

**The HYDRODYNAMICS Group**  
*studies in mass and energy transport in the earth*

# **FDA Compliance Report:**

## **Arrowhead Springs No.'s 2 and 3 San Bernardino National Forest**

Submitted to:

**The Perrier Group**

**June 4, 1997**

**Michael J. King, C.HG.  
John D. Bredehoeft, Ph.D., NAE**

**The HYDRODYNAMICS Group  
P.O. Box 352 (234 Scenic Dr) La Honda, CA 94020**

**(415) 747-0441/747-0273 fax jdbrede@aol.com  
web page: [www.mediacity.com/~hydrogup](http://www.mediacity.com/~hydrogup)**

## **1.0 INTRODUCTION**

The Arrowhead Springs No.'s 2 and 3 are currently licensed by the State of California Department of Health Services (DHS), Food and Drug Branch to operate as a Private Water Source (License No.'s 86068 to 86069 - Appendix A). The United States Food and Drug Administration (FDA) was specific in its new regulations that cover spring water sources. The objective of this study was to evaluate historical spring flows and chemical test data of Arrowhead Springs No. 2 and No. 3 to determine compliance with FDA regulations. The locations of these springs are shown on Plate 1. This report describes Arrowhead Springs No.'s 2 and 3, and presents the results of our compliance evaluation.

### **1.1 FDA Regulations**

The FDA spring regulations are defined in the Department of Health and Human Services, Federal Food and Drug Administration, Volume 60, No. 218, (Monday November 13, 1995), 21CFR Part 103, 129, 165, and 184 Doc. No. 88P-0030, RIN 0910-AA11 Beverages-Bottled Water, Code 165.110(a)(2)(vi), Sections 48, 53, and 54.

### **1.2 Approach to Demonstrate FDA Compliance**

Our approach was to inspect the Arrowhead Springs No.'s 2 and 3 to confirm the existence of natural springs, and at the same time inspect the local hydrogeology. We reviewed historical data to confirm that the springs have flowed for a long time. Water samples from Spring No.'s 2 and 3 were analyzed for their chemical composition. The chemical analyses were evaluated for compliance with Federal water quality standards.

### **1.3 Previous Site Studies**

John F. Mann, Jr., consulting geologist and hydrologist, worked for the Arrowhead Drinking Water Company (Arrowhead) from 1964 to 1988. During this period he prepared consultant reports describing the geology and hydrogeology of the Arrowhead Springs, which include Springs No.'s 2 and 3. The various springs are described in his report of April 1, 1988 entitled *The Arrowhead Springs*. Additional information, including historical

spring flow records, bore-hole drilling reports, and spring site plans, was made available by Arrowhead.

## **2.0 SETTING**

Collection galleries were constructed at Springs No.'s 2 and 3 in the 1930s. The galleries consist of tunnels driven through the decomposed granite into the hard granite at the sites of natural springs. There are three tunnels--No.'s 2, 3, and 7. Spring No. 7 is described in a separate report. The springs drain by gravity into a pipeline that runs down the mountain to the Waterman Canyon water storage tank and truck loading facilities.

### **2.1 Spring Locations**

The Arrowhead Springs No.'s 2 and 3 are situated in Township 2 North, Range 3 West, in the southwest  $\frac{1}{4}$  of the northeast  $\frac{1}{4}$  of the southwest  $\frac{1}{4}$  of Section 30, in San Bernardino County, California (Plate 1). The land is located within the boundaries of the San Bernardino National Forest, which is under the administrative jurisdiction of the U.S. Forest Service. Site access is from an undeveloped service trail off of "Rim of the World Drive" (State Route 18, Plate 1). The two springs are in close proximity, and they are described in one report.

### **2.2 Physiography**

The Arrowhead Springs are located in the San Bernardino Mountains. The upper springs, including Spring No.'s 2 and 3, are on a steep southern slope (64% slope) of Strawberry Peak. Arrowhead Springs No.'s 2 and 3 are at an elevation of approximately 5,200 feet and 5,100 feet, respectively. Springs No.'s 2 and 3 are adjacent to a tributary ravine of Strawberry Creek at the head of Coldwater Canyon (Plate 1). Springs No.'s 2 and 3 are located approximately 800 feet down slope from State Route 18, and are about 400 feet lower in elevation than the highway (Plate 1).

The detailed topography of the area of Arrowhead Springs No.'s 2 and 3 is shown on Plates 2 and 3. Both springs occur in tunnels that are about 700 feet apart. The mountain drops off on a steep ravine below each spring. There is shrub oak vegetation in the vicinity of each site.

### **2.3 Geology**

The San Bernardino Mountains in the vicinity of Arrowhead Springs No.'s 2 and 3 are composed entirely of crystalline rock; mainly of granite and metamorphic rock of the so-called "basement complex." The San Andreas Fault runs along the base of the San Bernardino Mountains, approximately 5 miles to the southwest; the fault in this area trends west-northwest to east-southeast.

Bore-holes near other springs in the vicinity suggest that the area is underlain by decomposed granite to a depth of about 20 feet; underlying that is highly fractured granite with clay grus lenses. There is almost no residual or colluvial soils at the site; however, the granite near the surface is decomposed.

### **2.4 Hydrostratigraphy**

The water-bearing materials are the decomposed granite and the fractured crystalline granite. The water-bearing characteristics of these materials are dependent on the degree of weathering and the presence of fractures. The matrix permeability is so small as to be negligible. Springs No.'s 2 and 3 produce water from the highly fractured granite.

## **3.0 SPRINGS**

At Springs No.'s 2 and 3 the natural springs are in hand dug tunnels that were driven horizontally through the decomposed granite into fractured granite approximately 30 feet and 70 feet, respectively. "As-built" construction diagrams of the tunnels are presented on Plates 2 and 3. Photographs of the spring tunnels are shown on Plates 4, 5, 6, 7, and 8. Water flows through exposed fractured rock at the end of each tunnel (Plates 6 and 8). The

discharge then flows through a concrete weir into a 4-inch diameter pipeline (Plate 5 and 7). The pipeline from each spring runs down the nearest ravine.

The historical records of spring flows are presented in Table 1. Flows were not recorded prior to 1947. A graph of the history of spring flows is presented in Plate 9. The data indicates that the springs have flowed continually through the period of record. However, the total flow volume in 1989, a drought year, was quite low.

#### **4.0 SPRING CHEMISTRY**

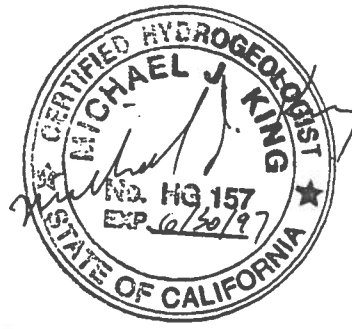
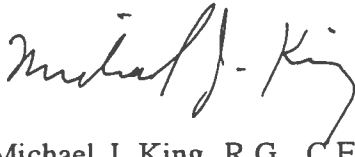
Water quality samples were collected from Springs No.'s 2 and 3. The samples were collected in accordance with state-of-the-practice protocols. Samples were submitted to EPA certified laboratories for analysis. Results of analysis are summarized in Table 2, and provided in Appendix B. The quality of Arrowhead Spring No.'s 2 and 3 bore-hole waters are within the Federal FDA and California DHS drinking water standards for a public water supply (Table 2).

For the purposes of comparison the major ion content of the water is plotted on a Piper Diagram; this is shown on Plate 10. The Piper Diagram shows that the waters have similar chemical composition. The similarity of chemical composition indicates the same ground-water source.

#### **5.0 FDA COMPLIANCE**

The Arrowhead Springs No.'s 2 and 3 comply with the FDA and DHS regulations regarding spring water sources. Our study determined the following:

1. Springs No.'s 2 and 3 are natural springs.
2. Flow at Springs No.'s 2 and 3 has been recorded since 1947.
3. The chemical similarity of the waters, as shown by the Piper Diagram, indicates the same ground-water source for both springs.



Michael J. King, R.G., C.E.G., C.HG.

C.HG. No. 157

Expires 6/30/99



John D. Bredehoeft, PhD., N.A.E.

Principal

## REFERENCES

Department of Health and Human Services, Federal Food and Drug Administration, Volume 60, No. 218, Monday November 13, 1995, 21CFR Part 103, 129, 165, and 184 Doc. No. 88P-0030, RIN 0910-AA11 Beverages-Bottled Water, Code 165.110(a)(2)(vi), Sections 48, 53, and 54.

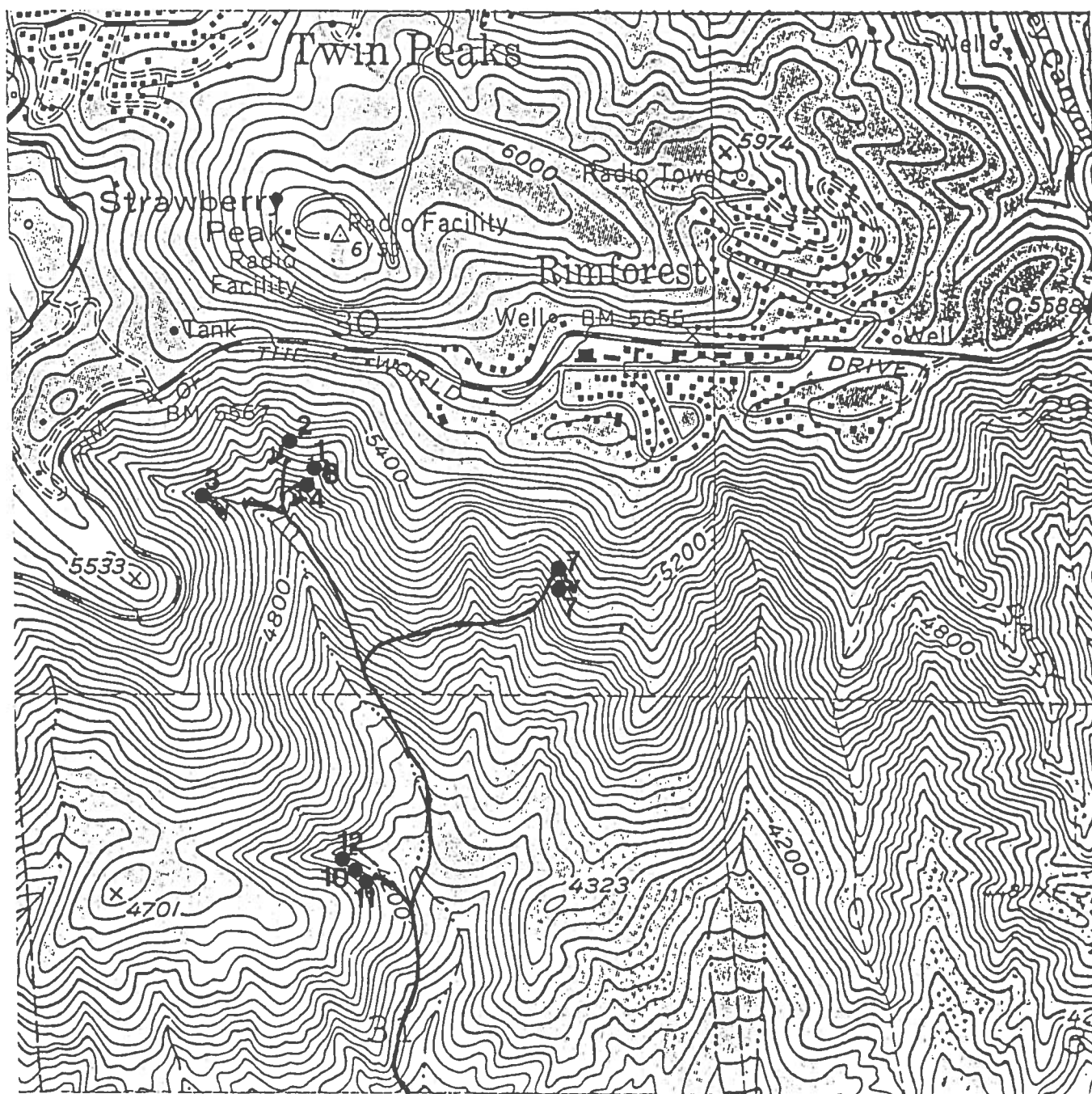
Mann, John F. Jr., 1964, Geologic and Hydrologic Report For The Area Of The Arrowhead And Puritas Springs, Consultant's Report to Arrowhead and Puritas Waters, Inc., April 6.

Mann, John F. Jr., 1977, Consultant's Letter Report to Arrowhead and Puritas Waters, Inc., September 12.

Mann, John F. Jr., 1987, Consultant's Letter Report to Arrowhead Drinking Water Company, Inc., March 28.

Mann, John F. Jr., 1988, The Arrowhead Springs, Consultant's Report to Arrowhead Drinking Water Company, Inc., April 1.

U.S. Geological Survey Topographical Map 1967 Photo Revised 1988: Harrison Mountain, California, Quadrangle, Ref. 34117-B2-TF-024.



1000 0 1000 2000

Scale (feet)  
Contour Interval 40 feet

- Key**
- 7 Spring
  - 1 Bore-hole
  - 4-inch diameter pipeline

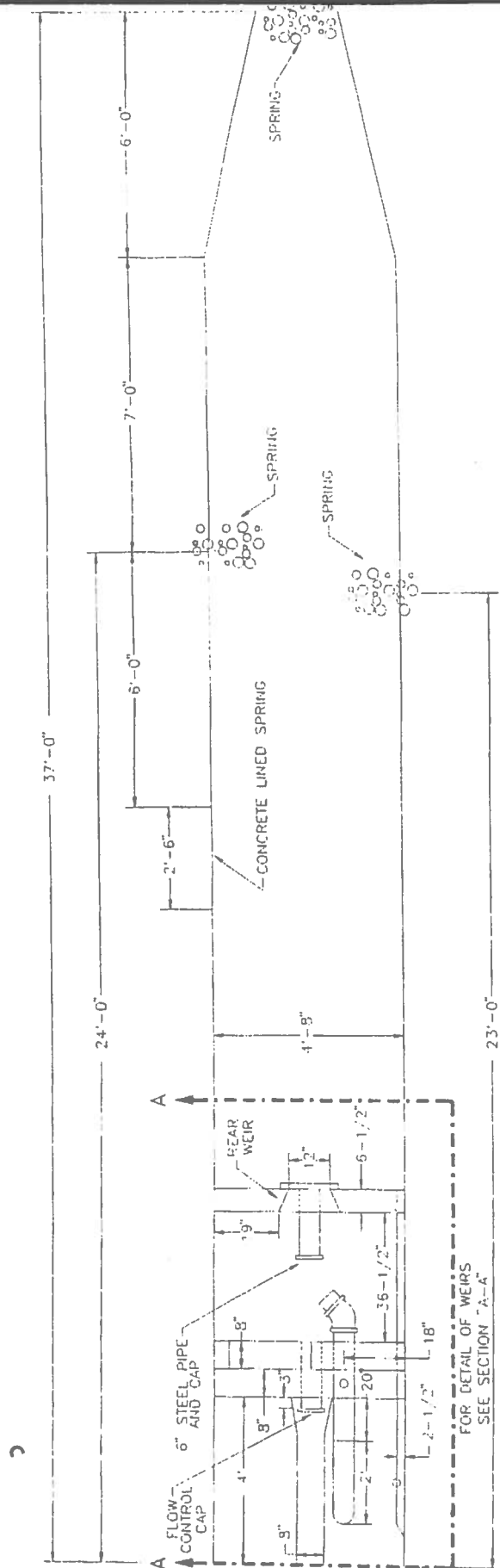
**The HYDRODYNAMICS Group**

**Arrowhead Spring Development  
Location Map**

Adapted from U.S. Geological Survey Map:  
Harrison Mountain, CA Quadrangle

**Plate 1**





SCALE:  $\frac{1}{4}" = 1'-0"$

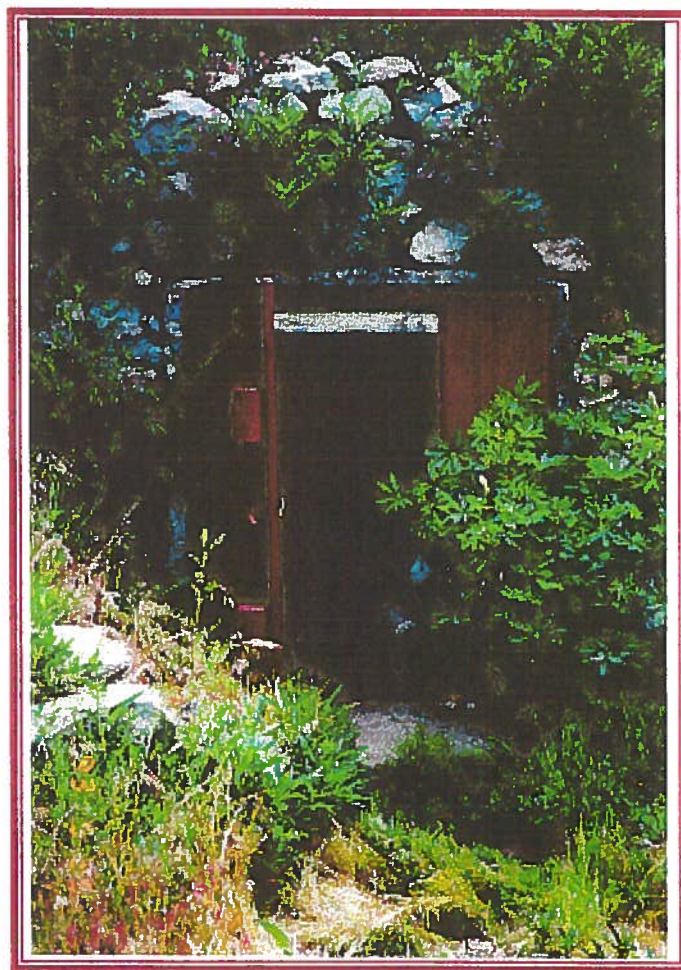
The HYDRODYNAMICS Group

Spring No. 3  
"As-Built" Tunnel Plan

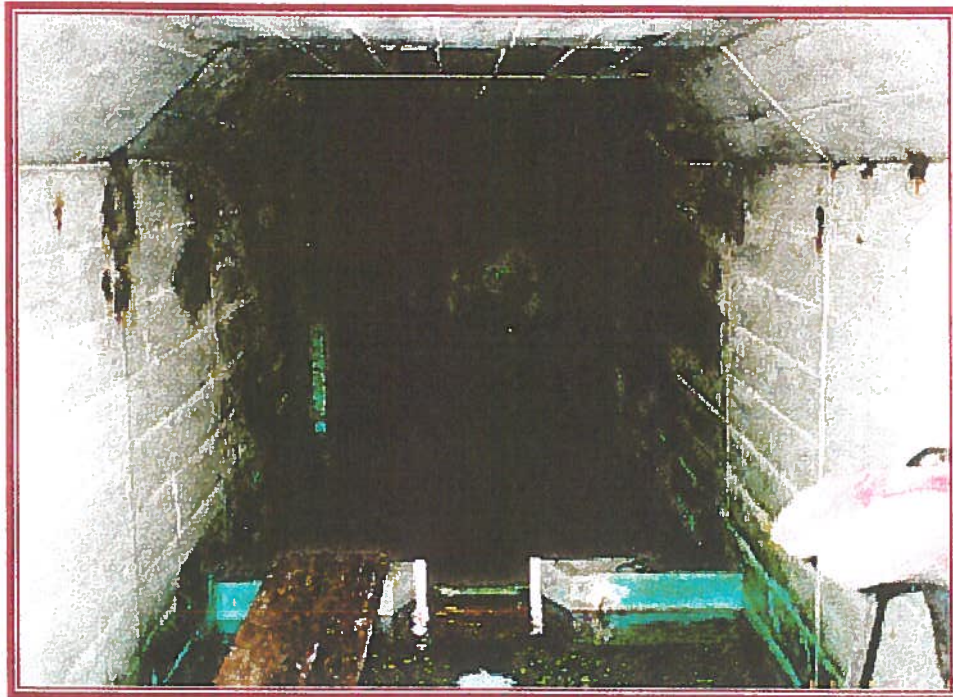
Plate 3



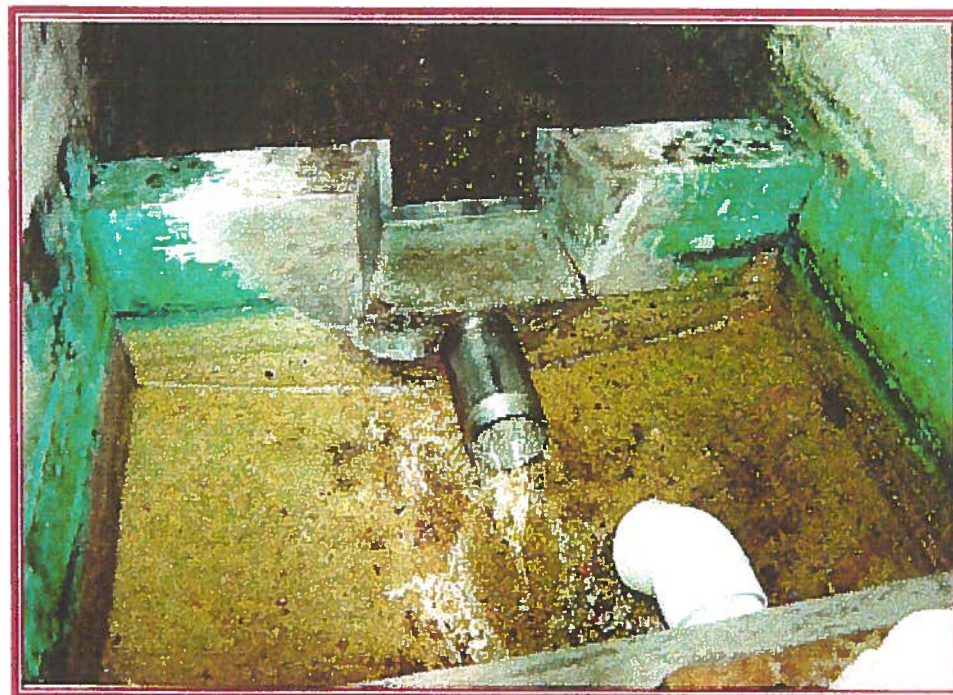
Entrance to Spring #2 (Aerial View)



Entrance to Spring #2



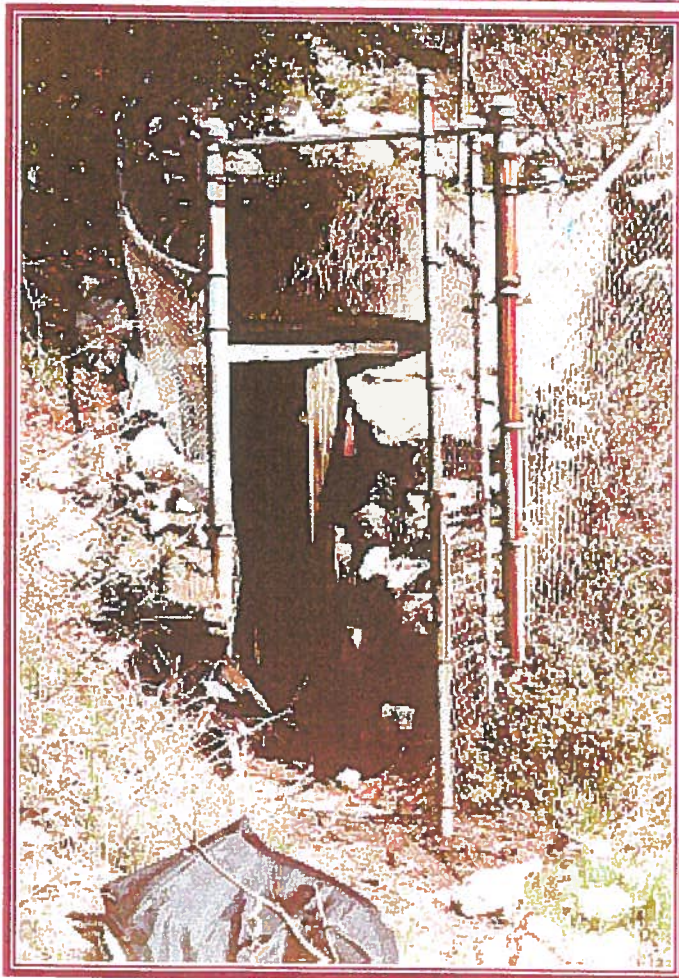
Interior of Spring #2



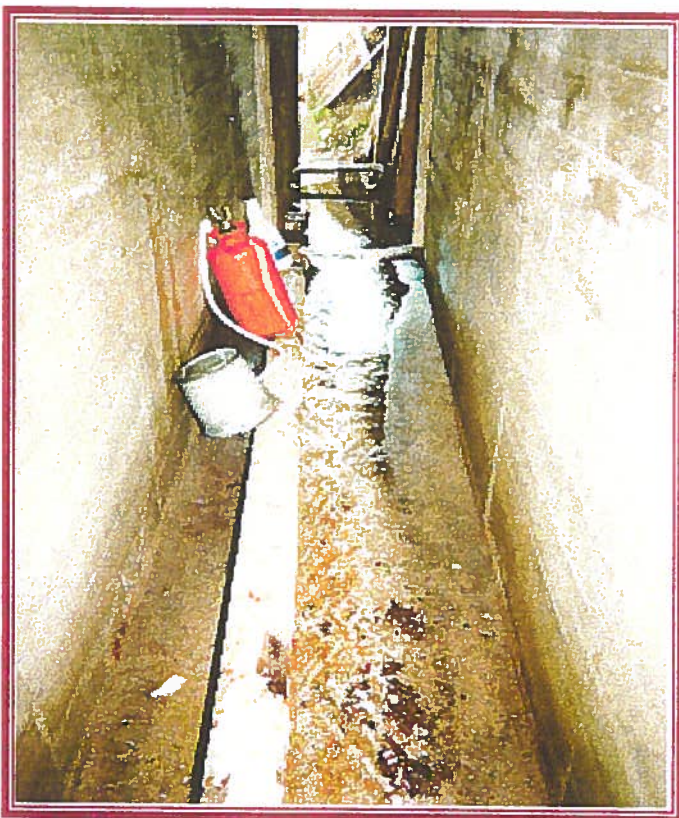
Interior of Spring #2



Interior of Spring #2



Entrance to Spring #3

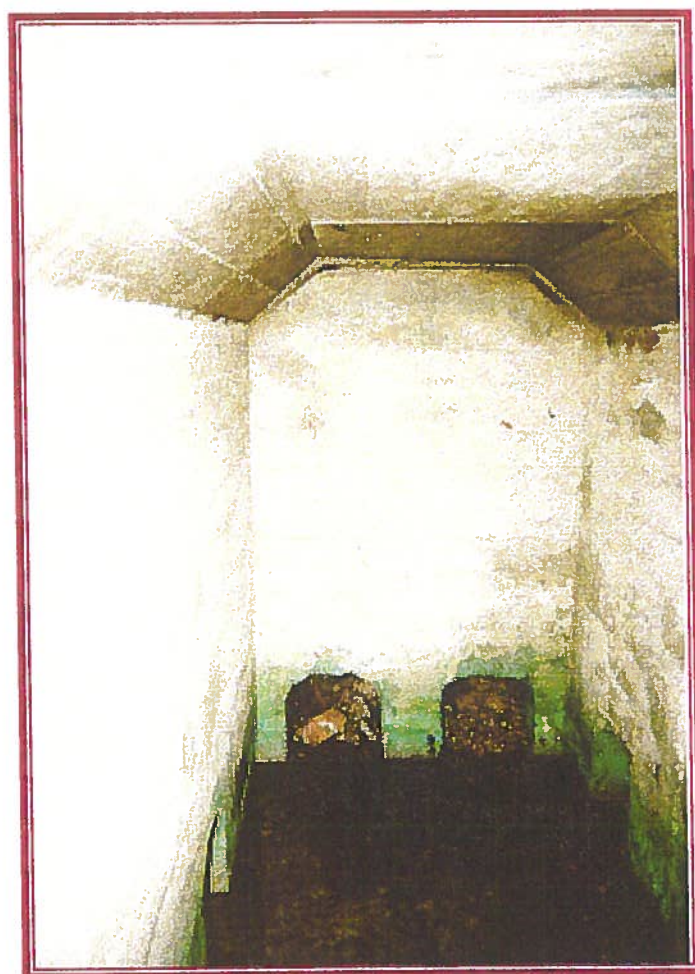


Interior of Spring #3 (near Entrance)

Plate 7

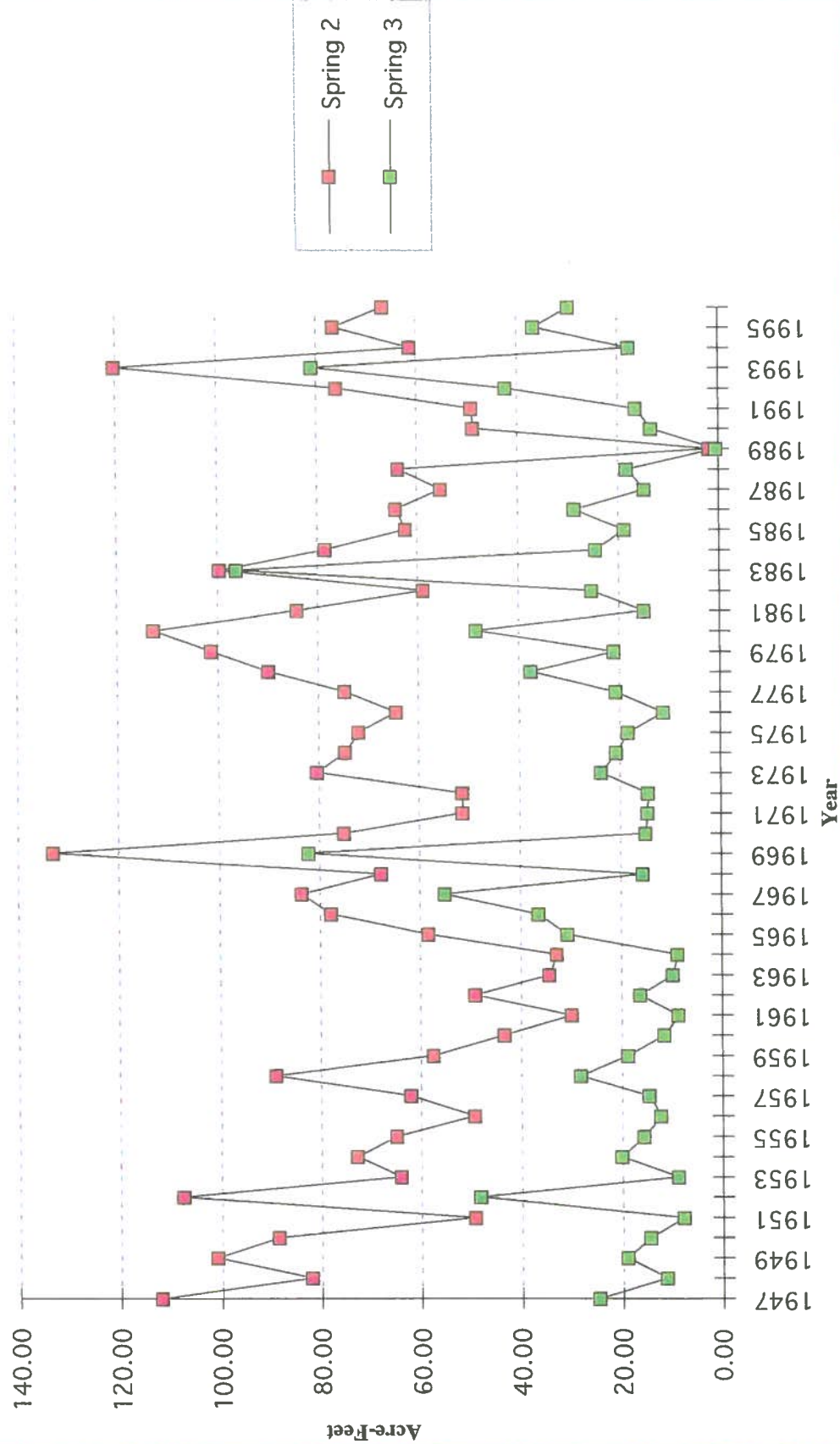


Interior of Spring #3



Interior of Spring #3

Plate 9: Annual Flow Volumes for Springs 2 and 3



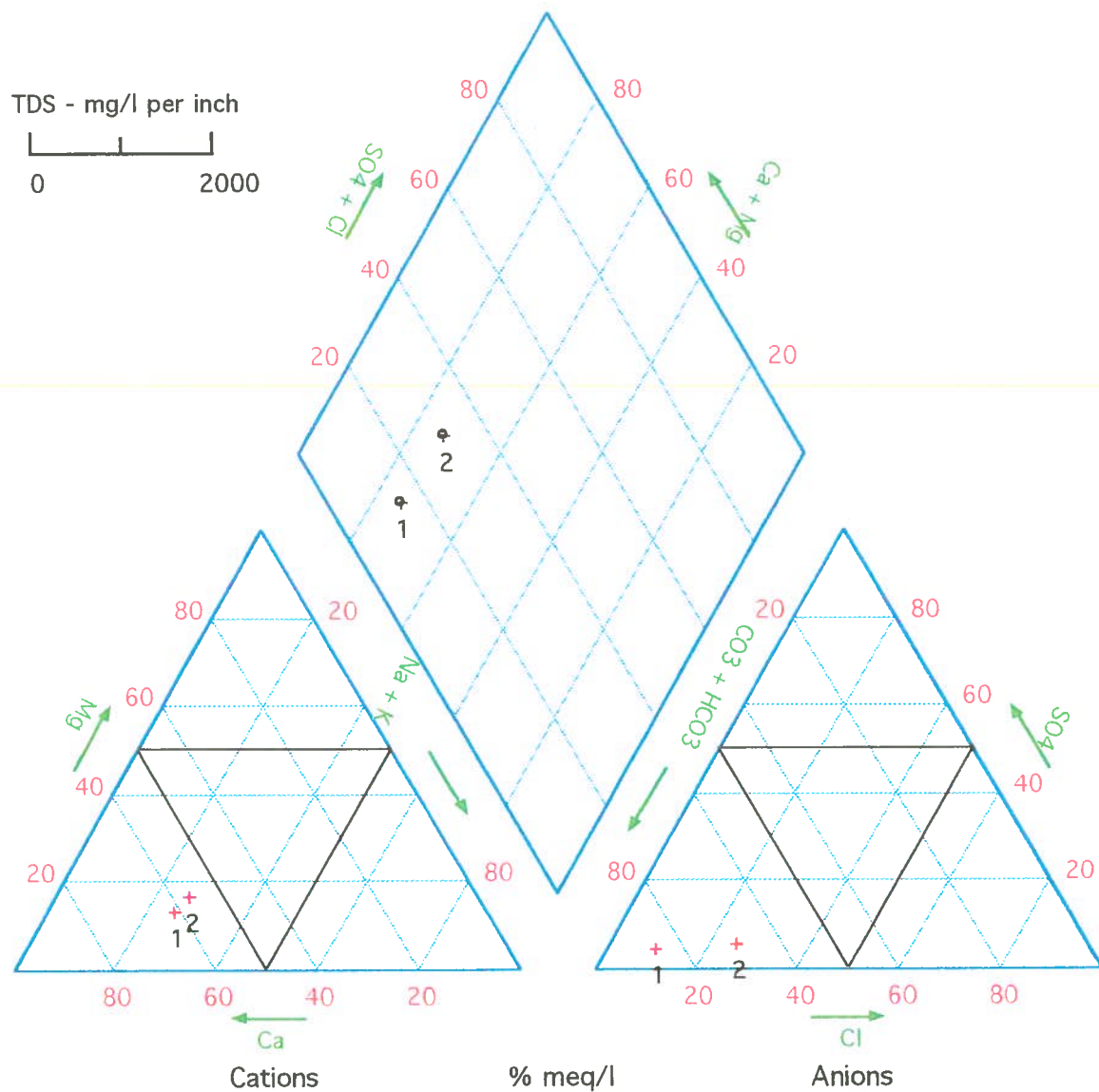


Plate 10. Spring No.'s 2 and 3 Piper Diagram					
No.	TDS	Sample	No.	TDS	Sample
1	116	Spring No. 2			
2	125	Spring No. 3			

No.	TDS	Sample	No.	TDS	Sample
1	116	Spring No. 2			
2	125	Spring No. 3			

**Table 1. Arrowhead Spring No.'s 2 and 3  
Annual Flow Volumes  
(Acre-Feet Per Year)**

YEAR	SPRING NO. 2	SPRING NO. 3
1947	112.00	24.64
1948	81.90	11.23
1949	100.80	19.04
1950	88.49	14.56
1951	49.28	7.84
1952	107.53	48.16
1953	64.02	8.89
1954	72.80	20.16
1955	64.96	15.68
1956	49.28	12.32
1957	62.02	14.67
1958	88.99	28.25
1959	57.48	18.80
1960	43.36	11.62
1961	29.94	8.85
1962	49.00	16.39
1963	34.36	9.87
1964	32.86	8.89
1965	58.30	30.68
1966	77.69	36.42
1967	83.58	54.99
1968	67.76	15.72
1969	132.96	82.14
1970	75.06	15.03
1971	51.34	14.62

YEAR	SPRING NO. 2	SPRING NO. 3
1972	51.34	14.52
1973	80.28	23.78
1974	74.77	20.80
1975	72.05	18.39
1976	64.48	11.37
1977	74.77	20.80
1978	89.92	37.60
1979	101.24	21.15
1980	112.70	48.40
1981	84.16	15.01
1982	58.90	25.40
1983	99.60	96.20
1984	78.40	24.60
1985	62.30	18.88
1986	64.23	28.78
1987	55.21	14.87
1988	63.70	18.34
1989	1.89	0.49
1990	48.72	13.43
1991	49.03	16.51
1992	76.00	42.30
1993	120.30	80.90
1994	61.20	17.70
1995	76.50	36.60
1996	66.60	29.70

ND = No Data Available

**TABLE 2. SPRING NO.'s 2 AND 3  
SUMMARY OF CHEMICAL ANALYSIS**

Method of Analysis	Constituent	Federal Max Levels	Spring No. 2	Spring No. 3
			1/25/96	1/25/96
No. M214 & M215	e.coil	<2 MPN/100 ml	ND	ND
EPA 200.7	Aluminum	0.20	ND	ND
	Antimony		ND	ND
	Arsenic	0.05	ND	ND
	Barium	2.00	ND	ND
	Beryllium	0.00	ND	ND
	Cadmium	0.01	ND	ND
	Calcium	NR	19.22	20.17
	Chromium	0.10	ND	ND
	Copper	1.00	ND	ND
	Iron	0.30	ND	ND
	Lead	0.01	ND	ND
	Magnesium	NR	2.50	3.56
	Manganese	0.05	ND	ND
	Mercury	0.00	ND	ND
	Nickel	0.10	ND	ND
	Potassium	NR	ND	ND
	Selenium		ND	ND
	Silver	0.10	ND	ND
	Sodium	NR	9.05	10.88
	Thallium	0.00	ND	ND
	Zinc	5.00	ND	ND
EPA Method 340.2	Fluoride	2.40	ND	ND
EPA Method 310.1	Total Alkalinity	NR	63.00	58.00
	Bicarbonate Alkalinity	NR	76.86	70.76
	Carbonate Alkalinity		ND	ND
EPA Method 300	Bromide	NR	ND	ND
	Chloride	250.00	5.07	14.83
	Nitrate	45.00	ND	1.03
	Phosphate		0.20	ND
	Silica	NR	27.31	33.81
	Sulfate	250.00	3.34	4.63
EPA Method 150.1	pH	NR	7.95	7.84
EPA Method 120.1	Electric Conductivity	250 umhos/cm	142.45	174.58
EPA Method 130.2	Total Hardness	NR	58.30	65.00
EPA Method 160.1	Total Dissolved Solids	NR	103.00	128.00
EPA Method 110.2	Color	NR	ND	ND
EPA Method 140.1	Odor	NR	ND	ND
EPA Method 180.1	Turbidity	5.00	ND	ND

Concentrations reported in mg/L unless otherwise specified.

ND = concentration below detection limit for method of analysis

NR = no required standard

**APPENDIX A**

**DHS Certification Documents**

**DEPARTMENT OF HEALTH SERVICES**

714/744 P Street (MS-357)  
P.O. Box 942732  
Sacramento, CA 94234-7320  
(916) 327-8041  
(916) 322-6326 FAX



May 7, 1997

Mr. Art Ramirez  
Great Spring Waters of America  
601 E. Potrero Grande Drive  
Monterey Park, CA 91754

Dear Mr. Ramirez:

This is in response to your request by facsimile to Ms. Laura Flores, dated April 23, 1997, for a letter confirming your firm's sources which are currently licensed in California.

Water from your firm's 12 spring sites, located on Arrowhead property in the San Bernadino Mountains along the south slopes of Strawberry Canyon two miles south-west of Rim Forrest, was classified on September 13, 1994 as spring water pursuant to the Health and Safety Code Section 1111<sup>70</sup>(a)(8). The classification is currently effective. The sources are designated by your firm as #1, #1A, #2, #3, #7, #7A, #7B, #7C, #8, #10, #11 and #12. The 1994 determination for the classification was based on our inspection of the sites and the information submitted by you including the analysis of water and hydrogeological study reports.

If you have questions or should require additional information, please call me at (916) 327-8041.

Sincerely,

A handwritten signature in cursive script, reading "Chang R. Lee".

Chang R. Lee, Ph.D.  
Food and Drug Scientist  
Food and Drug Branch

DEPARTMENT OF HEALTH SERVICES  
FOOD AND DRUG BRANCH

PRIVATE WATER SOURCE OPERATOR LICENSE

GREAT SPRING WATERS OF AMERICA - #2  
STRAWBERRY CANYON  
RIM FOREST, CA 91754

LICENSE NO: 86068 EXPIRATION DATE: 12/31/97

THE PERSON NAMED HEREIN IS LICENSED TO OPERATE A PRIVATE  
WATER SOURCE FROM THE ISSUE DATE TO AND INCLUDING THE  
EXPIRATION DATE. THIS LICENSE IS ISSUED IN ACCORDANCE  
WITH THE PROVISIONS OF DIVISION 104, PART 5, CHAPTER 5,  
ARTICLE 12, OF THE CALIFORNIA HEALTH AND SAFETY CODE  
AND IS NOT TRANSFERABLE TO ANY OTHER PERSON OR PLACE

ISSUE DATE: 03/21/97

DISTRICT: 37

DEPARTMENT OF HEALTH SERVICES  
FOOD AND DRUG BRANCH

PRIVATE WATER SOURCE OPERATOR LICENSE

GREAT SPRING WATERS OF AMERICA - #3  
STRAWBERRY CANYON  
RIM FOREST CA 91754

LICENSE NO: 86069

EXPIRATION DATE: 12/31/97

THE PERSON NAMED HEREIN IS LICENSED TO OPERATE A PRIVATE WATER SOURCE FROM THE ISSUE DATE TO AND INCLUDING THE EXPIRATION DATE. THIS LICENSE IS ISSUED IN ACCORDANCE WITH THE PROVISIONS OF DIVISION 104, PART 5, CHAPTER 5, ARTICLE 12, OF THE CALIFORNIA HEALTH AND SAFETY CODE AND IS NOT TRANSFERABLE TO ANY OTHER PERSON OR PLACE

ISSUE DATE: 03/21/97

DISTRICT: 37

**APPENDIX B**

**Water Quality Analytical Data**

# C O N F I D E N T I A L

Analysis Id : 12642 1405 Arrowhead Spring # 2  
Investigation: QUARTERLY (SPRING)  
Date sampled : 01-25-96 2 lgal, 2 4oz, 2 VOC vials  
Condition : Blue Ice pack  
Received by : Fatima  
Received Dt : 01-26-96 Due Date Page 1

Constituents.....	Minimum Detection Level	Fed Max Contam Level	PGA Max Contam Level	Level Found	Unit
524.2					
Benzene	.0400	5.0000	.5000	ND	ug/l
Bromobenzene	.1000	NR	.5000	ND	ug/l
Bromochloromethane	.1000	NR	.5000	ND	ug/l
Bromodichloromethane	.0800	100.0000	2.0000	ND	ug/l
Bromoform	.1200	100.0000	2.0000	ND	ug/l
Bromomethane	.1000	NR	.5000	ND	ug/l
n-Butylbenzene	.1000	NR	.5000	ND	ug/l
sec-Butylbenzene	.1000	NR	.5000	ND	ug/l
tert-Butylbenzene	.1000	NR	.5000	ND	ug/l
Carbon Tetrachloride	.2100	5.0000	.5000	ND	ug/l
Chlorobenzene	.1000	NR	.5000	ND	ug/l
Chloroethane	.1000	NR	.5000	ND	ug/l
Chloroform	.0300	100.0000	2.0000	ND	ug/l
Chloromethane	.1000	NR	.5000	ND	ug/l
2-Chlorotoluene	.1000	NR	.5000	ND	ug/l
4-Chlorotoluene	.1000	NR	.5000	ND	ug/l
Dibromochloromethane	.0500	100.0000	2.0000	ND	ug/l
1,2-Dibromochloropropane (DBCP)	.0200	.2000	.2000	ND	ug/l
1,2-Dibromoethane	.0100	.0500	.0500	ND	ug/l
Dibromomethane	.1000	NR	.5000	ND	ug/l
1,2-Dichlorobenzene (o-DCB)	.1000	600.0000	.5000	ND	ug/l
1,3-Dichlorobenzene (m-DCB)	.1000	600.0000	.5000	ND	ug/l
1,4-Dichlorobenzene (p-DCB)	.0300	75.0000	.5000	ND	ug/l
Dichlorodifluoromethane	.1000	NR	.5000	ND	ug/l
1,1-Dichloroethane (1,1-DCA)	.1000	NR	.5000	ND	ug/l
1,2-Dichloroethane (1,2-DCA)	.0600	5.0000	.5000	ND	ug/l
1,1-Dichloroethene	.1000	7.0000	.5000	ND	ug/l
cis-1,2-Dichloroethene	.1000	70.0000	.5000	ND	ug/l
trans-1,2-Dichloroethene	.1000	100.0000	.5000	ND	ug/l
1,2-Dichloropropane	.1000	5.0000	.5000	ND	ug/l
1,3-Dichloropropane	.1000	NR	.5000	ND	ug/l
2,2-Dichloropropane	.1000	NR	.5000	ND	ug/l
1,1-Dichloropropene	.1000	NR	.5000	ND	ug/l
1,3-Dichloropropene Total	.1000	NR	.5000	ND	ug/l
Ethylbenzene	.1000	700.0000	.5000	ND	ug/l
Hexachlorobutadiene	.1000	NR	.5000	ND	ug/l
Isopropylbenzene	.1000	NR	.5000	ND	ug/l
Isopropyltoluene	.1000	NR	.5000	ND	ug/l
Methylene chloride	.1000	5.0000	.5000	ND	ug/l
Naphthalene	.1000	NR	.5000	ND	ug/l
n-Propylbenzene	.1000	NR	.5000	ND	ug/l
Styrene	.1000	100.0000	.5000	ND	ug/l
1,2-Tetrachloroethane	.1000	NR	.5000	ND	ug/l
1,1,2,2-Tetrachloroethane	.1000	NR	.5000	ND	ug/l

ND - None Detected NR - None Required NA - Not Analyzed  
- Lvl Found exceeds Fed or PGA mcl. \*\* - Exceeds both Fed and PGA mcl.

C O N F I D E N T I A L

Analysis Id : 12642 1405 Arrowhead Spring # 2  
 Investigation: QUARTERLY (SPRING)  
 Date sampled : 01-25-96 2 1gal, 2 4oz, 2 VOC vials  
 Condition : Blue Ice pack  
 Received by : Fatima  
 Received Dt : 01-26-96 Due Date Page 2

Constituents.....	Minimum Detection Level	Fed Max Contam Level	PGA Max Contam Level	Level Found	Unit
1,1,2,2-Tetrachloroethane	.1000	NR	.5000	ND	ug/l
Tetrachloroethene	.1000	5.0000	.5000	ND	ug/l
Toluene	.1100	1000.0000	.5000	ND	ug/l
Total Trihalomethanes*	.1000	100.0000	2.0000	ND	ug/l
1,2,3-Trichlorobenzene	.1000	NR	.5000	ND	ug/l
1,2,4-Trichlorobenzene	.1000	9.0000	.5000	ND	ug/l
1,1,1-Trichloroethane	.1000	200.0000	.5000	ND	ug/l
1,1,1-TCA					
1,1,2-Trichloroethane	.1000	5.0000	.5000	ND	ug/l
1,1,2-TCA					
Trichloroethene (TCE)	.1000	5.0000	.5000	ND	ug/l
Trichlorofluoromethane (Freon 11)	.1000	150.0000	.5000	ND	ug/l
1,2,3-Trichloropropane	.1000	NR	.5000	ND	ug/l
1,2,4-Trimethylbenzene	.1000	NR	.5000	ND	ug/l
1,3,5-Trimethylbenzene	.1000	NR	.5000	ND	ug/l
Vinyl Chloride (VC)	.1000	2.0000	.5000	ND	ug/l
Hydrocarbons, Total (m,p & O)	.1000	0000.0000	.5000	ND	ug/l
1,3-Dichloropropene	.1000	NR	.5000	ND	ug/l
trans-1,3-Dichloropropene	.1000	NR	.5000	ND	ug/l
ANIONS					
Bicarbonate	1.0000	NR	NR	76.8600	mg/l
Carbonate	1.0000	NR	NR	ND	mg/l
Chloride	.5000	250.0000	50.0000	5.0700	mg/l
Fluoride	.1000	2.4000	2.0000	ND	mg/l
Fluoride (Added)	.1000	1.7000	1.1000		mg/l
Nitrate (NO3-N)	1.0000	10.0000	5.0000	ND	mg/l
Phosphate (PO4-P)	.0500	NR	NR	.2000	mg/l
Silica	.5000	NR	NR	27.3100	mg/l
Sulfate	.5000	250.0000	50.0000	3.3400	mg/l
Nitrite	.1000	1.0000	1.0000	ND	mg/l
Amide	.1000	NR	NR	ND	mg/L
CATIONS					
Aluminum	.0100	.2000	.0500	ND	mg/l
Arsenic	.0050	.0500	.0050	ND	mg/l
Barium	.0100	2.0000	.5000	ND	mg/l
Cadmium	.0010	.0050	.0050	ND	mg/l
Calcium	.5000	NR	75.0000	19.2200	mg/l
Chromium	.0010	.1000	.0050	ND	mg/l
Copper	.0050	1.0000	.1000	ND	mg/l
Iron	.0100	.3000	.0500	ND	mg/l
Lead	.0020	.0050	.0050	ND	mg/l
Magnesium	.0500	NR	25.0000	2.5000	mg/l
Manganese	.0030	.0500	.0050	ND	mg/l

- None Detected NR - None Required NA - Not Analyzed  
 \* - Lvl Found exceeds Fed or PGA mcl. \*\* - Exceeds both Fed and PGA mcl.

C O N F I D E N T I A L

Analysis Id : 12642 1405 Arrowhead Spring # 2  
 Investigation: QUARTERLY (SPRING)  
 Date sampled : 01-25-96 2 lgal, 2 4oz, 2 VOC vials  
 Condition : Blue Ice pack  
 Received by : Fatima  
 Received Dt : 01-26-96 Due Date Page 3

Constituents.....	Minimum Detection Level	Fed Max Contam Level	PGA Max Contam Level	Level Unit Found
Selenium	.0050	.0100	.0050	ND mg/l
Silver	.0050	.1000	.0050	ND mg/l
Sodium	.1000	NR	21.0000	9.0500 mg/l
Zinc	.0500	5.0000	1.0000	ND mg/l
Beryllium	.0005	.0040	.0040	ND mg/L
Antimony	.0010	.0060	.0060	ND mg/L
Nickel	.0010	.1000	.1000	ND mg/L
Thallium	.0005	.0020	.0020	ND mg/L
SECONDARY QUALITY FACTORS				
Coliforms	1.0000	2.2000	1.0000	ND c/100
Color	5.0000	15.0000	5.0000	ND units
Conductivity	1.0000	NR	NR	142.4500 uS/cm
Odor	1.0000	3.0000	3.0000	ND T.O.N
Phenolphthalein	1.0000	NR	NR	ND mg/l
PC Product	1.0000	NR	100.0000	C/ML
PC Source	1.0000	NR	100.0000	ND C/ML
TDS, Evaporated	.5000	NR	250.0000	103.0000 mg/l
Total Alkalinity	1.0000	NR	200.0000	63.0000 mg/l
Calc Hardness	.5000	NR	200.0000	58.3000 mg/l
Turbidity Product	.1000	5.0000	.2000	ntu
Turbidity Source	.1000	5.0000	.4000	ND ntu
pH	.0000	NR	NR	7.9500 pH
Flow Rate	NR	NR	NR	gal/m
ALGAE	NR	NR	NR	ND units
EAST	1.0000	NR	NR	ND CFU/M
COLD	1.0000	NR	NR	ND CFU/M
Pseudomonas aeruginosa	1.0000	NR	1.0000	ND MPN

Arrowhead Quality Services Laboratory

Chemist

Laboratory Manager

# CONFIDENTIAL

Analysis Id : 12643 1406 Arrowhead Spring # 3  
Investigation: QUARTERLY (SPRING)  
Date sampled : 01-25-96 2 1gal, 2 4oz, 2 VOC vials  
Condition : Blue Ice pack  
Received by : Fatima  
Received Dt : 01-26-96 Due Date Page 1

Constituents.....	Minimum Detection Level	Fed Max Contam Level	PGA Max Contam Level	Level Found	Unit
524.2					
Benzene	.0400	5.0000	.5000	ND	ug/l
Bromobenzene	.1000	NR	.5000	ND	ug/l
Bromochloromethane	.1000	NR	.5000	ND	ug/l
Bromodichloromethane	.0800	100.0000	2.0000	ND	ug/l
Bromoform	.1200	100.0000	2.0000	ND	ug/l
Bromomethane	.1000	NR	.5000	ND	ug/l
n-Butylbenzene	.1000	NR	.5000	ND	ug/l
m-Butylbenzene	.1000	NR	.5000	ND	ug/l
tert-Butylbenzene	.1000	NR	.5000	ND	ug/l
Carbon Tetrachloride	.2100	5.0000	.5000	ND	ug/l
Chlorobenzene	.1000	NR	.5000	ND	ug/l
Chloroethane	.1000	NR	.5000	ND	ug/l
Chloroform	.0300	100.0000	2.0000	ND	ug/l
Chloromethane	.1000	NR	.5000	ND	ug/l
o-Chlorotoluene	.1000	NR	.5000	ND	ug/l
m-Chlorotoluene	.1000	NR	.5000	ND	ug/l
p-Chlorotoluene	.1000	NR	.5000	ND	ug/l
Dibromochloromethane	.0500	100.0000	2.0000	ND	ug/l
Dibromochloropropane (DBCP)	.0200	.2000	.2000	ND	ug/l
1,2-Dibromoethane	.0100	.0500	.0500	ND	ug/l
Dibromomethane	.1000	NR	.5000	ND	ug/l
o-Dichlorobenzene (o-DCB)	.1000	600.0000	.5000	ND	ug/l
m-Dichlorobenzene (m-DCB)	.1000	600.0000	.5000	ND	ug/l
p-Dichlorobenzene (p-DCB)	.0300	75.0000	.5000	ND	ug/l
Chlorodifluoromethane	.1000	NR	.5000	ND	ug/l
1,1-Dichloroethane (1,1-DCA)	.1000	NR	.5000	ND	ug/l
1,2-Dichloroethane (1,2-DCA)	.0600	5.0000	.5000	ND	ug/l
1,1-Dichloroethene	.1000	7.0000	.5000	ND	ug/l
trans-1,2-Dichloroethene	.1000	70.0000	.5000	ND	ug/l
cis-1,2-Dichloroethene	.1000	100.0000	.5000	ND	ug/l
1,2-Dichloropropane	.1000	5.0000	.5000	ND	ug/l
1,3-Dichloropropane	.1000	NR	.5000	ND	ug/l
1,2-Dichloropropane	.1000	NR	.5000	ND	ug/l
1,1-Dichloropropene	.1000	NR	.5000	ND	ug/l
1,3-Dichloropropene Total	.1000	NR	.5000	ND	ug/l
Toluene	.1000	700.0000	.5000	.1200	ug/l
Hexachlorobutadiene	.1000	NR	.5000	ND	ug/l
Isopropylbenzene	.1000	NR	.5000	ND	ug/l
Isopropyltoluene	.1000	NR	.5000	ND	ug/l
Ethylene chloride	.1000	5.0000	.5000	ND	ug/l
Naphthalene	.1000	NR	.5000	ND	ug/l
Propylbenzene	.1000	NR	.5000	ND	ug/l
Styrene	.1000	100.0000	.5000	ND	ug/l
1,1,2-Tetrachloroethane	.1000	NR	.5000	ND	ug/l
1,1,2,2-Tetrachloroethane	.1000	NR	.5000	ND	ug/l

D - None Detected NR - None Required NA - Not Analyzed  
- Lvl Found exceeds Fed or PGA mcl. \*\* - Exceeds both Fed and PGA mcl.

C O N F I D E N T I A L

Analysis Id : 12643 1406 Arrowhead Spring # 3  
Investigation: QUARTERLY (SPRING)  
Date sampled : 01-25-96 2 lgal, 2 4oz, 2 VOC vials  
Condition : Blue Ice pack  
Received by : Fatima  
Received Dt : 01-26-96 Due Date Page 2

Constituents.....	Minimum Detection Level	Fed Max Contam Level	PGA Max Contam Level	Level Found	Unit
1,1,2,2-Tetrachloroethane	.1000	NR	.5000	ND	ug/l
Tetrachloroethene	.1000	5.0000	.5000	ND	ug/l
Toluene	.1100	1000.0000	.5000	.1400	ug/l
Total Trihalomethanes*	.1000	100.0000	2.0000	ND	ug/l
1,2,3-Trichlorobenzene	.1000	NR	.5000	ND	ug/l
1,2,4-Trichlorobenzene	.1000	9.0000	.5000	ND	ug/l
1,1,1-Trichloroethane	.1000	200.0000	.5000	ND	ug/l
1,1,1-TCA)					
1,1,2-Trichloroethane	.1000	5.0000	.5000	ND	ug/l
1,1,2-TCA)					
Trichloroethene (TCE)	.1000	5.0000	.5000	ND	ug/l
Trichlorofluoromethane (Freon 11)	.1000	150.0000	.5000	ND	ug/l
1,2,3-Trichloropropane	.1000	NR	.5000	ND	ug/l
1,2,4-Trimethylbenzene	.1000	NR	.5000	ND	ug/l
1,3,5-Trimethylbenzene	.1000	NR	.5000	ND	ug/l
Vinyl Chloride (VC)	.1000	2.0000	.5000	ND	ug/l
Xylenes, Total (m,p & O)	.1000	0000.0000	.5000	ND	ug/l
1,3-Dichloropropene	.1000	NR	.5000	ND	ug/l
trans-1,3-Dichloropropene	.1000	NR	.5000	ND	ug/l
ANIONS					
Bicarbonate	1.0000	NR	NR	70.7600	mg/l
Carbonate	1.0000	NR	NR	ND	mg/l
Chloride	.5000	250.0000	50.0000	14.8300	mg/l
Fluoride	.1000	2.4000	2.0000	ND	mg/l
Fluoride (Added)	.1000	1.7000	1.1000		mg/l
Nitrate (NO3-N)	1.0000	10.0000	5.0000	1.0300	mg/l
Phosphate (PO4-P)	.0500	NR	NR	ND	mg/l
Silica	.5000	NR	NR	33.8100	mg/l
Sulfate	.5000	250.0000	50.0000	4.6300	mg/l
Nitrite	.1000	1.0000	1.0000	ND	mg/l
Bromide	.1000	NR	NR	ND	mg/L
CATIONS					
Aluminum	.0100	.2000	.0500	ND	mg/l
Arsenic	.0050	.0500	.0050	ND	mg/l
Barium	.0100	2.0000	.5000	ND	mg/l
Cadmium	.0010	.0050	.0050	ND	mg/l
Calcium	.5000	NR	75.0000	20.1700	mg/l
Chromium	.0010	.1000	.0050	ND	mg/l
Copper	.0050	1.0000	.1000	ND	mg/l
Iron	.0100	.3000	.0500	ND	mg/l
Lead	.0020	.0050	.0050	ND	mg/l
Magnesium	.0500	NR	25.0000	3.5600	mg/l
Manganese	.0030	.0500	.0050	ND	mg/l

ND - None Detected NR - None Required NA - Not Analyzed  
\* - Lvl Found exceeds Fed or PGA mcl. \*\* - Exceeds both Fed and PGA mcl.

C O N F I D E N T I A L

Analysis Id : 12643 1406 Arrowhead Spring # 3  
 Investigation: QUARTERLY (SPRING)  
 Date sampled : 01-25-96 2 1gal, 2 4oz, 2 VOC vials  
 Condition : Blue Ice pack  
 Reviewed by : Fatima  
 Received Dt : 01-26-96 Due Date Page 3

Constituents.....	Minimum Detection Level	Fed Max Contam Level	PGA Max Contam Level	Level Found	Unit
Selenium	.0050	.0100	.0050	ND	mg/l
Silver	.0050	.1000	.0050	ND	mg/l
Sodium	.1000	NR	21.0000	10.8800	mg/l
Zinc	.0500	5.0000	1.0000	ND	mg/l
Beryllium	.0005	.0040	.0040	ND	mg/L
Antimony	.0010	.0060	.0060	ND	mg/L
Nickel	.0010	.1000	.1000	ND	mg/L
Thallium	.0005	.0020	.0020	ND	mg/L
SECONDARY QUALITY FACTORS					
Coliforms	1.0000	2.2000	1.0000	ND	c/100
Color	5.0000	15.0000	5.0000	ND	units
Conductivity	1.0000	NR	NR	174.5800	uS/cm
Odor	1.0000	3.0000	3.0000	ND	T.O.N
Phenolphthalein	1.0000	NR	NR	ND	mg/l
PC Product	1.0000	NR	100.0000		C/ML
PC Source	1.0000	NR	100.0000	ND	C/ML
TDS, Evaporated	.5000	NR	250.0000	128.0000	mg/l
Total Alkalinity	1.0000	NR	200.0000	58.0000	mg/l
Calc Hardness	.5000	NR	200.0000	65.0000	mg/l
Turbidity Product	.1000	5.0000	.2000		ntu
Turbidity Source	.1000	5.0000	.4000	ND	ntu
pH	.0000	NR	NR	7.8400	pH
Flow Rate	NR	NR	NR		gal/m
ALGAE	NR	NR	NR	ND	units
EAST	1.0000	NR	NR	ND	CFU/M
OLD	1.0000	NR	NR	ND	CFU/M
Pseudomonas aeruginosa	1.0000	NR	1.0000	ND	MPN

Arrowhead Quality Services Laboratory

Chemist

Laboratory Manager