

LEVEL I WATER-QUALITY INVENTORY,
SALINAS PUEBLO MISSIONS NATIONAL MONUMENT,
NEW MEXICO

U.S. GEOLOGICAL SURVEY

Prepared for the

NATIONAL PARK SERVICE

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OTHER FILES ON DISK

1. WQDATA.XLS
2. PARAMETER.DOC
3. STATIONS.XLS
4. README.DOC

CONVERSION FACTORS AND VERTICAL DATUM

Multiply	By	To obtain
foot	0.3048	meter
mile	1.609	kilometer
cubic foot per second	0.02832	cubic meter per second

Temperature in degrees Celsius (°C) can be converted to degrees Fahrenheit (°F) as follows:

$$^{\circ}\text{F} = 1.8 (^{\circ}\text{C}) + 32$$

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ABSTRACT

Data are presented in this report on values and concentrations of alkalinity, specific conductance, dissolved oxygen, pH, temperature, dissolved sulfate, dissolved phosphate, dissolved ammonia, dissolved nitrate plus nitrite, and instantaneous stream discharge in water-quality samples from springs and streams on or near the Quarai and Abo units of Salinas Pueblo Missions National Monument. These data are based on measurements made and samples collected between November 2000 and July 2001 as part of a level I water-quality inventory of Salinas Pueblos Missions National Monument.

INTRODUCTION

Salinas Pueblo Missions National Monument (SPMNM) is composed of three discontinuous units in central New Mexico. These units are the Quarai Ruins, the Abo Ruins, and the Gran Quivira Ruins (fig. 1). Water is present at or near land surface in springs or streams on or near the Quarai and Abo units.

Purpose and Scope

This report describes the results of analysis of water-quality samples and values of instantaneous stream discharge collected between November 2000 and July 2001 as part of a level I water-quality inventory of SPMNM. Data in this report include values and concentrations of alkalinity, specific conductance, dissolved oxygen, pH, temperature, dissolved sulfate, dissolved phosphate, dissolved ammonia, and dissolved nitrate plus nitrite and values of instantaneous stream discharge in ground- and surface-water samples from the Quarai and Abo units of SPMNM. Level I water-quality inventories include water-quality information on "those waters that are essential to the central cultural, historical, or natural resources management themes of the park or provide habitats to threatened or endangered plants or animals" (Gary Rosenlieb, National Park Service, Water Resources Division, written commun., 1998).

Study Area

The study area includes the Quarai and Abo units of the SPMNM (fig. 1). Water-quality samples were collected from two springs on the Quarai unit (Quarai Spring number 1 and Quarai Spring number 2) (fig. 2), from Cañon Espinoso (locally referred to as "Abo Arroyo") on the Abo unit, and from Abo Spring on private land near the Abo unit boundary (fig. 3).

Figure 1 goes here

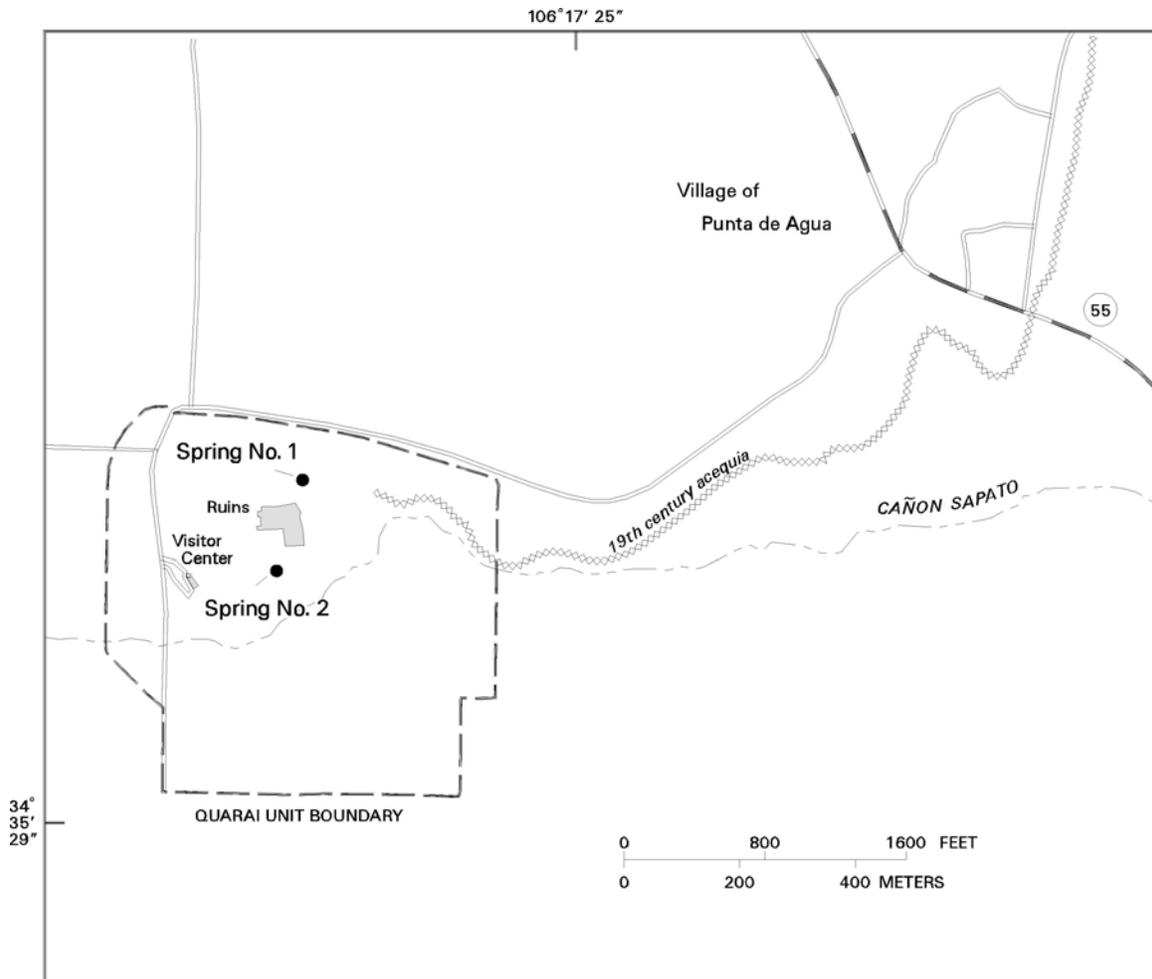


Figure 2. -- Location of the sampling sites on the Quarai unit of Salinas Pueblo Missions National Monument.

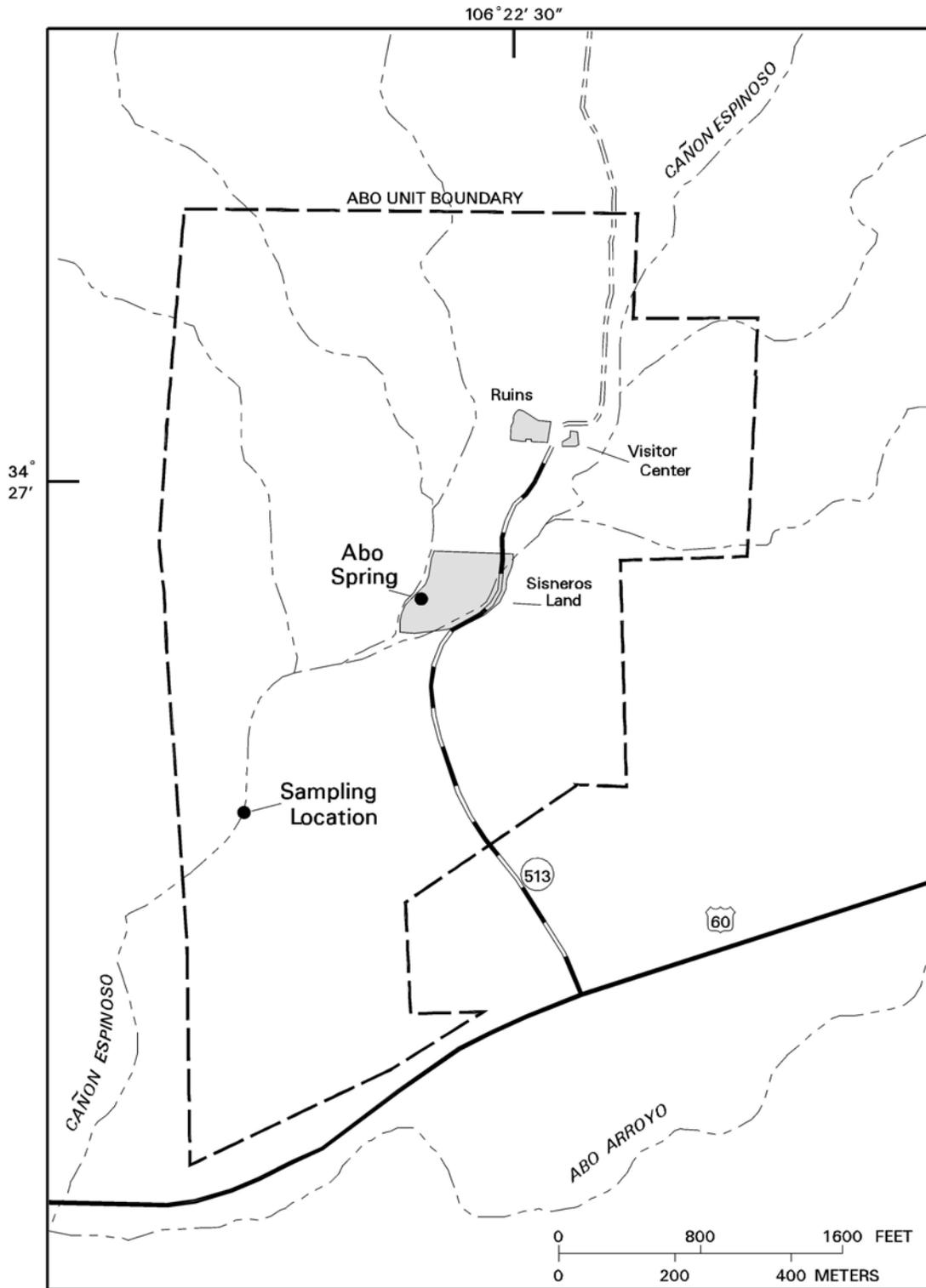


Figure 3. --Location of the sampling sites on the Abo unit of Salinas Pueblo Missions National Monument.

Previous Studies

Prior to this study, water-quality data on the Quarai and Abo units were limited to four samples collected from two surface-water pools on each unit (National Park Service, 1998).

DATA COLLECTED

Data collected during this study and tabulated in this report include values and concentrations of alkalinity, specific conductance, dissolved oxygen, pH, temperature, dissolved sulfate, dissolved phosphate, dissolved ammonia, and dissolved nitrate plus nitrite in water-quality samples from Quarai Spring number 1, Quarai Spring number 2, Cañon Espinoso, and Abo Spring. Instantaneous stream discharge was measured concurrently with water-quality sampling on Cañon Espinoso. The data are presented in table 1.

Sampling Protocols

Water-quality samples from the Quarai Springs and Abo Spring were collected using a peristaltic pump for the November 2000 sampling and using a submersible positive displacement pump for the remaining sampling events. The field properties specific conductance, dissolved oxygen, pH, and temperature were monitored during pumping. Water-quality samples were collected after monitored field properties showed stable values. Dissolved oxygen in springs was measured using a flow-through chamber system. Dissolved oxygen in Cañon Espinoso was measured by submerging the dissolved-oxygen sensor in moving water. Flow from the peristaltic pump during the November 2000 sampling, however, was inadequate for accurate measurement of dissolved oxygen. Water-quality samples from Cañon Espinoso were collected as dip samples. Instantaneous discharge on Cañon Espinoso was measured using a modified Parshall flume following the method described by Buchanan and Somers (1969).

Field treatment and preservation of collected samples included filtration through a 0.45-micrometer flow-through filter followed by chilling to 4 degrees Celsius. Samples were shipped to the laboratory within 3 days of collection.

Analytical Protocols

Field parameters were determined using procedures and techniques as follows: alkalinity, Radtke and others (1998e); specific conductance, Radtke and others (1998b); dissolved oxygen, Radtke and others (1998d); pH, Radtke and others (1998a); and

temperature, Radtke and others (1998c). Alkalinity titrations were performed within 24 hours following sample collection. The U.S. Geological Survey National Water Quality Laboratory (NWQL) conducted all laboratory analyses. Laboratory analyses for dissolved sulfate, dissolved phosphate, dissolved ammonia, and dissolved nitrate plus nitrite were performed using procedures and techniques described by Fishman and Friedman (1989). NWQL quality assurance and quality control procedures are described in Pritt and Raese (1995).

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Table 1. Water-quality data and discharge collected at Salinas Pueblo Missions National Monument

Sampling site identification number	Sample collection date	Sample collection time	Well or surface-water feature sampled	Sample medium
342650106224910	11/29/2000	10:00	Cañon Espinosa	Surface water
342650106224910	02/27/2001	13:30	Cañon Espinosa	Surface water
342650106224910	05/03/2001	10:30	Cañon Espinosa	Surface water
342650106224910	07/01/2001	16:00	Cañon Espinosa	Surface water
342652106223701	11/28/2000	16:00	Abo Spring	Ground water
342652106223701	02/27/2001	15:00	Abo Spring	Ground water
342652106223701	05/02/2001	18:30	Abo Spring	Ground water
342652106223701	07/01/2001	17:30	Abo Spring	Ground water
343547106174401	11/28/2000	12:00	Quarai Spring No. 1	Ground water
343547106174401	02/28/2001	12:00	Quarai Spring No. 1	Ground water
343547106174401	05/03/2001	13:30	Quarai Spring No. 1	Ground water
343547106174401	07/02/2001	10:30	Quarai Spring No. 1	Ground water
343543106174501	11/28/2000	14:00	Quarai Spring No. 2	Ground water
343543106174501	02/28/2001	13:30	Quarai Spring No. 2	Ground water
343543106174501	05/03/2001	15:00	Quarai Spring No. 2	Ground water
343543106174501	07/02/2001	12:00	Quarai Spring No. 2	Ground water

Sampling site identification number	Sample collection date	Sample depth, in feet above NGVD of 1929	Sample collector	Alkalinity, in milligrams per liter as CaCO ₃
342650106224910	11/29/2000		G. F. HUFF	369
342650106224910	02/27/2001		G. F. HUFF	344
342650106224910	05/03/2001		G. F. HUFF	336
342650106224910	07/01/2001		G. F. HUFF	
342652106223701	11/28/2000		G. F. HUFF	308
342652106223701	02/27/2001		G. F. HUFF	304
342652106223701	05/02/2001		G. F. HUFF	306
342652106223701	07/01/2001		G. F. HUFF	300
343547106174401	11/28/2000		G. F. HUFF	214
343547106174401	02/28/2001		G. F. HUFF	216
343547106174401	05/03/2001		G. F. HUFF	218
343547106174401	07/02/2001		G. F. HUFF	208
343543106174501	11/28/2000		G. F. HUFF	282
343543106174501	02/28/2001		G. F. HUFF	286
343543106174501	05/03/2001		G. F. HUFF	290
343543106174501	07/02/2001		G. F. HUFF	258

Table 1. Water-quality data and discharge collected at Salinas Pueblo Missions National Monument--Continued

Sampling site identification number	Sample collection date	Specific conductance, in microsiemens per centimeter at 25 °C	Dissolved oxygen, in milligrams per liter
342650106224910	11/29/2000	880	9.0
342650106224910	02/27/2001	843	8.0
342650106224910	05/03/2001	806	7.6
342650106224910	07/01/2001		
342652106223701	11/28/2000	759	
342652106223701	02/27/2001	769	3.3
342652106223701	05/02/2001	785	3.5
342652106223701	07/01/2001	784	4.2
343547106174401	11/28/2000	500	
343547106174401	02/28/2001	509	
343547106174401	05/03/2001	551	3.0
343547106174401	07/02/2001	530	1.7
343543106174501	11/28/2000	642	
343543106174501	02/28/2001	650	
343543106174501	05/03/2001	681	0.8
343543106174501	07/02/2001	590	0.2

Sampling site identification number	Sample collection date	Remarks
342650106224910	11/29/2000	
342650106224910	02/27/2001	
342650106224910	05/03/2001	
342650106224910	07/01/2001	No flow in Cañon Espinosa
342652106223701	11/28/2000	Equipment malfunction precluded accurate measurement of dissolved oxygen
342652106223701	02/27/2001	
342652106223701	05/02/2001	
342652106223701	07/01/2001	
343547106174401	11/28/2000	Equipment malfunction precluded accurate measurement of dissolved oxygen
343547106174401	02/28/2001	Equipment malfunction precluded accurate measurement of dissolved oxygen
343547106174401	05/03/2001	
343547106174401	07/02/2001	
343543106174501	11/28/2000	Equipment malfunction precluded accurate measurement of dissolved oxygen
343543106174501	02/28/2001	Equipment malfunction precluded accurate measurement of dissolved oxygen
343543106174501	05/03/2001	
343543106174501	07/02/2001	

Table 1. Water-quality data and discharge collected at Salinas Pueblo Missions National Monument--Concluded

Sampling site identification number	Sample collection date	pH	Water temperature, in °C	Dissolved sulfate, in milligrams per liter as SO ₄
342650106224910	11/29/2000	7.8	2.0	93.9
342650106224910	02/27/2001	7.8	6.5	89.0
342650106224910	05/03/2001	7.9	12.5	77.2
342650106224910	07/01/2001			
342652106223701	11/28/2000	7.4	13.5	70.6
342652106223701	02/27/2001	7.1	12.0	76.9
342652106223701	05/02/2001	7.2	12.0	78.9
342652106223701	07/01/2001	7.3	14.0	73.4
343547106174401	11/28/2000	7.3	10.0	26.5
343547106174401	02/28/2001	7.5	7.0	28.3
343547106174401	05/03/2001	7.2	10.5	30.8
343547106174401	07/02/2001	7.4	13.0	28.6
343543106174501	11/28/2000	7.0	10.0	34.2
343543106174501	02/28/2001	7.2	8.0	38.8
343543106174501	05/03/2001	7.1	11.0	35.1
343543106174501	07/02/2001	7.2	15.0	25.4

Sampling site identification number	Sample collection date	Orthophosphate, in milligrams per liter as P	Dissolved ammonia, in milligrams per liter as N	Dissolved nitrate plus nitrite, in milligrams per liter as N	Discharge, in cubic feet per second
342650106224910	11/29/2000	<0.018	<0.041	<0.047	0.03
342650106224910	02/27/2001	<0.018	<0.041	<0.047	0.05
342650106224910	05/03/2001	<0.018	<0.041	<0.047	0.02
342650106224910	07/01/2001				0
342652106223701	11/28/2000	0.038	<0.041	0.735	
342652106223701	02/27/2001	0.032	<0.041	0.850	
342652106223701	05/02/2001	0.025	<0.041	0.828	
342652106223701	07/01/2001	<0.018	0.041	0.654	
343547106174401	11/28/2000	0.070	<0.041	0.405	
343547106174401	02/28/2001	0.054	<0.041	0.485	
343547106174401	05/03/2001	0.054	<0.041	0.406	
343547106174401	07/02/2001	0.035	<0.041	0.456	
343543106174501	11/28/2000	0.085	<0.041	<0.047	
343543106174501	02/28/2001	0.099	<0.041	<0.047	
343543106174501	05/03/2001	0.088	<0.041	<0.047	
343543106174501	07/02/2001	<0.018	<0.041	<0.047	