**UNDERGROUND TEST AREA SUBPROJECT
PHASE I DATA ANALYSIS TASK**

VOLUME III

**GROUNDWATER
RECHARGE AND DISCHARGE DATA
DOCUMENTATION PACKAGE**

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Preface

This product represents partial documentation for the Phase I Data Analysis Task performed in support of the current Regional Flow Model, Transport Model, and Risk Assessment for the Nevada Test Site Underground Test Area Subproject. Because of the size and complexity of the model area, a considerable quantity of data were collected and analyzed in support of the modeling efforts. The data analysis task was broken into eight subtasks, and descriptions of the subtask activities are contained in the following eight volumes that comprise the Phase I Data Analysis Documentation.

- Volume I: Regional Geologic Model Documentation Package
- Volume II: Potentiometric Data Documentation Package
- Volume III: Groundwater Recharge and Discharge Data Documentation Package
- Volume IV: Hydrologic Parameter Data Documentation Package
- Volume V: Transport Parameter and Source Term Data Documentation Package
- Volume VI: Groundwater Flow Model Documentation Package
- Volume VII: Tritium Transport Model Documentation Package
- Volume VIII: Risk Assessment Documentation Package

Each of the volumes details the results of one or two related subtasks. A summary review of project data and results will be contained in the Phase I Report (in progress).

The Underground Test Area Subproject Phase I Data Analysis Task was led by IT Corporation; Tetra Tech, Inc.; GeoTrans, Inc.; and Daniel B. Stephens Corporation. The task could not have been completed without the cooperative efforts of many other participants involved in work at the Nevada Test Site. Their organizations are listed in alphabetical order:

- Bechtel Nevada
- Desert Research Institute
- Lawrence Livermore National Laboratory
- Los Alamos National Laboratory
- Raytheon Services Nevada
- U.S. Geological Survey - Geologic Division
- U.S. Geological Survey - Water Resources Division
- U.S. Geological Survey - Yucca Mountain Project

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List of Abbreviations and Acronyms

ac-ft/yr	Acre-feet per year
AH	Anomalously high
AL	Anomalously low
BN	Bechtel Nevada
C	Consistent
CAU	Corrective Action Unit(s)
cm	Centimeter(s)
cm/d	Centimeter(s) per day
cm/yr	Centimeter(s) per year
DDE-F	Data Documentation Evaluation Flag(s)
DEM	Digital Elevation Model
DIF	Data Information Form
DOE	U.S. Department of Energy
DOE/NV	U.S. Department of Energy, Nevada Operations Office
DQE-F	Data Quality Evaluation Flag(s)
DRI	Desert Research Institute
DT	Decreasing trend
EPA	U.S. Environmental Protection Agency
ER	Environmental Restoration
ERD	Environmental Restoration Division
ERDBMS	Environmental Restoration Data Base Management System
ERP	Environmental Restoration Program
ET	Evapotranspiration
ft	Foot (feet)
ft/yr	Foot (feet) per year
gpm	Gallon(s) per minute
HA	Hydrographic Area(s)
ICRP	International Commission on Radiation Protection
in.	Inch(es)
in./d	Inch(es) per day
in./yr	Inch(es) per year
IT	IT Corporation
km	Kilometer(s)

List of Abbreviations and Acronyms (Continued)

km ²	Square kilometer(s)
LANL	Los Alamos National Laboratories
LLNL	Lawrence Livermore National Laboratories
LSE	Land surface elevation
m	Meter(s)
m/d	Meter(s) per day
m ³ /d	Cubic meter(s) per day
ME	Maxey-Eakin
mi ²	Square mile(s)
NA	Not applicable or Not assessed
NC	Non-consistent
NTS	Nevada Test Site
NWIS	National Water Information System
PTA-F	Primary Temporal Analysis Flag(s)
QA	Quality Assurance
RSN	Raytheon Services Nevada
SOP	Standard Operating Procedure(s)
STA-F	Secondary Temporal Analysis Flag(s)
TIN	Triangulated Irregular Network
UGTA	Underground Test Area
USGS	U.S. Geological Survey
UTM	Universal Transverse Mercator

1.0 Introduction

The Nevada Test Site (NTS), located in Nye County southern Nevada, was the location of 908 announced nuclear detonations conducted in shafts and tunnels between 1951 and 1992. About one-third of these nuclear underground detonations were conducted near or below the water table. As an unavoidable consequence of these testing activities, radionuclides have been introduced into the subsurface environment, impacting groundwater. The U.S. Department of Energy, Nevada Operations Office (DOE/NV) has been in the process of investigating the effects of these underground nuclear detonations as part of the Underground Test Area (UGTA) Subproject. Descriptions of the project, the data analysis task, and the Groundwater Recharge and Discharge Data Subtask are briefly discussed in the following text.

1.1 Project Description

This subsection contains descriptions of the purpose, scope, objectives, strategy, and organization of the UGTA project. Documentation supporting this effort is outlined in Section 1.2.5 of the report.

1.1.1 Project Purpose and Scope

The purpose of the UGTA project is to collect data and perform technical evaluations to support decisions regarding the corrective actions necessary to ensure that the weapon testing areas do not pose a significant risk to human health and the environment.

The scope of the UGTA includes the following activities:

- Collection and evaluation of new and existing data
- Quantification of risk to human health and the environment
- Selection of the corrective actions to reduce risk from the sites
- Implementation of corrective actions and closure of the testing areas

1.1.2 Project Objectives

The UGTA project objectives are prerequisite to generating the necessary end products to complete the project. The objectives provide the framework for project strategy. Project definition establishes the starting point, and objectives focus the end-point products.

The overall objective of the UGTA project is to evaluate the effects of the weapons testing areas on groundwater and identify and implement the appropriate corrective actions. This objective ensures that risks to human health and the environment from impacted groundwater are within protective levels.

Meeting the overall objective requires that several specific project objectives be achieved:

- Effectively plan and scope the UGTA project so that needed data are properly collected and relevant evaluations are properly performed.
- Prepare UGTA project plans as guidance and information tools for efficiently conducting the project.
- Determine the characteristics of the groundwater system and the nature and extent of contamination at a level necessary to support a baseline risk assessment.
- Develop credible predictions of contaminant fate and transport.
- Quantify risk to human health and the environment, in the absence of any present or future remedial action, to acceptable levels of uncertainty.
- Evaluate an appropriate range of remedial technologies applicable to the various contaminants and impacted media.
- Select appropriate corrective action alternatives.
- Implement selected corrective actions.
- Close the underground test areas.

1.1.3 Project Strategy

The Nevada Division of Environmental Protection regulates U.S. Department of Energy's (DOE) Nevada corrective actions through the Federal Facility Agreement and Consent Order (FFACO, 1996). Appendix VI of the agreement, "The Corrective Action Strategy," describes the processes that will be used to complete the corrective actions, including those in the UGTA. The individual sites covered by the agreement are known as Corrective Action Sites, and they are grouped into Corrective Action Units (CAUs). The UGTA comprises six CAUs, generally reflecting the geographic locations and geologic and hydrologic environments of the weapons testing areas.

1.1.4 Project Organization

Because of the complexity of the problem, the UGTA scope was separated into two major phases. During Phase I, project activities have been focused on a regional investigation. During Phase II, several localized investigations focusing on the CAUs will be conducted.

Phase I consists of existing data assessment, groundwater flow and solute transport modeling, and risk assessment. A key portion of the data assessment activities is the completion of a preliminary risk assessment. The risk assessment was designed to determine whether or not there is an imminent risk to human health and the environment and to provide input to a value of information analysis that will identify and prioritize potential data needs. The results of Phase I will be directly used in developing the work scope for the weapons testing areas and in the implementation of Phase II. Further information on the Phase I data analysis task is provided in the following subsection.

1.2 Phase I Data Analysis Task Description

This subsection contains a more detailed description of the purpose and scope, objectives, approach, and data requirements and organization of the UGTA Data Analysis Task.

1.2.1 Task Purpose and Scope

The overall purpose of the Data Analysis Task is to compile and analyze existing, as well as new data. During Phase I, the focus of the data analysis task was a regional investigation. The Phase I Data Analysis Task scope of work includes the evaluation of regional groundwater flow conditions, the transport of tritium from the weapons testing areas, and the determination of the presence or absence of imminent risk to human health and the environment.

1.2.2 Task Objectives

The objectives of the Phase I Data Analysis Task are as follows:

- Evaluate the regional groundwater flow conditions using a groundwater flow model.
- Evaluate the transport of tritium in groundwater using a groundwater transport model.
- Develop a preliminary assessment of risk to human health and the environment from the weapons testing areas.

1.2.3 Task Approach

The approach for the Phase I Data Analysis Task has included the following steps:

- Selection of a regional groundwater flow system, large enough to encompass the NTS
- Selection of an area of investigation, large enough to include the selected regional groundwater flow system
- Collection and analysis of data
- Simulation of regional groundwater flow with a three-dimensional numerical code
- Definition of the major flow paths from the weapons testing areas using a particle-tracking code
- Simulation of the transport of tritium using a numerical, one-dimensional transport code
- Calculations of risk to humans and the environment from exposure to tritiated groundwater

The NTS regional groundwater-flow system ([Figure 1-1](#)), which fully encompasses the groundwater flow system underlying the NTS, was selected for this investigation. The boundary of this groundwater flow system has not been well-defined in some areas. The boundary defined by Waddell et al. (1984) was used at the start of this investigation and is shown on [Figure 1-1](#). The selected area of investigation had to be large enough to allow for a reevaluation and potential expansion of the groundwater flow system boundary. This area covers a large part of Southern Nevada and part of Inyo County in Eastern California. The area extends from Death Valley, north to Antelope Valley, and from the Palmetto Mountains east to the Sheep Range, extending over an area of 80,650 square kilometers (km²) (31,140 square miles).

Data collection and analysis activities are dictated by the type of data needed. Data types and their methods of analysis are, in turn, dictated by the modeling approach and will not be discussed in this section; however, the documentation of necessary data types, as well as the methods of analysis, are discussed in the appropriate data documentation volume.

The computer code selected to simulate groundwater flow is MODFLOW (McDonald and Harbaugh, 1988). MODFLOW was developed by the U.S. Geological Survey (USGS) for the numerical simulation of fully three-dimensional saturated groundwater flow in porous media, and it was designed to simulate flow under both steady-state and transient conditions. The code may

also be used to simulate flow in fractured media by invoking an equivalent porous media assumption. This assumption implies that at the scale of the model, the hydraulic behavior of fractured geologic units is analogous to that of porous media. The groundwater flow model for the NTS Region flow system was developed through the process of steady-state calibration. The calibration of the steady-state flow model was performed using the trial and error technique. Transmissivities were varied first within predetermined bounds to match the simulated heads and flux rates with predefined target values derived from observed data. Second, the recharge rates and distribution were modified, as needed, to achieve a reasonable calibration. The code selected to simulate pathlines is MODPATH (Pollock, 1989). MODPATH was developed by the USGS to compute and display three-dimensional pathlines based on results of steady-state simulations using MODFLOW. The program uses information on layer geometry, boundary conditions, and flux rates to calculate the velocities and positions of particles at different times. MODPATH was used to compute and display pathlines originating from individual underground nuclear testing locations located throughout the weapons testing areas. MODPATH also provided specific discharge distributions along the pathlines, which were used in the transport model.

The code used to simulate contaminant transport is MC_TRANS (GeoTrans, 1995). MC-TRANS was developed specifically for the UGTA project. This finite-element, one-dimensional, radionuclide transport model simulates advection in a dual-porosity, fractured system with dispersion, sorption, and first-order decay. The code was used to simulate the concentrations of tritium downgradient from selected nuclear test sites, under the no-corrective-action alternative. The code was used in the stochastic mode to evaluate the uncertainties associated with the predicted tritium concentrations.

The code used to estimate human health risk from exposure to tritium-contaminated groundwater is GW-RISK (IT Corporation [IT], 1996a), also developed specifically for this project. The code implements the appropriate U.S. Department of Energy (DOE, 1993 [5400.5]), International Commission on Radiation Protection (ICRP, 1991), and U.S. Environmental Protection Agency (EPA) approaches (EPA, 1989a; EPA, 1989b; and EPA, 1991). The code uses tritium concentrations simulated by MC_TRANS (GeoTrans, 1995) as input for three of the most conservative predicted pathlines. The ecological risk assessment determines tritium concentrations below which no adverse effects would be expected to ecological receptors. These concentrations were compared with measured and modeled tritium concentrations in surface water and groundwater. Although no formal guidance exists on how to assess ecological risks associated with exposure to radionuclides, the general format suggested in the EPA "Framework" document (EPA, 1992) was used in conjunction with published radiation dose models (Baker and Soldat, 1992; Blaylock et al., 1993). Both human and ecological risk assessments included

examination of data, exposure assessment, toxicity assessment, risk evaluation, and evaluation of uncertainties.

1.2.4 Task Data Requirements and Organization

Task data requirements and organization are briefly described in this section. Data required to achieve the objectives of the Phase I data analysis are as follows:

- Geologic data for regional groundwater flow and transport modeling
- Hydrologic data for regional groundwater flow modeling
- Transport parameter and tritium source data for tritium transport modeling
- Risk-related data for assessment of risk to human health and the environment

MODFLOW (McDonald and Harbaugh, 1988) data requirements include geologic framework data, potentiometric data, hydraulic conductivity/transmissivity data, and groundwater recharge and discharge data. Data needs also include estimates of the uncertainties which are used to define the input variable bounds and the output variables target ranges for use in the model calibration process. MODPATH data requirements are MODFLOW data and porosity data. In addition to the Darcy velocities calculated by MODPATH, the transport model, MC_TRANS, requires transport parameter data including bulk and fracture porosity, dispersion, and tritium matrix diffusion data. Data for the tritium source needed for the transport model include the tritium source initial spatial extent and concentration. Data needed for the risk assessment include the peak tritium concentration distribution generated by the transport model from flowpath at each receptor location. In addition, exposure scenario, tritium dosimetry, and tritium detriment and risk data are required.

The data analysis task was organized into several subtasks, based upon the approach and the major types of data needs. Data needs of the flow model were fulfilled under four subtasks: Geologic Model, Potentiometric Data, Groundwater Recharge and Discharge Data, and Hydrologic Parameter Data. Porosity data are needed by both MODPATH and MC_TRANS and were collected under the Transport Parameter Subtask, together with data on dispersion and matrix diffusion. Data needed to define the source term were collected and analyzed under the Source Term Subtask. Data needed for risk assessment were collected and analyzed under the Risk Assessment Subtask.

1.2.5 Task Documentation

Work performed under the data analysis task is documented in eight volumes:

- Volume I: *Regional Geologic Model Documentation Package* (IT, 1996b)
- Volume II: *Potentiometric Data Documentation Package* (IT, 1996c)
- Volume III: *Groundwater Recharge and Discharge Data Documentation Package* (This package)
- Volume IV: *Hydrologic Parameter Data Documentation Package* (IT, 1996d)
- Volume V: *Transport Parameter and Source Term Data Documentation Package* (IT, 1996e)
- Volume VI: *Groundwater Flow Model Documentation Package* (IT, 1996f)
- Volume VII: *Tritium Transport Model Documentation Package* (IT, 1996g)
- Volume VIII: *Risk Assessment Documentation Package* (IT, 1996a)

A separate documentation package was not prepared for the Source Term Subtask; however, results of this subtask are reported in Volume V of the task documentation.

The documentation packages are meant to fulfill several project needs. The first five packages serve as a repository of available and pertinent data collected for possible inclusion into the modeling process. There is little relationship between these five packages; instead, they are directly related to Volumes VI and VII, the packages that document the flow and transport modeling process and results. Volume VIII, the Risk Assessment and Modeling Package, is most directly related to the transport package, Volume VII. Concentrations of tritium at specific locations and times required by the risk assessment are provided by the transport model.

Figure 1-2 illustrates how information from each of the packages was utilized and how they relate to each other.

A second project need was the ability to centralize the required information and make it readily available for a highly technical review of the modeling process. The intended audience of these eight documents is the technical reviewer. A report of the entire project that contains information related to regulatory and risk management issues is contained in the *Regional Groundwater Flow and Tritium Transport Modeling, and Risk Assessment of the Underground*

Figure 1-2
Data Utilization in Phase I Modeling

Test Area, Nevada Test Site, Nevada (DOE, in press). This document is intended to serve as the primary project summary that reaches a broader audience.

1.3 Groundwater Recharge and Discharge Data Subtask Description

This subsection includes a description of the purpose and scope, objectives, and approach of the Groundwater Recharge and Discharge Data Subtask.

1.3.1 Subtask Purpose and Scope

The velocity of water in the groundwater system is a direct function of the amount of recharge to the system. The greater the recharge, the steeper the hydraulic gradients must be to move the water. Further, the areal distribution of the recharge affects flow directions. Unfortunately, it is difficult to measure recharge rates directly. Discharge rates have been used to estimate recharge rates, based on the assumption that under natural, steady-state, predevelopment conditions, the total recharge equals the total discharge for a groundwater flow system thus achieving mass balance.

Groundwater recharge and discharge are the two components of the mass balance of a given groundwater basin. The term “mass balance” stems from the universal principle of mass conservation which constitutes one of the foundations of numerical groundwater flow modeling. This principle, as applied to a groundwater flow system, simply states that given a bounded groundwater system, the amount of water leaving the system (discharge) must equal the sum of the amount of water entering the system (recharge) and the amount of water stored in the system (groundwater storage). Under predevelopment steady-state conditions, no change in groundwater storage occurs, and the principle is simplified to discharge being equal to recharge. Note that the term “predevelopment” here and throughout the text refers to the groundwater system when it was under natural stress conditions before any kind of significant human stress was imposed on the system.

The Groundwater Recharge and Discharge Data Subtask has multiple purposes, but its primary purpose is the compilation and analysis of groundwater recharge and discharge data for the NTS groundwater flow system and vicinity. The data are to be used in the development of a three-dimensional, predevelopment, and steady-state model for the NTS regional groundwater flow system. More specifically, the data were used in the following activities:

- Estimating the components of the mass balance (groundwater budget) of the NTS regional groundwater flow system for predevelopment, steady-state conditions

- Developing the corresponding hydraulic head distribution maps generated under the Potentiometric Data Subtask

The scope of work was to compile and analyze existing groundwater recharge and discharge information within the investigation area, emphasizing the NTS groundwater flow system.

1.3.2 Subtask Objectives

The objectives of the Groundwater Recharge and Discharge Data Subtask are as follows:

- Estimate recharge rates and spatial distribution.
- Develop a new method for distributing primary recharge between upland areas, stream channels, and alluvial fan/valley-fill settings.
- Estimate discharge from evapotranspiration (ET) and springs, including rates and spatial distribution.
- Compile well discharge data, including locations and rates for future use.

1.3.3 Subtask Approach

The general subtask approach used in the compilation and analysis of recharge and discharge data for a steady-state groundwater flow model includes the following steps:

- Compile primary recharge-related data and information.
- Develop a method of primary recharge redistribution on the NTS and vicinity.
- Estimate initial primary recharge distribution for use in the groundwater flow model.
- Compile available subsurface inflow information for the NTS groundwater flow system.
- Estimate the locations and volumes of subsurface inflow into the NTS groundwater flow system.
- Compile available evapotranspiration data within the NTS groundwater flow system.
- Compile available spring data within the investigation area.
- Estimate the locations and volumes of natural discharge from the NTS regional groundwater flow system by evapotranspiration and springs.
- Compile available flow boundary information for the NTS regional groundwater flow system.

- Estimate the locations and volumes of boundary flux into and out of the NTS regional groundwater flow system.
- Compile available well discharge data for future use in the groundwater flow models.

Because all data compilation subtasks, including this one, were conducted simultaneously and prior to the flow modeling subtask, it was necessary to make the following assumptions during the performance of this subtask:

- The selected model boundary approximately would coincide with that of the NTS regional groundwater flow system as depicted by Waddell et al. (1984) and presented in the UGTA Work Plan (DOE, 1995).
- Discharge by springs and evapotranspiration would be simulated using MODFLOW's drain package rather than the evapotranspiration (ET) package (McDonald and Harbaugh, 1988).
- The NTS groundwater flow system was assumed to have been under natural steady-state conditions before the initiation of human-induced stress including well pumping and underground nuclear testing.

1.4 Documentation Organization

This document is organized in eleven sections.

- Section 1.0 - Is this introduction
- Section 2.0 - Contains a description of the Quality Assurance (QA) protocols used
- Section 3.0 - Provides a description of the data types, sources, and prioritization
- Section 4.0 - Details how the data were evaluated for documentation and quality
- Section 5.0 - Presents brief descriptions of the data compilation and evaluation
- Section 6.0 - Contains a brief discussion of the data deficiencies and limitations
- Section 7.0 - Includes details of the analysis and results of the recharge data
- Section 8.0 - Contains details of the analysis and results of surface discharge data
- Section 9.0 - Contains details of the analysis and results of boundary flux data
- Section 10.0 - Contains a summary in the form of a groundwater budget
- Section 11.0 - List of references cited

2.0 Quality Control

A QA Program has been developed for all activities performed under the Environmental Restoration (ER) Program including the UGTA project. QA measures taken to control quality during the process of generating the products under the different data analysis subtasks include data documentation evaluation, data quality evaluation, checking procedures, software quality assurance, use of standard methodologies, technical and peer reviews, and corroboration through the models.

2.1 Data Documentation Evaluation

During the documentation evaluation process of the data, flags are assigned. The five levels of Data Documentation Evaluation Flags (DDE-F) are briefly presented here:

- Level 1: Data are collected in accordance with Nevada ER Program subproject quality assurance plans, approved Nevada procedures, and/or participant-specific procedures. This ranking indicates that all supporting documentation for the data is on file and is available for review by data users.
- Level 2: Data are collected in accordance with approved plans and procedures as required for Level 1, with the exception that one or more documentation requirements may be deficient in some way. Examples of data documentation deficiencies may include lost or destroyed field-data collection forms or data acquired using interim or draft procedures.
- Level 3: Data are collected using accepted scientific methodology (e.g., American Society of Testing Materials, U.S. Environmental Protection Agency methods, USGS procedures) and accompanied by supporting and corroborative documentation such as testing apparatus diagrams, field or laboratory notes, and procedures. Documents referenced to qualify submitted data under the Level 3 category are noted and described in Part II of the Data Information Form (DIF).
- Level 4: Data are collected by a participating Nevada Environmental Restoration Program (ERP) organization or another organization not associated with the Nevada ERP prior to the issuance and implementation of project-approved standard policies, procedures, or practices governing data acquisition and qualification. The methods of data collection are documented and traceable; however, the validity and prudence of data use or compliance with referenced procedures is indeterminate. Supporting documentation may or may not exist. Documentation provided to qualify submitted data under Level 4 shall be noted and described in Part II of the Data Information Form.

Level 5: Data are obtained under unknown, undesirable, or uncertain conditions. When data documentation is unknown, any available supporting or helpful descriptions of the intended use and conditions of data capture should be described and listed in Part II of the Data Information Form.

2.2 Data Quality Evaluation

The criteria used to evaluate the different types of required data were dependent on the type of data and the intended usage of the data. Thus, various criteria were used to evaluate data quality. The general procedure assigned one or more flags to each record compiled in the database, indicating the data quality or suitability of the individual data record for the intended usage. Subtask-specific data quality evaluation procedures are described in detail in the corresponding subtask documentation package.

2.3 Checking Procedures

Various checking procedures were designed for quality control purposes. Checking procedures applicable to the UGTA data analysis subtasks include those developed for transcription of data, generation of figures, tables and logs, and performance of calculations. Data compiled by project personnel were subjected to the checking procedures before being added to the ER database. However, the bulk of the ER database is comprised of external digital databases developed by agencies external to the UGTA project, mainly the National Water Information System (NWIS) data from the USGS. Internal procedures do not govern other ER database participants; therefore, their data were not subjected to the checking procedures described here.

2.4 Software Quality Assurance

Various computer codes were developed in-house to aid in the data analysis subtasks. Codes developed specifically for the UGTA project were subjected to software quality assurance requirements such as validation/verification, preparation of operating manuals, and documentation of the theoretical basis for the calculations. Codes developed to load data and perform unit conversion codes used on the Environmental Restoration Data Base Management System (ERDBMS) were also checked.

2.5 Standard Methodologies

Only standard and widely accepted methodologies were used in the development of the interpretive products. The various methodologies used are too numerous to list here; however, they are described and referenced, where appropriate, in the sections discussing their use in the data analysis process.

2.6 *Technical and Peer Reviews*

The review process constitutes an important measure of product quality. It was used throughout the performance of the data analysis activities and consisted of technical and peer reviews. The technical review process is internal and is performed by qualified personnel. The peer review process is intended to complement the technical review process and is usually performed by individuals who are independent of the project.

Products generated under the Data Analysis Task were subjected to a continual review process to identify major flaws, if any, in the conceptual model of the groundwater flow system at an early stage. For example, the geologic cross sections and maps were subjected to technical and peer reviews several times during their development.

The hydrogeologic cross sections were also subjected to technical peer reviews during their generation. The peer reviews were conducted during periodical meetings involving the IT geologists and hydrogeologists and representatives from Raytheon Services Nevada (RSN), the USGS, Desert Research Institute (DRI), Los Alamos National Laboratory (LANL), and Lawrence Livermore National Laboratory (LLNL). Comments were recorded, evaluated, and incorporated into the process of defining the hydrostratigraphy.

The map products were internally reviewed by project personnel and submitted for peer review along with this documentation package. Following receipt of comments from the peer reviewers on the documentation packages and the map products, comments were resolved either by explanation or by modification of the products. Formal responses were prepared.

2.7 *Corroboration of Data Through the Models*

The data are corroborated as the groundwater flow model is calibrated. During the calibration process, interpretations are tested and modified as required. This step particularly applies to the geologic model where extensive interpretation is necessary. The geologic model has been modified during the calibration of the flow model because the initial interpretations in some areas did not allow for the duplication of the observed hydraulic heads within the existing levels of uncertainties.

3.0 Data Types, Sources, and Prioritization

Data types relevant to the Groundwater Recharge and Discharge Subtask were compiled for the entire investigation area with emphasis on the NTS regional groundwater flow system. The specific types, their sources, and their prioritization for further evaluation are discussed in this section.

3.1 Data Types

Major components of the mass balance for a groundwater basin include recharge to and discharge from the system. Groundwater recharge components consist of recharge from precipitation (primary recharge), recharge through subsurface inflow, and secondary recharge from irrigation. Groundwater discharge components include evapotranspiration, spring discharge, subsurface outflow, and well discharge. Under predevelopment, steady-state conditions, recharge equals discharge with no change in storage, and secondary recharge and well discharge are nil.

Types of groundwater recharge and discharge data needed to develop a predevelopment, steady-state flow model are primary recharge and subsurface inflow and groundwater discharge by evapotranspiration, springs, and subsurface outflow. The majority of the groundwater discharged by springs is effectively lost from the groundwater basin through ET in the vicinity of the springs. Thus, spring discharge was not explicitly simulated in the groundwater flow model. However, spring discharge data were used to help define the potentiometric surface and provide an estimate of ET losses in major regional discharge areas of the NTS regional groundwater flow system.

Although well discharge data are not needed for the development of the predevelopment steady-state model, they were compiled along with the other discharge data for future use. Well discharge data may be used in the future to verify the steady-state model calibration or to simulate transient behavior of the flow systems under past, current, or future pumping conditions. The well discharge data were subjected to a minimum level of analysis and stored in the ER database. They will not be discussed any further in this document.

Types of data needed for the development of the predevelopment, steady-state flow model are as follows:

Primary Recharge information

- Precipitation rate distribution
- Land surface elevation distribution
- Method of recharge estimate

Spring Data

- Site ID
- Reporting Name
- Universal Transverse Mercator (UTM) coordinates
- Discharge type (flowing)
- Date discharge measured
- Discharge rate
- Land surface elevation (LSE)

ET Information

- Location and extent of ET areas
- Estimates of average ET rates
- Estimates of ET volumes

Flow boundary Information

- Inflow boundary locations
- Inflow volume estimates
- Outflow boundary locations
- Outflow volume estimates

3.2 Data Sources

Major information sources are the DRI, the U.S. Geological Survey, and various reports cited in this section. Information was obtained in the form of published and unpublished documents and data sets.

Data necessary to estimate the primary recharge distribution over the investigation area were compiled by DRI. Precipitation data were compiled by DRI from various federal, state, and local agencies. Land surface elevation data were obtained from the USGS or USGS topographic maps.

Sources of spring data include the USGS NWIS database (USGS, 1989), USGS unpublished data obtained from its Las Vegas Office, and reports by Thordarson and Robinson (1971) and McKinley et al. (1991). The first spring data subset consists of spring discharge data for 206 springs, obtained from the NWIS database. The second subset comprises a large data set consisting of 754 springs in California and Nevada compiled by Thordarson and Robinson (1971). The third subset includes eleven springs located on the NTS area identified by McKinley et al. (1991). The fourth subset consists of unpublished spring data for the Ash Meadows and Oasis Valley areas, obtained from U.S. Geological Survey Las Vegas Office. The subset includes data for 39 springs in Oasis Valley and 95 springs in the Ash Meadow area.

Groundwater ET information was obtained from USGS and other publications presented in Section 8.0. The USGS information relates to ongoing investigations of Ash Meadows and the Franklin Lake Playa. Groundwater underflow across basin boundaries cannot be directly measured in the field; however, some estimates from indirect calculations are available in the existing literature.

3.3 *Data Prioritization*

Data types were prioritized for uncertainty assessment which consists of data documentation evaluation and variance estimates. Data types that should be prioritized for this subtask are recharge rates and volume; subsurface inflow volumes; spring discharge rates and land surface elevations; evapotranspiration rates, volumes, and areas; and subsurface flow volumes. However, only the spring discharge data were subjected to QA evaluation because all of the other types of data are based on indirect estimation techniques, not on field measurements.

4.0 Data Reduction and Quality Evaluation

Only spring information was available in the form of field-measured or field-estimated data that necessitated significant reduction and quality evaluation. Thus, only spring data are discussed in this section.

4.1 Data Reduction

The various spring data subsets were combined into one data set which was then reduced by eliminating duplicate data. Types of duplicate data included identical spring locations and/or records of discharge for the same spring. The reduced spring data are presented in [Appendix A](#). The identification of springs issuing from the regional groundwater flow system (regional springs) was performed under the Potentiometric Data Subtask, for springs located in the NTS region and vicinity. The land surface elevations at the regional spring locations were used as approximations of hydraulic head at those locations. The procedure is explained in the corresponding documentation package (IT, 1996c). For the purpose of this subtask, only springs identified as regional and located within the major ET areas of the NTS regional groundwater flow system were subjected to further evaluation and analysis.

4.2 Data Evaluation

Two types of flags were assigned to the spring discharge data. The first type is the DDE-F described in Section 2.0 of this document, and the second type consists of two flags defined to evaluate data quality.

4.2.1 Data Documentation Evaluation

Data documentation flags used in this subtask range from 1 to 5 as described in Section 2.0. All spring discharge data, which were prioritized for QA evaluation, were assigned a level of 5 because all available data were either estimates rather than measurements or had insufficient or no documentation for the procedures used.

4.2.2 Data Quality Evaluation

A Data Quality Evaluation Flag (DQE-F) was defined based on the method of spring discharge measurement. The DQE-F were defined as follows:

- A: Spring discharge value is of adequate quality for use in detailed analyses. The discharge rate is a measured or estimated value.
- U: Spring discharge value is of unknown quality and should be used in detailed analyses with caution. The method used to obtain the spring discharge value is unknown.

These flags were assigned to spring discharge data in Oasis Valley and Ash Meadows.

5.0 Spring Discharge Data Evaluation

As stated earlier, spring discharge was used to support estimates of ET losses in major discharge areas of the NTS groundwater flow system. Spring discharge data were subjected to a temporal analysis and then used to estimate total spring discharge by ET area.

5.1 Temporal Analysis

The purpose of the temporal analysis was to identify spring discharge measurements that were inconsistent with a hydrograph's stable part of the curve. A horizontal stable trend is defined as that part of the hydrograph that includes only cyclical variations about a mean value. Such a stable trend is representative of steady-state conditions. Inconsistent discharge measurements are inappropriate for steady-state, pre-stressed conditions. Temporal analysis was performed only for springs which had more than one record of discharge.

The following criteria were developed to identify and flag data considered to be inconsistent data points:

- AL: Data points which are anomalously low as compared to the general trend of the hydrograph are considered outliers. The method used to define such outliers is comparative, highly subjective, and varies from hydrograph to hydrograph according to data trends, scatter, and number of records. The flag used for this type of data point is AL for Anomalously Low.
- AH: Data points which are anomalously high relative to the general trend of the hydrograph are also considered outliers. The method used to define such inconsistent data is also comparative, highly subjective, and varies from hydrograph to hydrograph according to data trends, scatter, and number of records. The flag used for this type of data point is AH for Anomalously High.
- DT: Data points which are part of a decreasing trend for a given spring are considered inconsistent with predevelopment steady-state conditions. Decreasing trends may be due to pumping from neighboring wells. Therefore, such data points are considered inconsistent and are flagged as DT for data point part of decreasing trend.
- NT: Data points which are not part of the stable trend and are not chosen for detailed analysis are referred to as "NT". These data points are not considered to be representative of steady-state conditions.

The procedure used in the temporal analysis of the spring discharge data included a general review of the hydrograph for each spring followed by a detailed review and evaluation of individual discharge records. The general procedure was as follows:

- Prepare a discharge hydrograph for each spring for which more than one record of discharge measurement exists.
- Review the hydrograph for general shape, scatter, and apparent trends.
- Identify a suitable stable trend based on a review of the hydrograph.
- All data points which are not part of the identified stable trend are assigned the appropriate code as described previously.

A Primary Temporal Analysis Flag (PTA-F) was created in the database to identify data to be used for subsequent analysis. Each spring discharge measurement was flagged either as consistent (C) with an identified horizontal stable trend or non-consistent (NC). For records flagged as “NC,” a Secondary Temporal Analysis Flag (STA-F) contains the flags described above which indicate if the data point was considered abnormally high or low, part of a decreasing trend, or not part of the stable trend.

5.2 *Total Spring Discharge Estimates*

Average spring discharge rates were calculated for each spring based on discharge records identified as consistent. For springs having only one measurement available, the single measurement was used. The average spring discharges were then added for springs located within each major discharge area for use in estimating ET losses. The application of this analysis is presented in Section 8.0.

6.0 *Data Limitations and Deficiencies*

The major limitation of the recharge and discharge data is that most data were not actually measured, but estimated. The spring data set is the exception.

The following limitations and deficiencies were identified in the spring data:

- The documentation of discharge measurement procedures is limited.
- The records had many temporal data gaps.
- Sometimes the discharge rates were estimated rather than measured.

7.0 Areal Recharge Data Analysis

A portion of the precipitation that occurs over the NTS region infiltrates through the geologic layers to recharge the groundwater flow system. The distribution and rates of this natural, areal recharge may not be directly and accurately measured. However, they may be estimated using one of the existing methods, the most common being the Maxey-Eakin (ME) method (Maxey and Eakin, 1949) which was modified and used in this investigation.

7.1 Previous Work

The quantification of groundwater recharge from precipitation requires estimates of precipitation rates and distribution. Existing methods of estimating the long-term average precipitation and recharge are briefly described in this section.

7.1.1 Precipitation

Several methods of estimating long-term average precipitation distribution for the Nevada and California deserts have been documented in the literature. For Nevada, they consist of the method used by Hardman (1936 and 1965) and the co-kriging method used by Hevesi et al. (1992a and 1992b). Precipitation maps have also been developed that include portions of California, by James (1993), Weedfall (1963) and Winograd and Thordarson (1975).

Hardman (1936) developed a precipitation map for the entire state of Nevada. The map presents areas of equal average annual precipitation which were defined by correlating precipitation data from over one hundred Weather Bureau stations with land surface elevation data, general topography, latitude, and types of vegetation (Hardman and Mason, 1949). Hardman (1936) defined six precipitation zones ranging from zero to over 20 inches per year (in./yr) (0 to over 50.8 centimeters per year [cm/yr]). He later updated this map to provide more detail in the southern Nevada area (Hardman, 1965).

Hevesi et al. (1992a and 1992b) described a co-kriging technique using precipitation and land surface elevation data for an area in southern Nevada surrounding Yucca Mountain.

This method is based on a relationship between precipitation and land surface elevation described by French (1983 and 1986). In this method one or more mathematical relationships are defined between precipitation and land surface elevation, based on existing data, to generate a spatial distribution of precipitation in the form of a grid. Semivariograms and cross-semivariogram are also generated during the co-kriging process.

During the early stages of this investigation, the co-kriging method was used to generate the precipitation map. Because of peer review comments disputing the validity of the associated recharge distribution and due to other unforeseen difficulties, this method was abandoned during the course of the investigation. Instead, precipitation rates and distribution were estimated based on maps developed by Hardman (1965) and James (1993) and were used to estimate groundwater recharge.

Other precipitation maps relevant to this investigation include those of Weedfall (1963), Winograd and Thordarson (1975), and James (1993). These maps also include coverage for Death Valley, California.

7.1.2 Recharge

Two major methods of estimating groundwater recharge from precipitation have been documented in the literature. They consist of the Maxey-Eakin Method (Maxey and Eakin, 1949) and related methods and a method modified from that of Maxey-Eakin by D'Agnese (1994).

The oldest and most widely-used method is an empirical method developed by Maxey and Eakin (1949). In this method, recharge ranges are calculated as percentages of the precipitation ranges defined by Hardman (1936). The percentages increase with increasing ranges of precipitation and are referred to as the ME coefficients. A related method is the area-altitude used by Eakin et al. (1951). In this method, the ME coefficients are associated with areas defined as ranges of altitudes, rather than directly related to precipitation. A more detailed description of this method and other related methods are presented in Section 7.2.

The most elaborate modification of the Maxey-Eakin method is that of D'Agnese (1994). First, D'Agnese developed a precipitation map based on the relationships between precipitation and land surface elevation established by Quiring (1968). Second, D'Agnese constructed a preliminary recharge map using the area-altitude method developed by Eakin et al. (1951). Third, D'Agnese adjusted the preliminary recharge distribution based on the locations of springs and different types of vegetation.

7.2 Maxey-Eakin Method

A description and an evaluation of the Maxey-Eakin method of estimating groundwater recharge are presented in this section.

7.2.1 Method Description

Maxey and Eakin (1949) first described a method of estimating recharge to groundwater from precipitation in a report on groundwater in White River Valley, Nevada. The method was subsequently modified by Eakin et al. (1951). Maxey and Eakin (1949) used the Nevada precipitation map developed by Hardman in 1936. In their method, they estimated recharge by assuming that a zone-specific percentage of precipitation infiltrates to groundwater. The initial percentages assigned, based on precipitation, are the Maxey-Eakin coefficients (Table 7-1). These coefficients were determined by trial and error by balancing of recharge with estimates of groundwater discharge for 13 valleys in east-central Nevada (Maxey and Eakin, 1949).

When the Maxey-Eakin Method is used, recharge for a given basin is calculated using the following equation:

$$R = \sum r_i P_i \quad (7-1)$$

Where:

R = Total Maxey-Eakin recharge for a given basin;

r_i = The Maxey-Eakin recharge coefficient; and

P_i = The volume of precipitation for each delineated precipitation zone.

The Maxey-Eakin method was subsequently modified as it was used in several studies in Nevada to estimate recharge for various hydrographic areas (Eakin et al., 1951; Walker and Eakin, 1963; Malmberg, 1967; and Czarnecki, 1984). Eakin et al. (1951) described a modified ME method, the area-altitude in a study on the hydrology of eastern Nevada. In this method, the ME coefficients are associated with areas defined as ranges of altitudes, rather than directly related to precipitation. Recharge is assumed to occur where the mean annual precipitation is above 20.3 centimeter (cm) (8 inches [in.]) or the land surface elevation is above 1,700 meters (m) (6,000 feet [ft]). Recharge then increases with elevation according to the ME coefficients (Table 7-1). Note that for all the studies in which the Maxey-Eakin method has been utilized, the ME coefficients have remained the same for all precipitation zones, except for the lowest one. For this zone, Maxey and Eakin (1949) used 3 percent, Eakin et al. (1951) used 2 percent, et al. used 1 percent (Walker and Eakin, 1963).

Table 7-1
Precipitation Zones and Corresponding Coefficients for the Maxey-Eakin Method

Precipitation Zone based on Rate (in centimeters per year)	Precipitation Zone based on Land Surface Elevation (in meters above mean sea level)	Maxey-Eakin Coefficient (% of precipitation)
>50.8	>2,439	25
38.1 - 50.8	2,134-2,439	15
30.5 - 38.1	1,829-2,134	7
20.3 - 30.5	1,524-1,829	1, 2 or 3
<20.3	<1,524	0

7.2.2 Method Evaluation

An evaluation of the Maxey-Eakin Method for calculating recharge to groundwater in Nevada was performed by the Las Vegas Valley Water District (1992). Estimates of recharge made using the Maxey-Eakin Method were compared with recharge estimates obtained using computer models and other methods such as water budget methods. The Maxey-Eakin Method showed good agreement with the other methods, and it was concluded that the method provides a good approximation for recharge (Las Vegas Valley Water District, 1992). However, The Maxey-Eakin method has some limitations.

The Maxey-Eakin method does not account for factors that may significantly affect infiltration such as vegetation, rock type, relative topography (flat or steep slopes), and bedrock permeability. In the Maxey-Eakin method, precipitation zones of less than 20.3 cm (8 in.) of annual precipitation ([Table 7-1](#)) are not generally considered groundwater recharge areas. However, over the NTS, recharge is known to occur in these areas. For example, in Fortymile Canyon (Wash), Savard (1994) found that recharge to groundwater occurs by infiltration along the stream beds. However, based on the Maxey-Eakin method, a zero recharge is assigned to these areas because the annual precipitation is less than 20.3 cm (8 in.).

Thus, although the recharge estimated using the Maxey-Eakin method may be appropriate for regional scale modeling, it may not be adequate for the NTS and vicinity in view of the future, local groundwater flow modeling to be performed for the weapons testing areas. It is important that the regional groundwater flow model provides realistic head distributions in these areas to help define the boundary conditions of these local models. Thus, a more accurate depiction of the recharge distribution on the NTS and vicinity would be advantageous. Such recharge distribution would include recharge to areas such as canyons and washes. This would allow for a more detailed simulation of the hydraulic head distribution in the vicinity of the canyons and washes of the Nevada Test Site.

7.3 Modified Maxey-Eakin Method

The recharge distribution used in the regional groundwater flow model was constructed using a modification of the Maxey-Eakin method (1949). The method included the following tasks:

- Construct an updated precipitation map using new and existing data
- Calculate recharge using Maxey-Eakin coefficients
- Calculate total recharge volumes for individual hydrographic areas
- Redistribute a percentage of the total recharge within selected subbasins to low-lying areas.

7.3.1 Precipitation

The precipitation map was constructed using existing precipitation maps, satellite imagery (Bechtel, 1996), precipitation station data (Jacobson, 1996; French, 1996), and a Digital Elevation Model (USGS, 1987). The method by which the precipitation map and grid file were constructed is explained in detail in the following sections.

7.3.1.1 Data Compilation and Review

The precipitation map used in the process of calculating the recharge distribution is based on existing precipitation maps. The primary map used is the “Nevada Precipitation Map” prepared by Hardman (1965). A second map prepared by James (1993) for the Death Valley Region was also used. Precipitation station data provided by DRI (Jacobson, 1996; French, 1996), a Digital Elevation Model (DEM) from the U.S. Geological Survey (USGS, 1987), and a “Nevada Test Site Image Map” prepared by Bechtel Nevada (BN) (Bechtel, 1996) were used in conjunction with the existing precipitation maps to validate the updated precipitation map encompassing the entire NTS Regional groundwater flow system.

The “Precipitation Map of Nevada” (Hardman, 1965) was used as a basis for construction of the precipitation map used to determine the recharge distribution by the modified Maxey-Eakin method. The “Precipitation Map of Nevada” was adapted by Hardman in 1965 from an earlier version constructed by Hardman in 1936. The map coverage includes the entire state of Nevada, but does not include the Death Valley portion of the NTS regional groundwater flow system. To complete this portion of the precipitation map, the Death Valley section developed by James (1993) was used.

Additional data used in the construction of the precipitation map included the precipitation station data, the Digital Elevation Model, and a “Nevada Test Site Image Map”. These data were used to validate the existing precipitation maps and any changes made to them in constructing the updated precipitation map.

7.3.1.2 Construction of the Digital Precipitation Map and Grid File

To estimate groundwater recharge, it was first necessary to generate a digital precipitation map of the NTS groundwater flow system. As stated previously, a combination of two existing precipitation maps served as the basis for constructing the digital precipitation map (Plate 1) by scanning and digitizing the precipitation contours from the existing maps, updating the digital map using current precipitation station data, and validating the map using satellite imagery and land surface elevations.

Precipitation contours from the existing precipitation maps of Hardman (1965) and James (1993) were digitized into a three-dimensional design file. The contours were traced onto velum paper and scanned as digital images. The digital images were then geographically registered, and the contours digitized into the three-dimensional design file and set to the appropriate depth as “xyz” data. The z coordinate in the three-dimensional design file was attributed to the average annual precipitation depth in in./yr.

The precipitation station data were posted in the design file as “xyz” data with the z-coordinate as the average annual precipitation in inches per year. The coordinates of the station data were converted from geographic coordinates (longitude/latitude) to the projected coordinates (easting/northing, UTM Zone 11, NAD 27). Only those stations with greater than eight years of record were posted in the design file after determining the criteria of a usable station in discussions with regional experts and providers of the data (Jacobson, 1996; French, 1996). The selected precipitation stations are presented in [Table 7-2](#).

Precipitation contours in selected areas were modified to incorporate the new data from the selected precipitation stations ([Table 7-2](#)). However, in most instances the precipitation station data validated the existing precipitation contours and only minimal modifications were necessary. The most notable modification was that of the 20.3 cm/yr (8.0 in./yr) contour between east Timber Mountain and west Yucca Flat ([Plate 1](#)). The modification of the 20.3 cm/yr (8.0 in./yr) contour in this area was substantiated by stations 29, 34, 36, 46, and 49 ([Table 7-2](#)). The extent of the area defined by the 20.3 cm/yr (8.0 in./yr) contour line was increased to accommodate these stations. Additional modifications on the Nevada Test Site included the 12.7 cm/yr (5.0 in./yr) contour line below Timber Mountain extending from Yucca Mountain to east of Mercury. This contour line was moved south to accommodate stations 35, 40, 47, 53, 56, 57, 59, 62, and 63. Other modifications include refining the contours on Spring Mountain in order to accommodate stations 66, 67, 69, 71, 74, and 75. Modifications in this area consisted of expanding the precipitation area in the southeast portion of the mountains. The last notable modification was that of the 20.3 to 30.5 cm/yr (8.0 and 12.0 in./yr) contours at the southern portion of the Grant Range just north of the Worthington Mountains. Modifications in this area included reshaping the contours to accommodate station 72. The satellite imagery and digital elevation model data were consulted prior to modifying the contours. Contour lines were only modified where there was sufficient data to substantiate any changes.

The precipitation map was validated using the digital elevation model and satellite imagery. The digital elevation model grid was contoured according to the land-area model of

Table 7-2
Precipitation Station Data

Station Number	Station Name	UTM Zone 11, NAD 27		Land Surface Elevation (m)	Average Annual Precipitation	
		Easting (meters [m])	Northing (m)		Depth cm/yr (inches/yr)	Years Record
11	Tonopah Airport	492,689	4,213,009	1,655	16.3 (6.42)	29
12	Sarcobatus	498,522	4,124,251	1,225	9.0 (3.54)	14
13	Death Valley	511,946	4,035,517	-52	6.9 (2.72)	18
14	Beatty	525,210	4,094,706	1,082	15.9 (6.26)	47
27	Lathrop Wells	558,275	4,030,159	664	8.5 (3.35)	21
29	Little Feller 2	560,698	4,106,882	1,573	20.6 (8.11)	15
34	40 MN	563,341	4,100,364	1,469	20.8 (8.19)	33
35	4JA	563,445	4,071,032	1,043	13.3 (5.24)	34
36	Shoshone Basin	566,464	4,087,547	1,725	21.6 (8.50)	13
40	Skull Mountain Pass	568,500	4,065,887	1,186	16.1 (6.32)	8
41	Area 12 Mesa	569,624	4,116,171	2,283	32.4 (12.76)	34
43	Stockade Pass	570,759	4,113,178	2,053	21.3 (8.39)	9
46	Tippipah Spring 2	571,887	4,100,851	1,518	24.3 (9.57)	28
47	RV-1	572,151	4,060,050	1,036	15.9 (6.26)	28
49	Mid Valley	573,701	4,091,914	1,420	23.6 (9.29)	29
53	RV-Wash	576,721	4,053,568	866	10.0 (3.92)	8
54	Cane Springs	579,583	4,074,185	1,219	20.6 (8.11)	29
56	BJY	584,209	4,102,022	1,241	16.1 (6.34)	33
57	Yucca	584,791	4,090,231	1,195	17.0 (6.69)	34
58	PHS Farm	585,301	4,118,280	1,391	19.4 (7.64)	24
59	Desert Rock	587,122	4,053,108	1,005	15.2 (5.98)	30
60	Pahrump	588,385	4,008,227	823	12.6 (4.96)	20
62	Mercury	589,740	4,057,169	1,149	15.7 (6.18)	23
63	Well 5B	592,263	4,073,193	939	12.7 (5.00)	30
66	Trough Spring	610,107	4,026,349	2,512	45.0 (17.70)	9
67	Cold Creek	613,563	4,030,708	1,862	23.0 (9.06)	8
68	Indian Springs	617,793	4,049,256	951	11.6 (4.57)	25
69	Lee Canyon	619,087	4,018,516	2,594	53.4 (21.02)	9
71	Kyle Canyon	623,466	4,012,260	2,365	67.8 (26.70)	10
72	Adaven	624,188	4,219,501	1,905	32.1 (12.64)	47
74	Roberts Ranch	627,418	4,003,163	1,862	35.4 (13.94)	8
75	Red Rock Summit	631,972	3,999,532	1,984	27.0 (10.63)	8
79	Hayford Peak	660,932	4,058,248	2,999	42.4 (16.70)	9
80	Hidden Forest	660,934	4,055,504	2,304	32.0 (12.60)	9
81	Alamo	662,347	4,136,921	1,049	12.8 (5.04)	26
82	Las Vegas Airport	665,072	3,994,546	661	10.4 (4.09)	33
83	Sunrise Manor	672,321	4,007,633	555	10.6 (4.17)	32

Source: Jacobson, 1996; French, 1996

Eakin et al. (1951) ([Table 7-1](#)) to show the 1,524 to 2,439 meters (m) (5,000 to 8,000 ft) contour lines. The precipitation map was validated by superposing the precipitation data (contours and station data) on the digital elevation model. The digital elevation model is accurate to 92 meters. The plot was used to ensure the contours were positioned correctly relative to elevation. In general, the contour shape coincides with the shape of the topographic features of the mountain ranges. Due to the poor copy and large scale of the Hardman map, the validation process proved to be a very important step in constructing the digital precipitation map as error was introduced in the tracing and scanning the maps developed by Hardman (1965) and James (1993).

The digital precipitation map was constructed so a precipitation grid file could be generated for calculation of the recharge distribution using the modified Maxey-Eakin method. The precipitation grid was generated after the final modifications to the digital precipitation map were made and the map was validated. To construct the precipitation grid, the precipitation data (contours and station data) in the design file were extracted as “xyz” data to create a Triangulated Irregular Network (TIN) model. A TIN model is a means of representing spatial data using triangles. For example, given three data points in “xyz” space, a triangle is constructed by connecting the data points. The triangle is a plane in “xyz” space; therefore all “xyz” data on the plane is defined. The TIN model uses triangles to interpolate “xyz” data from known “xyz” data points (contours and precipitation station data). After the TIN model was constructed, a grid file was generated with a 1x1 kilometer node spacing. The grid file represents a continuous distribution of data within the Nevada Test Site Groundwater Flow System.

7.3.1.3 Final Precipitation Distribution

The final precipitation distribution was generated by assigning each precipitation data point to its corresponding hydrographic area. This was accomplished by extracting the precipitation data points within a hydrographic area and assigning the hydrographic area number to each one resulting in the following format: X:easting, Y:northing, Z1:precipitation rate (in./yr), Z2:hydrographic area number. The final precipitation distribution was completed by assigning zero (0.00000) precipitation to those data points outside the NTS groundwater flow system. The total precipitation was then calculated for each hydrographic basin within the NTS Groundwater Flow System.

The final precipitation distribution is presented as [Plate 1](#) with precipitation depth contours and the precipitation station data, the NTS groundwater flow system boundary, and the digital elevation model. As indicated by [Plate 1](#), the precipitation depth increases with land surface elevation and follows the general topography. The Spring Mountains in the south receive the

most precipitation, followed by the Sheep Range to the east. Other mountain ranges in the NTS groundwater flow system receive approximately 30.5 to 38.1 cm/yr (12 to 15 in./yr). Death Valley receives the least precipitation with approximately 2 in./yr.

[Table 7-3](#) lists precipitation totals calculated for the hydrographic basins. The total precipitation calculated from the precipitation distribution (column 3) only includes the precipitation within the NTS groundwater flow system boundary. Any precipitation outside the groundwater flow system boundary is not included in the total for the hydrographic area. Total precipitation from Scott et al. (1971) is included in the table for comparison (columns 4 and 5). The highlighted totals in column 4 were prorated based on the area within the flow system boundary using the following equation: (published precipitation total) x ([area within flow system boundary] ÷ [total area of hydrographic basin]).

In general, the comparison between the calculated precipitation and published precipitation is reasonably good; the difference between the two totals is 35,800 acre-feet per year (ac-ft/yr). For each, the maximum precipitation is found in the Tikaboo and Emigrant Valley hydrographic basins. The precipitation totals for those basins including testing areas (Gold Flat, Yucca Flat, and Frenchman Flat) are similar to the published data. The basins with the largest discrepancy between totals are the Las Vegas Valley and Amargosa Desert. These basins lend very little, if any, recharge to the NTS groundwater flow system and should not effect the modeling results. Possible causes of discrepancies observed between the calculated precipitation and the published totals are as follows:

- Error introduced during the tracing and scanning of the Hardman (1965) and James (1993) maps
- The use of different methods to construct the precipitation map
- The use of different techniques to calculate the totals (i.e., summing individual grid nodes versus averaging contours within the basin)
- Rounding errors

7.3.2 Recharge

In Nevada, the Maxey-Eakin method has been used to calculate the total volume of recharge to a given hydrographic area (or hydrographic area). Although the method indirectly correlates recharge magnitude to precipitation zones, the method does not take into account the specific locations where recharge actually occurs. In this investigation, we will assume that the majority of the recharge does occur at higher elevations as assumed in the Maxey-Eakin method.

Table 7-3
Comparison of Precipitation Volumes
to Published Values by Hydrographic Area

Hydrographic Basins		Total Precipitation Calculated from Distribution (cubic meters per day [m ³ /d])	Published Precipitation Data (Scott et al., 1971)	
Basin No.	Basin Name		Total Precipitation within Flow System (m ³ /d)	Total Precipitation in Basin (m ³ /d)
145	Stonewall Flat	2,546	4,878	371,737
146	Sarcobatus Flat	202,290	311,556	642,091
147	Gold Flat	889,195	844,856	844,856
148	Cactus Flat	491,956	439,325	439,325
149	Stone Cabin Valley	1,471	2,402	1,182,799
156	Hot Creek Valley	1,846	2,544	1,317,976
157	Kawich Valley	622,296	506,914	506,914
158	Emigrant Valley	1,164,236	959,757	959,757
159	Yucca Flat	461,941	337,942	337,942
160	Frenchman Flat	511,223	506,914	506,914
161	Indian Springs Valley	728,691	912,445	912,445
162	Pahrump Valley	1,531	5,397	1,419,358
168	Three-Lakes Valley North	276,120	371,737	371,737
169	Tikaboo Valley	1,260,641	1,284,181	1,284,181
170	Penoyer Valley	1,127,129	912,445	912,445
171	Coal Valley	835	1,249	574,502
172	Garden Valley	68,283	115,092	777,268
173	Railroad Valley South	681,245	844,856	844,856
209	Pahrnagat Valley	1,446	3,564	912,445
210	Coyote Spring Valley	13,005	18,106	743,473
211	Three-Lakes Valley South	359,289	439,325	439,325
212	Las Vegas Valley	248,265	613,223	2,230,420
225	Mercury Valley	104,576	128,418	128,418
226	Rock Valley	85,759	87,865	87,865
227	Fortymile Canyon	715,443	669,126	669,126
228	Oasis Valley	660,013	506,914	506,914
229	Crater Flat	153,895	206,145	206,145
230	Amargosa Desert	1,131,415	811,062	811,062
242	Amargosa River	117,067	117,067 ^a	
243	Death Valley	398,318	398,318 ^a	
Total Precipitation:		12,481,935	12,363,624	

^aCalculated basin total included in published precipitation total. Published data for this basin not available at time of printing.

However, smaller portions of the recharge have been shown to occur at lower elevations, in washes, and in canyons. In a study of groundwater recharge in Fortymile Canyon, Savard (1994) reported that recharge does occur along the canyon after streamflow events, as evidenced by rising water levels. Consequently, for the purpose of this regional investigation, recharge was determined in two major steps: generation of a preliminary recharge distribution and reallocation of a fraction of this recharge to canyons and washes.

7.3.2.1 Preliminary Recharge Distribution

A preliminary recharge distribution was generated using the updated precipitation map and the ME coefficients. The resulting groundwater recharge map is presented in [Plate 3](#).

The area covering the NTS regional groundwater flow system was subdivided according to the boundaries of hydrographic areas (HA) as defined by Harrill et al. (1988). Thirty major hydrographic areas were identified within this area. Recharge was calculated for each of the HA using the 1x1 kilometer (km) precipitation grid and two sets of ME coefficients. The results are shown in [Table 7-4](#).

The recharge rates were first calculated for each 1x1 km grid cell by multiplying the corresponding precipitation value by the Maxey-Eakin coefficients shown in [Table 7-1](#). For the lower zone, recharge was calculated using an ME coefficient of 2 percent. Total recharge values for the groundwater flow system were also calculated using the 1 percent and 3 percent ME coefficient for the lowest recharge zone, to evaluate the range of potential recharge. The corresponding recharge estimates and distribution are presented in [Plate 2](#).

[Table 7-4](#) lists groundwater recharge totals calculated for the hydrographic areas. The total recharge calculated from the recharge distribution (column 3) only includes the recharge within the NTS groundwater flow system boundary. As for precipitation, any recharge that occurs outside of the groundwater flow system boundary is not included in the total for the hydrographic area. Recharge values for hydrographic areas from Scott et al. (1971) are included in the table for comparison (columns 4 and 5). The highlighted totals in column 4 were prorated in the same manner as precipitation.

As shown on [Plate 2](#), important recharge areas are located in the Belted, Groom, and Timpahute Ranges in the north, in the Pahranaagat and Sheep ranges to the east, and in the Spring Mountains on the southeastern boundary. The estimated total recharge for the NTS regional groundwater flow system is 233,447 cubic meters per day (m^3/d) (69,097 ac-ft/yr). The discrepancies observed

Table 7-4
Comparison of Recharge Volumes to Published Values by Hydrographic Area

Hydrographic Area		Recharge Rate (m ³ /d)	Published Recharge Rate (m ³ /d)	Recharge Rate (ac-ft/yr)	Published Recharge Rate (ac-ft/yr)
Area Number	Area Name				
145	Stonewall Flat	33	4	10	1
146	Sarcobatus Flat	1,848	1,968	547	582
147	Gold Flat	13,789	12,842	4,080	3,800
148	Cactus Flat	10,938	2,028	3,237	600
149	Stone Cabin Valley	157	34	46	10
156	Hot Creek Valley	129	46	38	14
157	Kawich Valley	22,858	11,828	6,764	3,500
158	Emigrant Valley	26,855	10,814	7,947	3,200
159	Yucca Flat	8,091	2,366	2,394	700
160	Frenchman Flat	1,737	338	514	100
161	Indian Springs Valley	18,214	33,794	5,390	10,000
162	Pahrump Valley	17	283	5	84
168	Three-Lakes Valley North	877	6,759	259	2,000
169	Tikaboo Valley	17,631	20,277	5,217	6,000
170	Penoyer Valley	28,713	14,532	8,496	4,300
171	Coal Valley	17	15	5	4
172	Garden Valley	4,733	5,004	1,400	1,481
173	Railroad Valley South	24,584	20,277	7,275	6,000
209	Pahrangat Valley	12	24	4	7
210	Coyote Spring Valley	1,156	156	342	46
211	Three-Lakes Valley South	8,124	20,277	2,404	6,000
212	Las Vegas Valley	17,502	23,228	5,179	6,873
225	Mercury Valley	92	845	27	250
226	Rock Valley	-	101	-	30
227	Fortymile Canyon	13,001	5,745	3,847	1,700
228	Oasis Valley	11,955	3,379	3,538	1,000
229	Crater Flat	267	743	79	220
230	Amargosa Desert	119	7,992	35	2,365
242	Amargosa River	-	-	-	-
243	Death Valley Central	-	-	-	-
TOTAL		233,447	205,697	69,079	60,868

between the calculated values and the literature values for some of the hydrographic areas may be due to two reasons. The first reason is that literature values were derived for recharge from the 1x1 km precipitation grid, which can introduce additional errors. The recharge range derived using the 1 and 3 percent ME coefficient for the lower recharge zone is from 177,484 to 289,410 m³/d (52,526 to 85,650 ac-ft/yr).

7.3.2.2 Recharge Allocation

A method by which a hydrographic area where recharge to groundwater may occur by infiltration through canyons and washes was developed. The method consists of identifying different types of recharge reallocation zones corresponding to the canyons and washes, and reallocating portions of the total HA recharge to the identified zones.

A given hydrographic area may be subdivided into three types of recharge zones: A, B and C.

- Type A zone: Upgradient recharge areas that receive greater than 20.3 cm (8 in.) of annual precipitation per year, and this is where the majority of infiltration occurs
- Type B zone: Canyon-wash recharge areas that receive less than 20.3 cm (8 in.) of precipitation per year but include alluvial fans and streams through which recharge may occur
- Type C zone: Areas of no recharge that receive less than 20.3 cm (8 in.) of precipitation per year, but contain no alluvial fans or stream reaches to facilitate infiltration

For the purposes of the recharge reallocation, the major hydrographic areas were further subdivided into subareas as shown on [Plate 3](#). Recharge volumes were calculated for each subarea as outlined above. Nine hydrographic areas where type B zones occur were identified on the NTS and vicinity. The subject HAs are Topopah Wash, Beatty Wash, Thirsty Canyon, Lower Fortymile Canyon, Upper Fortymile Canyon, Frenchman Flat, Yucca Flat, Silent Canyon, Kawich Valley South, and Groom Lake ([Plate 3](#)).

Each HA was further subdivided into Types A, B, and C. Type B areas are further subdivided into three types of recharge areas: B1, B2, and B3. Type B1 represents bottoms of canyons and valleys, Type B2 represent mountain fronts, and Type B3 represent valley bottoms. See [Table 7-5](#) for more detailed descriptions.

The recharge reallocation was not actually performed for this task, but a description of the method used is provided here. For each HA where Type B areas are known to exist, a portion of

Table 7-5
Areas of Potential Recharge Redistribution in the Nevada Test Site Region

Recharge Area Type	Recharge Area Subtype	Description
A Highland Recharge Areas	None	These are highlands where precipitation and climatic conditions are sufficient to create recharge by deep infiltration. This type was defined as areas with precipitation above 20.3 cm/yr.
B Canyon-Wash Recharge Areas	B1	These are upland canyon and valley washes and stream reaches where runoff periodically infiltrates through the stream bed and recharges the groundwater. Type B1 subareas are more likely to be steeply dipping with thin sediments above bedrock. It is expected that infiltration would be relatively small in B1 subareas. Type B1 subareas receive less than 20.3 cm/yr of precipitation.
	B2	These are mountain front washes and stream reaches where runoff periodically infiltrates through the stream bed and recharges the groundwater. At type B2 subareas, the topography flattens and sediments are thicker and more abundant than in Type B1 areas. Water can be stored in the sediment and allowed to infiltrate more readily than in B1 subareas. Type B1 subareas receive less than 20.3 cm/yr of precipitation.
	B3	These are valley bottom washes and stream reaches where runoff periodically infiltrates through the stream bed and recharges the groundwater. Type B3 subareas are at the distal end of the streams. They are typically low gradient, fan-like, and have the capacity to infiltrate large quantities of water. However, B3 subareas rarely receive flow. Type B1 subareas receive less than 20.3 cm/yr of precipitation.
C Areas of No Recharge	None	Low lands and inter-stream areas where infiltration is assumed not to occur. This type was defined as areas with precipitation below 20.3 cm/yr.

the HA recharge volume is redistributed from Type A areas to Type B areas. It is important to emphasize that the total rate of recharge calculated for each area was not modified; only the areal distribution is modified. The calculated total Maxey-Eakin recharge rate (V_T - total recharge rate in the basin) is redistributed from Type A areas (V_A) where recharge rates are greater than zero to Type B areas (V_B) such that:

$$V_T = V_A = V_B \quad (7-2)$$

Where:

V_T = Total recharge rate;

V_A = Recharge rate in Type A areas; and

V_B = Recharge rate in Type B areas.

The redistribution factor, α , is a fraction of the total recharge (between 0 and 1) so that $V_A = \alpha V_T$ and $V_B = (1 - \alpha)V_T$. For example, if $V_T = 100$ and $\alpha = .30$, then $V_A = 30$ and $V_B = 70$.

For each HA, the recharge rates in Type B areas are further distributed to each recharge subarea (B1, B2, and B3) based on fractions β , γ , and δ of recharge volume in B (V_B), such that the following relationships hold true:

$$\beta + \gamma + \delta = 1 \quad (7-3)$$

Where:

β = Fraction of V_B assigned to Type B1 subareas;

γ = Fraction of V_B assigned to Type B2 subareas; and

δ = Fraction of V_B assigned to Type B3 subareas.

The areas of types B1, B2, and B3 are canyons or washes. Within a given HA, each of them is subdivided into several reaches that are compatible with a selected grid. Recharge rates for each reach are then obtained by dividing the recharge rate assigned to a given subarea type (B1, B2, or B3) by the number of reaches available within a given HA.

A utility FORTRAN code was developed to implement the modified Maxey-Eakin method. The code requires the Maxey-Eakin recharge distribution by HA; the spatial distribution of different types of recharge areas described above; and values for ", \$, (and * based on estimates of recharge rates at B-type and subtype areas. The code calculates a new recharge distribution in the form of a grid that can be made compatible with the flow model grid, an important feature that allows adjusting of the recharge grid during the calibration process. The code listing and QA requirements are provided in the *Groundwater Flow Model Documentation Package* (IT, 1996f).

The recharge reallocation coefficients (" , (, \$, and *) are unknown because the amounts of recharge that occur in Type B areas located in the different hydrographic areas are also largely unknown. Arbitrary initial values must be assigned to these coefficients to generate the initial recharge grid. They are to be adjusted during the groundwater flow model calibration process. The process and the results are provided in the *Groundwater Flow Model Documentation Package* (IT, 1996f).

8.0 Surface Discharge

Groundwater discharge to the surface occurs through springs and by evapotranspiration. Although spring discharge is important within the NTS regional groundwater flow system, only a negligible portion of it is discharged from the basin through surface flow in the Amargosa River in the southern boundary of the NTS regional groundwater flow system. A flow rate of less than one cubic foot per second was observed in the Amargosa River at that location in 1992. The majority of the groundwater discharged by springs is effectively lost from the groundwater basin through ET in the vicinity of the springs. Thus, spring discharge was not explicitly simulated in the groundwater flow model. However, spring discharge data were used to provide an estimate of ET losses in regional discharge areas.

8.1 Spring Discharge

Springs occur at numerous locations within the NTS region ([Plate 3](#)). Springs located on the Nevada Test Site are perched. Springs located at higher elevations are perched. These include springs on the Sheep Range and the Spring Mountains. Springs of importance to this investigation are regional springs, defined as such because they originate from the regional groundwater system. Within the NTS regional groundwater flow system, a variable number of regional springs occur in Ash Meadows, Oasis Valley, Death Valley, Penoyer Valley, and Indian Springs Valley. The numerous springs that occur within the ET areas of Ash Meadows and Oasis Valley may be used to estimate a lower bound for the ET estimates in these areas. Thus, springs located in the Ash Meadows and Oasis Valley discharge areas were evaluated as described in Sections 4.0 and 5.0. The results of the data evaluation and analysis are presented in [Appendix B](#). The results of the spring data evaluation and temporal analysis are presented in [Table B-1](#). Based on [Table B-2](#), the total spring discharge at Ash Meadows is 56,381 m³/d (16,684 ac-ft/yr). This value is consistent with the previously reported value of 57,460 m³/d (17,000 ac-ft/yr) (Winograd and Thordarson, 1975). Based on [Table B-3](#), the total spring discharge at Oasis Valley is 6,370 m³/d (1,885 ac-ft/yr). This discharge value is based on currently available data and may actually be larger.

8.2 Evapotranspiration

Discharge by evapotranspiration constitutes the majority of the total discharge from the NTS regional groundwater flow system. Based on previous investigations of the NTS regional groundwater flow system, significant groundwater losses by ET are known to occur in Death Valley, Oasis Valley, and areas of the Amargosa Desert. Evapotranspiration also occurs in other areas, such as Pahute Mesa and Timber Mountain where vegetation density increases with

elevation (Feeney et al., 1987). However, because the depth to groundwater is greater than the ET extinction depth, groundwater losses by ET are negligible in these areas.

The ET discharge areas were selected based on identification of vegetated areas and spring locations on the corresponding U.S. Geological Survey, 1:24,000-scale (7½-minute) topographic maps. Seven areas were identified as probable surface discharge areas (Plate 3). They are the Ash Meadows, Oasis Valley, Death Valley, Franklin Lake Playa, Alkali Flat (Peters Playa), Penoyer Valley, and Amargosa River discharge areas.

For each of these areas, an estimate of the evaporative loss is presented. It is assumed that only evaporative losses are net losses from the groundwater flow system. Spring discharge alone may overestimate groundwater discharge because some of that water may infiltrate back to the shallow groundwater system. For several of the areas, the estimates are approximate with large uncertainty that cannot be eliminated without additional investigation. A summary of the ET data is presented in Table 8-1.

Ash Meadows

Ash Meadows is located in Amargosa Desert (Plate 3). The discharge area has numerous springs, twenty-four of which have measured discharges. The total spring discharge in Ash Meadows is 56,381 m³/d (16,684 ac-ft/yr). Thus, the ET discharge from the Ash Meadows area is expected to be of similar magnitude.

Estimation of evapotranspiration rates in the Ash Meadows area and vicinity is an ongoing project conducted by the U.S. Geological Survey, Nevada District Office. This USGS study will be carried on through the end of 1996 and includes direct measurements of temperature, solar radiation, heat flux, and depths to groundwater.

The preliminary result of ET rates in Ash Meadows ranges from 0.12 to 0.29 centimeters per day (cm/d) (1.5 to 3.5 feet/year [ft/yr]). Based on these rates and an approximate value of 10 acres for the discharge area, Lacznia estimated a range of 15,000 to 35,000 ac-ft/yr, including maximum uncertainty (Lacznia, 1996a and 1996b). He also commented that a narrower range of 20,000 to 30,000 ac-ft/yr (67,500 to 101,400 m³/d) was more probable, based on a narrower range of average ET rates between 0.16 to 0.25 cm/d (2 to 3 ft/yr) (Lacznia, 1996a).

Oasis Valley

The Oasis Valley groundwater discharge area is located to the west of the Nevada Test Site and appears to be the discharge area of a portion of the groundwater in volcanic rocks on Western

Table 8-1
Surface Discharge Data for the NTS Regional Groundwater Flow System

Location	Estimated Surface Area (km²)	ET Rate (cm/d)	Approximate ET Discharge (m³/d)	Depth to Water (meters)	References
Ash Meadows	34.0 - 36.4	0.19 - 0.30	67,000 - 101,400	5 - 10	Laczniak, 1996a and 1996b
Oasis Valley	8.9	0.2	17,000 - 27,000	2 - 10	Malmberg and Eakin, 1962; Laczniak, 1996
Death Valley	NA	NA	17,500 - 60,200	0 - 5	Hunt et al., 1966; PAL Consultants, 1995
Franklin Lake Playa	14.2	0.1 - 0.3	14,200 - 42,600	(-1) - 3	Czarnecki, 1990
Alkali Flat (Peters Playa)	12.6	0.1 - 0.3	3,000 - 35,000	2 - 5	Winograd and Thordarson, 1975: Estimated this study
Penoyer Valley	69	0.02 - 0.04	13,000 - 27,000	2 - 10	Van Denburgh and Rush, 1974; Estimated this study
Amargosa River	1.7	0.19 - 0.30	2,040 - 5,100	2 - 5	Estimated this study
Indian Springs	NA	NA	1,600 - 2,400	-	PAL Consultants, 1994

Pahute Mesa (Plate 3). Malmberg and Eakin (1962) estimated that evaporative losses from the groundwater system in Oasis Valley are on the order of 2,000 ac-ft/yr (7,000 m³/d). Based on early measurements of ET at Oasis Valley, Lacznia (1996a) believes that this estimate is too low and should be in the range of 5,000 to 8,000 ac-ft/yr (17,000 to 27,000 m³/d). An examination of the spring data produced 33 historical accounts of springs in the Oasis Valley. Twenty-three of which have a measured or estimated discharge value. The total of published spring discharge values in Oasis Valley is 6,370 m³/d (1,885 ac-ft/yr). Extrapolating for the other 10 springs for which discharge estimates are not available, the total spring discharge could be as large as 9,140 m³/d (2,700 ac-ft/yr). Malmberg and Eakin (1962) estimated that 400 ac-ft/yr (1,350 m³/d) of the spring discharge may leave Oasis Valley as underflow through the Amargosa Narrows southeast of Beatty. On the basis of published ET data and the spring flow estimates, the groundwater discharge in Oasis Valley ranges from 5,000 to 7,800 m³/d (1,485 to 2,300 ac-ft/yr).

Another method of estimating groundwater discharge is to determine the area of evapotranspiration and multiply by the average annual ET rate. The area of moderate to dense vegetation in Oasis Valley is approximately 8.9 km² (2,200 acres). An approximate annual ET rate for Oasis Valley, based on the recent measured ET rates from Ash Meadows, is 0.70 meters per day (m/d) (2.3 ft/yr). This value seems reasonable when compared with measured annual ET rates in Ash Meadows which are on the order of 0.61 to 0.91 m/d (2.0 to 3.0 ft/yr). ET in Oasis Valley is expected to be less than in the Ash Meadows area because the elevation of Oasis Valley is greater than that of Ash Meadows. Multiplying the Oasis Valley ET area by the rate yields an evaporative loss of 17,000 m³/d (5,000 ac-ft/yr).

The discharge flux estimates for Oasis Valley range from 5,000 to 27,000 m³/d (5,000 to 8,000 ac-ft/yr). The low end of this range represent older estimates and appear to be too low. The narrower range of 17,000 to 27,000 m³/d (5,000 to 8,000 ac-ft/yr) recommended by Lacznia (1996) was used as a calibration target range.

Death Valley

The Death Valley discharge area of interest is located in the Central Death Valley Subregion of the Death Valley Groundwater Flow System (PAL Consultants, 1995). A number of estimates of the evapotranspiration losses are available in Hunt et al. (1966) and Miller (1977). These estimates are summarized in a report by PAL (1995) and range from 43,927 to 405,480 m³/d (13,000 to 120,000 ac-ft/yr). These estimates cover slightly different areas of Death Valley and represent total discharge regardless of source. The largest value is from D'Agnese (1994) and is much larger than the 44,000 to 80,000 m³/d (13,000 to 23,500 ac-ft/yr) presented by other investigators. For this work, the D'Agnese estimate is not considered to be representative and it

is assumed that the smaller range of values is more representative of the actual discharge in Death Valley. Thus a range of 44,000 to 80,000 m³/d (13,000 to 23,500 ac-ft/yr) is considered representative of the total groundwater discharge in Central Death Valley. However, the discharge area included within the Death Valley groundwater basin as defined in this investigation does not extend across the entire Central Death Valley Subregion and does not account for groundwater discharge originating from the Panamint Mountains located south of Death Valley. Thus, the estimated range of this discharge should be smaller than the above estimates.

Hunt et al. (1966) focused their work in the salt pan area of Death Valley and differentiated components of groundwater that came from the east and west sides of the valley. On page B38 of Hunt et al. (1966), the total discharge of groundwater from the east side of the valley for the Cottonball Basin, Furnace Creek Wash, Middle Basin (south of Furnace Creek Wash) and Badwater Basin areas is given as 3,220 gallons per minute (gpm) (5,200 ac-ft/yr or 17,500 m³/d). The total discharge from both sides of the valley is given as 8,000 gpm (12,900 ac-ft/yr or 43,600 m³/d). The discharge area of interest corresponds quite well with the areas of Hunt et al., except that the model does not include the southern half of the Badwater Basin. The majority of the discharge in the Badwater Basin occurs in the vicinity of Badwater, so little error is introduced by taking the value of Hunt et al. (1966). Another estimate of discharge from Central Death Valley that is attributed to the east side may be obtained from estimates of discharge and recharge for Central Death Valley by PAL Consultants (1995). They report a total discharge by ET of 79,406 m³/d (23,500 ac-ft/yr) and recharge from the west side of Central Death Valley (Panamint Range) to be 19,260 m³/d (5,700 ac-ft/yr). The difference between the total discharge and the recharge from the west side of the valley, a value of 60,146 m³/d (17,800 ac-ft/yr), constitutes another estimate of the ET discharge from the east side of the Central Death Valley. Based on the estimates of Hunt et al. (1966) and PAL Consultants (1995), an approximate range of 17,500 to 60,200 m³/d (5,200 to 17,800 ac-ft/yr) was used as the target calibration range.

Franklin Lake Playa

ET was studied by Czarnecki (1990) in the Franklin Lake Playa (Alkali Flat). Measurements to estimate evapotranspiration were made between June 1983 and September 1984 using the eddy-correlation technique coupled with the energy-balance method. Energy-balance estimates were compared with evapotranspiration estimates derived from six other methods:

- Empirical relations of meteorological data to estimate potential evapotranspiration
- Temporal variations in soil-moisture content in the unsaturated zone
- Estimates of evapotranspiration by phreatophytes in the Owens and Santa Ana Valley

- Temperature profiles for the saturated zone
- Saturated zone vertical gradient
- A one-dimensional, finite difference model of vertical groundwater flow from the water table to land surface

The groundwater table in the vicinity of the playa ranges from 1 m above to 3 m below land surface. Czarnecki (1990) used seven different techniques to estimate the evapotranspiration rate from Franklin Lake playa. The estimates range from 0.06 to 1.7 cm/d. Czarnecki (1990) considered the narrower range of 0.1 to 0.3 cm/d from the energy-balance eddy correlation method to provide the most reasonable and representative estimates of the ET rates. Taking the area of the playa (14.2 km² or 3,509 acres) into consideration, the total discharge rates range from 14,200 to 42,600 m³/d (6,718 to 12,607 ac-ft/yr). Czarnecki stated that an evapotranspiration rate of 0.16 cm/d (22,700 m³/d) is representative of the average ET rate measured with the energy-balance eddy correlation method.

Alkali Flat (Peters Playa)

Alkali Flat or Peters playa is a discharge area northeast of Ash Meadows referred to as “the unnamed valley northeast of the spring line” by Winograd and Thordarson (1975). In their report, Winograd and Thordarson (1975) described it as an area of some groundwater discharge, but only crudely estimated the ET discharge to be less than 1000 ac-ft/yr (3,400 m³/d).

The playa has an area of about 12.6 km² based on Figure 34 of Winograd and Thordarson (1975) where a circular area of radius 2 km was used to approximate the playa extent. Recent drilling of well MSH-C in the northern portion of the playa confirmed a generally upward hydraulic gradient. The water table may be within a few meters of the land surface beneath much of the playa. If ET rates similar to Franklin Lake Playa are used, then the discharge rate could range from 12,600 to 37,800 m³/d (3,729 to 11,187 ac-ft/yr). The possible range of discharge rates is quite large, with little data to reduce the uncertainty. A large range of 3,000 to 35,000 m³/d (888 to 10,358 ac-ft/yr) is recommended for use in the groundwater flow model calibration. Additional work would be required to reduce this range further.

Penoyer Valley

Penoyer Valley, also known as Sand Spring Valley, is located north-northeast of the NTS. Van Denburgh and Rush (1974) investigated discharge in Penoyer Valley and determined the evaporative discharge to be 4,000 ac-ft/yr (13,500 m³/d). Using plate 1 of the report prepared by Van Denburgh and Rush (1974), the discharge area is estimated to be 69 km², which yields an

average ET rate of 0.02 cm/d (0.008 inches per day [in./d]). This rate is substantially lower than the rates for Ash Meadows or Oasis Valley, both of which are at lower elevations. The ET rate for Penoyer Valley may be larger than 0.02 cm/d (0.008 in./d) if the recent data from Ash Meadows are considered. In the latter case, older estimates appear to be up to a factor of 2 too small. If that pattern holds for Penoyer Valley as well, then the discharge could be as large as 27,000 m³/d (7,990 ac-ft/yr). For the purposes of model calibration, a discharge range of 13,000 to 27,000 m³/d (3,847 to 7,990 ac-ft/yr) is recommended.

Amargosa River

Discharge of groundwater occurs along selected reaches of the Amargosa River. One area of discharge is southwest of Ash Meadows where satellite photographs show vegetation. It is not known how much water evaporates from this area. The ET area is very small compared with Ash Meadows and presumably the total ET flux is also much less. It is difficult to determine the relative areas, but from satellite images, the ET area for the Amargosa River appears to be 3 to 5 percent of the ET area for Ash Meadows. Therefore, an estimate of the ET flux is taken to be 5 percent of the range of values given for Ash Meadows. This yields discharge values in the range of 3,400 to 5,100 m³/d (1,006 to 1,509 ac-ft/yr).

Indian Springs

A small ET area exists in the vicinity of Indian Springs in Indian Spring Valley. An estimate of the lower limit of the ET range is provided by the total spring discharge. This value was reported to be 1,689 m³/d (500 ac-ft/yr) by Rush (1970). D'Agnese (1994) estimated the ET to be 2,365 m³/d (700 ac-ft/yr). The approximate range of 1,600 to 2,400 m³/d (500 to 700 ac-ft/yr) was used as a calibration target.

9.0 Flow Boundaries

The boundary of the NTS regional groundwater flow system was delineated to mostly correspond to areas where no flow occurs such as groundwater divides ([Plate 2](#)). However, flow across the basin boundary occurs in some areas. Four areas along the NTS groundwater flow system boundary are known to be flux boundaries. The first and most important area is along the northeastern boundary with inflow occurring from Pahrnagat Valley to Desert (Tickaboo) Valley. The second area is along the western boundary of Pahrump Valley. The third area is located at the southern boundary by Eagle Mountain. The fourth area where flow might occur is on the western boundary with potential inflow or outflow from Sarcobatus Flat into the NTS regional groundwater flow system. Estimates of subsurface flow across the boundaries of the NTS groundwater flow system are then provided and are summarized in [Table 9-1](#). Negative values indicate flow out of the basin, and positive values indicate flow into the basin.

Pahrnagat Valley

The occurrence of subsurface inflow from Pahrnagat Valley is supported by studies using isotope and other chemical data (Thomas, 1988). Winograd and Thordarson (1975) also postulated a groundwater underflow from Pahrnagat Valley on the basis of potentiometric head data, major geologic features, and the deuterium content of spring waters in both basins. Winograd and Thordarson (1975) estimated that as much as 20,280 m³/d (6,002 ac-ft/yr) may enter Desert (Tickaboo) Valley from Pahrnagat Valley. The deuterium data were interpreted to suggest that 35 percent of the discharge at Ash Meadows comes from the Pahrnagat Valley. The uncertainty in this value is unknown, but can be estimated from the deuterium data presented in Table 13 of Winograd and Thordarson (1975). Using the given mean, standard deviation, and number of samples, a 95 percent confidence interval about the mean value was determined for each set of samples assuming normally distributed random variables. With the uncertainty in the mean values, the percentage of springflow at Ash Meadows that is derived from Pahrnagat Valley can be shown to vary from 8 to 60 percent. Using the range of discharge values already provided for Ash Meadows (67,500 to 101,400 m³/d or 19,976 to 30,000 ac-ft/yr), the range of values for inflow from Pahrnagat Valley is given by 8 percent of 67,500 m³/d to 60 percent of 101,400 m³/d or 5,400 to 60,800 m³/d (1,598 to 17,993 ac-ft/yr).

Pahrump Valley

Several investigators, including Maxey and Jameson (1948), Malmberg (1967), Loeltz (1960), and Hughes (1966), present estimates of groundwater movement from Pahrump Valley toward Ash Meadows that range from 3,000 to 13,000 ac-ft/yr (10,000 to 43,900 m³/d). Winograd and Thordarson (1975) suggest (on the basis of the presence of the lower clastic aquitard between

Table 9-1
Boundary Groundwater Flux Estimates

Location Boundary	Discharge (m³/d)	Source
Pahranagat Valley	5,400 to 60,800	Winograd and Thordarson (1975)
Pahrump Valley	5 to 7,600	Winograd and Thordarson (1975)
Sarcobatus Flat	-1,700 to 1,700	Malmberg and Eakin (1962)
Eagle Mountain	-850 to -3,400	Walker and Eakin (1963)

Pahrump and Ash Meadows), a significant head difference and different geochemistry of the water, that the discharge is much smaller. Using hydraulic parameters, they present a range of values from 1 to 1,400 gpm (5 to 7,600 m³/d). It would appear that the inflow from Pahrump is small and probably balanced by the outflow near Eagle Mountain.

Sarcobatus Flat

Sarcobatus Flat is located to the west of Oasis Valley, and it is possible that there may be some flux of groundwater between the two areas. Malmberg and Eakin (1962) examined the groundwater resources of Oasis and Sarcobatus Valleys. In both valleys, the estimated discharge by evapotranspiration and underflow far exceeds the local recharge. Malmberg and Eakin (1962) suggest that the difference between recharge and discharge is made up by underflow from valleys to the north such as Gold Flat and Stonewall Flat. There is no mention of underflow between Oasis and Sarcobatus valleys. Regional potentiometric maps suggest that the boundary between the two basins is a groundwater divide. Malmberg and Eakin (1962) present limited groundwater level data to suggest that the direction of groundwater flow in Sarcobatus Flat is to the west. The direction and amount of underflow between Oasis and Sarcobatus valleys is not known. It will be assumed that the magnitude of underflow will be less than 1,700 m³/d (500 ac-ft/yr). Therefore, the range of values to use in the model will be -1,700 to 1,700 m³/d (-500 to 500 ac-ft/yr).

Eagle Mountain

The flow occurs at Eagle Mountain, located southeast of Death Valley Junction and between the Resting Spring and the Greenwater mountain ranges. The Eagle Mountain boundary accounts for flow in alluvium underlying the Amargosa River. Walker and Eakin (1963) estimated the subsurface flow to be about 500 ac-ft/yr (1,700 m³/d). The uncertainty in this estimate is unknown. This discharge is not mentioned in most other documents describing groundwater flow in the Death Valley Groundwater Flow System, except for Harrill (1986) who considered it in the context of a water balance for Pahrump Valley. The conclusion to be drawn is that the flux is small, and not considered a significant factor in the flow system. For lack of a better estimate, the uncertainty will be assumed to be a factor of 2. Therefore, the range of values to be used for calibration is 250 to 1,000 ac-ft/yr (850 to 3,400 m³/d).

10.0 Groundwater Budget

Based on the analysis of groundwater recharge and discharge components presented in Sections 7.0, 8.0 and 9.0, an approximate groundwater budget (mass balance) for the NTS regional groundwater flow system was derived ([Table 10-1](#)). The recharge and discharge components are uncertain and may vary by a factor of two to three, thus ranges are provided rather than single values.

The wide ranges of steady-state recharge and discharge derived from this analysis demonstrate the uncertainties associated with the existing estimates. Although the ranges derived from the recharge and discharge components are similar, the range based on the discharge component of the budget is more reliable, because ET can be measured and has been measured in some areas like Ash Meadows (Laczniak, 1996a and 1996b).

Table 10-1
Estimated Steady-State Groundwater Budget
for the NTS Regional Groundwater Flow System

Recharge Recharge from precipitation Subsurface Inflow Total Natural Recharge	177,484 - 289,410 m ³ /d 5,405 - 70,100 m ³ /d 182,889 - 359,510 m³/d
Discharge Surface Discharge (ET and springs) Subsurface Outflow Total Natural Discharge	135,340 - 300,700 m ³ /d 850 - 5,100 m ³ /d 136,190 - 305,800 m³/d

11.0 References

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Appendix A

Spring Data Set

Table A-1 Spring Data Set

Official ID	Alias Name	Reporting Name	Northing UTM Zone 11 (meters)	Easting UTM Zone 11 (meters)	Land Surface Elevation (meters)	Date	Discharge Rate (m3/d)	Discharge Rate (gpm)
LV003	LV003		3984929	599638	811	194608	2	0
360714115522001	LV012		3987910	601711	920	19460505	109	20
360714115522001	LV012		3987910	601711	920	19270805	355	65
LV043	LV043	Mule	3988069	627889	1509	191608	2	0
DH006	DH006	Post Office	3988393	479731	323	195502	8339	1530
360246115241901	LV080		3990037	643658	1043	1946	1217	223
360246115241901	LV080		3990037	643658	1043	19550101	1228	225
360336115385701	LV028		3991246	621665	1536	19460505	44	8
360348115280901	LV078		3991855	637872	1212	19550101	764	140
360348115280901	LV078		3991855	637872	1212	1946	775	142
LV007	LV007	Mound	3994766	597526	838	195509	0	0
360109115441901	LV019		3996037	613546	1201	19160101	71	13
LV009	LV009		3996329	599509	866	191608	3	1
PM050	LV021		3996506	614011	1170	191608	1542	283
LV004	LV004		3996550	591505	793	191608	1	0
DH007	DH007	Warm Sulphur	3997017	480751	317	195502	6	1
LV034	LV034	Roses	4000340	623960	2000		600	110
360919115541501	LV013		4001525	598579	841	197508	0	0
360919115541501	LV013		4001525	598579	841	197608	0	0
360919115541501	LV013		4001525	598579	841	19761006	600	110
360919115541501	LV013		4001525	598579	841	1974	1364	250
360919115541501	LV013		4001525	598579	841	1970	1474	270
360919115541501	LV013		4001525	598579	841	19751125	1474	270
360919115541501	LV013		4001525	598579	841	1973	1965	360
360919115541501	LV013		4001525	598579	841	1969	2401	440
360919115541501	LV013		4001525	598579	841	1972	2401	440
360919115541501	LV013		4001525	598579	841	1971	2401	440
360919115541501	LV013		4001525	598579	841	1965	2838	521
360919115541501	LV013		4001525	598579	841	1968	2947	541
360919115541501	LV013		4001525	598579	841	1966	3657	671
360919115541501	LV013		4001525	598579	841	1967	3711	681
360919115541501	LV013		4001525	598579	841	1964	4366	801
360919115541501	LV013		4001525	598579	841	1963	4475	821
360919115541501	LV013		4001525	598579	841	1962	4748	871
360919115541501	LV013		4001525	598579	841	1961	5076	931
360919115541501	LV013		4001525	598579	841	1947	5076	931
360919115541501	LV013		4001525	598579	841	1955	6003	1101
360919115541501	LV013		4001525	598579	841	1959	6003	1101
360919115541501	LV013		4001525	598579	841	1958	6003	1101
360919115541501	LV013		4001525	598579	841	1953	6003	1101
360919115541501	LV013		4001525	598579	841	1960	6003	1101
360919115541501	LV013		4001525	598579	841	1957	6003	1101
360919115541501	LV013		4001525	598579	841	1956	6003	1101
360919115541501	LV013		4001525	598579	841	1948	6549	1201
360919115541501	LV013		4001525	598579	841	1950	6549	1201
360919115541501	LV013		4001525	598579	841	1951	6549	1201
360919115541501	LV013		4001525	598579	841	1954	6549	1201
360919115541501	LV013		4001525	598579	841	1949	6549	1201
360919115541501	LV013		4001525	598579	841	1927	6549	1201
360919115541501	LV013		4001525	598579	841	19160930	7641	1402
360919115541501	LV013		4001525	598579	841	1946	7641	1402
360919115541501	LV013		4001525	598579	841	1939	7641	1402

Table A-1 Spring Data Set

Official ID	Alias Name	Reporting Name	Northing UTM Zone 11 (meters)	Easting UTM Zone 11 (meters)	Land Surface Elevation (meters)	Date	Discharge Rate (m3/d)	Discharge Rate (gpm)
360919115541501	LV013		4001525	598579	841	1940	7641	1402
360919115541501	LV013		4001525	598579	841	1937	7641	1402
360919115541501	LV013		4001525	598579	841	1875	14736	2703
390949115440101	MH003		4002611	614335	1426	19160101	82	15
360940115294001	LV076		4002666	635427	1268	1969	16	3
LV024	LV024	Intermittent	4002682	614930	1579	191604	59950	10998
LV022	LV022		4002977	613927	1427	191608	1	0
361222115585801	LV017		4007087	591448	817	1959	0	0
361222115585801	LV017		4007087	591448	817	1958	4748	871
361222115585801	LV017		4007087	591448	817	1927	5403	991
361222115585801	LV017		4007087	591448	817	1957	6767	1241
361222115585801	LV017		4007087	591448	817	1956	6767	1241
361222115585801	LV017		4007087	591448	817	1939	10806	1982
361222115585801	LV017		4007087	591448	817	1916	11461	2103
361222115585801	LV017		4007087	591448	817	19430718	13753	2523
361222115585801	LV017		4007087	591448	817	1937	13862	2543
361222115585801	LV017		4007087	591448	817	1940	13862	2543
361222115585801	LV017		4007087	591448	817	1875	18283	3354
DH001	DH001	Crystal	4007691	438078	1951		6	1
DH008	DH008		4007798	481774	1079	195404	11	2
361322115405901	LV032		4009352	618342	2280	19160101	11	2
DH017	DH017		4009630	493510	2338	195404	44	8
LV030	LV030	Lee	4009782	615835	2606	191604	29365	5387
DH018	DH018	Thorndike Camp	4009938	493510	2341		6	1
DV227	DV227		4010039	584623	779	191608	0	0
DH003	DH003	French Madam	4010041	457316	1676	195604	1	0
DV007	DV007		4010563	513977	-86	195703	22	4
DH005	DH005	Box	4010648	459066	1195	195404	3	1
DV006	DV006	Tule	4010867	510732	-79		27	5
DV220	DV220		4010874	574879	750	191608	0	0
361437116045001	DV223		4011158	582618	779	197702	0	0
361437116045001	DV223		4011158	582618	779	19641101	0	0
361437116045001	DV223		4011158	582618	779	19460715	55	10
361433115323001	LV075		4011629	631044	1780	19351001	273	50
361512115393001	LV044		4012680	620543	2804	19160101	11	2
361512115393001	LV044		4012680	620543	2804	19460903	380	70
DH009	DH009	Wild Rose	4012730	481036	1128	195604	6	1
DH012	DH012	Wild Rose	4013339	484281	1311		27	5
361617115382001	LV058		4014707	622262	1573	19460903	90	17
361617115382001	LV058		4014707	622262	1573	19460801	115	21
LV023	LV023	Horse	4017601	600264	1567	191608	1	0
361811115530001	LV025		4017938	600264	1561	19160101	5	1
361823115374801	LV069		4018600	623006	2682	19460907	224	41
361823115374801	LV069		4018600	623006	2682	19460801	278	51
361828115402801	LV056		4018699	619013	2597	19460801	115	21
LV060	LV060	Scout Canyon	4019990	618692	2582	194608	60	11
361852115160601	LV092		4020015	655464	756	1946	1353	248
381913115404201	QC023		4020268	618792	2582	19460902	51	9
381913115404201	QC023		4020268	618792	2582	19460801	60	11
LV039	LV039	Buck	4022340	609933	2207	194509	136	25
362120116162201	DV117	Last Chance	4023429	565253	693	19620728	5.5	1
362142116154701	DV158	Brahma	4024113	566120	701	19620728	5.5	1

Table A-1 Spring Data Set

Official ID	Alias Name	Reporting Name	Northing UTM Zone 11 (meters)	Easting UTM Zone 11 (meters)	Land Surface Elevation (meters)	Date	Discharge Rate (m3/d)	Discharge Rate (gpm)
362145116161301	DV130	Bole	4024201	565472	693	19620727	65.5	12
362211115494101	LV038		4025392	605138	2036	19450101	5	1
362211115494101	LV038		4025392	605138	2036	19450701	5	1
362230116162001	DV145	Big Spring	4025554	565162	683	19920819	3700.0	679
362230116162001	DV145	Big Spring	4025554	565162	683	19770104	4044.0	742
362230116162001	DV145	Big Spring	4025554	565162	683	19761013	4093.0	751
362230116162001	DV145	Big Spring	4025554	565162	683	19910408	4213.0	773
362230116162001	DV145	Big Spring	4025554	565162	683	19781003	4333.0	795
362230116162001	DV145	Big Spring	4025554	565162	683	19770504	4410.0	809
362230116162001	DV145	Big Spring	4025554	565162	683	19761101	4432.0	813
362230116162001	DV145	Big Spring	4025554	565162	683	19760709	4459.0	818
362230116162001	DV145	Big Spring	4025554	565162	683	19751002	4481.0	822
362230116162001	DV145	Big Spring	4025554	565162	683	19750904	4508.0	827
362230116162001	DV145	Big Spring	4025554	565162	683	19920519	4557.0	836
362230116162001	DV145	Big Spring	4025554	565162	683	19751230	4579.0	840
362230116162001	DV145	Big Spring	4025554	565162	683	19760902	4579.0	840
362230116162001	DV145	Big Spring	4025554	565162	683	19810701	4579.0	840
362230116162001	DV145	Big Spring	4025554	565162	683	19810901	4579.0	840
362230116162001	DV145	Big Spring	4025554	565162	683	19770202	4628.0	849
362230116162001	DV145	Big Spring	4025554	565162	683	19770405	4628.0	849
362230116162001	DV145	Big Spring	4025554	565162	683	19780911	4628.0	849
362230116162001	DV145	Big Spring	4025554	565162	683	19790702	4655.0	854
362230116162001	DV145	Big Spring	4025554	565162	683	19781102	4677.0	858
362230116162001	DV145	Big Spring	4025554	565162	683	19811007	4704.0	863
362230116162001	DV145	Big Spring	4025554	565162	683	19811001	4754.0	872
362230116162001	DV145	Big Spring	4025554	565162	683	19701123	4775.0	876
362230116162001	DV145	Big Spring	4025554	565162	683	19760203	4825.0	885
362230116162001	DV145	Big Spring	4025554	565162	683	19760401	4825.0	885
362230116162001	DV145	Big Spring	4025554	565162	683	19800708	4852.0	890
362230116162001	DV145	Big Spring	4025554	565162	683	19820701	4852.0	890
362230116162001	DV145	Big Spring	4025554	565162	683	19751202	4874.0	894
362230116162001	DV145	Big Spring	4025554	565162	683	19801007	4874.0	894
362230116162001	DV145	Big Spring	4025554	565162	683	19860115	4874.0	894
362230116162001	DV145	Big Spring	4025554	565162	683	19770802	4901.0	899
362230116162001	DV145	Big Spring	4025554	565162	683	19780607	4901.0	899
362230116162001	DV145	Big Spring	4025554	565162	683	19780706	4901.0	899
362230116162001	DV145	Big Spring	4025554	565162	683	19780809	4901.0	899
362230116162001	DV145	Big Spring	4025554	565162	683	19750701	4923.0	903
362230116162001	DV145	Big Spring	4025554	565162	683	19761130	4950.0	908
362230116162001	DV145	Big Spring	4025554	565162	683	19780314	4950.0	908
362230116162001	DV145	Big Spring	4025554	565162	683	19780510	4972.0	912
362230116162001	DV145	Big Spring	4025554	565162	683	19780111	4999.0	917
362230116162001	DV145	Big Spring	4025554	565162	683	19790413	4999.0	917
362230116162001	DV145	Big Spring	4025554	565162	683	19810401	4999.0	917
362230116162001	DV145	Big Spring	4025554	565162	683	19830609	4999.0	917
362230116162001	DV145	Big Spring	4025554	565162	683	19780202	5021.0	921
362230116162001	DV145	Big Spring	4025554	565162	683	19770302	5070.0	930
362230116162001	DV145	Big Spring	4025554	565162	683	19771205	5070.0	930
362230116162001	DV145	Big Spring	4025554	565162	683	19790803	5070.0	930
362230116162001	DV145	Big Spring	4025554	565162	683	19791003	5070.0	930
362230116162001	DV145	Big Spring	4025554	565162	683	19770601	5119.0	939
362230116162001	DV145	Big Spring	4025554	565162	683	19780405	5119.0	939

Table A-1 Spring Data Set

Official ID	Alias Name	Reporting Name	Northing UTM Zone 11 (meters)	Easting UTM Zone 11 (meters)	Land Surface Elevation (meters)	Date	Discharge Rate (m3/d)	Discharge Rate (gpm)
362230116162001	DV145	Big Spring	4025554	565162	683	19790208	5119.0	939
362230116162001	DV145	Big Spring	4025554	565162	683	19800107	5119.0	939
362230116162001	DV145	Big Spring	4025554	565162	683	19790503	5168.0	948
362230116162001	DV145	Big Spring	4025554	565162	683	19730921	5196.0	953
362230116162001	DV145	Big Spring	4025554	565162	683	19771003	5196.0	953
362230116162001	DV145	Big Spring	4025554	565162	683	19750801	5217.0	957
362230116162001	DV145	Big Spring	4025554	565162	683	19810606	5217.0	957
362230116162001	DV145	Big Spring	4025554	565162	683	19750318	5239.0	961
362230116162001	DV145	Big Spring	4025554	565162	683	19760601	5239.0	961
362230116162001	DV145	Big Spring	4025554	565162	683	19781201	5239.0	961
362230116162001	DV145	Big Spring	4025554	565162	683	19820407	5239.0	961
362230116162001	DV145	Big Spring	4025554	565162	683	19701201	5267.0	966
362230116162001	DV145	Big Spring	4025554	565162	683	19701208	5267.0	966
362230116162001	DV145	Big Spring	4025554	565162	683	19930225	5267.0	966
362230116162001	DV145	Big Spring	4025554	565162	683	19770901	5288.0	970
362230116162001	DV145	Big Spring	4025554	565162	683	19790110	5288.0	970
362230116162001	DV145	Big Spring	4025554	565162	683	19890726	5288.0	970
362230116162001	DV145	Big Spring	4025554	565162	683	19701214	5316.0	975
362230116162001	DV145	Big Spring	4025554	565162	683	19760803	5316.0	975
362230116162001	DV145	Big Spring	4025554	565162	683	19810106	5316.0	975
362230116162001	DV145	Big Spring	4025554	565162	683	19920317	5316.0	975
362230116162001	DV145	Big Spring	4025554	565162	683	19910924	5365.0	984
362230116162001	DV145	Big Spring	4025554	565162	683	19920731	5387.0	988
362230116162001	DV145	Big Spring	4025554	565162	683	19760504	5414.0	993
362230116162001	DV145	Big Spring	4025554	565162	683	19800408	5458.0	1001
362230116162001	DV145	Big Spring	4025554	565162	683	19830210	5458.0	1001
362230116162001	DV145	Big Spring	4025554	565162	683	19920127	5458.0	1001
362230116162001	DV145	Big Spring	4025554	565162	683	19930216	5458.0	1001
362230116162001	DV145	Big Spring	4025554	565162	683	19771102	5512.0	1011
362230116162001	DV145	Big Spring	4025554	565162	683	19921118	5512.0	1011
362230116162001	DV145	Big Spring	4025554	565162	683	19750430	5567.0	1021
362230116162001	DV145	Big Spring	4025554	565162	683	19701117	5621.0	1031
362230116162001	DV145	Big Spring	4025554	565162	683	19731022	5621.0	1031
362230116162001	DV145	Big Spring	4025554	565162	683	19760301	5621.0	1031
362230116162001	DV145	Big Spring	4025554	565162	683	19790614	5621.0	1031
362230116162001	DV145	Big Spring	4025554	565162	683	19921231	5621.0	1031
362230116162001	DV145	Big Spring	4025554	565162	683	19620726	5646.0	1036
362230116162001	DV145	Big Spring	4025554	565162	683	19750602	5730.0	1051
362230116162001	DV145	Big Spring	4025554	565162	683	19770609	5730.0	1051
362230116162001	DV145	Big Spring	4025554	565162	683	19930329	5730.0	1051
362230116162001	DV145	Big Spring	4025554	565162	683	19530202	5750.0	1055
362230116162001	DV145	Big Spring	4025554	565162	683	19770706	5785.0	1061
362230116162001	DV145	Big Spring	4025554	565162	683	19930126	5785.0	1061
362230116162001	DV145	Big Spring	4025554	565162	683	19610601	5876.0	1078
362230116162001	DV145	Big Spring	4025554	565162	683	19750402	5894.0	1081
362230116162001	DV145	Big Spring	4025554	565162	683	19790306	5894.0	1081
362230116162001	DV145	Big Spring	4025554	565162	683	19751105	5949.0	1091
362230116162001	DV145	Big Spring	4025554	565162	683	19701229	6058.0	1111
362230116162001	DV145	Big Spring	4025554	565162	683	19920827	6058.0	1111
362230116162001	DV145	Big Spring	4025554	565162	683	19921001	6058.0	1111
362230116162001	DV145	Big Spring	4025554	565162	683	19921130	6058.0	1111
362230116162001	DV145	Big Spring	4025554	565162	683	19770708	6113.0	1121

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Official ID	Alias Name	Reporting Name	Northing UTM Zone 11 (meters)	Easting UTM Zone 11 (meters)	Land Surface Elevation (meters)	Date	Discharge Rate (m3/d)	Discharge Rate (gpm)
362230116162001	DV145	Big Spring	4025554	565162	683	19930429	6113.0	1121
362230116162001	DV145	Big Spring	4025554	565162	683	19160101	6116.0	1122
362230116162001	DV145	Big Spring	4025554	565162	683	19921104	6222.0	1141
362230116162001	DV145	Big Spring	4025554	565162	683	19930521	6931.0	1272
362252116425301	DV015	Navel Spring	4026055	525592	634	19920520	8	1
362252116425301	DV015	Navel Spring	4026055	525592	634	19920317	8	1
362252116425301	DV015	Navel Spring	4026055	525592	634	19900823	8	1
362252116425301	DV015	Navel Spring	4026055	525592	634	19910828	8	1
362252116425301	DV015	Navel Spring	4026055	525592	634	19930218	10	2
362252116425301	DV015	Navel Spring	4026055	525592	634	19930520	10	2
362252116425301	DV015	Navel Spring	4026055	525592	634	19920820	10	2
362252116425301	DV015	Navel Spring	4026055	525592	634	19921117	10	2
362238115462801	LV051		4026284	609937	1827	19450913	164	30
LV052	LV052	Trough	4026346	609883	2499	194509	164	30
362405116161305	DV208	Jack Rabbit	4027000	564828	701	19530201	2714.5	498
362405116161305	DV208	Jack Rabbit	4027000	564828	701	19810701	2947.1	541
362405116161305	DV208	Jack Rabbit	4027000	564828	701	19810901	2947.1	541
362405116161305	DV208	Jack Rabbit	4027000	564828	701	19810801	3001.7	551
362405116161305	DV208	Jack Rabbit	4027000	564828	701	19811001	3083.5	566
362405116161305	DV208	Jack Rabbit	4027000	564828	701	19620727	3200.0	587
362343116160805	DV200		4027837	565569	716	19620726	10.9	2
362343116160804	DV199		4027837	565569	715	19620726	103.7	19
362343116160802	DV197	Indian Rock	4027837	565569	716	19620725	120.1	22
362343116160803	DV198	Indian Rock	4027837	565569	716	19620726	2068.4	379
362354116174001	DV118		4028159	563275	701	19620725	60.0	11
362354116174001	DV118		4028159	563275	701	19530202	283.8	52
362407116162401	DV194	King; Point of Rock	4028267	565366	716	19610600	3734.0	685
362407116162401	DV194	King; Point of Rock	4028267	565366	716	19620725	5876.0	1078
362407116162401	DV194	King; Point of Rock	4028267	565366	716	19530131	6797.5	1247
362407116162401	DV194	King; Point of Rock	4028267	565366	716	19430717	11599.5	2128
362401116181102	DV108	Davis Ranch	4028369	562501	684	19620725	27.3	5
362401116181103	DV109	Davis Ranch	4028369	562501	686	19620725	163.7	30
362401116181101	DV107	Davis Ranch	4028369	562501	686	19620725	2164	397
LV036	LV036	Rainbow	4028929	593656	1530	191608	6	1
362440115512001	LV050		4029954	602616	1987	19441109	3766	691
LV073	LV073	Cold Creek Spr	4030140	612678	1896	194411	3761	690
362450115442002		Cold Creek	4030393	613070	1907		3766	691
362502116192301	DV093	Crystal Pool	4030574	560592	669	19710111	12388.8	2273
362502116192301	DV093	Crystal Pool	4030574	560592	669	19870825	12443.3	2283
362502116192301	DV093	Crystal Pool	4030574	560592	669	19920819	12716.2	2333
362502116192301	DV093	Crystal Pool	4030574	560592	669	19730921	12934.5	2373
362502116192301	DV093	Crystal Pool	4030574	560592	669	19920317	13262.0	2433
362502116192301	DV093	Crystal Pool	4030574	560592	669	19900825	13425.7	2463
362502116192301	DV093	Crystal Pool	4030574	560592	669	19701230	13480.3	2473
362502116192301	DV093	Crystal Pool	4030574	560592	669	19901116	13698.6	2513
362502116192301	DV093	Crystal Pool	4030574	560592	669	19910905	13753.2	2523
362502116192301	DV093	Crystal Pool	4030574	560592	669	19920127	13862.3	2543
362502116192301	DV093	Crystal Pool	4030574	560592	669	19860129	13916.9	2553
362502116192301	DV093	Crystal Pool	4030574	560592	669	19930421	14026.0	2573
362502116192301	DV093	Crystal Pool	4030574	560592	669	19921014	14080.6	2583
362502116192301	DV093	Crystal Pool	4030574	560592	669	19921118	14080.6	2583
362502116192301	DV093	Crystal Pool	4030574	560592	669	19701116	14135.2	2593

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Official ID	Alias Name	Reporting Name	Northing UTM Zone 11 (meters)	Easting UTM Zone 11 (meters)	Land Surface Elevation (meters)	Date	Discharge Rate (m3/d)	Discharge Rate (gpm)
362502116192301	DV093	Crystal Pool	4030574	560592	669	19911105	14135.2	2593
362502116192301	DV093	Crystal Pool	4030574	560592	669	19870318	14189.8	2603
362502116192301	DV093	Crystal Pool	4030574	560592	669	19701208	14571.8	2673
362502116192301	DV093	Crystal Pool	4030574	560592	669	19820806	14626.4	2683
362502116192301	DV093	Crystal Pool	4030574	560592	669	19900403	14626.4	2683
362502116192301	DV093	Crystal Pool	4030574	560592	669	19910408	14680.9	2693
362502116192301	DV093	Crystal Pool	4030574	560592	669	19890510	15008.4	2753
362502116192301	DV093	Crystal Pool	4030574	560592	669	19930521	15172.1	2783
362502116192301	DV093	Crystal Pool	4030574	560592	669	19530131	15344.5	2815
362502116192301	DV093	Crystal Pool	4030574	560592	669	19620729	15393.5	2824
362502116192301	DV093	Crystal Pool	4030574	560592	669	19880310	15445.0	2833
362502116192301	DV093	Crystal Pool	4030574	560592	669	19920317	15608.7	2863
362502116192301	DV093	Crystal Pool	4030574	560592	669	19920519	15772.5	2894
362502116192301	DV093	Crystal Pool	4030574	560592	669	19930216	15990.8	2934
362502116192301	DV093	Crystal Pool	4030574	560592	669	19701003	16154.5	2964
362502116192301	DV093	Crystal Pool	4030574	560592	669	19610601	16249.5	2981
362502116192301	DV093	Crystal Pool	4030574	560592	669	19701123	16318.2	2994
362502116192301	DV093	Crystal Pool	4030574	560592	669	19590401	16918.6	3104
362502116192301	DV093	Crystal Pool	4030574	560592	669	19750303	18010.1	3304
362502116192301	DV093	Crystal Pool	4030574	560592	669	19910403	20848.0	3825
LV068	LV068	Willow	4030673	610824	1826	193012	1853	340
DH014	DH014	Emigrant	4030904	482818	1234		6	1
362532116181501	DV132	School	4031172	562381	716	19620724	32.8	6
362532116181501	DV132	School	4031172	562381	716	19530000	136.4	25
362535116244801	DV058	Ash Tree	4031200	552594	671	19620731	49.1	9
362554116184101	DV125		4031846	561729	701	19620723	92.8	17
362557116181301	DV147		4031943	562425	724	19530203	480.3	88
362557116181301	DV147		4031943	562425	724	19620724	764.1	140
DV010	DV010		4032748	514688	98		1	0
DV011	DV011	Travertine	4032749	515186	98	195612	22	4
DV011	DV011	Travertine	4032749	515186	98	195612	22	4
DV011	DV011	Travertine	4032749	515186	98	195612	1199	220
DV011	DV011	Travertine	4032749	515186	98	195611	1472	270
DV011	DV011	Travertine	4032749	515186	98			0
DV013	DV013	Travertine	4032750	515435	122		0	0
DV013	DV013	Travertine	4032750	515435	122	195701	561	103
DV013	DV013	Travertine	4032750	515435	122		11990	2200
DV012	DV012		4033056	514688	98		1	0
DV012	DV012		4033056	514688	98		1	0
DV012	DV012		4033056	514688	98		1	0
DV012	DV012		4033056	514688	98		1	0
DV012	DV012		4033056	514688	98		1	0
DV012	DV012		4033056	514688	98	195712	22	4
DV016	DV016		4033058	515435	122		1	0
362630116002401	DV235		4033193	589032	1426	19160101	44	8
362630116002401	DV235		4033193	589032	1426	19450714	55	10
DV019	DV019		4033672	514438	49		1	0
DV019	DV019		4033672	514438	49		1	0
DV020	DV020		4033673	514687			1	0
DV021	DV021		4033673	514687	122		1	0
DV021	DV021		4033673	514687	122		22	4
362620115212601	LV089		4033680	647248	895	19550101	682	125

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Official ID	Alias Name	Reporting Name	Northing UTM Zone 11 (meters)	Easting UTM Zone 11 (meters)	Land Surface Elevation (meters)	Date	Discharge Rate (m3/d)	Discharge Rate (gpm)
362620115212601	LV089		4033680	647248	895	1946	813	149
DV017	DV017	DV Hotel Tunnel	4033979	513442	15	195703	807	148
DV022	DV022		4033980	514437	49	195702	22	4
362728116501101d	DV024	TEXAS SPR	4034534	514664	122	19910828	709	130
362728116501101d	DV024	TEXAS SPR	4034534	514664	122	19900823	835	153
362728116501101d	DV024	TEXAS SPR	4034534	514664	122	19920520	890	163
362728116501101d	DV024	TEXAS SPR	4034534	514664	122	19910410	890	163
362728116501101d	DV024	TEXAS SPR	4034534	514664	122	19920317	906	166
362728116501101d	DV024	TEXAS SPR	4034534	514664	122	19930520	906	166
362728116501101d	DV024	TEXAS SPR	4034534	514664	122	19920820	917	168
362728116501101d	DV024	TEXAS SPR	4034534	514664	122	19930218	944	173
362728116501101d	DV024	TEXAS SPR	4034534	514664	122	19921117	961	176
362728116501101	DV023	TEXAS SPR	4034534	514664	122	19900615	993	182
362728116501101	DV023	TEXAS SPR	4034534	514664	122	19900715	999	183
362728116501101	DV023	TEXAS SPR	4034534	514664	122	19901015	1021	187
362728116501101	DV023	TEXAS SPR	4034534	514664	122	19900815	1021	187
362728116501101	DV023	TEXAS SPR	4034534	514664	122	19901115	1021	187
362728116501101	DV023	TEXAS SPR	4034534	514664	122	19901215	1021	187
362728116501101	DV023	TEXAS SPR	4034534	514664	122	19910715	1037	190
362728116501101	DV023	TEXAS SPR	4034534	514664	122	19891115	1037	190
362728116501101	DV023	TEXAS SPR	4034534	514664	122	19891215	1048	192
362728116501101	DV023	TEXAS SPR	4034534	514664	122	19910815	1048	192
362728116501101	DV023	TEXAS SPR	4034534	514664	122	19911015	1048	192
362728116501101	DV023	TEXAS SPR	4034534	514664	122	19910915	1048	192
362728116501101	DV023	TEXAS SPR	4034534	514664	122	19911115	1048	192
362728116501101	DV023	TEXAS SPR	4034534	514664	122	19920115	1048	192
362728116501101	DV023	TEXAS SPR	4034534	514664	122	19930415	1048	192
362728116501101	DV023	TEXAS SPR	4034534	514664	122	19900215	1048	192
362728116501101	DV023	TEXAS SPR	4034534	514664	122	19910415	1048	192
362728116501101	DV023	TEXAS SPR	4034534	514664	122	19900115	1048	192
362728116501101	DV023	TEXAS SPR	4034534	514664	122	19930315	1048	192
362728116501101	DV023	TEXAS SPR	4034534	514664	122	19910515	1048	192
362728116501101	DV023	TEXAS SPR	4034534	514664	122	19910615	1048	192
362728116501101	DV023	TEXAS SPR	4034534	514664	122	19921015	1048	192
362728116501101	DV023	TEXAS SPR	4034534	514664	122	19920215	1048	192
362728116501101	DV023	TEXAS SPR	4034534	514664	122	19930515	1053	193
362728116501101	DV023	TEXAS SPR	4034534	514664	122	19911215	1059	194
362728116501101	DV023	TEXAS SPR	4034534	514664	122	19930215	1075	197
362728116501101d	DV024	TEXAS SPR	4034534	514664	122	19920127	1152	211
362723116184101	DV182		4034588	561709	732	19530203	627.6	115
362723116184101	DV182		4034588	561709	732	19620723	1053.3	193
LV066	LV066	Gold	4035702	593085	2067		1052	193
362751116192701	DV148	Longstreet Spring	4035811	560431	704	19880310	1910.2	350
362751116192701	DV148	Longstreet Spring	4035811	560431	704	19920317	1964.7	360
362751116192701	DV148	Longstreet Spring	4035811	560431	704	19900403	2292.2	421
362751116192701	DV148	Longstreet Spring	4035811	560431	704	19930421	2346.8	431
362751116192701	DV148	Longstreet Spring	4035811	560431	704	19911105	2728.8	501
362751116192701	DV148	Longstreet Spring	4035811	560431	704	19921014	2728.8	501
362751116192701	DV148	Longstreet Spring	4035811	560431	704	19901116	3274.6	601
362751116192701	DV148	Longstreet Spring	4035811	560431	704	19870825	3820.3	701
362751116192701	DV148	Longstreet Spring	4035811	560431	704	19910403	3820.3	701
362751116192701	DV148	Longstreet Spring	4035811	560431	704	19820806	4366.1	801

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Official ID	Alias Name	Reporting Name	Northing UTM Zone 11 (meters)	Easting UTM Zone 11 (meters)	Land Surface Elevation (meters)	Date	Discharge Rate (m3/d)	Discharge Rate (gpm)
362751116192701	DV148	Longstreet Spring	4035811	560431	704	19850123	4366.1	801
362751116192701	DV148	Longstreet Spring	4035811	560431	704	19860128	4366.1	801
362751116192701	DV148	Longstreet Spring	4035811	560431	704	19870315	4911.8	901
362751116192701	DV148	Longstreet Spring	4035811	560431	704	19710415	5130.1	941
362751116192701	DV148	Longstreet Spring	4035811	560431	704	19710909	5130.1	941
362751116192701	DV148	Longstreet Spring	4035811	560431	704	19620729	5457.6	1001
362751116192701	DV148	Longstreet Spring	4035811	560431	704	19701022	5457.6	1001
362751116192701	DV148	Longstreet Spring	4035811	560431	704	19701123	5457.6	1001
362751116192701	DV148	Longstreet Spring	4035811	560431	704	19711101	5457.6	1001
362751116192701	DV148	Longstreet Spring	4035811	560431	704	19710520	6003.4	1101
362751116192701	DV148	Longstreet Spring	4035811	560431	704	19710715	6003.4	1101
362751116192701	DV148	Longstreet Spring	4035811	560431	704	19711008	6003.4	1101
362751116192701	DV148	Longstreet Spring	4035811	560431	704	19530203	6549.1	1201
362751116192701	DV148	Longstreet Spring	4035811	560431	704	19210327	7094.9	1302
362751116192701	DV148	Longstreet Spring	4035811	560431	704	19610601	7094.9	1302
362835116192101	DV188	Rogers Spring	4037136	560422	693	19870825	709.5	130
362835116192101	DV188	Rogers Spring	4037136	560422	693	19870318	764.1	140
362835116192101	DV188	Rogers Spring	4037136	560422	693	19880310	873.2	160
362835116192101	DV188	Rogers Spring	4037136	560422	693	19911105	2292.2	421
362835116192101	DV188	Rogers Spring	4037136	560422	693	19890510	2728.8	501
362835116192101	DV188	Rogers Spring	4037136	560422	693	19900403	2728.8	501
362835116192101	DV188	Rogers Spring	4037136	560422	693	19901116	2728.8	501
362835116192101	DV188	Rogers Spring	4037136	560422	693	19920317	2728.8	501
362835116192101	DV188	Rogers Spring	4037136	560422	693	19930421	2728.8	501
362835116192101	DV188	Rogers Spring	4037136	560422	693	19820806	3274.6	601
362835116192101	DV188	Rogers Spring	4037136	560422	693	19860128	3274.6	601
362835116192101	DV188	Rogers Spring	4037136	560422	693	19910403	3820.3	701
362835116192101	DV188	Rogers Spring	4037136	560422	693	19921014	3820.3	701
362835116192101	DV188	Rogers Spring	4037136	560422	693	19620729	4012.0	736
362835116192101	DV188	Rogers Spring	4037136	560422	693	19850123	5457.6	1001
362848116195901	DV162	Bell	4037193	559749	671	19620731	431.2	79
DV029	DV029		4037983	512689		195712	22	4
362924116203001	DV150	Fairbanks	4038359	559020	686	19930520	4093.0	751
362924116203001	DV150	Fairbanks	4038359	559020	686	19750618	6003.0	1101
362924116203001	DV150	Fairbanks	4038359	559020	686	19751106	6113.0	1121
362924116203001	DV150	Fairbanks	4038359	559020	686	19900821	6113.0	1121
362924116203001	DV150	Fairbanks	4038359	559020	686	19750701	6222.0	1141
362924116203001	DV150	Fairbanks	4038359	559020	686	19760203	6440.0	1181
362924116203001	DV150	Fairbanks	4038359	559020	686	19760302	6713.0	1232
362924116203001	DV150	Fairbanks	4038359	559020	686	19750801	6931.0	1272
362924116203001	DV150	Fairbanks	4038359	559020	686	19751002	6986.0	1282
362924116203001	DV150	Fairbanks	4038359	559020	686	19751202	6986.0	1282
362924116203001	DV150	Fairbanks	4038359	559020	686	19701124	7040.0	1292
362924116203001	DV150	Fairbanks	4038359	559020	686	19701230	7040.0	1292
362924116203001	DV150	Fairbanks	4038359	559020	686	19710111	7149.0	1312
362924116203001	DV150	Fairbanks	4038359	559020	686	19760601	7149.0	1312
362924116203001	DV150	Fairbanks	4038359	559020	686	19701116	7259.0	1332
362924116203001	DV150	Fairbanks	4038359	559020	686	19761102	7259.0	1332
362924116203001	DV150	Fairbanks	4038359	559020	686	19760504	7313.0	1342
362924116203001	DV150	Fairbanks	4038359	559020	686	19750904	7422.0	1362
362924116203001	DV150	Fairbanks	4038359	559020	686	19760903	7422.0	1362
362924116203001	DV150	Fairbanks	4038359	559020	686	19760701	7586.0	1392

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Official ID	Alias Name	Reporting Name	Northing UTM Zone 11 (meters)	Easting UTM Zone 11 (meters)	Land Surface Elevation (meters)	Date	Discharge Rate (m3/d)	Discharge Rate (gpm)
362924116203001	DV150	Fairbanks	4038359	559020	686	19770503	7641.0	1402
362924116203001	DV150	Fairbanks	4038359	559020	686	19760804	7750.0	1422
362924116203001	DV150	Fairbanks	4038359	559020	686	19761014	7804.0	1432
362924116203001	DV150	Fairbanks	4038359	559020	686	19770404	7859.0	1442
362924116203001	DV150	Fairbanks	4038359	559020	686	19910408	7914.0	1452
362924116203001	DV150	Fairbanks	4038359	559020	686	19761201	8186.0	1502
362924116203001	DV150	Fairbanks	4038359	559020	686	19770706	8186.0	1502
362924116203001	DV150	Fairbanks	4038359	559020	686	19770801	8186.0	1502
362924116203001	DV150	Fairbanks	4038359	559020	686	19771101	8186.0	1502
362924116203001	DV150	Fairbanks	4038359	559020	686	19780201	8186.0	1502
362924116203001	DV150	Fairbanks	4038359	559020	686	19780606	8186.0	1502
362924116203001	DV150	Fairbanks	4038359	559020	686	19780809	8241.0	1512
362924116203001	DV150	Fairbanks	4038359	559020	686	19770105	8296.0	1522
362924116203001	DV150	Fairbanks	4038359	559020	686	19760401	8350.0	1532
362924116203001	DV150	Fairbanks	4038359	559020	686	19770202	8350.0	1532
362924116203001	DV150	Fairbanks	4038359	559020	686	19770301	8350.0	1532
362924116203001	DV150	Fairbanks	4038359	559020	686	19770901	8350.0	1532
362924116203001	DV150	Fairbanks	4038359	559020	686	19770601	8405.0	1542
362924116203001	DV150	Fairbanks	4038359	559020	686	19780907	8405.0	1542
362924116203001	DV150	Fairbanks	4038359	559020	686	19800605	8405.0	1542
362924116203001	DV150	Fairbanks	4038359	559020	686	19890726	8405.0	1542
362924116203001	DV150	Fairbanks	4038359	559020	686	19780314	8459.0	1552
362924116203001	DV150	Fairbanks	4038359	559020	686	19820111	8514.0	1562
362924116203001	DV150	Fairbanks	4038359	559020	686	19771003	8568.0	1572
362924116203001	DV150	Fairbanks	4038359	559020	686	19771205	8568.0	1572
362924116203001	DV150	Fairbanks	4038359	559020	686	19800508	8568.0	1572
362924116203001	DV150	Fairbanks	4038359	559020	686	19800313	8623.0	1582
362924116203001	DV150	Fairbanks	4038359	559020	686	19800408	8623.0	1582
362924116203001	DV150	Fairbanks	4038359	559020	686	19801007	8623.0	1582
362924116203001	DV150	Fairbanks	4038359	559020	686	19801104	8623.0	1582
362924116203001	DV150	Fairbanks	4038359	559020	686	19880726	8623.0	1582
362924116203001	DV150	Fairbanks	4038359	559020	686	19790803	8678.0	1592
362924116203001	DV150	Fairbanks	4038359	559020	686	19791003	8678.0	1592
362924116203001	DV150	Fairbanks	4038359	559020	686	19780103	8732.0	1602
362924116203001	DV150	Fairbanks	4038359	559020	686	19781002	8732.0	1602
362924116203001	DV150	Fairbanks	4038359	559020	686	19790702	8732.0	1602
362924116203001	DV150	Fairbanks	4038359	559020	686	19810701	8732.0	1602
362924116203001	DV150	Fairbanks	4038359	559020	686	19810801	8732.0	1602
362924116203001	DV150	Fairbanks	4038359	559020	686	19810901	8732.0	1602
362924116203001	DV150	Fairbanks	4038359	559020	686	19811001	8732.0	1602
362924116203001	DV150	Fairbanks	4038359	559020	686	19830318	8732.0	1602
362924116203001	DV150	Fairbanks	4038359	559020	686	19780706	8787.0	1612
362924116203001	DV150	Fairbanks	4038359	559020	686	19791206	8787.0	1612
362924116203001	DV150	Fairbanks	4038359	559020	686	19800107	8787.0	1612
362924116203001	DV150	Fairbanks	4038359	559020	686	19801202	8787.0	1612
362924116203001	DV150	Fairbanks	4038359	559020	686	19920318	8787.0	1612
362924116203001	DV150	Fairbanks	4038359	559020	686	19781102	8841.0	1622
362924116203001	DV150	Fairbanks	4038359	559020	686	19790413	8841.0	1622
362924116203001	DV150	Fairbanks	4038359	559020	686	19790503	8841.0	1622
362924116203001	DV150	Fairbanks	4038359	559020	686	19920127	8841.0	1622
362924116203001	DV150	Fairbanks	4038359	559020	686	19781130	8896.0	1632
362924116203001	DV150	Fairbanks	4038359	559020	686	19810312	8896.0	1632

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Official ID	Alias Name	Reporting Name	Northing UTM Zone 11 (meters)	Easting UTM Zone 11 (meters)	Land Surface Elevation (meters)	Date	Discharge Rate (m3/d)	Discharge Rate (gpm)
362924116203001	DV150	Fairbanks	4038359	559020	686	19530201	9054.0	1661
362924116203001	DV150	Fairbanks	4038359	559020	686	19780405	9060.0	1662
362924116203001	DV150	Fairbanks	4038359	559020	686	19780510	9060.0	1662
362924116203001	DV150	Fairbanks	4038359	559020	686	19790110	9060.0	1662
362924116203001	DV150	Fairbanks	4038359	559020	686	19910826	9060.0	1662
362924116203001	DV150	Fairbanks	4038359	559020	686	19920818	9060.0	1662
362924116203001	DV150	Fairbanks	4038359	559020	686	19830609	9169.0	1682
362924116203001	DV150	Fairbanks	4038359	559020	686	19610601	9277.5	1702
362924116203001	DV150	Fairbanks	4038359	559020	686	19810606	9278.0	1702
362924116203001	DV150	Fairbanks	4038359	559020	686	19820407	9278.0	1702
362924116203001	DV150	Fairbanks	4038359	559020	686	19620723	9348.5	1715
362924116203001	DV150	Fairbanks	4038359	559020	686	19790306	9387.0	1722
362924116203001	DV150	Fairbanks	4038359	559020	686	19820701	9387.0	1722
362924116203001	DV150	Fairbanks	4038359	559020	686	19790208	9442.0	1732
362924116203001	DV150	Fairbanks	4038359	559020	686	19921117	9442.0	1732
362924116203001	DV150	Fairbanks	4038359	559020	686	19460816	9572.0	1756
362924116203001	DV150	Fairbanks	4038359	559020	686	19830210	9605.0	1762
362924116203001	DV150	Fairbanks	4038359	559020	686	19230714	11136.5	2043
362924116203001	DV150	Fairbanks	4038359	559020	686	19100101	12848.0	2357
DV031	DV031		4038600	513186	31		3	1
BT009	BT009	Cow	4039217	513434	61	195703	98	18
BT008	BT008		4039523	512189	3	195612	6	1
BT001	BT001	Salt	4040131	500746	-73		11	2
BT010	BT010		4040143	514427	159	195703	1	0
BT012	BT012	Nevares	4040144	515422	220	195612	169	31
BT012	BT012	Nevares	4040144	515422	220			0
BT003	BT003	Warm	4040439	502487	-79		11	2
BT015	BT015	Nevares	4040452	515422	286	195612	1466	269
BT013	BT013	Nevares	4040454	516168	159	195612	120	22
BT014	BT014	Nevares	4040454	516168			218	40
BT014	BT014	Nevares	4040454	516168			1908	350
BT014	BT014	Nevares	4040454	516168		195512	1908	350
BT014	BT014	Nevares	4040454	516168				0
SV014	SV014	Cottonwood	4040813	466173	1106		6	1
BT006	BT006		4042909	509698	-79		3	1
BT007	BT007	Salt	4042910	510195	-79		6	1
IS017	IS017	Indian	4046815	619568	968		2344	430
363340115395001	IS017	Indian	4046815	619568	978		2347	431
363439115455901	IS005		4048114	605856	1006	19460730	3	1
SV017	SV017	McLean	4050915	498261	-37		4	1
363800115122701	IS024		4055491	660267	2438	19460101	2	0
BT016	BT016	Keane Wonder	4058312	506950	366		136	25
BT017	BT017	Daylight	4071561	505700	1318		6	1
364750116053001	BT214	Cane Sp 130	4072666	580929	1240		9	2
BT214	BT214	Cane Sp 130	4072666	580929			9	2
BT215	BT215	Cane	4073088	581453	1286	196011	11	2
SV009	SV009	Lower Warm	4073378	431114	421	195705	109	20
BT059	BT059		4082064	522030			546	100
BT060	BT060		4082065	522278	975		545	100
365503116444101	BT095	Beatty Municipal Springs	4085546	522742	1027	19560222	546	100
BT211	BT211	Topopah Sp 140	4088181	564953	1768	195803	1	0
365621116161401	BT211	Topopah Sp 140	4088181	564953	1845		6	1

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Official ID	Alias Name	Reporting Name	Northing UTM Zone 11 (meters)	Easting UTM Zone 11 (meters)	Land Surface Elevation (meters)	Date	Discharge Rate (m3/d)	Discharge Rate (gpm)
365636116430801	BT121	Circle C Ranch (Owner)	4088416	524169	1085	19620314	136	25
BT096	BT096	Lower Indian	4088526	518303	1219		44	8
365628116473801	BT092		4088586	518356	1227	19620315	8	1
BT128	BT128		4089160	525227	1061		191	35
365635116480201	BT091		4089262	517291	1189	19620316	27	5
BT100	BT100	Upper Indian Springs	4090084	524977	1280	19620316	27	5
365749116555601	BT075		4090633	506037	1516	19620314	1	0
365749116431101	BT141		4090668	524954	1085	19620314	546	100
365804116432101	BT146	Rancho Trueba (Owner)	4091129	524706	1084	19620314	546	100
BT159	BT159	29 Hot Springs	4091655	524997			6	1
365810116425101	BT158	Hot Springs	4091869	524778	1097	19620314	27	5
BT083	BT083	Currie Well	4091932	524724	1366	19620314	1	0
SV016	SV016		4092880	468109	671	1961	27	5
365856116453701	BT136	Crystal Springs	4093217	522030	1250	19620314	14	3
BT178	BT178		4094093	525954	1158		267	49
370002116430101	PM016	Torrance (Owner)	4094210	524573	1128	19620314	55	10
LC018	LC018	Surprise	4094724	469599	863	196301	16	3
370003116424501	PM018	Gross Springs	4094800	526128	1189	19620314	341	63
LC017	LC017	Surprise	4095033	469353	863	196301	22	4
PM013	PM013		4095629	524466	1122		55	10
370057116451901	PM001	Unknown	4096458	524072	1231	19620314	38	7
PM015	PM015	Long Spring	4097787	524954	1183		1390	255
370154116430201	PM017	Campbell (Owner)	4097787	525156	1204	19620314	82	15
370214116452701	PM002	Springdale Ranch	4098424	521843	1213	19620314	136	25
LC015	LC015	Staininger	4098438	465412	847		164	30
PM046	PM046	Tippipah Sp 139	4099896	570473			1	0
370240116122501	PM046	Tippipah Sp 139	4099896	570473	1579		11	2
370450116412401	PM026	Fleur-de-Lis Ranch	4102958	532647	1250	19620314	273	50
PM025	PM025	Susie Kimbell	4103034	527408			546	100
PM049	PM049	Captain jack	4113759	573812	1673	195905	1	0
LC003	LC003	Sand	4115766	450937	953		6	1
371122116114301	PM047	Rainer Sp 137	4115995	571422	1928		6	1
PM047	PM047	Rainer Sp 137	4115995	571422	1902	196011	6	1
371209116075202	PM052	Whiterock Sp 206	4117477	577116	1565		9	2
PM052	PM052	Whiterock Sp 206	4117477	577116			9	2
PM051	PM051	Whiterock	4117609	577057	1539	196011	6	1
371430116035001	PM060	Oak Sp 136	4121917	583011	1850		6	1
PM060	PM060	Oak Sp 136	4121917	583012			1	0
PM059	PM059	Butte Sp 129	4121948	583194			1	0
371450116040001	PM059	Butte Sp 129	4121948	583194	1882		6	1
PM056	PM056	Oak	4122219	582189	1768	196011	1	0
LC002	LC002	Willow	4131879	437742	1771		142	26
PM065	PM065	Indian Spr	4144046	579616	2038	196302	11	2
PM064	PM064	Indian Sp 132	4144195	579459			11	2
372635116060601	PM064	Indian Sp 132	4144195	579459	2017		109	20
372719117240301	LC022		4145249	464552	1570	19670101	1637	300
372754117293201	LC021		4146366	456475	1951	1967	164	30
372749115113401	PR030	ASH SPRS	4147634	659931	1102	19900314	38203	7008
372749115113401	PR030	ASH SPRS	4147634	659931	1102	19820730	38203	7008
372749115113401	PR030	ASH SPRS	4147634	659931	1102	19880212	38203	7008
372749115113401	PR030	ASH SPRS	4147634	659931	1102	19911104	38203	7008
372749115113401	PR030	ASH SPRS	4147634	659931	1102	19850121	38203	7008

Table A-1 Spring Data Set

Official ID	Alias Name	Reporting Name	Northing UTM Zone 11 (meters)	Easting UTM Zone 11 (meters)	Land Surface Elevation (meters)	Date	Discharge Rate (m3/d)	Discharge Rate (gpm)
372749115113401	PR030	ASH SPRS	4147634	659931	1102	19901105	43661	8010
372749115113401	PR030	ASH SPRS	4147634	659931	1102	19920325	43661	8010
372749115113401	PR030	ASH SPRS	4147634	659931	1102	19890227	43661	8010
372749115113401	PR030	ASH SPRS	4147634	659931	1102	19921014	43661	8010
372749115113401	PR030	ASH SPRS	4147634	659931	1102	19930420	43661	8010
372749115113401	PR030	ASH SPRS	4147634	659931	1102	19870416	43661	8010
372749115113401	PR030	ASH SPRS	4147634	659931	1102	19860127	49118	9011
372749115113401	PR030	ASH SPRS	4147634	659931	1102	19870820	49118	9011
372749115113401	PR030	ASH SPRS	4147634	659931	1102	19150101	49118	9011
372749115113401	PR030	ASH SPRS	4147634	659931	1102	19910319	54576	10012
LC005	LC005		4149296	419206	1555		273	50
PR029	PR029	Brownie	4150407	658154	1128		1226	225
372920115124001	PR029	Brownie	4150407	658154	1157		1228	225
372939115052401	PR034		4151202	668854	1622	198005	0	0
TR001	TR001	White Blotch	4153753	594252	1817	196302	1	0
373215117040601	GL025		4154298	493967	1768	1967	55	10
373155115135801	TR212	CRYSTAL SPRS	4155116	656153	1161	19900314	6549	1201
373155115135801	TR212	CRYSTAL SPRS	4155116	656153	1161	19890228	10369	1902
373155115135801	TR212	CRYSTAL SPRS	4155116	656153	1161	19920325	20739	3805
373155115135801	TR212	CRYSTAL SPRS	4155116	656153	1161	19911104	20739	3805
373155115135801	TR212	CRYSTAL SPRS	4155116	656153	1161	19930420	22376	4105
373155115135801	TR212	CRYSTAL SPRS	4155116	656153	1161	19921014	23468	4305
373155115135801	TR212	CRYSTAL SPRS	4155116	656153	1161	19850121	27288	5006
373155115135801	TR212	CRYSTAL SPRS	4155116	656153	1161	19630617	27288	5006
373155115135801	TR212	CRYSTAL SPRS	4155116	656153	1161	19820729	27288	5006
373155115135801	TR212	CRYSTAL SPRS	4155116	656153	1161	19860127	27288	5006
373155115135801	TR212	CRYSTAL SPRS	4155116	656153	1161	19901115	27288	5006
373554115125201	TR218	HIKO SPR	4162544	657632	1181	19900314	10369	1902
373554115125201	TR218	HIKO SPR	4162544	657632	1181	19911104	10369	1902
373554115125201	TR218	HIKO SPR	4162544	657632	1181	19930420	10915	2002
373554115125201	TR218	HIKO SPR	4162544	657632	1181	19910403	12007	2203
373554115125201	TR218	HIKO SPR	4162544	657632	1181	19630617	13098	2403
373554115125201	TR218	HIKO SPR	4162544	657632	1181	19920325	13098	2403
373554115125201	TR218	HIKO SPR	4162544	657632	1181	19870325	14190	2603
373554115125201	TR218	HIKO SPR	4162544	657632	1181	19860128	14736	2703
373554115125201	TR218	HIKO SPR	4162544	657632	1181	19880212	15281	2803
373554115125201	TR218	HIKO SPR	4162544	657632	1181	19921014	15827	2904
373554115125201	TR218	HIKO SPR	4162544	657632	1181	19820729	15827	2904
373554115125201	TR218	HIKO SPR	4162544	657632	1181	19901105	16373	3004
373554115125201	TR218	HIKO SPR	4162544	657632	1181	19850121	16373	3004
373554115125201	TR218	HIKO SPR	4162544	657632	1181	19870820	17464	3204
CF010	CF010		4163289	558837	1996	196302	1	0
CF003	CF003	Antelope Sprs	4163423	524024	1896	196302	2	0
GL027	GL027		4172019	494368	1660	196302	2	0
GL019	GL019	Rabbit	4172662	478452	1615		11	2
CF001	CF001		4172951	512733	1865	196302	22	4
CF002	CF002	Cactus Spr	4174807	516157	1913	196302	27	5
GL026	GL026	Wildhorse Spr	4175103	491922	1780	196302	3	1
GL001	GL001	Fish Lake	4176436	417512	2042	194911	7358	1350
374419115453001	TR162		4177333	609409	1465	19711005	1	0
374424115341601	TR180		4177723	625904	1841	198006	22	4
374503116164901	CF020		4178207	563409	1993	19670801	14	3

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Official ID	Alias Name	Reporting Name	Northing UTM Zone 11 (meters)	Easting UTM Zone 11 (meters)	Land Surface Elevation (meters)	Date	Discharge Rate (m3/d)	Discharge Rate (gpm)
374503116164901	CF020		4178207	563409	1993	19630201	16	3
GL011	GL011	Waterworks	4178368	444452	1305	1917	2725	500
CF017	CF017	Rose Spr	4178430	564113	2189	196302	11	2
374529115331001	TR189		4179751	627489	1920	198006	0	0
374536115332701	TR188		4179960	627069	1920	198006	16	3
374619116174101	CF019		4180540	562118	2042	1967	16	3
374643115350001	TR181		4181990	624763	1798	198006	0	0
CF012	CF012	Corral Spr	4182060	554545	2038	196302	3	1
CF011	CF011		4182365	554054	2024	196302	3	1
374930117195801	GL018		4186244	470717	1530	1967	218	40
GL017	GL017	Alkali	4186248	470175	1545	1913	218	40
TR226	TR226	Seaman	4190195	658862	1676		3	1
CF005	CF005	Silverbow Sprs	4191242	543978	1914	196302	16	3
CF004	CF004	Stinking Spr	4194004	541642	1986	196302	1	0
GL024	GL024	Sand	4195145	484860	1683	194911	55	10
375558115353601	TR199		4199083	623624	1981	198006	65	12
CF024	CF024	Five Mi Spr	4199636	555893	1987	196708	164	30
375601116070901	CF029		4200141	573222	1774	19670803	1	0
375742115403601	TR193		4202181	616255	1768	198006	7	1
375812116230501	CF023		4202458	554047	1969	19490101	5	1
CF013	CF013		4202642	543307	2121	196707	27	5
CF014	CF014		4203717	542569	2048	196707	109	20
CF026	CF026		4205325	553902	1951	196708	55	10
CF027	CF027	Rose Spr	4205635	554144	1920	196708	27	5
WS002	WS002	Cottonwood Spr	4206709	553406	1936	196708	164	30
380051115502101	QC001		4207815	601906	2073	198006	300	55
380512115464001	QC003		4215929	607190	2134	19701108	27	5
380701115341501	QC021		4219548	625287	1875	198006	16	3
381105116221301	WS004		4226290	555154	1676	19690901	1092	200
381105116221301	WS004		4226290	555154	1676	19691101	1146	210
381105116221301	WS004		4226290	555154	1676	19691201	1146	210
381105116221301	WS004		4226290	555154	1676	19691001	1146	210
381105116221301	WS004		4226290	555154	1676	19671201	1146	210
381105116221301	WS004		4226290	555154	1676	19680101	1146	210
381105116221301	WS004		4226290	555154	1676	19680201	1146	210
381105116221301	WS004		4226290	555154	1676	19680301	1146	210
381105116221301	WS004		4226290	555154	1676	19680801	1146	210
381105116221301	WS004		4226290	555154	1676	19680901	1146	210
381105116221301	WS004		4226290	555154	1676	190010	1146	210
381105116221301	WS004		4226290	555154	1676	19681101	1146	210
381105116221301	WS004		4226290	555154	1676	19681201	1146	210
381105116221301	WS004		4226290	555154	1676	19690101	1146	210
381105116221301	WS004		4226290	555154	1676	19690201	1146	210
381105116221301	WS004		4226290	555154	1676	19690301	1146	210
381105116221301	WS004		4226290	555154	1676	19690401	1146	210
381105116221301	WS004		4226290	555154	1676	19690501	1146	210
381105116221301	WS004		4226290	555154	1676	19690601	1146	210
381105116221301	WS004		4226290	555154	1676	19690701	1146	210
381105116221301	WS004		4226290	555154	1676	19690801	1146	210
381105116221301	WS004		4226290	555154	1676	19670901	1201	220
381105116221301	WS004		4226290	555154	1676	19671101	1201	220
381105116221301	WS004		4226290	555154	1676	19680401	1201	220

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Official ID	Alias Name	Reporting Name	Northing UTM Zone 11 (meters)	Easting UTM Zone 11 (meters)	Land Surface Elevation (meters)	Date	Discharge Rate (m3/d)	Discharge Rate (gpm)
381105116221301	WS004		4226290	555154	1676	19680501	1201	220
381105116221301	WS004		4226290	555154	1676	19680601	1201	220
381105116221301	WS004		4226290	555154	1676	19680701	1201	220
381105116221301	WS004		4226290	555154	1676	19671001	1201	220
381105116221301	WS004		4226290	555154	1676	1965	3657	671
381306115484801	QC005		4230498	603885	1487	19630101	3547	651
382105115104801	QC050	MOON RIV SPRS	4246193	658966	1591	19490101	4912	901
382105115104801	QC050	MOON RIV SPRS	4246193	658966	1591	19820725	8732	1602
382105115104801	QC050	MOON RIV SPRS	4246193	658966	1591	19870811	9824	1802
382105115104801	QC050	MOON RIV SPRS	4246193	658966	1591	19870211	9824	1802
382105115104801	QC050	MOON RIV SPRS	4246193	658966	1591	19850116	9824	1802
382105115104801	QC050	MOON RIV SPRS	4246193	658966	1591	19901108	9824	1802
382105115104801	QC050	MOON RIV SPRS	4246193	658966	1591	19900322	10369	1902
382105115104801	QC050	MOON RIV SPRS	4246193	658966	1591	19860203	10369	1902
382105115104801	QC050	MOON RIV SPRS	4246193	658966	1591	19880223	12007	2203
382105115104801	QC050	MOON RIV SPRS	4246193	658966	1591	19890314	12552	2303
382203115521401	QC018	ABEL SPR	4246987	598673	1463	19930917	65	12
382203115521401	QC018	ABEL SPR	4246987	598673	1463	19930406	71	13
382203115521401	QC018	ABEL SPR	4246987	598673	1463	19680912	136	25
382203115521401	QC018	ABEL SPR	4246987	598673	1463	19670101	142	26
382234115223901	QC046		4248585	641732	1893	1968	2292	420
382315115520501	QC019		4249209	598864	1469	19670807	11	2
382259115090801	QC051	HOT CRK SPR	4249725	661372	1593	19911023	14736	2703
382259115090801	QC051	HOT CRK SPR	4249725	661372	1593	19870812	19102	3504
382259115090801	QC051	HOT CRK SPR	4249725	661372	1593	19930503	21285	3905
382259115090801	QC051	HOT CRK SPR	4249725	661372	1593	19890314	21830	4005
382259115090801	QC051	HOT CRK SPR	4249725	661372	1593	19921014	22376	4105
382259115090801	QC051	HOT CRK SPR	4249725	661372	1593	19850116	22376	4105
382259115090801	QC051	HOT CRK SPR	4249725	661372	1593	19860203	22376	4105
382259115090801	QC051	HOT CRK SPR	4249725	661372	1593	19920318	22922	4205
382259115090801	QC051	HOT CRK SPR	4249725	661372	1593	19820726	27288	5006
382259115090801	QC051	HOT CRK SPR	4249725	661372	1593	19901108	27288	5006
382259115090801	QC051	HOT CRK SPR	4249725	661372	1593	19611207	32746	6007
382259115090801	QC051	HOT CRK SPR	4249725	661372	1593	19820723	32746	6007
382259115090801	QC051	HOT CRK SPR	4249725	661372	1593	19910304	32746	6007
382259115090801	QC051	HOT CRK SPR	4249725	661372	1593	19870211	32746	6007
382259115090801	QC051	HOT CRK SPR	4249725	661372	1593	19900323	32746	6007
382259115090801	QC051	HOT CRK SPR	4249725	661372	1593	19350406	38203	7008
382259115090801	QC051	HOT CRK SPR	4249725	661372	1593	19880223	38203	7008
382259115090801	QC051	HOT CRK SPR	4249725	661372	1593	19850201	60034	11013
382354115514701	QC020		4250416	599286	1465	19711007	27	5
382443115352501	QC032		4252255	623084	1463	19340207	164	30
382444115311101	QC041		4252383	629244	1829	19701107	5	1
382451115352201	QC033		4252503	623153	1448	19340207	164	30
382517115012001	QC053	FLAG SPR NO 3	4254215	672661	1612	19921014	3820	701
382517115012001	QC053	FLAG SPR NO 3	4254215	672661	1612	19901108	4366	801
382517115012001	QC053	FLAG SPR NO 3	4254215	672661	1612	19860204	4366	801
382517115012001	QC053	FLAG SPR NO 3	4254215	672661	1612	19930503	4366	801
382517115012001	QC053	FLAG SPR NO 3	4254215	672661	1612	19920318	4366	801
382517115012001	QC053	FLAG SPR NO 3	4254215	672661	1612	19870211	4912	901
382517115012001	QC053	FLAG SPR NO 3	4254215	672661	1612	19890314	4912	901
382517115012001	QC053	FLAG SPR NO 3	4254215	672661	1612	19910304	4912	901

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382517115012001	QC053	FLAG SPR NO 3	4254215	672661	1612	19880223	4912	901
382517115012001	QC053	FLAG SPR NO 3	4254215	672661	1612	19900322	4912	901
382517115012001	QC053	FLAG SPR NO 3	4254215	672661	1612	19911023	4912	901
382517115012001	QC053	FLAG SPR NO 3	4254215	672661	1612	19850116	5458	1001
382517115012001	QC053	FLAG SPR NO 3	4254215	672661	1612	19820724	5458	1001
382522115012001	QC054	FLAG SPR NO 2	4254369	672658	1609	19900322	1201	220
382522115012001	QC054	FLAG SPR NO 2	4254369	672658	1609	19910304	5458	1001
382522115012001	QC054	FLAG SPR NO 2	4254369	672658	1609	19901108	5458	1001
382522115012001	QC054	FLAG SPR NO 2	4254369	672658	1609	19860204	6549	1201
382522115012001	QC054	FLAG SPR NO 2	4254369	672658	1609	19870211	6549	1201
382522115012001	QC054	FLAG SPR NO 2	4254369	672658	1609	19820724	6549	1201
382522115012001	QC054	FLAG SPR NO 2	4254369	672658	1609	19850116	7095	1302
382522115012001	QC054	FLAG SPR NO 2	4254369	672658	1609	19921014	7095	1302
382522115012001	QC054	FLAG SPR NO 2	4254369	672658	1609	19911023	7095	1302
382522115012001	QC054	FLAG SPR NO 2	4254369	672658	1609	19890314	7095	1302
382522115012001	QC054	FLAG SPR NO 2	4254369	672658	1609	19920318	7095	1302
382522115012001	QC054	FLAG SPR NO 2	4254369	672658	1609	19930503	8186	1502
382522115012001	QC054	FLAG SPR NO 2	4254369	672658	1609	19880223	8732	1602
382526115011401	QC055	FLAG SPR NO 1	4254495	672801	1612	19900322	3820	701
382526115011401	QC055	FLAG SPR NO 1	4254495	672801	1612	19930503	4912	901
382526115011401	QC055	FLAG SPR NO 1	4254495	672801	1612	19911023	4912	901
382526115011401	QC055	FLAG SPR NO 1	4254495	672801	1612	19860204	4912	901
382526115011401	QC055	FLAG SPR NO 1	4254495	672801	1612	19921014	4912	901
382526115011401	QC055	FLAG SPR NO 1	4254495	672801	1612	19880223	4912	901
382526115011401	QC055	FLAG SPR NO 1	4254495	672801	1612	19820725	5458	1001
382526115011401	QC055	FLAG SPR NO 1	4254495	672801	1612	19870211	5458	1001
382526115011401	QC055	FLAG SPR NO 1	4254495	672801	1612	19901109	5458	1001
382526115011401	QC055	FLAG SPR NO 1	4254495	672801	1612	19920318	5458	1001
382526115011401	QC055	FLAG SPR NO 1	4254495	672801	1612	19850116	6003	1101
382526115011401	QC055	FLAG SPR NO 1	4254495	672801	1612	19910304	7095	1302
382526115011401	QC055	FLAG SPR NO 1	4254495	672801	1612	19890314	7641	1402
382530115012601	QC052		4254612	672507	1600	19490101	6003	1101
382555115343301	QC036		4254954	624158	1448	19680601	5	1
382555115343301	QC036		4254954	624158	1448	19711013	409	75
382614115340901	QC037		4255089	624884	1449	19340207	55	10
382622115340801	QC038		4255336	624904	1451	19340207	55	10
382624115004001	QC056	BUTTERFIELD SPR	4256271	673612	1622	19660309	4912	901
382624115004001	QC056	BUTTERFIELD SPR	4256271	673612	1622	19900322	4912	901
382624115004001	QC056	BUTTERFIELD SPR	4256271	673612	1622	19880223	5458	1001
382624115004001	QC056	BUTTERFIELD SPR	4256271	673612	1622	19870211	5458	1001
382624115004001	QC056	BUTTERFIELD SPR	4256271	673612	1622	19910304	6003	1101
382624115004001	QC056	BUTTERFIELD SPR	4256271	673612	1622	19820725	6003	1101
382624115004001	QC056	BUTTERFIELD SPR	4256271	673612	1622	19490101	6003	1101
382624115004001	QC056	BUTTERFIELD SPR	4256271	673612	1622	19901108	6003	1101
382624115004001	QC056	BUTTERFIELD SPR	4256271	673612	1622	19921014	6549	1201
382624115004001	QC056	BUTTERFIELD SPR	4256271	673612	1622	19930503	7095	1302
382624115004001	QC056	BUTTERFIELD SPR	4256271	673612	1622	19920318	7641	1402
382624115004001	QC056	BUTTERFIELD SPR	4256271	673612	1622	19850116	7641	1402
382624115004001	QC056	BUTTERFIELD SPR	4256271	673612	1622	19890314	7641	1402
382624115004001	QC056	BUTTERFIELD SPR	4256271	673612	1622	19860204	8186	1502
382624115004001	QC056	BUTTERFIELD SPR	4256271	673612	1622	19911023	8186	1502
382624115004001	QC056	BUTTERFIELD SPR	4256271	673612	1622	19870812	10369	1902

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Official ID	Alias Name	Reporting Name	Northing UTM Zone 11 (meters)	Easting UTM Zone 11 (meters)	Land Surface Elevation (meters)	Date	Discharge Rate (m3/d)	Discharge Rate (gpm)
382744115472501	QC029		4258019	605615	1466	19670807	109	20
382744115472501	QC029		4258019	605615	1466	19340207	518	95
382744115472501	QC029		4258019	605615	1466	19340207	518	95
383039115331101	DC019		4263279	626161	1445	19340207	11	2
383034116204301	MJ005		4263527	555506	1689	19690601	1201	220
383034116204301	MJ005		4263527	555506	1689	19690501	1255	230
383034116204301	MJ005		4263527	555506	1689	19690401	1310	240
383034116204301	MJ005		4263527	555506	1689	19690701	1419	260
383034116204301	MJ005		4263527	555506	1689	19690901	1419	260
383034116204301	MJ005		4263527	555506	1689	19690801	1474	270
383034116204301	MJ005		4263527	555506	1689	19681101	1474	270
383034116204301	MJ005		4263527	555506	1689	19681001	1474	270
383034116204301	MJ005		4263527	555506	1689	19690301	1474	270
383034116204301	MJ005		4263527	555506	1689	19681201	1528	280
383034116204301	MJ005		4263527	555506	1689	19690201	1528	280
383034116204301	MJ005		4263527	555506	1689	19691101	1583	290
383034116204301	MJ005		4263527	555506	1689	19690101	1583	290
383034116204301	MJ005		4263527	555506	1689	19680901	1583	290
383034116204301	MJ005		4263527	555506	1689	19671101	1583	290
383034116204301	MJ005		4263527	555506	1689	19680801	1583	290
383034116204301	MJ005		4263527	555506	1689	19691001	1583	290
383034116204301	MJ005		4263527	555506	1689	19680201	1637	300
383034116204301	MJ005		4263527	555506	1689	19671001	1637	300
383034116204301	MJ005		4263527	555506	1689	19671201	1637	300
383034116204301	MJ005		4263527	555506	1689	19680101	1637	300
383034116204301	MJ005		4263527	555506	1689	19680701	1637	300
383034116204301	MJ005		4263527	555506	1689	19680601	1746	320
383034116204301	MJ005		4263527	555506	1689	19691201	1746	320
383034116204301	MJ005		4263527	555506	1689	19680501	1801	330
383034116204301	MJ005		4263527	555506	1689	19680301	1856	340
383034116204301	MJ005		4263527	555506	1689	19680401	1856	340
383034116204301	MJ005		4263527	555506	1689	1965	4148	761
383103115325301	DC021	BUTTERFIELD SPR	4264429	626725	1448	19910307	147	27
383103115325301	DC021	BUTTERFIELD SPR	4264429	626725	1448	19900403	147	27
383103115325301	DC021	BUTTERFIELD SPR	4264429	626725	1448	19901114	196	36
383103115325301	DC021	BUTTERFIELD SPR	4264429	626725	1448	19661101	1092	200
383103115325301	DC021	BUTTERFIELD SPR	4264429	626725	1448	19350124	1255	230
383103115325301	DC021	BUTTERFIELD SPR	4264429	626725	1448	19850120	1856	340
383103115325301	DC021	BUTTERFIELD SPR	4264429	626725	1448	19820115	2401	440
383103115325301	DC021	BUTTERFIELD SPR	4264429	626725	1448	19870813	2729	501
383103115325301	DC021	BUTTERFIELD SPR	4264429	626725	1448	19870210	2729	501
383103115325301	DC021	BUTTERFIELD SPR	4264429	626725	1448	19911022	2729	501
383103115325301	DC021	BUTTERFIELD SPR	4264429	626725	1448	19860202	2729	501
383103115325301	DC021	BUTTERFIELD SPR	4264429	626725	1448	19880224	2729	501
383144116235201	MJ003		4264462	552497	1829	19691101	1856	340
383144116235201	MJ003		4264462	552497	1829	19691201	1856	340
383144116235201	MJ003		4264462	552497	1829	19680901	1910	350
383144116235201	MJ003		4264462	552497	1829	19681101	1910	350
383144116235201	MJ003		4264462	552497	1829	19671001	1910	350
383144116235201	MJ003		4264462	552497	1829	19671101	1965	360
383144116235201	MJ003		4264462	552497	1829	1965	1965	360
383144116235201	MJ003		4264462	552497	1829	19680701	1965	360

Table A-1 Spring Data Set

Official ID	Alias Name	Reporting Name	Northing UTM Zone 11 (meters)	Easting UTM Zone 11 (meters)	Land Surface Elevation (meters)	Date	Discharge Rate (m3/d)	Discharge Rate (gpm)
383144116235201	MJ003		4264462	552497	1829	19680801	1965	360
383144116235201	MJ003		4264462	552497	1829	19680101	1965	360
383144116235201	MJ003		4264462	552497	1829	19671201	1965	360
383144116235201	MJ003		4264462	552497	1829	19681201	2128	390
383144116235201	MJ003		4264462	552497	1829	19691001	2128	390
383144116235201	MJ003		4264462	552497	1829	19680601	2128	390
383144116235201	MJ003		4264462	552497	1829	19681001	2128	390
383144116235201	MJ003		4264462	552497	1829	19690901	2183	400
383144116235201	MJ003		4264462	552497	1829	19690801	2238	411
383144116235201	MJ003		4264462	552497	1829	19690101	2292	420
383144116235201	MJ003		4264462	552497	1829	19690701	2292	420
383144116235201	MJ003		4264462	552497	1829	19680401	2456	451
383144116235201	MJ003		4264462	552497	1829	19690201	2456	451
383144116235201	MJ003		4264462	552497	1829	19680501	2456	451
383144116235201	MJ003		4264462	552497	1829	19680201	2456	451
383144116235201	MJ003		4264462	552497	1829	19690601	2456	451
383144116235201	MJ003		4264462	552497	1829	19690301	2674	491
383144116235201	MJ003		4264462	552497	1829	19680301	2674	491
383144116235201	MJ003		4264462	552497	1829	19690401	2674	491
383144116235201	MJ003		4264462	552497	1829	19690501	2674	491
383259115460301	DC002	REYNOLDS SPRS	4267879	607568	1454	19910306	1201	220
383259115460301	DC002	REYNOLDS SPRS	4267879	607568	1454	19680828	1223	224
383259115460301	DC002	REYNOLDS SPRS	4267879	607568	1454	19700304	1370	251
383259115460301	DC002	REYNOLDS SPRS	4267879	607568	1454	19681219	1370	251
383259115460301	DC002	REYNOLDS SPRS	4267879	607568	1454	19930915	1419	260
383259115460301	DC002	REYNOLDS SPRS	4267879	607568	1454	19700415	1419	260
383259115460301	DC002	REYNOLDS SPRS	4267879	607568	1454	19680926	1419	260
383259115460301	DC002	REYNOLDS SPRS	4267879	607568	1454	19680709	1468	269
383259115460301	DC002	REYNOLDS SPRS	4267879	607568	1454	19900403	1474	270
383259115460301	DC002	REYNOLDS SPRS	4267879	607568	1454	19670927	1495	274
383259115460301	DC002	REYNOLDS SPRS	4267879	607568	1454	19710419	1545	283
383259115460301	DC002	REYNOLDS SPRS	4267879	607568	1454	19700505	1545	283
383259115460301	DC002	REYNOLDS SPRS	4267879	607568	1454	19690115	1566	287
383259115460301	DC002	REYNOLDS SPRS	4267879	607568	1454	19671122	1566	287
383259115460301	DC002	REYNOLDS SPRS	4267879	607568	1454	19700106	1566	287
383259115460301	DC002	REYNOLDS SPRS	4267879	607568	1454	19700630	1637	300
383259115460301	DC002	REYNOLDS SPRS	4267879	607568	1454	19860202	1637	300
383259115460301	DC002	REYNOLDS SPRS	4267879	607568	1454	19850120	1637	300
383259115460301	DC002	REYNOLDS SPRS	4267879	607568	1454	19661101	1637	300
383259115460301	DC002	REYNOLDS SPRS	4267879	607568	1454	19680411	1637	300
383259115460301	DC002	REYNOLDS SPRS	4267879	607568	1454	19700209	1637	300
383259115460301	DC002	REYNOLDS SPRS	4267879	607568	1454	19690305	1665	305
383259115460301	DC002	REYNOLDS SPRS	4267879	607568	1454	19770920	1692	310
383259115460301	DC002	REYNOLDS SPRS	4267879	607568	1454	19690625	1714	314
383259115460301	DC002	REYNOLDS SPRS	4267879	607568	1454	19690429	1736	318
383259115460301	DC002	REYNOLDS SPRS	4267879	607568	1454	19710622	1736	318
383259115460301	DC002	REYNOLDS SPRS	4267879	607568	1454	19680213	1763	323
383259115460301	DC002	REYNOLDS SPRS	4267879	607568	1454	19690529	1785	327
383259115460301	DC002	REYNOLDS SPRS	4267879	607568	1454	19681028	1812	332
383259115460301	DC002	REYNOLDS SPRS	4267879	607568	1454	19691203	1834	336
383259115460301	DC002	REYNOLDS SPRS	4267879	607568	1454	19691108	1834	336
383259115460301	DC002	REYNOLDS SPRS	4267879	607568	1454	19680314	1834	336

Table A-1 Spring Data Set

Official ID	Alias Name	Reporting Name	Northing UTM Zone 11 (meters)	Easting UTM Zone 11 (meters)	Land Surface Elevation (meters)	Date	Discharge Rate (m3/d)	Discharge Rate (gpm)
383259115460301	DC002	REYNOLDS SPRS	4267879	607568	1454	19680120	1834	336
383259115460301	DC002	REYNOLDS SPRS	4267879	607568	1454	19720203	1834	336
383259115460301	DC002	REYNOLDS SPRS	4267879	607568	1454	19671219	1861	341
383259115460301	DC002	REYNOLDS SPRS	4267879	607568	1454	19680611	1861	341
383259115460301	DC002	REYNOLDS SPRS	4267879	607568	1454	19880224	1910	350
383259115460301	DC002	REYNOLDS SPRS	4267879	607568	1454	19901114	1910	350
383259115460301	DC002	REYNOLDS SPRS	4267879	607568	1454	19690730	1910	350
383259115460301	DC002	REYNOLDS SPRS	4267879	607568	1454	19921014	1910	350
383259115460301	DC002	REYNOLDS SPRS	4267879	607568	1454	19691007	1981	363
383259115460301	DC002	REYNOLDS SPRS	4267879	607568	1454	19680513	2030	372
383259115460301	DC002	REYNOLDS SPRS	4267879	607568	1454	19710123	2030	372
383259115460301	DC002	REYNOLDS SPRS	4267879	607568	1454	19890315	2074	380
383259115460301	DC002	REYNOLDS SPRS	4267879	607568	1454	19820118	2292	420
383259115460301	DC002	REYNOLDS SPRS	4267879	607568	1454	19681122	2352	431
383259115460301	DC002	REYNOLDS SPRS	4267879	607568	1454	19700821	2352	431
383259115460301	DC002	REYNOLDS SPRS	4267879	607568	1454	19930408	2401	440
383259115460301	DC002	REYNOLDS SPRS	4267879	607568	1454	19920320	2401	440
383259115460301	DC002	REYNOLDS SPRS	4267879	607568	1454	19711005	2729	501
383259115460301	DC002	REYNOLDS SPRS	4267879	607568	1454	19710302	2767	508
383259115460301	DC002	REYNOLDS SPRS	4267879	607568	1454	19701123	3209	589
383259115460301	DC002	REYNOLDS SPRS	4267879	607568	1454	19911022	3275	601
383259115460301	DC002	REYNOLDS SPRS	4267879	607568	1454	19870210	3275	601
383311115461501	DC001	BIG SPR	4267997	607130	1469	19890315	709	130
383311115461501	DC001	BIG SPR	4267997	607130	1469	19880224	1746	320
383311115461501	DC001	BIG SPR	4267997	607130	1469	19711005	1965	360
383311115461501	DC001	BIG SPR	4267997	607130	1469	19680926	1981	363
383311115461501	DC001	BIG SPR	4267997	607130	1469	19681028	2030	372
383311115461501	DC001	BIG SPR	4267997	607130	1469	19690115	2058	378
383311115461501	DC001	BIG SPR	4267997	607130	1469	19680828	2107	387
383311115461501	DC001	BIG SPR	4267997	607130	1469	19681122	2178	400
383311115461501	DC001	BIG SPR	4267997	607130	1469	19680513	2227	409
383311115461501	DC001	BIG SPR	4267997	607130	1469	19680410	2254	414
383311115461501	DC001	BIG SPR	4267997	607130	1469	19690625	2347	431
383311115461501	DC001	BIG SPR	4267997	607130	1469	19691203	2374	436
383311115461501	DC001	BIG SPR	4267997	607130	1469	19691108	2374	436
383311115461501	DC001	BIG SPR	4267997	607130	1469	19870210	2401	440
383311115461501	DC001	BIG SPR	4267997	607130	1469	19680709	2500	459
383311115461501	DC001	BIG SPR	4267997	607130	1469	19700209	2500	459
383311115461501	DC001	BIG SPR	4267997	607130	1469	19700630	2500	459
383311115461501	DC001	BIG SPR	4267997	607130	1469	19681219	2500	459
383311115461501	DC001	BIG SPR	4267997	607130	1469	19710622	2543	467
383311115461501	DC001	BIG SPR	4267997	607130	1469	19770920	2565	471
383311115461501	DC001	BIG SPR	4267997	607130	1469	19670804	2571	472
383311115461501	DC001	BIG SPR	4267997	607130	1469	19700304	2592	476
383311115461501	DC001	BIG SPR	4267997	607130	1469	19700106	2620	481
383311115461501	DC001	BIG SPR	4267997	607130	1469	19690529	2620	481
383311115461501	DC001	BIG SPR	4267997	607130	1469	19691007	2620	481
383311115461501	DC001	BIG SPR	4267997	607130	1469	19710123	2620	481
383311115461501	DC001	BIG SPR	4267997	607130	1469	19060305	2641	484
383311115461501	DC001	BIG SPR	4267997	607130	1469	19680611	2669	490
383311115461501	DC001	BIG SPR	4267997	607130	1469	19720203	2691	494
383311115461501	DC001	BIG SPR	4267997	607130	1469	19680314	2691	494

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Official ID	Alias Name	Reporting Name	Northing UTM Zone 11 (meters)	Easting UTM Zone 11 (meters)	Land Surface Elevation (meters)	Date	Discharge Rate (m3/d)	Discharge Rate (gpm)
383311115461501	DC001	BIG SPR	4267997	607130	1469	19670927	2691	494
383311115461501	DC001	BIG SPR	4267997	607130	1469	19860202	2729	501
383311115461501	DC001	BIG SPR	4267997	607130	1469	19850120	2729	501
383311115461501	DC001	BIG SPR	4267997	607130	1469	19910306	2729	501
383311115461501	DC001	BIG SPR	4267997	607130	1469	19930915	2729	501
383311115461501	DC001	BIG SPR	4267997	607130	1469	19900403	2729	501
383311115461501	DC001	BIG SPR	4267997	607130	1469	19901114	2729	501
383311115461501	DC001	BIG SPR	4267997	607130	1469	19911022	2729	501
383311115461501	DC001	BIG SPR	4267997	607130	1469	19920320	2729	501
383311115461501	DC001	BIG SPR	4267997	607130	1469	19921014	2729	501
383311115461501	DC001	BIG SPR	4267997	607130	1469	19710419	2789	512
383311115461501	DC001	BIG SPR	4267997	607130	1469	19661101	2865	526
383311115461501	DC001	BIG SPR	4267997	607130	1469	19671219	2865	526
383311115461501	DC001	BIG SPR	4267997	607130	1469	19690429	2936	539
383311115461501	DC001	BIG SPR	4267997	607130	1469	19701123	2963	544
383311115461501	DC001	BIG SPR	4267997	607130	1469	19680120	3034	557
383311115461501	DC001	BIG SPR	4267997	607130	1469	19710302	3111	571
383311115461501	DC001	BIG SPR	4267997	607130	1469	19671121	3182	584
383311115461501	DC001	BIG SPR	4267997	607130	1469	19680213	3253	597
383311115461501	DC001	BIG SPR	4267997	607130	1469	19820117	3275	601
383311115461501	DC001	BIG SPR	4267997	607130	1469	19930408	3275	601
383311115461501	DC001	BIG SPR	4267997	607130	1469	19690730	3302	606
383311115461501	DC001	BIG SPR	4267997	607130	1469	19700821	3476	638
383256115453301	DC005	HAY CORRAL SPR	4268129	607782	1454	19930408	1910	350
383256115453301	DC005	HAY CORRAL SPR	4268129	607782	1454	19921014	1965	360
383256115453301	DC005	HAY CORRAL SPR	4268129	607782	1454	19911021	2019	370
383256115453301	DC005	HAY CORRAL SPR	4268129	607782	1454	19920320	2019	370
383256115453301	DC005	HAY CORRAL SPR	4268129	607782	1454	19901114	2074	380
383256115453301	DC005	HAY CORRAL SPR	4268129	607782	1454	19770920	2128	390
383256115453301	DC005	HAY CORRAL SPR	4268129	607782	1454	19860202	2347	431
383256115453301	DC005	HAY CORRAL SPR	4268129	607782	1454	19661101	2347	431
383256115453301	DC005	HAY CORRAL SPR	4268129	607782	1454	19880224	2729	501
383256115453301	DC005	HAY CORRAL SPR	4268129	607782	1454	19870210	2729	501
383256115453301	DC005	HAY CORRAL SPR	4268129	607782	1454	19930915	2729	501
383256115453301	DC005	HAY CORRAL SPR	4268129	607782	1454	19820117	2729	501
383256115453301	DC005	HAY CORRAL SPR	4268129	607782	1454	19890315	2729	501
383256115453301	DC005	HAY CORRAL SPR	4268129	607782	1454	19720330	2729	501
383256115453301	DC005	HAY CORRAL SPR	4268129	607782	1454	19850120	3275	601
383256115453301	DC005	HAY CORRAL SPR	4268129	607782	1454	19910306	3275	601
383256115453301	DC005	HAY CORRAL SPR	4268129	607782	1454	19900403	3275	601
383307115321001	DC023		4268335	628091	1449	19350114	76	14
383323115454401	DC003	N SPR	4268497	607680	1465	19900403	196	36
383323115454401	DC003	N SPR	4268497	607680	1465	19710302	415	76
383323115454401	DC003	N SPR	4268497	607680	1465	19710123	688	126
383323115454401	DC003	N SPR	4268497	607680	1465	19820118	709	130
383323115454401	DC003	N SPR	4268497	607680	1465	19680926	759	139
383323115454401	DC003	N SPR	4268497	607680	1465	19710622	759	139
383323115454401	DC003	N SPR	4268497	607680	1465	19700821	759	139
383323115454401	DC003	N SPR	4268497	607680	1465	19701005	764	140
383323115454401	DC003	N SPR	4268497	607680	1465	19700415	786	144
383323115454401	DC003	N SPR	4268497	607680	1465	19690730	786	144
383323115454401	DC003	N SPR	4268497	607680	1465	19711005	786	144

Table A-1 Spring Data Set

Official ID	Alias Name	Reporting Name	Northing UTM Zone 11 (meters)	Easting UTM Zone 11 (meters)	Land Surface Elevation (meters)	Date	Discharge Rate (m3/d)	Discharge Rate (gpm)
383323115454401	DC003	N SPR	4268497	607680	1465	19700505	786	144
383323115454401	DC003	N SPR	4268497	607680	1465	19680213	786	144
383323115454401	DC003	N SPR	4268497	607680	1465	19690429	808	148
383323115454401	DC003	N SPR	4268497	607680	1465	19680314	808	148
383323115454401	DC003	N SPR	4268497	607680	1465	19901114	819	150
383323115454401	DC003	N SPR	4268497	607680	1465	19700304	830	152
383323115454401	DC003	N SPR	4268497	607680	1465	19701123	830	152
383323115454401	DC003	N SPR	4268497	607680	1465	19680120	830	152
383323115454401	DC003	N SPR	4268497	607680	1465	19670804	857	157
383323115454401	DC003	N SPR	4268497	607680	1465	19770920	873	160
383323115454401	DC003	N SPR	4268497	607680	1465	19921014	873	160
383323115454401	DC003	N SPR	4268497	607680	1465	19910306	873	160
383323115454401	DC003	N SPR	4268497	607680	1465	19691108	879	161
383323115454401	DC003	N SPR	4268497	607680	1465	19700630	879	161
383323115454401	DC003	N SPR	4268497	607680	1465	19570601	906	166
383323115454401	DC003	N SPR	4268497	607680	1465	19690625	906	166
383323115454401	DC003	N SPR	4268497	607680	1465	19680709	906	166
383323115454401	DC003	N SPR	4268497	607680	1465	19880224	928	170
383323115454401	DC003	N SPR	4268497	607680	1465	19911021	928	170
383323115454401	DC003	N SPR	4268497	607680	1465	19720203	928	170
383323115454401	DC003	N SPR	4268497	607680	1465	19671121	955	175
383323115454401	DC003	N SPR	4268497	607680	1465	19690529	955	175
383323115454401	DC003	N SPR	4268497	607680	1465	19680513	955	175
383323115454401	DC003	N SPR	4268497	607680	1465	19680611	955	175
383323115454401	DC003	N SPR	4268497	607680	1465	19680410	955	175
383323115454401	DC003	N SPR	4268497	607680	1465	19670927	977	179
383323115454401	DC003	N SPR	4268497	607680	1465	19850120	982	180
383323115454401	DC003	N SPR	4268497	607680	1465	19690115	1004	184
383323115454401	DC003	N SPR	4268497	607680	1465	19671219	1026	188
383323115454401	DC003	N SPR	4268497	607680	1465	19681219	1026	188
383323115454401	DC003	N SPR	4268497	607680	1465	19930915	1037	190
383323115454401	DC003	N SPR	4268497	607680	1465	19700209	1053	193
383323115454401	DC003	N SPR	4268497	607680	1465	19710419	1053	193
383323115454401	DC003	N SPR	4268497	607680	1465	19690305	1075	197
383323115454401	DC003	N SPR	4268497	607680	1465	19870210	1092	200
383323115454401	DC003	N SPR	4268497	607680	1465	19691007	1102	202
383323115454401	DC003	N SPR	4268497	607680	1465	19680828	1102	202
383323115454401	DC003	N SPR	4268497	607680	1465	19860202	1146	210
383323115454401	DC003	N SPR	4268497	607680	1465	19681122	1173	215
383323115454401	DC003	N SPR	4268497	607680	1465	19681028	1201	220
383323115454401	DC003	N SPR	4268497	607680	1465	19930408	1201	220
383323115454401	DC003	N SPR	4268497	607680	1465	19700106	1321	242
383323115454401	DC003	N SPR	4268497	607680	1465	19920320	1364	250
383323115454401	DC003	N SPR	4268497	607680	1465	19691203	1370	251
383323115454401	DC003	N SPR	4268497	607680	1465	19890315	1637	300
383346115313801	DC024	BLUE EAGLE SPRS	4269110	628297	1452	19660310	4912	901
383346115313801	DC024	BLUE EAGLE SPRS	4269110	628297	1452	19921015	8732	1602
383346115313801	DC024	BLUE EAGLE SPRS	4269110	628297	1452	19930914	9278	1702
383346115313801	DC024	BLUE EAGLE SPRS	4269110	628297	1452	19340207	9824	1802
383346115313801	DC024	BLUE EAGLE SPRS	4269110	628297	1452	19890315	10369	1902
383346115313801	DC024	BLUE EAGLE SPRS	4269110	628297	1452	19820114	10369	1902
383346115313801	DC024	BLUE EAGLE SPRS	4269110	628297	1452	19711006	10369	1902

Table A-1 Spring Data Set

Official ID	Alias Name	Reporting Name	Northing UTM Zone 11 (meters)	Easting UTM Zone 11 (meters)	Land Surface Elevation (meters)	Date	Discharge Rate (m3/d)	Discharge Rate (gpm)
383346115313801	DC024	BLUE EAGLE SPRS	4269110	628297	1452	19860202	11461	2103
383346115313801	DC024	BLUE EAGLE SPRS	4269110	628297	1452	19480201	12552	2303
383346115313801	DC024	BLUE EAGLE SPRS	4269110	628297	1452	19901114	13098	2403
383346115313801	DC024	BLUE EAGLE SPRS	4269110	628297	1452	19911022	13098	2403
383346115313801	DC024	BLUE EAGLE SPRS	4269110	628297	1452	19930407	13098	2403
383346115313801	DC024	BLUE EAGLE SPRS	4269110	628297	1452	19850120	13098	2403
383346115313801	DC024	BLUE EAGLE SPRS	4269110	628297	1452	19920320	13098	2403
383346115313801	DC024	BLUE EAGLE SPRS	4269110	628297	1452	19870812	13644	2503
383346115313801	DC024	BLUE EAGLE SPRS	4269110	628297	1452	19900403	14190	2603
383346115313801	DC024	BLUE EAGLE SPRS	4269110	628297	1452	19910307	14190	2603
383346115313801	DC024	BLUE EAGLE SPRS	4269110	628297	1452	19880224	14190	2603
383346115313801	DC024	BLUE EAGLE SPRS	4269110	628297	1452	19870210	14736	2703
383424115311501	DC026		4270259	628859	1451	1968	25978	4766
383540116220301	MJ004		4271419	555596	2158	19670415	0	0
383540116220301	MJ004		4271419	555596	2158	19680730	3	1
383535116155301	MJ017		4271667	564038	2060	19680726	109	20
383535116155301	MJ017		4271667	564038	2060	19661216	164	30
383540115081801	DC053	MOORMAN SPR	4273239	662135	1614	19930504	928	170
383540115081801	DC053	MOORMAN SPR	4273239	662135	1614	19921015	1037	190
383540115081801	DC053	MOORMAN SPR	4273239	662135	1614	19911024	1092	200
383540115081801	DC053	MOORMAN SPR	4273239	662135	1614	19900322	1255	230
383540115081801	DC053	MOORMAN SPR	4273239	662135	1614	19860201	1310	240
383540115081801	DC053	MOORMAN SPR	4273239	662135	1614	19880223	1364	250
383540115081801	DC053	MOORMAN SPR	4273239	662135	1614	19920319	1419	260
383540115081801	DC053	MOORMAN SPR	4273239	662135	1614	19850117	1419	260
383540115081801	DC053	MOORMAN SPR	4273239	662135	1614	19820723	1419	260
383540115081801	DC053	MOORMAN SPR	4273239	662135	1614	19870211	1474	270
383540115081801	DC053	MOORMAN SPR	4273239	662135	1614	19901108	1637	300
383540115081801	DC053	MOORMAN SPR	4273239	662135	1614	19890314	1637	300
383540115081801	DC053	MOORMAN SPR	4273239	662135	1614	19910305	1692	310
383540115081801	DC053	MOORMAN SPR	4273239	662135	1614	19490101	10369	1902
383804116181201	MJ010		4274382	560437	2457	19680726	8	1
383804116181201	MJ010		4274382	560437	2457	19681013	21	4
383811116180501	MJ012		4274783	560434	2487	19681013	55	10
383811116180501	MJ012		4274783	560434	2487	19680726	76	14
383726115025101	DC057	EMIGRANT SPRS	4276640	669977	1670	19921014	1856	340
383726115025101	DC057	EMIGRANT SPRS	4276640	669977	1670	19901108	2729	501
383726115025101	DC057	EMIGRANT SPRS	4276640	669977	1670	19890314	3275	601
383726115025101	DC057	EMIGRANT SPRS	4276640	669977	1670	19920318	4366	801
383726115025101	DC057	EMIGRANT SPRS	4276640	669977	1670	19870326	4366	801
383726115025101	DC057	EMIGRANT SPRS	4276640	669977	1670	19870812	4366	801
383726115025101	DC057	EMIGRANT SPRS	4276640	669977	1670	19911024	4366	801
383726115025101	DC057	EMIGRANT SPRS	4276640	669977	1670	19880223	4366	801
383726115025101	DC057	EMIGRANT SPRS	4276640	669977	1670	19900322	4366	801
383726115025101	DC057	EMIGRANT SPRS	4276640	669977	1670	19930504	4912	901
383726115025101	DC057	EMIGRANT SPRS	4276640	669977	1670	19910305	4912	901
383726115025101	DC057	EMIGRANT SPRS	4276640	669977	1670	19820724	5458	1001
383726115025101	DC057	EMIGRANT SPRS	4276640	669977	1670	19850117	5458	1001
383726115025101	DC057	EMIGRANT SPRS	4276640	669977	1670	19490101	7095	1302
383726115025101	DC057	EMIGRANT SPRS	4276640	669977	1670	19860201	7641	1402
383915116184401	MJ006		4276808	559209	2542	19680726	7	1
383915116184401	MJ006		4276808	559209	2542	19681013	9	2

Table A-1 Spring Data Set

Official ID	Alias Name	Reporting Name	Northing UTM Zone 11 (meters)	Easting UTM Zone 11 (meters)	Land Surface Elevation (meters)	Date	Discharge Rate (m3/d)	Discharge Rate (gpm)
383809115042601	DC055		4277917	667652	1631	1968	1092	200
383902116183401	MJ007		4278017	560095	2472	19680723	7	1
383902116183401	MJ007		4278017	560095	2472	19681013	19	3
383945116165601	MJ016		4279298	562381	2256	19670320	38	7
383945116165601	MJ016		4279298	562381	2256	19681013	65	12
383945116165601	MJ016		4279298	562381	2256	19680728	109	20
383952116183701	MJ009		4279558	560011	2697	19680723	13	2
383952116183701	MJ009		4279558	560011	2697	19681013	14	3
384009116151501	MJ019		4279999	565131	2167	19670320	27	5
384009116151501	MJ019		4279999	565131	2167	19681013	41	8
384009116151501	MJ019		4279999	565131	2167	19680728	55	10
384012116182001	MJ013		4280177	560417	2585	19681013	21	4
384012116182001	MJ013		4280177	560417	2585	19680723	38	7
384014116152301	MJ018		4280272	564694	2225	19681013	1	0
384014116152301	MJ018		4280272	564694	2225	19680728	1	0
384024116184101	MJ011		4280542	559713	2652	19680723	1	0
384024116184101	MJ011		4280542	559713	2652	19681013	5	1
384024116184801	MJ008		4280696	559712	2652	19680723	22	4
384024116184801	MJ008		4280696	559712	2652	19681013	27	5
384034116181701	MJ014		4280856	560484	2548	19681013	41	8
384034116181701	MJ014		4280856	560484	2548	19680722	52	10
384034116181701	MJ014		4280856	560484	2548	19670501	207	38
384044116181001	MJ015		4281165	560651	2524	19681013	44	8
384044116181001	MJ015		4281165	560651	2524	19680722	120	22
384044116181001	MJ015		4281165	560651	2524	19670501	273	50
384227116050201	MJ020		4284508	579660	2100	19800501	16	3
384427115473601	DC006		4286779	605333	2012	19701106	7	1
384359117010101	IV026		4287839	498531	2111	19680820	1092	200
384417115281201	DC045		4289236	633431	1600	19711012	1092	200
384528116334101	MJ001		4289780	538114	2615	19650901	246	45
384524115001801	DC064		4291455	673356	1722	1968	955	175
384614115432501	DC014		4292560	611000	1884	19670807	5	1
384621115290301	DC046		4292755	631852	1634	19711012	1637	300
384705117101101	IV015		4293093	485335	1707	19680101	27	5
384753117110601	IV004		4294174	483938	1707	19680101	5458	1001
384721115213201	DC049		4294451	642539	2118	19160201	9824	1802
384858117104402	IV016		4296177	484473	1707	19680709	5	1
385158115000401	DC067	LUND SPR	4301818	673347	1676	19890314	10915	2002
385158115000401	DC067	LUND SPR	4301818	673347	1676	19900322	11461	2103
385158115000401	DC067	LUND SPR	4301818	673347	1676	19860201	13644	2503
385158115000401	DC067	LUND SPR	4301818	673347	1676	19880223	13644	2503
385158115000401	DC067	LUND SPR	4301818	673347	1676	19920319	15281	2803
385158115000401	DC067	LUND SPR	4301818	673347	1676	19820118	16919	3104
385158115000401	DC067	LUND SPR	4301818	673347	1676	19901109	17464	3204
385158115000401	DC067	LUND SPR	4301818	673347	1676	19911024	18010	3304
385158115000401	DC067	LUND SPR	4301818	673347	1676	19930504	19102	3504
385158115000401	DC067	LUND SPR	4301818	673347	1676	19470509	23468	4305
385158115000401	DC067	LUND SPR	4301818	673347	1676	19910303	24559	4505
385158115000401	DC067	LUND SPR	4301818	673347	1676	19870211	27288	5006
385158115000401	DC067	LUND SPR	4301818	673347	1676	19921014	27288	5006
385158115000401	DC067	LUND SPR	4301818	673347	1676	19850117	27288	5006
385353115481801	DC017		4303200	604416	1923	1971	5	1

Table A-1 Spring Data Set

Official ID	Alias Name	Reporting Name	Northing UTM Zone 11 (meters)	Easting UTM Zone 11 (meters)	Land Surface Elevation (meters)	Date	Discharge Rate (m3/d)	Discharge Rate (gpm)
385207115013501	DC066		4303838	671229	1707	1968	13098	2403
385345115225901	DC051		4306251	640230	2347	1968	819	150
385440115401901	DC037		4307324	617130	1701	19711012	5	1
385539115045702	DC058	ARNOLDSON SPR	4308272	668001	1737	19910303	1910	350
385539115045702	DC058	ARNOLDSON SPR	4308272	668001	1737	19901106	2729	501
385539115045702	DC058	ARNOLDSON SPR	4308272	668001	1737	19470509	7641	1402
385539115045702	DC058	ARNOLDSON SPR	4308272	668001	1737	19900404	8186	1502
385539115045702	DC058	ARNOLDSON SPR	4308272	668001	1737	19840730	8186	1502
385539115045702	DC058	ARNOLDSON SPR	4308272	668001	1737	19890314	8186	1502
385539115045702	DC058	ARNOLDSON SPR	4308272	668001	1737	19930504	8732	1602
385539115045702	DC058	ARNOLDSON SPR	4308272	668001	1737	19860201	8732	1602
385539115045702	DC058	ARNOLDSON SPR	4308272	668001	1737	19911024	9824	1802
385539115045702	DC058	ARNOLDSON SPR	4308272	668001	1737	19820119	9824	1802
385539115045702	DC058	ARNOLDSON SPR	4308272	668001	1737	19850121	9824	1802
385539115045702	DC058	ARNOLDSON SPR	4308272	668001	1737	19880223	9824	1802
385539115045702	DC058	ARNOLDSON SPR	4308272	668001	1737	19921015	10369	1902
385539115045702	DC058	ARNOLDSON SPR	4308272	668001	1737	19920319	10369	1902
385439115033701	DC063	UNKNOWN (PRESTON)	4308461	668189	1713	19930503	0	0
385439115033701	DC063	UNKNOWN (PRESTON)	4308461	668189	1713	19921015	0	0
385439115033701	DC063	UNKNOWN (PRESTON)	4308461	668189	1713	19840730	0	0
385439115033701	DC063	UNKNOWN (PRESTON)	4308461	668189	1713	19920319	0	0
385439115033701	DC063	UNKNOWN (PRESTON)	4308461	668189	1713	19890314	0	0
385439115033701	DC063	UNKNOWN (PRESTON)	4308461	668189	1713	19820120	49	9
385439115033701	DC063	UNKNOWN (PRESTON)	4308461	668189	1713	19850121	71	13
385439115033701	DC063	UNKNOWN (PRESTON)	4308461	668189	1713	19860201	147	27
385530115044601	DC061	NICHOLAS SPRS	4308646	668185	1737	19920319	600	110
385530115044601	DC061	NICHOLAS SPRS	4308646	668185	1737	19890314	1583	290
385530115044601	DC061	NICHOLAS SPRS	4308646	668185	1737	19850121	5458	1001
385530115044601	DC061	NICHOLAS SPRS	4308646	668185	1737	19820119	6003	1101
385530115044601	DC061	NICHOLAS SPRS	4308646	668185	1737	19860201	6003	1101
385530115044601	DC061	NICHOLAS SPRS	4308646	668185	1737	19900404	6003	1101
385530115044601	DC061	NICHOLAS SPRS	4308646	668185	1737	19470509	6003	1101
385530115044601	DC061	NICHOLAS SPRS	4308646	668185	1737	19840730	6549	1201
385530115044601	DC061	NICHOLAS SPRS	4308646	668185	1737	19911024	6549	1201
385530115044601	DC061	NICHOLAS SPRS	4308646	668185	1737	19901106	7095	1302
385530115044601	DC061	NICHOLAS SPRS	4308646	668185	1737	19921015	7641	1402
385530115044601	DC061	NICHOLAS SPRS	4308646	668185	1737	19930504	7641	1402
385530115044601	DC061	NICHOLAS SPRS	4308646	668185	1737	19910303	8186	1502
385530115044601	DC061	NICHOLAS SPRS	4308646	668185	1737	19880223	8732	1602
385507114574801	GR001	COLD SPRS	4309252	667691	1835	19930504	109	20
385507114574801	GR001	COLD SPRS	4309252	667691	1835	19921015	819	150
385507114574801	GR001	COLD SPRS	4309252	667691	1835	19901109	2074	380
385507114574801	GR001	COLD SPRS	4309252	667691	1835	19840730	2401	440
385507114574801	GR001	COLD SPRS	4309252	667691	1835	19850121	2401	440
385507114574801	GR001	COLD SPRS	4309252	667691	1835	19860201	2729	501
385507114574801	GR001	COLD SPRS	4309252	667691	1835	19910305	3275	601
385507114574801	GR001	COLD SPRS	4309252	667691	1835	19470509	4366	801
385507114574801	GR001	COLD SPRS	4309252	667691	1835	19920319	4366	801
385507114574801	GR001	COLD SPRS	4309252	667691	1835	19820119	4366	801
385507114574801	GR001	COLD SPRS	4309252	667691	1835	19900404	4912	901
385507114574801	GR001	COLD SPRS	4309252	667691	1835	19911024	5458	1001
385507114574801	GR001	COLD SPRS	4309252	667691	1835	19880223	5458	1001

Table A-1 Spring Data Set

Official ID	Alias Name	Reporting Name	Northing UTM Zone 11 (meters)	Easting UTM Zone 11 (meters)	Land Surface Elevation (meters)	Date	Discharge Rate (m3/d)	Discharge Rate (gpm)
385507114574801	GR001	COLD SPRS	4309252	667691	1835	19890314	8186	1502
385539115424100	DC033		4309615	613531	1664	19711005	273	50
385542115045801	DC059	INDIAN RANCH SPR	4310362	666197	1743	19920319	873	160
385542115045801	DC059	INDIAN RANCH SPR	4310362	666197	1743	19930504	1201	220
385542115045801	DC059	INDIAN RANCH SPR	4310362	666197	1743	19901109	1201	220
385542115045801	DC059	INDIAN RANCH SPR	4310362	666197	1743	19860201	1255	230
385542115045801	DC059	INDIAN RANCH SPR	4310362	666197	1743	19900404	1255	230
385542115045801	DC059	INDIAN RANCH SPR	4310362	666197	1743	19890314	1255	230
385542115045801	DC059	INDIAN RANCH SPR	4310362	666197	1743	19921015	1255	230
385542115045801	DC059	INDIAN RANCH SPR	4310362	666197	1743	19911024	1364	250
385542115045801	DC059	INDIAN RANCH SPR	4310362	666197	1743	19840730	1474	270
385542115045801	DC059	INDIAN RANCH SPR	4310362	666197	1743	19850117	1474	270
385542115045801	DC059	INDIAN RANCH SPR	4310362	666197	1743	19910305	1528	280
385542115045801	DC059	INDIAN RANCH SPR	4310362	666197	1743	19820120	1583	290
385542115045801	DC059	INDIAN RANCH SPR	4310362	666197	1743	19880223	2019	370
385552115421001	DC035	LITTLE WARM SPR	4310377	612967	1704	19720330	1092	200
385552115421001	DC035	LITTLE WARM SPR	4310377	612967	1704	19820113	1474	270
385552115421001	DC035	LITTLE WARM SPR	4310377	612967	1704	19910305	3820	701
385552115421001	DC035	LITTLE WARM SPR	4310377	612967	1704	19921014	3820	701
385552115421001	DC035	LITTLE WARM SPR	4310377	612967	1704	19890315	4366	801
385552115421001	DC035	LITTLE WARM SPR	4310377	612967	1704	19880224	4366	801
385552115421001	DC035	LITTLE WARM SPR	4310377	612967	1704	19930915	4366	801
385552115421001	DC035	LITTLE WARM SPR	4310377	612967	1704	19870813	4912	901
385552115421001	DC035	LITTLE WARM SPR	4310377	612967	1704	19900323	6003	1101
385552115421001	DC035	LITTLE WARM SPR	4310377	612967	1704	19901114	6003	1101
385552115421001	DC035	LITTLE WARM SPR	4310377	612967	1704	19860203	7641	1402
385552115421001	DC035	LITTLE WARM SPR	4310377	612967	1704	19850119	8186	1502
385552115421001	DC035	LITTLE WARM SPR	4310377	612967	1704	19911025	8186	1502
385552115421001	DC035	LITTLE WARM SPR	4310377	612967	1704	19920319	8732	1602
385552115421001	DC035	LITTLE WARM SPR	4310377	612967	1704	19930408	8732	1602
385651117042601	IV028		4310744	493601	1673	19690725	3	1
385540115045701	DC060	PRESTON BIG SPR	4310952	666378	1737	19820119	17464	3204
385540115045701	DC060	PRESTON BIG SPR	4310952	666378	1737	19820722	18556	3404
385540115045701	DC060	PRESTON BIG SPR	4310952	666378	1737	19870811	19102	3504
385540115045701	DC060	PRESTON BIG SPR	4310952	666378	1737	19911024	19102	3504
385540115045701	DC060	PRESTON BIG SPR	4310952	666378	1737	19910303	19102	3504
385540115045701	DC060	PRESTON BIG SPR	4310952	666378	1737	19820825	19647	3604
385540115045701	DC060	PRESTON BIG SPR	4310952	666378	1737	19870211	19647	3604
385540115045701	DC060	PRESTON BIG SPR	4310952	666378	1737	19930504	20193	3704
385540115045701	DC060	PRESTON BIG SPR	4310952	666378	1737	19850117	20739	3805
385540115045701	DC060	PRESTON BIG SPR	4310952	666378	1737	19920319	20739	3805
385540115045701	DC060	PRESTON BIG SPR	4310952	666378	1737	19900322	20739	3805
385540115045701	DC060	PRESTON BIG SPR	4310952	666378	1737	19821209	21285	3905
385540115045701	DC060	PRESTON BIG SPR	4310952	666378	1737	19470508	21285	3905
385540115045701	DC060	PRESTON BIG SPR	4310952	666378	1737	19880223	21830	4005
385540115045701	DC060	PRESTON BIG SPR	4310952	666378	1737	19901106	21830	4005
385540115045701	DC060	PRESTON BIG SPR	4310952	666378	1737	19921015	22376	4105
385540115045701	DC060	PRESTON BIG SPR	4310952	666378	1737	19890314	22922	4205
385614115045001	DC062	UNKNOWN (PRESTON)	4311353	666369	1750	19820722	76	14
385614115045001	DC062	UNKNOWN (PRESTON)	4311353	666369	1750	19921015	491	90
385614115045001	DC062	UNKNOWN (PRESTON)	4311353	666369	1750	19930504	546	100
385614115045001	DC062	UNKNOWN (PRESTON)	4311353	666369	1750	19920319	600	110

Table A-1 Spring Data Set

Official ID	Alias Name	Reporting Name	Northing UTM Zone 11 (meters)	Easting UTM Zone 11 (meters)	Land Surface Elevation (meters)	Date	Discharge Rate (m3/d)	Discharge Rate (gpm)
385614115045001	DC062	UNKNOWN (PRESTON)	4311353	666369	1750	19880223	1201	220
385650115421301	DC040	BIG WARM SPR	4311822	612657	1708	19880224	10915	2002
385650115421301	DC040	BIG WARM SPR	4311822	612657	1708	19911025	14190	2603
385650115421301	DC040	BIG WARM SPR	4311822	612657	1708	19910305	18556	3404
385650115421301	DC040	BIG WARM SPR	4311822	612657	1708	19920319	18556	3404
385650115421301	DC040	BIG WARM SPR	4311822	612657	1708	19901114	21830	4005
385650115421301	DC040	BIG WARM SPR	4311822	612657	1708	19921014	23468	4305
385650115421301	DC040	BIG WARM SPR	4311822	612657	1708	19720203	27288	5006
385650115421301	DC040	BIG WARM SPR	4311822	612657	1708	19900323	27288	5006
385650115421301	DC040	BIG WARM SPR	4311822	612657	1708	19701123	27288	5006
385650115421301	DC040	BIG WARM SPR	4311822	612657	1708	19680709	27288	5006
385650115421301	DC040	BIG WARM SPR	4311822	612657	1708	19820113	27288	5006
385650115421301	DC040	BIG WARM SPR	4311822	612657	1708	19680611	27288	5006
385650115421301	DC040	BIG WARM SPR	4311822	612657	1708	19680926	32746	6007
385650115421301	DC040	BIG WARM SPR	4311822	612657	1708	19710302	32746	6007
385650115421301	DC040	BIG WARM SPR	4311822	612657	1708	19700630	32746	6007
385650115421301	DC040	BIG WARM SPR	4311822	612657	1708	19690625	32746	6007
385650115421301	DC040	BIG WARM SPR	4311822	612657	1708	19690529	32746	6007
385650115421301	DC040	BIG WARM SPR	4311822	612657	1708	19000101	32746	6007
385650115421301	DC040	BIG WARM SPR	4311822	612657	1708	19680801	32746	6007
385650115421301	DC040	BIG WARM SPR	4311822	612657	1708	19681028	32746	6007
385650115421301	DC040	BIG WARM SPR	4311822	612657	1708	19670927	32746	6007
385650115421301	DC040	BIG WARM SPR	4311822	612657	1708	19711005	32746	6007
385650115421301	DC040	BIG WARM SPR	4311822	612657	1708	19710419	32746	6007
385650115421301	DC040	BIG WARM SPR	4311822	612657	1708	19691108	32746	6007
385650115421301	DC040	BIG WARM SPR	4311822	612657	1708	19700505	32746	6007
385650115421301	DC040	BIG WARM SPR	4311822	612657	1708	19680828	32746	6007
385650115421301	DC040	BIG WARM SPR	4311822	612657	1708	19691007	32746	6007
385650115421301	DC040	BIG WARM SPR	4311822	612657	1708	19670804	32746	6007
385650115421301	DC040	BIG WARM SPR	4311822	612657	1708	19690730	32746	6007
385650115421301	DC040	BIG WARM SPR	4311822	612657	1708	19680315	32746	6007
385650115421301	DC040	BIG WARM SPR	4311822	612657	1708	19930408	32746	6007
385650115421301	DC040	BIG WARM SPR	4311822	612657	1708	19700415	32746	6007
385650115421301	DC040	BIG WARM SPR	4311822	612657	1708	19680119	32746	6007
385650115421301	DC040	BIG WARM SPR	4311822	612657	1708	19710622	32746	6007
385650115421301	DC040	BIG WARM SPR	4311822	612657	1708	19680213	32746	6007
385650115421301	DC040	BIG WARM SPR	4311822	612657	1708	19890315	38203	7008
385650115421301	DC040	BIG WARM SPR	4311822	612657	1708	19850119	38203	7008
385650115421301	DC040	BIG WARM SPR	4311822	612657	1708	19930915	38203	7008
385650115421301	DC040	BIG WARM SPR	4311822	612657	1708	19860203	38203	7008
385650115421301	DC040	BIG WARM SPR	4311822	612657	1708	19870813	49118	9011
385833115491601	DC030		4312088	602758	1902	19701106	2	0
384803115133001	DC052		4312265	653561	1895	19471216	737	135
385828117100601	IV025		4313745	485422	1676	19680101	546	100
390045115493501	MH001		4316117	601960	1911	19701106	5	1
390141117080901	SC024		4319689	488246	1676	19680101	3	1
390148116395701	SM002		4319949	528928	2047	19640101	2538	466
390159117094701	SC019		4320248	485891	1676	19640922	1092	200
390220116123901	SM012		4321179	568304	2225	19650101	491	90
390245115373301	MH005		4323067	618339	1765	1968	1228	225
390347116123601	SM013		4323861	568353	2256	1965	2456	451
390402117082201	SC023		4324036	487940	1686	19680913	955	175

Table A-1 Spring Data Set

Official ID	Alias Name	Reporting Name	Northing UTM Zone 11 (meters)	Easting UTM Zone 11 (meters)	Land Surface Elevation (meters)	Date	Discharge Rate (m3/d)	Discharge Rate (gpm)
390342115324401	MH007		4324818	625861	1905	19701105	41	8
390407115382301	MH004		4325061	617684	1774	19701106	2183	400
390447116382001	SM004		4325476	531239	2016	19640101	2538	466
390641116134001	SM011		4329212	566769	2438	1965	109	20
390915117005701	SC030		4333675	498636	1689	19130101	2456	451
390926117052501	SC025		4334018	492203	1804	19680522	355	65
391253116482501	SM001		4340413	516670	2128	19680813	5	1
391543115255701	MH009		4346806	635241	2304	1968	4912	901
391637116021801	SM015	FISH CRK SPRS	4347741	582953	1859	19900403	8732	1602
391637116021801	SM015	FISH CRK SPRS	4347741	582953	1859	19911025	9278	1702
391637116021801	SM015	FISH CRK SPRS	4347741	582953	1859	19921014	10915	2002
391637116021801	SM015	FISH CRK SPRS	4347741	582953	1859	19650101	13098	2403
391637116021801	SM015	FISH CRK SPRS	4347741	582953	1859	19930918	15827	2904
391637116021801	SM015	FISH CRK SPRS	4347741	582953	1859	19920318	16373	3004
391637116021801	SM015	FISH CRK SPRS	4347741	582953	1859	19901115	17464	3204
391637116021801	SM015	FISH CRK SPRS	4347741	582953	1859	19930419	19647	3604
391637116021801	SM015	FISH CRK SPRS	4347741	582953	1859	19890313	22922	4205
391637116021801	SM015	FISH CRK SPRS	4347741	582953	1859	19910307	27288	5006
391637116021801	SM015	FISH CRK SPRS	4347741	582953	1859	19880224	27288	5006
391637116021801	SM015	FISH CRK SPRS	4347741	582953	1859	19870327	27288	5006
391938116512601	SM003		4352889	512310	1725	19130101	33	6
392416116204901	SM009		4361653	556231	1932	19640416	2729	501
392552116555101	SM005		4364411	505957	1935	19641001	5	1
392518115022601	MH010		4365491	668190	2347	196510	25	5
392634116463501	SM007		4366013	504593	2033	19680101	1	0
392722116583901	SM006		4367183	501939	2243	19680101	0	0
392716115022001	MH011		4369195	668324	2316	196510	273	50
392917116470901	SM008		4370750	518421	2109	19680101	1	0
PM024	PM024	1 Qsd 2 Peacock R	4114727	521797			60	11
PM050	PM050	Captain Jack Sp 131	4113933	574538			1	0
371020116093201	PM050	Captain Jack Sp 131	4113933	574538	1717		11	2
SV003	SV003	Littlehuntercan Vega	4061417	424317	512	195705	818	150
371440115483301	PR004	Watertown 1 SW Cryst	4122437	605605	1401		86	16
PR004	PR004	Watertown 1 SW Cryst	4122437	605605			86	16
371539115500302	PR002	Watertown 1 SW Cryst	4122437	603381	1401		1382	254
PR002	PR002	Watertown 1 SW Cryst	4122437	603381			1382	254

Appendix B
Spring Discharge Data in Ash Meadows and Oasis Valley

Table B-1 Spring Discharge Data Set for the Ash Meadows Groundwater Discharge Area

Official ID	Alias Name	Reporting Name	Northing UTM Zone 11 (meters)	Easting UTM Zone 11 (meters)	Land Surface Elevation (meters)	Date	Discharge Rate (m³/d)	Discharge Rate (gpm)	DQE-F ^a	PTA-F ^b	STA-F ^c
ASH MEADOWS DISCHARGE AREA											
362535116244801	DV058	Ash Tree	4031200	552594	671	19620731	49.1	9.0	A	C	
362502116192301	DV093	Crystal Pool	4030574	560592	669	19530131	15344.5	2815.0	A	C	
362502116192301	DV093	Crystal Pool	4030574	560592	669	19590401	16918.6	3103.8	U	C	
362502116192301	DV093	Crystal Pool	4030574	560592	669	19610601	16249.5	2981.0	U	C	
362502116192301	DV093	Crystal Pool	4030574	560592	669	19620729	15393.5	2824.0	A	C	
362502116192301	DV093	Crystal Pool	4030574	560592	669	19701003	16154.5	2963.6	A	C	
362502116192301	DV093	Crystal Pool	4030574	560592	669	19701116	14135.2	2593.1	A	C	
362502116192301	DV093	Crystal Pool	4030574	560592	669	19701123	16318.2	2993.6	A	C	
362502116192301	DV093	Crystal Pool	4030574	560592	669	19701208	14571.8	2673.2	A	C	
362502116192301	DV093	Crystal Pool	4030574	560592	669	19701230	13480.3	2473.0	A	C	
362502116192301	DV093	Crystal Pool	4030574	560592	669	19710111	12388.8	2272.8	A	C	
362502116192301	DV093	Crystal Pool	4030574	560592	669	19730921	12934.5	2372.9	A	C	
362502116192301	DV093	Crystal Pool	4030574	560592	669	19750303	18010.1	3304.0	A	C	
362502116192301	DV093	Crystal Pool	4030574	560592	669	19820806	14626.4	2683.2	A	C	
362502116192301	DV093	Crystal Pool	4030574	560592	669	19860129	13916.9	2553.1	A	C	
362502116192301	DV093	Crystal Pool	4030574	560592	669	19870318	14189.8	2603.2	A	C	
362502116192301	DV093	Crystal Pool	4030574	560592	669	19870825	12443.3	2282.8	A	C	
362502116192301	DV093	Crystal Pool	4030574	560592	669	19880310	15445.0	2833.4	A	C	
362502116192301	DV093	Crystal Pool	4030574	560592	669	19890510	15008.4	2753.3	A	C	
362502116192301	DV093	Crystal Pool	4030574	560592	669	19900403	14626.4	2683.2	A	C	
362502116192301	DV093	Crystal Pool	4030574	560592	669	19900825	13425.7	2463.0	A	C	
362502116192301	DV093	Crystal Pool	4030574	560592	669	19901116	13698.6	2513.0	A	C	
362502116192301	DV093	Crystal Pool	4030574	560592	669	19910403	20848.0	3824.6	A	C	
362502116192301	DV093	Crystal Pool	4030574	560592	669	19910408	14680.9	2693.3	A	C	
362502116192301	DV093	Crystal Pool	4030574	560592	669	19910905	13753.2	2523.1	A	C	
362502116192301	DV093	Crystal Pool	4030574	560592	669	19911105	14135.2	2593.1	A	C	
362502116192301	DV093	Crystal Pool	4030574	560592	669	19920127	13862.3	2543.1	A	C	
362502116192301	DV093	Crystal Pool	4030574	560592	669	19920317	13262.0	2432.9	A	C	
362502116192301	DV093	Crystal Pool	4030574	560592	669	19920317	15608.7	2863.5	A	C	
362502116192301	DV093	Crystal Pool	4030574	560592	669	19920519	15772.5	2893.5	A	C	
362502116192301	DV093	Crystal Pool	4030574	560592	669	19920819	12716.2	2332.8	A	C	
362502116192301	DV093	Crystal Pool	4030574	560592	669	19921014	14080.6	2583.1	A	C	

Table B-1 Spring Discharge Data Set for the Ash Meadows Groundwater Discharge Area

Official ID	Alias Name	Reporting Name	Northing UTM Zone 11 (meters)	Easting UTM Zone 11 (meters)	Land Surface Elevation (meters)	Date	Discharge Rate (m ³ /d)	Discharge Rate (gpm)	DQE-F ^a	PTA-F ^b	STA-F ^c
362502116192301	DV093	Crystal Pool	4030574	560592	669	19921118	14080.6	2583.1	A	C	
362502116192301	DV093	Crystal Pool	4030574	560592	669	19930216	15990.8	2933.6	A	C	
362502116192301	DV093	Crystal Pool	4030574	560592	669	19930421	14026.0	2573.1	A	C	
362502116192301	DV093	Crystal Pool	4030574	560592	669	19930521	15172.1	2783.4	A	C	
362401116181101	DV107	Davis Ranch	4028369	562501	686	19620725	2164.0	397.0	A	C	
362401116181102	DV108	Davis Ranch	4028369	562501	684	19620725	27.3	5.0	A	C	
362401116181103	DV109	Davis Ranch	4028369	562501	686	19620725	163.7	30.0	A	C	
362120116162201	DV117	Last Chance	4023429	565253	693	19620728	5.5	1.0	A	C	
362354116174001	DV118		4028159	563275	701	19530202	283.8	52.1	A	C	
362354116174001	DV118		4028159	563275	701	19620725	60.0	11.0	A	C	
362554116184101	DV125		4031846	561729	701	19620723	92.8	17.0	A	C	
362145116161301	DV130	Bole	4024201	565472	693	19620727	65.5	12.0	A	C	
362532116181501	DV132	School	4031172	562381	716	19530000	136.4	25.0	A	C	
362532116181501	DV132	School	4031172	562381	716	19620724	32.8	6.0	A	C	
362230116162001	DV145	Big Spring	4025554	565162	683	19160101	6116.0	1122.0	U	C	
362230116162001	DV145	Big Spring	4025554	565162	683	19530202	5750.0	1054.9	A	C	
362230116162001	DV145	Big Spring	4025554	565162	683	19610601	5876.0	1078.0	U	C	
362230116162001	DV145	Big Spring	4025554	565162	683	19620726	5646.0	1035.8	A	C	
362230116162001	DV145	Big Spring	4025554	565162	683	19701117	5621.0	1031.2	A	C	
362230116162001	DV145	Big Spring	4025554	565162	683	19701123	4775.0	876.0	A	C	
362230116162001	DV145	Big Spring	4025554	565162	683	19701201	5267.0	966.2	A	C	
362230116162001	DV145	Big Spring	4025554	565162	683	19701208	5267.0	966.2	A	C	
362230116162001	DV145	Big Spring	4025554	565162	683	19701214	5316.0	975.2	A	C	
362230116162001	DV145	Big Spring	4025554	565162	683	19701229	6058.0	1111.4	A	C	
362230116162001	DV145	Big Spring	4025554	565162	683	19730921	5196.0	953.2	A	C	
362230116162001	DV145	Big Spring	4025554	565162	683	19731022	5621.0	1031.2	A	C	
362230116162001	DV145	Big Spring	4025554	565162	683	19750318	5239.0	961.1	A	C	
362230116162001	DV145	Big Spring	4025554	565162	683	19750402	5894.0	1081.3	A	C	
362230116162001	DV145	Big Spring	4025554	565162	683	19750430	5567.0	1021.3	A	C	
362230116162001	DV145	Big Spring	4025554	565162	683	19750602	5730.0	1051.2	A	C	
362230116162001	DV145	Big Spring	4025554	565162	683	19750701	4923.0	903.1	A	C	
362230116162001	DV145	Big Spring	4025554	565162	683	19750801	5217.0	957.1	A	C	
362230116162001	DV145	Big Spring	4025554	565162	683	19750904	4508.0	827.0	A	C	
362230116162001	DV145	Big Spring	4025554	565162	683	19751002	4481.0	822.1	A	C	

Table B-1 Spring Discharge Data Set for the Ash Meadows Groundwater Discharge Area

Official ID	Alias Name	Reporting Name	Northing UTM Zone 11 (meters)	Easting UTM Zone 11 (meters)	Land Surface Elevation (meters)	Date	Discharge Rate (m³/d)	Discharge Rate (gpm)	DQE-F ^a	PTA-F ^b	STA-F ^c
362230116162001	DV145	Big Spring	4025554	565162	683	19751105	5949.0	1091.4	A	C	
362230116162001	DV145	Big Spring	4025554	565162	683	19751202	4874.0	894.1	A	C	
362230116162001	DV145	Big Spring	4025554	565162	683	19751230	4579.0	840.0	A	C	
362230116162001	DV145	Big Spring	4025554	565162	683	19760203	4825.0	885.2	A	C	
362230116162001	DV145	Big Spring	4025554	565162	683	19760301	5621.0	1031.2	A	C	
362230116162001	DV145	Big Spring	4025554	565162	683	19760401	4825.0	885.2	A	C	
362230116162001	DV145	Big Spring	4025554	565162	683	19760504	5414.0	993.2	A	C	
362230116162001	DV145	Big Spring	4025554	565162	683	19760601	5239.0	961.1	A	C	
362230116162001	DV145	Big Spring	4025554	565162	683	19760709	4459.0	818.0	A	C	
362230116162001	DV145	Big Spring	4025554	565162	683	19760803	5316.0	975.2	A	C	
362230116162001	DV145	Big Spring	4025554	565162	683	19760902	4579.0	840.0	A	C	
362230116162001	DV145	Big Spring	4025554	565162	683	19761013	4093.0	750.9	A	C	
362230116162001	DV145	Big Spring	4025554	565162	683	19761101	4432.0	813.1	A	C	
362230116162001	DV145	Big Spring	4025554	565162	683	19761130	4950.0	908.1	A	C	
362230116162001	DV145	Big Spring	4025554	565162	683	19770104	4044.0	741.9	A	C	
362230116162001	DV145	Big Spring	4025554	565162	683	19770202	4628.0	849.0	A	C	
362230116162001	DV145	Big Spring	4025554	565162	683	19770302	5070.0	930.1	A	C	
362230116162001	DV145	Big Spring	4025554	565162	683	19770405	4628.0	849.0	A	C	
362230116162001	DV145	Big Spring	4025554	565162	683	19770504	4410.0	809.0	A	C	
362230116162001	DV145	Big Spring	4025554	565162	683	19770601	5119.0	939.1	A	C	
362230116162001	DV145	Big Spring	4025554	565162	683	19770609	5730.0	1051.2	A	C	
362230116162001	DV145	Big Spring	4025554	565162	683	19770706	5785.0	1061.3	A	C	
362230116162001	DV145	Big Spring	4025554	565162	683	19770708	6113.0	1121.4	A	C	
362230116162001	DV145	Big Spring	4025554	565162	683	19770802	4901.0	899.1	A	C	
362230116162001	DV145	Big Spring	4025554	565162	683	19770901	5288.0	970.1	A	C	
362230116162001	DV145	Big Spring	4025554	565162	683	19771003	5196.0	953.2	A	C	
362230116162001	DV145	Big Spring	4025554	565162	683	19771102	5512.0	1011.2	A	C	
362230116162001	DV145	Big Spring	4025554	565162	683	19771205	5070.0	930.1	A	C	
362230116162001	DV145	Big Spring	4025554	565162	683	19780111	4999.0	917.1	A	C	
362230116162001	DV145	Big Spring	4025554	565162	683	19780202	5021.0	921.1	A	C	
362230116162001	DV145	Big Spring	4025554	565162	683	19780314	4950.0	908.1	A	C	
362230116162001	DV145	Big Spring	4025554	565162	683	19780405	5119.0	939.1	A	C	
362230116162001	DV145	Big Spring	4025554	565162	683	19780510	4972.0	912.1	A	C	
362230116162001	DV145	Big Spring	4025554	565162	683	19780607	4901.0	899.1	A	C	

Table B-1 Spring Discharge Data Set for the Ash Meadows Groundwater Discharge Area

Official ID	Alias Name	Reporting Name	Northing UTM Zone 11 (meters)	Easting UTM Zone 11 (meters)	Land Surface Elevation (meters)	Date	Discharge Rate (m³/d)	Discharge Rate (gpm)	DQE-F ^a	PTA-F ^b	STA-F ^c
362230116162001	DV145	Big Spring	4025554	565162	683	19780706	4901.0	899.1	A	C	
362230116162001	DV145	Big Spring	4025554	565162	683	19780809	4901.0	899.1	A	C	
362230116162001	DV145	Big Spring	4025554	565162	683	19780911	4628.0	849.0	A	C	
362230116162001	DV145	Big Spring	4025554	565162	683	19781003	4333.0	794.9	A	C	
362230116162001	DV145	Big Spring	4025554	565162	683	19781102	4677.0	858.0	A	C	
362230116162001	DV145	Big Spring	4025554	565162	683	19781201	5239.0	961.1	A	C	
362230116162001	DV145	Big Spring	4025554	565162	683	19790110	5288.0	970.1	A	C	
362230116162001	DV145	Big Spring	4025554	565162	683	19790208	5119.0	939.1	A	C	
362230116162001	DV145	Big Spring	4025554	565162	683	19790306	5894.0	1081.3	A	C	
362230116162001	DV145	Big Spring	4025554	565162	683	19790413	4999.0	917.1	A	C	
362230116162001	DV145	Big Spring	4025554	565162	683	19790503	5168.0	948.1	A	C	
362230116162001	DV145	Big Spring	4025554	565162	683	19790614	5621.0	1031.2	A	C	
362230116162001	DV145	Big Spring	4025554	565162	683	19790702	4655.0	854.0	A	C	
362230116162001	DV145	Big Spring	4025554	565162	683	19790803	5070.0	930.1	A	C	
362230116162001	DV145	Big Spring	4025554	565162	683	19791003	5070.0	930.1	A	C	
362230116162001	DV145	Big Spring	4025554	565162	683	19800107	5119.0	939.1	A	C	
362230116162001	DV145	Big Spring	4025554	565162	683	19800408	5458.0	1001.3	A	C	
362230116162001	DV145	Big Spring	4025554	565162	683	19800708	4852.0	890.1	A	C	
362230116162001	DV145	Big Spring	4025554	565162	683	19801007	4874.0	894.1	A	C	
362230116162001	DV145	Big Spring	4025554	565162	683	19810106	5316.0	975.2	A	C	
362230116162001	DV145	Big Spring	4025554	565162	683	19810401	4999.0	917.1	A	C	
362230116162001	DV145	Big Spring	4025554	565162	683	19810606	5217.0	957.1	A	C	
362230116162001	DV145	Big Spring	4025554	565162	683	19810701	4579.0	840.0	A	C	
362230116162001	DV145	Big Spring	4025554	565162	683	19810901	4579.0	840.0	A	C	
362230116162001	DV145	Big Spring	4025554	565162	683	19811001	4754.0	872.1	A	C	
362230116162001	DV145	Big Spring	4025554	565162	683	19811007	4704.0	863.0	A	C	
362230116162001	DV145	Big Spring	4025554	565162	683	19820407	5239.0	961.1	A	C	
362230116162001	DV145	Big Spring	4025554	565162	683	19820701	4852.0	890.1	A	C	
362230116162001	DV145	Big Spring	4025554	565162	683	19830210	5458.0	1001.3	A	C	
362230116162001	DV145	Big Spring	4025554	565162	683	19830609	4999.0	917.1	A	C	
362230116162001	DV145	Big Spring	4025554	565162	683	19860115	4874.0	894.1	A	C	
362230116162001	DV145	Big Spring	4025554	565162	683	19890726	5288.0	970.1	A	C	
362230116162001	DV145	Big Spring	4025554	565162	683	19910408	4213.0	772.9	A	C	
362230116162001	DV145	Big Spring	4025554	565162	683	19910924	5365.0	984.2	A	C	

Table B-1 Spring Discharge Data Set for the Ash Meadows Groundwater Discharge Area

Official ID	Alias Name	Reporting Name	Northing UTM Zone 11 (meters)	Easting UTM Zone 11 (meters)	Land Surface Elevation (meters)	Date	Discharge Rate (m³/d)	Discharge Rate (gpm)	DQE-F ^a	PTA-F ^b	STA-F ^c
362230116162001	DV145	Big Spring	4025554	565162	683	19920127	5458.0	1001.3	A	C	
362230116162001	DV145	Big Spring	4025554	565162	683	19920317	5316.0	975.2	A	C	
362230116162001	DV145	Big Spring	4025554	565162	683	19920519	4557.0	836.0	A	C	
362230116162001	DV145	Big Spring	4025554	565162	683	19920731	5387.0	988.3	A	C	
362230116162001	DV145	Big Spring	4025554	565162	683	19920819	3700.0	678.8	A	C	
362230116162001	DV145	Big Spring	4025554	565162	683	19920827	6058.0	1111.4	A	C	
362230116162001	DV145	Big Spring	4025554	565162	683	19921001	6058.0	1111.4	A	C	
362230116162001	DV145	Big Spring	4025554	565162	683	19921104	6222.0	1141.4	A	C	
362230116162001	DV145	Big Spring	4025554	565162	683	19921118	5512.0	1011.2	A	C	
362230116162001	DV145	Big Spring	4025554	565162	683	19921130	6058.0	1111.4	A	C	
362230116162001	DV145	Big Spring	4025554	565162	683	19921231	5621.0	1031.2	A	C	
362230116162001	DV145	Big Spring	4025554	565162	683	19930126	5785.0	1061.3	A	C	
362230116162001	DV145	Big Spring	4025554	565162	683	19930216	5458.0	1001.3	A	C	
362230116162001	DV145	Big Spring	4025554	565162	683	19930225	5267.0	966.2	A	C	
362230116162001	DV145	Big Spring	4025554	565162	683	19930329	5730.0	1051.2	A	C	
362230116162001	DV145	Big Spring	4025554	565162	683	19930429	6113.0	1121.4	A	C	
362230116162001	DV145	Big Spring	4025554	565162	683	19930521	6931.0	1271.5	A	C	
362557116181301	DV147		4031943	562425	724	19530203	480.3	88.1	A	C	
362557116181301	DV147		4031943	562425	724	19620724	764.1	140.2	A	C	
362751116192701	DV148	Longstreet Spring	4035811	560431	704	19210327	7094.9	1301.6	U	C	
362751116192701	DV148	Longstreet Spring	4035811	560431	704	19530203	6549.1	1201.5	A	C	
362751116192701	DV148	Longstreet Spring	4035811	560431	704	19610601	7094.9	1301.6	U	C	
362751116192701	DV148	Longstreet Spring	4035811	560431	704	19620729	5457.6	1001.2	A	C	
362751116192701	DV148	Longstreet Spring	4035811	560431	704	19701022	5457.6	1001.2	A	C	
362751116192701	DV148	Longstreet Spring	4035811	560431	704	19701123	5457.6	1001.2	A	C	
362751116192701	DV148	Longstreet Spring	4035811	560431	704	19710415	5130.1	941.1	A	C	
362751116192701	DV148	Longstreet Spring	4035811	560431	704	19710520	6003.4	1101.3	A	C	
362751116192701	DV148	Longstreet Spring	4035811	560431	704	19710715	6003.4	1101.3	A	C	
362751116192701	DV148	Longstreet Spring	4035811	560431	704	19710909	5130.1	941.1	A	C	
362751116192701	DV148	Longstreet Spring	4035811	560431	704	19711008	6003.4	1101.3	A	C	
362751116192701	DV148	Longstreet Spring	4035811	560431	704	19711101	5457.6	1001.2	A	C	
362751116192701	DV148	Longstreet Spring	4035811	560431	704	19820806	4366.1	801.0	A	NC	DT
362751116192701	DV148	Longstreet Spring	4035811	560431	704	19850123	4366.1	801.0	A	NC	DT
362751116192701	DV148	Longstreet Spring	4035811	560431	704	19860128	4366.1	801.0	A	NC	DT

Table B-1 Spring Discharge Data Set for the Ash Meadows Groundwater Discharge Area

Official ID	Alias Name	Reporting Name	Northing UTM Zone 11 (meters)	Easting UTM Zone 11 (meters)	Land Surface Elevation (meters)	Date	Discharge Rate (m³/d)	Discharge Rate (gpm)	DQE-F ^a	PTA-F ^b	STA-F ^c
362751116192701	DV148	Longstreet Spring	4035811	560431	704	19870315	4911.8	901.1	A	NC	DT
362751116192701	DV148	Longstreet Spring	4035811	560431	704	19870825	3820.3	700.8	A	NC	DT
362751116192701	DV148	Longstreet Spring	4035811	560431	704	19880310	1910.2	350.4	A	NC	DT
362751116192701	DV148	Longstreet Spring	4035811	560431	704	19900403	2292.2	420.5	A	NC	DT
362751116192701	DV148	Longstreet Spring	4035811	560431	704	19901116	3274.6	600.7	A	NC	DT
362751116192701	DV148	Longstreet Spring	4035811	560431	704	19910403	3820.3	700.8	A	NC	DT
362751116192701	DV148	Longstreet Spring	4035811	560431	704	19911105	2728.8	500.6	A	NC	DT
362751116192701	DV148	Longstreet Spring	4035811	560431	704	19920317	1964.7	360.4	A	NC	DT
362751116192701	DV148	Longstreet Spring	4035811	560431	704	19921014	2728.8	500.6	A	NC	DT
362751116192701	DV148	Longstreet Spring	4035811	560431	704	19930421	2346.8	430.5	A	NC	DT
362924116203001	DV150	Fairbanks	4038359	559020	686	19100101	12848.0	2357.0	U	C	
362924116203001	DV150	Fairbanks	4038359	559020	686	19230714	11136.5	2043.0	U	C	
362924116203001	DV150	Fairbanks	4038359	559020	686	19460816	9572.0	1756.0	U	C	
362924116203001	DV150	Fairbanks	4038359	559020	686	19530201	9054.0	1661.0	A	C	
362924116203001	DV150	Fairbanks	4038359	559020	686	19610601	9277.5	1702.0	U	C	
362924116203001	DV150	Fairbanks	4038359	559020	686	19620723	9348.5	1715.0	A	C	
362924116203001	DV150	Fairbanks	4038359	559020	686	19701116	7259.0	1331.7	A	NC	NT
362924116203001	DV150	Fairbanks	4038359	559020	686	19701124	7040.0	1291.5	A	NC	NT
362924116203001	DV150	Fairbanks	4038359	559020	686	19701230	7040.0	1291.5	A	NC	NT
362924116203001	DV150	Fairbanks	4038359	559020	686	19710111	7149.0	1311.5	A	NC	NT
362924116203001	DV150	Fairbanks	4038359	559020	686	19750618	6003.0	1101.3	A	NC	NT
362924116203001	DV150	Fairbanks	4038359	559020	686	19750701	6222.0	1141.4	A	NC	NT
362924116203001	DV150	Fairbanks	4038359	559020	686	19750801	6931.0	1271.5	A	NC	NT
362924116203001	DV150	Fairbanks	4038359	559020	686	19750904	7422.0	1361.6	A	NC	NT
362924116203001	DV150	Fairbanks	4038359	559020	686	19751002	6986.0	1281.6	A	NC	NT
362924116203001	DV150	Fairbanks	4038359	559020	686	19751106	6113.0	1121.4	A	NC	NT
362924116203001	DV150	Fairbanks	4038359	559020	686	19751202	6986.0	1281.6	A	NC	NT
362924116203001	DV150	Fairbanks	4038359	559020	686	19760203	6440.0	1181.4	A	NC	NT
362924116203001	DV150	Fairbanks	4038359	559020	686	19760302	6713.0	1231.5	A	NC	NT
362924116203001	DV150	Fairbanks	4038359	559020	686	19760401	8350.0	1531.8	A	NC	NT
362924116203001	DV150	Fairbanks	4038359	559020	686	19760504	7313.0	1341.6	A	NC	NT
362924116203001	DV150	Fairbanks	4038359	559020	686	19760601	7149.0	1311.5	A	NC	NT
362924116203001	DV150	Fairbanks	4038359	559020	686	19760701	7586.0	1391.7	A	NC	NT
362924116203001	DV150	Fairbanks	4038359	559020	686	19760804	7750.0	1421.8	A	NC	NT

Table B-1 Spring Discharge Data Set for the Ash Meadows Groundwater Discharge Area

Official ID	Alias Name	Reporting Name	Northing UTM Zone 11 (meters)	Easting UTM Zone 11 (meters)	Land Surface Elevation (meters)	Date	Discharge Rate (m ³ /d)	Discharge Rate (gpm)	DQE-F ^a	PTA-F ^b	STA-F ^c
362924116203001	DV150	Fairbanks	4038359	559020	686	19760903	7422.0	1361.6	A	NC	NT
362924116203001	DV150	Fairbanks	4038359	559020	686	19761014	7804.0	1431.7	A	NC	NT
362924116203001	DV150	Fairbanks	4038359	559020	686	19761102	7259.0	1331.7	A	NC	NT
362924116203001	DV150	Fairbanks	4038359	559020	686	19761201	8186.0	1501.7	A	NC	NT
362924116203001	DV150	Fairbanks	4038359	559020	686	19770105	8296.0	1521.9	A	NC	NT
362924116203001	DV150	Fairbanks	4038359	559020	686	19770202	8350.0	1531.8	A	NC	NT
362924116203001	DV150	Fairbanks	4038359	559020	686	19770301	8350.0	1531.8	A	NC	NT
362924116203001	DV150	Fairbanks	4038359	559020	686	19770404	7859.0	1441.8	A	NC	NT
362924116203001	DV150	Fairbanks	4038359	559020	686	19770503	7641.0	1401.8	A	NC	NT
362924116203001	DV150	Fairbanks	4038359	559020	686	19770601	8405.0	1541.9	A	NC	NT
362924116203001	DV150	Fairbanks	4038359	559020	686	19770706	8186.0	1501.7	A	NC	NT
362924116203001	DV150	Fairbanks	4038359	559020	686	19770801	8186.0	1501.7	A	NC	NT
362924116203001	DV150	Fairbanks	4038359	559020	686	19770901	8350.0	1531.8	A	NC	NT
362924116203001	DV150	Fairbanks	4038359	559020	686	19771003	8568.0	1571.8	A	NC	NT
362924116203001	DV150	Fairbanks	4038359	559020	686	19771101	8186.0	1501.7	A	NC	NT
362924116203001	DV150	Fairbanks	4038359	559020	686	19771205	8568.0	1571.8	A	NC	NT
362924116203001	DV150	Fairbanks	4038359	559020	686	19780103	8732.0	1601.9	A	NC	NT
362924116203001	DV150	Fairbanks	4038359	559020	686	19780201	8186.0	1501.7	A	NC	NT
362924116203001	DV150	Fairbanks	4038359	559020	686	19780314	8459.0	1551.8	A	NC	NT
362924116203001	DV150	Fairbanks	4038359	559020	686	19780405	9060.0	1662.1	A	NC	NT
362924116203001	DV150	Fairbanks	4038359	559020	686	19780510	9060.0	1662.1	A	NC	NT
362924116203001	DV150	Fairbanks	4038359	559020	686	19780606	8186.0	1501.7	A	NC	NT
362924116203001	DV150	Fairbanks	4038359	559020	686	19780706	8787.0	1612.0	A	NC	NT
362924116203001	DV150	Fairbanks	4038359	559020	686	19780809	8241.0	1511.8	A	NC	NT
362924116203001	DV150	Fairbanks	4038359	559020	686	19780907	8405.0	1541.9	A	NC	NT
362924116203001	DV150	Fairbanks	4038359	559020	686	19781002	8732.0	1601.9	A	NC	NT
362924116203001	DV150	Fairbanks	4038359	559020	686	19781102	8841.0	1621.9	A	NC	NT
362924116203001	DV150	Fairbanks	4038359	559020	686	19781130	8896.0	1632.0	A	NC	NT
362924116203001	DV150	Fairbanks	4038359	559020	686	19790110	9060.0	1662.1	A	NC	NT
362924116203001	DV150	Fairbanks	4038359	559020	686	19790208	9442.0	1732.2	A	NC	NT
362924116203001	DV150	Fairbanks	4038359	559020	686	19790306	9387.0	1722.1	A	NC	NT
362924116203001	DV150	Fairbanks	4038359	559020	686	19790413	8841.0	1621.9	A	NC	NT
362924116203001	DV150	Fairbanks	4038359	559020	686	19790503	8841.0	1621.9	A	NC	NT
362924116203001	DV150	Fairbanks	4038359	559020	686	19790702	8732.0	1601.9	A	NC	NT

Table B-1 Spring Discharge Data Set for the Ash Meadows Groundwater Discharge Area

Official ID	Alias Name	Reporting Name	Northing UTM Zone 11 (meters)	Easting UTM Zone 11 (meters)	Land Surface Elevation (meters)	Date	Discharge Rate (m ³ /d)	Discharge Rate (gpm)	DQE-F ^a	PTA-F ^b	STA-F ^c
362924116203001	DV150	Fairbanks	4038359	559020	686	19790803	8678.0	1592.0	A	NC	NT
362924116203001	DV150	Fairbanks	4038359	559020	686	19791003	8678.0	1592.0	A	NC	NT
362924116203001	DV150	Fairbanks	4038359	559020	686	19791206	8787.0	1612.0	A	NC	NT
362924116203001	DV150	Fairbanks	4038359	559020	686	19800107	8787.0	1612.0	A	NC	NT
362924116203001	DV150	Fairbanks	4038359	559020	686	19800313	8623.0	1581.9	A	NC	NT
362924116203001	DV150	Fairbanks	4038359	559020	686	19800408	8623.0	1581.9	A	NC	NT
362924116203001	DV150	Fairbanks	4038359	559020	686	19800508	8568.0	1571.8	A	NC	NT
362924116203001	DV150	Fairbanks	4038359	559020	686	19800605	8405.0	1541.9	A	NC	NT
362924116203001	DV150	Fairbanks	4038359	559020	686	19801007	8623.0	1581.9	A	NC	NT
362924116203001	DV150	Fairbanks	4038359	559020	686	19801104	8623.0	1581.9	A	NC	NT
362924116203001	DV150	Fairbanks	4038359	559020	686	19801202	8787.0	1612.0	A	NC	NT
362924116203001	DV150	Fairbanks	4038359	559020	686	19810312	8896.0	1632.0	A	NC	NT
362924116203001	DV150	Fairbanks	4038359	559020	686	19810606	9278.0	1702.1	A	NC	NT
362924116203001	DV150	Fairbanks	4038359	559020	686	19810701	8732.0	1601.9	A	NC	NT
362924116203001	DV150	Fairbanks	4038359	559020	686	19810801	8732.0	1601.9	A	NC	NT
362924116203001	DV150	Fairbanks	4038359	559020	686	19810901	8732.0	1601.9	A	NC	NT
362924116203001	DV150	Fairbanks	4038359	559020	686	19811001	8732.0	1601.9	A	NC	NT
362924116203001	DV150	Fairbanks	4038359	559020	686	19820111	8514.0	1561.9	A	NC	NT
362924116203001	DV150	Fairbanks	4038359	559020	686	19820407	9278.0	1702.1	A	NC	NT
362924116203001	DV150	Fairbanks	4038359	559020	686	19820701	9387.0	1722.1	A	NC	NT
362924116203001	DV150	Fairbanks	4038359	559020	686	19830210	9605.0	1762.1	A	NC	NT
362924116203001	DV150	Fairbanks	4038359	559020	686	19830318	8732.0	1601.9	A	NC	NT
362924116203001	DV150	Fairbanks	4038359	559020	686	19830609	9169.0	1682.1	A	NC	NT
362924116203001	DV150	Fairbanks	4038359	559020	686	19880726	8623.0	1581.9	A	NC	NT
362924116203001	DV150	Fairbanks	4038359	559020	686	19890726	8405.0	1541.9	A	NC	NT
362924116203001	DV150	Fairbanks	4038359	559020	686	19900821	6113.0	1121.4	A	NC	NT
362924116203001	DV150	Fairbanks	4038359	559020	686	19910408	7914.0	1451.8	A	NC	NT
362924116203001	DV150	Fairbanks	4038359	559020	686	19910826	9060.0	1662.1	A	NC	NT
362924116203001	DV150	Fairbanks	4038359	559020	686	19920127	8841.0	1621.9	A	NC	NT
362924116203001	DV150	Fairbanks	4038359	559020	686	19920318	8787.0	1612.0	A	NC	NT
362924116203001	DV150	Fairbanks	4038359	559020	686	19920818	9060.0	1662.1	A	NC	NT
362924116203001	DV150	Fairbanks	4038359	559020	686	19921117	9442.0	1732.2	A	NC	NT
362924116203001	DV150	Fairbanks	4038359	559020	686	19930520	4093.0	750.9	A	NC	NT
362142116154701	DV158	Brahma	4024113	566120	701	19620728	5.5	1.0	A	C	

Table B-1 Spring Discharge Data Set for the Ash Meadows Groundwater Discharge Area

Official ID	Alias Name	Reporting Name	Northing UTM Zone 11 (meters)	Easting UTM Zone 11 (meters)	Land Surface Elevation (meters)	Date	Discharge Rate (m³/d)	Discharge Rate (gpm)	DQE-F ^a	PTA-F ^b	STA-F ^c
362848116195901	DV162	Bell	4037193	559749	671	19620731	431.2	79.1	A	C	
362723116184101	DV182		4034588	561709	732	19530203	627.6	115.1	A	C	
362723116184101	DV182		4034588	561709	732	19620723	1053.3	193.2	A	C	
362835116192101	DV188	Rogers Spring	4037136	560422	693	19620729	4012.0	736.0	A	C	
362835116192101	DV188	Rogers Spring	4037136	560422	693	19820806	3274.6	600.7	A	C	
362835116192101	DV188	Rogers Spring	4037136	560422	693	19850123	5457.6	1001.2	A	C	
362835116192101	DV188	Rogers Spring	4037136	560422	693	19860128	3274.6	600.7	A	C	
362835116192101	DV188	Rogers Spring	4037136	560422	693	19870318	764.1	140.2	A	NC	AL
362835116192101	DV188	Rogers Spring	4037136	560422	693	19870825	709.5	130.2	A	NC	AL
362835116192101	DV188	Rogers Spring	4037136	560422	693	19880310	873.2	160.2	A	NC	AL
362835116192101	DV188	Rogers Spring	4037136	560422	693	19890510	2728.8	500.6	A	C	
362835116192101	DV188	Rogers Spring	4037136	560422	693	19900403	2728.8	500.6	A	C	
362835116192101	DV188	Rogers Spring	4037136	560422	693	19901116	2728.8	500.6	A	C	
362835116192101	DV188	Rogers Spring	4037136	560422	693	19910403	3820.3	700.8	A	C	
362835116192101	DV188	Rogers Spring	4037136	560422	693	19911105	2292.2	420.5	A	C	
362835116192101	DV188	Rogers Spring	4037136	560422	693	19920317	2728.8	500.6	A	C	
362835116192101	DV188	Rogers Spring	4037136	560422	693	19921014	3820.3	700.8	A	C	
362835116192101	DV188	Rogers Spring	4037136	560422	693	19930421	2728.8	500.6	A	C	
362407116162401	DV194	King; Point of Rock	4028267	565366	716	19430717	11599.5	2128.0	U	C	
362407116162401	DV194	King; Point of Rock	4028267	565366	716	19530131	6797.5	1247.0	A	C	
362407116162401	DV194	King; Point of Rock	4028267	565366	716	19610600	3734.0	685.0	U	C	
362407116162401	DV194	King; Point of Rock	4028267	565366	716	19620725	5876.0	1078.0	A	C	
362343116160802	DV197	Indian Rock	4027837	565569	716	19620725	120.1	22.0	A	C	
362343116160803	DV198	Indian Rock	4027837	565569	716	19620726	2068.4	379.5	A	C	
362343116160804	DV199		4027837	565569	715	19620726	103.7	19.0	A	C	
362343116160805	DV200		4027837	565569	716	19620726	10.9	2.0	A	C	
362405116161305	DV208	Jack Rabbit	4027000	564828	701	19530201	2714.5	498.0	A	C	
362405116161305	DV208	Jack Rabbit	4027000	564828	701	19620727	3200.0	587.0	A	C	
362405116161305	DV208	Jack Rabbit	4027000	564828	701	19810701	2947.1	540.7	A	C	
362405116161305	DV208	Jack Rabbit	4027000	564828	701	19810801	3001.7	550.7	A	C	
362405116161305	DV208	Jack Rabbit	4027000	564828	701	19810901	2947.1	540.7	A	C	
362405116161305	DV208	Jack Rabbit	4027000	564828	701	19811001	3083.5	565.7	A	C	

Table B-1 Spring Discharge Data Set for the Ash Meadows Groundwater Discharge Area

Official ID	Alias Name	Reporting Name	Northing UTM Zone 11 (meters)	Easting UTM Zone 11 (meters)	Land Surface Elevation (meters)	Date	Discharge Rate (m³/d)	Discharge Rate (gpm)	DQE-F ^a	PTA-F ^b	STA-F ^c
OASIS VALLEY DISCHARGE AREA											
370214116452701	PM002	Springdale Ranch (Owner)	4098424	521843	1213	19620314	136	24.9	A	C	
BT059	BT059		4082064	522030			546	100.2	U	C	
BT060	BT060		4082065	522278	975		545	100.0	U	C	
365503116444101	BT095	Beatty Municipal Springs	4085546	522742	1027	19560222	546	100.2	A	C	
365636116430801	BT121	Circle C Ranch (Owner)	4088416	524169	1085	19620314	136	24.9	A	C	
BT128	BT128		4089160	525227	1061		191	35.0	U	C	
BT100	BT100	Upper Indian Springs	4090084	524977	1280	19620316	27	5.0	A	C	
365749116431101	BT141		4090668	524954	1085	19620314	546	100.2	A	C	
365804116432101	BT146	Rancho Trueba (Owner)	4091129	524706	1084	19620314	546	100.2	A	C	
BT159	BT159	29 Hot Springs	4091655	524997			6	1.1	U	C	
BT177	BT177	25Qbm 1	4094522	525211			55	10.1	U	C	
365810116425101	BT158	Hot Springs	4091869	524778	1097	19620314	27	5.0	A	C	
BT083	BT083	Currie Well	4091932	524724	1366	19620314	1	0.2	A	C	
365856116453701	BT136	Crystal Springs	4093217	522030	1250	19620314	14	2.6	A	C	
BT178	BT178		4094093	525954	1158		267	49.0	U	C	
370002116430101	PM016	Torrance (Owner)	4094210	524573	1128	19620314	55	10.1	A	C	
370003116424501	PM018	Gross Springs	4094800	526128	1189	19620314	341	62.6	A	C	
PM013	PM013		4095629	524466	1122		55	10.1	U	C	
370057116451901	PM001	Unknown	4096458	524072	1231	19620314	38	7.0	A	C	
PM015	PM015	Long Spring	4097787	524954	1183		1390	255.0	U	C	
370154116430201	PM017	Campbell (Owner)	4097787	525156	1204	19620314	82	15.0	A	C	
370450116412401	PM026	Fleur-de-Lis Ranch (Owner)	4102958	532647	1250	19620314	273	50.1	A	C	
PM025	PM025	Susie Kimbell	4103034	527408			546	100.2	U	C	

^a Data Quality Evaluation Flag

^b Primary Temporal Analysis Flag

^c Secondary Temporal Analysis Flag

Table B-2 Predevelopment Spring Discharge in Ash Meadows

Official ID	Alias Name	Reporting Name	Northing UTM Zone 11 (meters)	Easting UTM Zone 11 (meters)	Average Discharge (m3/d)	Average Discharge (gpm)	Total Number of Records ^a	Number of records used ^b	Land Surface Elevation (meters)
362535116244801	DV058	Ash Tree	4031200	552594	49	9	1	1	671
362502116192301	DV093	Crystal Pool	4030574	560592	14779	2711	35	35	669
362401116181101	DV107	Davis Ranch	4028369	562501	2164	397	1	1	686
362401116181102	DV108	Davis Ranch	4028369	562501	27	5	1	1	684
362401116181103	DV109	Davis Ranch	4028369	562501	164	30	1	1	686
362120116162201	DV117	Last Chance	4023429	565253	5	1	1	1	693
362354116174001	DV118		4028159	563275	172	32	2	2	701
362554116184101	DV125		4031846	561729	93	17	1	1	701
362145116161301	DV130	Bole	4024201	565472	65	12	1	1	693
362532116181501	DV132	School	4031172	562381	85	16	2	2	716
362230116162001	DV145	Big Spring	4025554	565162	5183	951	105	105	683
362557116181301	DV147		4031943	562425	622	114	2	2	724
362751116192701	DV148	Longstreet Spring	4035811	560431	5903	1083	25	12	704
362920116203001	DV150	Fairbanks	4038359	559020	10206	1872	91	5	686
362142116154701	DV158	Brahma	4024113	566120	5	1	1	1	701
362848116195901	DV162	Bell	4037193	559749	431	79	1	1	671
362723116184101	DV182		4034588	561709	840	154	2	2	732
362835116192101	DV188	Rogers Spring	4037136	560422	3300	605	15	12	693
362407116162401	DV194	King; Point of Rock	4028267	565366	7002	1284	4	2	716
362343116160802	DV197	Indian Rock	4027837	565569	120	22	1	1	716
362343116160803	DV198	Indian Rock	4027837	565569	2068	379	1	1	716
362343116160804	DV199		4027837	565569	104	19	1	1	715
362343116160805	DV200		4027837	565569	11	2	1	1	716
362405116161305	DV208	Jack Rabbit	4027000	564828	2982	547	6	6	701

^a Total number of spring discharge records available

^b Number of spring discharge records used to calculate average.

Total Discharge = 56382 cubic meters/day
Total Discharge = 10343 gallons/minute
Total Discharge = 16684 acre-feet/year

Table B-3 Predevelopment Spring Discharge in the Oasis Valley Discharge Area

Official ID	Alias Name	Reporting Name	Northing UTM Zone 11 (meters)	Easting UTM Zone 11 (meters)	REC. REP NO	Discharge (m3/d) ^a	Discharge (gpm) ^a	Land Surface Elevation (meters)
BT059	BT059		4082064	522030		546	100	
BT060	BT060		4082065	522278		545	100	975
BT083	BT083	Currie Well	4091932	524724	19620314	1	0	1366
365503116444101	BT095	Beatty Municipal Springs	4085546	522742	19560222	546	100	1027
BT100	BT100	Upper Indian Springs	4090084	524977	19620316	27	5	1280
365636116430801	BT121	Circle C Ranch (Owner)	4088416	524169	19620314	136	25	1085
BT128	BT128		4089160	525227		191	35	1061
365856116453701	BT136	Crystal Springs	4093217	522030	19620314	14	3	1250
365749116431101	BT141		4090668	524954	19620314	546	100	1085
365804116432101	BT146	Rancho Trueba (Owner)	4091129	524706	19620314	546	100	1084
365810116425101	BT158	Hot Springs	4091869	524778	19620314	27	5	1097
BT159	BT159	29 Hot Springs	4091655	524997		6	1	
BT177	BT177	25Qbm 1	4094522	525211		55	10.1	
BT178	BT178		4094093	525954		267	49	1158
370057116451901	PM001	Unknown	4096458	524072	19620314	38	7	1231
370214116452701	PM002	Springdale Ranch (Owner)	4098424	521843	19620314	136	25	1213
PM013	PM013		4095629	524466		55	10	1122
PM015	PM015	Long Spring	4097787	524954		1390	255	1183
370002116430101	PM016	Torrance (Owner)	4094210	524573	19620314	55	10	1128
370154116430201	PM017	Campbell (Owner)	4097787	525156	19620314	82	15	1204
370003116424501	PM018	Gross Springs	4094800	526128	19620314	341	63	1189
PM025	PM025	Susie Kimbell	4103034	527408		546	100	
370450116412401	PM026	Fleur-de-Lis Ranch (Owner)	4102958	532647	19620314	273	50	1250

^a Only one spring discharge record was available per spring. The single value is used in place of an average

Total Discharge =	6369	cubic meters/day
Total Discharge =	1168	gallons/minute
Total Discharge =	1885	acre-feet/year

EXPLANATION:

- 27 Station Number
- Location of Precipitation Station (Desert Research Institute)
- 3.35 Average Annual Precipitation (in/yr [to convert to cm/yr multiply by 2.54])
- 21 Number of Records (years)
- 8.0 Precipitation Contour (in/yr [to convert to cm/yr multiply by 2.54])
- 230 Hydrographic Area Identifier
- Boundary of Hydrographic Area
- Boundary of the Nevada Test Site Regional Groundwater Flow System
- Nevada Test Site Boundary
- Digital Elevation Model (U.S. Geological Survey)

Coordinates: UTM Zone 11, NAD 27
Scale: 1:500,000

DRAWN BY	A. Burns	10-7-96	COMPUTER GENERATED DRAWING NO MANUAL CHANGES ALLOWED
DRAFT CHK	A. Burns	10-8-96	PROJ NO. 768693.02010103
PROJ CHK	D. Driol	10-8-96	DIR. NAME c:\smithers\nts\dgn
PROJ MGR	J. Eberlin	10-10-96	FILE NAME hrdmnz1.dgn

PREPARED FOR
UNITED STATES DEPARTMENT OF ENERGY
NEVADA OPERATIONS OFFICE (DOE/NV)
NEVADA ENVIRONMENTAL RESTORATION PROJECT
LAS VEGAS, NEVADA

TITLE
PLATE 1
Precipitation Map for the Nevada Test Site Region
(Adapted from Nevada Precipitation Map Prepared
by George Hardman, 1965; and Climate of the Death
Valley Region, Nevada/California, John James, 1993).

EXPLANATION:

- 0.16** Recharge Contour (in/yr [to convert to cm/yr multiply by 2.54])
- - - Boundary of the Nevada Test Site Regional Groundwater Flow System
- Nevada Test Site Boundary
- Digital Elevation Model (U.S. Geological Survey)

Coordinates: UTM Zone 11, NAD 27
Scale: 1:500,000

DRAWN BY:	A. Burns	10-14-96	COMPUTER GENERATED DRAWING NO MANUAL CHANGES ALLOWED	PREPARED FOR	UNITED STATES DEPARTMENT OF ENERGY NEVADA OPERATIONS OFFICE (DOE/NVI) NEVADA ENVIRONMENTAL RESTORATION PROJECT LAS VEGAS, NEVADA	TITLE	PLATE 2
DRAFT CHK	A. Burns	10-15-96	PROJ NO. 768693.02010103			Distribution of Groundwater Recharge in the Nevada Test Site Region, Using Moxey-Eakin Coefficients	
PROJ CHK	O. Drici	10-15-96	DIR. NAME c:\smithers\nts\dgn				
PROJ MGR	J. Eberlin	10-16-96	FILE NAME rchrgz1.dgn

EXPLANATION:

- Crater Flat 229 Hydrographic Area Name
- Hydrographic Area Identifier
- Boundary of Hydrographic Area
- Nevada Test Site boundary
- Canyon wash recharge areas
- Upland canyon and valley
- Mountain front
- Valley bottom

DRAWN BY	A. Burns	10-14-96	COMPUTER GENERATED DRAWING NO MANUAL CHANGES ALLOWED
DRAFT CHK	O. Driscoll	10-15-96	PROJ NO. 768693.02010103
PROJ CHK	O. Driscoll	10-16-96	DIR. NAME c:\smithers\nts\dgn
PROJ MGR	J. Eberlin	10-16-96	FILE NAME re_rchrgl.dgn

PREPARED FOR	UNITED STATES DEPARTMENT OF ENERGY NEVADA OPERATIONS OFFICE (DOE/NV) NEVADA ENVIRONMENTAL RESTORATION PROJECT LAS VEGAS, NEVADA
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TITLE	PLATE 3 Potential Recharge Redistribution Areas in the Nevada Test Site Region
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