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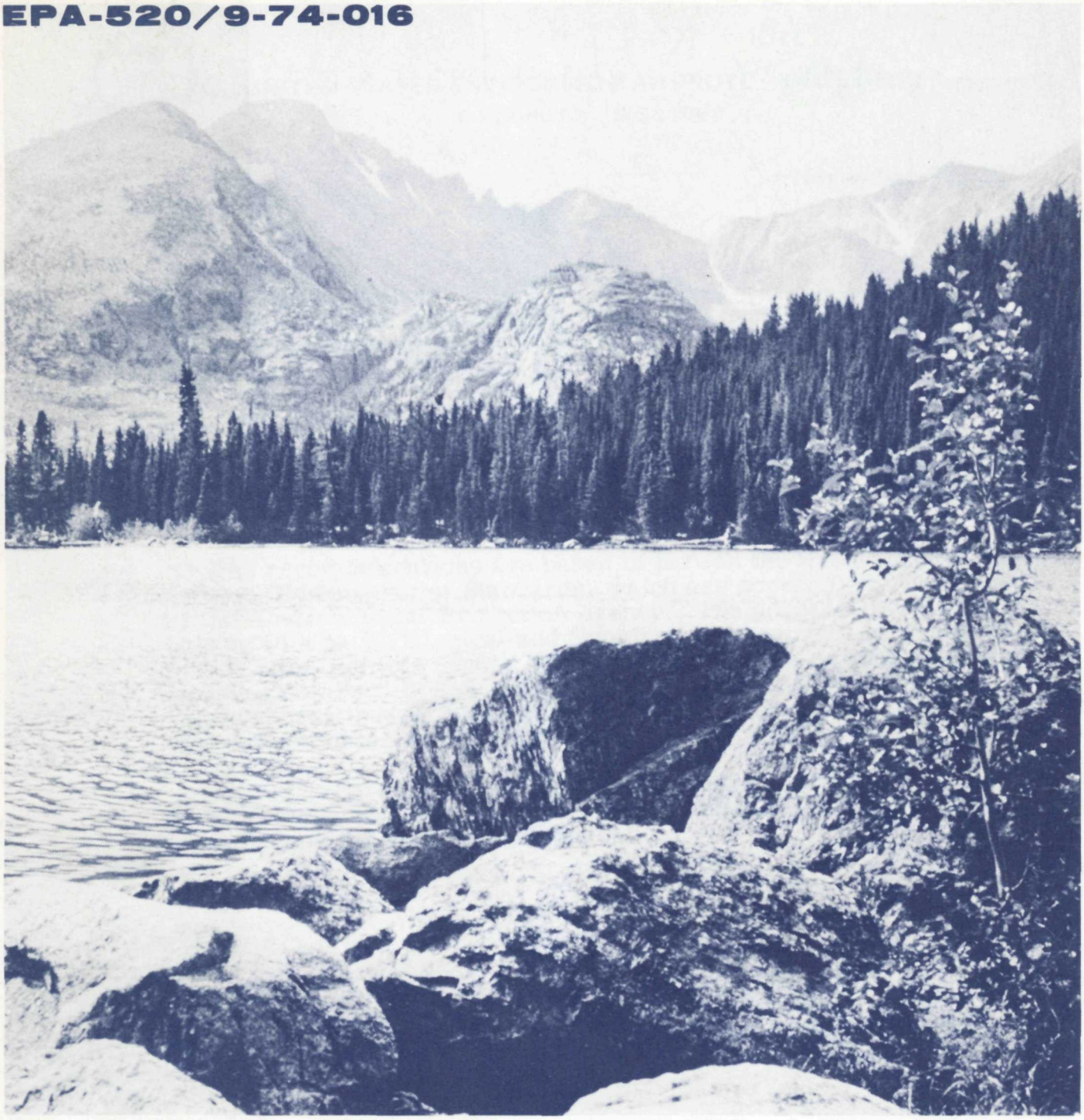

A PILOT STUDY OF DRINKING WATER SYSTEMS IN THE NATIONAL PARK SERVICE SYSTEM

WATER SUPPLY DIVISION

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

November 27, 1974

Mr. Ronald H. Walker
Director, National Park Service
Department of the Interior
Washington, D. C. 20240

Dear Mr. Walker:

We have completed our pilot study of drinking water supplies in the National Park Service System and are pleased to submit a report of our findings and recommendations.

The recommendations are based in part on the 1962 Public Health Service Drinking Water Standards, which are currently being revised by the Environmental Protection Agency. The proposed revisions dealing with bacteriological and chemical monitoring, and summarized in Appendix D of this report, could significantly reduce the amount of analyses now required by the current standards. After the new standards are issued, we would be pleased to meet with you to revise the cost estimates for surveillance contained in this report.

We appreciate the cooperation and assistance provided by the Park Service during this study and offer our assistance, where possible, to implement the recommendations.

Sincerely yours,

James H. McDermott, P.E.
Director
Water Supply Division (WH-450)

Enclosure

A PILOT STUDY
OF
DRINKING WATER SYSTEMS
IN THE
NATIONAL PARK SERVICE SYSTEM

WATER SUPPLY DIVISION
OFFICE OF WATER AND HAZARDOUS MATERIALS
ENVIRONMENTAL PROTECTION AGENCY

DECEMBER 1974

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ACKNOWLEDGEMENTS

The assistance of the National Park Service in planning this project was provided from the beginning. The help of the agency is acknowledged with appreciation for its efforts. Special thanks must go to the Park Service personnel who cooperated fully with the project, joined the field surveys, and gave freely of their time.

INTRODUCTION

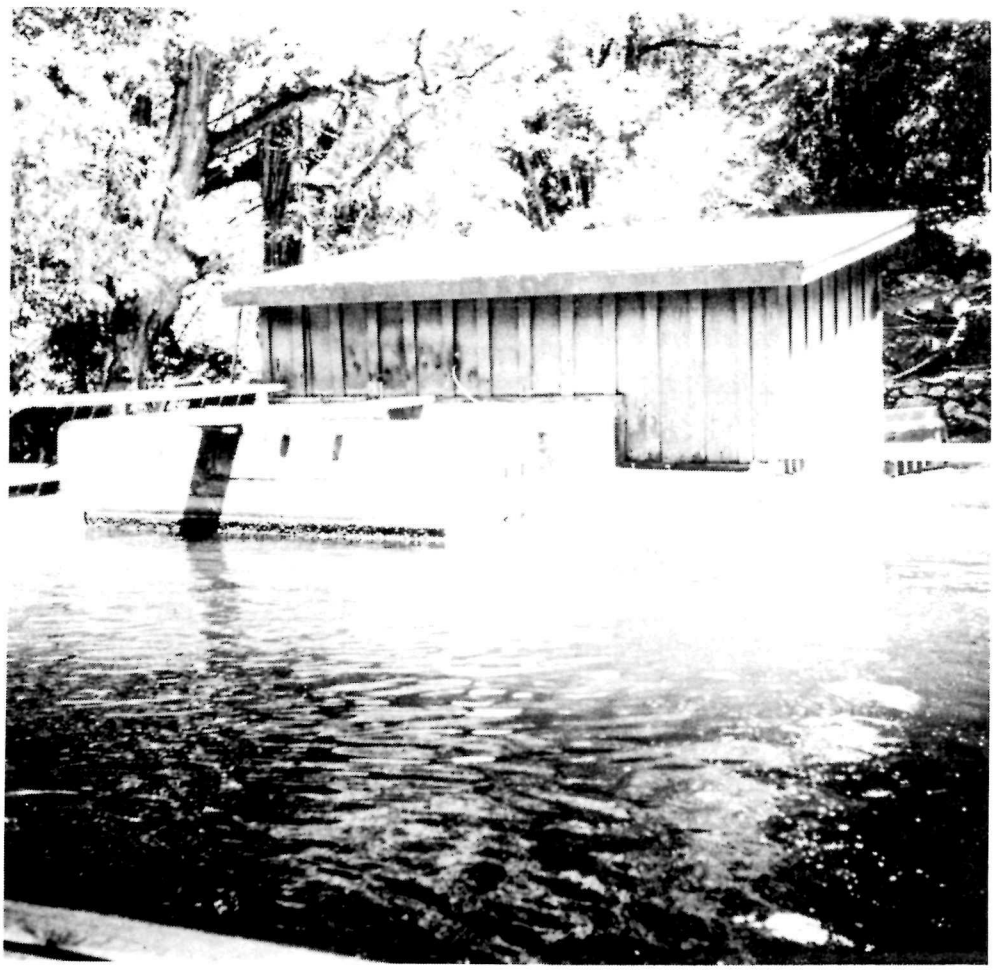
INTRODUCTION

The quality of water served to Americans by municipalities has received increasing attention in recent years. However, little notice has been given to the quality of drinking water available to the public at recreational areas. Generally, these are very small water supplies which receive little surveillance or maintenance. As such, these supplies have great potential for spreading waterborne diseases since they serve large numbers of people. This is well illustrated by the fact that during 1966–1970, the size of waterborne disease outbreaks in non municipal water systems more than doubled due to the number of large outbreaks in recreational areas.[1] The significance of this becomes readily apparent when it is realized that more than 215 million people per year visit the facilities of the National Park Service.

In view of these important public health considerations, the National Park Service cooperated with the Water Supply Division of the Environmental Protection Agency to conduct a pilot study of 42 water systems in two geographical areas. These parks experience more than 21.3 million visits per year.

The purpose of this study was to assess the construction, water quality, operation, maintenance and surveillance of water supplies on National Park Service lands and to propose any recommendations necessary for the National Park Service to maintain an effective water supply program; thus assuring the visitors to national parks safe drinking water.

[1] Craun, G. F. and L. J. McCabe. "Review of the Causes of Waterborne Disease Outbreaks." *Journal American Water Works Association,* 65 (January 1973), 74–84.



SUMMARY OF FINDINGS AND RECOMMENDATIONS

SUMMARY OF FINDINGS AND RECOMMENDATIONS

This study included 42 drinking water supply systems at 18 national parks. The field work, completed in May and June of 1973, was divided between the States of Maryland, Pennsylvania, and Virginia in the East and Arizona and California in the West. At each water system, a sanitary survey was conducted; water samples from the distribution system were collected for bacteriological, chemical, and physical analyses; chlorine residuals were measured; and the distribution system pressure was determined.

The specific findings and recommendations of the study are:

Water Quality

1. Twenty (48 percent) of the 42 drinking water systems did not comply with one or more of the constituent limits of the 1962 U.S. Public Health Service Drinking Water Standards. Eleven systems (26 percent) failed at least one mandatory chemical or bacteriological limit and 11 (26 percent) did not comply with at least one recommended limit. The mandatory chemical limits failed included fluoride, mercury and lead. *The presence of substances failing a mandatory limit constitutes grounds for rejection of the supply; therefore, their continued presence should be carefully monitored and evaluated by the appropriate health authorities and a decision made regarding corrective measures or discontinuing use of the supply.*

2. Bacteriological analysis of samples collected from the distribution system during this survey showed that 2 (6 percent) of the systems using ground water and two (33 percent) of the systems using surface water were contaminated. Where contamination was found, the appropriate authorities were notified immediately. *To prevent bacteriological contamination of the source, improved source protection and attention to the sanitary conditions of the water systems are necessary. Disinfection should be a mandatory requirement for all systems using surface water. Since high turbidity can impede the disinfection process, other treatment should be employed as necessary to ensure that the turbidity level meets the limit established in the Drinking Water Standards. Disinfection should be a mandatory requirement for all drinking water systems using ground water unless a history of satisfactory bacteriological quality and sanitary surveys is developed.*

Surveillance

3. Records of the bacteriological surveillance for the 12 months preceding the study were investigated for each water system. The results of this investigation show that only 23 (55 percent) of the water systems surveyed had an acceptable bacteriological surveillance program. No samples were taken during three or more months of operation at six (14 percent) water systems. An examination of the bacteriological quality for the 12 months prior to the field visit revealed that 10 (24 percent) of the systems failed the Drinking Water Standards for one or more months. *A bacteriological sampling program that will meet the minimum requirements of the Drinking Water Standards should be required at each system. This program should be continued at all times the system is operational. All samples should be analyzed at a laboratory certified by a State or an EPA approved certifying officer.*

4. There was no chemical analysis on record for 19 (45 percent) of the water systems studied. Only nine systems (21 percent) had a chemical analysis within the past five years. None of the chemical analyses performed included all of the constituents in the Drinking Water Standards. *The water from all drinking water systems should be tested for all chemical constituents listed in the Drinking Water Standards before the water is made available to the public. Additional chemical analyses should be made at a minimum of once every three years for systems supplied by ground water or more often when there is reason to believe the chemical quality may be deteriorating. Water systems supplied by surface water should receive a chemical analysis on a yearly basis. The results of all*

chemical sampling should be forwarded to one office so that trends in chemical quality and frequency of surveillance may be reviewed on a continuing basis.

5. Sanitary surveys are necessary to identify and correct sanitary deficiencies in water systems. Nine (21 percent) systems in this study were found not to have had a sanitary survey in the year preceding the study. *Yearly sanitary surveys of and continuing attention to each water system should be provided. For water systems that are not operated during the winter months, the sanitary surveys should be performed when the system is placed in operation in the spring. No water system should be placed in operation until satisfactory bacteriological quality has been demonstrated.*

Operation, Control, and Protection

6. Nine (21 percent) of the water systems studied did not have adequate source protection. *The source protection of a water system is vital to the maintenance of a safe water supply. More attention should be given to proper source protection in well and spring construction and surface water intakes.*

7. The adequacy of the operation and control was determined at all water systems. Fourteen (33 percent) of the water systems were judged to have inadequate operation and control. Treatment equipment and/or chlorine residuals were not checked daily at these systems. The study shows that while personnel are available for water system maintenance, many of the individuals responsible for the water systems do not have a full knowledge of what they should be doing and the reasoning behind these duties. *The National Park Service should assure that all persons responsible for the operation of a water system in the national parks are adequately trained.*

8. An adequate level of chlorine was not found in all parts of the distribution system at 12 (63 percent) of the systems where chlorination equipment was operated. This includes seven (37 percent) systems where no chlorine residual was detected. *Daily inspection of the chlorine feed equipment and daily records of the chlorine residuals should be maintained. Chlorine residuals should be present at the ends of the distribution system.*

9. The ability of each water system to deliver a continuous supply of safe drinking water was investigated. Fifteen (36 percent) of the systems needed improvements such as a change in source, treatment equipment, distribution system, and/or storage facilities. *Improvements should be made where necessary to help assure safe water at all times.*

10. The National Park Service has long followed the recommended procedure of having a single group responsible for the surveillance of its water systems, and this has resulted in a substantially better class of water systems than have been found in other recreational areas. However, the results of this study show the need for improving the surveillance procedures.

The National Park Service (NPS) should devote a higher priority to initiating and maintaining an acceptable program of bacteriological and chemical surveillance and to providing regular sanitary surveys of the water systems. The cost of an adequate surveillance program, which would typically include a chemical analysis of the water from systems using surface water every year and from systems using ground water once every three years, two bacteriological samples per month for each month of operation, and one sanitary survey each year, is approximately $360 per system. This is the estimated amount that the National Park Service should be spending in professional time, expenses, and laboratory costs to provide the needed surveillance.

SCOPE

SCOPE OF SYSTEMS STUDIED

The National Park System is comprised of 298 units, "ranging from tiny historic properties to vast natural areas of over 2,000,000 acres in size. These parks are found from northern climates, with short seasons of active visitation, to the tropics, where use can occur year-round." [1]

Since 1960, 94 areas have been added to the National Park System to bring the total acreage to 30.5 million acres. Public use of the national parks increased to 215,540,400 visits in FY 1973, including 169,159,900 recreational visits; overnight stays totaled 14,766,200.

This study covered 42 drinking water systems at 18 National Park Service areas. A water supply system as defined by this study included the collection, treatment, and distribution facilities from the sources of supply to the free-flowing outlets of the distribution system.

The pilot study was centered in two geographical areas. The eastern area included parks in the States of Maryland, Pennsylvania, and Virginia while the western area covered parks in Arizona and California.

Table 1 lists those parks that were visited in each area and gives information on the visitation in each park in FY 1973. The eastern area included six parks with a total annual visitation of 15.5 million visitors, with 0.6 million of these staying overnight in the parks. In the western area, water systems at 12 parks were evaluated. These 12 parks contributed 5.8 million visitors and included 1.8 million overnight stays. Together, those parks where evaluations were made represent 21.3 million visits per year, approximately 13% of the total for the Park Service. The total of 2.4 million overnight stays represent approximately 17% of the total for the Park Service. The location of each park where evaluations were made is shown in Figures 1 and 2.

Figure 3 summarizes the types of water systems that were studied. Thirty-six water systems (86 percent) in the study were supplied by ground water. Five systems, all located in California, were supplied by surface water, and one water system, the El Portal system in Yosemite, used a combined source of a stream with a well to augment the supply when the stream flow dropped too low for demand.

As expected, springs played a large role in supplying water in the eastern parks. Ten (48 percent) of the twenty-one water systems studied in the East used springs as a water source. These springs ranged greatly in capacity and degree of protection. Six of the ten springs served systems where the water flow was augmented by wells.

Some drinking water supplied in the national

[1] "Public Use of the National Park System," National Park Service, GPO 1973 870–095, p. 1.

National Park Service Study
Table 1.—Summary of Parks Included in the Study.

Park	Visits (In Thousands)			Overnight Stays (FY 1973) (In Thousands)
	Recreational	Non-Recreational	Total	
Maryland:				
Assateague Island National Seashore	1,836.3	2.7	1,839.0	83.2
Catoctin Mountain Park	241.7	132.9	374.6	58.0
Pennsylvania:				
Ft. Necessity National Battlefield	270.6	—	270.6	5.9
Gettysburg National Military Park	1,641.8	82.8	1,724.6	7.1
Virginia:				
Colonial National Historical Park	6,234.9	2,672.1	8,907.0	—
Shenandoah National Park	2,160.5	265.9	2,426.4	490.0
Total Eastern States	12,385.8	3,156.4	15,542.2	644.2

National Park Service Study
Table 1.—Summary of Parks Included in the Study.—Continued

Park	Visits (In Thousands)			Overnight Stays (FY 1973) (In Thousands)
	Recreational	Non-Recreational	Total	
Arizona:				
Chiricahua National Monument	66.6	—	66.6	8.3
Coronado National Memorial	55.8	2.3	58.2	—
Montezuma Castle National Memorial	367.7	1.4	369.1	—
Organ Pipe Cactus National Monument	95.0	2.0	97.0	64.9
Petrified Forest National Park	1,147.5	5.5	1,153.0	0.1
Saguaro National Monument	384.0	—	384.0	1.9
Tonto National Monument	58.5	—	58.5	—
Tumacacori National Monument	75.9	—	75.9	—
Walnut Canyon National Memorial	64.2	0.5	64.7	—
California:				
Pinnacles National Monument	163.4	—	163.4	44.8
Point Reyes National Seashore	1,257.6	25.8	1,283.3	30.0
Yosemite National Park	1,941.1	82.5	2,023.6	1,682.5
Total Western Sites	5,677.3	120.0	5,727.3	1,832.5
GRAND TOTAL	18,063.1	3,276.4	21,339.5	2,476.7

parks is water that has been collected and treated by others (usually a municipality) and sold to the Park Service. In these cases, the Park Service does not exercise direct control over the quality of water that is supplied to it, although it should receive some guarantee that the water meets the Drinking Water Standards. Since much information has already been gathered on the status of municipal water systems, this study was limited to those water systems in which the entire system is under Park Service control.

A summary of the water treatment practices at the water systems that were surveyed is presented in Table 2. There was no water treatment at twenty (48 percent) of the systems studied. Disinfection was provided at twenty (48 percent) other water systems. This includes all six surface water systems, four ground water systems in the East, and 10 ground water systems in the West. The form of disinfection was chlorination in all cases except one. The chlorination equipment consisted of an automatic feeder with either chlorine gas or a hypochlorite solution. One water system used ultraviolet light to disinfect the water.

Treatment other than disinfection was practiced at six (14 percent) of the water systems. This included one system in the East (Ft. Necessity) that had an activated carbon filter and

National Park Service Study
Table 2.—Summary of Water Treatment at Systems Surveyed.

Treatment	Type of System (Number)				System Totals (42)	
	Ground Water (36)		Surface Water* (6)		Number	Percent
	East	West	East	West		
None	16	4	0	0	20	48
Disinfection Only	4	8	0	4	16	38
Disinfection with Other Treatment	0	2	0	2	4	9
Treatment without Disinfection	1	1	0	0	2	5

*The combined source system has been placed in this category for analytical purposes.

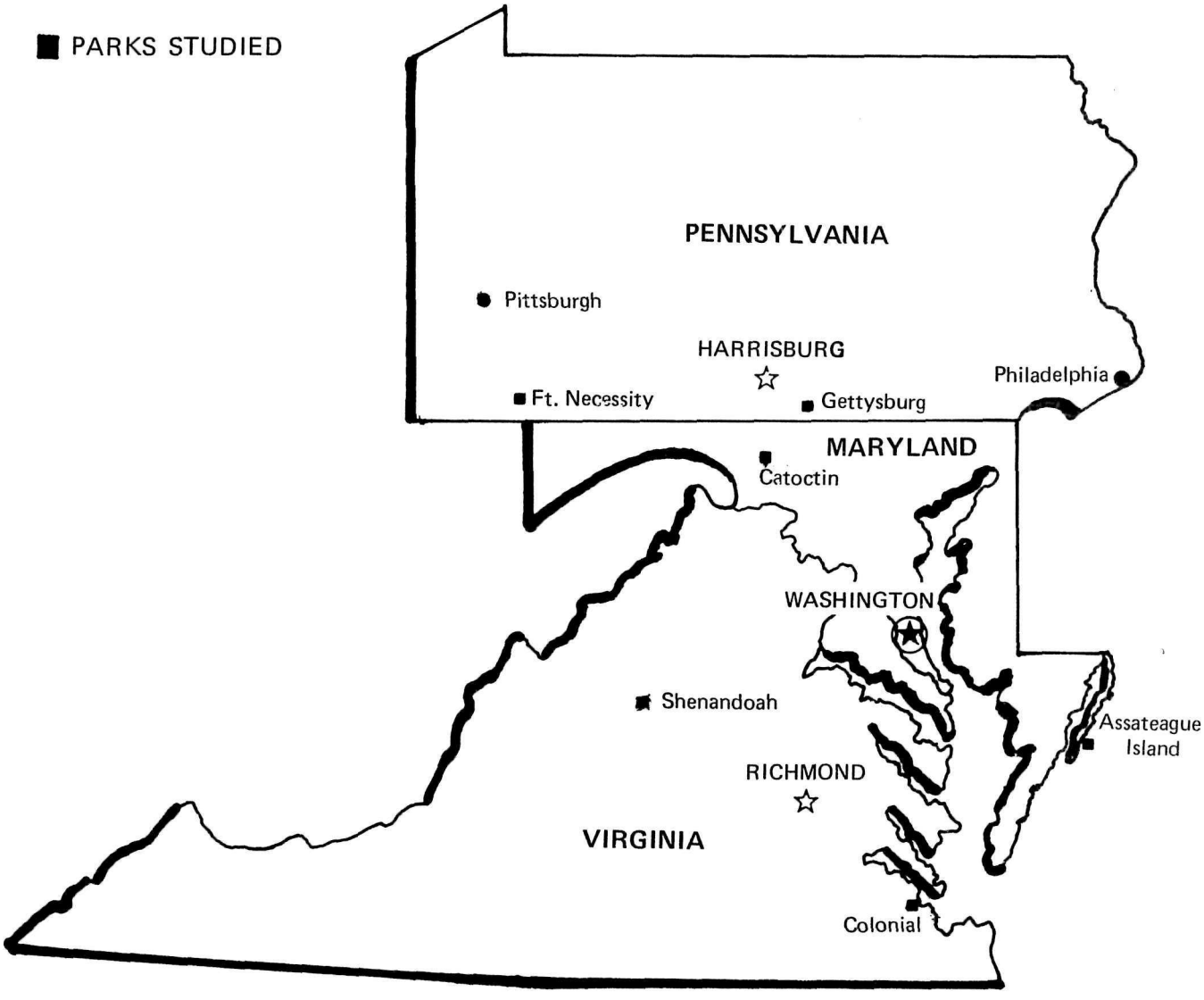
sedimentation in the system. The ground water system at Tonto National Monument utilized a softening process. Another ground water system at Organ Pipe Cactus National Monument had a small defluoridation unit. However, this unit provided water for only one hosebib and one drinking water fountain at the small building housing the unit. The defluoridated water is meant only for the use of the children of permanent employees. Containers of water must be hand-carried to individual residences for use.

Three water systems at Yosemite National

NATIONAL PARK SERVICE STUDY

Figure 1

Parks Studied in the East



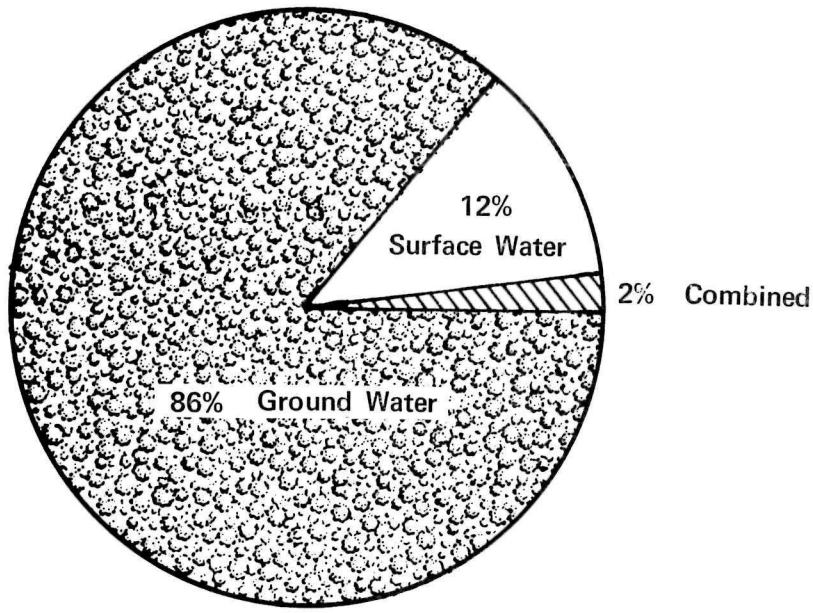
NATIONAL PARK SERVICE STUDY

Figure 2

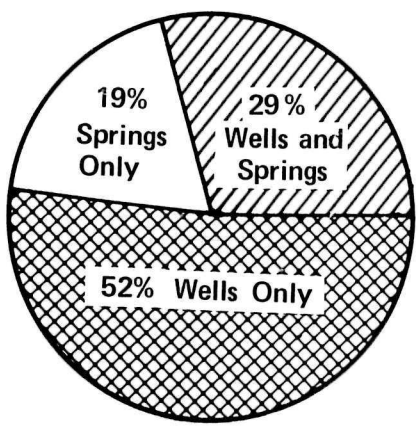
Parks Studied in the West

NATIONAL PARK SERVICE STUDY

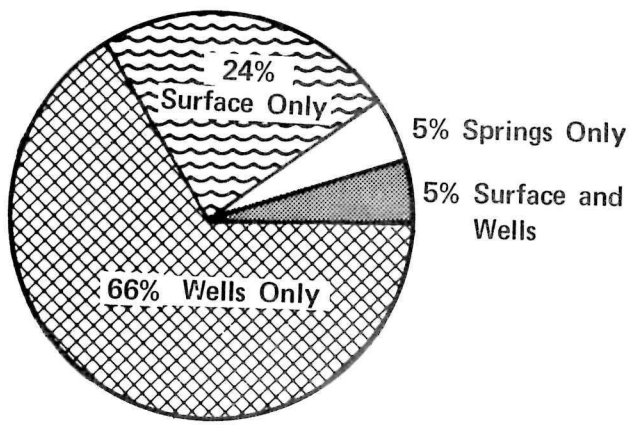
Figure 3
Types of Water Systems Studied



Source of Water
All Systems

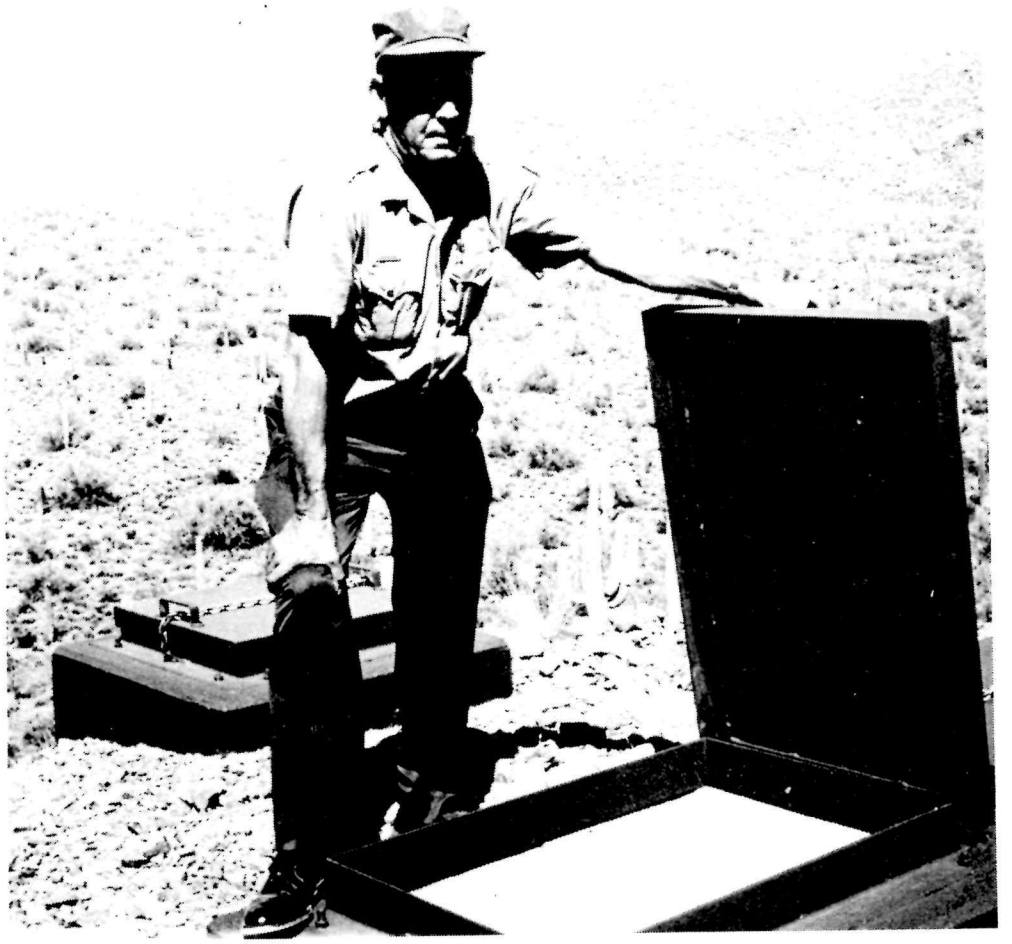


Source of Water
Systems in East



Source of Water
Systems in West

Park also employed some form of treatment other than chlorination. Hodgton had a sand filter box at the stream intake, and a sand filter was being installed at Arch Rock when the survey was being made. The water supply for Yosemite Valley has an open sedimentation basin which gives some clarification at times of non-peak water flow through the plant.



EVALUATION CRITERIA

EVALUATION CRITERIA

The water systems evaluated by this study were assessed from three different but related approaches:

1. Drinking water quality was determined by sampling the finished and distributed water. These samples were sent to the Environmental Protection Agency Laboratories for bacteriological, chemical, and physical analyses.
2. The general condition of the water systems was determined by a field survey of each system. (Samples of the survey forms appear in Appendix A).
3. The adequacy of the surveillance program was evaluated by reviewing the bacteriological sampling records for the previous 12 months, chemical sampling records, and the past sanitary surveys.

Water Quality Criteria

Based on water samples collected during the field survey, water quality was compared with the Drinking Water Standards[1] (see Table 3) and rated as either:

1. Meeting the Standards for all limits.
2. Failing to meet one or more of the "recommended" limits, but meeting all the "mandatory" limits.
3. Failing to meet one or more of the "mandatory" limits.

Facilities and Operation Criteria

Source, treatment, operation, and distribution facilities were judged[2] either:

1. To be essentially free from major deficiencies, or
2. To be deficient if one or more of the following were inadequate:
   a. Source protection
   b. Treatment, if needed
   c. Pressure (20 psi minimum) in all areas of the distribution system.
   d. Operation and control
   e. Storage
   f. Distribution system

Surveillance Criteria

The surveillance of a water supply system was judged to be adequate if it met the following criteria:

1. Collection of the required number[3] of bacteriological samples during the period of the year the water system is in operation.
2. A complete chemical analysis of a sample of the water from each groundwater system every three years and a complete chemical analysis of a sample from each surface water supply on an annual basis.
3. At least one sanitary survey of the water system each year.

[1] "U.S. Public Health Service, Drinking Water Standards, 1962" PHS Publication No. 956, Superintendent of Documents, Government Printing Office, Washington, D.C., 61 pp.

[2] For basis of judgement see "Manual For Evaluating Public Drinking Water Supplies", EPA Publication, Reprinted 1971. Previously published in 1969 as U.S. Public Health Service Pub. 1820.

[3] See pages 3-6 of the U.S. Public Health Service Drinking Water Standards, 1962.

National Park Service Study

Table 3.—Criteria for Evaluating Bacteriological, Chemical, and Physical Quality of Water Systems Studied.

Recommended Physical Limits [1]

Drinking water should contain no impurity which would cause offense to the sight, taste, or smell. Under general use, the following limits should not be exceeded:

Constituent	*Limit*
Turbidity	5 s.u.
Color	15 s.u.

Recommended Chemical Limits [1]

Arsenic	0.01	mg/l
Chloride	250.	mg/l
Copper	1.	mg/l
Fluoride	0.8 to 1.7	mg/l
Iron	0.3	mg/l
M.B.A.S (Foaming Agents)	0.5	mg/l
Manganese	0.05	mg/l
Nitrate	45.	mg/l
Sulfate	250.	mg/l
Total Dissolved Solids	500.	mg/l
Zinc	5.0	mg/l

Mandatory Chemical Limits [1]

The presence of the following substances in excess of the concentrations listed shall constitute grounds for the rejection of the supply: therefore, their continued presence should be carefully measured and evaluated by health authorities and a decision made regarding corrective measures or discontinuing use of the supply.

Constituent	*Limit*	
Arsenic	0.05	mg/l
Barium	1.0	mg/l
Cadium	0.01	mg/l
Chromium	.05	mg/l
Fluoride	1.4 to 2.4	mg/l
Lead	0.05	mg/l
Mercury [2]	0.002	mg/l
Selenium	0.01	mg/l
Silver	0.05	mg/l

[1] In "U.S. Public Health Service Drinking Water Standards, 1962."

Mandatory Bacteriological Limits [1]

Coliform Organisms: Membrane Filter Method	Fails standards in any one month if: a. Arithmetic average of samples collected greater than 1 per 100 ml; b. Two or more samples (5% or more if more than 20 examined) contain densities more than 4/100 ml.
Multiple Tube Method	When 10 ml standard portions are examined, the Standards are failed in any one month if more than 10% are positive. The presence of the coliform group in three or more portions of a standard sample is not allowed if this occurs: a. In more than one sample per month or when less than 20 are examined per month; b. In more than 5% of the samples when 20 or more are examined per month. When 100 ml standard portions are examined, the standards are failed in any one month if more than 60% are positive. The presence of the coliform group in all five of the portions is not allowed if this occurs: a. In more than one sample per month when less than five are examined per month; or b. In more than 20 percent of the samples when five or more are examined per month.

[2] Proposed for inclusion in the Revised Drinking Water Standards.

PROCEDURES

PROCEDURES

Office Review

The water systems to be studied were selected in meetings with representatives of the National Park Service and the Public Health Service. An effort was made to select geographical areas or regions where diverse water systems would probably be found. The determination of which systems would be studied in a geographical area was influenced by the time necessary to transport the water samples to the laboratories.

Before the field work was initiated, records for the water systems to be studied were reviewed. This review took place at the headquarters and regional offices of the Park Service and Public Health Service. Available information was collected in the following areas:

1. Bacteriological test results for the past year.
2. Water quality as shown by the most recently conducted chemical analysis and the frequency of past chemical surveillance.
3. Information contained in the most recently conducted sanitary survey and the frequency of past surveys.
4. Water system design and construction.
5. Guidelines and policies for construction, operation, and surveillance of water systems.

At the time of the office review, the National Park Service was in the process of establishing a new system of reporting, record-keeping, and follow-up maintenance of the water supplies operated by the Park Service. This new system was reviewed after the field evaluations were completed.

Field Survey

National Park Service officials in the regional offices and in the individual parks were given advance notice and an explanation of the survey by the Park Service's headquarters office. Appointments for the field survey were made two to six weeks in advance of the visit.

The field surveys were performed by engineers from the headquarters office of the Water Supply Division of the Environmental Protection Agency. A National Park Service representative accompanied the EPA engineers during the sanitary survey of each water system except for those systems in Shenandoah National Park. A representative from the Public Health Service, also participated in the evaluation of several water systems. This evaluation included a sanitary survey [1] of the source, treatment plant, storage, and distribution facilities of the water system as well as a review of any records available at the park for past surveillance. These records were combined with the records obtained in the office review.

The results of the study were recorded on PHS and EPA standard forms and other forms developed especially for use in this study. Field determinations of the pH, pressure, air and water temperature, and chlorine residual at chlorinated systems (using the orthotolidine method) were made at each point where a water sample was taken.

The summary of findings for each water system is shown in Appendix B. The individual sheets were forwarded when completed to those responsible for each water system and other interested National Park Service personnel.

Sampling Program

During the field study, the following samples were taken at each water system:

1. Raw Water
   Where possible, one bacteriological sample was taken of the raw water before treatment. This sample was omitted if the water in the system did not undergo any treatment. In many systems, a raw water sample could not be obtained because of the physical arrangement of the piping system.
2. Finished Water.
   a. A 1-gallon grab sample was taken and sent to the National Environmental Re-

[1] For the definition of a sanitary survey see "Manual for Evaluating Public Drinking Water Supplies", EPA publication, reprinted 1971. Previously published as U.S. Public Health Service Publication 1820.

search Center in Cincinnati, Ohio, to be analyzed for the following:

Chloride
Color
Fluoride
pH
Selenium
Sulfate
Total Dissolved Solids (TDS)
Turbidity

b. A 1-quart sample was taken and preserved in the field by the addition of 1¼ ml of concentrated nitric acid. The sample was sent to the National Environmental Research Center in Cincinnati, Ohio, to be analyzed for the presence of the following trace metals:

Arsenic	Lead
Barium	Manganese
Cadmium	Mercury
Chromium	Silver
Copper	Zinc
Iron	

c. A 1-quart grab sample was taken and preserved in the field by the addition of 1 ml of a 20,000 ppm solution of mercury (2.71 grams $HgCl_2$ per 100 ml). The sample was sent to the National Environmental Research Center in Cincinnati, Ohio, to be analyzed for nitrates and MBAS (methylene-blue active substances).

d. Bacteriological samples were taken from the distribution system at a rate of at least 10 percent of the number required by the Drinking Water Standards (based on the resident population served by the system) or a minimum of two from any water supply.

These samples were taken at different points in the distribution system, one close to the treatment plant and one near the end of the distribution line. They were taken from outlets such as hosebibs in camping areas, restrooms, or drinking fountains. A bacteriological sample was taken only after satisfactorily flushing the line; the chemical samples were taken after the bacteriological samples.

Bacteriological samples were collected in 8-ounce sterile, plastic, wide-mouth, screw-capped bottles that contained 0.2 ml of a 10-percent sodium thiosulfate solution. These samples were iced after collection and during transportation to the National Environmental Research Center in Cincinnati, Ohio. An exception were those samples collected in Arizona. These samples were transported to a certified mobile EPA laboratory temporarily located in Tucson, Arizona, for the study. The time between collection and the start of the analysis of the samples did not exceed 30 hours.

Laboratory Procedures

The bacteriological quality examination procedures used in this study were those listed in *Standard Methods.*[1] The membrane filter procedure was used to examine water samples for total coliforms. The procedure involved using M-Endo MF broth and incubating at 35° C for 20–24 hours. Coliform colonies detected were verified further by transfer to lactose broth for 24- and 48-hour periods at 35°C incubation. All positive phenol red lactose broth tubes were then transferred to brilliant green lactose broth at 35° C for verification of total coliforms and to EC medium at 44.5° C for detection of fecal coliforms.

The laboratory procedures for the chemical and physical analyses of the water samples were those of *Standard Methods,*[2] except for the use of a variation of the colorimetric titration procedure for the chloride analysis.

[1] "Standard Methods for the Examination of Water and Wastewater", 13th ed., (APHA, AWWA, WPCF) American Public Health Association. New York, N.Y., 769 pp. (1971).

[2] Ibid.

FINDINGS

FINDINGS

Water Quality

Twenty (48 percent) of the 42 drinking water systems studied delivered water that failed to meet some constituent limit of the Drinking Water Standards. Eleven systems (26 percent) failed at least one mandatory chemical or bacteriological limit and 11 (26 percent) failed at least one recommended limit. These figures are shown in graphic form in Figure 4. Figure 5 illustrates the number of systems failing to meet specific constituent limits. As can be seen, the fluoride standard and the coliform standard were most frequently failed. Table 4 shows the general location where constituent limits were not met.

Table 5 compares distributed water quality by the source of the raw water. The surface water showed a high level of dissolved solids in one instance and more color than allowed by the Drinking Water Standards in another. There were also two (33 percent) surface water systems showing coliform contamination. All other water that failed a constituent limit of the Drinking Water Standards came from the ground.

The maximum concentrations of various physical and chemical constituents in excess of the Drinking Water Standards are listed in Table 6. As can be seen, the maximum levels of zinc, iron, and total dissolved solids were very high. The frequency distributions in Table 7 provide a more descriptive picture of the levels found.

On the basis of samples collected on the field visit, four systems showed bacteriological contamination. There was no disinfection being practiced at one of these systems. The other three systems had chlorination equipment, but no chlorine residual could be detected in the distribution system water at the time of the survey.

National Park Service Study
Table 4.—Drinking Water Standards Limits Not Met.

Constituent	Parks in the East (21)		Parks in the West (21)	
	Number	Percent	Number	Percent
	Recommended Limits Not Met			
Color	0	0	1	5
Iron	2	10	0	0
Manganese	1	5	1	5
TDS	0	0	4	17
Zinc	2	10	0	0
	Mandatory Limits Not Met			
Coliform Organisms	1	5	3	14
Fluoride	3	14	2	10
Lead	1	5	0	0
Mercury	2	10	0	0

Bacteriological Surveillance

Since bacteriological samples collected at the time of the field survey can only give an indication of the quality of water at a given time and not a complete picture of water quality over a period of time, an effort was made to gather the records of bacteriological examinations made in the last 12 months before the field survey. Records of tests made by the State health departments and the National Park Service were

National Park Service Study
Table 5.—Water Systems Surveyed Failing to Meet Drinking Water Standards, By Source.

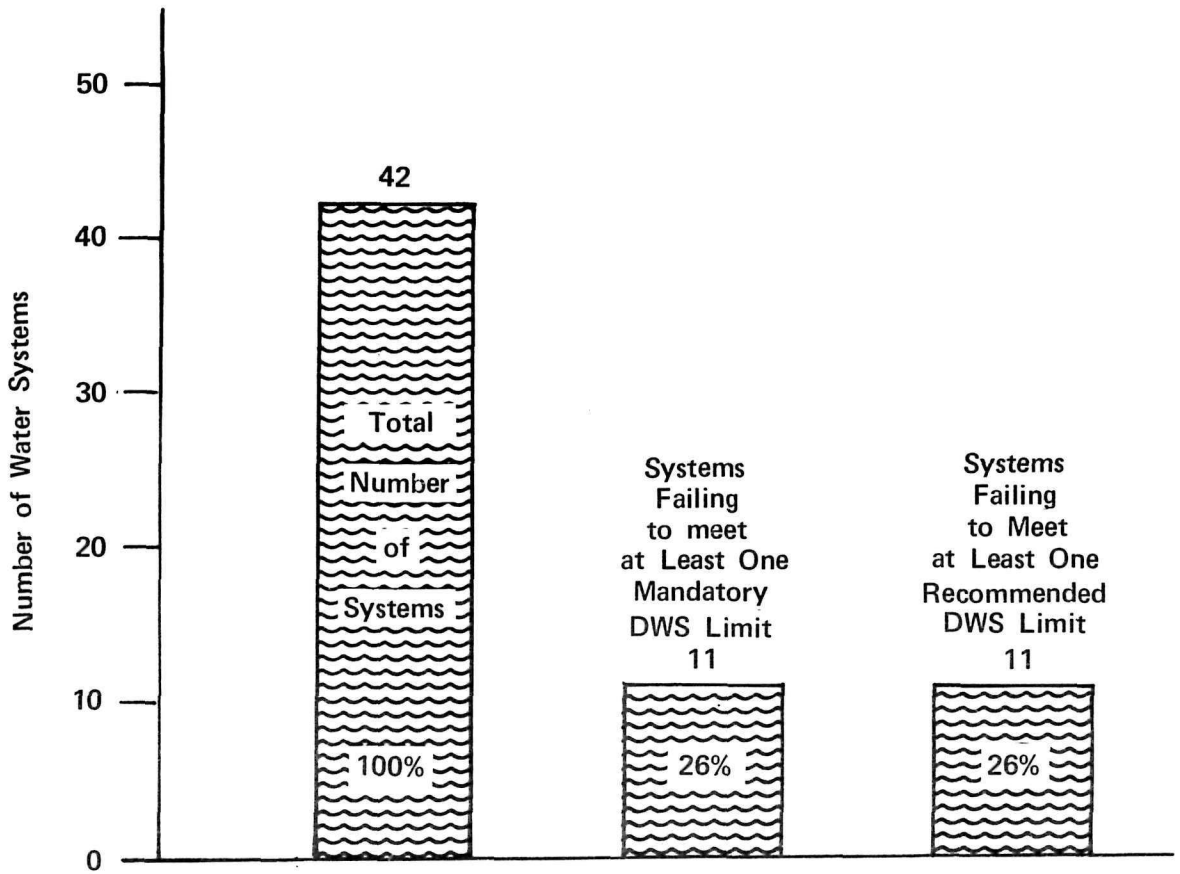
Constituent	Ground water (36)		Surface Water (6)*	
	Number	Percent	Number	Percent
	Recommended Limits			
Color	0	0	1	17
Iron	2	6	0	0
Manganese	2	6	0	0
TDS	3	8	1	17
Zinc	2	6	0	0
	Mandatory Limits			
Coliform	2	6	2	33
Fluoride	5	14	0	0
Lead	1	3	0	0
Mercury	2	6	0	0

*Combined source system considered as surface source for analytical purposes.

NATIONAL PARK SERVICE STUDY

Figure 4

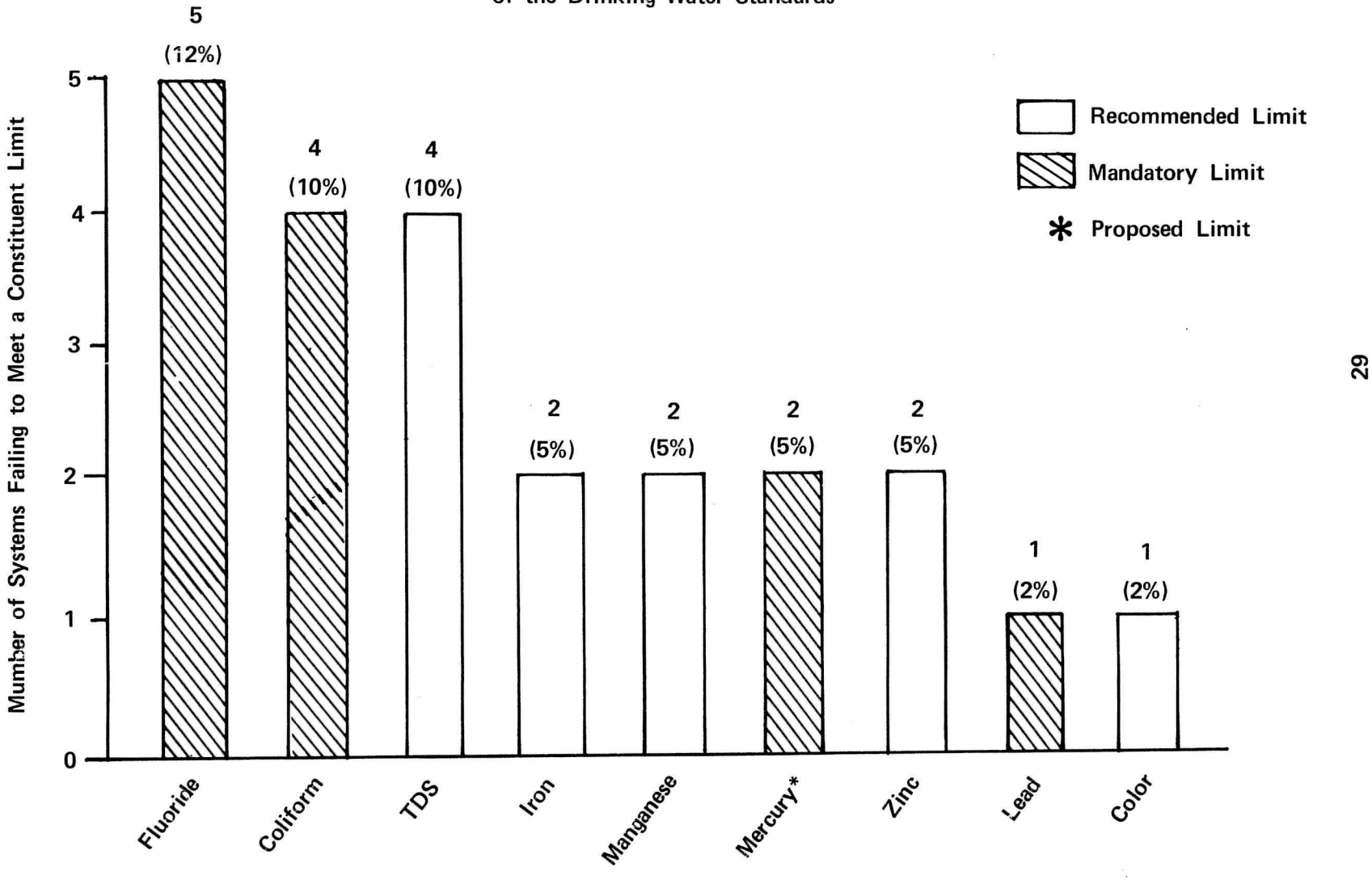
Number of Systems Failing to Meet Standards



NATIONAL PARK SERVICE STUDY

Figure 5

Systems Failing to Meet a Constituent Limit
of the Drinking Water Standards



National Park Service Study

Table 6.—Maximum Concentration of Physical and Chemical Constituents Failing to Meet Limits for Systems Surveyed.

Constituent	Concentration	
Color (15)	25	s.u.
Fluoride (1.4 to 2.4) [1]	3.00	mg/l
Iron (0.3)	1.80	mg/l
Lead (0.05) [1]	.110	mg/l
Manganese (0.05)	.076	mg/l
Mercury (0.002) [2]	.0075	mg/l
Total Dissolved Solids (500)	1138	mg/l
Zinc (5)	29	mg/l

( ) PHS Drinking Water Standard.

[1] Mandatory Limit.

[2] Proposed for inclusion in the Drinking Water Standards as a mandatory limit.

examined, and the bacteriological quality and number of bacteriological samples collected each month from the distribution system were recorded.

The number of bacteriological samples taken in the last year varied widely, depending in part on the length of the operating season of the system. Twenty three systems (55 percent) had records of an acceptable bacteriological surveillance program.[3] Of the 19 (45 percent) systems that did not have an acceptable bacteriological surveillance program, 13 were in the East and 6 were in the West. No samples were taken during three or more months at 6 (14 percent) water systems. One water system at Gettysburg National Military Park had not been sampled in the past year, and systems at Ft. Necessity National Battlefield, Catoctin Mountain Park, and Assateague Island National Seashore received poor sampling.

An examination of the bacteriological quality for the 12 months prior to the field visit revealed that 10 (24 percent) of the systems failed the Drinking Water Standards for one or more months. Seven of these ten systems were in the East and 3 were in the West. Organ Pipe Cactus National Monument had the most serious problems in not meeting the bacteriological quality standards in 8 of the prior 12 months. Figure 6 summarizes the bacteriological monitoring at the water systems studied.

[3] This means that the sampling frequency as stated in the Drinking Water Standards (a minimum of two samples per month) was met at least every month of operation except one.

National Park Service Study

Table 7.—Frequency Distribution of Various Chemicals That Failed to Meet the Drinking Water Standards.

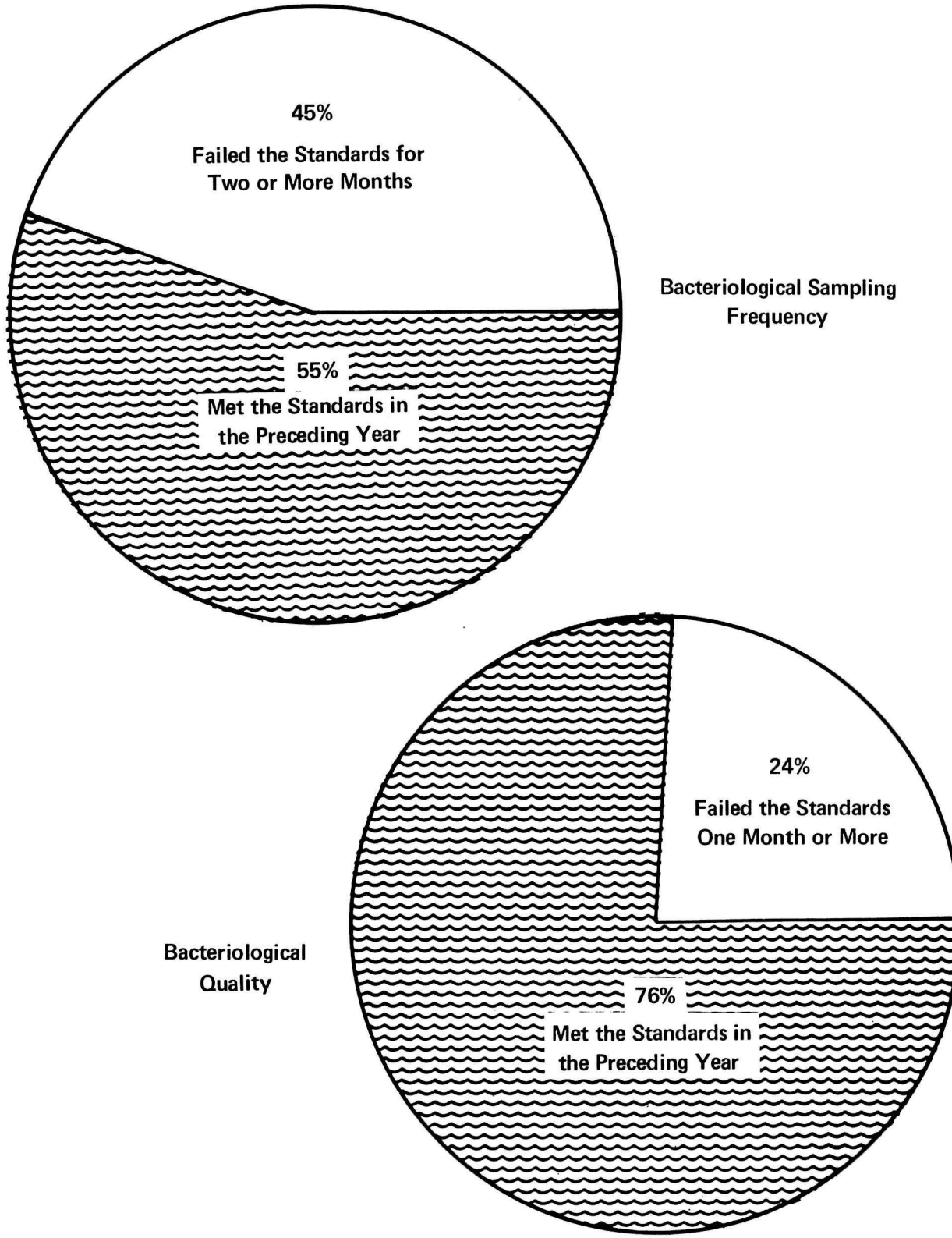
(Line indicates Drinking Water Standards limit)

Range	*Number*
Fluoride	
0 to .09	20
.10 to .39	12
.40 to .69	2
.70 to .99	1
1.00 to 1.29	1
1.30 to 1.59	1
1.60 to 1.89	0
1.90 to 2.19	0
2.20 to 2.49	0
2.50 to 2.79	2
2.80 to 3.09	3
Lead	
0 to 0.005	38
0.006 to 0.01	0
0.011 to 0.02	0
0.021 to 0.03	2
0.031 to 0.04	1
0.041 to 0.05	0
0.051 to 0.07	0
0.071 to 0.10	0
0.101 to 0.15	1
Mercury	
0 to .00049	37
.0005 to .00099	2
.0010 to .0019	1
.0020 to .0049	0
.005 to .0099	2
Zinc	
0 to 0.10	15
0.11 to 0.20	9
0.21 to 0.50	7
0.51 to 1.00	5
1.01 to 1.50	3
1.51 to 2.10	0
2.11 to 3.00	1
3.01 to 4.00	0
4.01 to 5.00	0
>5.00	1

Range	*Number*
Iron	
0 to 0.05	26
0.06 to 0.1	6
0.11 to 0.2	2
0.21 to 0.3	3
0.31 to 0.6	3
0.61 to 1.0	0
1.01 to 3.0	2
Manganese	
0 to 0.005	32
0.006 to 0.01	3
0.011 to 0.02	1
0.021 to 0.03	3
0.031 to 0.04	0
0.041 to 0.05	1
0.051 to 0.07	1
0.071 to 0.10	1
TDS	
0 to 99	18
100 to 199	3
200 to 299	7
300 to 399	6
400 to 499	4
500 to 599	1
600 to 699	1
700 to 799	1
800 to 899	0
900 to 999	0
1000 to 1099	0
1100 to 1199	1
Color	
1 to 2	25
3 to 4	12
5 to 6	3
7 to 9	1
10 to 12	0
13 to 15	0
>15	1

Chemical Surveillance

There was no chemical analysis on record at 19 (45 percent) of the water systems studied. Fifteen of these systems were in the East. Only nine systems (21 percent) had a chemical analysis within the past five years. For the remainder of those systems that have records of chemical surveillance, the last chemical sample was an-



NATIONAL PARK SERVICE STUDY

Figure 6
Summary of Bacteriological Monitoring
at Water Systems Studied

alyzed seven years ago. None of the chemical analyses performed included all of the constituents in the Drinking Water Standards.

Sanitary Surveys

Surveillance of the Park Service water systems has been the responsibility of the U.S. Public Health Service for many years under a reimbursable agreement. This group of nine persons has been responsible for sanitary surveys of the water systems, technical assistance, and monitoring the results of bacteriological and chemical sampling. They travel to each park on a periodic basis (once every one to three years) and inspect solid waste facilities, sewage treatment facilities, and food service establishments as well as the drinking water systems. The group has now been detailed to the National Park Service and has issued a classification system for Park Service water systems. The memo explaining this system is in Appendix C.

Many of the water systems included in this study had been visited by the Public Health Service just prior to the field evaluation. Nine (43 percent) of the systems in the West and 2 (10 percent) of the systems in the East, had been surveyed in the spring of 1973. Twenty-two (52 percent) were surveyed in 1972. Nine (21 percent) systems in this study did not have a sanitary survey in the past year.

Operation, Control, and Protection

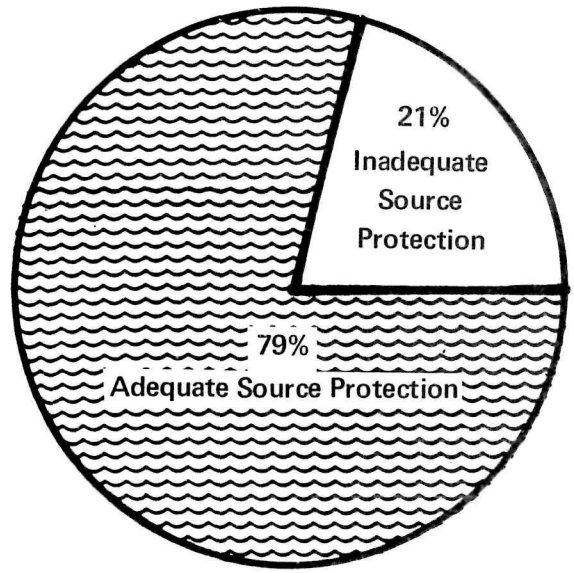
A sanitary survey was made of each of the 42 water systems. On the basis of this survey, judgements were made as to the adequacy of the source protection, adequacy of operation and control, and the need for major improvements. The results are summarized in Figure 7.

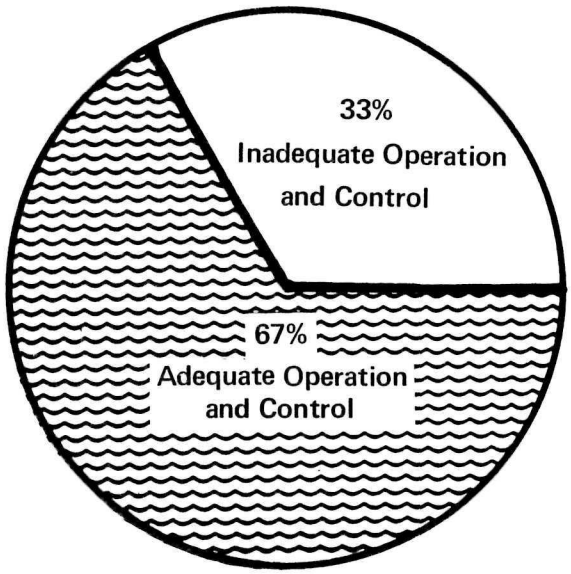
Nine (21 percent) of the water systems studied did not have adequate source protection. Fourteen (33%) of the systems had inadequate operation and control. Ten of these fourteen systems were in the West and the remainder were in the East.

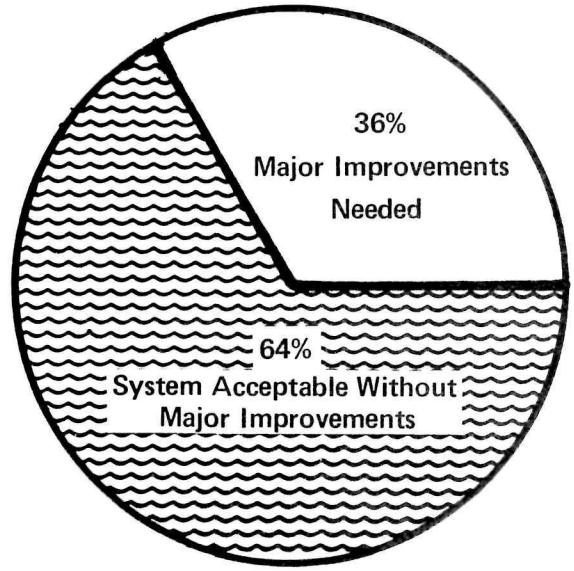
There were also fifteen (36 percent) systems that were judged not capable of delivering a continuous supply of safe drinking water without major improvements. Major improvements as used here means a change in source, treatment equipment, distribution system, and/or storage facilities to help assure safe water at all times.

The source of water for each system was evaluated as to its ability to provide adequate quantities of water during the entire period of operation. All water systems in the East had an adequate supply of water, but three systems in the West had a source that was not sufficient for demands. These included the headquarters system at Point Reyes National Seashore and two systems in Yosemite National Park: Crane Flat and El Portal. The water shortage problem at El Portal is particularly acute because of the large number of permanent employees and their families who depend on the water and the plans for future expansion in this area.

The water pressure was recorded in two places at all water systems having a pressure distribution system. The pressure was judged to be adequate if it exceeded 20 p.s.i. at all points in the







NATIONAL PARK SERVICE STUDY

Figure 7
Summary of Sanitary Conditions at
Water Systems Studied

distribution system. This criterion was not met at two water systems: the Lewis Mountain system at Shenandoah National Park and the Yosemite Valley system in Yosemite National Park.

Table 8 summarizes the chlorination practices and their effectiveness at the water systems surveyed. Where chlorination was practiced, the chlorine residual was determined at two separate places in the distribution system. No chlorine residual was detected in the water at seven (37 percent) of the systems where chlorination equipment was operated. A chlorine residual was found in at least one place in 12 (63 percent) of the systems and at two points in 7 (37 percent) of the water systems. Twelve systems (63 percent) did not have an adequate level of chlorine (a residual at all points in the distribution system).

National Park Service Study

Table 8.—Chlorination Practices and Their Effectiveness at Water Systems Surveyed.

Source or Area	Number of Supplies That Chlorinate	Systems With Chlorine Residual Found in One or Both Points in the Distribution System		Systems With Chlorine Residual Found in Both Points in the Distribution System	
		Number	Percent of Those That Chlorinate	Number	Percent of Those That Chlorinate
Surface Water	6	3	50	2	33
Ground Water	13	9	69	5	38
Total	19	12	63	7	37
Supplies in East	3	2	67	2	67
Supplies in West	16	10	63	5	31
Total	19	12	63	7	37

DISCUSSION

DISCUSSION

General

The National Park Service has made great efforts to provide facilities for the convenience of the public. The fact that there were over 215 million visits to the national parks last year is evidence that the quality of water consumed is of considerable public health importance. The public assumes and rightly expects that the drinking water made available to them is safe for consumption and will be esthetically pleasing. The recommendations included in this report are presented with these objectives in mind.

The National Park Service (NPS) has for some time been using a system of surveillance under which one group (in this case personnel of the U.S. Public Health Service now on detail to the NPS) has specific responsibility for overseeing the sanitary conditions of the drinking water systems at the parks. Although this discussion includes areas where improvements are recommended, the effectiveness of the surveillance system is apparent. These water systems as a whole are much better than similar systems found in other EPA studies. The National Park Service is to be commended for their efforts and interest in this area. The NPS is also fortunate to have many employees who are interested in their water systems and work to keep them in good condition.

One of the problems facing all agencies is in the application of established criteria and standards for municipal systems to the small water systems found in this study. These small systems have water demands that vary to a large degree during the week. Also, due to economic considerations, small systems have a difficult time providing the full water treatment that large water systems routinely employ.

Water Quality

The Drinking Water Standards have been promulgated to provide specific limits for substances which are toxic or cause adverse health effects in man. These substances are usually naturally occurring in the earth, and can be dissolved into water by the passage of water through certain formations in the earth's surface or by the addition of these substances to water by man (i.e., through pollution). Because of these processes, substances may be found in drinking water in concentrations that are potentially hazardous to health.

Since 48 percent of the water systems did not comply with some constituent limit of the Drinking Water Standards, there is a general need for improvement in water quality for the supplies studied. This need for improvement is not as critical for those supplies which did not comply with only the recommended standards as it is for those which failed to meet the mandatory limits, but improvement is important for all these systems.

Three mandatory chemical limits were not met for water systems in this study: fluoride, mercury, and lead. High levels of fluoride may cause dental fluorosis and bone changes, especially for children. Chronic exposure to high levels of mercury are characterized by central nervous system toxicity. The symptoms of lead intoxication are gastrointestinal disturbances, loss of appetite, fatigue, anemia, motor nerve paralysis, and encephalopathy. Those systems producing water that failed a mandatory chemical standard were generally grouped in the same geographical area. The source of the problems should be further investigated and the water resampled for another chemical analysis. If the results of this study are confirmed, a new water source should be found or treatment instituted to ensure that the water is safe to drink.

The results of this study also show that 26 percent of the systems produced water that did not meet at least one recommended limit of the Drinking Water Standards. These recommended limits are primarily esthetic in nature and are divided into chemical and physical characteristics. They relate to materials that impart objectionable taste, appearance, or odor to the water, and are important because a consumer may reject a safe water supply if its taste or appearance is unsatisfactory to him. Therefore, these limits

should not be exceeded when a more suitable water source can be made available.

The recommended standards that were not met were those for color, iron, manganese, total dissolved solids, and zinc. In almost all cases, these standards and the mandatory chemical standards were not met for ground water with the surface water being of better chemical quality. The surface sources found in this study were in relatively remote areas and generally not subject to pollution by man.

The coliform group of bacteria are used as indicator organisms in testing the sanitary quality of drinking water. This bacteria group proliferate in the intestines of man; and when found in drinking water, indicate the potential presence of pathogenic or disease-producing organisms. The Drinking Water Standards prescribe specific criteria for the maximum concentration of coliform bacteria and require that immediate corrective action be taken if this concentration is exceeded.

At the time of the field survey, two (6 percent) of the well water systems and two (33 percent) of the systems using surface water as a raw water source were contaminated with coliform bacteria. The meaning of these statistics in relation to the facilities and operation of each system and the surveillance of each system will be discussed later. Immediate steps should be taken to rectify the problem. More samples should be taken until the water supply can be shown to be safe.

Bacteriological Surveillance

The standard used to judge the acceptability of the bacteriological surveillance program is the one used to certify the use of a water supply for an interstate carrier [1], the legislatively mandated duty of the Federal Government. Forty-five percent of the water supplies would not be classified as approved under this system. There was found to be a significantly better record of bacteriological surveillance in the West than in the East.

There is a great need to expand the existing bacteriological sampling practices so that a regular program of surveillance is implemented which would comply with Drinking Water Standards requirements. This regular program should be continued during the entire period the system is operational and serving drinking water to the traveling public and should include the provision for follow-up or check samples when unsatisfactory results are obtained. All samples should be sent to a laboratory certified by a State or an EPA approved certifying officer. While there is an advantage in sending the samples to a central laboratory within 30 hours of collection, there are instances where this may be impossible. In such cases, bacteriological analyses made in a certified field laboratory are satisfactory.

The bacteriological quality, as revealed by the review of the results of the bacteriological sampling for the past twelve months, was not satisfactory. Twenty-four percent of the systems failed the Drinking Water Standards for one or more months. With this background, there can be no surprise that 10 percent of the bacteriological samples collected for the field evaluations of this study were contaminated.

Chemical Surveillance

None of the water systems studied were subject to a regular program of chemical surveillance. There was no chemical analysis on record at 45 percent of the water systems studied. None of the water systems that had a chemical analysis on record had a complete analysis for all constituents in the Drinking Water Standards. Another problem was that records of chemical analyses were not kept in any one location. Some were found at the NPS headquarters, some at the NPS regional offices, and the remainder were found at the parks. There is no way to determine, without much time and effort, the status of the chemical sampling program.

The water from all drinking water systems should be tested for all chemical constituents listed in the Drinking Water Standards before the water is made available to the traveling public. In addition, a complete chemical analysis is recommended for systems supplied by ground water every three years and surface water every year, or more often when there is reason to believe the chemical quality is deteriorating. Signs of deteriorating water quality might include unpleasant taste and/or odor or the occurrence of frequent public or operating personnel complaints.

The results of all chemical testing should be forwarded to one office of the National Park

[1] "A Guide to the Interstate Carrier Water Supply Certification Program," Environmental Protection Agency, Washington, D.C. April 1973.

Service so that trends in chemical quality and frequency of surveillance may be reviewed on a continuing basis.

Sanitary Surveys

Twenty-one percent of the water systems did not have a sanitary survey in the past year. Although operating personnel at the parks generally made regular visits to the water systems and seemed to be aware of sanitary conditions, more thorough investigations by trained investigators of the condition of the water systms are needed. Yearly sanitary surveys of each water system should be conducted. Sanitary surveys should include checks on the system's physical facilities used to treat, distribute and store the water and the adequacy and condition of source protection. Any deficiencies noted in the sanitary surveys should be corrected.

The classification system for drinking water supplies issued by the NPS during this study is patterned after the "Guide to the Interstate Carrier Water Supply Certification Program" [2] prepared by the Environmental Protection Agency. The NPS system prescribes criteria to classify drinking water systems as "Satisfactory," "Provisionally Satisfactory," or "Use Prohibited," on the basis of water quality, sampling frequency, and proper operation and maintenance. While the system is generally very good, there should be a time frame (such as 12 months) factored into it. For example, if bacteriological limits are exceeded for one of the months sampled *in the past 12 months,* the system will be classified "Provisionally Satisfactory" (Section A. 1).

Operation, Control, and Protection

The adequacy of the source protection, adequacy of the operation and control, and the need for major improvements for each water system were determined by a sanitary survey of each water system. The adequacy of the source protection was based on the existence of a formation seal in wells, sanitary seal in wells, properly installed vents, adequately protected and drained spring and well pits, protection for springs, etc. Twenty-one percent of the systems did not meet this criteria for adequate source protection.

The adequacy of the operation and control was based on whether or not chlorine residuals in the distribution systems were checked daily and recorded and, if other treatment was employed, whether or not the treatment facilities were checked daily for optimum operation. Operation and control was also deemed to be inadequate if no chlorine residual was found in the distribution system on the day of the field evaluation. Thirty-three percent of the water systems did not have adequate operation and control.

One of the major deficiencies noted in this study was the improper operation of disinfection equipment. For those four systems contaminated with coliform bacteria, one did not disinfect in any way. Chlorinators were installed at the other three systems showing coliform contamination. However, none of these three systems carried a detectable chlorine residual on the day of the field evaluation. Of those systems which chlorinated, seven (37 percent) had no chlorine residual on the day of the survey.

Chlorination of a water system involves several operating problems. Quite often the chlorine feed system becomes clogged or the chlorinator is inadvertently turned off, some consumers complain about the taste and odor of chlorinated water and during the periods of low water use, the chlorine residual disappears in the distribution system and sometimes in the storage tank. The fact that a chlorinator has been placed in the water system does not guarantee a safe supply. If chlorinators are to be effectively used for disinfection, daily inspections of the feed equipment and determinations of the chlorine residuals must be conducted. Booster chlorination of the water as it flows to the system from storage tanks may be necessary.

The foregoing operational problems emphasize the necessity for some type of operator training. Some of the individuals responsible for the water systems do not have a full knowledge of what they should be doing and the reasoning behind these duties.

Low pressure in drinking water systems is a problem because it reduces the protection of the system from the backflow of contaminated water. Unsafe water may be siphoned into a water system through any kind of temporary or permanent cross connection. Low pressure (<20 p.s.i.) was found at two water systems. The pressure problems were due to undersized pipe in the distribution system, i.e., the pipes were not

[2] Ibid

able to handle the high demand. More attention should be given to this problem in future design work.

For each drinking water system, a determination was made for the capability of the system to deliver a continuous supply of safe drinking water without improvements in the system. Consideration was given to the availability of sufficient raw water to prevent water shortages, existence of cross connections, proximity to sources of pollution, use of disinfection, capacities of the pumps, adequate pressure in all parts of the system, detention time for maximum benefit from treatment, properly covered and vented storage tanks, etc. There were fifteen (36 percent) water systems in need of improvements to help assure safe water at all times.

In particular, water shortages were found to have occurred at three water systems in the West. At a minimum, periods of no water are a great inconvenience to families living at the parks full-time and the park visitors. But there is a temptation to pump water from other sources which may be less safe or transport water by truck to the water system. This extra handling through temporary connections decreases the margin of safety in any water system. For these reasons, new water sources should be developed and treatment instituted as necessary to assure an adequate quantity of water.

Surveillance Program Resource Requirements

The staffing and cost of an adequate surveillance program for a water system operated 12 months per year is approximately 3.2 man days and $360 per system. This is calculated according to the following assumptions:

1. The average annual estimated personnel cost for surveillance is $20,000 per man-year.
2. Program administration is 25% of surveillance.
3. The time required for sanitary surveys and related technical assistance (including training) for a water system is 1.0 man-days per system. Assuming 220 man days per year, the cost of this surveillance is $90 per system per year.
4. One chemical analysis will be performed for each system using surface water every year and for each system using ground water once every three years. The manpower required to perform the laboratory analyses averages .88 man-days per system per year and the cost averages $80 per system per year.
5. The manpower required to perform the analysis of two bacteriological samples per month is .66 man-days per system per year. The total cost including sample bottles, mailing containers, labels and postage is $120 per system per year for 12 months of operation.

The total estimated water supply program manpower needs and costs are summarized in Table 9.

Since the National Park Service has 1,000 water systems under its complete control, the NPS should be allocating at least $362,000 to its surveillance program. The total manpower needs are 3,170 man-days per year or 14.4 man years per year. Until the NPS has the laboratory capability to analyze the required samples, some of this work must be done on a contract basis.

The manpower and costs required for just the sanitary surveys and technical assistance and the administration of this part of the program is calculated as follows:

Manpower

[1.0 + .25 (1.0)] 1000 NPS water systems = 1250 man-days per year or 5.68 man-years per year

Costs

[90 + .25 (90)] 1,000 NPS water systems = $112,500

There are currently nine full time people in the PHS unit of the Park Service performing sanitary surveys and providing technical assistance for the water systems. Since they are also responsible for sewage treatment, solid waste, and food service consultation in the parks, and this study has found a number of areas where improvement is needed, the number of people having these responsibilities should be increased so that they can better perform their responsibilities.

National Park Service Study

Table 9.—Estimated Water Supply Program Manpower Needs and Costs.
(Per System Per Year)

Program Activity	Man-Days	Cost
Surveillance:		
Sanitary Surveys, Tech. Assistance ...	1.0	$ 90
Chemical Surveillance	.88	80
Bacteriological Surveillance	.66	120
Subtotal:	2.54	$290
Program Administration @ 25% of Surveillance	.63	72
TOTAL	3.17	$362

PARTICIPANTS

PARTICIPANTS

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Deputy Director	William N. Long
Project Director	Curtis F. Fehn
Project Consultant	John A. Cofrancesco
Project Advisors	Thomas N. Hushower
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Report Preparation	Curtis F. Fehn
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	Joseph P. Schock
Regions	W. A. Kingsbury
	Ronald R. Speedy

APPENDICES

APPENDIX A

SANITARY SURVEY FORMS USED IN STUDY

EPA-9 (CIN)
(REV. 6-72)

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF WATER PROGRAMS
WATER SUPPLY PROGRAMS DIVISION

SERIAL NO. 16741

PUNCH IN COLS. 1 6

IDENTIFICATION OF WATER SAMPLE

1. LOCATION OF WATER SUPPLY _____
CITY, COUNTY, STATE

FOR OFFICE USE ONLY ☐☐☐☐☐☐☐☐☐☐☐☐ (7–18)

DO NOT WRITE BELOW THIS LINE

2. WATER SUPPLY NAME _____

3. DATE OF SAMPLING
BEGINNING DATE OF COMPOSITE — MO. ☐☐ DAY ☐☐ (19–22)
ENDING DATE OF COMPOSITE OR DATE OF GRAB SAMPLE — MO. ☐☐ DAY ☐☐ YR. ☐☐ (23–28)

4. SAMPLE FROM ☐ TREATMENT PLANT (8) ☐ WELL (4) ☐ RESERVOIR (2) ☐ DISTRIBUTION SYSTEM (1) ☐ OTHER (0) — ☐ (29)

5. SAMPLING POINT LOCATION AND/OR DESCRIPTION _____ ☐☐☐ (30–32)

6. TYPE OF WATER SAMPLED ☐ FINISHED (8) ☐ PARTIALLY TREATED (4) ☐ RAW (2) ☐ OTHER (0) — ☐ (33)

7. SOURCE OF WATER ☐ SURFACE (8) ☐ GROUND (4) ☐ COMBINED (2) ☐ OTHER (0) — ☐ (34)

Send Sample Results to
Tech. Op., DWS., EPA
Wash., D.C. 20460

8. SAMPLING METHOD ☐ COMPOSITE (8) ☐ GRAB (4) ☐ OTHER (0) — ☐ (35)

9. ANALYSIS REQUIRED ☐ ORGANIC (8) ☐ TRACE ELEMENTS (4) ☐ WET (2) ☐ RADIO-CHEMICAL (1) ☐ OTHER (0) — ☐ (36)

10. WATER SUPPLY CATEGORY ☐ COMMUNITY WATER SUPPLY (8) ☐ ICWS (4) ☐ FEDERAL INSTALLATION (2) ☐ SPECIAL STUDY (1) ☐ OTHER (0) — ☐☐ (37–39)

11. APPEARANCE OF SAMPLE _____

12. ADDITIONAL REMARKS _____

13. COLLECTED BY _____ ☐ USPHS STAFF ☐ OTHER — 1 (80)

DO NOT WRITE BELOW THIS LINE

LAB. SAMPLE NO. _____ DATE RECEIVED _____

LABORATORY REMARKS

OVER FOR INSTRUCTIONS

ENVIRONMENTAL PROTECTION AGENCY

Office of Water Programs
Division of Water Hygiene

INDIVIDUAL WATER SUPPLY SURVEY QUESTIONNAIRE

Card 1

NAME _____ SAMPLE NO. [1][ ][ ][ ][ ][ ]

ADDRESS _____ YEAR [ ][ ] (8)

Col. _____

I. THE SOURCE

9 A. Spring [ ](1); Well [ ](2); Surface Source [ ](3); Cistern [ ](4)

10 B. On-premise [ ](1); Off-premise [ ](2) (distance: _____)

11 C. Ground Water from: Sand/Gravel [ ](1); Limestone [ ](2); Sandstone [ ](3); Other Formation [ ](4) Specify _____; Unknown [ ](5)

12 D. Construction: By Contractor [ ](1); Owner/Occupant [ ](2); Other [ ](3); Unknown [ ](4)

II. A. SPRING

13 1. Flowing [ ](1); Non-Flowing [ ](2); Intermittent [ ](3)

14 2. Encasement: Brick, Block, or Stone [ ](1); Reinforced Concrete [ ](2); Other [ ](3)

15 General Condition: Good [ ](1); Fair [ ](2); Poor [ ](3)

16 3. Surface Drainage Controlled? Yes [ ](1); No [ ](2)

17 4. Adequate Fencing around spring? Yes [ ](1); No [ ](2)

18 5. Water withdrawn with: Power Pump [ ](1); Hand Pump [ ](2); Bucket [ ](3); Gravity Flow [ ](4); Other [ ](5)

19-20 6. Estimated Minimum Capacity: [ ][ ] (Numeric) GPM

B. WELL

21 1. Dug [ ](1); Driven [ ](2); Jetted [ ](3); Bored [ ](4); Drilled [ ](5)

2. Dug Well:

22 Acceptable lining to 10' or more? Yes [ ](1); No [ ](2)

23 Acceptable cover? Yes [ ](1); No [ ](2)

24 Masonry or other jointe lining, sealed: Yes [ ](1); No [ ](2); Unknown [ ](3)

25 Reconstructed, sealed and filled: Yes [ ](1); No [ ](2)

26 General condition: Good [ ](1); Fair [ ](2); Poor [ ](3)

3. Other Types of Walls:

27-28 a. Casing: Diameter: [ ][ ] (Numeric) inches, I.D.

Col.

29 Steel or Black Iron ☐1; Galvanized Iron or Steel ☐2; Plastic ☐3; Masonry or Ceramic ☐4; Other ☐5

30 Joints Screwed Coupling ☐1; Joints Welded ☐2; Unknown ☐3.

31 Wall thickness, Std. or better? Yes ☐1; No ☐2

b. Depths:

32-34 Ground surface to bottom of well: ☐☐☐ Ft.

35-37 Ground surface to bottom of casing: ☐☐☐ Ft. (Numeric)

c. Formation Seal:

38 Cement grout seal from depth of 5 to 10' up to surface ☐1; 10 to 20' up to surface ☐2; Fine sand (natural) seal 10 to 20' up to surface ☐3; Puddled clay seal 5 to 20' up to surface ☐4; No apparent formation seal between casing and earth ☐5; Concealed (buried) formation grout seal reported ☐6; Unknown ☐7

d. Sanitary Well Seal:

39 Water tight cover? Yes ☐1; No ☐2

40 Well exposed to flooding by surface water? Yes ☐1; No ☐2

e. Well Pit

41 Pit around well? Yes ☐1; No ☐2

42 Pit has acceptable cover? Yes ☐1; No ☐2

43 Pit drains to open air? Yes ☐1; No ☐2

44 Pit drains to drain line or sewer? Yes ☐1; No ☐2

45 Possible to flood pit in any way? Yes ☐1; No ☐2

46 Pitless adapter? Yes ☐1; No ☐2

47 Pitless adapter with top of well buried or below ground level: Yes ☐1; No ☐2

48 f. Well "Filter" or Screen*

Open hole ☐1; Perforated or slotted pipe ☐2; Gravel Pack ☐3; Sand (well) point or screen of horizontal, endless slot type ☐4; Other type of screen ☐5

49 g. Age of Well: <2 yrs. ☐1; 2-5 yrs. ☐2; 6-10 yrs. ☐3; 11-20 yrs. ☐4; >20 yrs. ☐5

50 C. PUMP AT SOURCE: Yes ☐1; No ☐2; Bucket ☐3

51 1. Hand pump ☐1; "Shallow well" (Low-Lift) Jet or Centrifugal pump ☐2; "Deep well"(Hi-Lift) Jet Pump ☐3; Submersible pump ☐4; Piston Pump ☐5; None ☐6

*Not to be confused with "filter" or strainer attached to suction inlet of pump.

Col.

52 2. Pump never breaks suction ☐1; Sometimes breaks suction ☐2

53 3. With existing pump, source delivers: <3 GPM ☐1; 3-5 GPM ☐2; 5-10 GPM ☐3; 10-20 GPM ☐4; >20 GPM ☐5

D. SURFACE SOURCE (Stream; Lake)

54 1. Perennial ☐1; Intermittent ☐2

55 2. Upstream: Human activity currently on watershed? Yes ☐1; No ☐2

56 3. Delivery: Flow by pumping ☐1; By gravity ☐2

E. CISTERN

57 1. Catchment Area: Rooftops ☐1; Ground surface paved or covered with impermeable material ☐2

58 2. Ground Area Only: Fenced ☐1; Signs posted ☐2; Unprotected ☐3

59 3. Cistern Construction: Above ground ☐1; Below ground ☐2;

60 Brick or Stone ☐1; Concrete ☐2; Wood ☐3; Steel ☐4

61 General Condition: Good ☐1; Fair ☐2; Poor ☐3

62 4. Device for discarding first water? Yes ☐1; No ☐2

63 5. Cistern Protection: Screened against rodents, birds? Yes ☐1; No ☐2

64 6. Cleaning: Does cistern have drain which permits cleaning and flushing to waste? Yes ☐1; No ☐2

65 Does cistern need cleaning now? Yes ☐1; No ☐2

F. WATER TREATMENT

66 1. Sedimentation: Yes ☐1; No ☐2

67 2. Filtration Through: Sand ☐1; Other Medium ☐2

68 3. Chlorination: Automatic ☐1; Manual ☐2

69 4. Softening: Yes ☐1; No ☐2

70 5. Other: Yes ☐1 (Describe)_____; No ☐2

71 G. STORAGE (All Sources): Yes ☐1; No ☐2

72 1. Pressure tank ☐1

73 2. Other storage: Elevated or Ground Level ☐1; Below ground level ☐2

74 3. Construction: Steel ☐1; Brick, block or stone ☐2; Concrete ☐3; Wood ☐4; Plastic ☐5; Other ☐6

75 4. General Condition: Good ☐1; Fair ☐2; Poor ☐3

76

H. DELIVERY

76 1. Water flows to point of use by hand pumping ☐1; Power pumping ☐2; Gravity ☐3; Hand carry ☐4

80 CARD NUMBER 1; CARD 2 - Dup. 1-8

Col.

I. PHYSICAL QUALITY OF WATER

9 1. Colored ☐(1); Turbid ☐(2); Clear ☐(3); Contains sand ☐(4)

10 2. Taste: Good ☐(1); Fair ☐(2); Poor* ☐(3) _____

11 3. Evidence of iron or manganese problem: Yes ☐(1); No ☐(2)

12 4. Water Softener in regular operation: Yes ☐(1); No ☐(2)

13 5. Other water conditioner devices used: Yes ☐(1); No ☐(2)

J. PUBLIC AGENCY INTERESTS**

14 1. Has any public agency inspected this supply at any time within the last two years? Yes ☐(1) ** _____ _____; No ☐(2); Unknown ☐(3)

15 2. Has bacteriological analysis ever been made on the water? Yes ☐(1); Date _____,** _____ _____; No ☐(2); Unknown ☐(3)

16 a. If "yes", was the water found "safe"? Yes ☐(1); No ☐(2)

17 b. If "no" (under 2a), were corrections recommended? Yes ☐(1); No ☐(2)

18. c. Were corrections made? Yes ☐(1); No ☐(2)

19 d. After corrections were made, was water retested? Yes ☐(1) ** _____; No ☐(2)

20 3. Did the owner, before attempting any construction at the source or before using the source, consult any agency about its suitability? Yes ☐(1) ** _____ _____; No ☐(2)

21 4. Have any chemical analyses ever been made on the water? Yes ☐(1) Date _____, ** _____ _____; No ☐(2); Unknown ☐(3)

K. USER'S PREFERENCE

22 1. User prefers: Present supply ☐(1); Another or improved individual supply ☐(2); A public supply ☐(3)

23-25 ☐☐☐ 2. Reason(s) for Preference: Lower cost ☐(1); Better tasting water ☐(2); Softer water ☐(4); Independence ☐(8); More reliable source ☐(16); Safer ☐(32); More convenient ☐(64); Other ☐(128)

L. PRESENT CONSUMPTION

26 1. Number of dwelling units using system ☐

27-30 2. Number of persons using system. Adults ☐☐ ; Children ☐☐

31 3. Is water shortage ever experienced: Yes ☐(1) ** _____ _____; No ☐(2)

80 CARD NUMBER 2

* Identify if possible

** Identify agency

APPENDIX B

SANITARY SURVEY RESULTS

REPORT ON INDIVIDUAL WATER SUPPLIES
NATIONAL PARK SERVICE STUDY

NAME OF PARK - Gettysbury Nat'l Military Park DATE OF SURVEY 5/16/73
NAME OF SUPPLY Electric Map Museum STORAGE 200 gal pressure tank
TREATMENT none SOURCE well

BACTERIOLOGICAL QUALITY

NUMBER OF MONTHS IN PAST YEAR OF OPERATION THAT NO BACTERIOLOGICAL SAMPLES WERE TAKEN. 12

NUMBER OF MONTHS IN PAST YEAR OF OPERATION THAT ONE BACTERIOLOGICAL SAMPLE WAS TAKEN. 0

NUMBER OF MONTHS WHEN THE BACTERIOLOGICAL LIMITS OF THE DWS WERE NOT MET. 0

CHEMICAL QUALITY

DWS MANDATORY LIMITS FAILED Mercury

DWS RECOMMENDED LIMITS FAILED

SANITARY CONDITIONS

IS THE SOURCE PROTECTION ADEQUATE? YES ___ NO x

Well should have a sanitary seal.

IS OPERATION AND CONTROL ADEQUATE? YES x NO ___

IS THE WATER SYSTEM CAPABLE OF DELIVERING A CONTINUOUS SUPPLY OF SAFE WATER? YES ___ NO x

Pump capacity not large enough.

PHYSICAL AND CHEMICAL RESULTS

ARSENIC (0.01)*	< .005	FLUORIDE (1.4 to 2.4) **	.10	pH	6.7
(0.05)**		IRON (0.3)*	.018	SELENIUM (0.01)**	< .005
BARIUM (1.0)**	< .05	LEAD (0.05)**	.000	SILVER (0.05)**	.000
CADMIUM (0.01)**	.000	M.B.A.S. (0.5)*	< .250	SULFATE (250)*	28
CHLORIDE (250)*	71	MANGANESE (0.05)*	.000	TOTAL DISSOLVED SOLIDS (500)*	333
CHROMIUM (.05)**	.000	MERCURY	.0075	TURBIDITY (5 s.u.)*	.2
COLOR (15 s.u.)*	3	NITRATE (45)*	25.0	ZINC (5.0)*	.085
COPPER (1.0)*	.120				

*RECOMMENDED LIMIT **MANDATORY LIMIT
ALL VALUES ARE MILLIGRAMS PER LITER UNLESS OTHERWISE NOTED.

BACTERIOLOGICAL RESULTS

	COLIFORM/100 ml	FECAL COLIFORM/100 ml
RAW WATER		
DISTRIBUTION #1	0	0
DISTRIBUTION #2	0	0

REPORT ON INDIVIDUAL WATER SUPPLIES
NATIONAL PARK SERVICE STUDY

NAME OF PARK Gettysburg Nat'l Military Park DATE OF SURVEY 5/16/73
NAME OF SUPPLY South End Station STORAGE pressure tank
TREATMENT UV disinfection SOURCE well

BACTERIOLOGICAL QUALITY

NUMBER OF MONTHS IN PAST YEAR OF OPERATION THAT NO BACTERIOLOGICAL SAMPLES WERE TAKEN. 11

NUMBER OF MONTHS IN PAST YEAR OF OPERATION THAT ONE BACTERIOLOGICAL SAMPLE WAS TAKEN. 1

NUMBER OF MONTHS WHEN THE BACTERIOLOGICAL LIMITS OF THE DWS WERE NOT MET. 0

CHEMICAL QUALITY

DWS MANDATORY LIMITS FAILED Mercury

DWS RECOMMENDED LIMITS FAILED

SANITARY CONDITIONS

IS THE SOURCE PROTECTION ADEQUATE? YES ___ NO x

Well vent should have a screen.

IS OPERATION AND CONTROL ADEQUATE? YES ___ NO x

UV not checked daily; tubes changed yearly.

IS THE WATER SYSTEM CAPABLE OF DELIVERING A CONTINUOUS SUPPLY OF SAFE WATER? YES ___ NO x

Storage not properly vented.

PHYSICAL AND CHEMICAL RESULTS

ARSENIC (0.01)*	< .005	FLUORIDE (1.4 to 2.4) **	.10	pH	7.5
(0.05)**		IRON (0.3)*	.096	SELENIUM (0.01)**	< .005
BARIUM (1.0)**	< .05	LEAD (0.05)**	.000	SILVER (0.05)**	.000
CADMIUM (0.01)**	.000	M.B.A.S. (0.5)*	< .250	SULFATE (250)*	< 25.
CHLORIDE (250)*	11	MANGANESE (0.05)*	.000	TOTAL DISSOLVED SOLIDS (500)*	232.0
CHROMIUM (.05)**	.000	MERCURY	.0075	TURBIDITY (5 s.u.)*	.1
COLOR (15 s.u.)*	3	NITRATE (45)*	5.0	ZINC (5.0)*	.190
COPPER (1.0)*	.150				

*RECOMMENDED LIMIT **MANDATORY LIMIT
ALL VALUES ARE MILLIGRAMS PER LITER UNLESS OTHERWISE NOTED.

BACTERIOLOGICAL RESULTS

	COLIFORM/100 ml	FECAL COLIFORM/100 ml
RAW WATER		
DISTRIBUTION #1	0	0
DISTRIBUTION #2	0	0

REPORT ON INDIVIDUAL WATER SUPPLIES
NATIONAL PARK SERVICE STUDY

NAME OF PARK Catoctin Mountain Park — DATE OF SURVEY 5/17/73
NAME OF SUPPLY Ike Smith — STORAGE underground concrete tank
TREATMENT chlorination — SOURCE springs

BACTERIOLOGICAL QUALITY

NUMBER OF MONTHS IN PAST YEAR OF OPERATION THAT NO BACTERIOLOGICAL SAMPLES WERE TAKEN. 2

NUMBER OF MONTHS IN PAST YEAR OF OPERATION THAT ONE BACTERIOLOGICAL SAMPLE WAS TAKEN. 7

NUMBER OF MONTHS WHEN THE BACTERIOLOGICAL LIMITS OF THE DWS WERE NOT MET. 1

CHEMICAL QUALITY

DWS MANDATORY LIMITS FAILED
DWS RECOMMENDED LIMITS FAILED

SANITARY CONDITIONS

IS THE SOURCE PROTECTION ADEQUATE? YES x NO ___

IS OPERATION AND CONTROL ADEQUATE? YES ___ NO x

Chlorine residuals never checked. No chlorine residual in distribution system.

IS THE WATER SYSTEM CAPABLE OF DELIVERING A CONTINUOUS SUPPLY OF SAFE WATER? YES x NO ___

PHYSICAL AND CHEMICAL RESULTS

ARSENIC (0.01)*	<.005	FLUORIDE (1.4 to 2.4) **	<.10	pH	6.4
(0.05)**		IRON (0.3)*	.330	SELENIUM (0.01)**	<.005
BARIUM (1.0)**	<.05	LEAD (0.05)**	.000	SILVER (0.05)**	.000
CADMIUM (0.01)**	.000	M.B.A.S. (0.5)*	<.250	SULFATE (250)*	< 25.
CHLORIDE (250)*	10.	MANGANESE (0.05)*	.010	TOTAL DISSOLVED SOLIDS (500)*	57.0
CHROMIUM (.05)**	.000	MERCURY	<.0005	TURBIDITY (5 s.u.)*	.3
COLOR (15 s.u.)*	2	NITRATE (45)*	4.0	ZINC (5.0)*	.057
COPPER (1.0)*	.140				

*RECOMMENDED LIMIT **MANDATORY LIMIT
ALL VALUES ARE MILLIGRAMS PER LITER UNLESS OTHERWISE NOTED.

BACTERIOLOGICAL RESULTS

	COLIFORM/100 ml	FECAL COLIFORM/100 ml
RAW WATER		
DISTRIBUTION #1	0	0
DISTRIBUTION #2	0	0

REPORT ON INDIVIDUAL WATER SUPPLIES
NATIONAL PARK SERVICE STUDY

NAME OF PARK Ft. Necessity Nat'l Battlefield — DATE OF SURVEY 5/15/73
NAME OF SUPPLY Headquarters System — STORAGE underground concrete tank
TREATMENT sedimentation and activated carbon filter. — SOURCE well

BACTERIOLOGICAL QUALITY

NUMBER OF MONTHS IN PAST YEAR OF OPERATION THAT NO BACTERIOLOGICAL SAMPLES WERE TAKEN. 5

NUMBER OF MONTHS IN PAST YEAR OF OPERATION THAT ONE BACTERIOLOGICAL SAMPLE WAS TAKEN. 7

NUMBER OF MONTHS WHEN THE BACTERIOLOGICAL LIMITS OF THE DWS WERE NOT MET. 0

CHEMICAL QUALITY

DWS MANDATORY LIMITS FAILED
DWS RECOMMENDED LIMITS FAILED

SANITARY CONDITIONS

IS THE SOURCE PROTECTION ADEQUATE? YES x NO ___

IS OPERATION AND CONTROL ADEQUATE? YES x NO ___

IS THE WATER SYSTEM CAPABLE OF DELIVERING A CONTINUOUS SUPPLY OF SAFE WATER? YES x NO ___

PHYSICAL AND CHEMICAL RESULTS

ARSENIC (0.01)*	<.005	FLUORIDE (1.4 to 2.4) **	.15	pH	7.6
(0.05)**		IRON (0.3)*	.012	SELENIUM (0.01)**	<.005
BARIUM (1.0)**	<.05	LEAD (0.05)**	.023	SILVER (0.05)**	.000
CADMIUM (0.01)**	.000	M.B.A.S. (0.5)*	<.205	SULFATE (250)*	< 25
CHLORIDE (250)*	<10.	MANGANESE (0.05)*	.054	TOTAL DISSOLVED SOLIDS (500)*	136.0
CHROMIUM (.05)**	.000	MERCURY	<.0005	TURBIDITY (5 s.u.)*	1
COLOR (15 s.u.)*	2	NITRATE (45)*	<1	ZINC (5.0)*	.070
COPPER (1.0)*	.048				

*RECOMMENDED LIMIT **MANDATORY LIMIT
ALL VALUES ARE MILLIGRAMS PER LITER UNLESS OTHERWISE NOTED.

BACTERIOLOGICAL RESULTS

	COLIFORM/100 ml	FECAL COLIFORM/100 ml
RAW WATER		
DISTRIBUTION #1	0	0
DISTRIBUTION #2	0	0

REPORT ON INDIVIDUAL WATER SUPPLIES
NATIONAL PARK SERVICE STUDY

NAME OF PARK Catoctin Mountain Park
NAME OF SUPPLY Jim Brown
TREATMENT chlorination
DATE OF SURVEY 5/17/73
STORAGE underground concrete tank
SOURCE well

BACTERIOLOGICAL QUALITY

NUMBER OF MONTHS IN PAST YEAR OF OPERATION THAT NO BACTERIOLOGICAL SAMPLES WERE TAKEN. 3

NUMBER OF MONTHS IN PAST YEAR OF OPERATION THAT ONE BACTERIOLOGICAL SAMPLE WAS TAKEN. 7

NUMBER OF MONTHS WHEN THE BACTERIOLOGICAL LIMITS OF THE DWS WERE NOT MET. 0

CHEMICAL QUALITY

DWS MANDATORY LIMITS FAILED

DWS RECOMMENDED LIMITS FAILED

SANITARY CONDITIONS

IS THE SOURCE PROTECTION ADEQUATE? YES x NO ___

IS OPERATION AND CONTROL ADEQUATE? YES ___ NO x

Chlorine residual not checked daily.

IS THE WATER SYSTEM CAPABLE OF DELIVERING A CONTINUOUS SUPPLY OF SAFE WATER? YES x NO ___

PHYSICAL AND CHEMICAL RESULTS

ARSENIC (0.01)* (0.05)**	<.005	FLUORIDE (1.4 to 2.4) **	<.10	pH	6.4
BARIUM (1.0)**	<.05	IRON (0.3)*	.018	SELENIUM (0.01)**	<.005
CADMIUM (0.01)**	.000	LEAD (0.05)**	.023	SILVER (0.05)**	.000
CHLORIDE (250)*	.000	M.B.A.S. (0.5)*	<.250	SULFATE (250)*	<25
CHROMIUM (.05)**	.000	MANGANESE (0.05)*	.000	TOTAL DISSOLVED SOLIDS (500)*	34.0
COLOR (15 s.u.)*	2	MERCURY	<.0005	TURBIDITY (5 s.u.)*	.1
COPPER (1.0)*	.420	NITRATE (45)*	<1	ZINC (5.0)*	.051

*RECOMMENDED LIMIT **MANDATORY LIMIT
ALL VALUES ARE MILLIGRAMS PER LITER UNLESS OTHERWISE NOTED.

BACTERIOLOGICAL RESULTS

	COLIFORM/100 ml	FECAL COLIFORM/100 ml
RAW WATER	0	0
DISTRIBUTION #1	0	0
DISTRIBUTION #2	0	0

REPORT ON INDIVIDUAL WATER SUPPLIES
NATIONAL PARK SERVICE STUDY

NAME OF PARK Catoctin Mountain Park
NAME OF SUPPLY Misty Mount
TREATMENT none
DATE OF SURVEY 5/17/73
STORAGE concrete & steel tanks
SOURCE well

BACTERIOLOGICAL QUALITY

NUMBER OF MONTHS IN PAST YEAR OF OPERATION THAT NO BACTERIOLOGICAL SAMPLES WERE TAKEN. 2

NUMBER OF MONTHS IN PAST YEAR OF OPERATION THAT ONE BACTERIOLOGICAL SAMPLE WAS TAKEN. 5

NUMBER OF MONTHS WHEN THE BACTERIOLOGICAL LIMITS OF THE DWS WERE NOT MET. 0

CHEMICAL QUALITY

DWS MANDATORY LIMITS FAILED

DWS RECOMMENDED LIMITS FAILED Manganese

SANITARY CONDITIONS

IS THE SOURCE PROTECTION ADEQUATE? YES ___ NO x

Should have vent pipe facing down and screened.

IS OPERATION AND CONTROL ADEQUATE? YES x NO ___

IS THE WATER SYSTEM CAPABLE OF DELIVERING A CONTINUOUS SUPPLY OF SAFE WATER? YES ___ NO x

Well has hole in side of casing .
The vent pipe is only 2 inches above ground.

PHYSICAL AND CHEMICAL RESULTS

ARSENIC (0.01)* (0.05)**	<.005	FLUORIDE (1.4 to 2.4) **	<.10	pH	6.8
BARIUM (1.0)**	<.05	IRON (0.3)*	.047	SELENIUM (0.01)**	<.005
CADMIUM (0.01)**	.000	LEAD (0.05)**	.000	SILVER (0.05)**	.000
CHLORIDE (250)*	<10.	M.B.A.S. (0.5)*	.25	SULFATE (250)*	<25.
CHROMIUM (.05)**	.000	MANGANESE (0.05)*	.066	TOTAL DISSOLVED SOLIDS (500)*	43.0
COLOR (15 s.u.)*	2	MERCURY	<.0005	TURBIDITY (5 s.u.)*	.1
COPPER (1.0)*	.470	NITRATE (45)*	1	ZINC (5.0)*	.260

*RECOMMENDED LIMIT **MANDATORY LIMIT
ALL VALUES ARE MILLIGRAMS PER LITER UNLESS OTHERWISE NOTED.

BACTERIOLOGICAL RESULTS

	COLIFORM/100 ml	FECAL COLIFORM/100 ml
RAW WATER		
DISTRIBUTION #1	0	0
DISTRIBUTION #2	0	0

REPORT ON INDIVIDUAL WATER SUPPLIES
NATIONAL PARK SERVICE STUDY

NAME OF PARK Colonial Nat'l Historical Park
NAME OF SUPPLY Glasshouse System
TREATMENT none

DATE OF SURVEY 5/17/73
STORAGE pressure tank
SOURCE well

BACTERIOLOGICAL QUALITY

NUMBER OF MONTHS IN PAST YEAR OF OPERATION THAT NO BACTERIOLOGICAL SAMPLES WERE TAKEN. 0

NUMBER OF MONTHS IN PAST YEAR OF OPERATION THAT ONE BACTERIOLOGICAL SAMPLE WAS TAKEN. 0

NUMBER OF MONTHS WHEN THE BACTERIOLOGICAL LIMITS OF THE DWS WERE NOT MET. 0

CHEMICAL QUALITY

DWS MANDATORY LIMITS FAILED Fluoride
DWS RECOMMENDED LIMITS FAILED

SANITARY CONDITIONS

IS THE SOURCE PROTECTION ADEQUATE? YES x NO ___

IS OPERATION AND CONTROL ADEQUATE? YES x NO ___

IS THE WATER SYSTEM CAPABLE OF DELIVERING A CONTINUOUS SUPPLY OF SAFE WATER? YES x NO ___

PHYSICAL AND CHEMICAL RESULTS

ARSENIC (0.01)*	.012	FLUORIDE (1.4 to 2.4) **	2.90	pH	7.8
(0.05)**				SELENIUM (0.01)**	< .005
BARIUM (1.0)**	< .05	IRON (0.3)*	.330	SILVER (0.05)**	.000
CADMIUM (0.01)**	.000	LEAD (0.05)**	.000	SULFATE (250)*	< 25
CHLORIDE (250)*	32	M.B.A.S. (0.5)*	< .250	TOTAL DISSOLVED	405.0
CHROMIUM (.05)**	.000	MANGANESE (0.05)*	.000	SOLIDS (500)*	
COLOR (15 s.u.)*	3	MERCURY	< .0005	TURBIDITY (5 s.u.)*	.5
COPPER (1.0)*	.039	NITRATE (45)*	< 1	ZINC (5.0)*	.200

*RECOMMENDED LIMIT **MANDATORY LIMIT
ALL VALUES ARE MILLIGRAMS PER LITER UNLESS OTHERWISE NOTED.

BACTERIOLOGICAL RESULTS

	COLIFORM/100 ml	FECAL COLIFORM/100 ml
RAW WATER		
DISTRIBUTION #1	0	0
DISTRIBUTION #2	0	0

REPORT ON INDIVIDUAL WATER SUPPLIES
NATIONAL PARK SERVICE STUDY

NAME OF PARK Colonial Nat'l Historical Park
NAME OF SUPPLY Jamestown Visitors Center
TREATMENT none

DATE OF SURVEY 5/17/73
STORAGE underground pressure tank
SOURCE well

BACTERIOLOGICAL QUALITY

NUMBER OF MONTHS IN PAST YEAR OF OPERATION THAT NO BACTERIOLOGICAL SAMPLES WERE TAKEN. 0

NUMBER OF MONTHS IN PAST YEAR OF OPERATION THAT ONE BACTERIOLOGICAL SAMPLE WAS TAKEN. 0

NUMBER OF MONTHS WHEN THE BACTERIOLOGICAL LIMITS OF THE DWS WERE NOT MET. 0

CHEMICAL QUALITY

DWS MANDATORY LIMITS FAILED Fluoride
DWS RECOMMENDED LIMITS FAILED

SANITARY CONDITIONS

IS THE SOURCE PROTECTION ADEQUATE? YES x NO ___

IS OPERATION AND CONTROL ADEQUATE? YES x NO ___

IS THE WATER SYSTEM CAPABLE OF DELIVERING A CONTINUOUS SUPPLY OF SAFE WATER? YES x NO ___

PHYSICAL AND CHEMICAL RESULTS

ARSENIC (0.01)*	.010	FLUORIDE (1.4 to 2.4) **	3.00	pH	7.8
(0.05)**				SELENIUM (0.01)**	< .005
BARIUM (1.0)**	< .05	IRON (0.3)*	.072	SILVER (0.05)**	.000
CADMIUM (0.01)**	.000	LEAD (0.05)**	.000	SULFATE (250)*	< 25
CHLORIDE (250)*	18	M.B.A.S. (0.5)*	< .250	TOTAL DISSOLVED	
CHROMIUM (.05)**	.000	MANGANESE (0.05)*	.000	SOLIDS (500)*	347.0
COLOR (15 s.u.)*	3	MERCURY	< .0005	TURBIDITY (5 s.u.)*	.3
COPPER (1.0)*	.250	NITRATE (45)*	< 1	ZINC (5.0)*	.100

*RECOMMENDED LIMIT **MANDATORY LIMIT
ALL VALUES ARE MILLIGRAMS PER LITER UNLESS OTHERWISE NOTED.

BACTERIOLOGICAL RESULTS

	COLIFORM/100 ml	FECAL COLIFORM/100 ml
RAW WATER		
DISTRIBUTION #1	0	0
DISTRIBUTION #2	0	0

REPORT ON INDIVIDUAL WATER SUPPLIES
NATIONAL PARK SERVICE STUDY

NAME OF PARK Assateague Island Nat'l Seashore DATE OF SURVEY 5/22/73
NAME OF SUPPLY North Beach STORAGE pressure tank
TREATMENT none SOURCE well

BACTERIOLOGICAL QUALITY
NUMBER OF MONTHS IN PAST YEAR OF OPERATION THAT NO BACTERIOLOGICAL SAMPLES WERE TAKEN. 0
NUMBER OF MONTHS IN PAST YEAR OF OPERATION THAT ONE BACTERIOLOGICAL SAMPLE WAS TAKEN. 6
NUMBER OF MONTHS WHEN THE BACTERIOLOGICAL LIMITS OF THE DWS WERE NOT MET. 0

CHEMICAL QUALITY
DWS MANDATORY LIMITS FAILED
DWS RECOMMENDED LIMITS FAILED

SANITARY CONDITIONS
IS THE SOURCE PROTECTION ADEQUATE? YES x NO ___

IS OPERATION AND CONTROL ADEQUATE? YES x NO ___

IS THE WATER SYSTEM CAPABLE OF DELIVERING A CONTINUOUS SUPPLY OF SAFE WATER? YES x NO ___

PHYSICAL AND CHEMICAL RESULTS

ARSENIC (0.01)* (0.05)**	.012	FLUORIDE (1.4 to 2.4) **	.20	pH	8.2
BARIUM (1.0)**	∠.05	IRON (0.3)*	.240	SELENIUM (0.01)**	∠.005
CADMIUM (0.01)**	.000	LEAD (0.05)**	.000	SILVER (0.05)**	.000
CHLORIDE (250)*	20	M.B.A.S. (0.5)*	∠.250	SULFATE (250)*	25
CHROMIUM (.05)**	.000	MANGANESE (0.05)*	.000	TOTAL DISSOLVED SOLIDS (500)*	330.0
COLOR (15 s.u.)*	5	MERCURY	∠.0005	TURBIDITY (5 s.u.)*	.4
COPPER (1.0)*	.059	NITRATE (45)*	2.0	ZINC (5.0)*	.200

*RECOMMENDED LIMIT **MANDATORY LIMIT
ALL VALUES ARE MILLIGRAMS PER LITER UNLESS OTHERWISE NOTED.

BACTERIOLOGICAL RESULTS

	COLIFORM/100 ml	FECAL COLIFORM/100 ml
RAW WATER		
DISTRIBUTION #1	0	0
DISTRIBUTION #2	0	0

REPORT ON INDIVIDUAL WATER SUPPLIES
NATIONAL PARK SERVICE STUDY

NAME OF PARK Colonial Nat'l Historical Park DATE OF SURVEY 5/17/73
NAME OF SUPPLY Jamestown Maintenance STORAGE pressure tank
TREATMENT none SOURCE well

BACTERIOLOGICAL QUALITY
NUMBER OF MONTHS IN PAST YEAR OF OPERATION THAT NO BACTERIOLOGICAL SAMPLES WERE TAKEN. 0
NUMBER OF MONTHS IN PAST YEAR OF OPERATION THAT ONE BACTERIOLOGICAL SAMPLE WAS TAKEN. 0
NUMBER OF MONTHS WHEN THE BACTERIOLOGICAL LIMITS OF THE DWS WERE NOT MET. 0
DWS limit not met on day of survey.

CHEMICAL QUALITY
DWS MANDATORY LIMITS FAILED Fluoride,
DWS RECOMMENDED LIMITS FAILED

SANITARY CONDITIONS
IS THE SOURCE PROTECTION ADEQUATE? YES x NO ___

IS OPERATION AND CONTROL ADEQUATE? YES x NO ___

IS THE WATER SYSTEM CAPABLE OF DELIVERING A CONTINUOUS SUPPLY OF SAFE WATER? YES ___ NO x

Cross connection in system firehose used to fill pumper.

PHYSICAL AND CHEMICAL RESULTS

ARSENIC (0.01)* (0.05)**	.012	FLUORIDE (1.4 to 2.4) **	2.90	pH	7.8
BARIUM (1.0)**	∠.05	IRON (0.3)*	.220	SELENIUM (0.01)**	∠.005
CADMIUM (0.01)**	.000	LEAD (0.05)**	.000	SILVER (0.05)**	.000
CHLORIDE (250)*	45	M.B.A.S. (0.5)*	∠.250	SULFATE (250)*	∠25
CHROMIUM (.05)**	.000	MANGANESE (0.05)*	.000	TOTAL DISSOLVED SOLIDS (500)*	450
COLOR (15 s.u.)*	3	MERCURY	∠.0005	TURBIDITY (5 s.u.)*	.3
COPPER (1.0)*	.077	NITRATE (45)*	∠1	ZINC (5.0)*	.095

*RECOMMENDED LIMIT **MANDATORY LIMIT
ALL VALUES ARE MILLIGRAMS PER LITER UNLESS OTHERWISE NOTED.

BACTERIOLOGICAL RESULTS

	COLIFORM/100 ml	FECAL COLIFORM/100 ml
RAW WATER		
DISTRIBUTION #1	130	0
DISTRIBUTION #2	0	0

REPORT ON INDIVIDUAL WATER SUPPLIES
NATIONAL PARK SERVICE STUDY

NAME OF PARK Shenandoah National Park — DATE OF SURVEY 5/21/73
NAME OF SUPPLY Headquarters — STORAGE underground steel tank
TREATMENT chlorination — SOURCE well

BACTERIOLOGICAL QUALITY

NUMBER OF MONTHS IN PAST YEAR OF OPERATION THAT NO BACTERIOLOGICAL SAMPLES WERE TAKEN. 0

NUMBER OF MONTHS IN PAST YEAR OF OPERATION THAT ONE BACTERIOLOGICAL SAMPLE WAS TAKEN. 5

NUMBER OF MONTHS WHEN THE BACTERIOLOGICAL LIMITS OF THE DWS WERE NOT MET. 1

CHEMICAL QUALITY

DWS MANDATORY LIMITS FAILED

DWS RECOMMENDED LIMITS FAILED

SANITARY CONDITIONS

IS THE SOURCE PROTECTION ADEQUATE? YES x NO ___

IS OPERATION AND CONTROL ADEQUATE? YES ___ NO x
Chlorine residual not checked daily and recorded.

IS THE WATER SYSTEM CAPABLE OF DELIVERING A CONTINUOUS SUPPLY OF SAFE WATER? YES ___ NO x

Insects and snakes have free access into storage tank around the cover.

PHYSICAL AND CHEMICAL RESULTS

ARSENIC (0.01)* (0.05)**	<.005	FLUORIDE (1.4 to 2.4) **	.10	pH	7.4
BARIUM (1.0)**	<.05	IRON (0.3)*	.015	SELENIUM (0.01)**	<.005
CADMIUM (0.01)**	.000	LEAD (0.05)**	.000	SILVER (0.05)**	.000
CHLORIDE (250)*	<10	M.B.A.S. (0.5)*	<.250	SULFATE (250)*	<25.
CHROMIUM (.05)**	.000	MANGANESE (0.05)*	.000	TOTAL DISSOLVED SOLIDS (500)*	112.0
COLOR (15 s.u.)*	2	MERCURY	<.0005	TURBIDITY (5 s.u.)*	.6
COPPER (1.0)*	.027	NITRATE (45)*	5.0	ZINC (5.0)*	.220

*RECOMMENDED LIMIT **MANDATORY LIMIT
ALL VALUES ARE MILLIGRAMS PER LITER UNLESS OTHERWISE NOTED.

BACTERIOLOGICAL RESULTS

	COLIFORM/100 ml	FECAL COLIFORM/100 ml
RAW WATER		
DISTRIBUTION #1	0	0
DISTRIBUTION #2	0	0

REPORT ON INDIVIDUAL WATER SUPPLIES
NATIONAL PARK SERVICE STUDY

NAME OF PARK Assateague Island Nat'l Seashore — DATE OF SURVEY 5/22/73
NAME OF SUPPLY Headquarters system — STORAGE pressure tank
TREATMENT none — SOURCE well

BACTERIOLOGICAL QUALITY

NUMBER OF MONTHS IN PAST YEAR OF OPERATION THAT NO BACTERIOLOGICAL SAMPLES WERE TAKEN. 0

NUMBER OF MONTHS IN PAST YEAR OF OPERATION THAT ONE BACTERIOLOGICAL SAMPLE WAS TAKEN. 8

NUMBER OF MONTHS WHEN THE BACTERIOLOGICAL LIMITS OF THE DWS WERE NOT MET. 0

CHEMICAL QUALITY

DWS MANDATORY LIMITS FAILED

DWS RECOMMENDED LIMITS FAILED Iron

SANITARY CONDITIONS

IS THE SOURCE PROTECTION ADEQUATE? YES x NO ___

IS OPERATION AND CONTROL ADEQUATE? YES x NO ___

IS THE WATER SYSTEM CAPABLE OF DELIVERING A CONTINUOUS SUPPLY OF SAFE WATER? YES x NO ___

PHYSICAL AND CHEMICAL RESULTS

ARSENIC (0.01)* (0.05)**	.010	FLUORIDE (1.4 to 2.4) **	.10	pH	7.7
BARIUM (1.0)**	<.05	IRON (0.3)*	1.200	SELENIUM (0.01)**	<.005
CADMIUM (0.01)**	.000	LEAD (0.05)**	.000	SILVER (0.05)**	.000
CHLORIDE (250)*	16	M.B.A.S. (0.5)*	<.250	SULFATE (250)*	< 25
CHROMIUM (.05)**	.000	MANGANESE (0.05)*	.029	TOTAL DISSOLVED SOLIDS (500)*	262.0
COLOR (15 s.u.)*	3	MERCURY	<.0005	TURBIDITY (5 s.u.)*	1.0
COPPER (1.0)*	.050	NITRATE (45)*	< 1	ZINC (5.0)*	.095

*RECOMMENDED LIMIT **MANDATORY LIMIT
ALL VALUES ARE MILLIGRAMS PER LITER UNLESS OTHERWISE NOTED.

BACTERIOLOGICAL RESULTS

	COLIFORM/100 ml	FECAL COLIFORM/100 ml
RAW WATER		
DISTRIBUTION #1	0	0
DISTRIBUTION #2	0	0

REPORT ON INDIVIDUAL WATER SUPPLIES
NATIONAL PARK SERVICE STUDY

NAME OF PARK Shenandoah National Park
NAME OF SUPPLY Skyland
TREATMENT none
DATE OF SURVEY 5/21/73
STORAGE multiple tanks
SOURCE spring and well

BACTERIOLOGICAL QUALITY

NUMBER OF MONTHS IN PAST YEAR OF OPERATION THAT NO BACTERIOLOGICAL SAMPLES WERE TAKEN. 0

NUMBER OF MONTHS IN PAST YEAR OF OPERATION THAT ONE BACTERIOLOGICAL SAMPLE WAS TAKEN. 0

NUMBER OF MONTHS WHEN THE BACTERIOLOGICAL LIMITS OF THE DWS WERE NOT MET. 0

CHEMICAL QUALITY

DWS MANDATORY LIMITS FAILED
DWS RECOMMENDED LIMITS FAILED

SANITARY CONDITIONS

IS THE SOURCE PROTECTION ADEQUATE? YES x NO ___

IS OPERATION AND CONTROL ADEQUATE? YES x NO ___

IS THE WATER SYSTEM CAPABLE OF DELIVERING A CONTINUOUS SUPPLY OF SAFE WATER? YES x NO ___

PHYSICAL AND CHEMICAL RESULTS

ARSENIC (0.01)*		FLUORIDE (1.4 to		pH	6.4
(0.05)**	<.005	2.4) **	<.10	SELENIUM (0.01)**	<.005
BARIUM (1.0)**	.05	IRON (0.3)*	.056	SILVER (0.05)**	.000
CADMIUM (0.01)**	.000	LEAD (0.05)**	<.250	SULFATE (250)*	25
CHLORIDE (250)*	10	M.B.A.S. (0.5)*	.000	TOTAL DISSOLVED	27.0
CHROMIUM (.05)**	.000	MANGANESE (0.05)*	.000	SOLIDS (500)*	
COLOR (15 s.u.)*	2	MERCURY	<.0005	TURBIDITY (5 s.u.)*	.2
COPPER (1.0)*	.450	NITRATE (45)*	2.0	ZINC (5.0)*	.69

*RECOMMENDED LIMIT **MANDATORY LIMIT
ALL VALUES ARE MILLIGRAMS PER LITER UNLESS OTHERWISE NOTED.

BACTERIOLOGICAL RESULTS

	COLIFORM/100 ml	FECAL COLIFORM/100 ml
RAW WATER		
DISTRIBUTION #1	0	0
DISTRIBUTION #2	0	0

REPORT ON INDIVIDUAL WATER SUPPLIES
NATIONAL PARK SERVICE STUDY

NAME OF PARK Shenandoah National Park
NAME OF SUPPLY Matthew's Arm
TREATMENT none
DATE OF SURVEY 5/21/73
STORAGE concrete tank
SOURCE spring and well

BACTERIOLOGICAL QUALITY

NUMBER OF MONTHS IN PAST YEAR OF OPERATION THAT NO BACTERIOLOGICAL SAMPLES WERE TAKEN. 0

NUMBER OF MONTHS IN PAST YEAR OF OPERATION THAT ONE BACTERIOLOGICAL SAMPLE WAS TAKEN. 4

NUMBER OF MONTHS WHEN THE BACTERIOLOGICAL LIMITS OF THE DWS WERE NOT MET. 0

CHEMICAL QUALITY

DWS MANDATORY LIMITS FAILED
DWS RECOMMENDED LIMITS FAILED

SANITARY CONDITIONS

IS THE SOURCE PROTECTION ADEQUATE? YES x ? NO ___

IS OPERATION AND CONTROL ADEQUATE? YES x NO ___

IS THE WATER SYSTEM CAPABLE OF DELIVERING A CONTINUOUS SUPPLY OF SAFE WATER? YES x NO ___

PHYSICAL AND CHEMICAL RESULTS

ARSENIC (0.01)*		FLUORIDE (1.4 to		pH	6.7
(0.05)**	<.005	2.4) **	<.10	SELENIUM (0.01)**	<.005
BARIUM (1.0)**	<.05	IRON (0.3)*	.015	SILVER (0.05)**	.000
CADMIUM (0.01)**	.000	LEAD (0.05)**	.000	SULFATE (250)*	<25
CHLORIDE (250)*	<10	M.B.A.S. (0.5)*	<.250	TOTAL DISSOLVED	25.0
CHROMIUM (.05)**	.000	MANGANESE (0.05)*	.000	SOLIDS (500)*	
COLOR (15 s.u.)*	3	MERCURY	<.0005	TURBIDITY (5 s.u.)*	.1
COPPER (1.0)*	.014	NITRATE (45)*	2.0	ZINC (5.0)*	.100

*RECOMMENDED LIMIT **MANDATORY LIMIT
ALL VALUES ARE MILLIGRAMS PER LITER UNLESS OTHERWISE NOTED.

BACTERIOLOGICAL RESULTS

	COLIFORM/100 ml	FECAL COLIFORM/100 ml
RAW WATER		
DISTRIBUTION #1	0	0
DISTRIBUTION #2	0	0

REPORT ON INDIVIDUAL WATER SUPPLIES
NATIONAL PARK SERVICE STUDY

NAME OF PARK Shenandoah National Park
NAME OF SUPPLY Big Meadows
TREATMENT none

DATE OF SURVEY 5/23/73
STORAGE 3 underground reservoirs
SOURCE spring and well

BACTERIOLOGICAL QUALITY

NUMBER OF MONTHS IN PAST YEAR OF OPERATION THAT NO BACTERIOLOGICAL SAMPLES WERE TAKEN. 0

NUMBER OF MONTHS IN PAST YEAR OF OPERATION THAT ONE BACTERIOLOGICAL SAMPLE WAS TAKEN. 6

NUMBER OF MONTHS WHEN THE BACTERIOLOGICAL LIMITS OF THE DWS WERE NOT MET. 1

CHEMICAL QUALITY

DWS MANDATORY LIMITS FAILED

DWS RECOMMENDED LIMITS FAILED

SANITARY CONDITIONS

IS THE SOURCE PROTECTION ADEQUATE? YES x NO ___

IS OPERATION AND CONTROL ADEQUATE? YES x NO ___

IS THE WATER SYSTEM CAPABLE OF DELIVERING A CONTINUOUS SUPPLY OF SAFE WATER ? YES ___ NO x

Overflow from weir room storage and pump room not screened. Cover of reservior has large enough opening to allow a snake to enter.

PHYSICAL AND CHEMICAL RESULTS

ARSENIC (0.01)*		FLUORIDE (1.4 to 2.4) **	<.10	pH	6.4
(0.05)**	<.005	IRON (0.3)*	.031	SELENIUM (0.01)**	<.005
BARIUM (1.0)**	<.05	LEAD (0.05)**	.000	SILVER (0.05)**	.000
CADMIUM (0.01)**	.000	M.B.A.S. (0.5)*	<.250	SULFATE (250)*	<25
CHLORIDE (250)*	<10	MANGANESE (0.05)*	.000	TOTAL DISSOLVED SOLIDS (500)*	
CHROMIUM (.05)**	.000	MERCURY	<.0005	TURBIDITY (5 s.u.)*	.2
COLOR (15 s.u.)*	2	NITRATE (45)*	2.0	ZINC (5.0)*	.029
COPPER (1.0)*	.220				

*RECOMMENDED LIMIT **MANDATORY LIMIT
ALL VALUES ARE MILLIGRAMS PER LITER UNLESS OTHERWISE NOTED.

BACTERIOLOGICAL RESULTS

	COLIFORM/100 ml	FECAL COLIFORM/100 ml
RAW WATER		
DISTRIBUTION #1	0	0
DISTRIBUTION #2	0	0

REPORT ON INDIVIDUAL WATER SUPPLIES
NATIONAL PARK SERVICE STUDY

NAME OF PARK Shenandoah National Park
NAME OF SUPPLY Byrd's Nest #2
TREATMENT none

DATE OF SURVEY 5/23/73
STORAGE underground steel tank
SOURCE spring

BACTERIOLOGICAL QUALITY

NUMBER OF MONTHS IN PAST YEAR OF OPERATION THAT NO BACTERIOLOGICAL SAMPLES WERE TAKEN. 0

NUMBER OF MONTHS IN PAST YEAR OF OPERATION THAT ONE BACTERIOLOGICAL SAMPLE WAS TAKEN. 1

NUMBER OF MONTHS WHEN THE BACTERIOLOGICAL LIMITS OF THE DWS WERE NOT MET. 0

CHEMICAL QUALITY

DWS MANDATORY LIMITS FAILED

DWS RECOMMENDED LIMITS FAILED Zinc

SANITARY CONDITIONS

IS THE SOURCE PROTECTION ADEQUATE? YES ___ ??? NO ___

IS OPERATION AND CONTROL ADEQUATE? YES x NO ___

IS THE WATER SYSTEM CAPABLE OF DELIVERING A CONTINUOUS SUPPLY OF SAFE WATER? YES x NO ___

PHYSICAL AND CHEMICAL RESULTS

ARSENIC (0.01)*	<.005	FLUORIDE (1.4 to 2.4) **	<.10	pH	6.7
(0.05)**		IRON (0.3)*	.280	SELENIUM (0.01)**	<.005
BARIUM (1.0)**	<.05	LEAD (0.05)**	.000	SILVER (0.05)**	.000
CADMIUM (0.01)**	.000	M.B.A.S. (0.5)*	<.250	SULFATE (250)*	<25
CHLORIDE (250)*	<10	MANGANESE (0.05)*	.022	TOTAL DISSOLVED SOLIDS (500)*	29.0
CHROMIUM (.05)**	.000	MERCURY	<.0005	TURBIDITY (5 s.u.)*	.3
COLOR (15 s.u.)*	2	NITRATE (45)*	<1	ZINC (5.0)*	29
COPPER (1.0)*	.027				

*RECOMMENDED LIMIT **MANDATORY LIMIT
ALL VALUES ARE MILLIGRAMS PER LITER UNLESS OTHERWISE NOTED.

BACTERIOLOGICAL RESULTS

	COLIFORM/100 ml	FECAL COLIFORM/100 ml
RAW WATER		
DISTRIBUTION #1	0	0
DISTRIBUTION #2	0	0

REPORT ON INDIVIDUAL WATER SUPPLIES
NATIONAL PARK SERVICE STUDY

NAME OF PARK Shenandoah National Park
NAME OF SUPPLY Panorama
TREATMENT none

DATE OF SURVEY 5/22/73
STORAGE concrete tanks
SOURCE spring and well

BACTERIOLOGICAL QUALITY

NUMBER OF MONTHS IN PAST YEAR OF OPERATION THAT NO BACTERIOLOGICAL SAMPLES WERE TAKEN. 0

NUMBER OF MONTHS IN PAST YEAR OF OPERATION THAT ONE BACTERIOLOGICAL SAMPLE WAS TAKEN. 4

NUMBER OF MONTHS WHEN THE BACTERIOLOGICAL LIMITS OF THE DWS WERE NOT MET. 0

CHEMICAL QUALITY

DWS MANDATORY LIMITS FAILED
DWS RECOMMENDED LIMITS FAILED

SANITARY CONDITIONS

IS THE SOURCE PROTECTION ADEQUATE? YES ___ NO x

No diversion of surface water around one spring.

IS OPERATION AND CONTROL ADEQUATE? YES x NO ___

IS THE WATER SYSTEM CAPABLE OF DELIVERING A CONTINUOUS SUPPLY OF SAFE WATER? YES ___ NO x

Surface drainage not controlled at collection box. Part of system infested with mice.

PHYSICAL AND CHEMICAL RESULTS

ARSENIC (0.01)* (0.05)**	<.005	FLUORIDE (1.4 to 2.4) **	<.10	pH	6.9
BARIUM (1.0)**	< .05	IRON (0.3)*	.025	SELENIUM (0.01)**	<.005
CADMIUM (0.01)**	.000	LEAD (0.05)**	.000	SILVER (0.05)**	.000
CHLORIDE (250)*	< 10	M.B.A.S. (0.5)*	<.250	SULFATE (250)*	< 25
CHROMIUM (.05)**	.000	MANGANESE (0.05)*	.000	TOTAL DISSOLVED SOLIDS (500)*	22.0
COLOR (15 s.u.)*	2	MERCURY	<.0005	TURBIDITY (5 s.u.)*	.2
COPPER (1.0)*	.270	NITRATE (45)*	3.0	ZINC (5.0)*	.095

*RECOMMENDED LIMIT **MANDATORY LIMIT
ALL VALUES ARE MILLIGRAMS PER LITER UNLESS OTHERWISE NOTED.

BACTERIOLOGICAL RESULTS

	COLIFORM/100 ml	FECAL COLIFORM/100 ml
RAW WATER		
DISTRIBUTION #1	2	1
DISTRIBUTION #2	0	0

REPORT ON INDIVIDUAL WATER SUPPLIES
NATIONAL PARK SERVICE STUDY

NAME OF PARK Shenandoah National Park
NAME OF SUPPLY Pass Mt. Parking Overlook
TREATMENT none

DATE OF SURVEY 5/21/73
STORAGE underground concrete tank
SOURCE spring

BACTERIOLOGICAL QUALITY

NUMBER OF MONTHS IN PAST YEAR OF OPERATION THAT NO BACTERIOLOGICAL SAMPLES WERE TAKEN. 0

NUMBER OF MONTHS IN PAST YEAR OF OPERATION THAT ONE BACTERIOLOGICAL SAMPLE WAS TAKEN. 0

NUMBER OF MONTHS WHEN THE BACTERIOLOGICAL LIMITS OF THE DWS WERE NOT MET. 1

CHEMICAL QUALITY

DWS MANDATORY LIMITS FAILED
DWS RECOMMENDED LIMITS FAILED

SANITARY CONDITIONS

IS THE SOURCE PROTECTION ADEQUATE? YES ___ ?? NO ___

IS OPERATION AND CONTROL ADEQUATE? YES x NO ___

IS THE WATER SYSTEM CAPABLE OF DELIVERING A CONTINUOUS SUPPLY OF SAFE WATER? YES x NO ___

PHYSICAL AND CHEMICAL RESULTS

ARSENIC (0.01)* (0.05)**	<.005	FLUORIDE (1.4 to 2.4) **	<.10	pH	6.0
BARIUM (1.0)**	<.05	IRON (0.3)*	.050	SELENIUM (0.01)**	<.005
CADMIUM (0.01)**	.000	LEAD (0.05)**	.000	SILVER (0.05)**	.000
CHLORIDE (250)*	<10	M.B.A.S. (0.5)*	<.250	SULFATE (250)*	< 25
CHROMIUM (.05)**	.000	MANGANESE (0.05)*	.000	TOTAL DISSOLVED SOLIDS (500)*	16.0
COLOR (15 s.u.)*	2	MERCURY	<.0005	TURBIDITY (5 s.u.)*	.2
COPPER (1.0)*	.000	NITRATE (45)*	<1	ZINC (5.0)*	.058

*RECOMMENDED LIMIT **MANDATORY LIMIT
ALL VALUES ARE MILLIGRAMS PER LITER UNLESS OTHERWISE NOTED.

BACTERIOLOGICAL RESULTS

	COLIFORM/100 ml	FECAL COLIFORM/100 ml
RAW WATER		
DISTRIBUTION #1	0	0
DISTRIBUTION #2	0	0

REPORT ON INDIVIDUAL WATER SUPPLIES
NATIONAL PARK SERVICE STUDY

NAME OF PARK Shenandoah National Park
NAME OF SUPPLY Camp Hoover
TREATMENT none

DATE OF SURVEY 5/23/73
STORAGE concrete underground tank
SOURCE springs

BACTERIOLOGICAL QUALITY

NUMBER OF MONTHS IN PAST YEAR OF OPERATION THAT NO BACTERIOLOGICAL SAMPLES WERE TAKEN. 0

NUMBER OF MONTHS IN PAST YEAR OF OPERATION THAT ONE BACTERIOLOGICAL SAMPLE WAS TAKEN. 0

NUMBER OF MONTHS WHEN THE BACTERIOLOGICAL LIMITS OF THE DWS WERE NOT MET. 1

CHEMICAL QUALITY

DWS MANDATORY LIMITS FAILED
DWS RECOMMENDED LIMITS FAILED Zinc

SANITARY CONDITIONS

IS THE SOURCE PROTECTION ADEQUATE? YES ___ NO x

New lids needed on spring boxes.

IS OPERATION AND CONTROL ADEQUATE? YES x NO ___

IS THE WATER SYSTEM CAPABLE OF DELIVERING A CONTINUOUS SUPPLY OF SAFE WATER? YES x NO ___

PHYSICAL AND CHEMICAL RESULTS

ARSENIC (0.01)* <.005	FLUORIDE (1.4 to 2.4) **<.10	pH 6.8
(0.05)**	IRON (0.3)* .009	SELENIUM (0.01)** <.005
BARIUM (1.0)** <.05	LEAD (0.05)** .040	SILVER (0.05)** .000
CADMIUM (0.01)** .000	M.B.A.S. (0.5)* <.025	SULFATE (250)* <25
CHLORIDE (250)* <10	MANGANESE (0.05)* .000	TOTAL DISSOLVED SOLIDS (500)* 39.0
CHROMIUM (.05)** .000	MERCURY <.0005	TURBIDITY (5 s.u.)* .1
COLOR (15 s.u.)* 2	NITRATE (45)* <1	ZINC (5.0)* 12.5
COPPER (1.0)* .100		

*RECOMMENDED LIMIT **MANDATORY LIMIT
ALL VALUES ARE MILLIGRAMS PER LITER UNLESS OTHERWISE NOTED.

BACTERIOLOGICAL RESULTS

	COLIFORM/100 ml	FECAL COLIFORM/100 ml
RAW WATER		
DISTRIBUTION #1	0	0
DISTRIBUTION #2	0	0

REPORT ON INDIVIDUAL WATER SUPPLIES
NATIONAL PARK SERVICE STUDY

NAME OF PARK Shenandoah National Park
NAME OF SUPPLY Loft Mountain
TREATMENT none

DATE OF SURVEY 5/24/73
STORAGE several steel reservoirs
SOURCE spring and wells

BACTERIOLOGICAL QUALITY

NUMBER OF MONTHS IN PAST YEAR OF OPERATION THAT NO BACTERIOLOGICAL SAMPLES WERE TAKEN. 2

NUMBER OF MONTHS IN PAST YEAR OF OPERATION THAT ONE BACTERIOLOGICAL SAMPLE WAS TAKEN. 4

NUMBER OF MONTHS WHEN THE BACTERIOLOGICAL LIMITS OF THE DWS WERE NOT MET. 3

CHEMICAL QUALITY

DWS MANDATORY LIMITS FAILED
DWS RECOMMENDED LIMITS FAILED

SANITARY CONDITIONS

IS THE SOURCE PROTECTION ADEQUATE? YES x ? NO ___

IS OPERATION AND CONTROL ADEQUATE? YES x NO ___

IS THE WATER SYSTEM CAPABLE OF DELIVERING A CONTINUOUS SUPPLY OF SAFE WATER? YES x NO ___

PHYSICAL AND CHEMICAL RESULTS

ARSENIC (0.01)*	FLUORIDE (1.4 to 2.4) **<.10	pH 6.4
(0.05)** <.005	IRON (0.3)* .020	SELENIUM (0.01)** <.005
BARIUM (1.0)** <.05	LEAD (0.05)** .000	SILVER (0.05)** .000
CADMIUM (0.01)** .000	M.B.A.S. (0.5)* <.250	SULFATE (250)* <25
CHLORIDE (250)* <10	MANGANESE (0.05)* .000	TOTAL DISSOLVED SOLIDS (500)* 40.0
CHROMIUM (.05)** .000	MERCURY <.0005	TURBIDITY (5 s.u.)* 1
COLOR (15 s.u.)* 1	NITRATE (45)* 8.0	ZINC (5.0)* .840
COPPER (1.0)* .000		

*RECOMMENDED LIMIT **MANDATORY LIMIT
ALL VALUES ARE MILLIGRAMS PER LITER UNLESS OTHERWISE NOTED.

BACTERIOLOGICAL RESULTS

	COLIFORM/100 ml	FECAL COLIFORM/100 ml
RAW WATER		
DISTRIBUTION #1	0	0
DISTRIBUTION #2	0	0

REPORT ON INDIVIDUAL WATER SUPPLIES
NATIONAL PARK SERVICE STUDY

NAME OF PARK Montezuma Castle Nat'l Monument DATE OF SURVEY 6/4/73
NAME OF SUPPLY Well Area STORAGE pressure tank
TREATMENT chlorination SOURCE well

BACTERIOLOGICAL QUALITY

NUMBER OF MONTHS IN PAST YEAR OF OPERATION THAT NO BACTERIOLOGICAL SAMPLES WERE TAKEN. 0

NUMBER OF MONTHS IN PAST YEAR OF OPERATION THAT ONE BACTERIOLOGICAL SAMPLE WAS TAKEN. 0

NUMBER OF MONTHS WHEN THE BACTERIOLOGICAL LIMITS OF THE DWS WERE NOT MET. 0

CHEMICAL QUALITY

DWS MANDATORY LIMITS FAILED

DWS RECOMMENDED LIMITS FAILED Total Dissolved Solids

SANITARY CONDITIONS

IS THE SOURCE PROTECTION ADEQUATE? YES x NO ___

IS OPERATION AND CONTROL ADEQUATE? YES x NO ___

IS THE WATER SYSTEM CAPABLE OF DELIVERING A CONTINUOUS SUPPLY OF SAFE WATER? YES x NO ___

PHYSICAL AND CHEMICAL RESULTS

ARSENIC (0.01)*		FLUORIDE (1.4 to 2.4) **	.20	pH	7.8
(0.05)**	.030	IRON (0.3)*	.020	SELENIUM (0.01)**	<.005
BARIUM (1.0)**	.38	LEAD (0.05)**	.000	SILVER (0.05)**	.000
CADMIUM (0.01)**	.000	M.B.A.S. (0.5)*	<.250	SULFATE (250)*	< 25
CHLORIDE (250)*	45	MANGANESE (0.05)*	.000	TOTAL DISSOLVED SOLIDS (500)*	722.0
CHROMIUM (.05)**	.000	MERCURY	<.0005	TURBIDITY (5 s.u.)*	.4
COLOR (15 s.u.)*	2	NITRATE (45)*	2.0	ZINC (5.0)*	2.200
COPPER (1.0)*	.014				

*RECOMMENDED LIMIT **MANDATORY LIMIT
ALL VALUES ARE MILLIGRAMS PER LITER UNLESS OTHERWISE NOTED.

BACTERIOLOGICAL RESULTS

	COLIFORM/100 ml	FECAL COLIFORM/100 ml
RAW WATER	0	0
DISTRIBUTION #1	0	0
DISTRIBUTION #2	0	0

REPORT ON INDIVIDUAL WATER SUPPLIES
NATIONAL PARK SERVICE STUDY

NAME OF PARK Montezuma Castle Nat'l Monument DATE OF SURVEY 6/4/73
NAME OF SUPPLY Castle STORAGE steel tank
TREATMENT chlorination SOURCE well

BACTERIOLOGICAL QUALITY

NUMBER OF MONTHS IN PAST YEAR OF OPERATION THAT NO BACTERIOLOGICAL SAMPLES WERE TAKEN. 0

NUMBER OF MONTHS IN PAST YEAR OF OPERATION THAT ONE BACTERIOLOGICAL SAMPLE WAS TAKEN. 1

NUMBER OF MONTHS WHEN THE BACTERIOLOGICAL LIMITS OF THE DWS WERE NOT MET. 0

CHEMICAL QUALITY

DWS MANDATORY LIMITS FAILED

DWS RECOMMENDED LIMITS FAILED

SANITARY CONDITIONS

IS THE SOURCE PROTECTION ADEQUATE? YES x NO ___

IS OPERATION AND CONTROL ADEQUATE? YES x NO ___

IS THE WATER SYSTEM CAPABLE OF DELIVERING A CONTINUOUS SUPPLY OF SAFE WATER? YES x NO ___

PHYSICAL AND CHEMICAL RESULTS

ARSENIC (0.01)*	<.005	FLUORIDE (1.4 to 2.4) **	.10	pH	7.7
(0.05)**		IRON (0.3)*	.003	SELENIUM (0.01)**	< .005
BARIUM (1.0)**	.17	LEAD (0.05)**	.000	SILVER (0.05)**	.000
CADMIUM (0.01)**	.000	M.B.A.S. (0.5)*	<.250	SULFATE (250)*	< 25
CHLORIDE (250)*	19	MANGANESE (0.05)*	.000	TOTAL DISSOLVED SOLIDS (500)*	417.0
CHROMIUM (.05)**	.000	MERCURY	<.0005	TURBIDITY (5 s.u.)*	.1
COLOR (15 s.u.)*	2	NITRATE (45)*	1.0	ZINC (5.0)*	.190
COPPER (1.0)*	.000				

*RECOMMENDED LIMIT **MANDATORY LIMIT
ALL VALUES ARE MILLIGRAMS PER LITER UNLESS OTHERWISE NOTED.

BACTERIOLOGICAL RESULTS

	COLIFORM/100 ml	FECAL COLIFORM/100 ml
RAW WATER	0	0
DISTRIBUTION #1	0	0
DISTRIBUTION #2	0	0

REPORT ON INDIVIDUAL WATER SUPPLIES
NATIONAL PARK SERVICE STUDY

NAME OF PARK Petrified Forest Nat'l Park
NAME OF SUPPLY Park System
TREATMENT chlorination
DATE OF SURVEY 6/5/73
STORAGE-5 underground tanks
SOURCE well

BACTERIOLOGICAL QUALITY

NUMBER OF MONTHS IN PAST YEAR OF OPERATION THAT NO BACTERIOLOGICAL SAMPLES WERE TAKEN. 1

NUMBER OF MONTHS IN PAST YEAR OF OPERATION THAT ONE BACTERIOLOGICAL SAMPLE WAS TAKEN. 0

NUMBER OF MONTHS WHEN THE BACTERIOLOGICAL LIMITS OF THE DWS WERE NOT MET. 0

CHEMICAL QUALITY

DWS MANDATORY LIMITS FAILED

DWS RECOMMENDED LIMITS FAILED Manganese, Total Dissolved Solids

SANITARY CONDITIONS

IS THE SOURCE PROTECTION ADEQUATE? YES x NO ___

IS OPERATION AND CONTROL ADEQUATE? YES ___ NO x

No chlorine residual in the distribution system on the day of the survey.

IS THE WATER SYSTEM CAPABLE OF DELIVERING A CONTINUOUS SUPPLY OF SAFE WATER ? YES x NO ___

PHYSICAL AND CHEMICAL RESULTS

ARSENIC (0.01)* (0.05)**	<.005	FLUORIDE (1.4 to 2.4) **	1.40	pH	8.2
BARIUM (1.0)**	.09	IRON (0.3)*	.095	SELENIUM (0.01)**	<.005
CADMIUM (0.01)**	.000	LEAD (0.05)**	.000	SILVER (0.05)**	.000
CHLORIDE (250)*	90	M.B.A.S. (0.5)*	<.250	SULFATE (250)*	195
CHROMIUM (.05)**	.000	MANGANESE (0.05)*	.076	TOTAL DISSOLVED SOLIDS (500)*	1138
COLOR (15 s.u.)*	7	MERCURY	<.0005	TURBIDITY (5 s.u.)*	.6
COPPER (1.0)*	.580	NITRATE (45)*	<1	ZINC (5.0)*	.120

*RECOMMENDED LIMIT **MANDATORY LIMIT
ALL VALUES ARE MILLIGRAMS PER LITER UNLESS OTHERWISE NOTED.

BACTERIOLOGICAL RESULTS

	COLIFORM/100 ml	FECAL COLIFORM/100 ml
RAW WATER		
DISTRIBUTION #1	0	0
DISTRIBUTION #2	0	0

REPORT ON INDIVIDUAL WATER SUPPLIES
NATIONAL PARK SERVICE STUDY

NAME OF PARK-Walnut Canyon Nat'l Monument
NAME OF SUPPLY Park System
TREATMENT chlorination
DATE OF SURVEY 6/4/73
STORAGE elevated tank
SOURCE well

BACTERIOLOGICAL QUALITY

NUMBER OF MONTHS IN PAST YEAR OF OPERATION THAT NO BACTERIOLOGICAL SAMPLES WERE TAKEN. 0

NUMBER OF MONTHS IN PAST YEAR OF OPERATION THAT ONE BACTERIOLOGICAL SAMPLE WAS TAKEN. 0

NUMBER OF MONTHS WHEN THE BACTERIOLOGICAL LIMITS OF THE DWS WERE NOT MET. 0

DWS limit not met on day of survey.

CHEMICAL QUALITY

DWS MANDATORY LIMITS FAILED

DWS RECOMMENDED LIMITS FAILED

SANITARY CONDITIONS

IS THE SOURCE PROTECTION ADEQUATE? YES x NO ___

IS OPERATION AND CONTROL ADEQUATE? YES x NO ___

IS THE WATER SYSTEM CAPABLE OF DELIVERING A CONTINUOUS SUPPLY OF SAFE WATER? YES x NO ___

PHYSICAL AND CHEMICAL RESULTS

ARSENIC (0.01)* (0.05)**	<.005	FLUORIDE (1.4 to 2.4) **	.10	pH	7.8
BARIUM (1.0)**	.33	IRON (0.3)*	.035	SELENIUM (0.01)**	<.005
CADMIUM (0.01)**	.000	LEAD (0.05)**	.000	SILVER (0.05)**	.000
CHLORIDE (250)*	<10	M.B.A.S. (0.5)*	<.250	SULFATE (250)*	< 25
CHROMIUM (.05)**	.000	MANGANESE (0.05)*	.000	TOTAL DISSOLVED SOLIDS (500)*	273.0
COLOR (15 s.u.)*	2	MERCURY	<.0005	TURBIDITY (5 s.u.)*	.1
COPPER (1.0)*	.000	NITRATE (45)*	8.0	ZINC (5.0)*	.090

*RECOMMENDED LIMIT **MANDATORY LIMIT
ALL VALUES ARE MILLIGRAMS PER LITER UNLESS OTHERWISE NOTED.

BACTERIOLOGICAL RESULTS

	COLIFORM/100 ml	FECAL COLIFORM/100 ml
RAW WATER		
DISTRIBUTION #1	80	68
DISTRIBUTION #2	0	0

REPORT ON INDIVIDUAL WATER SUPPLIES
NATIONAL PARK SERVICE STUDY

NAME OF PARK -Tumacacori National Monument
NAME OF SUPPLY Park System
TREATMENT chlorination

DATE OF SURVEY 6/7/73
STORAGE underground concrete tank
SOURCE well

BACTERIOLOGICAL QUALITY

NUMBER OF MONTHS IN PAST YEAR OF OPERATION THAT NO BACTERIOLOGICAL SAMPLES WERE TAKEN. 0

NUMBER OF MONTHS IN PAST YEAR OF OPERATION THAT ONE BACTERIOLOGICAL SAMPLE WAS TAKEN. 1

NUMBER OF MONTHS WHEN THE BACTERIOLOGICAL LIMITS OF THE DWS WERE NOT MET. 0

CHEMICAL QUALITY

DWS MANDATORY LIMITS FAILED

DWS RECOMMENDED LIMITS FAILED

SANITARY CONDITIONS

IS THE SOURCE PROTECTION ADEQUATE? YES x NO ___

IS OPERATION AND CONTROL ADEQUATE? YES x NO ___

IS THE WATER SYSTEM CAPABLE OF DELIVERING A CONTINUOUS SUPPLY OF SAFE WATER? YES x NO ___

PHYSICAL AND CHEMICAL RESULTS

ARSENIC (0.01)* (0.05)**	<.005	FLUORIDE (1.4 to 2.4) **	1.00	pH	7.8
BARIUM (1.0)**	<.05	IRON (0.3)*	.003	SELENIUM (0.01)**	<.005
CADMIUM (0.01)**	.000	LEAD (0.05)**	.000	SILVER (0.05)**	.000
CHLORIDE (250)*	14	M.B.A.S. (0.5)*	<.250	SULFATE (250)*	34
CHROMIUM (.05)**	.000	MANGANESE (0.05)*	.000	TOTAL DISSOLVED SOLIDS (500)*	325.0
COLOR (15 s.u.)*	3	MERCURY	<.0005	TURBIDITY (5 s.u.)*	2
COPPER (1.0)*	.000	NITRATE (45)*	4.0	ZINC (5.0)*	.350

*RECOMMENDED LIMIT **MANDATORY LIMIT
ALL VALUES ARE MILLIGRAMS PER LITER UNLESS OTHERWISE NOTED.

BACTERIOLOGICAL RESULTS

	COLIFORM/100 ml	FECAL COLIFORM/100 ml
RAW WATER	1	0
DISTRIBUTION #1	0	0
DISTRIBUTION #2	0	0

REPORT ON INDIVIDUAL WATER SUPPLIES
NATIONAL PARK SERVICE STUDY

NAME OF PARK Tonto National Monument
NAME OF SUPPLY Park System
TREATMENT chorination and softening

DATE OF SURVEY 6/5/73
STORAGE concrete and steel tanks
SOURCE well

BACTERIOLOGICAL QUALITY

NUMBER OF MONTHS IN PAST YEAR OF OPERATION THAT NO BACTERIOLOGICAL SAMPLES WERE TAKEN. 0

NUMBER OF MONTHS IN PAST YEAR OF OPERATION THAT ONE BACTERIOLOGICAL SAMPLE WAS TAKEN. 0

NUMBER OF MONTHS WHEN THE BACTERIOLOGICAL LIMITS OF THE DWS WERE NOT MET. 2

CHEMICAL QUALITY

DWS MANDATORY LIMITS FAILED

DWS RECOMMENDED LIMITS FAILED Total Dissolved Solids

SANITARY CONDITIONS

IS THE SOURCE PROTECTION ADEQUATE? YES x NO ___

IS OPERATION AND CONTROL ADEQUATE? YES x NO ___

IS THE WATER SYSTEM CAPABLE OF DELIVERING A CONTINUOUS SUPPLY OF SAFE WATER? YES x NO ___

PHYSICAL AND CHEMICAL RESULTS

ARSENIC (0.01)* (0.05)**	<.005	FLUORIDE (1.4 to 2.4) **	.35	pH	7.9
BARIUM (1.0)**	<.05	IRON (0.3)*	.150	SELENIUM (0.01)**	<.005
CADMIUM (0.01)**	.000	LEAD (0.05)**	.000	SILVER (0.05)**	.000
CHLORIDE (250)*	38	M.B.A.S. (0.5)*	<.250	SULFATE (250)*	25
CHROMIUM (.05)**	.000	MANGANESE (0.05)*	.016	TOTAL DISSOLVED SOLIDS (500)*	650.0
COLOR (15 s.u.)*	2	MERCURY	<.0005	TURBIDITY (5 s.u.)*	.2
COPPER (1.0)*	.140	NITRATE (45)*	3.0	ZINC (5.0)*	.170

*RECOMMENDED LIMIT **MANDATORY LIMIT
ALL VALUES ARE MILLIGRAMS PER LITER UNLESS OTHERWISE NOTED.

BACTERIOLOGICAL RESULTS

	COLIFORM/100 ml	FECAL COLIFORM/100 ml
RAW WATER		
DISTRIBUTION #1	0	0
DISTRIBUTION #2	0	0

REPORT ON INDIVIDUAL WATER SUPPLIES
NATIONAL PARK SERVICE STUDY

NAME OF PARK Coronado National Memorial
NAME OF SUPPLY Headquarters well
TREATMENT none

DATE OF SURVEY 6/7/73
STORAGE steel tanks
SOURCE well

BACTERIOLOGICAL QUALITY

NUMBER OF MONTHS IN PAST YEAR OF OPERATION THAT NO BACTERIOLOGICAL SAMPLES WERE TAKEN. 2

NUMBER OF MONTHS IN PAST YEAR OF OPERATION THAT ONE BACTERIOLOGICAL SAMPLE WAS TAKEN. 3

NUMBER OF MONTHS WHEN THE BACTERIOLOGICAL LIMITS OF THE DWS WERE NOT MET. 0

CHEMICAL QUALITY

DWS MANDATORY LIMITS FAILED

DWS RECOMMENDED LIMITS FAILED Total Dissolved Solids

SANITARY CONDITIONS

IS THE SOURCE PROTECTION ADEQUATE? YES x NO ___

IS OPERATION AND CONTROL ADEQUATE? YES x NO ___

IS THE WATER SYSTEM CAPABLE OF DELIVERING A CONTINUOUS SUPPLY OF SAFE WATER? YES x NO ___

PHYSICAL AND CHEMICAL RESULTS

ARSENIC (0.01)*		FLUORIDE (1.4 to 2.4) **	.25	pH	7.4
(0.05)**	<.005	IRON (0.3)*	.005	SELENIUM (0.01)**	<.005
BARIUM (1.0)**	.19	LEAD (0.05)**	.000	SILVER (0.05)**	.000
CADMIUM (0.01)**	.000	M.B.A.S. (0.5)*	<.250	SULFATE (250)*	94
CHLORIDE (250)*	<10	MANGANESE (0.05)*	.000	TOTAL DISSOLVED SOLIDS (500)*	520.0
CHROMIUM (.05)**	.000	MERCURY	<.0005	TURBIDITY (5 s.u.)*	.1
COLOR (15 s.u.)*	2	NITRATE (45)*	<1	ZINC (5.0)*	.038
COPPER (1.0)*	.000				

*RECOMMENDED LIMIT **MANDATORY LIMIT
ALL VALUES ARE MILLIGRAMS PER LITER UNLESS OTHERWISE NOTED.

BACTERIOLOGICAL RESULTS

	COLIFORM/100 ml	FECAL COLIFORM/100 ml
RAW WATER		
DISTRIBUTION #1	0	0
DISTRIBUTION #2	0	0

REPORT ON INDIVIDUAL WATER SUPPLIES
NATIONAL PARK SERVICE STUDY

NAME OF PARK Chiricahua National Monument
NAME OF SUPPLY Headquarters well
TREATMENT chlorination

DATE OF SURVEY 6/6/73
STORAGE underground concrete tanks
SOURCE well

BACTERIOLOGICAL QUALITY

NUMBER OF MONTHS IN PAST YEAR OF OPERATION THAT NO BACTERIOLOGICAL SAMPLES WERE TAKEN. 2

NUMBER OF MONTHS IN PAST YEAR OF OPERATION THAT ONE BACTERIOLOGICAL SAMPLE WAS TAKEN. 0

NUMBER OF MONTHS WHEN THE BACTERIOLOGICAL LIMITS OF THE DWS WERE NOT MET. 0

CHEMICAL QUALITY

DWS MANDATORY LIMITS FAILED Fluoride

DWS RECOMMENDED LIMITS FAILED

SANITARY CONDITIONS

IS THE SOURCE PROTECTION ADEQUATE? YES x NO ___

IS OPERATION AND CONTROL ADEQUATE? YES x NO ___

IS THE WATER SYSTEM CAPABLE OF DELIVERING A CONTINUOUS SUPPLY OF SAFE WATER? YES x NO ___

PHYSICAL AND CHEMICAL RESULTS

ARSENIC (0.01)*	<.005	FLUORIDE (1.4 to 2.4) **	2.6	pH	7.3
(0.05)**		IRON (0.3)*	.046	SELENIUM (0.01)**	<.005
BARIUM (1.0)**	<.05	LEAD (0.05)**	.000	SILVER (0.05)**	.000
CADMIUM (0.01)**	.000	M.B.A.S. (0.5)*	<.250	SULFATE (250)*	32
CHLORIDE (250)*	<10	MANGANESE (0.05)*	.000	TOTAL DISSOLVED SOLIDS (500)*	207.0
CHROMIUM (.05)**	.000	MERCURY	<.0005	TURBIDITY (5 s.u.)*	.2
COLOR (15 s.u.)*	<5	NITRATE (45)*	<1	ZINC (5.0)*	.270
COPPER (1.0)*	.000				

*RECOMMENDED LIMIT **MANDATORY LIMIT
ALL VALUES ARE MILLIGRAMS PER LITER UNLESS OTHERWISE NOTED.

BACTERIOLOGICAL RESULTS

	COLIFORM/100 ml	FECAL COLIFORM/100 ml
RAW WATER	0	0
DISTRIBUTION #1	0	0
DISTRIBUTION #2	0	0

REPORT ON INDIVIDUAL WATER SUPPLIES
NATIONAL PARK SERVICE STUDY

NAME OF PARK Saguaro National Monument
NAME OF SUPPLY Headquarters system
TREATMENT none
DATE OF SURVEY 6/7/73
STORAGE concrete underground tank
SOURCE well

BACTERIOLOGICAL QUALITY

NUMBER OF MONTHS IN PAST YEAR OF OPERATION THAT NO BACTERIOLOGICAL SAMPLES WERE TAKEN. 0

NUMBER OF MONTHS IN PAST YEAR OF OPERATION THAT ONE BACTERIOLOGICAL SAMPLE WAS TAKEN. 0

NUMBER OF MONTHS WHEN THE BACTERIOLOGICAL LIMITS OF THE DWS WERE NOT MET. 0

CHEMICAL QUALITY

DWS MANDATORY LIMITS FAILED

DWS RECOMMENDED LIMITS FAILED

SANITARY CONDITIONS

IS THE SOURCE PROTECTION ADEQUATE? YES x NO ___

IS OPERATION AND CONTROL ADEQUATE? YES x NO ___

IS THE WATER SYSTEM CAPABLE OF DELIVERING A CONTINUOUS SUPPLY OF SAFE WATER ? YES x NO ___

PHYSICAL AND CHEMICAL RESULTS

ARSENIC (0.01)*	<.005	FLUORIDE (1.4 to 2.4) **	.75	pH	7.7
(0.05)**		IRON (0.3)*	.025	SELENIUM (0.01)**	<.005
BARIUM (1.0)**	<.05	LEAD (0.05)**	.000	SILVER (0.05)**	.000
CADMIUM (0.01)**	.000	M.B.A.S. (0.5)*	<.250	SULFATE (250)*	< 25
CHLORIDE (250)*	14	MANGANESE (0.05)*	.000	TOTAL DISSOLVED SOLIDS (500)*	228.0
CHROMIUM (.05)**	.000	MERCURY	<.0005	TURBIDITY (5 s.u.)*	.1
COLOR (15 s.u.)*	2	NITRATE (45)*	6.0	ZINC (5.0)*	.220
COPPER (1.0)*	.076				

*RECOMMENDED LIMIT **MANDATORY LIMIT
ALL VALUES ARE MILLIGRAMS PER LITER UNLESS OTHERWISE NOTED.

BACTERIOLOGICAL RESULTS

	COLIFORM/100 ml	FECAL COLIFORM/100 ml
RAW WATER		
DISTRIBUTION #1	0	0
DISTRIBUTION #2	0	0

REPORT ON INDIVIDUAL WATER SUPPLIES
NATIONAL PARK SERVICE STUDY

NAME OF PARK -Organ Pipe Cactus Nat'l Monument
NAME OF SUPPLY Park System
TREATMENT defluoridation for part of system
DATE OF SURVEY 6/6/73
STORAGE two steel reservoirs
SOURCE two wells

BACTERIOLOGICAL QUALITY

NUMBER OF MONTHS IN PAST YEAR OF OPERATION THAT NO BACTERIOLOGICAL SAMPLES WERE TAKEN. 0

NUMBER OF MONTHS IN PAST YEAR OF OPERATION THAT ONE BACTERIOLOGICAL SAMPLE WAS TAKEN. 0

NUMBER OF MONTHS WHEN THE BACTERIOLOGICAL LIMITS OF THE DWS WERE NOT MET. 8

CHEMICAL QUALITY

DWS MANDATORY LIMITS FAILED Fluoride

DWS RECOMMENDED LIMITS FAILED

The defluoridation equipment for one tap provides water at a fluoride level of .11 mg/l.

SANITARY CONDITIONS

IS THE SOURCE PROTECTION ADEQUATE? YES x NO ___

IS OPERATION AND CONTROL ADEQUATE? YES x NO ___

IS THE WATER SYSTEM CAPABLE OF DELIVERING A CONTINUOUS SUPPLY OF SAFE WATER? YES x NO ___

PHYSICAL AND CHEMICAL RESULTS

ARSENIC (0.01)*		FLUORIDE (1.4 to 2.4) **	2.50	pH	7.9
(0.05)**	<.005	IRON (0.3)*	.015	SELENIUM (0.01)**	<.005
BARIUM (1.0)**	<.05	LEAD (0.05)**	.000	SILVER (0.05)**	.000
CADMIUM (0.01)**	.000	M.B.A.S. (0.5)*	<.250	SULFATE (250)*	53
CHLORIDE (250)*	81	MANGANESE (0.05)*	.000	TOTAL DISSOLVED SOLIDS (500)*	493.0
CHROMIUM (.05)**	.000	MERCURY	<.0005	TURBIDITY (5 s.u.)*	.3
COLOR (15 s.u.)*	2	NITRATE (45)*	18.0	ZINC (5.0)*	.130
COPPER (1.0)*	.014				

*RECOMMENDED LIMIT **MANDATORY LIMIT
ALL VALUES ARE MILLIGRAMS PER LITER UNLESS OTHERWISE NOTED.

BACTERIOLOGICAL RESULTS

	COLIFORM/100 ml	FECAL COLIFORM/100 ml
RAW WATER		
DISTRIBUTION #1	0	0
DISTRIBUTION #2	0	0

REPORT ON INDIVIDUAL WATER SUPPLIES
NATIONAL PARK SERVICE STUDY

NAME OF PARK Yosemite National Park
NAME OF SUPPLY Wawona
TREATMENT chlorination
DATE OF SURVEY 6/12/73
STORAGE steel and wood tanks
SOURCE South Fork, Merced River

BACTERIOLOGICAL QUALITY

NUMBER OF MONTHS IN PAST YEAR OF OPERATION THAT NO BACTERIOLOGICAL SAMPLES WERE TAKEN. 0

NUMBER OF MONTHS IN PAST YEAR OF OPERATION THAT ONE BACTERIOLOGICAL SAMPLE WAS TAKEN. 0

NUMBER OF MONTHS WHEN THE BACTERIOLOGICAL LIMITS OF THE DWS WERE NOT MET. 0

DWS limit not met on day of survey.

CHEMICAL QUALITY

DWS MANDATORY LIMITS FAILED
DWS RECOMMENDED LIMITS FAILED

SANITARY CONDITIONS

IS THE SOURCE PROTECTION ADEQUATE? YES x NO ___

IS OPERATION AND CONTROL ADEQUATE? YES ___ NO x

Chlorine residuals are only checked weekly and only at the treatment plant. No chlorine residual at time of survey.

IS THE WATER SYSTEM CAPABLE OF DELIVERING A CONTINUOUS SUPPLY OF SAFE WATER? YES ___ NO x

There is no screen on the storage tank vents. Chlorine residual never gets past storage tank. Chlorinator needs maintenance, and gas mask and ventilator fan are needed.

PHYSICAL AND CHEMICAL RESULTS

ARSENIC (0.01)*	<.005	FLUORIDE (1.4 to 2.4) **	<.10
(0.05)**		IRON (0.3)*	.040
BARIUM (1.0)**	<.05	LEAD (0.05)**	.000
CADMIUM (0.01)**	.000	M.B.A.S. (0.5)*	<.250
CHLORIDE (250)*	<10	MANGANESE (0.05)*	.000
CHROMIUM (.05)**	.000	MERCURY	<.0005
COLOR (15 s.u.)*	5	NITRATE (45)*	<1
COPPER (1.0)*	.000	pH	5.8
		SELENIUM (0.01)**	<.005
		SILVER (0.05)**	.000
		SULFATE (250)*	<25
		TOTAL DISSOLVED SOLIDS (500)*	9.8
		TURBIDITY (5 s.u.)*	.3
		ZINC (5.0)*	.320

*RECOMMENDED LIMIT **MANDATORY LIMIT
ALL VALUES ARE MILLIGRAMS PER LITER UNLESS OTHERWISE NOTED.

BACTERIOLOGICAL RESULTS

	COLIFORM/100 ml	FECAL COLIFORM/100 ml
RAW WATER	10	0
DISTRIBUTION #1	60	0
DISTRIBUTION #2	0	0

REPORT ON INDIVIDUAL WATER SUPPLIES
NATIONAL PARK SERVICE STUDY

NAME OF PARK Saguaro National Monument
NAME OF SUPPLY Tucson Mountain District
TREATMENT none
DATE OF SURVEY 6/7/73
STORAGE underground tank
SOURCE well

BACTERIOLOGICAL QUALITY

NUMBER OF MONTHS IN PAST YEAR OF OPERATION THAT NO BACTERIOLOGICAL SAMPLES WERE TAKEN. 3

NUMBER OF MONTHS IN PAST YEAR OF OPERATION THAT ONE BACTERIOLOGICAL SAMPLE WAS TAKEN. 0

NUMBER OF MONTHS WHEN THE BACTERIOLOGICAL LIMITS OF THE DWS WERE NOT MET. 0

CHEMICAL QUALITY

DWS MANDATORY LIMITS FAILED
DWS RECOMMENDED LIMITS FAILED

SANITARY CONDITIONS

IS THE SOURCE PROTECTION ADEQUATE? YES ___ NO x

Well should be vented.

IS OPERATION AND CONTROL ADEQUATE? YES x NO ___

IS THE WATER SYSTEM CAPABLE OF DELIVERING A CONTINUOUS SUPPLY OF SAFE WATER? YES x NO ___

PHYSICAL AND CHEMICAL RESULTS

ARSENIC (0.01)*	<.005	FLUORIDE (1.4 to 2.4) **	.40
(0.05)**		IRON (0.3)*	.020
BARIUM (1.0)**	.09	LEAD (0.05)**	.000
CADMIUM (0.01)**	.000	M.B.A.S. (0.5)*	<.250
CHLORIDE (250)*	29	MANGANESE (0.05)*	.000
CHROMIUM (.05)**	.000	MERCURY	<.0005
COLOR (15 s.u.)*	1	NITRATE (45)*	6.0
COPPER (1.0)*	.050	pH	7.9
		SELENIUM (0.01)**	<.005
		SILVER (0.05)**	.000
		SULFATE (250)*	32
		TOTAL DISSOLVED SOLIDS (500)*	296.0
		TURBIDITY (5 s.u.)*	.1
		ZINC (5.0)*	.061

*RECOMMENDED LIMIT **MANDATORY LIMIT
ALL VALUES ARE MILLIGRAMS PER LITER UNLESS OTHERWISE NOTED.

BACTERIOLOGICAL RESULTS

	COLIFORM/100 ml	FECAL COLIFORM/100 ml
RAW WATER		
DISTRIBUTION #1	0	0
DISTRIBUTION #2	0	0

REPORT ON INDIVIDUAL WATER SUPPLIES
NATIONAL PARK SERVICE STUDY

NAME OF PARK Yosemite National Park
NAME OF SUPPLY Hodgton
TREATMENT chlorination and sand filtration
DATE OF SURVEY 6/14/73
STORAGE steel tank
SOURCE Hazel Green Creek

BACTERIOLOGICAL QUALITY

NUMBER OF MONTHS IN PAST YEAR OF OPERATION THAT NO BACTERIOLOGICAL SAMPLES WERE TAKEN. 0

NUMBER OF MONTHS IN PAST YEAR OF OPERATION THAT ONE BACTERIOLOGICAL SAMPLE WAS TAKEN. 0

NUMBER OF MONTHS WHEN THE BACTERIOLOGICAL LIMITS OF THE DWS WERE NOT MET. 0

CHEMICAL QUALITY

DWS MANDATORY LIMITS FAILED

DWS RECOMMENDED LIMITS FAILED

SANITARY CONDITIONS

IS THE SOURCE PROTECTION ADEQUATE? YES x NO ___

IS OPERATION AND CONTROL ADEQUATE? YES ___ NO x

Chlorine residuals not checked daily

IS THE WATER SYSTEM CAPABLE OF DELIVERING A CONTINUOUS SUPPLY OF SAFE WATER ? YES ___ NO x

Filter box becomes silted and must be shoveled.

PHYSICAL AND CHEMICAL RESULTS

ARSENIC (0.01)*	<.005	FLUORIDE (1.4 to 2.4) **	<.10
(0.05)**		IRON (0.3)*	.000
BARIUM (1.0)**	<.05	LEAD (0.05)**	.000
CADMIUM (0.01)**	.000	M.B.A.S. (0.5)*	<.250
CHLORIDE (250)*	<10	MANGANESE (0.05)*	.000
CHROMIUM (.05)**	.000	MERCURY	<.0005
COLOR (15 s.u.)*	2	NITRATE (45)*	<1
COPPER (1.0)*	.015	pH	7.5
		SELENIUM (0.01)**	<.005
		SILVER (0.05)**	.000
		SULFATE (250)*	< 25
		TOTAL DISSOLVED SOLIDS (500)*	95.0
		TURBIDITY (5 s.u.)*	.1
		ZINC (5.0)*	.150

*RECOMMENDED LIMIT **MANDATORY LIMIT
ALL VALUES ARE MILLIGRAMS PER LITER UNLESS OTHERWISE NOTED.

BACTERIOLOGICAL RESULTS

	COLIFORM/100 ml	FECAL COLIFORM/100 ml
RAW WATER	5	0
DISTRIBUTION #1	0	0
DISTRIBUTION #2	0	0

REPORT ON INDIVIDUAL WATER SUPPLIES
NATIONAL PARK SERVICE STUDY

NAME OF PARK Yosemite National Park
NAME OF SUPPLY Crane Flat
TREATMENT chlorination
DATE OF SURVEY 6/14/73
STORAGE steel tank
SOURCE surface

BACTERIOLOGICAL QUALITY

NUMBER OF MONTHS IN PAST YEAR OF OPERATION THAT NO BACTERIOLOGICAL SAMPLES WERE TAKEN. 0

NUMBER OF MONTHS IN PAST YEAR OF OPERATION THAT ONE BACTERIOLOGICAL SAMPLE WAS TAKEN. 1

NUMBER OF MONTHS WHEN THE BACTERIOLOGICAL LIMITS OF THE DWS WERE NOT MET. 0

CHEMICAL QUALITY

DWS MANDATORY LIMITS FAILED

DWS RECOMMENDED LIMITS FAILED Color

SANITARY CONDITIONS

IS THE SOURCE PROTECTION ADEQUATE? YES x NO ___

IS OPERATION AND CONTROL ADEQUATE? YES ___ NO x

Chlorine residual only checked weekly.

IS THE WATER SYSTEM CAPABLE OF DELIVERING A CONTINUOUS SUPPLY OF SAFE WATER ? YES ___ NO x

Occasional water shortage.

PHYSICAL AND CHEMICAL RESULTS

ARSENIC (0.01)*		FLUORIDE (1.4 to 2.4) **	<.10
(0.05)**	<.005	IRON (0.3)*	.050
BARIUM (1.0)**	<.05	LEAD (0.05)**	.000
CADMIUM (0.01)**	.000	M.B.A.S. (0.5)*	<.250
CHLORIDE (250)*	<10	MANGANESE (0.05)*	.006
CHROMIUM (.05)**	.000	MERCURY	<.0005
COLOR (15 s.u.)*	25	NITRATE (45)*	<1
COPPER (1.0)*	.019	pH	6.8
		SELENIUM (0.01)**	<.005
		SILVER (0.05)**	.000
		SULFATE (250)*	< 25
		TOTAL DISSOLVED SOLIDS (500)*	38.0
		TURBIDITY (5 s.u.)*	.2
		ZINC (5.0)*	1.100

*RECOMMENDED LIMIT **MANDATORY LIMIT
ALL VALUES ARE MILLIGRAMS PER LITER UNLESS OTHERWISE NOTED.

BACTERIOLOGICAL RESULTS

	COLIFORM/100 ml	FECAL COLIFORM/100 ml
RAW WATER	0	0
DISTRIBUTION #1	0	0
DISTRIBUTION #2	0	0

REPORT ON INDIVIDUAL WATER SUPPLIES
NATIONAL PARK SERVICE STUDY

NAME OF PARK Yosemite National Park
NAME OF SUPPLY Arch Rock
TREATMENT sand filtration, chlorination
DATE OF SURVEY 6/13/73
STORAGE steel tank
SOURCE spring

BACTERIOLOGICAL QUALITY

NUMBER OF MONTHS IN PAST YEAR OF OPERATION THAT NO BACTERIOLOGICAL SAMPLES WERE TAKEN. 0

NUMBER OF MONTHS IN PAST YEAR OF OPERATION THAT ONE BACTERIOLOGICAL SAMPLE WAS TAKEN. 0

NUMBER OF MONTHS WHEN THE BACTERIOLOGICAL LIMITS OF THE DWS WERE NOT MET. 0

CHEMICAL QUALITY

DWS MANDATORY LIMITS FAILED
DWS RECOMMENDED LIMITS FAILED

SANITARY CONDITIONS

IS THE SOURCE PROTECTION ADEQUATE? YES ___ NO x

Gravel pack should be protected from surface drainage and the stream.

IS OPERATION AND CONTROL ADEQUATE? YES ___ NO x

No chlorine residual at time of survey. Chlorine feed rate should be boosted and checked daily.

IS THE WATER SYSTEM CAPABLE OF DELIVERING A CONTINUOUS SUPPLY OF SAFE WATER? YES ___ NO x

Lid on storage tank should be more completely bolted.

PHYSICAL AND CHEMICAL RESULTS

ARSENIC (0.01)*	FLUORIDE (1.4 to 2.4) **	pH	6.8
(0.05)** <.005	<.10	SELENIUM (0.01)**	<.005
BARIUM (1.0)** <.05	IRON (0.3)* .050	SILVER (0.05)**	.000
CADMIUM (0.01)** .000	LEAD (0.05)** .000	SULFATE (250)*	< 25
CHLORIDE (250)* <10	M.B.A.S. (0.5)* <.25	TOTAL DISSOLVED SOLIDS (500)*	38
CHROMIUM (.05)** .000	MANGANESE (0.05)* .006		
COLOR (15 s.u.)* 3	MERCURY <.0005	TURBIDITY (5 s.u.)*	.2
COPPER (1.0)* .019	NITRATE (45)* <1	ZINC (5.0)*	1.1

*RECOMMENDED LIMIT **MANDATORY LIMIT
ALL VALUES ARE MILLIGRAMS PER LITER UNLESS OTHERWISE NOTED.

BACTERIOLOGICAL RESULTS

	COLIFORM/100 ml	FECAL COLIFORM/100 ml
RAW WATER	10	0
DISTRIBUTION #1	0	0
DISTRIBUTION #2	0	0

REPORT ON INDIVIDUAL WATER SUPPLIES
NATIONAL PARK SERVICE STUDY

NAME OF PARK Yosemite National Park
NAME OF SUPPLY Yosemite Valley
TREATMENT Sedimentation, chlorination
DATE OF SURVEY 6/11/73
STORAGE Sedimentation tank
SOURCE River

BACTERIOLOGICAL QUALITY

NUMBER OF MONTHS IN PAST YEAR OF OPERATION THAT NO BACTERIOLOGICAL SAMPLES WERE TAKEN. 0

NUMBER OF MONTHS IN PAST YEAR OF OPERATION THAT ONE BACTERIOLOGICAL SAMPLE WAS TAKEN. 0

NUMBER OF MONTHS WHEN THE BACTERIOLOGICAL LIMITS OF THE DWS WERE NOT MET. 0

CHEMICAL QUALITY

DWS MANDATORY LIMITS FAILED
DWS RECOMMENDED LIMITS FAILED

SANITARY CONDITIONS

IS THE SOURCE PROTECTION ADEQUATE? YES x NO ___

IS OPERATION AND CONTROL ADEQUATE? YES ___ NO x

Chlorine residual not checked daily.

IS THE WATER SYSTEM CAPABLE OF DELIVERING A CONTINUOUS SUPPLY OF SAFE WATER? YES ___ NO x

Turbidity is high after large rains. Springs should remain under surveillance although not normally used. Pressure drops to zero in some places upon high instantaneous demand. Gas mask should be installed at plant.

PHYSICAL AND CHEMICAL RESULTS

ARSENIC (0.01)*	FLUORIDE (1.4 to 2.4) **	pH	5.9
(0.05)** <.005	<.10	SELENIUM (0.01)**	<.005
BARIUM (1.0)** <.05	IRON (0.3)* .066	SILVER (0.05)**	.000
CADMIUM (0.01)** .000	LEAD (0.05)** .000	SULFATE (250)*	< 25
CHLORIDE (250)* <10	M.B.A.S. (0.5)* <.250	TOTAL DISSOLVED SOLIDS (500)*	7.8
CHROMIUM (.05)** .000	MANGANESE (0.05)* .000		
COLOR (15 s.u.)* 3	MERCURY <.0005	TURBIDITY (5 s.u.)*	.2
COPPER (1.0)* .000	NITRATE (45)* <1	ZINC (5.0)*	.019

*RECOMMENDED LIMIT **MANDATORY LIMIT
ALL VALUES ARE MILLIGRAMS PER LITER UNLESS OTHERWISE NOTED.

BACTERIOLOGICAL RESULTS

	COLIFORM/100 ml	FECAL COLIFORM/100 ml
RAW WATER	90	1
DISTRIBUTION #1	0	0
DISTRIBUTION #2	0	0

REPORT ON INDIVIDUAL WATER SUPPLIES
NATIONAL PARK SERVICE STUDY

NAME OF PARK Pinnacles National Monument
NAME OF SUPPLY Headquarters
TREATMENT chlorination
DATE OF SURVEY 6/13/73
STORAGE two steel tanks
SOURCE well

BACTERIOLOGICAL QUALITY

NUMBER OF MONTHS IN PAST YEAR OF OPERATION THAT NO BACTERIOLOGICAL SAMPLES WERE TAKEN. 2

NUMBER OF MONTHS IN PAST YEAR OF OPERATION THAT ONE BACTERIOLOGICAL SAMPLE WAS TAKEN. 2

NUMBER OF MONTHS WHEN THE BACTERIOLOGICAL LIMITS OF THE DWS WERE NOT MET. 0

CHEMICAL QUALITY

DWS MANDATORY LIMITS FAILED

DWS RECOMMENDED LIMITS FAILED

SANITARY CONDITIONS

IS THE SOURCE PROTECTION ADEQUATE? YES x NO ___

IS OPERATION AND CONTROL ADEQUATE? YES ___ NO x

Chlorine residuals should be checked daily. No chlorine residual in distribution system on day of survey.

IS THE WATER SYSTEM CAPABLE OF DELIVERING A CONTINUOUS SUPPLY OF SAFE WATER? YES x NO ___

PHYSICAL AND CHEMICAL RESULTS

ARSENIC (0.01)*<.005 (0.05)**	FLUORIDE (1.4 to 2.4) ** .40	pH	7.6
BARIUM (1.0)** <.05	IRON (0.3)* .045	SELENIUM (0.01)** <.005	
CADMIUM (0.01)**.000	LEAD (0.05)** .000	SILVER (0.05)** .000	
CHLORIDE (250)* 41	M.B.A.S. (0.5)* <.250	SULFATE (250)* < 25	
CHROMIUM (.05)**.000	MANGANESE (0.05)* .000	TOTAL DISSOLVED SOLIDS (500)*	265.0
COLOR (15 s.u.)*5	MERCURY .0007	TURBIDITY (5 s.u.)* .4	
COPPER (1.0)* .010	NITRATE (45)* 4.0	ZINC (5.0)* .600	

*RECOMMENDED LIMIT **MANDATORY LIMIT
ALL VALUES ARE MILLIGRAMS PER LITER UNLESS OTHERWISE NOTED.

BACTERIOLOGICAL RESULTS

	COLIFORM/100 ml	FECAL COLIFORM/100 ml
RAW WATER	0	0
DISTRIBUTION #1	0	0
DISTRIBUTION #2	0	0

REPORT ON INDIVIDUAL WATER SUPPLIES
NATIONAL PARK SERVICE STUDY

NAME OF PARK Yosemite National Park
NAME OF SUPPLY El Portal
TREATMENT chlorination
DATE OF SURVEY 6/13/73
STORAGE three steel tanks
SOURCE Moss Creek and well

BACTERIOLOGICAL QUALITY

NUMBER OF MONTHS IN PAST YEAR OF OPERATION THAT NO BACTERIOLOGICAL SAMPLES WERE TAKEN. 0

NUMBER OF MONTHS IN PAST YEAR OF OPERATION THAT ONE BACTERIOLOGICAL SAMPLE WAS TAKEN. 0

NUMBER OF MONTHS WHEN THE BACTERIOLOGICAL LIMITS OF THE DWS WERE NOT MET. 0

DWS limit not met on day of survey.

CHEMICAL QUALITY

DWS MANDATORY LIMITS FAILED

DWS RECOMMENDED LIMITS FAILED

SANITARY CONDITIONS

IS THE SOURCE PROTECTION ADEQUATE? YES ___ NO x

Well should have a sanitary seal.

IS OPERATION AND CONTROL ADEQUATE? YES ___ NO x

No chlorine residual in distribution system on the day of the survey.

IS THE WATER SYSTEM CAPABLE OF DELIVERING A CONTINUOUS SUPPLY OF SAFE WATER? YES ___ NO x

Booster chlorinator should be installed on line up from the well. Water shortages occur.

PHYSICAL AND CHEMICAL RESULTS

ARSENIC (0.01)* < .005 (0.05)**	FLUORIDE (1.4 to 2.4) **< .10	pH	6.9
BARIUM (1.0)** <.05	IRON (0.3)* .056	SELENIUM (0.01)** < .005	
CADMIUM (0.01)** .000	LEAD (0.05)** .000	SILVER (0.05)** .000	
CHLORIDE (250)* <10	M.B.A.S. (0.5)* .250	SULFATE (250)* < 25	
CHROMIUM (.05)** .000	MANGANESE (0.05)* .000	TOTAL DISSOLVED SOLIDS (500)*	24.0
COLOR (15 s.u.)* 3	MERCURY < .0005	TURBIDITY (5 s.u.)*	1.0
COPPER (1.0)* .019	NITRATE (45)* < 1	ZINC (5.0)* .079	

*RECOMMENDED LIMIT **MANDATORY LIMIT
ALL VALUES ARE MILLIGRAMS PER LITER UNLESS OTHERWISE NOTED.

BACTERIOLOGICAL RESULTS

	COLIFORM/100 ml	FECAL COLIFORM/100 ml
RAW WATER	0	
DISTRIBUTION #1	5.2	0
DISTRIBUTION #2	0	0
		6

REPORT ON INDIVIDUAL WATER SUPPLIES
NATIONAL PARK SERVICE STUDY

NAME OF PARK - Point Reyes National Seashore DATE OF SURVEY 6/14/73
NAME OF SUPPLY Headquarters STORAGE concrete tank
TREATMENT chlorination SOURCE surface

BACTERIOLOGICAL QUALITY

NUMBER OF MONTHS IN PAST YEAR OF OPERATION THAT NO BACTERIOLOGICAL SAMPLES WERE TAKEN. 3

NUMBER OF MONTHS IN PAST YEAR OF OPERATION THAT ONE BACTERIOLOGICAL SAMPLE WAS TAKEN. 2

NUMBER OF MONTHS WHEN THE BACTERIOLOGICAL LIMITS OF THE DWS WERE NOT MET. 1

CHEMICAL QUALITY

DWS MANDATORY LIMITS FAILED
DWS RECOMMENDED LIMITS FAILED

SANITARY CONDITIONS

IS THE SOURCE PROTECTION ADEQUATE? YES ___ NO x

Facilities very old; major repairs needed.

IS OPERATION AND CONTROL ADEQUATE? YES ___ NO x

No chlorine residual in distribution system. Chlorine residual test should be made on water in the distribution system.

IS THE WATER SYSTEM CAPABLE OF DELIVERING A CONTINUOUS SUPPLY OF SAFE WATER? YES ___ NO x

Water shortages occur.

PHYSICAL AND CHEMICAL RESULTS

ARSENIC (0.01)*	<.005	FLUORIDE (1.4 to 2.4) **	<.10	pH	7.6
(0.05)**		IRON (0.3)*	.003	SELENIUM (0.01)**	<.005
BARIUM (1.0)**	<.05	LEAD (0.05)**	.000	SILVER (0.05)**	.000
CADMIUM (0.01)**	.000	M.B.A.S. (0.5)*	<.250	SULFATE (250)*	< 25
CHLORIDE (250)*	24	MANGANESE (0.05)*	.000	TOTAL DISSOLVED SOLIDS (500)*	189.0
CHROMIUM (.05)**	.000	MERCURY	.0008	TURBIDITY (5 s.u.)*	.1
COLOR (15 s.u.)*	2	NITRATE (45)*	1.0	ZINC (5.0)*	.160
COPPER (1.0)*	.003				

*RECOMMENDED LIMIT **MANDATORY LIMIT
ALL VALUES ARE MILLIGRAMS PER LITER UNLESS OTHERWISE NOTED.

BACTERIOLOGICAL RESULTS

	COLIFORM/100 ml	FECAL COLIFORM/100 ml
RAW WATER	0	0
DISTRIBUTION #1	0	0
DISTRIBUTION #2	0	0

REPORT ON INDIVIDUAL WATER SUPPLIES
NATIONAL PARK SERVICE STUDY

NAME OF PARK Pinnacles National Monument DATE OF SURVEY 6/13/73
NAME OF SUPPLY Chaparral Ranger Station STORAGE steel tank
TREATMENT none SOURCE well

BACTERIOLOGICAL QUALITY

NUMBER OF MONTHS IN PAST YEAR OF OPERATION THAT NO BACTERIOLOGICAL SAMPLES WERE TAKEN. 0

NUMBER OF MONTHS IN PAST YEAR OF OPERATION THAT ONE BACTERIOLOGICAL SAMPLE WAS TAKEN. 1

NUMBER OF MONTHS WHEN THE BACTERIOLOGICAL LIMITS OF THE DWS WERE NOT MET. 0

CHEMICAL QUALITY

DWS MANDATORY LIMITS FAILED
DWS RECOMMENDED LIMITS FAILED

SANITARY CONDITIONS

IS THE SOURCE PROTECTION ADEQUATE? YES ___ ? NO ___

IS OPERATION AND CONTROL ADEQUATE? YES x NO ___

IS THE WATER SYSTEM CAPABLE OF DELIVERING A CONTINUOUS SUPPLY OF SAFE WATER? YES x NO ___

PHYSICAL AND CHEMICAL RESULTS

ARSENIC (0.01)*	.015	FLUORIDE (1.4 to 2.4) **	.10	pH	7.8
(0.05)**		IRON (0.3)*	.015	SELENIUM (0.01)**	<.005
BARIUM (1.0)**	<.05	LEAD (0.05)**	.000	SILVER (0.05)**	.000
CADMIUM (0.01)**	.000	M.B.A.S. (0.5)*	<.250	SULFATE (250)*	< 25
CHLORIDE (250)*	23	MANGANESE (0.05)*	.006	TOTAL DISSOLVED SOLIDS (500)*	315.0
CHROMIUM (.05)**	.000	MERCURY	<.0005	TURBIDITY (5 s.u.)*	.1
COLOR (15 s.u.)*	2	NITRATE (45)*	<1	ZINC (5.0)*	.290
COPPER (1.0)*	.010				

*RECOMMENDED LIMIT **MANDATORY LIMIT
ALL VALUES ARE MILLIGRAMS PER LITER UNLESS OTHERWISE NOTED.

BACTERIOLOGICAL RESULTS

	COLIFORM/100 ml	FECAL COLIFORM/100 ml
RAW WATER	0	0
DISTRIBUTION #1	0	0
DISTRIBUTION #2	0	0

REPORT ON INDIVIDUAL WATER SUPPLIES
NATIONAL PARK SERVICE STUDY

NAME OF PARK Shenandoah National Park
NAME OF SUPPLY Lewis Mountain
TREATMENT none

DATE OF SURVEY 5/24/73
STORAGE underground concrete reservoir
SOURCE well and spring

BACTERIOLOGICAL QUALITY

NUMBER OF MONTHS IN PAST YEAR OF OPERATION THAT NO BACTERIOLOGICAL SAMPLES WERE TAKEN. 0

NUMBER OF MONTHS IN PAST YEAR OF OPERATION THAT ONE BACTERIOLOGICAL SAMPLE WAS TAKEN. 0

NUMBER OF MONTHS WHEN THE BACTERIOLOGICAL LIMITS OF THE DWS WERE NOT MET. 0

CHEMICAL QUALITY

DWS MANDATORY LIMITS FAILED Lead
DWS RECOMMENDED LIMITS FAILED Iron

SANITARY CONDITIONS

IS THE SOURCE PROTECTION ADEQUATE? YES x ? NO ___

IS OPERATION AND CONTROL ADEQUATE? YES x NO ___

IS THE WATER SYSTEM CAPABLE OF DELIVERING A CONTINUOUS SUPPLY OF SAFE WATER? YES ___ NO x

Low water pressure found in distribution system.

PHYSICAL AND CHEMICAL RESULTS

ARSENIC (0.01)* (0.05)**	< .005	FLUORIDE (1.4 to 2.4) **	< .10	pH	8.4
BARIUM (1.0)**	.08	IRON (0.3)*	.370	SELENIUM (0.01)**	< .005
CADMIUM (0.01)**	.000	LEAD (0.05)**	.110	SILVER (0.05)**	.000
CHLORIDE (250)*	< 10	M.B.A.S. (0.5)*	.250	SULFATE (250)*	< 25
CHROMIUM (.05)**	.000	MANGANESE (0.05)*	.000	TOTAL DISSOLVED SOLIDS (500)*	48.0
COLOR (15 s.u.)*	3	MERCURY	< .0005	TURBIDITY (5 s.u.)*	2.7
COPPER (1.0)*	.039	NITRATE (45)*	< 1	ZINC (5.0)*	2.300

*RECOMMENDED LIMIT **MANDATORY LIMIT
ALL VALUES ARE MILLIGRAMS PER LITER UNLESS OTHERWISE NOTED.

BACTERIOLOGICAL RESULTS

	COLIFORM/100 ml	FECAL COLIFORM/100 ml
RAW WATER		
DISTRIBUTION #1	0	0
DISTRIBUTION #2	0	0

REPORT ON INDIVIDUAL WATER SUPPLIES
NATIONAL PARK SERVICE STUDY

NAME OF PARK Point Reyes National Seashore
NAME OF SUPPLY Drakes - Ocean Beaches
TREATMENT chlorination

DATE OF SURVEY 6/14/73
STORAGE underground concrete tanks
SOURCE wells

BACTERIOLOGICAL QUALITY

NUMBER OF MONTHS IN PAST YEAR OF OPERATION THAT NO BACTERIOLOGICAL SAMPLES WERE TAKEN. 0

NUMBER OF MONTHS IN PAST YEAR OF OPERATION THAT ONE BACTERIOLOGICAL SAMPLE WAS TAKEN. 4

NUMBER OF MONTHS WHEN THE BACTERIOLOGICAL LIMITS OF THE DWS WERE NOT MET. 0

CHEMICAL QUALITY

DWS MANDATORY LIMITS FAILED
DWS RECOMMENDED LIMITS FAILED

SANITARY CONDITIONS

IS THE SOURCE PROTECTION ADEQUATE? YES x NO ___

IS OPERATION AND CONTROL ADEQUATE? YES ___ NO x

Chlorine residual not checked daily. No backflow preventer on chlorine feeder.

IS THE WATER SYSTEM CAPABLE OF DELIVERING A CONTINUOUS SUPPLY OF SAFE WATER? YES x NO ___

PHYSICAL AND CHEMICAL RESULTS

ARSENIC (0.01)* (0.05)**	.005	FLUORIDE (1.4 to 2.4) **	< .10	pH	7.9
BARIUM (1.0)**	< .05	IRON (0.3)*	.110	SELENIUM (0.01)**	< .005
CADMIUM (0.01)**	.000	LEAD (0.05)**	.000	SILVER (0.05)**	.000
CHLORIDE (250)*	101	M.B.A.S. (0.5)*	< .250	SULFATE (250)*	< 25
CHROMIUM (.05)**	.000	MANGANESE (0.05)*	.000	TOTAL DISSOLVED SOLIDS (500)*	344.0
COLOR (15 s.u.)*	2	MERCURY	.0013	TURBIDITY (5 s.u.)*	.4
COPPER (1.0)*	.024	NITRATE (45)*	< 1	ZINC (5.0)*	.020

*RECOMMENDED LIMIT **MANDATORY LIMIT
ALL VALUES ARE MILLIGRAMS PER LITER UNLESS OTHERWISE NOTED.

BACTERIOLOGICAL RESULTS

	COLIFORM/100 ml	FECAL COLIFORM/100 ml
RAW WATER		
DISTRIBUTION #1	0	0
DISTRIBUTION #2	0	0
	0	0

APPENDIX C

NATIONAL PARK SERVICE WATER SUPPLY CLASSIFICATION SYSTEM

United States Department of the Interior

NATIONAL PARK SERVICE
WASHINGTON, D.C. 20240

IN REPLY REFER TO:
P32-ME

DEC 11 1973

Memorandum

To: Regional Directors and Director, National Capital Parks

From: Associate Director, Park System Management

Subject: Classification of NPS Water Supply Systems

In insuring that water supplied to visitors, employees, and residents in National Park Service areas is safe for drinking and domestic purposes, we must do everything possible and necessary to meet the highest public health standards. A recent preliminary evaluation by the Public Health Service-National Park Service Environmental Sanitation Program of water quality, monitoring and sanitary construction and operation of approximately 888 water supply systems shows:

8% constitute health hazards due to significant construction deficiencies or lack adequate treatment;

73% were not sampled adequately to determine bacteriological safety;

20% of those sampled for bacteriological quality exceeded the limits in the PHS 1962 Drinking Water Standards (DWS)

A limited study by the General Accounting Office indicated similar findings.

A procedure is being established to classify the sanitary status of each water supply system to identify those which are or have the potential for not providing safe water. Systems will be classified as satisfactory, provisionally satisfactory, or use prohibited based upon:

1. Quality using the Drinking Water Standards,

2. Monitoring the results of bacteriological and chemical analysis, laboratory reliability and the frequency of sampling, and

3. Reliability based on an evaluation of the facility by the PHS to continuously produce safe water.

CLASSIFICATION DEFINITIONS

1. Satisfactory indicates that the quality of water meets the DWS and the system is judged to have a high degree of reliability for continuously producing safe water

2. Provisionally Satisfactory indicates that the system is capable of producing safe water but:

   a. water of less than the highest quality is being produced and/or

   b. there is inadequate bacteriological or chemical monitoring and/or

   c. the bacteriological or chemical analysis provided the PHS Program are not up-to-date and/or

   d. deficiencies in facilities or operation of the system exist which compromise its reliability in consistently producing safe water.

A provisionally satisfactory classification may be assigned to a system for an indefinite period. When a system is classified provisionally satisfactory the deficiency such as "quality," "bacteriological monitoring," "operation," "no current information," etc. will be noted.

3. Use Prohibited indicates that the system is incapable of consistently producing safe water and water from this system should not be used until deficiencies are corrected.

CLASSIFICATION CRITERIA

Systems will be classified using the criteria in the attached Table A.

IMPLEMENTATION

Implementation of these criteria will be as indicated below. All systems will initially be classified as satisfactory, or provisionally satisfactory unless known deficiencies constitute a critical health hazard in which case the use prohibited classification will apply. PHS consultants in cooperation with park personnel will establish the time by which corrections are to be made. Failure to make the necessary correction will result in reclassification to a use prohibited status.

Quality - Systems having a bacteriological quality which would result in a use prohibited classification will, except in extreme cases, initially be classified provisionally satisfactory for a period up to one year. Adequate treatment must be provided or the system will be reclassified use prohibited.

Monitoring - Systems with inadequate bacteriological or chemical sampling frequencies which would result in a use prohibited classification will initially be classified provisionally satisfactory for a period up to one year.

Reliability - Systems with construction defects of public health significance, other than treatment, may depending upon the deficiency, initially be classified provisionally satisfactory for a period up to 3 years.

This classification system should be great assistance in fulfilling our responsibilities toward those who drink our water. This system is consistent with EPA's standards for public water supplies. We would like this classification system to reflect your comments and suggestions when it is put into effect. Our tentative time schedule is to make it effective January 1, 1974 and have the initial listing of classifications of all systems by April 1, 1974.

John E. Cook

Enclosure

TABLE A.
CRITERIA FOR CLASSIFICATION
OF NPS WATER SUPPLY SYSTEMS

December 1, 1973

CRITERIA	SATISFACTORY	PROVISIONALLY SATISFACTORY	USE PROHIBITED
A. QUALITY (as compared with PHS Drinking Water Standards) 1. Bacteriological	Comply with limits in Sect. 3.2 for each month sampled	Exceed limits in Sect. 3.2 for one of the months sampled	Exceed limits in Sect. 3.2 for two or more of the months sampled
2. Chemical	Comply with limits in Sect. 4.2, 5.21, 5.22, 5.23 and 6.2 except the supply may be satisfactory when the limits for not more than 3 of these substances are not being met - color, odor, chloride, iron, manganese, sulfate, or total dissolved solids	Fails to meet limits for any of these substances - turbidity, ABS, arsenic, copper, CCE, Cyanide, fluoride, nitrate, phenol or zinc. (Limits for arsenic, cyanide and fluoride are those in Sect. 5.21); or fails to meet the limits for 4 or more of these substances - color, odor, chloride, iron, manganeese, sulfate or total dissolved solids; or exceeds limits in Sec. 5.23 but PHS guidelines for use being followed; or chemical analysis incomplete	Exceeds limits in Sect. 5.23 and PHS guidelines for use not being followed Exceeds limits in Sect. 5.22 and 6.2

CRITERIA	SATISFACTORY	PROVISIONALLY SATISFACTORY	USE PROHIBITED
B. MONITORING 1. Bacteriological Public supply - A minimum of 2 samples/ month should be collected and analyzed while the system is in use. Additional samples may be required in high use areas as recommended by the PHS NPS areas located in cities & served by the city system should be included in the city bacteriological sampling program wherever possible. Single family system - one sample/month unless results show closer surveillance is necessary	Complies with sampling rates at least 11 months for year round systems Not more than one sample omitted for seasonal operating systems	Failure to comply with sampling rate for 2 or more months for year round systems Not more than 2 samples omitted for seasonal operating systems	Failure to obtain at least 50% of required samples for any 3 months of operation
2. Chemical A complete chemical analysis is required every 3 years unless levels of chemicals hazardous to health indicates more frequent sampling is necessary. Systems using river or other surface water where chemical characteristics are likely to change should be analyzed annually.	Complete analysis within last 3 years	Complete analysis not within last 3 years but water quality not suspected to be hazardous to health	Complete analysis not within last 3 years and water quality suspected to be hazardous to health

CRITERIA	SATISFACTORY	PROVISIONALLY SATISFACTORY	USE PROHIBITED
C. RELIABILITY	A water supply may be considered reliable and have minimum risk of failure to continously provide water that is fit; has an adequate well-protected good quality source; treatment facilities adequate for the quality of raw water and for the quantities required by maximum demands; trained operators and maintenance personnel who do their work properly; and a good distribution system free from hazards such as cross-connections, areas of low pressure and unproperly protected distribution reservoirs	Water supply having inadequate, antiquated, or overloaded facilities; or whose operations may result in intermediate or high risk as judged by the PHS	Failure to maintain a safe water supply as specified in Section 2 of the DWS

APPENDIX D

PROPOSED CHEMICAL AND BACTERIOLOGICAL SAMPLING CRITERIA

APPENDIX D

PROPOSED CHEMICAL AND BACTERIOLOGICAL SAMPLING CRITERIA

The chemical and bacteriological monitoring criteria recommended in this Report are based on the 1962 Public Health Service Drinking Water Standards and EPA, Water Supply Division (WSD) guidance. A change in current WSD guidance on recommended frequency of chemical and bacteriological sampling is under consideration. This proposed change, summarized in the following paragraphs, is based on a concept of routinely monitoring for only those constituents in the standards where the potential for failing a limit is the greatest.

Chemical Monitoring

This proposed change is based on the concept of routinely monitoring only those constituents in the DWS where the potential for failing a limit is the greatest. This selection is based in part on an initial record of the water quality.

To establish an initial record of water quality, a complete analysis of all chemical and physical constituents for which a limit is established would be required for all systems. This requirement would be considered fulfilled if a reliable analysis has been performed for each constituent in the past and there is no reason to suspect that a significant change in water quality has occurred. The requirement may be waived for an initial record for pesticides and/or organics-carbon adsorable for specific ground water sources, if there is evidence to indicate that these constituents will not be found at significant levels. A single complete analysis combined with a review of watershed and aquifer characteristics, possible avenues of contamination, potential pollution sources, and available environmental monitoring data will provide an acceptable initial record to establish a routine analytical program.

A routine monitoring program would be established for "selected" constituents where the potential for failing a limit is the greatest. A "selected" analysis would include all constituents which, in an initial record, or subsequent sampling analysis, were present at levels in excess of 50% of the limit, plus any other determination of potential "problem" contaminants. A selective analysis would be required at least annually for surface supplies and triennially for ground water supplies. A more complete analysis would be required whenever there is reason to believe there may be a significant change in water quality. After this analysis, an appreciable adjustment to the routine sampling schedule would be made.

In summary, a periodic analysis of "selected" parameters, coupled with information gained through other means such as periodic sanitary surveys and environmental monitoring, will be a cost effective way to determine compliance with the physical and chemical constituents of the DWS. The proposed alternative monitoring requirements should result in a substantial reduction of cost over those contained in this report, which are based on the 1962 Public Health Service Drinking Water Standards.

Bacteriological Monitoring

The 1962 U.S. Public Health Service Drinking Water Standards are designed for interstate carrier water supply systems. It is proposed that separate guidance be issued for water systems having less than ten service connections or serving less than 40 individuals on a continuous basis. The frequency of bacteriological sampling could be established by taking into consideration the water supply source, method of treatment and storage, past bacteriological record, and the protection of the delivered water. The minimum number of samples collected and examined each month for these systems would be one. The time interval between samples would be approximately 30 calendar days.

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