/1976	Day	2.56	--	USGS, 1976
1841002	184	10/13/1976	Day	2.61	--	USGS, 1977
1841002	184	2/23/1977	Day	2.14	--	USGS, 1977
1841002	184	4/21/1977	Day	2.86	--	USGS, 1977
1841002	184	8/24/1977	Day	2.46	--	USGS, 1977
1841002	184	4/19/1978	Day	4.4	--	USGS, 1978
1841002	184	5/18/1978	Day	15.7	--	USGS, 1978
1841002	184	7/24/1978	Day	4.97	--	USGS, 1978
1841002	184	10/2/1978	Day	3.32	--	USGS, 1979
1841002	184	2/21/1979	Day	1.88	--	USGS, 1979
1841002	184	5/22/1979	Day	18.7	--	USGS, 1979
1841002	184	9/18/1979	Day	3.61	--	USGS, 1979
1841002	184	1/22/1980	Day	3.1	--	USGS, 1980
1841002	184	7/16/1991	Day	4.65	--	USGS, 1991
1841002	184	10/22/1991	Day	2.15	--	USGS, 1992
1841002	184	12/3/1991	Day	2.54	--	USGS, 1992
1841002	184	3/16/1992	Day	1.72	--	USGS, 1992
1841002	184	6/24/1992	Day	1.99	--	USGS, 1992
1841002	184	6/23/1993	Day	9.31	Fair	Katzer and Donovan, 2003

Table C.1-1
Miscellaneous Discharge Measurement Data
(Page 7 of 21)

Station Number	HA	Date	Date Accuracy	Discharge (cfs)	Measurement Accuracy	Data Source
1841002	184	7/18/1996	Day	5.26	Good	SNWA
1841002	184	7/17/1998	Day	11.5	Fair	SNWA
1841002	184	7/13/1999	Day	5.96	Fair	SNWA
1841002	184	7/24/2000	Day	4.13	Fair	SNWA
1841002	184	7/26/2000	Day	3.28	Fair	SNWA
1841002	184	7/26/2000	Day	3.49	Fair	SNWA
1841002	184	7/26/2000	Day	3.54	Fair	SNWA
1841002	184	7/26/2000	Day	3.58	Fair	SNWA
1841002	184	7/26/2000	Day	4.34	Fair	SNWA
1841002	184	7/26/2000	Day	4.51	Fair	SNWA
1841002	184	8/8/2001	Day	1.93	Fair	SNWA
1841002	184	8/9/2001	Day	2.09	Fair	SNWA
1841002	184	7/16/2002	Day	2.6	Good	SNWA
1841002	184	8/7/2003	Day	2.76	Fair	SNWA
1841002	184	7/28/2004	Day	3.07	Good	SNWA
1841002	184	7/27/2006	Day	3.77	Fair	SNWA
1841101	184	7/17/1996	Day	0.94	Fair	SNWA
1841101	184	7/15/1998	Day	2.48	Fair	SNWA
1841101	184	7/17/1998	Day	1.8	Fair	SNWA
1841101	184	7/13/1999	Day	1.26	Good	SNWA
1841101	184	7/24/2000	Day	0.449	Fair	SNWA
1841101	184	7/27/2000	Day	0.479	Fair	SNWA
1841101	184	8/8/2001	Day	0.485	Fair	SNWA
1841101	184	8/7/2003	Day	0.28	Fair	SNWA
1841101	184	7/29/2004	Day	0.315	Fair	SNWA
1841101	184	7/28/2005	Day	1.18	Fair	SNWA
1841101	184	10/24/2005	Day	0.648	Fair	SNWA
1841101	184	7/27/2006	Day	1.18	Fair	SNWA
1841201	184	11/7/1972	Day	1.4	--	USGS, 1973
1841201	184	1/24/1973	Day	1.01	--	USGS, 1973
1841201	184	4/26/1973	Day	2.33	--	USGS, 1973
1841201	184	5/21/1973	Day	10.9	--	USGS, 1973
1841201	184	7/25/1973	Day	2.26	--	USGS, 1973
1841201	184	9/18/1973	Day	2.12	--	USGS, 1973
1841201	184	10/30/1973	Day	1.7	--	USGS, 1974
1841201	184	12/11/1973	Day	1.2	--	USGS, 1974
1841201	184	1/30/1974	Day	1.0	--	USGS, 1974
1841201	184	3/18/1974	Day	1.57	--	USGS, 1974
1841201	184	5/14/1974	Day	2.27	--	USGS, 1974
1841201	184	6/12/1974	Day	5.48	--	USGS, 1974
1841201	184	8/20/1974	Day	1.46	--	USGS, 1974
1841201	184	10/1/1974	Day	0.76	--	USGS, 1975
1841201	184	1/14/1975	Day	1.19	--	USGS, 1975

Table C.1-1
Miscellaneous Discharge Measurement Data
(Page 8 of 21)

Station Number	HA	Date	Date Accuracy	Discharge (cfs)	Measurement Accuracy	Data Source
1841201	184	5/19/1975	Day	5.16	--	USGS, 1975
1841201	184	6/12/1975	Day	16.8	--	USGS, 1975
1841201	184	9/18/1975	Day	1.75	--	USGS, 1975
1841201	184	4/21/1976	Day	1.02	--	USGS, 1976
1841201	184	6/23/1976	Day	2.07	--	USGS, 1976
1841201	184	8/19/1976	Day	1.94	--	USGS, 1976
1841201	184	10/13/1976	Day	0.95	--	USGS, 1977
1841201	184	2/23/1977	Day	1.31	--	USGS, 1977
1841201	184	4/21/1977	Day	1.03	--	USGS, 1977
1841201	184	8/24/1977	Day	1.49	--	USGS, 1977
1841201	184	4/19/1978	Day	1.98	--	USGS, 1978
1841201	184	5/18/1978	Day	5.35	--	USGS, 1978
1841201	184	7/24/1978	Day	2.77	--	USGS, 1978
1841201	184	10/2/1978	Day	1.34	--	USGS, 1979
1841201	184	2/21/1979	Day	1.24	--	USGS, 1979
1841201	184	5/22/1979	Day	5.24	--	USGS, 1979
1841201	184	9/18/1979	Day	0.7	--	USGS, 1979
1841201	184	1/23/1980	Day	0.67	--	USGS, 1980
1841201	184	7/16/1991	Day	2.51	--	USGS, 1991
1841201	184	10/23/1991	Day	1.24	--	USGS, 1992
1841201	184	12/3/1991	Day	0.98	--	USGS, 1992
1841201	184	3/17/1992	Day	1.06	--	USGS, 1992
1841201	184	6/24/1992	Day	1.41	--	USGS, 1992
1841201	184	6/24/1993	Day	6.93	Fair	Katzer and Donovan, 2003
1841201	184	7/18/1996	Day	2.18	Fair	SNWA
1841201	184	7/15/1998	Day	6.39	Fair	SNWA
1841201	184	7/17/1998	Day	6.34	Fair	SNWA
1841201	184	7/15/1999	Day	4.35	Good	SNWA
1841201	184	7/24/2000	Day	2.0	Fair	SNWA
1841201	184	8/7/2001	Day	1.34	Fair	SNWA
1841201	184	7/29/2004	Day	1.25	Fair	SNWA
1841201	184	10/24/2005	Day	1.98	Fair	SNWA
1841201	184	7/25/2006	Day	1.84	Fair	SNWA
1841301	184	7/15/1999	Day	6.4	Fair	SNWA
1841301	184	7/15/1999	Day	6.46	Fair	SNWA
1841301	184	7/15/1999	Day	6.62	Fair	SNWA
1841301	184	7/15/1999	Day	6.85	Fair	SNWA
1841302	184	7/14/1964	Day	9.52	--	USGS, 1964
1841302	184	8/15/1964	Day	5.95	--	USGS, 1964
1841302	184	6/1/1980	Month	18.9	--	ERTEC, 1981
1841302	184	7/16/1991	Day	7.58	--	USGS, 1991
1841302	184	10/22/1991	Day	3.49	--	USGS, 1992
1841302	184	12/3/1991	Day	2.89	--	USGS, 1992

Table C.1-1
Miscellaneous Discharge Measurement Data
(Page 9 of 21)

Station Number	HA	Date	Date Accuracy	Discharge (cfs)	Measurement Accuracy	Data Source
1841302	184	3/17/1992	Day	2.78	--	USGS, 1992
1841302	184	6/24/1992	Day	3.63	--	USGS, 1992
1841302	184	5/18/1993	Day	40.5	Fair	SNWA
1841302	184	7/17/1996	Day	5.82	Fair	SNWA
1841302	184	7/15/1998	Day	14.9	Fair	SNWA
1841302	184	7/15/1998	Day	15.45	Fair	SNWA
1841302	184	7/17/1998	Day	10.8	Good	SNWA
1841302	184	7/15/1999	Day	7.98	Good	SNWA
1841302	184	7/15/1999	Day	8.33	Good	SNWA
1841302	184	7/15/1999	Day	8.46	Good	SNWA
1841302	184	7/15/1999	Day	8.51	Good	SNWA
1841302	184	7/15/1999	Day	8.61	Good	SNWA
1841302	184	7/15/1999	Day	8.7	Good	SNWA
1841302	184	7/24/2000	Day	4.31	Fair	SNWA
1841302	184	7/27/2000	Day	3.54	Fair	SNWA
1841302	184	8/8/2001	Day	4.38	Fair	SNWA
1841302	184	8/9/2001	Day	3.88	Fair	SNWA
1841302	184	7/16/2002	Day	4.55	Fair	SNWA
1841302	184	8/7/2003	Day	3.38	Fair	SNWA
1841302	184	7/28/2004	Day	3.77	Fair	SNWA
1841302	184	7/27/2005	Day	13.3	Fair	SNWA
1841302	184	10/24/2005	Day	5.63	Fair	SNWA
1841302	184	7/25/2006	Day	6.6	Fair	SNWA
1841302	184	8/17/2006	Day	5.34	Good	SNWA
1841303	184	10/24/2005	Day	2.99	Good	SNWA
1841401	184	6/1/1980	Month	12.9	--	ERTEC, 1981
1841401	184	7/16/1991	Day	2.51	--	USGS, 1991
1841401	184	10/23/1991	Day	0.71	--	USGS, 1992
1841401	184	12/4/1991	Day	0.77	--	USGS, 1992
1841401	184	3/17/1992	Day	0.37	--	USGS, 1992
1841401	184	6/24/1992	Day	1.22	--	USGS, 1992
1841401	184	7/18/1996	Day	2.08	Fair	SNWA
1841401	184	7/15/1998	Day	10.7	Fair	SNWA
1841401	184	7/16/1998	Day	8.43	Fair	SNWA
1841401	184	7/13/1999	Day	4.32	Good	SNWA
1841401	184	7/24/2000	Day	1.24	Fair	SNWA
1841401	184	7/27/2000	Day	1.27	Fair	SNWA
1841401	184	8/7/2001	Day	1.21	Fair	SNWA
1841401	184	7/25/2006	Day	2.0	Fair	SNWA
1841402	184	7/14/1964	Day	3.0	--	Rush and Kazmi, 1965
1841402	184	9/18/1964	Day	2.0	--	Rush and Kazmi, 1965
1841501	184	7/25/2000	Day	0.69	Fair	SNWA
1841501	184	7/27/2000	Day	0.76	Good	SNWA

Table C.1-1
Miscellaneous Discharge Measurement Data
(Page 10 of 21)

Station Number	HA	Date	Date Accuracy	Discharge (cfs)	Measurement Accuracy	Data Source
1841501	184	7/25/2006	Day	0.994	Fair	SNWA
1841601	184	8/24/1982	Day	1.33	--	USGS, 1987
1841602	184	8/24/1982	Day	1.13	--	USGS, 1987
1841603	184	8/24/1982	Day	1.33	--	USGS, 1987
1841604	184	8/24/1982	Day	0.96	--	USGS, 1987
1841605	184	8/24/1982	Day	0.17	--	USGS, 1987
1841606	184	8/24/1982	Day	8.89	--	USGS, 1987
1841606	184	10/6/1987	Day	5.97	--	USGS, 1987
1841607	184	5/17/1993	Day	37.9	Fair	SNWA
1841607	184	5/17/1993	Day	38.1	Fair	SNWA
1841607	184	7/14/1997	Day	8.55	Fair	SNWA
1841607	184	7/14/1997	Day	8.64	Fair	SNWA
1841607	184	7/14/1997	Day	8.78	Fair	SNWA
1841607	184	7/14/1997	Day	8.81	Fair	SNWA
1841607	184	7/14/1997	Day	9.09	Fair	SNWA
1841607	184	7/14/1997	Day	9.28	Fair	SNWA
1841607	184	7/15/1997	Day	8.35	Fair	SNWA
1841607	184	7/15/1997	Day	8.35	Fair	SNWA
1841607	184	7/15/1997	Day	8.48	Good	SNWA
1841607	184	7/16/1997	Day	8.26	Fair	SNWA
1841607	184	7/12/1998	Day	21.4	Fair	SNWA
1841607	184	7/27/2000	Day	7.74	Fair	SNWA
1841608	184	5/17/1993	Day	34.8	Fair	SNWA
1841608	184	7/15/1997	Day	6.41	Good	SNWA
1841608	184	7/15/1997	Day	6.79	Fair	SNWA
1841608	184	7/15/1997	Day	8.0	Fair	SNWA
1841608	184	7/16/1997	Day	8.16	Fair	SNWA
1841609	184	5/17/1993	Day	40.4	Fair	SNWA
1841609	184	7/15/1997	Day	7.97	Fair	SNWA
1841609	184	7/15/1997	Day	8.52	Good	SNWA
1841609	184	7/15/1997	Day	9.06	Good	SNWA
1841609	184	7/16/1997	Day	8.62	Fair	SNWA
1841610	184	8/24/1982	Day	8.97	--	USGS, 1987
1841611	184	5/17/1993	Day	37.7	Fair	SNWA
1841611	184	7/18/1996	Day	8.65	Fair	SNWA
1841611	184	7/14/1997	Day	7.43	Fair	SNWA
1841611	184	7/14/1997	Day	7.61	Good	SNWA
1841611	184	7/14/1997	Day	8.27	Good	SNWA
1841611	184	7/15/1997	Day	7.41	Fair	SNWA
1841611	184	7/15/1997	Day	7.74	Good	SNWA
1841611	184	7/12/1998	Day	19.8	Good	SNWA
1841611	184	7/14/1998	Day	17.5	Fair	SNWA
1841611	184	7/17/1998	Day	18.0	Good	SNWA

Table C.1-1
Miscellaneous Discharge Measurement Data
(Page 11 of 21)

Station Number	HA	Date	Date Accuracy	Discharge (cfs)	Measurement Accuracy	Data Source
1841611	184	7/12/1999	Day	13.67	Fair	SNWA
1841611	184	7/13/1999	Day	14.2	Good	SNWA
1841611	184	7/14/1999	Day	12.79	Fair	SNWA
1841611	184	7/15/1999	Day	13.73	Fair	SNWA
1841611	184	7/16/1999	Day	13.6	Good	SNWA
1841611	184	7/24/2000	Day	7.33	Good	SNWA
1841611	184	7/25/2000	Day	7.14	Good	SNWA
1841611	184	7/26/2000	Day	6.85	Fair	SNWA
1841611	184	7/27/2000	Day	7.37	Fair	SNWA
1841611	184	7/27/2000	Day	7.44	Good	SNWA
1841611	184	7/27/2000	Day	7.48	Good	SNWA
1841611	184	7/27/2000	Day	8.05	Good	SNWA
1841611	184	8/6/2001	Day	6.09	Good	SNWA
1841611	184	8/7/2001	Day	6.2	Fair	SNWA
1841611	184	8/8/2001	Day	6.26	Fair	SNWA
1841611	184	8/9/2001	Day	6.57	Good	SNWA
1841611	184	7/16/2002	Day	6.01	Fair	SNWA
1841611	184	7/17/2002	Day	5.61	Fair	SNWA
1841611	184	8/7/2003	Day	5.4	Good	SNWA
1841611	184	7/27/2004	Day	5.22	Fair	SNWA
1841611	184	7/28/2004	Day	6.06	Fair	SNWA
1841611	184	10/28/2004	Day	8.13	Good	Squires, 2004
1841611	184	10/28/2004	Day	8.43	Good	Squires, 2004
1841611	184	10/28/2004	Day	8.78	Good	Squires, 2004
1841611	184	10/29/2004	Day	7.87	Good	Squires, 2004
1841611	184	10/29/2004	Day	7.87	Good	Squires, 2004
1841611	184	10/29/2004	Day	8.22	Good	Squires, 2004
1841611	184	10/30/2004	Day	7.95	Good	Squires, 2004
1841611	184	7/27/2005	Day	20.1	Fair	SNWA
1841611	184	7/28/2005	Day	11.3	Poor	SNWA
1841611	184	10/6/2005	Day	9.01	Fair	SNWA
1841611	184	7/24/2006	Day	13.4	Fair	SNWA
1841611	184	8/15/2006	Day	9.1	Fair	SNWA
1841611	184	8/16/2006	Day	8.41	Fair	SNWA
1841611	184	8/17/2006	Day	9.0	Fair	SNWA
1841612	184	8/24/1982	Day	0.19	--	USGS, 1987
1841612	184	10/6/1987	Day	0.03	--	USGS, 1987
1841701	184	7/15/1998	Day	10.5	Fair	SNWA
1841701	184	7/17/1998	Day	6.47	Fair	SNWA
1841701	184	7/13/1999	Day	5.95	Fair	SNWA
1841701	184	7/25/2000	Day	0.78	Fair	SNWA
1841701	184	7/27/2000	Day	0.789	Fair	SNWA
1841701	184	8/7/2001	Day	1.27	Fair	SNWA

Table C.1-1
Miscellaneous Discharge Measurement Data
(Page 12 of 21)

Station Number	HA	Date	Date Accuracy	Discharge (cfs)	Measurement Accuracy	Data Source
1841701	184	7/16/2002	Day	0.363	Fair	SNWA
1841701	184	8/7/2003	Day	0.737	Good	SNWA
1841701	184	7/28/2004	Day	0.455	Fair	SNWA
1841701	184	7/27/2005	Day	9.91	Fair	SNWA
1841701	184	10/24/2005	Day	3.05	Fair	SNWA
1841701	184	7/24/2006	Day	3.8	Poor	SNWA
1841701	184	8/17/2006	Day	2.81	Good	SNWA
1841901	184	7/14/1964	Day	0.07	--	USGS, 1964
1841901	184	7/14/1998	Day	2.17	Fair	SNWA
1841901	184	7/16/1998	Day	2.02	Poor	SNWA
1841901	184	7/13/1999	Day	1.67	Good	SNWA
1841901	184	7/24/2000	Day	0.482	Fair	SNWA
1841901	184	7/26/2000	Day	0.555	Fair	SNWA
1841901	184	8/7/2001	Day	0.516	Fair	SNWA
1841901	184	7/29/2004	Day	0.256	Fair	SNWA
1841901	184	7/28/2005	Day	4.28	Fair	SNWA
1841901	184	8/17/2006	Day	0.889	Good	SNWA
1842001	184	8/8/2001	Day	1.31	Good	SNWA
1842001	184	8/8/2001	Day	1.36	Good	SNWA
1842001	184	8/8/2001	Day	1.39	Good	SNWA
1842002	184	8/8/2001	Day	1.32	Fair	SNWA
1842002	184	8/8/2001	Day	1.35	Fair	SNWA
1842002	184	8/8/2001	Day	1.37	Fair	SNWA
1842002	184	8/6/2003	Day	1.35	Good	SNWA
1842003	184	7/14/1964	Day	3.03	--	Rush and Kazmi, 1965
1842003	184	7/14/1998	Day	4.44	Fair	SNWA
1842003	184	7/16/1998	Day	6.69	Good	SNWA
1842003	184	7/13/1999	Day	5.76	Good	SNWA
1842003	184	7/24/2000	Day	1.17	Fair	SNWA
1842003	184	7/26/2000	Day	1.08	Fair	SNWA
1842003	184	8/8/2001	Day	1.51	Fair	SNWA
1842003	184	8/8/2001	Day	1.61	Fair	SNWA
1842003	184	8/8/2001	Day	1.62	Fair	SNWA
1842003	184	8/8/2001	Day	1.67	Fair	SNWA
1842003	184	8/8/2001	Day	1.67	Fair	SNWA
1842003	184	8/6/2003	Day	0.69	Good	SNWA
1842004	184	7/17/2002	Day	0.537	Good	SNWA
1842004	184	7/29/2004	Day	0.766	Fair	SNWA
1842004	184	7/28/2005	Day	7.4	Fair	SNWA
1842004	184	8/17/2006	Day	3.03	Fair	SNWA
1842101	184	7/12/1964	Day	0.35	--	USGS, 1964
1842101	184	7/18/1991	Day	0.46	--	USGS, 1991
1842101	184	10/24/1991	Day	0.29	--	USGS, 1992

Table C.1-1
Miscellaneous Discharge Measurement Data
(Page 13 of 21)

Station Number	HA	Date	Date Accuracy	Discharge (cfs)	Measurement Accuracy	Data Source
1842101	184	12/3/1991	Day	1.39	--	USGS, 1992
1842101	184	3/17/1992	Day	0.62	--	USGS, 1992
1842101	184	6/25/1992	Day	0.28	--	USGS, 1992
1842102	184	7/26/2006	Day	0.218	Fair	SNWA
1842201	184	7/12/1966	Day	4.01	--	Hess and Mifflin, 1978
1842201	184	6/15/1980	Day	9.36	--	USGS-NWIS, 2004
1842201	184	5/19/1993	Day	44.3	Fair	SNWA
1842201	184	7/13/1998	Day	52.41	Fair	SNWA
1842201	184	7/14/1998	Day	21.5	Fair	SNWA
1842201	184	7/16/1998	Day	35.4	Fair	SNWA
1842201	184	7/18/1998	Day	32.3	Fair	SNWA
1842201	184	7/14/1999	Day	7.75	Fair	SNWA
1842201	184	7/16/1999	Day	6.87	Fair	SNWA
1842201	184	7/23/2000	Day	0.969	Fair	SNWA
1842201	184	7/25/2000	Day	0.75	Fair	SNWA
1842201	184	8/7/2001	Day	1.13	Fair	SNWA
1842201	184	7/17/2002	Day	2.31	Fair	SNWA
1842201	184	8/7/2003	Day	0.953	Good	SNWA
1842201	184	7/28/2004	Day	0.658	Good	SNWA
1842201	184	7/28/2005	Day	21.0	Fair	SNWA
1842201	184	10/6/2005	Day	2.03	Poor	SNWA
1842201	184	7/26/2006	Day	3.71	Fair	SNWA
1842301	184	1/1/1962	Year	2.0	--	USGS, 1962
1842301	184	1/1/1963	Year	Dry	--	USGS, 1963
1842301	184	8/17/1965	Day	0.4	--	USGS, 1965
1842301	184	1/1/1967	Year	Dry	--	USGS, 1967
1842301	184	1/1/1968	Year	Dry	--	USGS, 1968
1842301	184	3/1/1969	Month	0.2	--	USGS, 1969
1842301	184	1/1/1970	Year	Dry	--	USGS, 1970
1842301	184	1/1/1971	Year	Dry	--	USGS, 1971
1842301	184	1/1/1972	Year	Dry	--	USGS, 1972
1842301	184	1/1/1973	Year	Dry	--	USGS, 1973
1842301	184	1/1/1974	Year	Dry	--	USGS, 1974
1842301	184	9/18/1975	Day	0.2	--	USGS, 1975
1842301	184	4/1/1976	Month	0.4	--	USGS, 1976
1842301	184	1/1/1977	Year	Dry	--	USGS, 1977
1842301	184	1/1/1978	Year	Dry	--	USGS, 1978
1842301	184	1/1/1979	Year	Dry	--	USGS, 1979
1842301	184	1/1/1980	Year	Dry	--	USGS, 1980
1842301	184	1/1/1981	Year	Dry	--	USGS, 1981
1842301	184	1/1/1982	Year	Dry	--	USGS, 1982
1842501	184	7/16/1991	Day	Dry	--	USGS, 1991
1842501	184	10/22/1991	Day	Dry	--	USGS, 1992

Table C.1-1
Miscellaneous Discharge Measurement Data
(Page 14 of 21)

Station Number	HA	Date	Date Accuracy	Discharge (cfs)	Measurement Accuracy	Data Source
1842501	184	12/5/1991	Day	Dry	--	USGS, 1992
1842501	184	3/17/1992	Day	Dry	--	USGS, 1992
1842501	184	6/25/1992	Day	Dry	--	USGS, 1992
1842501	184	7/24/2006	Day	Dry	Excellent	SNWA
1842601	184	7/14/1964	Day	3.0	--	Rush and Kazmi, 1965
1842602	184	10/11/2002	Day	0.3	Poor	USGS-NWIS, 07/20/2006
1842602	184	11/15/2002	Day	0.35	Poor	USGS-NWIS, 07/20/2006
1842602	184	1/24/2003	Day	0.3	Poor	USGS-NWIS, 07/20/2006
1842602	184	5/6/2003	Day	0.54	Poor	USGS-NWIS, 07/20/2006
1842602	184	7/9/2003	Day	1.57	Poor	USGS-NWIS, 07/20/2006
1842602	184	9/16/2003	Day	0.4	Poor	USGS-NWIS, 07/20/2006
1842602	184	3/16/2004	Day	0.33	Poor	USGS-NWIS, 07/20/2006
1842602	184	7/15/2004	Day	0.96	Poor	USGS-NWIS, 07/20/2006
1842602	184	10/5/2004	Day	0.34	Poor	USGS-NWIS, 07/20/2006
1842602	184	8/16/2006	Day	0.635	Fair	SNWA
1842701	184	7/14/1964	Day	3.0	--	Rush and Kazmi, 1965
1842702	184	8/16/2006	Day	0.933	Fair	SNWA
1842901	184	8/15/2006	Day	Dry	Excellent	SNWA
1843001	184	7/27/2006	Day	0.782	Fair	SNWA
1843001	184	8/17/2006	Day	0.617	Fair	SNWA
1843102	184	7/26/2006	Day	1.14	Fair	SNWA
1843103	184	6/11/2003	Day	2.02	Fair	Elliott et al., 2006
1843103	184	10/9/2003	Day	0.77	Fair	Elliott et al., 2006
1843104	184	6/11/2003	Day	1.83	Fair	Elliott et al., 2006
1843104	184	10/9/2003	Day	0.59	Poor	Elliott et al., 2006
1843105	184	6/11/2003	Day	1.71	Fair	Elliott et al., 2006
1843105	184	10/9/2003	Day	0.63	Fair	Elliott et al., 2006
1843301	184	7/26/2006	Day	0.025	Poor	SNWA
1843401	184	8/15/2006	Day	0.011	Excellent	SNWA
1843501	184	7/25/2006	Day	0.061	Poor	SNWA
1843601	184	7/25/2006	Day	0.718	Fair	SNWA
1843701	184	8/17/2006	Day	0.018	Fair	SNWA
1843801	184	8/17/2006	Day	0.008	Fair	SNWA
1843901	184	7/26/2006	Day	Dry	Excellent	SNWA
1844001	184	8/15/2006	Day	Dry	Excellent	SNWA
1844201	184	8/15/2006	Day	Dry	Excellent	SNWA
1844301	184	8/16/2006	Day	Dry	Excellent	SNWA
1844401	184	8/16/2006	Day	Dry	Excellent	SNWA
1844501	184	8/16/2006	Day	Dry	Excellent	SNWA
1844601	184	8/16/2006	Day	Dry	Excellent	SNWA
1844701	184	7/24/2006	Day	Dry	Excellent	SNWA
1844901	184	8/17/2006	Day	Dry	Excellent	SNWA
1845001	184	8/17/2006	Day	Dry	Excellent	SNWA

Table C.1-1
Miscellaneous Discharge Measurement Data
(Page 15 of 21)

Station Number	HA	Date	Date Accuracy	Discharge (cfs)	Measurement Accuracy	Data Source
1845101	184	8/17/2006	Day	Dry	Excellent	SNWA
1845201	184	8/17/2006	Day	Dry	Excellent	SNWA
1845301	184	8/17/2006	Day	Dry	Excellent	SNWA
1845401	184	8/17/2006	Day	Dry	Excellent	SNWA
1950101	195	10/31/2004	Day	1.53	Fair	Squires, 2004
1950101	195	8/3/2005	Day	4.71	Fair	SNWA
1950101	195	10/4/2005	Day	1.11	Good	SNWA
1950201	195	8/1/1979	Month	1.0	--	ERTEC, 1981
1950201	195	8/3/2005	Day	2.38	Fair	SNWA
1950202	195	10/31/2004	Day	0.68	Fair	Squires, 2004
1950203	195	10/31/2004	Day	Dry	Excellent	Squires, 2004
1950301	195	8/3/2005	Day	4.34	Fair	SNWA
1950301	195	10/4/2005	Day	2.45	Fair	SNWA
1950302	195	10/31/2004	Day	0.9	Fair	Squires, 2004
1950401	195	8/3/2005	Day	4.08	Fair	SNWA
1950402	195	10/31/2004	Day	1.55	Fair	Squires, 2004
1950501	195	10/30/2004	Day	Dry	Excellent	Squires, 2004
1950501	195	8/3/2005	Day	Dry	Excellent	SNWA
1950601	195	10/30/2004	Day	Dry	Excellent	Squires, 2004
1950601	195	8/3/2005	Day	Dry	Excellent	SNWA
1950701	195	7/12/1964	Day	3.16	--	USGS, 1964
1950701	195	8/1/1979	Month	1.9	--	ERTEC, 1981
1950701	195	8/4/2005	Day	6.41	Fair	SNWA
1950701	195	10/4/2005	Day	0.975	Good	SNWA
1950702	195	10/30/2004	Day	Dry	Good	Squires, 2004
1950801	195	10/30/2004	Day	0.2	Poor	Squires, 2004
1950801	195	8/4/2005	Day	0.721	Fair	SNWA
1950802	195	7/12/1964	Day	1.18	--	USGS, 1964
1950901	195	7/12/1964	Day	3.09	--	USGS, 1964
1950901	195	8/1/1979	Month	0.85	--	ERTEC, 1981
1950901	195	7/17/1991	Day	2.57	--	USGS, 1991
1950901	195	10/24/1991	Day	1.3	--	USGS, 1992
1950901	195	12/7/1991	Day	1.21	--	USGS, 1992
1950901	195	3/18/1992	Day	1.26	--	USGS, 1992
1950901	195	6/25/1992	Day	0.77	--	USGS, 1992
1950901	195	10/30/2004	Day	1.25	Good	Squires, 2004
1950901	195	8/4/2005	Day	3.41	Fair	SNWA
1950901	195	10/4/2005	Day	2.64	Good	SNWA
1951001	195	7/12/1964	Day	3.85	--	USGS, 1964
1951001	195	10/29/2004	Day	1.33	Fair	Squires, 2004
1951002	195	8/4/2005	Day	9.62	Fair	SNWA
1951002	195	10/4/2005	Day	4.44	Good	SNWA
1951101	195	10/29/2004	Day	Dry	Excellent	Squires, 2004

Table C.1-1
Miscellaneous Discharge Measurement Data
(Page 16 of 21)

Station Number	HA	Date	Date Accuracy	Discharge (cfs)	Measurement Accuracy	Data Source
1951101	195	8/4/2005	Day	1.17	Fair	SNWA
1951201	195	7/12/1964	Day	1.85	--	USGS, 1964
1951201	195	10/29/2004	Day	0.75	Fair	Squires, 2004
1951201	195	8/4/2005	Day	4.43	Fair	SNWA
1951202	195	6/11/2003	Day	2.29	Fair	Elliott et al., 2006
1951202	195	10/8/2003	Day	0.12	Good	Elliott et al., 2006
1951203	195	6/11/2003	Day	2.32	Fair	Elliott et al., 2006
1951203	195	10/8/2003	Day	0.17	Fair	Elliott et al., 2006
1951204	195	6/11/2003	Day	2.96	Fair	Elliott et al., 2006
1951204	195	10/8/2003	Day	0.43	Poor	Elliott et al., 2006
1951205	195	6/11/2003	Day	2.37	Fair	Elliott et al., 2006
1951205	195	10/8/2003	Day	0.31	Poor	Elliott et al., 2006
1951206	195	6/11/2003	Day	3.18	Fair	Elliott et al., 2006
1951206	195	10/8/2003	Day	0.25	Poor	Elliott et al., 2006
1951207	195	6/11/2003	Day	2.76	Fair	Elliott et al., 2006
1951207	195	10/8/2003	Day	0.17	Poor	Elliott et al., 2006
1951301	195	8/25/1993	Day	7.3	Fair	SNWA
1951301	195	10/29/2004	Day	2.32	Good	Squires, 2004
1951301	195	8/4/2005	Day	18.5	Fair	SNWA
1951302	195	7/22/2003	Day	3.49	Good	Elliott et al., 2006
1951302	195	10/7/2003	Day	2.67	Good	Elliott et al., 2006
1951302	195	8/4/2005	Day	3.48	Fair	SNWA
1951304	195	7/22/2003	Day	6.57	Good	Elliott et al., 2006
1951304	195	10/7/2003	Day	2.56	Good	Elliott et al., 2006
1951305	195	7/22/2003	Day	11.7	Fair	Elliott et al., 2006
1951305	195	10/7/2003	Day	5.16	Fair	Elliott et al., 2006
1951306	195	7/22/2003	Day	8.82	Good	Elliott et al., 2006
1951306	195	10/7/2003	Day	4.19	Good	Elliott et al., 2006
1951307	195	10/7/2003	Day	0.49	Good	Elliott et al., 2006
1951308	195	7/22/2003	Day	9.91	Good	Elliott et al., 2006
1951308	195	10/7/2003	Day	5.03	Good	Elliott et al., 2006
1951401	195	10/29/2004	Day	3.89	Fair	Squires, 2004
1951401	195	8/4/2005	Day	21.9	Fair	SNWA
1951402	195	9/3/1960	Day	92.0	--	USGS, 1963
1951402	195	5/29/1961	Day	28.0	--	USGS, 1963
1951402	195	6/22/1962	Day	75.0	--	USGS, 1963
1951402	195	6/21/1963	Day	79.0	--	USGS, 1963
1951402	195	5/24/1964	Day	62.0	--	USGS, 1964
1951402	195	7/12/1964	Day	11.3	--	USGS, 1964
1951402	195	8/14/1964	Day	6.08	--	USGS, 1964
1951402	195	6/13/1965	Day	86.0	--	USGS, 1965
1951402	195	5/27/1966	Day	22.0	--	USGS, 1966
1951402	195	6/23/1967	Day	400.0	--	USGS, 1967

Table C.1-1
Miscellaneous Discharge Measurement Data
(Page 17 of 21)

Station Number	HA	Date	Date Accuracy	Discharge (cfs)	Measurement Accuracy	Data Source
1951402	195	5/30/1968	Day	96.0	--	USGS, 1968
1951402	195	1/1/1969	Year	70.0	--	USGS, 1969
1951402	195	6/22/1970	Day	66.0	--	USGS, 1970
1951402	195	5/17/1971	Day	90.0	--	USGS, 1971
1951402	195	6/4/1972	Day	54.0	--	USGS, 1972
1951402	195	5/20/1973	Day	147.0	--	USGS, 1973
1951402	195	1/1/1974	Year	14.0	--	USGS, 1974
1951402	195	9/21/1977	Day	3.85	--	USGS, 1977
1951402	195	7/17/1991	Day	14.6	--	USGS, 1991
1951402	195	10/24/1991	Day	5.54	--	USGS, 1992
1951402	195	12/6/1991	Day	3.15	--	USGS, 1992
1951402	195	3/18/1992	Day	4.04	--	USGS, 1992
1951402	195	6/25/1992	Day	11.2	--	USGS, 1992
1951402	195	7/22/2003	Day	3.31	Good	Elliott et al., 2006
1951402	195	10/8/2003	Day	1.92	Fair	Elliott et al., 2006
1951402	195	3/17/2004	Day	2.22	Fair	USGS-NWIS, 01/29/2007
1951402	195	5/14/2004	Day	17.1	Poor	USGS-NWIS, 01/29/2007
1951402	195	7/12/2004	Day	5.02	Fair	USGS-NWIS, 01/29/2007
1951402	195	10/4/2004	Day	2.69	Fair	USGS-NWIS, 01/29/2007
1951403	195	8/25/1993	Day	2.9	Fair	SNWA
1951404	195	8/25/1993	Day	3.4	Fair	SNWA
1951404	195	8/25/1993	Day	3.41	Fair	SNWA
1951405	195	8/25/1993	Day	3.32	Fair	SNWA
1951406	195	8/25/1993	Day	11.1	Fair	SNWA
1951407	195	8/25/1993	Day	11.4	Fair	SNWA
1951408	195	7/22/2003	Day	6.66	Good	Elliott et al., 2006
1951408	195	10/8/2003	Day	3.03	Good	Elliott et al., 2006
1951409	195	7/22/2003	Day	3.9	Good	Elliott et al., 2006
1951409	195	10/8/2003	Day	1.64	Fair	Elliott et al., 2006
1951410	195	7/22/2003	Day	8.07	Good	Elliott et al., 2006
1951410	195	10/8/2003	Day	4.31	Good	Elliott et al., 2006
1951411	195	10/8/2003	Day	3.24	Good	Elliott et al., 2006
1951412	195	7/22/2003	Day	0.15	Poor	Elliott et al., 2006
1951412	195	10/8/2003	Day	Dry	--	Elliott et al., 2006
1951413	195	7/22/2003	Day	3.37	Fair	Elliott et al., 2006
1951413	195	10/8/2003	Day	2.03	Fair	Elliott et al., 2006
1951501	195	8/24/1993	Day	2.5	Fair	SNWA
1951501	195	8/24/1993	Day	2.81	Fair	SNWA
1951502	195	8/24/1993	Day	3.41	Fair	SNWA
1951502	195	8/24/1993	Day	3.79	Fair	SNWA
1951503	195	6/10/2003	Day	13.7	Fair	Elliott et al., 2006
1951503	195	10/7/2003	Day	Dry	--	Elliott et al., 2006
1951503	195	8/4/2005	Day	15.7	Fair	SNWA

Table C.1-1
Miscellaneous Discharge Measurement Data
(Page 18 of 21)

Station Number	HA	Date	Date Accuracy	Discharge (cfs)	Measurement Accuracy	Data Source
1951504	195	10/5/2005	Day	2.11	Good	SNWA
1951505	195	8/24/1993	Day	3.78	Fair	SNWA
1951505	195	10/28/2004	Day	2.31	Good	Squires, 2004
1951506	195	8/24/1993	Day	6.29	Fair	SNWA
1951506	195	6/10/2003	Day	14.8	Fair	Elliott et al., 2006
1951506	195	10/7/2003	Day	2.42	Fair	Elliott et al., 2006
1951507	195	8/24/1993	Day	5.6	Fair	SNWA
1951507	195	10/5/2005	Day	6.57	Good	SNWA
1951508	195	7/11/1964	Day	7.55	--	USGS, 1964
1951508	195	8/24/1993	Day	5.91	Fair	SNWA
1951508	195	6/10/2003	Day	14.3	Fair	Elliott et al., 2006
1951508	195	10/7/2003	Day	2.31	Fair	Elliott et al., 2006
1951508	195	8/4/2005	Day	23	Fair	SNWA
1951509	195	8/24/1993	Day	5.19	Fair	SNWA
1951510	195	8/4/2005	Day	4.59	Fair	SNWA
1951510	195	10/5/2005	Day	4.59	Good	SNWA
1951511	195	8/24/1993	Day	2.7	Fair	SNWA
1951512	195	6/10/2003	Day	15.5	Good	Elliott et al., 2006
1951512	195	10/7/2003	Day	1.05	Fair	Elliott et al., 2006
1951513	195	6/10/2003	Day	14.6	Good	Elliott et al., 2006
1951513	195	10/7/2003	Day	1.88	Fair	Elliott et al., 2006
1951514	195	6/10/2003	Day	12.9	Good	Elliott et al., 2006
1951514	195	10/7/2003	Day	1.14	Fair	Elliott et al., 2006
1951515	195	6/10/2003	Day	13.9	Good	Elliott et al., 2006
1951515	195	10/7/2003	Day	0.92	Fair	Elliott et al., 2006
1951517	195	6/10/2003	Day	2.02	Fair	Elliott et al., 2006
1951517	195	10/7/2003	Day	1.78	Fair	Elliott et al., 2006
1951601	195	10/5/2005	Day	Dry	--	SNWA
1951602	195	6/10/2003	Day	4.51	Good	Elliott et al., 2006
1951602	195	10/6/2003	Day	0.063	Poor	Elliott et al., 2006
1951602	195	10/5/2005	Day	1	Poor	SNWA
1951603	195	10/5/2005	Day	1.62	Fair	SNWA
1951604	195	8/3/2005	Day	5.68	Fair	SNWA
1951605	195	7/11/1964	Day	1.8	--	USGS, 1964
1951605	195	10/28/2004	Day	0.59	Fair	Squires, 2004
1951606	195	10/5/2005	Day	2.94	Good	SNWA
1951607	195	6/10/2003	Day	5.05	Good	Elliott et al., 2006
1951607	195	10/6/2003	Day	0.51	Poor	Elliott et al., 2006
1951608	195	6/10/2003	Day	1.49	Fair	Elliott et al., 2006
1951608	195	10/6/2003	Day	0.3	Fair	Elliott et al., 2006
1951609	195	6/10/2003	Day	3.02	Fair	Elliott et al., 2006
1951609	195	10/6/2003	Day	Dry	--	Elliott et al., 2006
1951610	195	6/10/2003	Day	4.44	Good	Elliott et al., 2006

Table C.1-1
Miscellaneous Discharge Measurement Data
(Page 19 of 21)

Station Number	HA	Date	Date Accuracy	Discharge (cfs)	Measurement Accuracy	Data Source
1951610	195	10/6/2003	Day	Dry	--	Elliott et al., 2006
1951611	195	6/10/2003	Day	4.47	Fair	Elliott et al., 2006
1951611	195	10/6/2003	Day	0.14	Good	Elliott et al., 2006
1951701	195	7/17/1991	Day	Dry	--	USGS, 1991
1951701	195	10/24/1991	Day	Dry	--	USGS, 1992
1951701	195	12/7/1991	Day	Dry	--	USGS, 1992
1951701	195	6/25/1992	Day	Dry	--	USGS, 1992
1951701	195	10/28/2004	Day	Dry	Excellent	Squires, 2004
1951701	195	8/3/2005	Day	1.84	Fair	SNWA
1951801	195	10/28/2004	Day	Dry	--	Squires, 2004
1951801	195	8/3/2005	Day	Dry	--	SNWA
2070102	207	1/15/2003	Day	0.954	Poor	USGS-NWIS, Feb 2006
2070102	207	2/5/2003	Day	0.35	Poor	USGS-NWIS, Feb 2006
2070102	207	3/19/2003	Day	0.92	Poor	USGS-NWIS, Feb 2006
2070102	207	4/24/2003	Day	3.0	Fair	USGS-NWIS, Feb 2006
2070102	207	5/12/2003	Day	9.19	Fair	USGS-NWIS, Feb 2006
2070102	207	5/14/2003	Day	10.8	Good	USGS-NWIS, Feb 2006
2070102	207	6/6/2003	Day	6.13	Good	USGS-NWIS, Feb 2006
2070102	207	7/16/2003	Day	2.16	Fair	USGS-NWIS, Feb 2006
2070102	207	9/23/2003	Day	0.95	Poor	USGS-NWIS, Feb 2006
2070102	207	10/24/2003	Day	0.88	Poor	USGS-NWIS, Feb 2006
2070102	207	12/11/2003	Day	1.33	Poor	USGS-NWIS, Feb 2006
2070102	207	3/5/2004	Day	0.56	Poor	USGS-NWIS, Feb 2006
2070102	207	4/8/2004	Day	13.4	Fair	USGS-NWIS, Feb 2006
2070102	207	4/8/2004	Day	13.4	Good	USGS-NWIS, Feb 2006
2070102	207	5/14/2004	Day	4.8	Good	USGS-NWIS, Feb 2006
2070102	207	7/2/2004	Day	1.98	Fair	USGS-NWIS, Feb 2006
2070102	207	9/1/2004	Day	0.63	Poor	USGS-NWIS, Feb 2006
2070102	207	10/19/2004	Day	0.77	Poor	USGS-NWIS, Feb 2006
2070102	207	3/22/2005	Day	23.0	Fair	USGS-NWIS, Feb 2006
2070102	207	4/20/2005	Day	57.3	Good	USGS-NWIS, Feb 2006
2070102	207	5/4/2005	Day	80.1	Good	USGS-NWIS, Feb 2006
2070102	207	5/18/2005	Day	94.8	Good	USGS-NWIS, Feb 2006
2070102	207	7/29/2005	Day	14.6	Good	USGS-NWIS, Feb 2006
2070102	207	9/13/2005	Day	7.67	Good	USGS-NWIS, Feb 2006
2070102	207	9/13/2005	Day	8.44	Good	USGS-NWIS, Feb 2006
2070102	207	10/20/2005	Day	6.34	Good	USGS-NWIS, Feb 2006
2070102	207	10/27/2005	Day	6.1	--	SNWA
2070102	207	12/8/2005	Day	4.77	Good	USGS-NWIS, Feb 2006
2070102	207	4/20/2006	Day	45.0	Good	USGS-NWIS, 11/21/2006
2070102	207	4/20/2006	Day	47.0	Fair	USGS-NWIS, 11/21/2006
2070102	207	7/12/2006	Day	6.33	Good	USGS-NWIS, 11/21/2006
2070102	207	8/23/2006	Day	4.69	Fair	USGS-NWIS, 11/21/2006

Table C.1-1
Miscellaneous Discharge Measurement Data
(Page 20 of 21)

Station Number	HA	Date	Date Accuracy	Discharge (cfs)	Measurement Accuracy	Data Source
2070103	207	7/8/1915	Day	3.6	--	Maxey and Eakin, 1949
2070103	207	5/27/1918	Day	3.84	--	Maxey and Eakin, 1949
2070103	207	6/2/1933	Day	8.01	--	Maxey and Eakin, 1949
2070103	207	6/8/1933	Day	9.38	--	Maxey and Eakin, 1949
2070103	207	6/16/1933	Day	6.83	--	Maxey and Eakin, 1949
2070103	207	6/23/1933	Day	5.38	--	Maxey and Eakin, 1949
2070103	207	7/12/1933	Day	3.35	--	Maxey and Eakin, 1949
2070103	207	7/17/1933	Day	3.23	--	Maxey and Eakin, 1949
2070103	207	5/5/1935	Day	10.78	--	Maxey and Eakin, 1949
2070103	207	5/2/1936	Day	20.91	--	Maxey and Eakin, 1949
2070103	207	5/7/1936	Day	14.8	--	Maxey and Eakin, 1949
2070103	207	5/12/1936	Day	10.5	--	Maxey and Eakin, 1949
2070103	207	5/16/1936	Day	9.25	--	Maxey and Eakin, 1949
2070103	207	5/19/1936	Day	5.2	--	Maxey and Eakin, 1949
2070103	207	5/23/1936	Day	4.65	--	Maxey and Eakin, 1949
2070103	207	5/26/1936	Day	5.3	--	Maxey and Eakin, 1949
2070103	207	5/30/1936	Day	5.11	--	Maxey and Eakin, 1949
2070103	207	6/2/1936	Day	7.86	--	Maxey and Eakin, 1949
2070103	207	6/5/1936	Day	6.1	--	Maxey and Eakin, 1949
2070103	207	6/9/1936	Day	5.01	--	Maxey and Eakin, 1949
2070103	207	6/16/1936	Day	4.08	--	Maxey and Eakin, 1949
2070103	207	6/19/1936	Day	3.8	--	Maxey and Eakin, 1949
2070103	207	6/23/1936	Day	3.6	--	Maxey and Eakin, 1949
2070103	207	6/27/1936	Day	3.35	--	Maxey and Eakin, 1949
2070103	207	7/2/1937	Day	6.15	--	Maxey and Eakin, 1949
2070103	207	7/7/1937	Day	5.3	--	Maxey and Eakin, 1949
2070103	207	7/12/1937	Day	4.61	--	Maxey and Eakin, 1949
2070103	207	7/15/1937	Day	4.22	--	Maxey and Eakin, 1949
2070103	207	7/19/1937	Day	4.28	--	Maxey and Eakin, 1949
2070103	207	7/23/1937	Day	4.0	--	Maxey and Eakin, 1949
2070103	207	7/29/1937	Day	4.0	--	Maxey and Eakin, 1949
2070103	207	6/24/1943	Day	4.05	--	Maxey and Eakin, 1949
2070104	207	4/29/1936	Day	13.31	--	Maxey and Eakin, 1949
2070104	207	12/22/1947	Day	2.09	--	Maxey and Eakin, 1949
2070105	207	5/27/1914	Day	12.4	--	Grover and others, 1917
2070105	207	7/13/1914	Day	4.6	--	Grover and others, 1917
2070105	207	7/17/1914	Day	2.9	--	Grover and others, 1917
2070106	207	2/29/2000	Day	21.2	Poor	USGS-NWIS, 5/31/2007
2070106	207	2/29/2000	Day	23.4	Poor	USGS-NWIS, 5/31/2007
2070106	207	3/13/2000	Day	16.3	Poor	USGS-NWIS, 5/31/2007
2070106	207	3/13/2000	Day	16.6	Poor	USGS-NWIS, 5/31/2007
2070106	207	3/17/2000	Day	2.29	Poor	USGS-NWIS, 5/31/2007
2070106	207	3/17/2000	Day	2.35	Poor	USGS-NWIS, 5/31/2007

Table C.1-1
Miscellaneous Discharge Measurement Data
(Page 21 of 21)

Station Number	HA	Date	Date Accuracy	Discharge (cfs)	Measurement Accuracy	Data Source
2070106	207	4/11/2001	Day	3.61	Poor	USGS-NWIS, 5/31/2007
2070107	207	12/22/1947	Day	1.66	--	Maxey and Eakin, 1949
2070201	207	10/27/2005	Day	1.65	Good	SNWA
2070202	207	10/27/2005	Day	1.94	Fair	SNWA
2070203	207	10/27/2005	Day	Dry	Excellent	SNWA
2070204	207	12/22/1947	Day	0.43	--	Maxey and Eakin, 1949
2070301	207	10/8/1985	Day	0.28	--	USGS, 1987
2070301	207	5/13/1987	Day	0.55	--	USGS, 1987
2070302	207	8/25/1982	Day	3.26	--	USGS, 1987
2070302	207	10/8/1985	Day	2.75	--	USGS, 1987
2070302	207	5/13/1987	Day	1.92	--	USGS, 1987
2070302	207	8/20/1987	Day	1.01	--	USGS, 1987
2070302	207	10/6/1987	Day	1.29	--	USGS, 1987
2070303	207	8/25/1982	Day	2.98	--	USGS, 1987
2070303	207	10/8/1985	Day	2.87	--	USGS, 1987
2070303	207	8/20/1987	Day	1.57	--	USGS, 1987
2070304	207	8/25/1982	Day	3.55	--	USGS, 1987
2070305	207	8/25/1982	Day	4.18	--	USGS, 1987
2070305	207	10/8/1985	Day	2.25	--	USGS, 1987
2070305	207	8/20/1987	Day	1.3	--	USGS, 1987
2070306	207	8/25/1982	Day	3.42	--	USGS, 1987
2070306	207	10/8/1985	Day	2.54	--	USGS, 1987
2070307	207	8/25/1982	Day	3.0	--	USGS, 1987
2070308	207	8/25/1982	Day	3.09	--	USGS, 1987
2070308	207	10/8/1985	Day	2.42	--	USGS, 1987
2070309	207	8/25/1982	Day	3.15	--	USGS, 1987
2070309	207	10/8/1985	Day	2.31	--	USGS, 1987
2070401	207	8/4/2003	Day	1.17	Fair	SNWA

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Appendix D

Physical Characteristics of Drainage Areas in Spring, Snake, and White River Valleys

D.1.0 PHYSICAL CHARACTERISTICS OF DRAINAGE AREAS

Tables D.1-1 through D.1-3 tabulate the physical characteristics of the drainage areas in this study.

Table D.1-1
Physical Characteristics of Drainage Areas in Spring Valley, NV--HA 184
(Page 1 of 2)

Site Name	Site Number	Stream Length (mi)	Slope (ft/mile)	Minimum Altitude (ft)	Maximum Altitude (ft)	Average Altitude (ft)	Total Area (mi^2)	Area Above 8,000 ft-amsl (mi^2)	Area Above 8,000 ft-amsl (%)	Alluvium (%)	Volcanic (%)	Carbonate (%)	Clastic (%)	Metamorphic (%)	Intrusive (%)
Siegel Creek	1840201	4.5	519	6,680	10,170	8,210	5.5	2.9	53	18	12	65	4	1	0
Frenchman Creek	1840501	4.1	487	6,520	8,970	7,700	4.8	1.3	27	4	33	63	0	0	0
North Creek at Sunkist	1840401	3.8	535	6,950	10,260	8,620	3.2	2.6	81	0	9	78	13	0	0
Muncy Creek	1840602	7.4	368	6,180	9,820	8,270	14	9.6	69	8	28	59	3	1	1
Kalamazoo Creek	1840704	7.1	362	6,220	10,900	8,250	14.6	9.3	64	4	40	39	13	4	0
Cooper Creek	1842501	7.6	262	6,520	10,730	7,820	25.9	8.7	34	8	16	60	16	0	0
Stage Canyon	1840101	5.5	296	6,550	9,060	7,440	8.6	1.2	14	56	28	16	0	0	0
Horse Canyon	1845201	3.3	475	7,020	9,770	8,210	2.1	1.4	67	4	0	84	12	0	0
Silver Creek	1840301	2.8	910	7,160	10,280	8,890	2.4	2.0	83	0	0	75	20	5	0
Trail Canyon	1844201	2.8	1,077	6,470	10,060	8,230	1.9	1.1	58	0	0	20	68	12	0
Fandango Creek	1842901	2.3	1,175	6,460	9,320	7,700	0.9	0.3	33	0	0	0	48	52	0
Meadow Creek	1843001	3.3	1,041	6,590	10,940	8,740	2.8	2.2	79	0	0	34	44	22	0
Rams Horn Canyon	1844001	3.1	1,225	6,750	10,920	8,560	1.3	0.9	69	0	0	8	54	38	0
North Creek above Robinson	1843401	3.5	1,033	6,620	10,890	8,820	2.7	2.0	74	0	0	23	47	30	0
Piermont Creek	1840802	5.4	656	6,510	11,070	8,900	7.5	6.1	81	0	0	19	54	27	0
Garden Creek	1840901	3.2	1,306	6,250	10,830	8,400	2.9	1.8	62	0	0	0	12	88	0
Bassett Creek	1841002	4.6	852	6,600	11,880	9,440	6.3	5.4	86	0	0	0	65	35	0
Little Negro Creek	1841101	4.0	1,183	6,320	11,810	8,610	3.0	2.0	67	0	0	0	32	68	0
Odgers Creek	1841201	4.1	1,005	6,500	11,790	9,140	3.9	3.2	82	11	0	0	49	40	0
McCoy Creek	1841302	4.2	898	6,620	11,770	9,400	6.2	5.3	85	10	0	0	53	37	0
Taft Creek	1841401	4.1	991	6,980	11,740	9,800	4.3	4.0	93	20	0	0	55	25	0
Ranger Creek	1843501	3.3	1,332	6,570	11,460	8,490	1.6	1.1	69	20	0	0	20	60	0
South Taft Creek	1843601	3.3	1,179	6,570	11,730	9,190	3.2	2.3	72	37	0	0	41	22	0

Table D.1-1
Physical Characteristics of Drainage Areas in Spring Valley, NV--HA 184
(Page 2 of 2)

Site Name	Site Number	Stream Length (mi)	Slope (ft/mile)	Minimum Altitude (ft)	Maximum Altitude (ft)	Average Altitude (ft)	Total Area (mi^2)	Area Above 8,000 ft-amsl (mi^2)	Area Above 8,000 ft-amsl (%)	Alluvium (%)	Volcanic (%)	Carbonate (%)	Clastic (%)	Metamorphic (%)	Intrusive (%)
Stephens Creek	1841501	3.3	1,346	6,560	11,480	8,970	2.9	2.2	76	0	0	0	58	42	0
Cleve Creek	1841611	11.0	391	6,200	11,760	8,860	31.8	23.2	73	2	0	41	57	0	0
Bastian Creek	1841701	3.4	989	6,360	10,450	8,180	2.7	1.4	52	1	0	99	0	0	0
Eight Mile Creek	1841901	2.8	769	6,570	9,330	8,090	3.1	1.8	58	3	0	13	68	0	16
Negro Creek	1842003	9.6	359	6,200	12,010	8,220	27.4	15.1	55	9	0	78	13	0	0
Willard Creek	1842101	3.3	723	6,980	11,510	8,830	3.8	3.1	82	10	0	0	1	76	13
Board Creek	1843301	3.1	1,364	7,370	11,550	9,060	0.8	0.7	88	13	0	0	1	81	5
Shingle Creek	1843103	3.3	1,179	7,400	11,730	9,550	2.2	2.0	91	5	0	0	6	88	1
Swallow Creek	1842201	3.0	1,201	6,380	10,890	8,470	3.5	2.3	66	2	0	98	0	0	0
Dry Canyon	1842601	3.3	1,209	7,150	11,730	9,630	2.9	2.6	90	0	0	4	96	0	0
Pine and Ridge Creeks	1842701	3.4	1,532	7,190	12,930	9,100	4.0	3.0	75	14	0	0	15	64	7
Williams Canyon	1842801	3.2	1,048	7,340	11,760	9,680	3.2	3.0	94	1	0	0	49	0	50

Table D.1-2
Physical Characteristics of Drainage Areas in Snake Valley, NV and UT--HA 195

Site Name	Site Number	Stream Length (mi)	Slope (ft/mile)	Minimum Altitude (ft)	Maximum Altitude (ft)	Average Altitude (ft)	Total Area (mi^2)	Area Above 8,000 ft-amsl (mi^2)	Area Above 8,000 ft-amsl (%)	Alluvium (%)	Volcanic (%)	Carbonate (%)	Clastic (%)	Metamorphic (%)	Intrusive (%)
Indian Farm Creek	1950101	5.6	1,112	5,515	11,995	8,536	5.6	3.3	58	20	0	0	0	0	80
Granite Creek	1950201	5.0	877	6,346	12,066	9,073	8.1	6.0	73	17	0	0	3	35	45
Birch Creek	1950401	8.7	540	5,206	11,291	8,624	9.7	7.1	73	8	0	0	92	0	0
Lehman Creek	1951306	8.1	574	6,399	13,034	9,333	11.4	8.9	78	33	0	1	55	9	2
Lexington Creek	1951701	7.5	375	6,393	10,992	8,074	11.7	6.0	51	16	0	67	1	0	16
Trout Creek	1950301	6.2	617	6,191	11,562	9,199	8.4	6.8	81	20	0	0	0	80	0
Strawberry Creek	1951201	6.2	530	6,735	11,514	8,850	7.8	6.0	76	14	0	0	20	44	22
Weaver Creek	1951101	4.1	589	6,794	10,134	8,127	6.6	3.3	50	21	0	0	17	44	18
Swan Creek	1950501	13.0	209	5,838	9,563	7,131	23.9	3.4	14	16	0	84	0	0	0
Smith Creek	1950701	13.7	220	5,667	12,036	8,492	56.2	39.6	70	2	0	62	33	0	3
Snake Creek	1951508	14.2	299	5,560	11,861	7,996	28.4	14.0	49	14	0	40	19	0	27
Big Wash	1951606	15.3	218	5,873	11,646	8,369	27.9	16.1	58	24	0	72	2	0	2
Marble Wash	1950601	10.4	281	6,102	10,088	7,957	22.1	9.7	44	0	0	98	2	0	0
Hampton Creek	1950802	5.7	767	6,388	11,026	8,830	7.5	5.6	74	0	0	37	63	0	0
Hendrys Creek	1950901	10.6	471	5,640	12,041	8,989	23.6	17.6	75	0	0	38	62	0	0
Silver Creek	1951002	8.4	240	6,481	11,797	8,805	23.0	19.2	83	0	0	61	10	0	29
Baker Creek	1951407	8.0	402	6,590	13,064	9,518	16.8	14.3	85	1	0	5	77	0	17
Red Cedar Creek	1952301	6.7	927	5,360	12,070	9,060	6.2	4.5	73	24	0	0	0	0	76
Toms Creek	1952901	8.1	622	5,060	11,680	8,530	6.7	4.2	63	4	0	0	0	0	96
Choke Cherry Creek	1951801	3.0	738	6,669	9,797	8,132	2.5	1.4	55	0	0	100	0	0	0

Table D.1-3
Physical Characteristics of Drainage Areas in the White River Valley, NV--HA 207

Site Name	Site Number	Stream Length (mi)	Slope (ft/mile)	Minimum Altitude (ft)	Maximum Altitude (ft)	Average Altitude (ft)	Total Area (mi^2)	Area Above 8,000 ft-amsl (mi^2)	Area Above 8,000 ft-amsl (%)	Alluvium (%)	Volcanic (%)	Carbonate (%)	Clastic (%)	Metamorphic (%)	Intrusive (%)
White River	2070102	9.3	204	6,650	11,450	8,020	28.2	10.8	38	2	73	25	0	0	0
Water Canyon Creek	2070310	7.0	338	6,440	10,000	8,080	10.6	5.5	52	10	6	84	0	0	0
Ellison Creek	2070202	12.8	157	6,500	9,560	7,790	41.9	13.5	32	29	50	21	0	0	0
Forest Home Creek	2070401	1.9	257	5,920	6,570	6,140	0.4	0	0	55	0	28	17	0	0

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Appendix E

Discharge Estimates for Ungaged Streams Listed by Station Number and by Measurement Date

Table E.1-1
Discharge Estimates for Ungaged Streams in Spring Valley, NV
Listed by Station Number and by Measurement Date

(Page 1 of 12)

Station Number	Station Name	Data Source	Measurement Date	Measurement Accuracy	Date Accuracy	Q_a Discharge (cfs)	Q_b MDV (cfs)	Q_a/Q_b	Q_M (2006)	Q_m (2006)	Long Term Average (2006)
1840201	Siegel Creek at Mountain Block	SNWA[a]	7/16/1996	Fair	Day	1.30	8.0	0.16	10.50	1.68	1.00
1840201	Siegel Creek at Mountain Block	SNWA[a]	7/13/1998	Fair	Day	2.65	22.0	0.12	10.50	1.26	
1840201	Siegel Creek at Mountain Block	SNWA[a]	7/12/1999	Good	Day	2.66	16.0	0.17	10.50	1.79	
1840201	Siegel Creek at Mountain Block	SNWA[a]	7/24/2000	Fair	Day	0.250	7.2	0.03	10.50	0.32	
1840201	Siegel Creek at Mountain Block	SNWA[a]	7/26/2000	Fair	Day	0.474	7.2	0.07	10.50	0.74	
1840201	Siegel Creek at Mountain Block	SNWA[a]	8/6/2001	Fair	Day	0.120	6.1	0.02	10.50	0.21	
1840201	Siegel Creek at Mountain Block	SNWA[a]	7/16/2002	Fair	Day	0.210	6.0	0.04	10.50	0.42	
1840201	Siegel Creek at Mountain Block	SNWA[a]	8/6/2003	Fair	Day	0.670	5.8	0.12	10.50	1.26	
1840201	Siegel Creek at Mountain Block	SNWA[a]	7/28/2004	Fair	Day	0.290	5.3	0.05	10.50	0.53	
1840201	Siegel Creek at Mountain Block	SNWA[a]	7/28/2005	Fair	Day	2.95	18.0	0.16	10.50	1.68	
1840201	Siegel Creek at Mountain Block	SNWA[a]	8/16/2006	Fair	Day	0.895	8.3	0.11	10.50	1.16	
1840401	North Creek at Sunkist, NV	USGS, 1964	7/14/1964		Day	2.23	8.4	0.27	10.50	2.84	1.24
1840401	North Creek at Sunkist, NV	SNWA[a]	7/17/1996	Fair	Day	1.13	7.5	0.15	10.50	1.58	
1840401	North Creek at Sunkist, NV	SNWA[a]	7/14/1998	Fair	Day	3.11	21.0	0.15	10.50	1.58	
1840401	North Creek at Sunkist, NV	SNWA[a]	7/17/1998	Fair	Day	2.74	18.0	0.15	10.50	1.58	
1840401	North Creek at Sunkist, NV	SNWA[a]	7/12/1999	Fair	Day	2.40	16.0	0.15	10.50	1.58	
1840401	North Creek at Sunkist, NV	SNWA[a]	7/24/2000	Fair	Day	0.600	7.2	0.08	10.50	0.84	
1840401	North Creek at Sunkist, NV	SNWA[a]	7/25/2000	Fair	Day	0.611	7.2	0.08	10.50	0.84	
1840401	North Creek at Sunkist, NV	SNWA[a]	7/25/2000	Fair	Day	0.656	7.2	0.09	10.50	0.95	
1840401	North Creek at Sunkist, NV	SNWA[a]	7/25/2000	Fair	Day	0.572	7.2	0.08	10.50	0.84	
1840401	North Creek at Sunkist, NV	SNWA[a]	7/25/2000	Fair	Day	0.554	7.2	0.08	10.50	0.84	
1840401	North Creek at Sunkist, NV	SNWA[a]	8/6/2001	Good	Day	0.370	6.1	0.06	10.50	0.63	
1840401	North Creek at Sunkist, NV	SNWA[a]	8/9/2001	Fair	Day	0.421	6.3	0.07	10.50	0.74	
1840401	North Creek at Sunkist, NV	SNWA[a]	7/16/2002	Fair	Day	0.680	6.0	0.11	10.50	1.16	
1840401	North Creek at Sunkist, NV	SNWA[a]	8/6/2003	Good	Day	0.670	5.8	0.12	10.50	1.26	
1840401	North Creek at Sunkist, NV	SNWA[a]	7/28/2004	Fair	Day	0.564	5.3	0.11	10.50	1.16	
1840401	North Creek at Sunkist, NV	SNWA[a]	7/28/2005	Fair	Day	2.05	18.0	0.11	10.50	1.16	

Table E.1-1
Discharge Estimates for Ungaged Streams in Spring Valley, NV
Listed by Station Number and by Measurement Date

(Page 2 of 12)

Station Number	Station Name	Data Source	Measurement Date	Measurement Accuracy	Date Accuracy	Q_a Discharge (cfs)	Q_b MDV (cfs)	Q_a/Q_b	Q_M (2006)	Q_m (2006)	Long Term Average (2006)
1840401	North Creek at Sunkist, NV	SNWA[a]	8/16/2006	Poor	Day	1.42	8.3	0.17	10.5	1.79	
1840501	Frenchman Creek at Mountain Block	SNWA[a]	7/17/1996	Good	Day	0.660	7.5	0.09	10.5	0.95	0.563
1840501	Frenchman Creek at Mountain Block	SNWA[a]	7/14/1998	Fair	Day	0.898	21.0	0.04	10.5	0.42	
1840501	Frenchman Creek at Mountain Block	SNWA[a]	7/17/1998	Fair	Day	0.860	18.0	0.05	10.5	0.53	
1840501	Frenchman Creek at Mountain Block	SNWA[a]	7/12/1999	Good	Day	1.04	16.0	0.07	10.5	0.74	
1840501	Frenchman Creek at Mountain Block	SNWA[a]	8/7/2001	Fair	Day	0.104	6.1	0.02	10.5	0.21	
1840501	Frenchman Creek at Mountain Block	SNWA[a]	8/15/2006	Fair	Day	0.384	8.2	0.05	10.5	0.53	
1840602	Muncy Creek near Muncy Ranch	SNWA[a]	7/16/1998	Good	Day	5.17	18.0	0.29	10.5	3.05	1.92
1840602	Muncy Creek near Muncy Ranch	SNWA[a]	7/17/1998	Fair	Day	5.14	18.0	0.29	10.5	3.05	
1840602	Muncy Creek near Muncy Ranch	SNWA[a]	7/13/1999	Good	Day	5.04	18.0	0.28	10.5	2.94	
1840602	Muncy Creek near Muncy Ranch	SNWA[a]	7/24/2000	Poor	Day	1.06	7.2	0.15	10.5	1.58	
1840602	Muncy Creek near Muncy Ranch	SNWA[a]	7/24/2000	Poor	Day	0.806	7.2	0.11	10.5	1.16	
1840602	Muncy Creek near Muncy Ranch	SNWA[a]	7/27/2000	Fair	Day	0.750	6.9	0.11	10.5	1.16	
1840602	Muncy Creek near Muncy Ranch	SNWA[a]	8/7/2001	Fair	Day	0.800	6.1	0.13	10.5	1.37	
1840602	Muncy Creek near Muncy Ranch	SNWA[a]	8/16/2006	Fair	Day	0.824	8.3	0.10	10.5	1.05	
1840704	Kalamazoo Creek (Site 1)	USGS, 1964	7/14/1964	--	Day	6.87	8.4	0.82	10.5	8.61	6.00
1840704	Kalamazoo Creek (Site 1)	USGS, 1964	8/15/1964	--	Day	5.95	7.1	0.84	10.5	8.82	
1840704	Kalamazoo Creek (Site 1)	USGS, 1983	12/8/1982	--	Day	5.29	12.0	0.44	10.5	4.62	
1840704	Kalamazoo Creek (Site 1)	USGS, 1985	10/26/1983	--	Day	6.68	15.0	0.45	10.5	4.73	
1840704	Kalamazoo Creek (Site 1)	USGS, 1985	11/7/1984	--	Day	7.52	15.0	0.50	10.5	5.25	
1840704	Kalamazoo Creek (Site 1)	USGS, 1985	2/5/1985	--	Day	5.75	12.0	0.48	10.5	5.04	
1840704	Kalamazoo Creek (Site 1)	USGS, 1991	7/12/1991	--	Day	4.42	7.6	0.58	10.5	6.09	
1840704	Kalamazoo Creek (Site 1)	USGS, 1992	10/22/1991	--	Day	3.18	5.4	0.59	10.5	6.20	

Table E.1-1
Discharge Estimates for Ungaged Streams in Spring Valley, NV
Listed by Station Number and by Measurement Date

(Page 3 of 12)

Station Number	Station Name	Data Source	Measurement Date	Measurement Accuracy	Date Accuracy	Q_a Discharge (cfs)	Q_b MDV (cfs)	Q_a/Q_b	Q_M (2006)	Q_m (2006)	Long Term Average (2006)
1840704	Kalamazoo Creek (Site 1)	USGS, 1992	12/3/1991	--	Day	3.02	5.7	0.53	10.5	5.57	
1840704	Kalamazoo Creek (Site 1)	USGS, 1992	3/16/1992	--	Day	3.42	6.3	0.54	10.5	5.67	
1840704	Kalamazoo Creek (Site 1)	SNWA[a]	7/15/1996	Good	Day	4.75	7.6	0.63	10.5	6.62	
1840704	Kalamazoo Creek (Site 1)	SNWA[a]	7/16/1996	Good	Day	5.05	8.0	0.63	10.5	6.62	
1840704	Kalamazoo Creek (Site 1)	SNWA[a]	7/16/1997	Good	Day	5.62	8.4	0.67	10.5	7.04	
1840704	Kalamazoo Creek (Site 1)	SNWA[a]	7/17/1997	Good	Day	5.79	8.8	0.66	10.5	6.93	
1840704	Kalamazoo Creek (Site 1)	SNWA[a]	7/17/1997	Good	Day	5.75	8.8	0.65	10.5	6.83	
1840704	Kalamazoo Creek (Site 1)	SNWA[a]	7/17/1997	Good	Day	5.83	8.8	0.66	10.5	6.93	
1840704	Kalamazoo Creek (Site 1)	SNWA[a]	7/17/1997	Fair	Day	5.74	8.8	0.65	10.5	6.83	
1840704	Kalamazoo Creek (Site 1)	SNWA[a]	7/17/1997	Good	Day	5.98	8.8	0.68	10.5	7.14	
1840704	Kalamazoo Creek (Site 1)	SNWA[a]	7/18/1997	Good	Day	6.04	9.0	0.67	10.5	7.04	
1840704	Kalamazoo Creek (Site 1)	SNWA[a]	7/12/1998	Fair	Day	9.31	24.0	0.39	10.5	4.10	
1840704	Kalamazoo Creek (Site 1)	SNWA[a]	7/14/1998	Fair	Day	9.96	21.0	0.47	10.5	4.94	
1840704	Kalamazoo Creek (Site 1)	SNWA[a]	7/13/1999	Good	Day	7.26	18.0	0.40	10.5	4.20	
1840704	Kalamazoo Creek (Site 1)	SNWA[a]	7/24/2000	Fair	Day	3.27	7.2	0.45	10.5	4.73	
1840704	Kalamazoo Creek (Site 1)	SNWA[a]	7/27/2000	Fair	Day	3.51	6.9	0.51	10.5	5.36	
1840704	Kalamazoo Creek (Site 1)	SNWA[a]	8/9/2001	Poor	Day	3.77	6.3	0.60	10.5	6.30	
1840704	Kalamazoo Creek (Site 1)	SNWA[a]	7/16/2002	Fair	Day	3.10	6.0	0.52	10.5	5.46	
1840704	Kalamazoo Creek (Site 1)	SNWA[a]	8/7/2003	Fair	Day	3.35	5.8	0.58	10.5	6.09	
1840704	Kalamazoo Creek (Site 1)	SNWA[a]	7/28/2004	Fair	Day	2.73	5.3	0.52	10.5	5.46	
1840704	Kalamazoo Creek (Site 1)	SNWA[a]	7/27/2005	Fair	Day	10.1	19.0	0.53	10.5	5.57	
1840704	Kalamazoo Creek (Site 1)	SNWA[a]	10/25/05	Fair	Day	5.38	11.0	0.49	10.5	5.15	
1840704	Kalamazoo Creek (Site 1)	SNWA[a]	8/15/2006	Fair	Day	4.87	8.2	0.59	10.5	6.20	
1840802	Piermont Creek at Mountain Block at Piermont, NV	USGS, 1977	10/13/1976	--	Day	1.14	7.4	0.15	10.5	1.58	1.69
1840802	Piermont Creek at Mountain Block at Piermont, NV	USGS, 1977	2/23/1977	--	Day	1.06	5.2	0.20	10.5	2.10	

Table E.1-1
Discharge Estimates for Ungaged Streams in Spring Valley, NV
Listed by Station Number and by Measurement Date

(Page 4 of 12)

Station Number	Station Name	Data Source	Measurement Date	Measurement Accuracy	Date Accuracy	Q_a Discharge (cfs)	Q_b MDV (cfs)	Q_a/Q_b	Q_M (2006)	Q_m (2006)	Long Term Average (2006)
1840802	Piermont Creek at Mountain Block at Piermont, NV	USGS, 1977	8/24/1977	--	Day	1.04	7.3	0.14	10.5	1.47	
1840802	Piermont Creek at Mountain Block at Piermont, NV	USGS, 1978	7/24/1978	--	Day	1.53	9.2	0.17	10.5	1.79	
1840802	Piermont Creek at Mountain Block at Piermont, NV	USGS, 1979	10/2/1978	--	Day	1.08	6.2	0.17	10.5	1.79	
1840802	Piermont Creek at Mountain Block at Piermont, NV	USGS, 1979	2/21/1979	--	Day	1.06	8.5	0.12	10.5	1.26	
1840802	Piermont Creek at Mountain Block at Piermont, NV	USGS, 1979	9/18/1979	--	Day	0.740	6.6	0.11	10.5	1.16	
1840802	Piermont Creek at Mountain Block at Piermont, NV	USGS, 1980	1/23/1980	--	Day	1.05	8.7	0.12	10.5	1.26	
1840802	Piermont Creek at Mountain Block at Piermont, NV	USGS, 1983	12/8/1982	--	Day	2.60	12.0	0.22	10.5	2.31	
1840802	Piermont Creek at Mountain Block at Piermont, NV	SNWA[a]	7/16/1996	Good	Day	1.09	8.0	0.14	10.5	1.47	
1840802	Piermont Creek at Mountain Block at Piermont, NV	SNWA[a]	7/14/1998	Fair	Day	5.94	21.0	0.28	10.5	2.94	
1840802	Piermont Creek at Mountain Block at Piermont, NV	SNWA[a]	7/15/1998	Fair	Day	6.47	19.0	0.34	10.5	3.57	
1840802	Piermont Creek at Mountain Block at Piermont, NV	SNWA[a]	7/17/1998	Fair	Day	4.96	18.0	0.28	10.5	2.94	
1840802	Piermont Creek at Mountain Block at Piermont, NV	SNWA[a]	7/14/1999	Good	Day	2.82	17.0	0.17	10.5	1.79	
1840802	Piermont Creek at Mountain Block at Piermont, NV	SNWA[a]	7/14/1999	Good	Day	2.74	17.0	0.16	10.5	1.68	
1840802	Piermont Creek at Mountain Block at Piermont, NV	SNWA[a]	7/14/1999	Good	Day	2.91	17.0	0.17	10.5	1.79	
1840802	Piermont Creek at Mountain Block at Piermont, NV	SNWA[a]	7/14/1999	Good	Day	2.90	17.0	0.17	10.5	1.79	
1840802	Piermont Creek at Mountain Block at Piermont, NV	SNWA[a]	7/14/1999	Good	Day	2.87	17.0	0.17	10.5	1.79	

Table E.1-1
Discharge Estimates for Ungaged Streams in Spring Valley, NV
Listed by Station Number and by Measurement Date

(Page 5 of 12)

Station Number	Station Name	Data Source	Measurement Date	Measurement Accuracy	Date Accuracy	Q_a Discharge (cfs)	Q_b MDV (cfs)	Q_a/Q_b	Q_M (2006)	Q_m (2006)	Long Term Average (2006)
1840802	Piermont Creek at Mountain Block at Piermont, NV	SNWA[a]	7/14/1999	Good	Day	2.74	17.0	0.16	10.5	1.68	
1840802	Piermont Creek at Mountain Block at Piermont, NV	SNWA[a]	7/14/1999	Good	Day	2.83	17.0	0.17	10.5	1.79	
1840802	Piermont Creek at Mountain Block at Piermont, NV	SNWA[a]	7/24/2000	Good	Day	0.923	7.2	0.13	10.5	1.37	
1840802	Piermont Creek at Mountain Block at Piermont, NV	SNWA[a]	7/27/2000	Fair	Day	0.733	6.9	0.11	10.5	1.16	
1840802	Piermont Creek at Mountain Block at Piermont, NV	SNWA[a]	7/27/2000	Fair	Day	0.682	6.9	0.10	10.5	1.05	
1840802	Piermont Creek at Mountain Block at Piermont, NV	SNWA[a]	8/8/2001	Fair	Day	0.511	6.3	0.08	10.5	0.84	
1840802	Piermont Creek at Mountain Block at Piermont, NV	SNWA[a]	8/9/2001	Good	Day	0.703	6.3	0.11	10.5	1.16	
1840802	Piermont Creek at Mountain Block at Piermont, NV	SNWA[a]	8/7/2003	Fair	Day	0.562	5.8	0.10	10.5	1.05	
1840802	Piermont Creek at Mountain Block at Piermont, NV	SNWA[a]	7/28/2004	Fair	Day	0.558	5.3	0.11	10.5	1.16	
1840802	Piermont Creek at Mountain Block at Piermont, NV	SNWA[a]	10/25/05	Fair	Day	1.96	11.0	0.18	10.5	1.89	
1840802	Piermont Creek at Mountain Block at Piermont, NV	SNWA[a]	7/27/2006	Fair	Day	1.46	10.0	0.15	10.5	1.58	
1840901	Garden Creek at Mountain Block	SNWA[a]	7/14/1998	Fair	Day	1.12	21.0	0.05	10.5	0.53	0.40
1840901	Garden Creek at Mountain Block	SNWA[a]	7/13/1999	Fair	Day	0.926	18.0	0.05	10.5	0.53	
1840901	Garden Creek at Mountain Block	SNWA[a]	8/7/2001	Fair	Day	0.098	6.1	0.02	10.5	0.21	
1840901	Garden Creek at Mountain Block	SNWA[a]	7/27/2006	Fair	Day	0.270	10.0	0.03	10.5	0.32	
1841002	Bassett Creek at Mountain Block	Rush and Kazmi, 1965	7/16/1964	--	Day	5.00	7.8	0.64	10.5	6.72	4.99
1841002	Bassett Creek at Mountain Block	USGS, 1964	8/15/1964	--	Day	3.13	7.1	0.44	10.5	4.62	
1841002	Bassett Creek at Mountain Block	USGS, 1968	9/24/1964	--	Day	2.48	6.2	0.40	10.5	4.16	
1841002	Bassett Creek at Mountain Block	USGS, 1977	10/13/1976	--	Day	2.61	7.4	0.35	10.5	3.68	

Table E.1-1
Discharge Estimates for Ungaged Streams in Spring Valley, NV
Listed by Station Number and by Measurement Date

(Page 6 of 12)

Station Number	Station Name	Data Source	Measurement Date	Measurement Accuracy	Date Accuracy	Q_a Discharge (cfs)	Q_b MDV (cfs)	Q_a/Q_b	Q_M (2006)	Q_m (2006)	Long Term Average (2006)
1841002	Bassett Creek at Mountain Block	USGS, 1977	2/23/1977	--	Day	2.14	5.2	0.41	10.5	4.31	
1841002	Bassett Creek at Mountain Block	USGS, 1977	8/24/1977	--	Day	2.46	7.3	0.34	10.5	3.57	
1841002	Bassett Creek at Mountain Block	USGS, 1978	7/24/1978	--	Day	4.97	9.2	0.54	10.5	5.67	
1841002	Bassett Creek at Mountain Block	USGS, 1979	10/2/1978	--	Day	3.32	6.2	0.54	10.5	5.67	
1841002	Bassett Creek at Mountain Block	USGS, 1979	2/21/1979	--	Day	1.88	8.5	0.22	10.5	2.31	
1841002	Bassett Creek at Mountain Block	USGS, 1979	9/18/1979	--	Day	3.61	6.6	0.55	10.5	5.78	
1841002	Bassett Creek at Mountain Block	USGS, 1980	1/22/1980	--	Day	3.10	7.7	0.40	10.5	4.20	
1841002	Bassett Creek at Mountain Block	USGS, 1991	7/16/1991	--	Day	4.65	6.7	0.69	10.5	7.25	
1841002	Bassett Creek at Mountain Block	USGS, 1992	10/22/1991	--	Day	2.15	5.4	0.40	10.5	4.20	
1841002	Bassett Creek at Mountain Block	USGS, 1992	12/3/1991	--	Day	2.54	5.7	0.45	10.5	4.73	
1841002	Bassett Creek at Mountain Block	USGS, 1992	3/16/1992	--	Day	1.72	6.3	0.27	10.5	2.84	
1841002	Bassett Creek at Mountain Block	SNWA[a]	7/18/1996	Good	Day	5.26	7.3	0.72	10.5	7.56	
1841002	Bassett Creek at Mountain Block	SNWA[a]	7/17/1998	Fair	Day	11.5	18.0	0.64	10.5	6.72	
1841002	Bassett Creek at Mountain Block	SNWA[a]	7/13/1999	Fair	Day	5.96	18.0	0.33	10.5	3.47	
1841002	Bassett Creek at Mountain Block	SNWA[a]	7/24/2000	Fair	Day	4.13	7.2	0.57	10.5	5.99	
1841002	Bassett Creek at Mountain Block	SNWA[a]	7/26/2000	Fair	Day	3.49	7.0	0.50	10.5	5.25	
1841002	Bassett Creek at Mountain Block	SNWA[a]	7/26/2000	Fair	Day	3.58	7.0	0.51	10.5	5.36	
1841002	Bassett Creek at Mountain Block	SNWA[a]	7/26/2000	Fair	Day	3.28	7.0	0.47	10.5	4.94	
1841002	Bassett Creek at Mountain Block	SNWA[a]	7/26/2000	Fair	Day	4.34	7.0	0.62	10.5	6.51	
1841002	Bassett Creek at Mountain Block	SNWA[a]	7/26/2000	Fair	Day	4.51	7.0	0.64	10.5	6.72	
1841002	Bassett Creek at Mountain Block	SNWA[a]	7/26/2000	Fair	Day	3.54	7.0	0.51	10.5	5.36	
1841002	Bassett Creek at Mountain Block	SNWA[a]	8/8/2001	Fair	Day	1.93	6.3	0.31	10.5	3.26	
1841002	Bassett Creek at Mountain Block	SNWA[a]	8/9/2001	Fair	Day	2.09	6.3	0.33	10.5	3.47	
1841002	Bassett Creek at Mountain Block	SNWA[a]	7/16/2002	Good	Day	2.60	6.0	0.43	10.5	4.52	
1841002	Bassett Creek at Mountain Block	SNWA[a]	8/7/2003	Fair	Day	2.76	5.8	0.48	10.5	5.04	
1841002	Bassett Creek at Mountain Block	SNWA[a]	7/28/2004	Good	Day	3.07	5.3	0.58	10.5	6.09	
1841002	Bassett Creek at Mountain Block	SNWA[a]	7/27/2006	Fair	Day	3.77	10.0	0.38	10.5	3.99	

Table E.1-1
Discharge Estimates for Ungaged Streams in Spring Valley, NV
Listed by Station Number and by Measurement Date

(Page 7 of 12)

Station Number	Station Name	Data Source	Measurement Date	Measurement Accuracy	Date Accuracy	Q_a Discharge (cfs)	Q_b MDV (cfs)	Q_a/Q_b	Q_M (2006)	Q_m (2006)	Long Term Average (2006)
1841101	Little Negro Creek above Diversion near Bassett Ranch	SNWA[a]	7/17/1996	Fair	Day	0.94	7.5	0.13	10.5	1.37	0.86
1841101	Little Negro Creek above Diversion near Bassett Ranch	SNWA[a]	7/15/1998	Fair	Day	2.48	19.0	0.13	10.5	1.37	
1841101	Little Negro Creek above Diversion near Bassett Ranch	SNWA[a]	7/17/1998	Fair	Day	1.8	18	0.10	10.5	1.05	
1841101	Little Negro Creek above Diversion near Bassett Ranch	SNWA[a]	7/13/1999	Good	Day	1.26	18	0.07	10.5	0.74	
1841101	Little Negro Creek above Diversion near Bassett Ranch	SNWA[a]	7/24/2000	Fair	Day	0.45	7.2	0.06	10.5	0.65	
1841101	Little Negro Creek above Diversion near Bassett Ranch	SNWA[a]	7/27/2000	Fair	Day	0.48	6.9	0.07	10.5	0.72	
1841101	Little Negro Creek above Diversion near Bassett Ranch	SNWA[a]	8/8/2001	Fair	Day	0.485	6.3	0.08	10.5	0.73	
1841101	Little Negro Creek above Diversion near Bassett Ranch	SNWA[a]	8/7/2003	Fair	Day	0.28	5.8	0.05	10.5	0.50	
1841101	Little Negro Creek above Diversion near Bassett Ranch	SNWA[a]	7/29/2004	Fair	Day	0.315	5.1	0.06	10.5	0.64	
1841101	Little Negro Creek above Diversion near Bassett Ranch	SNWA[a]	7/27/2006	Fair	Day	1.18	10	0.12	10.5	1.24	
1841201	Odgers Creek at Mountain Block	USGS, 1977	10/13/1976	--	Day	0.95	7.4	0.13	10.5	1.34	2.37
1841201	Odgers Creek at Mountain Block	USGS, 1977	2/23/1977	--	Day	1.31	5.2	0.25	10.5	2.63	
1841201	Odgers Creek at Mountain Block	USGS, 1977	8/24/1977	--	Day	1.49	7.3	0.20	10.5	2.14	
1841201	Odgers Creek at Mountain Block	USGS, 1978	7/24/1978	--	Day	2.77	9.2	0.30	10.5	3.15	
1841201	Odgers Creek at Mountain Block	USGS, 1979	10/2/1978	--	Day	1.34	6.2	0.22	10.5	2.31	
1841201	Odgers Creek at Mountain Block	USGS, 1979	2/21/1979	--	Day	1.24	8.5	0.15	10.5	1.58	
1841201	Odgers Creek at Mountain Block	USGS, 1979	9/18/1979	--	Day	0.7	6.6	0.11	10.5	1.16	
1841201	Odgers Creek at Mountain Block	USGS, 1980	1/23/1980	--	Day	0.67	8.7	0.08	10.5	0.84	
1841201	Odgers Creek at Mountain Block	USGS, 1991	7/16/1991	--	Day	2.51	6.7	0.37	10.5	3.89	
1841201	Odgers Creek at Mountain Block	USGS, 1992	10/23/1991	--	Day	1.24	5.6	0.22	10.5	2.31	

Table E.1-1
Discharge Estimates for Ungaged Streams in Spring Valley, NV
Listed by Station Number and by Measurement Date

(Page 8 of 12)

Station Number	Station Name	Data Source	Measurement Date	Measurement Accuracy	Date Accuracy	Q_a Discharge (cfs)	Q_b MDV (cfs)	Q_a/Q_b	Q_M (2006)	Q_m (2006)	Long Term Average (2006)
1841201	Odgers Creek at Mountain Block	USGS, 1992	12/3/1991	--	Day	0.98	5.7	0.17	10.5	1.78	
1841201	Odgers Creek at Mountain Block	USGS, 1992	3/17/1992	--	Day	1.06	6.4	0.17	10.5	1.78	
1841201	Odgers Creek at Mountain Block	SNWA[a]	7/18/1996	Fair	Day	2.18	7.3	0.30	10.5	3.15	
1841201	Odgers Creek at Mountain Block	SNWA[a]	7/15/1998	Fair	Day	6.39	19	0.34	10.5	3.57	
1841201	Odgers Creek at Mountain Block	SNWA[a]	7/17/1998	Fair	Day	6.34	18	0.35	10.5	3.68	
1841201	Odgers Creek at Mountain Block	SNWA[a]	7/15/1999	Good	Day	4.35	15	0.29	10.5	3.05	
1841201	Odgers Creek at Mountain Block	SNWA[a]	7/24/2000	Fair	Day	2.00	7.2	0.28	10.5	2.94	
1841201	Odgers Creek at Mountain Block	SNWA[a]	8/7/2001	Fair	Day	1.34	6.1	0.22	10.5	2.31	
1841201	Odgers Creek at Mountain Block	SNWA[a]	7/29/2004	Fair	Day	1.25	5.1	0.24	10.5	2.52	
1841201	Odgers Creek at Mountain Block	SNWA[a]	7/25/2006	Fair	Day	1.84	11	0.17	10.5	1.78	
1841302	McCoy Creek at Mountain Block	USGS, 1964	7/14/1964	--	Day	9.52	8.4	1.13	10.5	11.9	6.92
1841302	McCoy Creek at Mountain Block	USGS, 1964	8/15/1964	--	Day	5.95	7.1	0.84	10.5	8.82	
1841302	McCoy Creek at Mountain Block	USGS, 1991	7/16/1991	--	Day	7.58	6.7	1.13	10.5	11.9	
1841302	McCoy Creek at Mountain Block	USGS, 1992	10/22/1991	--	Day	3.49	5.4	0.65	10.5	6.83	
1841302	McCoy Creek at Mountain Block	USGS, 1992	12/3/1991	--	Day	2.89	5.7	0.51	10.5	5.36	
1841302	McCoy Creek at Mountain Block	USGS, 1992	3/17/1992	--	Day	2.78	6.4	0.43	10.5	4.52	
1841302	McCoy Creek at Mountain Block	SNWA[a]	7/17/1996	Fair	Day	5.82	7.5	0.78	10.5	8.19	
1841302	McCoy Creek at Mountain Block	SNWA[a]	7/15/1998	Fair	Day	15.45	19	0.81	10.5	8.51	
1841302	McCoy Creek at Mountain Block	SNWA[a]	7/15/1998	Fair	Day	14.9	19	0.78	10.5	8.19	
1841302	McCoy Creek at Mountain Block	SNWA[a]	7/17/1998	Good	Day	10.8	18	0.60	10.5	6.30	
1841302	McCoy Creek at Mountain Block	SNWA[a]	7/15/1999	Good	Day	8.61	15	0.57	10.5	5.98	
1841302	McCoy Creek at Mountain Block	SNWA[a]	7/15/1999	Good	Day	8.46	15	0.56	10.5	5.88	
1841302	McCoy Creek at Mountain Block	SNWA[a]	7/15/1999	Good	Day	8.70	15	0.58	10.5	6.09	
1841302	McCoy Creek at Mountain Block	SNWA[a]	7/15/1999	Good	Day	7.98	15	0.53	10.5	5.56	
1841302	McCoy Creek at Mountain Block	SNWA[a]	7/15/1999	Good	Day	8.33	15	0.56	10.5	5.88	
1841302	McCoy Creek at Mountain Block	SNWA[a]	7/15/1999	Good	Day	8.51	15	0.57	10.5	5.98	
1841302	McCoy Creek at Mountain Block	SNWA[a]	7/24/2000	Fair	Day	4.31	7.2	0.60	10.5	6.30	

Table E.1-1
Discharge Estimates for Ungaged Streams in Spring Valley, NV
Listed by Station Number and by Measurement Date

(Page 9 of 12)

Station Number	Station Name	Data Source	Measurement Date	Measurement Accuracy	Date Accuracy	Q_a Discharge (cfs)	Q_b MDV (cfs)	Q_a/Q_b	Q_M (2006)	Q_m (2006)	Long Term Average (2006)
1841302	McCoy Creek at Mountain Block	SNWA[a]	7/27/2000	Fair	Day	3.54	6.9	0.51	10.5	5.36	
1841302	McCoy Creek at Mountain Block	SNWA[a]	8/8/2001	Fair	Day	4.38	6.3	0.70	10.5	7.35	
1841302	McCoy Creek at Mountain Block	SNWA[a]	8/9/2001	Fair	Day	3.88	6.3	0.62	10.5	6.51	
1841302	McCoy Creek at Mountain Block	SNWA[a]	7/16/2002	Fair	Day	4.55	6.0	0.76	10.5	7.98	
1841302	McCoy Creek at Mountain Block	SNWA[a]	8/7/2003	Fair	Day	3.38	5.8	0.58	10.5	6.09	
1841302	McCoy Creek at Mountain Block	SNWA[a]	7/28/2004	Fair	Day	3.77	5.3	0.71	10.5	7.46	
1841302	McCoy Creek at Mountain Block	SNWA[a]	7/27/2005	Fair	Day	13.3	19	0.70	10.5	7.35	
1841302	McCoy Creek at Mountain Block	SNWA[a]	10/24/05	Fair	Day	5.63	11	0.51	10.5	5.36	
1841302	McCoy Creek at Mountain Block	SNWA[a]	7/25/2006	Fair	Day	6.60	11	0.60	10.5	6.3	
1841401	Taft Creek at Diversion	USGS, 1991	7/16/1991	--	Day	2.51	6.7	0.37	10.5	3.88	2.61
1841401	Taft Creek at Diversion	USGS, 1992	10/23/1991	--	Day	0.71	5.6	0.13	10.5	1.37	
1841401	Taft Creek at Diversion	USGS, 1992	12/4/1991	--	Day	0.77	5.3	0.14	10.5	1.47	
1841401	Taft Creek at Diversion	USGS, 1992	3/17/1992	--	Day	0.37	6.4	0.06	10.5	0.63	
1841401	Taft Creek at Diversion	SNWA[a]	7/18/1996	Fair	Day	2.08	7.3	0.28	10.5	2.94	
1841401	Taft Creek at Diversion	SNWA[a]	7/15/1998	Fair	Day	10.7	19	0.56	10.5	5.88	
1841401	Taft Creek at Diversion	SNWA[a]	7/16/1998	Fair	Day	8.43	18	0.47	10.5	4.94	
1841401	Taft Creek at Diversion	SNWA[a]	7/13/1999	Good	Day	4.32	18	0.24	10.5	2.52	
1841401	Taft Creek at Diversion	SNWA[a]	7/24/2000	Fair	Day	1.24	7.2	0.17	10.5	1.78	
1841401	Taft Creek at Diversion	SNWA[a]	7/27/2000	Fair	Day	1.27	6.9	0.18	10.5	1.89	
1841401	Taft Creek at Diversion	SNWA[a]	8/7/2001	Fair	Day	1.21	6.1	0.20	10.5	2.10	
1841401	Taft Creek at Diversion	SNWA[a]	7/25/2006	Fair	Day	2.00	11	0.18	10.5	1.89	
1841501	Stephens Creek at Mountain Block	SNWA[a]	7/25/2000	Fair	Day	0.69	7.2	0.10	10.5	1.05	1.05
1841501	Stephens Creek at Mountain Block	SNWA[a]	7/27/2000	Good	Day	0.76	6.9	0.11	10.5	1.16	
1841501	Stephens Creek at Mountain Block	SNWA[a]	7/25/2006	Fair	Day	0.994	11	0.09	10.5	0.94	
1841701	Bastian Creek at Mountain Block	SNWA[a]	7/15/1998	Fair	Day	10.5	19	0.55	10.5	5.78	2.75
1841701	Bastian Creek at Mountain Block	SNWA[a]	7/17/1998	Fair	Day	6.47	18	0.36	10.5	3.78	
1841701	Bastian Creek at Mountain Block	SNWA[a]	7/13/1999	Fair	Day	5.95	18	0.33	10.5	3.47	

Table E.1-1
Discharge Estimates for Ungaged Streams in Spring Valley, NV
Listed by Station Number and by Measurement Date

(Page 10 of 12)

Station Number	Station Name	Data Source	Measurement Date	Measurement Accuracy	Date Accuracy	Q_a Discharge (cfs)	Q_b MDV (cfs)	Q_a/Q_b	Q_M (2006)	Q_m (2006)	Long Term Average (2006)
1841701	Bastian Creek at Mountain Block	SNWA[a]	7/25/2000	Fair	Day	0.78	7.2	0.11	10.5	1.16	
1841701	Bastian Creek at Mountain Block	SNWA[a]	7/27/2000	Fair	Day	0.789	6.9	0.11	10.5	1.16	
1841701	Bastian Creek at Mountain Block	SNWA[a]	8/7/2001	Fair	Day	1.27	6.1	0.21	10.5	2.10	
1841701	Bastian Creek at Mountain Block	SNWA[a]	7/16/2002	Fair	Day	0.363	6	0.06	10.5	0.63	
1841701	Bastian Creek at Mountain Block	SNWA[a]	8/7/2003	Good	Day	0.737	5.8	0.13	10.5	1.36	
1841701	Bastian Creek at Mountain Block	SNWA[a]	7/28/2004	Fair	Day	0.455	5.3	0.09	10.5	0.94	
1841701	Bastian Creek at Mountain Block	SNWA[a]	7/27/2005	Fair	Day	9.91	19	0.52	10.5	5.46	
1841701	Bastian Creek at Mountain Block	SNWA[a]	10/24/2005	Fair	Day	3.05	11	0.28	10.5	2.94	
1841701	Bastian Creek at Mountain Block	SNWA[a]	7/24/2006	Poor	Day	3.8	11	0.34	10.5	3.57	
1841701	Bastian Creek at Mountain Block	SNWA[a]	8/17/2006	Good	Day	2.81	8.8	0.32	10.5	3.36	
1841901	Eight Mile Creek at Mountain Block	USGS, 1964	7/14/1964	--	Day	0.07	8.4	0.01	10.5	0.10	0.98
1841901	Eight Mile Creek at Mountain Block	SNWA[a]	7/14/1998	Fair	Day	2.17	21	0.10	10.5	1.05	
1841901	Eight Mile Creek at Mountain Block	SNWA[a]	7/16/1998	Poor	Day	2.02	18	0.11	10.5	1.16	
1841901	Eight Mile Creek at Mountain Block	SNWA[a]	7/13/1999	Good	Day	1.67	18	0.09	10.5	0.94	
1841901	Eight Mile Creek at Mountain Block	SNWA[a]	7/24/2000	Fair	Day	0.482	7.2	0.07	10.5	0.74	
1841901	Eight Mile Creek at Mountain Block	SNWA[a]	7/26/2000	Fair	Day	0.555	7	0.08	10.5	0.84	
1841901	Eight Mile Creek at Mountain Block	SNWA[a]	8/7/2001	Fair	Day	0.516	6.1	0.08	10.5	0.84	
1841901	Eight Mile Creek at Mountain Block	SNWA[a]	7/29/2004	Fair	Day	0.256	5.1	0.05	10.5	0.52	
1841901	Eight Mile Creek at Mountain Block	SNWA[a]	7/28/2005	Fair	Day	4.28	18	0.24	10.5	2.52	
1841901	Eight Mile Creek at Mountain Block	SNWA[a]	8/17/2006	Good	Day	0.889	8.8	0.10	10.5	1.05	
1842004	Negro Creek Below Ranch (Site 3)	SNWA[a]	7/17/2002	Good	Day	0.537	5.8	0.09	10.5	0.94	2.60
1842004	Negro Creek Below Ranch (Site 3)	SNWA[a]	7/29/2004	Fair	Day	0.766	5.1	0.15	10.5	1.58	
1842004	Negro Creek Below Ranch (Site 3)	SNWA[a]	7/28/2005	Fair	Day	7.4	18	0.41	10.5	4.30	
1842004	Negro Creek Below Ranch (Site 3)	SNWA[a]	8/17/2006	Fair	Day	3.03	8.8	0.34	10.5	3.57	
1842101	Willard Creek	USGS, 1964	7/12/1964	--	Day	0.35	8.6	0.04	10.5	0.42	0.91
1842101	Willard Creek	USGS, 1991	7/18/1991	--	Day	0.46	6.6	0.07	10.5	0.74	
1842101	Willard Creek	USGS, 1992	10/24/1991	--	Day	0.29	5.5	0.05	10.5	0.52	

Table E.1-1
Discharge Estimates for Ungaged Streams in Spring Valley, NV
Listed by Station Number and by Measurement Date

(Page 11 of 12)

Station Number	Station Name	Data Source	Measurement Date	Measurement Accuracy	Date Accuracy	Q_a Discharge (cfs)	Q_b MDV (cfs)	Q_a/Q_b	Q_M (2006)	Q_m (2006)	Long Term Average (2006)
1842101	Willard Creek	USGS, 1993	12/3/1991	--	Day	1.39	5.7	0.24	10.5	2.52	
1842101	Willard Creek	USGS, 1992	3/17/1992	--	Day	0.62	6.4	0.10	10.5	1.05	
1842101	Willard Creek	SNWA[a]	7/26/2006	Fair	Day	0.218	10	0.02	10.5	0.21	
1842201	Swallow Canyon above Diversion near Minerva, NV	SNWA[a]	7/13/1998	Fair	Day	52.41	22	2.38	10.5	24.99	7.65
1842201	Swallow Canyon above Diversion near Minerva, NV	SNWA[a]	7/14/1998	Fair	Day	21.5	21	1.02	10.5	10.7	
1842201	Swallow Canyon above Diversion near Minerva, NV	SNWA[a]	7/16/1998	Fair	Day	35.4	18	1.97	10.5	20.7	
1842201	Swallow Canyon above Diversion near Minerva, NV	SNWA[a]	7/18/1998	Fair	Day	32.3	18	1.79	10.5	18.8	
1842201	Swallow Canyon above Diversion near Minerva, NV	SNWA[a]	7/14/1999	Fair	Day	7.75	17	0.46	10.5	4.83	
1842201	Swallow Canyon above Diversion near Minerva, NV	SNWA[a]	7/16/1999	Fair	Day	6.87	14	0.49	10.5	5.14	
1842201	Swallow Canyon above Diversion near Minerva, NV	SNWA[a]	7/23/2000	Fair	Day	0.969	7.1	0.14	10.5	1.47	
1842201	Swallow Canyon above Diversion near Minerva, NV	SNWA[a]	7/25/2000	Fair	Day	0.75	7.2	0.10	10.5	1.05	
1842201	Swallow Canyon above Diversion near Minerva, NV	SNWA[a]	8/7/2001	Fair	Day	1.13	6.1	0.18	10.5	1.89	
1842201	Swallow Canyon above Diversion near Minerva, NV	SNWA[a]	7/17/2002	Fair	Day	2.31	5.8	0.40	10.5	4.20	
1842201	Swallow Canyon above Diversion near Minerva, NV	SNWA[a]	8/7/2003	Good	Day	0.953	5.8	0.16	10.5	1.68	
1842201	Swallow Canyon above Diversion near Minerva, NV	SNWA[a]	7/28/2004	Good	Day	0.658	5.3	0.12	10.5	1.26	
1842201	Swallow Canyon above Diversion near Minerva, NV	SNWA[a]	7/28/2005	Fair	Day	21	18	1.17	10.5	12.3	
1842201	Swallow Canyon above Diversion near Minerva, NV	SNWA[a]	7/26/2006	Fair	Day	3.71	10	0.37	10.5	3.88	

Table E.1-1
Discharge Estimates for Ungaged Streams in Spring Valley, NV
Listed by Station Number and by Measurement Date

(Page 12 of 12)

Station Number	Station Name	Data Source	Measurement Date	Measurement Accuracy	Date Accuracy	Q_a Discharge (cfs)	Q_b MDV (cfs)	Q_a/Q_b	Q_M (2006)	Q_m (2006)	Long Term Average (2006)
1842201	Swallow Canyon above Diversion near Minerva, NV	SNWA[a]	10/06/2006	Poor	Day	2.03	11	0.18	10.5	1.89	
1842602	Williams Canyon above aqueduct near Minerva, NV	USGS-NWIS	2003	--	Year	--	--	--	--	1.27	1.03
1842602	Williams Canyon above aqueduct near Minerva, NV	USGS-NWIS	2004	--	Year	--	--	--	--	0.98	
1842602	Williams Canyon above aqueduct near Minerva, NV	SNWA[a]	8/16/2006	Fair	Day	0.635	8.3	0.08	10.5	0.84	
1842702	Pine and Ridge Creeks below Confluence (Site 2)	SNWA[a]	8/16/2006	Fair	Day	0.933	8.3	0.11	10.5	1.16	1.16
1843001	Meadow Creek at Mountain Block	SNWA[a]	7/27/2006	Fair	Day	0.782	10	0.08	10.5	0.84	0.79
1843001	Meadow Creek at Mountain Block	SNWA[a]	8/17/2006	Fair	Day	0.617	8.8	0.07	10.5	0.74	
1843101	Shingle Creek near Great Basin National Park boundary near Osceola, NV	USGS-NWIS	2003	--	Year	--	--	--	--	0.93	0.95
1843101	Shingle Creek near Great Basin National Park boundary near Osceola, NV	USGS-NWIS	2004	--	Year	--	--	--	--	0.76	--
1843201	Shingle Creek at Mountain Block	SNWA[a]	7/26/2006	Fair	Day	1.14	10	0.11	10.5	1.16	--
1843301	Board Creek below mountain block and spring	SNWA[a]	7/26/2006	Poor	Day	0.025	10	0.003	10.5	0.03	0.03
1843401	North Creek at Mountain Block above Robinson Ranch	SNWA[a]	8/15/2006	Excellent	Day	0.011	8.2	0.001	10.5	0.01	0.01
1843501	Ranger Creek at road crossing	SNWA[a]	7/25/2006	Poor	Day	0.06	11	0.01	10.5	0.10	0.10
1843601	South Taft Creek at Mountain Block	SNWA[a]	7/25/2006	Fair	Day	0.718	11	0.06	10.5	0.63	0.63

Ungaged Streams Estimated Long Term Annual Discharge (cfs):	**51.1**
Cleve Creek Measured Long Term Annual Discharge (cfs):	**10.5**
Total Estimated Discharge (cfs):	**61.6**
Total Estimated Discharge (afy):	**44,629**

[a]SNWA - Miscellaneous measurement collected by SNWA staff from 1993 to 2005.

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